DIGI

TX64

User Guide

원문: Digi TX64 사용설명서(영문) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

Revision history—90002348

Revision	Date	Description
A	November 2019	Initial release of Digi TX64 firmware version 19.11.
B	February 2020	Release of Digi TX64 firmware version 20.2: • Digi SureLink™ support (formerly known as active recovery). ◦ Enabled by default on preconfigured WANs and WLANs. • Role-based user access. ◦ Allow shell option added to authentication. ◦ Read-only access option added to user configuration.

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Revision	Date	Description
C	June, 2020	Release of Digi TX64 firmware version 20.5: • Support for LDAP user authentication. • Preconfigured Wi-Fi SSID and password enabled by default. ◦ The default SSID for both of the access points is: Digi-TX64-serial_number ◦ Default password is the unique password as found on the device's label. You will need to change the SSID and password before any configuration changes can be saved. • Wi-Fi client isolation options. • Firmware installation from the Digi firmware server. • Enhanced Digi Remote Manager support: ◦ Support for remote proxy server for Digi Remote Manager. ◦ Watchdog support for connection to Digi Remote Manager. ◦ Locally authenticate CLI option added to Digi Remote Manager configuration to control whether a user is required to provide device-level authentication when accessing the console of the device through Digi Remote Manager. ◦ Added a randomized two minute delay window for uploading health metrics to the Digi Remote Manager to avoid situations where multiple devices are uploading metrics at the same time. • Enhanced Python support: ◦ Support for the Python serial module to allow programmatic access to serial ports. ◦ Support for the Python HID module to allow programmatic access to a USB Human Interface Device (HID) from within a Python script. • Application mode for serial ports to allow for Python programmatic control.

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- Product serial number (s)
- Firmware version
- Operating system/browser (if applicable)
- Logs (from time of reported issue)
- Trace (if possible)
- Description of issue
- Steps to reproduce

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Contents

Revision history—80002346 8

What's new in Digi TX64 version 25.5

Digi TX64 Quick start

Quick start using the Digi Remote Manager mobile app 15
Step 1: What's in the box 16
Step 2: Gather accessories 16
Step 3: Connect 17
Step 4: Power up 18
Step 5: Configure 18

Digi TX64 hardware reference

TX64 key features 19
TX64 hardware specifications 19
TX64 front view 19
TX64 LEDs 20
Power 20
GNSS Service 20
Wi-Fi1 Service 20
Wi-Fi2 Service 20
WWAN1/WWAN2 Signal 20
WWAN1/WWAN2 Service 20
Ethernet 1–4 Link and Activity (on rear panel) 21
Power sensor and button behavior 21
TX64 back view 22
Digi TX64 serial connector pinout 22

Hardware setup

Install SIM cards 24
Tips for improving cellular signal strength 24
Connect data cables 24
Connect antennas 24
Mount the TX64 to a mounting surface 25
Connect power 25
Mount and ground chassis 25
TX64 electrical rating 26

원문: Digi TX64 사용설명서(영문) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

TX64 power connector 27

Configuration and management

Restore TX64 default settings 38
Local WebUI 38
Digi Remote Manager 38
Default interface configuration 38
Other default configuration settings 41
Reset default password for the default admin user 42
Reset default SSIDs and pre-shared keys for the preconfigured Wi-Fi access points 43
Configuration methods 44
Using Digi Remote Manager 44
Access Digi Remote Manager 44
Using the web interface 44
Log out of the web interface 47
Using the command line 48
Access the command line interface 48
Log in to the command line interface 48
Exit the command line interface 49

Interfaces

Wide Area Networks (WANs) 51
Wide Area Networks (WANs) and Wireless Wide Area Networks (WWANs) 52
Configure WAN/WWAN priority and default route metrics 53
WAN/WWAN failover 54
Configure SureLink active recovery to detect WAN/WWAN failures 54
Configure the device to reboot when a failure is detected 57
Disable SureLink 58
Example: Use a ping test for WAN failover from Ethernet to cellular 58
Using Ethernet devices in a WAN 61
Using cellular modems in a Wireless WAN (WWAN) 61
Configure a Wide Area Network (WAN) 62
Configure a Wireless Wide Area Network (WWAN) 63
Show WAN and WWAN status and statistics 66
Delete a WAN or WWAN 66
Local Area Networks (LANs) 67
About Local Area Networks (LANs) 67
Configure a LAN 67
Example: Configure two LANs 68
Show LAN status and statistics 69
Delete a LAN 70
DHCP servers 70
Create a Virtual LAN (VLAN) route 77
Bridging 78
Edit the preconfigured LAN1 bridge 78
Configure a bridge 78

Serial port

Configure the serial port 80
Add a USB serial port 80

TX64 User Guide 6

원문: Digi TX64 사용설명서(영문) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

Show serial status and statistics 176

Wi-Fi

Wi-Fi configuration 177
Default access point SSID and password 177
Default Wi-Fi configuration 177
Configure the Wi-Fi module channel 179
Configure the Wi-Fi module band and protocol 181
Configure a Wi-Fi access point with no security 183
Configure a Wi-Fi access point with personal security 186
Configure a Wi-Fi access point with enterprise security 190
Isolate Wi-Fi clients 195
Isolate clients connected to the same access point 195
Isolate clients connected to different access points 196
Show Wi-Fi access point status and statistics 198
Configure a Wi-Fi client and add client networks 199
Show Wi-Fi client status and statistics 202

Hotspot

Hotspot authentication modes 205
Hotspot DHCP server 206
Hotspot security 207
Hotspot configuration 208
Enable hotspot using the default configuration 209
Change the default hotspot SSID 210
Change the default hotspot IP address and subnet 210
Change the default hotspot bandwidth limits 212
Add an Ethernet port to the default hotspot 213
Create a new hotspot 214
Configure the hotspot to use local shared password authentication 215
Configure the hotspot to use RADIUS shared password authentication 216
Configure the hotspot to use RADIUS users authentication 218
Configure the hotspot to use HotspotSystem authentication 220
Show hotspot status and statistics 222
Customize the hotspot login page 227
Edit sample hotspot HTML pages 228
Upload custom hotspot HTML pages 230
Restore hotspot default sample pages 230
Hotspot RADIUS attributes 230

Routing

IP routing 232
Configure a static route 232
Delete a static route 232
Policy-based routing 234
Configure a routing policy 234
Example: Dual WAN policy-based routing 236
Example: Route traffic to a specific WAN interface based on the client MAC address 237
Routing services 239
Configure routing services 239

원문: Digi TX64 사용설명서(영문) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

Show the routing table
Dynamic DNS
Configure dynamic DNS
Virtual Router Redundancy Protocol (VRRP)
Configure VRRP
Show VRRP status and statistics

Virtual Private Networks (VPN)

IPsec
IPsec data protection
IPsec modes
Internet Key Exchange (IKE) settings
Authentication
Configure an IPsec tunnel
Configure IPsec failover
Configure SureLink active recovery for IPsec
Show IPsec status and statistics
Configure a Simple Certificate Enrollment Protocol client
Example: SCEP client configuration with Fortinet SCEP server
OpenVPN
Configure an OpenVPN server
Configure an OpenVPN Authentication Group and User
Configure an OpenVPN client by using an .ovpn file
Configure an OpenVPN client without using an .ovpn file
Configure active recovery for OpenVPN
Show OpenVPN server status and statistics
Show OpenVPN client status and statistics
Generic Routing Encapsulation (GRE)
Configuring a GRE tunnel
Show GRE tunnels
Example: GRE tunnel over an IPSec tunnel

Services

Allow remote access for web administration and SSH
Configure the web administration service
Configure SSH access
Use SSH with key authentication
Generating SSH key pairs
Configure telnet access
Configure DNS
Simple Network Management Protocol (SNMP)
SNMP Security
Configure Simple Network Management Protocol (SNMP)
Download MIBs
Location Information
Configure the location server
Enable or disable the internal GNSS module
Use a dead reckoning external USB GNSS receiver
Configure the device to accept location messages from external sources
Forward location information to a remote host
Show location information
System time

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Configure the system time
Network Time Protocol
Configure the device as an NTP server
Configure a multicast route
Enable service discovery (mDNS)
Use the iPerf service
Example performance test using iperf3

Applications

Configure applications to run automatically
Task one: Upload the application
Task two: Configure the application to run automatically
Run a Python application at the shell prompt
Start an interactive Python session
Digidevice module
Use digidevice.cli to execute CLI commands
Use digidevice.datapoint to upload custom datapoints to Digi Remote Manager
Use digidevice.config for device configuration
Use Python to respond to Digi Remote Manager SCI requests
Use digidevice runtime to access the runtime database
Using Python to upload the device name to Digi Remote Manager
The digidevice.led submodule
Hid module
Help for the hid module
Use Python to access serial ports

User authentication

TX64 user authentication
User authentication methods
Add a new authentication method
Delete an authentication method
Rearrange the position of authentication methods
Authentication groups
Change the access rights for a predefined group
Add an authentication group
Delete an authentication group
Local users
Change a local user's password
Configure a local user
Delete a local user
Terminal Access Controller Access-Control System Plus (TACACS+)
TACACS+ user configuration
TACACS+ server failover and failback to local authentication
Configure your TX64 device to use a TACACS+ server
Remote Authentication Dial-In User Service (RADIUS)
RADIUS user configuration
RADIUS server failover and failback to local configuration
Configure your TX64 device to use a RADIUS server
LDAP
LDAP user configuration
LDAP server failover and failback to local configuration
Configure your TX64 device to use an LDAP server

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Disable shell access
Set the idle timeout for TX64 users
Example user configuration
Example 1: Administrator user with local authentication
Example 2: RADIUS, TACACS+, and local authentication for one user

Firewall

Firewall configuration
Create a custom firewall zone
Configure the firewall zone for a network interface
Delete a custom firewall zone
Port forwarding rules
Configure port forwarding
Delete a port forwarding rule
Packet filtering
Configure packet filtering
Enable or disable a packet filtering rule
Delete a packet filtering rule
Configure custom firewall rules
Configure captive portals
Delete captive portals
Configure Quality of Service options
Web filtering
Configure web filtering with Cisco Umbrella
Configure web filtering with manual DNS servers
Verify your web filtering configuration
Show web filter service information

System administration

Review device status
Configure system information
Update system firmware
Manage firmware updates using Digi Remote Manager
Certificate management for firmware images
Update cellular module firmware
Reboot your TX64 device
Reboot your device immediately
Schedule reboots of your device
Reset the device to factory defaults
Configure power delays for power ignition sensor
Configure power button behavior
Configure automatic reboot behavior for temporary power drop
Configuration files
Save configuration changes
Save configuration to a file
Restore the device configuration
Schedule system maintenance tasks

Monitoring

IntelliFlow

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Enable IntelFlow
Use IntelFlow to display average CPU and RAM usage
Use IntelFlow to display top data usage information
Use IntelFlow to display data usage by host over time
Configure NetFlow Probe
Enable the Bluetooth scanner
Display the output of the Bluetooth scanner
Enable the Wi-Fi scanner
Required configuration
Additional configuration
Display the output of the Wi-Fi scanner

Central management with Digi Remote Manager

Digi Remote Manager support
Configure Digi Remote Manager
Collect device health data and set the sample interval
Log into Digi Remote Manager
Use Digi Remote Manager to view and manage your device
Add a device to Digi Remote Manager
View Digi Remote Manager connection status
Use the Digi Remote Manager mobile app
Configure multiple devices using profiles
Learn more

File system

The TX64 local file system
Display directory contents
Create a directory
Display file contents
Copy a file or directory
Move or rename a file or directory
Delete a file or directory
Upload and download files
Upload and download files by using the Web UI
Upload and download files by using the Secure Copy command
Upload and download files using SFTP

Diagnostics

Generate a support report
View system event logs
View System Logs
View Event Logs
Configure syslog servers
Configure options for the event and system logs
Analyze network traffic
Configure packet capture for the network analyzer
Example filters for capturing data traffic
Capture packets from the command line
Stop capturing packets
Show captured traffic data

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Save captured data traffic to a file
Download captured data to your PC
Clear captured data
Use the ping command to troubleshoot network connections
Ping to check Internet connection
Stop ping commands
Use the traceroute command to diagnose IP routing problems

Digi TX64 regulatory and safety statements

RF exposure statement
Federal Communication (FCC) Part 15 Class B
Radio Frequency Interference (RFI) (FCC 15.105)
European Community - CE Mark Declaration of Conformity (DoC)
CE mark (Europe)
Maximum transmit power for radio frequencies
Innovation, Science, and Economic Development Canada (IC) certifications
RoHS compliance statement
Safety statements
Special safety notes for wireless routers
Product disposal instructions

Digi TX64 certifications

International EMC (Electromagnetic Compatibility) and safety standards

Command line interface

Access the command line interface
Log in to the command line interface
Exit the command line interface
Execute a command from the web interface
Display help for commands and parameters
The help command
The question mark (?) command
Display help for individual commands
Use the Tab key or the space bar to display abbreviated help
Auto-complete commands and parameters
Available commands
Use the scp command
Display status and statistics using the show command
show config
show system
show network
Device configuration using the command line interface
Execute configuration commands at the root Admin CLI prompt
Display help for the config command from the root Admin CLI prompt
Configuration mode
Enable configuration mode
Enter configuration commands in configuration mode
Save changes and exit configuration mode
Exit configuration mode without saving changes
Configuration actions

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Display command line help in configuration mode
Move within the configuration schema
Manage elements in lists
The revert command
Enter strings in configuration commands
Example: Create a new user by using the command line
Example: Configure multiple WANs and LANs by using the command line
Command line reference
analyzer
cp
help
ls
mkdir
modem
modem pulse-status [mal ATRRRd] [name ATRRRd]
more
mv
ping
reboot
rm
scp
show
system
traceroute
update

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What's new in Digi TX64 version 20.5

Release of Digi TX64 firmware version 20.5:

- Support for LDAP user authentication.
- Preconfigured Wi-Fi SSID and password enabled by default.
  - The default SSID for both of the access points is:

    Digi-TX64-serial_number
  - Default password is the unique password as found on the device's label.

  You will need to change the SSID and password before any configuration changes can be saved.
- Wi-Fi client isolation options.
- Firmware installation from the Digi firmware server.
- Enhanced Digi Remote Manager support:
  - Support for remote proxy server for Digi Remote Manager.
  - Watchdog support for connection to Digi Remote Manager.
  - Locally authenticate CLI option added to Digi Remote Manager configuration to control whether a user is required to provide device-level authentication when accessing the console of the device through Digi Remote Manager.
  - Added a randomized two minute delay window for uploading health metrics to the Digi Remote Manager to avoid situations where multiple devices are uploading metrics at the same time.
- Enhanced Python support:
  - Support for the Python serial module to allow programmatic access to serial ports.
  - Support for the Python HID module to allow programmatic access to a USB Human Interface Device (HID) from within a Python script.
- Application mode for serial ports to allow for Python programmatic control.

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Digi TX64 Quick start

The following steps guide you through the setup of your Digi TX64 device.

Quick start using the Digi Remote Manager mobile app

After connecting your hardware and powering up, you can use the Digi Remote Manager mobile app to quickly install your TX64 into your Digi Remote Manager account.

Here's how:

If you already have a Digi Remote Manager account:

1. Download the **Digi Remote Manager** mobile app from the App Store (iPhone) or Google Play (Android).
2. Click **Log In** or **Sign Up** and log in to your account.
3. From the menu, select **Install a device with a QR or bar code** and scan the installation QR code on the label.
4. Follow the prompts to complete your TX64 registration.

If you need to sign up for a Digi Remote Manager account:

1. Click here to create a new account. You'll receive an email with login instructions.
2. On your smartphone or tablet, download the **Digi Remote Manager** mobile app from the App Store (iPhone) or Google Play (Android).
3. Open the **Digi Remote Manager** mobile app, click **Log In** and log into your new account.
4. From the menu, select **Install a device with a QR or bar code** and scan the installation QR code on the label.
5. Follow the prompts to complete your TX64 registration.

Step 1: What's in the box

When you open the TX64 package, look for the following:

- **Digi TX64 device**

  The Digi TX64 has a product label on the bottom of the device. The label includes product identification information and the default password assigned to the device.

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- **Antennas**



Two cellular antenna are included. For the Wi-Fi-enabled TX64-W device, a Wi-Fi antenna is also included.

- **Power supply and adapters**



- **Ethernet cable**
- **Insert cards**
- **Digi TX64 label**

  Printed copy of the product label on the bottom of your device. You can affix this label to the top or side of the device such that you can access the label after the device is mounted, or store the label in a safe place for future reference.

- **Digi CORE modem label**

  Printed copy of the CORE modem label on the bottom of your CORE modem. You can affix this label to the top or side of the device such that you can access the label after the device is mounted, or store the label in a safe place for future reference.

Step 2: Gather accessories

Digi offers several TX64 accessory kits so you can purchase exactly what you need to support your TX64. See TX64 support for a list of accessory kits.

Here's the list of accessories used in this Quick start:



Antennas
Use antennas provided by a Digi accessory kit or use alternate antennas that comply with the TX64 antenna requirements.



Ethernet cable(s)

- If you intend to configure Ethernet WAN access at this time, use an Ethernet cable to connect the TX64 WAN/ETH1 port to a WAN.
- Use an Ethernet cable to connect the TX64 ETH2 port to a laptop or PC to access the local web interface via a browser.

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Phillips-head screwdriver
Use a #1 Phillips-head screwdriver to remove and replace the SIM gasket cover when installing SIM cards.



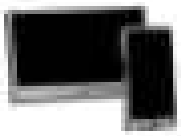
Power supply
Use a power supply provided by a Digi accessory kit or use an alternate power supply that complies with the power supply requirements.



Laptop or personal computer
Use an Ethernet cable to connect your TX64 to a laptop or PC.



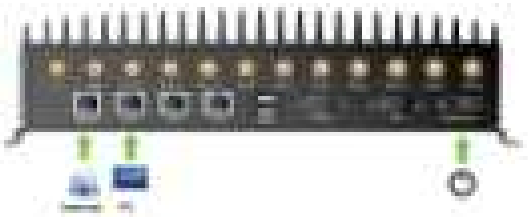
SIM card(s)
If you intend to configure cellular WWAN access at this time, acquire SIM cards as needed. Note the carrier, network APN (Access Point Name), and SIM pin (if any) for each card.



Smart phone or tablet
Optional: Use a smart phone or table to to automatically register your TX64 in your Digi Remote Manager account and connect to your cellular network. See Quick start: using the Digi Remote Manager mobile app.

Step 3: Connect





a. If you intend to configure cellular WWAN access at this time, install SIM cards.
b. Attach antenna(s).
c. If you intend to configure Ethernet WAN access at this time, use an Ethernet cable to connect

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the TX64 WAN/ETH1 port to a hub with access to the Internet.

2. Use an Ethernet cable to connect the TX64 ETH2 port to your PC.

Step 4: Power up

a. Connect DC power.

Note If you need help understanding power requirements, see TX64 power connector.

b. Indicator LEDs blink to show status during startup.

c. Wait for the power LED to stop blinking. The device is ready.

Step 5: Configure

a. On the PC connected to the TX64, open a browser and go to 192.168.2.1.

b. Log into the TX64:

User name: Use the default user name: admin.

Password: Use the unique password printed on the bottom label of the device (or the printed label included in the package).

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Digi TX64 hardware reference

TX64 key features

The Digi TX64 is an LTE-Advanced (LTE-A) router. Key features include:

- Wired Gigabit Ethernet (4-port) for onboard systems.
- Segmented private versus public data communication across dual 600 Mbps CAT 11 cellular.
- Video offload over 1.7 Gbps 802.11ac Wi-Fi backhaul.
- Passenger Wi-Fi over 867 Mbps 802.11ac access point.
- Superior network performance management through Digi Remote Manager.
- Global deployment support.

TX64 hardware specifications

For a detailed list of TX64 hardware specifications, see Digi TX64 specifications.

TX64 front view

The following figure shows front view of the TX64.



Item	Description
SIM gasket	See Install SIM cards.
LEDs	See TX64 LEDs.
Power button	See Power sensor and button behavior.

TX64 User Guide 15

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TX64 LEDs

The TX64 LEDs are located on the top front panel. The number of LEDs varies by model. During bootup, the front-panel LEDs light up in sequence to indicate boot progress.



Power

- **Off:** No power.
- **Blinking Blue:** Unit is powering on.
- **Blue:** Unit has power.

GNSS Service

- **Solid Green:** GNSS is enabled and has a valid fix.
- **Blinking Green:** GNSS is enabled but does not have a valid fix.
- **Off:** GNSS is not enabled.

Wi-Fi1 Service

- **Solid Green:** Wi-Fi access points or Wi-Fi clients using Wi-Fi1 radio are enabled.
- **Off:** No Wi-Fi access points or Wi-Fi clients using Wi-Fi1 radio are enabled.

Wi-Fi2 Service

- **Solid Green:** Wi-Fi access points or Wi-Fi clients using Wi-Fi2 radio are enabled.
- **Off:** No Wi-Fi access points or Wi-Fi clients using Wi-Fi2 radio are enabled.

WWAN1/WWAN2 Signal

Indicates strength of cellular signal.

- **Off:** No service.
- **Yellow:** Poor / Fair signal.
- **Green:** Good / Excellent signal.

WWAN1/WWAN2 Service

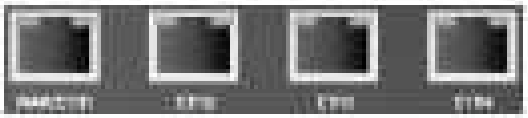
Indicates the presence and level of cellular service running on the device.

- **Off:** No service.
- **Blinking Green:** 2G/3G/4G connection is coming up.
- **Solid Yellow:** 2G or 3G connection is up.
- **Solid Green:** 4G connection is up.

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Ethernet 1-4 Link and Activity (on rear panel)

The LEDs on the WAN/ETH1, ETH2, ETH3, and ETH4 ports indicate that the Ethernet network interface is up and there is activity on the network interface.



Left LED (on top of port connector)

- **Off:** No Ethernet link detected.
- **Blinking amber:** Indicates Ethernet traffic.

Right LED (on top of port connector)

- **Off:** No Ethernet link detected.
- **Solid green:** 10/100 Mbps link detected.
- **Solid amber:** 1000 Mbps link detected.

Power sensor and button behavior

The TX64 has an ignition sensor that can automatically power on the device when the ignition line is on.



You can also power on the TX64 using the Power button. If the TX64 does not automatically restart when the power ignition sense is on, press the Power button to restore power.

TX64 back view

The following figure shows the back view of the TX64.



- Antenna connectors
- WAN/ETH1
- ETH2/ETH3/ETH4
- USB 3.0

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- Serial
- Power

Digi TX64 serial connector pinout

The TX64 is a DTE device. The pinout for the DB9 serial connector is as follows:

Signal name	Abbreviated signal	DTE signal direction	DB9 pin number
Transmit Data	TxD	In	3
Receive Data	RxD	Out	2
Ready To Send	RTS	In	7
Clear to Send	CTS	Out	8
Data Set Ready	DSR	Out	6
Ground	GND	N/A	5
Data Carrier Detect	DCD	Out	1
Data Terminal Ready	DTR	In	4
Ring Indicate	RI	Out	9

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Hardware setup

This chapter contains the following topics:

Install SIM cards
Connect data cables
Connect antennas
Mount the TX64 to a mounting surface
Connect power

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Install SIM cards

To install SIM cards:

1. On the TX64 front panel, use a screwdriver to remove the SIM slot cover.
2. For high-vibration environments, apply a thin layer of dielectric grease to the SIM contacts.

   Note If the TX64 device is used in an environment with high vibration levels, SIM card contact fretting may cause unexpected SIM card failures. To protect the SIM cards, Digi strongly recommends that you apply a thin layer of dielectric grease to the SIM contacts prior to inserting the SIM cards.

3. Insert the SIM card(s) into the SIM sockets. Insert the end of each SIM card with the chamfered corner first and the SIM contacts facing upwards:



4. After all SIM cards are in place, replace the SIM slot cover.

Tips for improving cellular signal strength

If the signal strength LEDs or the signal quality for your device indicate Poor or No service, try the following things to improve signal strength:

- Move the device to another location.
- Try connecting a different set of antennas, if available.
- Purchase a Digi Antenna Extender Kit (Antenna Extender Kit, 1m).

Connect data cables

The TX64 provides two types of data ports:

- **Ethernet (RJ-45)**: Use a Cat 5e or Cat 6 Ethernet cable.
- **Serial (9-pin RS-232)**: Use a serial cable with a 9-pin RS-232 connector.

Connect antennas

Connect antennas to the appropriate antenna connector:

- GNSS
- Wi-Fi 1-1, Wi-Fi 1-2 and Wi-Fi 2-1, Wi-Fi 2-2
- WWAN1-1, WWAN1-2 and WWAN2-1, WWAN2-2

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Mount the TX64 to a mounting surface

Mount the TX64 device to a mounting surface by using the two mounting brackets. The mounting brackets are preinstalled when the device is delivered.

Tighten self-tapping screws to the mounting surface through the mounting holes of mounting brackets.

Note The mounting screw specifications are: Roundhead M4 slot screws or comparable non-metric (8-32 slot). Type and length is dependent on the mounting surface type.



Connect power

Connect the TX64 power cable to a power source.

Vehicle installation

The TX64 shall be powered from a 5 A fused circuit or shall be installed with an in-line Slow Blow fuse rated at 5 A.

Maximum ambient operating temperature is limited to 74°C.

Note Always follow the vehicle manufacturer recommendations for electrical accessories connections. All components used in the electrical connection to the vehicle should be UL listed. See also Mount and ground chassis.

Alternate installations

The TX64 shall be powered by a Certified ITE LPS power supply or a Direct Plug-In Class 2 output transformer rated at either 12 VDC/2.5 A or 24 VDC/1.25 A minimum. Supplies shall be suitable for the ambient for which they are installed.

Maximum ambient operating temperature is limited to the lower of the maximum ambient operating temperature of the power supply or 74° C.

Digi recommends the power supplies in the following accessory kits:

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- Installations up to +40° C: Digi part number 24000040
- Installations up to +70° C: Digi part number 76000079 or 76000085
- Installations up to +74° C: TRACO Power TPP-60-112J, TPP-60-115J, TPP-60-124J, and TEXXD-112

Mount and ground chassis

If you intend to install the TX64 in a vehicle, follow these directions for mounting and grounding the device.

Note Always follow the vehicle manufacturer recommendations for electrical accessories connections.

Mount the device following these general guidelines:

- Device position allows easy access to all ports located on the back of the device.
- Device position allows you to easily view the LEDs located on the front of the device.
- Device location is away from direct exposure to the elements, such as sun, rain, dust, and similar conditions.
- Device and cables should not be near high amperage or exposed to extreme temperatures.
- Device and cables should be installed in an area with adequate airflow.

The TX64 has two mounting brackets located on the left and right sides of the device.

For DC installations (with a fixed system ground reference), ground the TX64 chassis to the system ground reference.

For proper grounding reference:

- Attach the device to a grounded metal surface.
- Connect one end of a short AWG or larger gauge wire to the upper-right grounding hole and connect the other end to the vehicle chassis.

Special considerations

- Separate Ethernet and power cables from other wiring in the vehicle and route the cables away from sharp edges.
- Use cable strain relief for installations in high-vibration environments.

TX64 electrical rating

The TX64 device requires connection to a conditioned power system that meets these requirements:

- Tolerance within maximum operating voltage range 9 VDC to 35 VDC.
- TX64 power connector on the front of the device requires wiring terminals with the following specifications:

  Wire size: 30-12 AWG

  Wire type: copper wire only

  Terminal blocks torque: 5-7 pounds per inch

  For supply connections, use wires suitable for at least 85° C.

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- Power installation must be performed by a qualified electrician, following the National Electrical Code, ANSI/NFPA 70 and Canadian Electrical Code, Part I, CSA C22.1.
- There must be a disconnect device in front of TX64 devices to protect maintenance workers. Use a 30 A circuit-breaker as the disconnect device.
- Before doing any maintenance, the maintenance worker must use caution and close the general power supply.

TX64 power connector

The TX64 has a power connector located on the back of the device:



Pin	Connection
1	Ignition sensor
2	Positive
3	Negative

See Connect power for information on connecting power to the device.

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Configuration and management

This chapter contains the following topics:

Restore TX64 default settings 28
Reset default password for the default admin user 28
Reset default SSIDs and pre-shared keys for the preconfigured Wi-Fi access points 28
Configuration methods 28
Using Digi Remote Manager 28
Access Digi Remote Manager 28
Using the web interface 28
Using the command line 28
Access the command line interface 28
Log in to the command line interface 28
Exit the command line interface 28

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Review TX64 default settings

You can review the default settings for your TX64 device by using the local WebUI or Digi Remote Manager:

Local WebUI

1. Log into the TX64 WebUI as a user with Admin access. See Using the web interface for details.
2. On the menu, click System > Device Configuration.

Digi Remote Manager

1. If you have not already done so, connect to your Digi Remote Manager account.
2. Click Device Management to display a list of your devices.
3. Locate and select your device as described in Use Digi Remote Manager to view and manage your device.
4. Click Configure.

The following tables list important factory default settings for the TX64.

Default interface configuration

Network type	Pre-configured interfaces	Devices	Default configuration
Wide Area Network (WAN)	• WAN1	• Ethernet: ETH1	• Firewall zone: External • WAN priority: Metric1 • IP Address: DHCP client • Digi SureLink™ enabled for IPv4
Wireless Wide-Area Networks (WWAN)	• WWAN1	• Dual-cellular models: WWAN1 cellular modem	• Firewall zone: External • WAN priority: Metric2 • SIM failover after 3 attempts • SureLink enabled for IPv4
	• WWAN2	• WWAN2 cellular modem	• Firewall zone: External • WAN priority: Metric3 • SIM failover after 3 attempts • SureLink enabled for IPv4

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Configuration and management Review TX64 default settings

Interface type	Preconfigured interfaces	Devices	Default configuration
Local Area Networks (LANs)	• LAN1	• Bridge:LAN1	• Firewall zone: Internal • IP address: 192.168.2.1/24 • DHCP server enabled • LAN priority: Medium3
	• LAN hotspot	• Bridge: hotspot_ bridge	• DHCP server: disabled
	• Loopback	• Ethernet: Loopback	• Firewall zone: Loopback • IP address: 127.0.0.1/8
	• Default IP	• Bridge:LAN1	• Firewall zone: Setup • IP address 192.168.210.1/24
	• Default Link-local IP	• Bridge:LAN1	• Firewall zone: Setup • IP address 169.254.100.100/16
Wi-Fi	• Wi-Fi access point: Digi AP (Wi-Fi1)	• Wi-Fi1 radio	• Enabled • SSID: Digi-TX64-serial_ number • Encryption: WAP2 Personal (PSK) • Pre-shared key: The unique password printed on the bottom label of the device.
	• Wi-Fi access point: Digi AP (Wi-Fi2)	• Wi-Fi2 radio	• Enabled • SSID: Digi-TX64-serial_ number • Encryption: WAP2 Personal (PSK) • Pre-shared key: The unique password printed on the bottom label of the device.
	• Hotspot access point: Digi Hotspot AP (Wi-Fi1)	• Wi-Fi1 radio	• Disabled • SSID: Digi Hotspot • Encryption: Open (Unencrypted)

TX64 User Guide 30

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Interface type	Preconfigured interfaces	Devices	Default configuration
	• Hotspot access point: Digi Hotspot AP (Wi-Fi2)	• Wi-Fi2 radio	• Disabled • SSID: Digi Hotspot • Encryption: Open (Unencrypted)
Bridge	• Bridge: LAN1	• Ethernet: ETH2 • Ethernet: ETH3 • Ethernet: ETH4 • Wi-Fi access point: Digi AP (Wi-Fi1) • Wi-Fi access point: Digi AP (Wi-Fi2)	• Enabled • Used by the LAN1 interface
	• hotspot_ bridge	• Wi-Fi access point: Digi Hotspot AP (Wi-Fi1) • Wi-Fi access point: Digi Hotspot AP (Wi-Fi2)	• Disabled • Used by the hotspot interface
Hotspot	• hotspot	• Bridge: hotspot_ bridge	• Disabled • Authentication mode: Click-through • IP address: 10.0.0.1/24 • DHCP server: Automatically enabled (on all hotspots) • DHCP server lease range: 100-250

Other default configuration settings

Feature	Configuration
Central management	• Digi Remote Manager enabled as the central management service.

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Feature	Configuration
Security policies	• Packet filtering allows all outbound traffic. • SSH and web administration: • Enabled for local administration • Firewall zone: Internal
Monitoring	• Device health metrics uploaded to Digi Remote Manager at 60 minute interval. • SNMP: Disabled

Reset default password for the default admin user

When you first log into the WebUI or the command line, or after erasing the configuration, you will be required to change the unique, factory-assigned default password for the default admin user prior to being able to save any changes or exit the user interface. The unique, factory-assigned default password is printed on the bottom label of the device (or the printed label included in the package).

Additionally, when you first log into the WebUI or the command line, you will be required the change the SSIDs and pre-shared keys (passwords) for the preconfigured Wi-Fi access points. See Reset default SSIDs and pre-shared keys for the preconfigured Wi-Fi access points for instructions.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



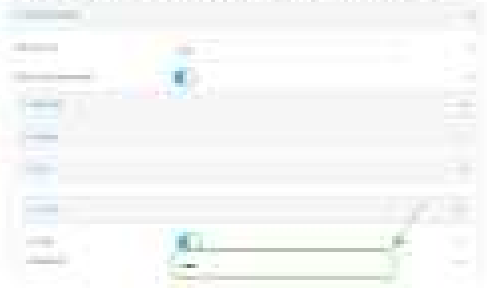
The **Configuration** window is displayed.



3. Click **Authentication** > **Users** > **admin**.

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4. Enter a new password for the admin user.



5. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set a new password for the admin user:

```
(config)> auth user admin password new-password
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Reset default SSIDs and pre-shared keys for the preconfigured Wi-Fi access points

By default, the SSIDs and pre-shared keys for the preconfigured Wi-Fi access points are:

- Enabled
- SSID: Digi-TX64-serial_number

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Configuration and management

Reset default SSIDs and pre-shared keys for the preconfigured Wi-Fi access points

- Encryption: WAP2 Personal (PSK)
- Pre-shared key: The unique password printed on the bottom label of the device.

When you first log into the WebUI or the command line, or after erasing the configuration, you will be required to change the SSIDs and pre-shared keys for the preconfigured Wi-Fi access points.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > Wi-Fi > Digi AP (Wi-Fi1)**.



4. Enter a new **SSID** and **Pre-shared key**.
5. Repeat the above steps for the **Digi AP (Wi-Fi2)** access point.
6. Click **Apply** to save the configuration and apply the change.

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Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Set a new SSID for the **digi_ap1** access point:

```
(config)> network wifi ap digi_ap1 ssid new_ssid
(config)>
```

4. Set a new pre-shared key:

```
(config)> network wifi ap digi_ap1 encryption key_psk2 new_key
(config)>
```

5. Set a new SSID and pre-shared key for the **digi_ap2** access point:

```
(config)> network wifi ap digi_ap2 ssid new_ssid
(config)> network wifi ap digi_ap2 encryption key_psk2 new_key
(config)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configuration methods

There are two primary methods for configuring your TX64 device:

- Web interface.

  The web interface can be accessed in two ways:

  - Central management using the Digi Remote Manager, a cloud-based device management and data enablement platform that allows you to connect any device to any application, anywhere. With the Remote Manager, you can configure your TX64 device and use the configuration as a basis for a profile which can be applied to other similar devices. See

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Using Digi Remote Manager for more information about using the Remote Manager to manage and configure your TX64 devices.

- The local web interface. See Using the web interface for more information about using the local web interface to manage and configure your TX64 device.

Web-based instructions in this guide are applicable to both the Remote Manager and the local web interface.

- Command line.

  A robust command line allows you to perform all configuration and management tasks from within a command shell. Both the Remote Manager and the local web interface also have the option to open a terminal emulator for executing commands on your TX64 device. See Using the command line for more information about using the command line to manage and configure your TX64 device.

In this guide, task topics show how to perform tasks:



Shows how to perform a task by using the local web interface.



Shows how to perform a task by using the command line interface.

Using Digi Remote Manager

By default, your TX64 device is configured to use Digi Remote Manager as its central management server. No configuration changes are required to begin using the Remote Manager.

For information about configuring central management for your TX64 device, see Central management with Digi Remote Manager.

Access Digi Remote Manager

To access Digi Remote Manager:

1. If you have not already done so, go to https://myaccount.digi.com/ to sign up for a Digi Remote Manager account.

   Check your email for Digi Remote Manager login instructions.
2. Go to remotemanager.digi.com.
3. Enter your username and password.

   The Digi Remote Manager Dashboard appears.

Using the web interface

To connect to the TX64 local WebUI:

1. Use an Ethernet cable to connect the TX64's ETH2 port to a laptop or PC.
2. Open a browser and go to 192.168.2.1.
3. Log into the device using a configured user name and password.

   The default user name is admin and the default password is the unique password printed on the label packaged with your device.

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After logging in, the local web admin dashboard is displayed.



The dashboard shows the current state of the device.

Dashboard area	Description
Network activity	Summarizes network statistics: the total number of bytes sent and received over all configured bridges and Ethernet devices.
Digi Remote Manager	Displays the device connection status for Digi Remote Manager, the amount of time the connection has been up, and the Digi Remote Manager device ID. See Using Digi Remote Manager.
Device	Displays the TX64 device's status, statistics, and identifying information.
Network interfaces	Displays the status of the network interfaces configured on the device.
Modems	Provides information about the signal strength and technology of the cellular modem (s).

Log out of the web interface

- On the main menu, click your user name. Click Log out.



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Using the command line

The Digi TX64 device provides a command-line interface that you can use to configure the device, display status and statistics, update firmware, and manage device files.

See Command line interface for detailed instructions on using the command line interface and see Command line reference for information on available commands.

Access the command line interface

You can access the TX64 command line interface using an SSH connection, a telnet connection, or a serial connection. You can use an open-source terminal software, such as PuTTY or TeraTerm, to access the device through one of these mechanisms.

You can also access the command line interface in the WebUI by using the **Terminal**, or the Digi Remote Manager by using the **Console**.

To access the command line, your device must be configured to allow access, and you must log in as a user who has been configured for the appropriate access. For further information about configuring access to these services, see:

- Serial: Configure the serial port
- WebUI: Configure the web administration service
- SSH: Configure SSH access
- Telnet: Configure telnet access

Log in to the command line interface

Command line

1. Connect to the TX64 device by using a serial connection, SSH or telnet, or the **Terminal** in the WebUI or the **Console** in the Digi Remote Manager. See Access the command line interface for more information.
   - For serial connections, the default configuration is:
     - 115200 baud rate
     - 8 data bits
     - no parity
     - 1 stop bit
     - no flow control
   - For SSH and telnet connections, the default IP address of the device is 192.168.2.1 on the ETH2, ETH3, and ETH4 Ethernet ports.
2. At the login prompt, enter the username and password of a user with Admin access:

```
login: admin
Password: **********
```

The default username is **admin**. The default unique password for your device is printed on the device label.

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3. Depending on the device configuration, you may be presented with another menu, for example:

```
Access selection menu:

        a: Admin CLI
        s: Shell
        q: Quit

Select access or quit [admin] :
```

Type a or admin to access the TX64 command line.

You will now be connected to the Admin CLI:

```
Connecting now, 'exit' to disconnect from Admin CLI ...

>
```

See Command line interface for detailed instructions on using the command line interface.

Exit the command line interface

Command line

1. At the command prompt, type exit.

```
> exit
```

2. Depending on the device configuration, you may be presented with another menu, for example:

```
Access selection menu:

        a: Admin CLI
        s: Shell
        q: Quit

Select access or quit [admin] :
```

Type q or quit to exit.

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Interfaces

TX64 devices have several physical communications interfaces. These interfaces can be bridged in a Local Area Network (LAN) or assigned to a Wide Area Network (WAN).

This chapter contains the following topics:

Wide Area Networks (WANs) 41
Local Area Networks (LANs) 42
Bridging 43

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Wide Area Networks (WANs)

The TX64 device is preconfigured with one Wide Area Network (WAN), named WAN1, and two Wireless Wide Area Networks (WWANs), named WWAN1 and WWAN2.

Interface type	Preconfigured interfaces	Devices	Default configuration
Wide Area Network (WAN)	• WAN1	• Ethernet: ETH1	• Firewall zone: External • WAN priority: Metric=1 • IP Address: DHCP client • Digi SureLink™ enabled for IPv4
Wireless Wide-Area Networks (WWANs)	• WWAN1	• Dual-cellular models: WWAN1 cellular modem	• Firewall zone: External • WAN priority: Metric=2 • Will failover after 5 attempts • SureLink enabled for IPv4
	• WWAN2	• WWAN2 cellular modem	• Firewall zone: External • WAN priority: Metric=3 • Will failover after 5 attempts • SureLink enabled for IPv4

You can modify configuration settings for the existing WAN and WWANs, and you can create new WANs and WWANs.

This section contains the following topics:

Wide Area Networks (WANs) and Wireless Wide Area Networks (WWANs) 42
Configure WAN/WWAN priority and default route metrics 43
WAN/WWAN failover 45
Configure SureLink active recovery to detect WAN/WWAN failures 46
Configure the device to reboot when a failure is detected 54
Disable SureLink 56
Example: Use a ping test for WAN failover from Ethernet to cellular 58
Using Ethernet devices in a WAN 67
Using cellular modems in a Wireless WAN (WWAN) 67
Configure a Wide Area Network (WAN) 68
Configure a Wireless Wide Area Network (WWAN) 69
Show WAN and WWAN status and statistics 69
Delete a WAN or WWAN 69

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Wide Area Networks (WANs) and Wireless Wide Area Networks (WWANs)

A Wide Area Network (WAN) provides connectivity to the Internet or a remote network. A WAN configuration consists of the following:

- A physical device, such as an Ethernet device or a cellular modem.
- Several networking parameters for the WAN, such as firewall configuration and IPv4 and IPv6 support.
- Several parameters controlling failover.

Configure WAN/WWAN priority and default route metrics

The TX64 device is preconfigured with one Wide Area Network (WAN), named WAN1, and two Wireless Wide Area Networks (WWANs), named WWAN1 and WWAN2. You can also create additional WANs and WWANs.

When a WAN is initialized, the TX64 device automatically adds a default IP route for the WAN. The priority of the WAN is based on the metric of the default route, as configured in the WAN's IPv4 and IPv6 metric settings.

Assigning priority to WANs

By default, the TX64 device's WAN (WAN1) is configured with the lowest metric (1), and is therefor the highest priority WAN. By default, the Wireless WANs (WWAN1 and WWAN2) are configured with a metric of 2, which means they have an equal priority between themselves, and a lower priority than WAN1. You can assign priority to WANs based on the behavior you want to implement for primary and backup WAN interfaces. For example, if you want a cellular connection to be your primary WAN, with an Ethernet interface as backup, configure the metric of the WWAN to be lower than the metric of the WAN.

Example: Configure cellular connection as the primary WAN, and the Ethernet connection as backup

Required configuration items

- Configured WAN and WWAN interfaces. This example uses the preconfigured WAN1 and WWAN1 interfaces.
- The metric for each WAN.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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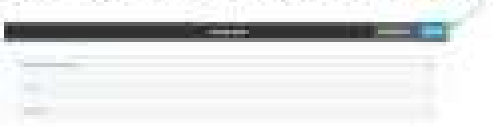
5. Set the metrics for WWAN1:
   a. Click Network > Interfaces > WWAN1 > IPv4.
   b. For Metric, type 1.
   c. Click IPv6.
   d. For Metric, type 1.

4. Set the metrics for WAN1:
   a. Click Network > Interfaces > WAN1 > IPv4.
   b. For Metric, type 2.
   c. Click IPv6.
   d. For Metric, type 2.

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5. Click Apply to save the configuration and apply the change.



The TX64 device is now configured to use the cellular modem WWAN, WWAN1, as its highest priority WAN, and its Ethernet WAN, WAN1, as its secondary WAN.

Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Set the metrics for WWAN1:
   a. Set the IPv4 metric for WWAN1 to 1. For example:

```
(config)> network interface wwan1 ipv4 metric 1
(config)>
```

   b. Set the IPv6 metric for WWAN1 to 1:

```
(config)> network interface wwan1 ipv6 metric 1
(config)>
```


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4. Set the metrics for WAN1:
   a. Set the IPv4 metric for WAN1 to 2:

```
(config)> network interface wan1 ipv4 metric 2
(config)>
```

   b. Set the IPv6 metric for WAN1 to 2:

```
(config)> network interface wan1 ipv6 metric 2
(config)>
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

The TX64 device is now configured to use the cellular modem WWAN, WWAN1, as its highest priority WAN, and its Ethernet WAN, WAN1, as its secondary WAN.

WAN/WWAN failover

If a connection to a WAN interface is lost for any reason, the TX64 device will immediately fail over to the next WAN or WWAN interface, based on WAN priority. See Configure WAN/WWAN priority and default route metrics for more information about WAN priority.

Active vs. passive failure detection

There are two ways to detect WAN or WWAN failure: active detection and passive detection.

- Active detection uses Digi SureLink™ technology to send probe tests to a target host or to test the status of the interface. The WAN/WWAN is considered to be down if there are no responses for a configured amount of time. See Configure SureLink active recovery to detect WAN/WWAN failures for more information about active failure detection.
- Passive detection involves detecting the WAN going down by monitoring its link status by some means other than active detection. For example, if an Ethernet cable is disconnected or the state of a cellular interface changes from on to off, the WAN is down.

Default Digi SureLink configuration

Beginning with firmware version 20.2.x, SureLink is enabled by default for IPv4 on all WAN and WWAN interfaces, and is configured to perform two tests on these interfaces:

- Interface connectivity.
- DNS query to the DNS servers for interface's the network connection.

  DNS servers are typically received as part of the interface's DHCP client connection, although you can manually configure the DNS servers that will be used by SureLink.

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Note If your device is operating on a private APN or on wired network with firewall restrictions, ensure that the DNS servers on your private network allow DNS lookups for my.devicecloud.com; otherwise, the SureLink DNS query test will fail and the TX64 device will determine that the interface is down.

By default, these tests will be performed every 15 minutes, with a response timeout of 15 seconds. If the tests fail three consecutive times, the device will reset the network interface to attempt to recover the connection.

Configure SureLink active recovery to detect WAN/WWAN failures

Problems can occur beyond the immediate WAN/WWAN connection that prevent some IP traffic from reaching its destination. Normally this kind of problem does not cause the TX64 device to detect that the WAN has failed, because the connection continues to work while the core problem exists somewhere else in the network.

Using Digi SureLink, you can configure the TX64 device to regularly probe connections through the WAN to determine if the WAN has failed.

Required configuration items

- Enable SureLink.

  SureLink can be enabled for both IPv4 and IPv6 configurations. By default, SureLink is enabled for IPv4 for the preconfigured WAN (WAN1) and WWANs (WWAN1 and WWAN2). It is disabled for IPv6.

- The type of probe test to be performed, either:
  - Ping: Requires the hostname or IP address of the host to be pinged.
  - DNS query: You can perform a DNS query to a named DNS server, or to the DNS servers configured for the WAN.
  - HTTP or HTTPS test: Requires the URL of the host to be tested.
  - Interface status: Determines if the interface has an IP address assigned to it, that the physical link is up, and that a route is present to send traffic out of the network interface.

  The preconfigured WAN is configured by default to use SureLink to both test the interface status and perform a test DNS query.

Additional configuration items

- The behavior of the TX64 device upon test failure:
  - The default behavior, which is to fail over to the next priority WAN/WWAN.
  - Restart the WAN interface.
  - Reboot the device.
- The interval between connectivity tests.
- The number of probe attempts before the WAN is considered to have failed.
- The amount of time that the device should wait for a response to a probe attempt before considering it to have failed.

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- If the type of probe test is:
  - Ping: Configure the number of bytes in the ping packet.
  - Interface status: Configure the amount of time that the interface is down before it is considered to have failed, and the amount of time it takes to make an initial connection before it is considered down.
- Additional test targets.
- If more than one test target is configured, determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets.

To configure the TX64 device to regularly probe connections through the WAN:

WebUI

SureLink can be configured for both IPv4 and IPv6.

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > Interfaces**.
4. Create a new WAN or WWAN or select an existing one:
   - To create a new WAN or WWAN, see Configure a Wide Area Network (WAN) or Configure a Wireless Wide Area Network (WWAN).
   - To edit an existing WAN or WWAN, click to expand the appropriate WAN or WWAN.

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5. After creating or selecting the WAN or WWAN, click IPv4 or IPv6 > SureLink.

6. Enable SureLink.

   SureLink can be enabled for both IPv4 and IPv6 configurations. By default, SureLink is enabled for IPv4 for the preconfigured WAN (WAN1) and WWAN (WWAN1 and WWAN2). It is disabled for IPv6.

7. Click to expand **Test targets**.

8. For **Add Test Target**, click +.



9. Select the **Test type**:

   - **Ping test**: Tests connectivity by sending an ICMP echo request to the hostname or IP address specified in **Ping host**. You can also optionally change the number of bytes in the **Ping payload size**.
   - **DNS test**: Tests connectivity by sending a DNS query to the specified DNS server.
   - **HTTP test**: Tests connectivity by sending an HTTP or HTTPS GET request to the URL specified in **Web servers**. The URL should take the format of http[s]://hostname/[path].
   - **Test DNS servers configured for this interface**: Tests connectivity by sending a DNS query to the DNS servers configured for this interface.
   - **Test the interface status**: The interface is considered to be down based on:
     - **Down time**: The amount of time that the interface can be down before this test is considered to have failed.

       Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

       For example, to set **Down time** to ten minutes, enter 10m or 600s.

       The default is 60 seconds.
     - **Initial connection time**: The amount of time to wait for an initial connection to the interface before this test is considered to have failed.

       Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

       For example, to set **Initial connection time** to ten minutes, enter 10m or 600s.

       The default is 60 seconds.

10. Optional active recovery configuration parameters:

    a. For **Restart interface**, enable to configure the device to restart the interface when its connection is considered to have failed. This is useful for interfaces that may regain

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connectivity after restarting, such as a cellular modem.

b. For **Reboot device**, enable to instruct the device to reboot when the WAN connection is considered to have failed.

c. Change the **Interval** between connectivity tests.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set Interval to ten minutes, enter **10m** or **600s**.

The default is 15 minutes.

d. If more than one test target is configured, for **Success condition**, determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets.

e. For **Attempts**, type the number of probe attempts before the WAN is considered to have failed.

f. For **Response timeout**, type the amount of time that the device should wait for a response to a probe attempt before considering it to have failed.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set Response timeout to ten minutes, enter **10m** or **600s**.

The default is 15 seconds.

11. (Optional) Repeat this procedure for IPv6.
12. Click **Apply** to save the configuration and apply the change.



Command line

Active recovery can be configured for both IPv4 and IPv6. These instructions are for IPv4; to configure IPv6 active recovery, replace ipv4 in the command line with ipv6.

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
>config
(config)>
```

3. Create a new WAN or WWAN, or edit an existing one:
   - To create a new WAN or WWAN, see Configure a Wide Area Network (WAN) or Configure a Wireless Wide Area Network (WWAN).
   - To edit an existing WAN or WWAN, change to the WAN or WWAN's node in the configuration schema. For example, for a WAN or WWAN named my_wan, change to the my_wan node in the configuration schema:

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```
(config)> network interface my_wan
(config network interface my_wan)>
```

4. Enable SureLink:

   SureLink can be enabled for both IPv4 and IPv6 configurations. By default, SureLink is enabled for IPv4 for the preconfigured WAN (wan1) and WWAN (wwan1 and wwan2). It is disabled for IPv6.

```
(config network interface my_wan)> ipv4 surelink enable true
(config network interface my_wan)>
```

5. Add a test target:

```
(config network interface my_wan)> add ipv4 surelink target end
(config network interface my_wan ipv4 surelink target 0)>
```

6. Set the test type:

```
(config network interface my_wan ipv4 surelink target 0)> test value
(config network interface my_wan ipv4 surelink target 0)>
```

   where value is one of:

   - ping: Tests connectivity by sending an ICMP echo request to a specified hostname or IP address.
     - Specify the hostname or IP address:

```
(config network interface my_wan ipv4 surelink target 0)> ping.
host host
(config network interface my_wanipv4 surelink target 0)>
```

     - [Optional] Set the size, in bytes, of the ping packet:

```
(config network interface my_wan ipv4 surelink target 0)> ping.
size [num]
(config network interface my_wan ipv4 surelink target 0)>
```

   - dns: Tests connectivity by sending a DNS query to the specified DNS server.
     - Specify the DNS server. Allowed value is the IP address of the DNS server.

```
(config network interface my_wan ipv4 surelinktarget 0)> dns.
server ip_address
(config network interface my_wan ipv4 surelinktarget 0)>
```

   - dns_configured: Tests connectivity by sending a DNS query to the DNS servers configured for this interface.
   - http: Tests connectivity by sending an HTTP or HTTPS GET request to the specified URL.
     - Specify the url:

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```
(config network interface my_wan ipv4 sureLink target 8)> http_url
value
(config network interface my_wan ipv4 sureLink target 8)>
```

where value uses the format http[s]://Hostname/[path]

- interface_up: The interface is considered to be down based on the interfaces down time, and the amount of time an initial connection to the interface takes before this test is considered to have failed.
  - [Optional] Set the amount of time that the interface can be down before this test is considered to have failed:

```
(config network interface my_wan ipv4 sureLink target 8)>
interface_down_time value
(config network interface my_wan ipv4 sureLink target 8)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

For example, to set interface_down_time to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 sureLink target 8)>
interface_down_time 600s
(config network interface my_wan ipv4 sureLink target 8)>
```

The default is 60 seconds.

  - [Optional] Set the amount of time to wait for an initial connection to the interface before this test is considered to have failed:

```
(config network interface my_wan ipv4 sureLink target 8)>
interface_timeout value
(config network interface my_wan ipv4 sureLink target 8)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

For example, to set interface_timeout to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 sureLink target 8)>
interface_timeout 600s
(config network interface my_wan ipv4 sureLink target 8)>
```

The default is 60 seconds.

[Optional] Repeat to add additional test targets.

7. Optional active recovery configuration parameters:
   a. Move back two levels in the configuration by typing .. ..:

```
(config network interface my_wan ipv4 sureLink target 8)> .. ..
(config network interface my_wan ipv4 sureLink>
```

   b. To configure the device to restart the interface when its connection is considered to have failed:

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```
(config network interface my_wan ipv4 sureLink)> restart enable
(config network interface my_wan ipv4 sureLink>
```

This is useful for interfaces that may regain connectivity after restarting, such as a cellular modem.

c. To configure the device to reboot when the interface is considered to have failed:

```
(config network interface my_wan ipv4 sureLink)> reboot enable
(config network interface my_wan ipv4 sureLink>
```

d. Set the interval between connectivity tests:

```
(config network interface my_wan ipv4 sureLink)> interval value
(config network interface my_wan ipv4 sureLink>
```

Where value is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

For example, to set interval to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 sureLink)> interval 600s
(config network interface my_wan ipv4 sureLink)>
```

The default is 15 minutes.

e. If more than one test target is configured, determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets:

```
(config network interface my_wan ipv4 sureLink)> success_condition value
(config network interface my_wan ipv4 sureLink>
```

Where value is either one or all.

f. Set the number of probe attempts before the WAN is considered to have failed:

```
(config network interface my_wan ipv4 sureLink)> attempts num
(config network interface my_wan ipv4 sureLink>
```

The default is 3.

g. Set the amount of time that the device should wait for a response to a probe attempt before considering it to have failed:

```
(config network interface my_wan ipv4 sureLink)> timeout value
(config network interface my_wan ipv4 sureLink>
```

Where value is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

For example, to set timeout to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 sureLink)> timeout 600s
(config network interface my_wan ipv4 sureLink)>
```

The default is 15 seconds.

8. (Optional) Repeat this procedure for IPv6.

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9. Save the configuration and apply the change:

```
(config network interface my_wan ipv4 sureLink)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the device to reboot when a failure is detected

Using SureLink, you can configure the TX64 device to reboot when it has determined that an interface has failed.

Required configuration items

- Enable SureLink.

  SureLink can be enabled for both IPv4 and IPv6 configurations. By default, SureLink is enabled for IPv4 for the preconfigured WAN (WAN1) and WWAN1 (WWAN1 and WWAN2). It is disabled for IPv6.
- Enable device reboot upon interface failure.
- The type of probe test to be performed, either:
  - Ping: Requires the hostname or IP address of the host to be pinged.
  - DNS query: You can perform a DNS query to a named DNS server, or to the DNS servers configured for the WAN.
  - HTTP or HTTPS test: Requires the URL of the host to be tested.
  - Interface status: Determines if the interface has an IP address assigned to it, that the physical link is up, and that a route is present to send traffic out of the network interface.

Additional configuration items

- See Configure SureLink active recovery to detect WAN/WWAN failures for optional SureLink configuration parameters.

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To configure the TX64 device to reboot when an interface has failed:

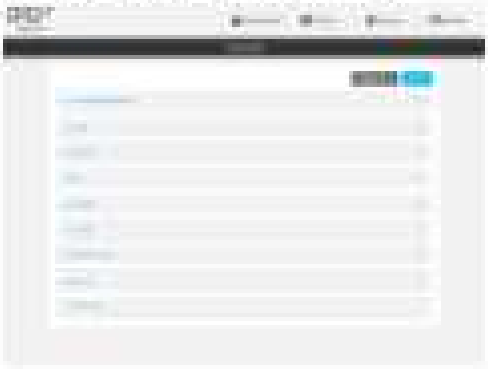
WebUI

SureLink can be configured for both IPv4 and IPv6.

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Interfaces**.
4. Create a new interface or select an existing one:
   - To create a new interface, see Configure a LAN, Configure a Wide Area Network (WAN), or Configure a Wireless Wide Area Network (WWAN).
   - To edit an existing interface, click to expand the appropriate interface.
5. After creating or selecting the interface, click **IPv4** (or **IPv6**) > **SureLink**.

6. **Enable SureLink**.

   SureLink can be enabled for both IPv4 and IPv6 configurations. By default, SureLink is enabled for IPv4 for the preconfigured WAN (**WAN1**) and WWAN (**WWAN1** and **WWAN2**). It is disabled for IPv6.
7. **Enable Reboot device**.
8. Click to expand **Test targets**.

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a. For Add Test Target, click +.



10. Select the Test type:
    - Ping test: Tests connectivity by sending an ICMP echo request to the hostname or IP address specified in Ping host. You can also optionally change the number of bytes in the Ping payload size.
    - DNS test: Tests connectivity by sending a DNS query to the specified DNS server.
    - HTTP test: Tests connectivity by sending an HTTP or HTTPS GET request to the URL specified in Web servers. The URL should take the format of http[s]://hostname/[path].
    - Test DNS servers configured for this interface: Tests connectivity by sending a DNS query to the DNS servers configured for this interface.
    - Test the interface status: The interface is considered to be down based on:
        - Down time: The amount of time that the interface can be down before this test is considered to have failed.

          Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s].

          For example, to set Down time to ten minutes, enter 10m or 600s.

          The default is 60 seconds.
        - Initial connection time: The amount of time to wait for an initial connection to the interface before this test is considered to have failed.

          Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s].

          For example, to set Initial connection time to ten minutes, enter 10m or 600s.

          The default is 60 seconds.
11. Optional active recovery configuration parameters:
    a. Change the interval between connectivity tests.

       Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s].

       For example, to set Interval to ten minutes, enter 10m or 600s.

       The default is 15 minutes.
    b. If more than one test target is configured, for Success condition, determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets.
    c. For Attempts, type the number of probe attempts before the WAN is considered to have failed.
    d. For Response timeout, type the amount of time that the device should wait for a response to a probe attempt before considering it to have failed.

       Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s].

       For example, to set Response timeout to ten minutes, enter 10m or 600s.

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The default is 15 seconds.

11. (Optional) Repeat this procedure for IPv6.
12. Click Apply to save the configuration and apply the change.



Command Line

Active recovery can be configured for both IPv4 and IPv6. These instructions are for IPv4; to configure IPv6 active recovery, replace ipv4 in the command line with ipv6.

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create a new interface, or edit an existing one:
   - To create a new interface, see Configure a LAN, Configure a Wide Area Network (WAN), or Configure a Wide Area Network (WAN) or Configure a Wireless Wide Area Network (WWAN).
   - To edit an existing interface, change to the interface's node in the configuration schema. For example, for a interface named my_wan, change to the my_wan node in the configuration schema:

```
(config)> network interface my_wan
(config network interface my_wan)>
```

4. Enable SureLink.
   SureLink can be enabled for both IPv4 and IPv6 configurations. By default, SureLink is enabled for IPv4 for the preconfigured WAN (wan1) and WWAN (wwan1 and wwan2). It is disabled for IPv6.

```
(config network interface my_wan> ipv4 surelink enable true
(config network interface my_wan)>
```

5. Set the device to reboot when the interface is considered to have failed:

```
(config network interface my_wan ipv4 surelink)> reboot true
(config network interface my_wan ipv4 surelink>
```

6. Add a test target:

```
(config network interface my_wan)> add ipv4 surelink target end
(config network interface my_wan ipv4 surelink target 0)>
```


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7. Set the test type:

```
(config network interface my_wan ipv4 sureLink target 0)> test value
(config network interface my_wan ipv4 sureLink target 0)>
```

where value is one of:

- ping: Tests connectivity by sending an ICMP echo request to a specified hostname or IP address.
  - Specify the hostname or IP address:

    ```
    (config network interface my_wan ipv4 sureLink target 0)> ping_host host
    (config network interface my_wanipv4 sureLink target 0)>
    ```

  - (Optional) Set the size, in bytes, of the ping packet:

    ```
    (config network interface my_wan ipv4 sureLink target 0)> ping_size [num]
    (config network interface my_wan ipv4 sureLink target 0)>
    ```

- dns: Tests connectivity by sending a DNS query to the specified DNS server.
  - Specify the DNS server. Allowed value is the IP address of the DNS server.

    ```
    (config network interface my_wan ipv4 sureLinktarget 0)> dns_server ip_address
    (config network interface my_wan ipv4 sureLinktarget 0)>
    ```

- dns_configured: Tests connectivity by sending a DNS query to the DNS servers configured for this interface.
- http: Tests connectivity by sending an HTTP or HTTPS GET request to the specified URL.
  - Specify the url:

    ```
    (config network interface my_wan ipv4 sureLink target 0)> http_url value
    (config network interface my_wan ipv4 sureLink target 0)>
    ```

    where value uses the format http[s]://hostname/[path]
- interface_up: The interface is considered to be down based on the interfaces down time, and the amount of time an initial connection to the interface takes before this test is considered to have failed.
  - (Optional) Set the amount of time that the interface can be down before this test is considered to have failed:

    ```
    (config network interface my_wan ipv4 sureLink target 0)> interface_down_time value
    (config network interface my_wan ipv4 sureLink target 0)>
    ```

    where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

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For example, to set interface_down_time to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 sureLink target 8)>
interface_down_time 600s
(config network interface my_wan ipv4 sureLink target 8)>
```

The default is 60 seconds.

c. [Optional] Set the amount of time to wait for an initial connection to the interface before this test is considered to have failed:

```
(config network interface my_wan ipv4 sureLink target 8)>
interface_timeout value
(config network interface my_wan ipv4 sureLink target 8)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set interface_timeout to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 sureLink target 8)>
interface_timeout 600s
(config network interface my_wan ipv4 sureLink target 8)>
```

The default is 60 seconds.

[Optional] Repeat to add additional test targets.

8. Optional active recovery configuration parameters:

a. Move back two levels in the configuration by typing .. ..:

```
(config network interface my_wan ipv4 sureLink target 8)> .. ..
(config network interface my_wan ipv4 sureLink>
```

b. Set the interval between connectivity tests:

```
(config network interface my_wan ipv4 sureLink)> interval value
(config network interface my_wan ipv4 sureLink>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set interval to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 sureLink)> interval 600s
(config network interface my_wan ipv4 sureLink)>
```

The default is 15 minutes.

c. If more than one test target is configured, determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets:

```
(config network interface my_wan ipv4 sureLink)> success_condition value
(config network interface my_wan ipv4 sureLink>
```

Where value is either one or all.

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c. Set the number of probe attempts before the WAN is considered to have failed:

```
(config network interface my_wan ipv4 surelink)> attempts num
(config network interface my_wan ipv4 surelink)>
```

The default is 3.

e. Set the amount of time that the device should wait for a response to a probe attempt before considering it to have failed:

```
(config network interface my_wan ipv4 surelink)> timeout value
(config network interface my_wan ipv4 surelink)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set timeout to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 surelink)> timeout 600s
(config network interface my_wan ipv4 surelink)>
```

The default is 15 seconds.

9. (Optional) Repeat this procedure for IPv6.
10. Save the configuration and apply the change:

```
(config network interface my_wan ipv4 surelink)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Disable SureLink

If your device uses a private APN with no Internet access, or your device has a restricted wired WAN connection that doesn't allow DNS resolution, follow this procedure to disable the default SureLink connectivity tests. You can also disable DNS lookup or other Internet activity, while retaining the SureLink interface test.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Network > Interfaces**.
4. Select the appropriate WAN or WWAN on which SureLink should be disabled.
3. After selecting the WAN or WWAN, click **IPv4 > SureLink**.

6. Toggle off **Enable** to disable SureLink.
7. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Change to the WAN or WWAN's node in the configuration schema. For example, to disable SureLink for the WWAN1 interface:

```
(config)> network interface wwan1
(config network interface wwan1)>
```


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4. Disable SureLink:

```
(config network interface wwan1> ipv4 surelink enable false
(config network interface wwan1)>
```

5. Save the configuration and apply the changes:

```
(config network interface my_wwan ipv4 surelink)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Disable DNS lookup

Alternatively, you can disable DNS lookup or other Internet activity for devices that use a private APN with no Internet access, or that have restricted wired WAN connections that do not allow DNS resolution, while retaining the SureLink interface test. The SureLink interface test determines if the interface has an IP address assigned to it, that the physical link is up, and that a route is present to send traffic out of the network interface.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Interfaces**.
4. Select the appropriate WAN or WWAN on which SureLink should be disabled.

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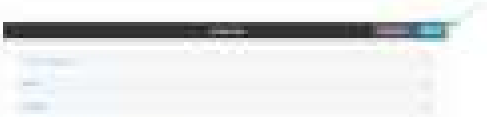
5. After selecting the WAN or WWAN, click IPv4 > SureLink.

6. Click to expand Test targets.
7. Click to expand the second test target. This test target has its Test type set to Test DNS servers configured for this interface.



8. Click the menu icon (...) next to the target and select Delete.

9. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Change to the WAN or WWAN's node in the configuration schema. For example, to disable SureLink for the WWAN1 interface:

```
(config)> network interface wwan1
(config network interface wwan1)>
```


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4. Determine the index number of the target:

```
(config network interface wwan1)> show ipv4 sureLink target
0
        interface_down_time 600s
        interface_timeout 120s
        test interface_up
1
        test dns_configured
(config network interface wwan1)>
```

5. Delete the target:

```
(config network interface wwan1)> del ipv4 sureLink target 1
(config network interface wwan1)>
```

6. Save the configuration and apply the change:

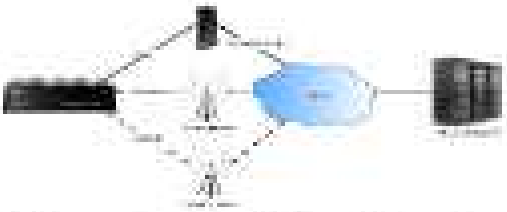
```
(config network interface my_wwan ipv4 sureLink)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Example: Use a ping test for WAN failover from Ethernet to cellular

In this example configuration, the WAN1 interface serves as the primary WAN, while the cellular WWAN1 and WWAN2 interfaces, respectively, serve as the backup WANs.



In this example configuration, SureLink is used over the WAN1 interface to send a probe packet of size 256 bytes to the IP host 45.86.83.111 every 10 seconds. If there are three consecutive failed responses, the TX64 device brings the WAN1 interface down and starts using the WWAN1 interface.

If the TX64 device cannot get a connection on the WWAN1 interface, it attempts to use the WWAN2 interface. It continues to regularly test the connection to WAN1 and WWAN1, and when tests on one of those WANs succeeds, the device fails back to the successful highest priority WAN.

To achieve this WAN failover from the WAN1 to the WWAN1 and WWAN2 interfaces, the WAN failover configuration is:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Configure active recovery on WAN1:
   a. Click **Network** > **Interfaces** > **WAN1** > **IPv4** > **SureLink**.

   b. For **Interval**, type **10s**.
   c. Click to expand **Test targets**.
   d. Delete the existing test targets:
      Click the menu icon (...) next to each target and select **Delete**.

   e. For **Add Test Target**, click **+**.



   f. For **Test type**, select **Ping test**.
   g. For **Ping host**, type **43.88.93.111**.

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b. For Ping payload size, type 256.

4. Repeat the above step for WWAN1 and WWAN2 to enable SureLink on those interfaces.
5. Configure WWAN1 to have priority over WWAN2. The default configurations for WWAN1 and WWAN2 both have the metric set to 3, while WAN1 has a metric of 1. To configure WWAN1 to have priority over WWAN2 and continue to be setup as a backup to WAN1, WWAN1's metric should be set to 2.
   a. Click Network > Interfaces > WWAN1 > IPv4.
   b. For Metric, type 2.

6. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Configure SureLink on WAN1:
   a. Set the interval to ten seconds:

```
(config)> network interface wan1 ipv4 surelink interval 10s
(config)>
```

   b. Delete the existing test targets:

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```
(config network interface wan1> del ipv4 sureLink target 0
(config network interface wan1> del ipv4 sureLink target 1
(config network interface wan1)>
```

c. Add a test target:

```
(config)> add network interface wan1 ipv4 sureLink target end
(config network interface wan1 ipv4 sureLink target 0)>
```

d. Set the probe type to ping:

```
(config network interface wan1 ipv4 sureLink target 0)> test ping
(config network interface wan1 ipv4 sureLink target 0)>
```

e. Set the packet size to 256 bytes:

```
(config network interface wan1 ipv4 sureLink target 0)> ping_size 256
(config network interface wan1 ipv4 sureLink target 0)>
```

f. Set the host to ping:

```
(config network interface wan1 ipv4 sureLink target 0)> ping_host
63.66.93.111
(config network interface wan1 ipv4 sureLink target 0)>
```

5. Repeat the above step for the cellular WWAN1 (wwan1) and WWAN2 (wwan2) interfaces to enable SureLink on those interfaces.
4. Configure WWAN1 to have priority over WWAN2. The default configurations for WWAN1 and WWAN2 both have the metric set to 2, while WAN1 has a metric of 1. To configure WWAN1 to have priority over WWAN2 and continue to be setup as a backup to WAN1, WWAN1's metric should be set to 3.

a. Type ... to return to the root of the config prompt:

```
(config network interface wan1 ipv4 sureLink target 0)> ...
(config)>
```

b. Set the metric for WWAN1:

```
(config)> network interface wwan1 ipv4 metric 3
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

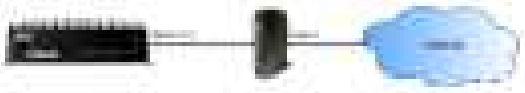
5. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Using Ethernet devices in a WAN

The TX64 device has four Ethernet devices, named ETH1 , ETH2, ETH3, and ETH4. You can use these Ethernet interfaces as a WAN when connecting to the Internet, through a device such as a cable modem:



By default, the WAN/ETH1 Ethernet device is configured as a WAN, named WAN1, with both DHCP and NAT enabled and using the External firewall zone. This means you should be able to connect to the Internet by connecting the WAN/ETH1 Ethernet port to another device that already has an Internet connection.

The ETH2, ETH3, and ETH4 devices are by default configured as part of a bridge named LAN1 that is used by the LAN1 interface, which uses the Internal firewall zone. If desired, you can assign these Ethernet devices to a WAN.

Using cellular modems in a Wireless WAN (WWAN)

The TX64 supports two cellular modems, named **WWAN1 cellular modem** and **WWAN2 cellular modem**, which are included in two preconfigured Wireless WANs, WWAN1 and WWAN2.

Each cellular modem can have only one active interface at any one time. For example, WWAN1 cellular modem can have either SIM1 or SIM2 up at one time.

Typically, you configure SIM1 of the cellular modem as the primary cellular interface, and SIM2 as the backup cellular interface. In this way, if the TX64 device cannot connect to the network using SIM1, it automatically fails over to SIM2. TX64 devices automatically use the correct cellular module firmware for each carrier when switching SIMs.

Because the TX64 device has two cellular modems, it can have two cellular interfaces up at one time—one for each modem. Typically, an administrator would route traffic to different destinations over a specific cellular interface.

Configure cellular modem APNs

The TX64 device uses a preconfigured list of Access Point Names (APNs) when attempting to connect to a cellular carrier for the first time. After the device has successfully connected, it will remember the correct APN. As a result, it is generally not necessary to configure APNs. However, you can configure the system to use a specified APN.

To configure the APN:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. The TX64 device has two WWANs, WWAN1 and WWAN2, which correspond to each cellular modem. Select the appropriate WWAN.

   For example, to configure the Access Point Names (APNs) for WWAN1, click **Network** > **Interfaces** > **WWAN1** > **APN Set** > **APN**.

4. For APN, type the Access Point Name (APN) to be used when connecting to the cellular carrier.
5. (Optional) IP version:

   For IP version, select one of the following:

   - **Automatic**: Requests both IPv4 and IPv6 address.
   - **IPv4**: Requests only an IPv4 address.
   - **IPv6**: Requests only an IPv6 address.

   The default is Automatic.

6. (Optional) Authentication method:

   For Authentication method, select one of the following:

   - **None**: No authentication is required.
   - **Automatic**: The device will attempt to connect using CHAP first, and then PAP.
   - **CHAP**: Uses the Challenge Handshake Authentication Protocol (CHAP) to authenticate.
   - **PAP**: Uses the Password Authentication Protocol (PAP) to authenticate.

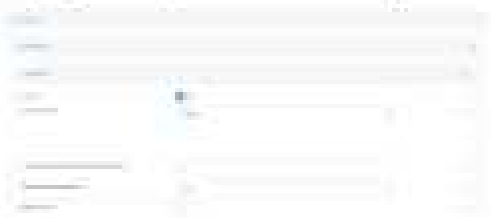
   If Automatic, CHAP, or PAP is selected, enter the Username and Password required to authenticate.

   The default is None.

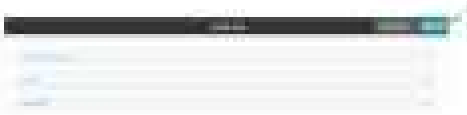
7. To add additional APNs, for Add APN, click **+** and repeat the preceding instructions.

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5. (Optional) To configure the device to bypass its preconfigured APN list and only use the configured APNs, enable APN list only.



6. Click Apply to save the configuration and apply the changes.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. The TX64 device has two WWANs, wwan1 and wwan2, which correspond to each cellular modem. Use the appropriate WWAN name to set the APN for the modem used by that WWAN. For example, to configure the APN for the modem used by wwan1:

```
(config)> network interface wwan1 modem apn 0 apn value
(config)>
```

   where value is the APN for the SIM card.
4. (Optional) To add additional APNs:
   a. Use the add command to add a new APN entry. For example:

```
(config)> add network interface wwan1 modem apn end
(config network interface wwan1 modem apn 1)>
```

   b. Set the value of the APN:

```
(config network interface wwan1 modem apn 1)> apn value
(config network interface wwan1 modem apn 1)>
```

   where value is the APN for the SIM card.
5. (Optional) Set the IP version:

```
(config)> network interface wwan1 modem apn 0 ip_version version
```


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```
(config)>
```

where version is one of the following:

- auto: Requests both IPv4 and IPv6 address.
- ipv4: Requests only an IPv4 address.
- ipv6: Requests only an IPv6 address.

The default is auto.

6. (Optional) Set the authentication method:

```
(config)> network interface wwan1 modem apn 0 auth method
(config)>
```

where method is one of the following:

- none: No authentication is required.
- auto: The device will attempt to connect using CHAP first, and then PAP.
- chap: Uses the Challenge Handshake Authentication Profile (CHAP) to authenticate.
- pap: Uses the Password Authentication Profile (PAP) to authenticate.

If auto, chap, or pap is selected, enter the Username and Password required to authenticate:

```
(config)> network interface wwan1 modem apn 0 username name
(config)> network interface wwan1 modem apn 0 password pwd
(config)>
```

The default is none.

7. (Optional) To configure the device to bypass its preconfigured APN list and only use the configured APNs:

```
(config)> network interface wwan1 modem apn_lock true
(config)>
```

8. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

9. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show cellular status and statistics

You can view a summary status for all cellular modems, or view detailed status and statistics for a specific modem.

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **Status**.

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3. Under Connections, click Modems.
   The modem status window is displayed.

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Use the show modem command:
   - To view a status summary for all modems:

```
> show modem

Modem  SIM          Status      APN        Signal Strength
-----  -----------  ----------  ---------  ---------------
wwan1  1 (ready)    connected   1234       Good (-84 dBm)
wwan2  1 (ready)    connected   1234       Good (-84 dBm)

>
```

   - To view detailed status and statistics for a specific modem, use the show modem name name command. For example, to view detailed status and statistics for a modem named wwan1:

```
> show modem name wwan1

wwan1: [Telit] LM940

-------
IMEI                : 781154786325488
Manufacturer        : Telit
Model               : LM940
FW Version          : 24.81.541_ATT
Revision            : 24.81.541

Status
------
State               : connected
APN                 : 1234
Signal Strength     : Good (-85 dBm)
Bars                : 2/5
Access Mode         : 4G
Temperature         : 34C
IP address (IPv4)   : 10.200.1.2
Gateway (IPv4)      : 10.200.1.1

SIM
---
SIM Slot            : 1
SIM Status          : ready
IMSI                : 7568521648 2134
```


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```
IOCID                 : 2656789654321546333317
SIM Provider          : AT&T

>
```

Unlock a SIM card

A SIM card can be locked if a user tries to set an invalid PIN for the SIM card too many times. In addition, some cellular carriers require a SIM PIN to be added before the SIM card can be used. If the SIM card is locked, the TX64 device cannot make a cellular connection.

Command line

To unlock a SIM card:

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the Admin CLI prompt, use the modem command to set a new PIN for the SIM card:

   ```
   > modem puk unlock puk_code new_pin modem_name
   >
   ```

   For example, to unlock a SIM card in the modem named wwan1 with PUK code 12345678, and set the new SIM PIN to 1234:

   ```
   > modem puk unlock 12345678 1234 wwan1
   >
   ```

3. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Note If the SIM remains in a locked state after using the unlock command, contact your cellular carrier.

Signal strength for 4G cellular connections

For 4G connections, the RSRP value determines signal strength.

- Excellent: > -90 dBm
- Good: -90 dBm to -105 dBm
- Fair: -106 dBm to -113 dBm
- Poor: -114 dBm to -120 dBm
- No service: < -120 dBm

See Show cellular status and statistics for procedures to view this information.

Signal strength for 3G and 2G cellular connections

For 3G and 2G cellular connections, the current RSSI value determines signal strength.

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- Excellent: > -70 dBm
- Good: -70 dBm to -85 dBm
- Fair: -86 dBm to -100 dBm
- Poor: < -100 dBm to -109 dBm
- No service: -110 dBm

See Show cellular status and statistics for procedures to view this information.

Tips for improving cellular signal strength

If the signal strength LEDs or the signal quality for your device indicate Poor or No service, try the following things to improve signal strength:

- Move the TX64 device to another location.
- Try connecting a different set of antennas, if available.
- Purchase a Digi Antenna Extender Kit:
  - Antenna Extender Kit, 1m
  - Antenna Extender Kit, 3m

AT command access

To run AT commands from the TX64 command line:

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the Admin CLI prompt, type modem at-interactive and press Enter. Type n if you do not want exclusive access. This allows you to send AT commands to the device while still allowing the device to connect, disconnect, and/or reconnect to the cellular network.
3. At the Admin CLI prompt, use the modem command to begin an interactive AT command session:

```
> modem at-interactive user want

Do you want exclusive access to the modem? (y/n) [y]:
```

4. Type n if you do not want exclusive access. This allows you to send AT commands to the device while still allowing the device to connect, disconnect, and/or reconnect to the cellular network.

   The following is an example interactive AT command:

```
> modem at-interactive user want

Do you want exclusive access to the modem? (y/n) [y]: n
Starting terminal access to modem AT commands.
Note that the modem is still in operation.
```


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```
To quit enter '~.' ('~~.' if using an ssh client) and press ENTER

Connected
at!i
Manufacturer: Sierra Wireless, Incorporated
Model: MC7455
Revision: SWI9X30C_02.34.03.00 r6978 CARMD-EV-FW00007 2017/03/02 13:36:45
MEID: 35987306945169
IMEI: 359873069451693
IMEI SV: 9
FSN: LQ6585519078136
+GCAP: +CGSM
OK
```

3. Type **exit** to exit the Admin CLI.

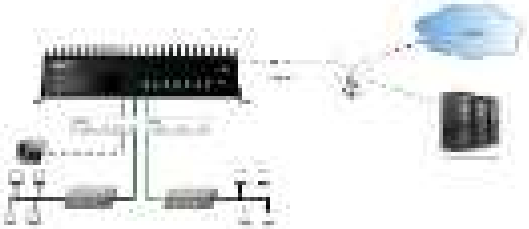
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configure dual APNs

Some cellular carriers offer a dual APN feature that allows a SIM card to be provisioned with two separate APNs that can be used simultaneously. For example, Verizon offers this service as its Split Data Routing feature. This feature provides two separate networking paths through a single cellular modem and SIM card, and allows for configurations such as:

- Segregating public and private traffic, including policy-based routes to ensure that your internal network traffic always goes through the private connection.
- Separation of untrusted Internet traffic from trusted internal network traffic.
- Secure connection to internal customer network without using a VPN.
- Separate billing structures for public and private traffic.
- Site-to-site networking, without the overhead of tunneling for each device.

In the following example configuration, all traffic on LAN1 is routed through the public APN to the Internet, and all traffic on LAN2 is routed through the private APN to the customer's data center.



To accomplish this, we will create separate WWAN interfaces that use the same modem but use different APNs, and then use routing rules to forward traffic to the appropriate WWAN interface.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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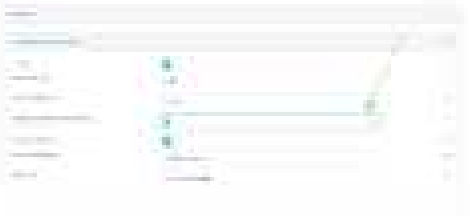
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Increase the maximum number of interfaces allowed for the modem:
   a. Click **Network** > **Modems** > **WWAN1 cellular modem**.
   b. For **Maximum number of interfaces**, type **2**.



4. Create the WWAN interfaces:
   In this example, we will create two interfaces named **WWAN_Public** and **WWAN_Private**.
   a. Click **Network** > **Interfaces**.
   b. For **Add interface**, type **WWAN_Public** and click **+**.

   c. For **Interface type**, select **Modem**.
   d. For **Zone**, select **External**.
   e. For **Device**, select **WWAN1 cellular modem**.
   f. (Optional): Configure the public APN. If the public APN is not configured, the TX64 will attempt to determine the APN.

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k. Click to expand APN list > APN.
l. For APN, type the public APN for your cellular carrier.



g. For Add interface, type WWAN_Private and click +.

h. For Interface type, select Modem.
i. For Zone, select External.
j. For Device, select WWAN1 cellular modem.
This should be the same modem selected for the WWAN_Public WWAN.
k. Enable APN list only.
l. Click to expand APN list > APN.
m. For APN, type the private APN provided to you by your cellular carrier.



5. Create the routing policies. For example, to route all traffic from LAN1 through the public APN, and LAN2 through the private APN:

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a. Click **Network** > **Routes** > **Policy-based routing**.
b. Click the **+** to add a new route policy.

c. For **Label**, enter Route through public APN.
d. For **Interface**, select **Interface: WWAN_Public**.
e. Configure the source address:
   i. Click to expand **Source address**.
   ii. For **Type**, select **Interface**.
   iii. For **Interface**, select **LAN1**.
f. Configure the destination address:
   i. Click to expand **Destination address**.
   ii. For **Type**, select **Interface**.
   iii. For **Interface**, select **Interface: WWAN_Public**.

g. Click the **+** to add another route policy.
h. For **Label**, enter Route through private APN.
i. For **Interface**, select **Interface: WWAN_Private**.
j. Configure the source address:
   i. Click to expand **Source address**.
   ii. For **Type**, select **Interface**.
   iii. For **Interface**, select **LAN2**.
k. Configure the destination address:
   i. Click to expand **Destination address**.
   ii. For **Type**, select **Interface**.

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iii. For Interface, select Interface: WWAN_Private.

5. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set the maximum number of interfaces for the modem:

```
(config)> network modem wwan1 max_totifs 2
(config)>
```

4. Create the WWAN interfaces:
   a. Create the WWANPublic interface:

```
(config)> add network interface WWANPublic
(config network interface WWANPublic)>
```

   b. Set the interface type to modem:

```
(config network interface WWANPublic)> type modem
(config network interface WWANPublic)>
```

   c. Set the modem device:

```
(config network interface WWANPublic)> modem device wwan1
(config network interface WWANPublic)>
```

   d. (Optional) Set the public APN. If the public APN is not configured, the TX64 will attempt to determine the APN.

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```
(config network interface WWANPublic)> modem apn public_apn
(config network interface WWANPublic)>
```

e. Use to periods (..) to move back one level in the configuration:

```
(config network interface WWANPublic)> ..
(config network interface)>
```

f. Create the WWANPrivate interface:

```
(config network interface)> add WWANPrivate
(config network interface WWANPrivate)>
```

g. Set the interface type to modem:

```
(config network interface WWANPrivate)> type modem
(config network interface WWANPrivate)>
```

h. Set the modem device:

```
(config network interface WWANPrivate)> modem device wwan1
(config network interface WWANPrivate)>
```

i. Enable APN list only:

```
(config network interface WWANPrivate)> apn_lock true
(config network interface WWANPrivate)>
```

j. Set the private APN:

```
(config network interface WWANPublic)> modem apn private_apn
(config network interface WWANPublic)>
```

3. Create the routing policies. For example, to route all traffic from LAN1 through the public APN, and LAN2 through the private APN:

a. Add a new routing policy:

```
(config)> add network route policy end
(config network route policy 0)>
```

b. Set the label that will be used to identify this route policy:

```
(config network route policy 0)> label "Route through public apn"
(config network route policy 0)>
```

c. Set the interface:

```
(config network route policy 0)> interface /network/interface/WWANPublic
(config network route policy 0)>
```


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d. Configure the source address:

i. Set the source type to interface:

```
(config network route policy 8)> src type interface
(config network route policy 8)>
```

ii. Set the interface to LAN1:

```
(config network route policy 8)> src interface LAN1
(config network route policy 8)>
```

e. Configure the destination address:

i. Set the type to interface:

```
(config network route policy 8)> dst type interface
(config network route policy 8)>
```

ii. Set the interface to WWANPublic:

```
(config network route policy 8)> interface
/network/interface/WWANPublic
(config network route policy 8)>
```

f. Use to periods (..) to move back one level in the configuration:

```
(config network route policy 8)> ..
(config network route policy)>
```

g. Add a new routing policy:

```
(config network route policy )> add end
(config network route policy 1)>
```

h. Set the label that will be used to identify this route policy:

```
(config network route policy 1)> label "Route through private apn"
(config network route policy 1)>
```

i. Set the interface:

```
(config network route policy 1)> interface
/network/interface/WWANPrivate
(config network route policy 1)>
```

j. Configure the source address:

i. Set the source type to interface:

```
(config network route policy 1)> src type interface
(config network route policy 1)>
```


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i. Set the interface to LAN2:

```
(config network route policy 1)> src interface LAN2
(config network route policy 1)>
```

ii. Configure the destination address:

i. Set the type to interface:

```
(config network route policy 1)> dst type interface
(config network route policy 1)>
```

ii. Set the interface to WWANPrivate :

```
(config network route policy 1)> interface
/network/interface/WWANPrivate
(config network route policy 1)>
```

iii. Save the configuration and apply the change:

```
(config network route policy 1)> save
Configuration saved.
>
```

iv. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Configure a Wide Area Network (WAN)

Configuring a Wide Area Network (WAN) involves configuring the following items:

Required configuration items

- The interface type: Ethernet.
- The firewall zone: External.
- The network device or bridge that is used by the WAN.
- Configure the WAN as a DHCP client.

Additional configuration items

- Additional IPv4 configuration:
  - The metric for IPv4 routes associated with the WAN.
  - The relative weight for IPv4 routes associated with the WAN.
  - The IPv4 management priority of the WAN. The active interface with the highest management priority will have its address reported as the preferred contact address for central management and direct device access.
  - The IPv4 Maximum Transmission Unit (MTU) of the WAN.
  - When to use DNS servers for this interface.
  - Whether to include the TX64 device's hostname in DHCP requests.
  - SureLink active recovery configuration. See Configure SureLink active recovery to detect WAN/WWAN failures for further information.
- IPv6 configuration:
  - The metric for IPv6 routes associated with the WAN.
  - The relative weight for IPv6 routes associated with the WAN.
  - The IPv6 management priority of the WAN. The active interface with the highest management priority will have its address reported as the preferred contact address for central management and direct device access.
  - The IPv6 Maximum Transmission Unit (MTU) of the WAN.
  - When to use DNS servers for this interface.
  - Whether to include the TX64 device's hostname in DHCP requests.
  - Active recovery configuration. See Configure SureLink active recovery to detect WAN/WWAN failures for further information.
- MAC address blacklist and whitelist.

To create a new WAN or edit an existing WAN:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Interfaces**.
4. Create the WAN or select an existing WAN:
   - To create a new WAN, for **Add Interface**, type a name for the WAN and click ➕.

   - To edit an existing WAN, click to expand the WAN.

The **Interface** configuration window is displayed.

New WANs are enabled by default. To disable, click **Enable**.

5. For **Interface type**, leave at the default setting of **Ethernet**.
6. For **Zone**, select **External**.
7. For **Device**, select an Ethernet device, a Wi-Fi client, or a bridge. See Bridging for more information about bridging.

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8. Configure IPv4 settings:
   a. Click to expand IPv4.

      IPv4 support is enabled by default.
   b. For Type, select DHCP address.
   c. Optional IPv4 configuration items:
      i. Set the Metric.

         See Configure WAN/WWAN priority and default route metrics for further information about metrics.
      ii. For Weight, type the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, Weight is used to load balance traffic to the interfaces.
      iii. Set the Management priority. This determines which interface will have priority for central management activity. The interface with the highest number will be used.
      iv. Set the MTU.
      v. For Use DNS, select one of the following:
         - Always: DNS will always be used for this WAN; when multiple interfaces have the same DNS server, the interface with the lowest metric will be used for DNS requests.
         - When primary default route: Only use the DNS servers provided for this interface when the interface is the primary route.
         - Never: Never use DNS servers for this interface.
      vi. Enable DHCP Hostname to instruct the TX64 device to include the device's system name with DHCP requests as the Client FQDN option. The DHCP server can then be configured to register the device's hostname and IP address with an associated DNS server.
         - See RFC4702 for further information about DHCP server support for the Client FQDN option.
         - See Configure system information for information about setting the TX64 device's system name.
   d. See Configure SureLink active recovery to detect WAN/WWAN failures for information about configuring Active recovery.
9. (Optional) Configure IPv6 settings:
   a. Click to expand IPv6.
   b. Enable IPv6 support.
   c. For Type, select DHCPv6 address.
   d. For Prefix length, type the minimum length of the prefix to assign to this LAN. If the minimum length is not available, then a longer prefix will be used.
   e. For Prefix ID, type the identifier used to extend the prefix to the assigned length. Leave blank to use a random identifier.
   f. Set the Metric.

      See Configure WAN/WWAN priority and default route metrics for further information about metrics.

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g. For **Weight**, type the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, **Weight** is used to load balance traffic to the interfaces.

h. Set the **Management priority**. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

i. Set the **MTU**.

j. For **Use DNS**:

- **Always**: DNS will always be used for this WAN; when multiple interfaces have the same DNS server, the interface with the lowest metric will be used for DNS requests.
- **When primary default route**: Only use the DNS servers provided for this interface when the interface is the primary route.
- **Never**: Never use DNS servers for this interface.

k. Enable **DHCP Hostname** to instruct the TX64 device to include the device's system name with DHCP requests as the Client FQDN option. The DHCP server can then be configured to register the device's hostname and IP address with an associated DNS server.

- See [illegible] for further information about DHCP server support for the Client FQDN option.
- See Configure system information for information about setting the TX64 device's system name.

10. (Optional) Click to expand **MAC address blacklist**.

Incoming packets will be dropped from any devices whose MAC addresses is included in the **MAC address blacklist**.

a. Click to expand **MAC address blacklist**.

b. For **Add MAC address**, click ➕.

c. Type the **MAC address**.

11. (Optional) Click to expand **MAC address whitelist**.

If there whitelist entries are specified, incoming packets will only be accepted from the listed MAC addresses.

a. Click to expand **MAC address whitelist**.

b. For **Add MAC address**, click ➕.

c. Type the **MAC address**.

12. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create a new WAN or edit an existing one:
   - To create a new WAN named my_wan:

```
(config)> add network interface my_wan
(config network interface my_wan)>
```

   - To edit an existing WAN named my_wan, change to the my_wan node in the configuration schema:

```
(config)> network interface my_wan
(config network interface my_wan)>
```

4. Set the appropriate firewall zone:

```
(config network interface my_wan)> zone zone
(config network interface my_wan)>
```

See Firewall configuration for further information.

5. Select an Ethernet device, a Wi-Fi device, or a bridge. See Bridging for more information about bridging.
   a. Enter device ? to view available devices and the proper syntax.

```
(config network interface my_wan)> device ?

Device: The network device used by this network interface.
Format:
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/loopback
  /network/bridge/hotspot_bridge
  /network/bridge/lan1
  /network/wireless/ap/digi_ap1
  /network/wireless/ap/digi_ap2
  /network/wireless/ap/digi_hotspot_ap1
  /network/wireless/ap/digi_hotspot_ap2
Current value:

(config network interface my_wan)> device
```

   b. Set the device for the LAN:

```
(config network interface my_wan)> device device
(config network interface my_wan)>
```


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6. Configure IPv4 settings:
   - IPv4 support is enabled by default. To disable:

```
(config network interface my_wan)> ipv4 enable false
(config network interface my_wan)>
```

   - Configure the WAN to be a DHCP client:

```
(config network interface my_wan)> ipv4 type dhcp
(config network interface my_wan)>
```

   a. Optional IPv4 configuration items:
      i. Set the IP metric:

```
(config network interface my_wan)> ipv4 metric num
(config network interface my_wan)>
```

      See Configure WAN/WWAN priority and default route metrics for further information about metrics.

      ii. Set the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, the weight is used to load balance traffic to the interfaces.

```
(config network interface my_wan)> ipv4 weight num
(config network interface my_wan)>
```

      iii. Set the management priority. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

```
(config network interface my_wan)> ipv4 mgmt num
(config network interface my_wan)>
```

      iv. Set the MTU:

```
(config network interface my_wan)> ipv4 mtu num
(config network interface my_wan)>
```

      v. Configure how to use DNS:

```
(config network interface my_wan)> ipv4 use_dns value
(config network interface my_wan)>
```

      where value is one of:
      - always: DNS will always be used for this WAN; when multiple interfaces have the same DNS server, the interface with the lowest metric will be used for DNS requests.
      - primary: Only use the DNS servers provided for this interface when the interface is the primary route.
      - never: Never use DNS servers for this interface.

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vi. Enable DHCP Hostname to instruct the TX64 device to include the device's system name with DHCP requests as the Client FQDN option. The DHCP server can then be configured to register the device's hostname and IP address with an associated DNS server.

```
(config network interface my_wan)> ipv4 dhcp_hostname true
(config network interface my_wan)>
```

- See RFC4702 for further information about DHCP server support for the Client FQDN option.
- See Configure system information for information about setting the TX64 device's system name.

b. See Configure SureLink active recovery to detect WAN/WWAN failures for information about configuring active recovery.

7. (Optional) Configure IPv6 settings:

a. Enable IPv6 support:

```
(config network interface my_wan)> ipv6 enable true
(config network interface my_wan)>
```

b. Set the IPv6 type to DHCP:

```
(config network interface my_wan)> ipv6 type dhcpv6
(config network interface my_wan)>
```

c. Generally, the default settings for IPv6 support are sufficient. You can view the default IPv6 settings by using the question mark (?):

```
(config network interface my_wan)> ipv6 ?

IPv6

Parameters                  Current Value
--------------------------  ------------  ------------------------------
dhcp_hostname               false         DHCP Hostname
enable                      true          Enable
metric                      0             Metric
mgmt                        0             Management priority
mtu                         1500          MTU
type                        dhcpv6        Type
use_dns                     always        Use DNS
weight                      10            Weight

Additional Configuration
--------------------------  ------------  ------------------------------
connection_monitor          Active recovery

(config network interface my_wan)>
```


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d. Modify any of the remaining default settings as appropriate. For example, to change the metric:

```
(config network interface my_wan)> ipv6 metric 1
(config network interface my_wan)>
```

If the minimum length is not available, then a longer prefix will be used.

See Configure WAN/WWAN priority and default route metrics for further information about metrics.

8. Save the configuration and apply the change:

```
(config network interface my_wan)> save
Configuration saved.
>
```

9. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure a Wireless Wide Area Network (WWAN)

Configuring a Wireless Wide Area Network (WWAN) involves configuring the following items:

Required configuration items

- The interface type: Modem.
- The firewall zone: External.
- The cellular modem that is used by the WWAN.

Additional configuration items

- SIM selection for the WWAN.
- The SIM PIN.
- The SIM phone number for SMS connections.
- Enable or disable roaming.
- DNS options.
- SIM failover configuration.
- APN configuration.
- The custom gateway/netmask.
- IPv4 configuration:
  - The metric for IPv4 routes associated with the WAN.
  - The relative weight for IPv4 routes associated with the WAN.
  - The IPv4 management priority of the WAN. The active interface with the highest management priority will have its address reported as the preferred contact address for central management and direct device access.
  - The IPv4 Maximum Transmission Unit (MTU) of the WAN.

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- SureLink active recovery configuration. See Configure SureLink active recovery to detect WAN/WWAN failures for further information.

- IPv6 configuration:
  - The metric for IPv6 routes associated with the WAN.
  - The relative weight for IPv6 routes associated with the WAN.
  - The IPv6 management priority of the WAN. The active interface with the highest management priority will have its address reported as the preferred contact address for central management and direct device access.
  - The IPv6 Maximum Transmission Unit (MTU) of the WAN.
  - SureLink active recovery configuration. See Configure SureLink active recovery to detect WAN/WWAN failures for further information.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > Interfaces**.
4. Create the WWAN or select an existing WWAN:
   - To create a new WWAN, for **Add Interface**, type a name for the WWAN and click **+**.

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- To edit an existing WWAN, click to expand the WWAN.

  New WWANs are enabled by default. To disable, click **Enable**.

3. For **Interface type**, select **Modem**.



6. For **Zone**, select **External**.
7. For **Device**, select a cellular modem.
8. Optional WWAN configuration items:
   a. For **Match SIM by**, select a SIM matching criteria to determine when this WWAN should be used:
      - If **SIM slot** is selected, for **Match SIM slot**, select which SIM slot must be in active for this WWAN to be used.
      - If **Carrier** is selected, for **Match SIM carrier**, select which cellular carrier must be in active for this WWAN to be used.
      - If **PLMN identifier** is selected, for **Match PLMN identifier**, type the PLMN id that must be in active for this WWAN to be used.
      - If **IMSI** is selected, for **Match IMSI**, type the International Mobile Subscriber Identity (IMSI) that must be in active for this WWAN to be used.
      - If **ICCID** is selected, for **Match ICCID**, type the unique SIM card ICCID that must be in active for this WWAN to be used.
   b. Type the **PIN** for the SIM. Leave blank if no PIN is required.
   c. Type the **Phone number** for the SIM, for SMS connections.

      Normally, this should be left blank. It is only necessary to complete this field if the SIM does not have a phone number or if the phone number is incorrect.
   d. **Roaming** is enabled by default. Click to disable.
   e. For **Use DNS**:
      - **Always**: DNS will always be used for this WWAN; when multiple interfaces have the same DNS server, the interface with the lowest metric will be used for DNS requests.
      - **When primary default route**: Only use the DNS servers provided for this WWAN when the WWAN is the primary route.
      - **Never**: Never use DNS servers for this WWAN.

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The default setting is **When primary default route**.

f. **SIM failover** is enabled by default, which means that the modem will automatically fail over from the active SIM to the next available SIM when the active SIM fails to connect. If enabled:

i. For **Connection attempts before SIM failover**, type the number of times that the device should attempt to connect to the active SIM before failing over to the next available SIM.

ii. For **SIM failover alternative**, configure how SIM failover will function if automatic SIM switching is unavailable:

- **None**: The device will perform no alternative action if automatic SIM switching is unavailable.
- **Reset modem**: The device will reset the modem if automatic SIM switching is unavailable.
- **Reboot device**: The device will reboot if automatic SIM switching is unavailable.

9. For **APN list and APN list only**, the TX64 device uses a preconfigured list of Access Point Names (APNs) when attempting to connect to a cellular carrier for the first time. After the device has successfully connected, it will remember the correct APN. As a result, it is generally not necessary to configure APNs. See Configure cellular modem APNs for further information and instructions for setting an APN.

10. (Optional) To configure the IP address of a custom gateway or a custom netmask:

a. Click **Custom gateway** to expand.

b. Click **Enable**.

c. For **Gateway/Netmask**, enter the IP address and netmask of the custom gateway. To override only the gateway netmask, but not the gateway IP address, use all zeros for the IP address. For example, 0.0.0.0/32 will use the network-provided gateway, but with a /32 netmask.

11. Optional IPv4 configuration items:

a. Click **IPv4** to expand.

b. IPv4 support is **Enabled** by default. Click to disable.

c. Set the **Metric**.

See Configure WAN/WWAN priority and default route metrics for further information about metrics.

d. For **Weight**, type the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, **Weight** is used to load balance traffic to the interfaces.

e. Set the **Management priority**. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

f. Set the **MTU**.

g. See Configure SureLink active recovery to detect WAN/WWAN failures for information about configuring Active recovery.

12. Optional IPv6 configuration items:

a. Click **IPv6** to expand.

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b. IPv6 support is Enabled by default. Click to disable.

c. Set the Metric.

See Configure WAN/WWAN priority and default route metrics for further information about metrics.

d. For Weight, type the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, Weight is used to load balance traffic to the interfaces.

e. Set the Management priority. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

f. Set the MTU.

g. See Configure SureLink active recovery to detect WAN/WWAN failures for information about configuring Active recovery.

Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create a new WWAN or edit an existing one:

   - To create a new WWAN named my_wwan:

```
(config)> add network interface my_wwan
(config network interface my_wwan)>
```

   - To edit an existing WWAN named my_wwan, change to the my_wwan node in the configuration schema:

```
(config)> network interface my_wwan
(config network interface my_wwan)>
```

4. Set the appropriate firewall zone:

```
(config network interface my_wwan)> zone zone
(config network interface my_wwan)>
```

See Firewall configuration for further information.

5. Select a cellular modem:

   a. Enter modem device ? to view available modems and the proper syntax.

```
(config network interface my_wwan)> modem device ?

Device: The modem used by this network interface.
Format:
```


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```
  wwan1
  wwan2
Current value:

(config network interface my_wwan)> device
```

b. Set the device:

```
(config network interface my_wwan)> modem device device
(config network interface my_wwan)>
```

5. Optional WWAN configuration items:

a. Set the SIM matching criteria to determine when this WWAN should be used:

```
(config network interface my_wwan)> modem match value
(config network interface my_wwan)>
```

Where value is one of:

- any
- carrier

Set the cellular carrier must be in active for this WWAN to be used:

i. Use ? to determine available carriers:

```
(config network interface my_wwan)> modem carrier

Match SIM carrier: The SIM carrier match criteria. This
interface is applied when the SIM card is
provisioned from the carrier.
Format:
  AT&T
  Rogers
  Sprint
  T-Mobile
  Telstra
  Verizon
  Vodafone
  other
Default value: AT&T
Current value: AT&T

(config network interface my_wwan)>
```

ii. Set the carrier:

```
(config network interface my_wwan)> modem carrier value
(config network interface my_wwan)>
```


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- **iccid**

  Set the unique SIM card ICCID that must be in active for this WWAN to be used:

  ```
  (config network interface my_wwan)> modem iccid ICCID
  (config network interface my_wwan)>
  ```

- **imsi**

  Set the International Mobile Subscriber Identity (IMSI) that must be in active for this WWAN to be used:

  ```
  (config network interface my_wwan)> modem imsi IMSI
  (config network interface my_wwan)>
  ```

- **plmn_id**

  Set the PLMN Id that must be in active for this WWAN to be used:

  ```
  (config network interface my_wwan)> modem plmn_id PLMN_ID
  (config network interface my_wwan)>
  ```

- **sim_slot**

  Set which SIM slot must be in active for this WWAN to be used:

  ```
  (config network interface my_wwan)> modem sim_slot value
  (config network interface my_wwan)>
  ```

  Where value is either 1 or 2.

b. Set the PIN for the SIM. Leave blank if no PIN is required.

```
(config network interface my_wwan)> modem pin value
(config network interface my_wwan)>
```

c. Set the phone number for the SIM, for SMS connections:

```
(config network interface my_wwan)> modem phone num
(config network interface my_wwan)>
```

Normally, this should be left blank. It is only necessary to complete this field if the SIM does not have a phone number or if the phone number is incorrect.

d. Roaming is enabled by default. To disable:

```
(config network interface my_wwan)> modem roaming false
(config network interface my_wwan)>
```

e. Configure when the WWAN's DNS servers will be used:

```
(config network interface my_wwan)> modem dns value
(config network interface my_wwan)>
```

Where value is one of:

- **always**: DNS will always be used for this WWAN; when multiple interfaces have the same DNS server, the interface with the lowest metric will be used for DNS.

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requests.

- never: Never use DNS servers for this WWAN.
- primary: Only use the DNS servers provided for this WWAN when the WWAN is the primary route.

The default setting is primary.

f. SIM failover is enabled by default, which means that the modem will automatically fail over from the active SIM to the next available SIM when the active SIM fails to connect. To disable:

```
(config network interface my_wwan)> modem sim_failover false
(config network interface my_wwan)>
```

If enabled:

i. Set the number of times that the device should attempt to connect to the active SIM before failing over to the next available SIM:

```
(config network interface my_wwan)> modem sim_failover_retries num
(config network interface my_wwan)>
```

The default setting is 3.

ii. Configure how SIM failover will function if automatic SIM switching is unavailable:

```
(config network interface my_wwan)> modem sim_failover_alt value
(config network interface my_wwan)>
```

where value is one of:

- none: The device will perform no alternative action if automatic SIM switching is unavailable.
- reset: The device will reset the modem if automatic SIM switching is unavailable.
- reboot: The device will reboot if automatic SIM switching is unavailable.

7. The TX64 device uses a preconfigured list of Access Point Names (APNs) when attempting to connect to a cellular carrier for the first time. After the device has successfully connected, it will remember the correct APN. As a result, it is generally not necessary to configure APNs. See Configure cellular modem APNs for further information and instructions for setting an APN.

8. (Optional) To configure the IP address of a custom gateway or a custom netmask:

a. Enable the custom gateway:

```
(config network interface my_wwan)> modem custom_gw enable true
(config network interface my_wwan)>
```

b. Set the IP address and netmask of the custom gateway:

```
(config network interface my_wwan)> modem custom_gw gateway ip_
address/netmask
(config network interface my_wwan)> modem custom_gw
```


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To override only the gateway netmask, but not the gateway IP address, use all zeros for the IP address. For example, 0.0.0.0/32 will use the network-provided gateway, but with a /32 netmask.

8. Optional IPv4 configuration items:
   a. IPv4 support is enabled by default. To disable:

```
(config network interface my_wwan)> ipv4 enable false
(config network interface my_wwan)>
```

   b. Set the metric:

```
(config network interface my_wwan)> ipv4 metric num
(config network interface my_wwan)>
```

See Configure WAN/WWAN priority and default route metrics for further information about metrics.

   c. Set the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, the weight is used to load balance traffic to the interfaces.

```
(config network interface my_wwan)> ipv4 weight num
(config network interface my_wwan)>
```

   d. Set the management priority. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

```
(config network interface my_wwan)> ipv4 mgmt num
(config network interface my_wwan)>
```

   e. Set the MTU:

```
(config network interface my_wwan)> ipv4 mtu num
(config network interface my_wwan)>
```

   f. See Configure SureLink active recovery to detect WAN/WWAN failures for information about configuring active recovery.
10. Optional IPv6 configuration items:
   a. Click IPv6 to expand.
   b. IPv6 support is enabled by default. To disable:

```
(config network interface my_wwan)> ipv6 enable false
(config network interface my_wwan)>
```

   c. Set the metric.

```
(config network interface my_wwan)> ipv6 metric num
(config network interface my_wwan)>
```

See Configure WAN/WWAN priority and default route metrics for further information about metrics.

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d. Set the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, the weight is used to load balance traffic to the interfaces.

```
(config network interface my_wwan0)> ipv6 weight num
(config network interface my_wwan0)>
```

e. Set the management priority. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

```
(config network interface my_wwan0)> ipv6 mgmt num
(config network interface my_wwan0)>
```

f. Set the MTU.

```
(config network interface my_wwan0)> ipv6 mtu num
(config network interface my_wwan0)>
```

g. See Configure SureLink active recovery to detect WAN/WWAN failures for information about configuring active recovery.

Show WAN and WWAN status and statistics

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. From the menu, click **Status**.
3. Under **Networking**, click **Interfaces**.

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. Enter the show network command at the Admin CLI prompt:

```
> show network
```

Interface	Proto	Status	Address
defaultip	IPv4	up	192.168.210.1/24
defaultlinklocal	IPv4	up	169.254.100.100/16
lan1	IPv4	up	192.168.2.1/24
lan1	IPv6	up	fd00:2704::1/48
loopback	IPv4	up	127.0.0.1/8
wan1	IPv4	up	10.10.10.10/24
wan1	IPv6	up	fe80:2404::240:ffff:fe80:128/64
wwan1	IPv4	up	10.200.1.101/30
wwan1	IPv6	down	
wwan2	IPv4	pending	

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```
wwan2                IPv6    down

>
```

5. Enter show network interface name at the Admin CLI prompt to display additional information about a specific WAN. For example, to display information about WAN1, enter show network interface wan1:

```
> show network interface wan1

wan1 Interface Status
---------------------
Device                : wan1
Zone                  : external

IPv4 Status           : up
IPv4 Type             : dhcp
IPv4 Address(es)      : 10.10.10.10/24
IPv4 Gateway          : 10.10.10.1
IPv4 MTU              : 1500
IPv4 Metric           : 1
IPv4 Weight           : 10
IPv4 DNS Server(s)    : 10.10.10.2, 10.10.10.3

IPv6 Status           : up
IPv6 Type             : dhcpv6
IPv6 Address(es)      : fe80:2404::240:1fff:fe80:120/64
IPv6 Gateway          : fe80::224:13ff:fe0e:4320
IPv6 MTU              : 1500
IPv6 Metric           : 1
IPv6 Weight           : 10
IPv6 DNS Server(s)    : fe80:244::1, fe80::224:13f4:fe0e:4320

>
```

4. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete a WAN or WWAN.

Follow this procedure to delete any WANs and WWANs that have been added to the system. You cannot delete the preconfigured WAN, WAN1, or the preconfigured WWANs, WWAN1 and WWAN2.



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1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.

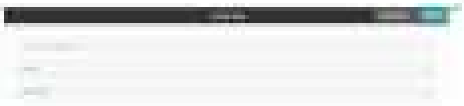


The **Configuration** window is displayed.



3. Click **Network > Interfaces**.
4. Click the menu icon (...) next to the name of the WAN or WWAN to be deleted and select **Delete**.

5. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Use the **del** command to delete the WAN or WWAN. For example, to delete a WWAN named my_wwan:

```
(config)> del network interface my_wwan
```


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4. Save the configuration and apply the changes.

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Local Area Networks (LANs)

The TX64 device is preconfigured with the following Local Area Networks (LANs):

Interface type	Preconfigured Networks	Device	Default configuration
Local Area Networks (LANs)	• LAN1	• Bridge: LAN1	• Firewall zone: Internal • IP address: 192.168.2.1/24 • DHCP server enabled • LAN priority: Restricted
	• LAN hotspot	• Bridge: hotspot_ bridge	• DHCP server: disabled
	• Loopback	• Schemat: Loopback	• Firewall zone: Loopback • IP address: 127.0.0.1/8
	• Default IP	• Bridge: LAN1	• Firewall zone: Setup • IP address 192.168.210.1/24
	• Default Link-local IP	• Bridge: LAN1	• Firewall zone: Setup • IP address 169.254.100.100/16

You can modify configuration settings for LANs, and you can create new LANs.

This section contains the following topics:

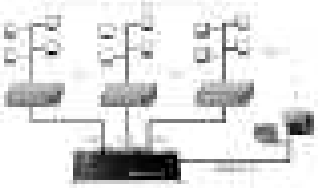
About Local Area Networks (LANs) 102
Configure a LAN 102
Example: Configure two LANs 112
Show LAN status and statistics 118
Delete a LAN 120
DHCP servers 121
Create a Virtual LAN (VLAN) route 127

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About Local Area Networks (LANs)

A Local Area Network (LAN) connects network devices together, such as Ethernet or Wi-Fi, in a logical Layer-2 network.

The following diagram shows a LAN connected to the ETH2, ETH3, and ETH4 Ethernet devices and the Digi AP (Wi-Fi1) access point. Once the LAN is configured and enabled, the devices connected to the network interfaces can communicate with each other, as demonstrated by the ping commands.



Configure a LAN

Configuring a Local Area Network (LAN) involves configuring the following items:

Required configuration items

- The interface type: either Ethernet, IP Passthrough, or PPPoE.
- The firewall zone: Internal.
- The network device or bridge that is used by the LAN.
- The IPv4 address and subnet mask for the LAN. While it is not strictly necessary for a LAN to have an IP address, if you want to send traffic from other networks to the LAN, you must configure an IP address.

> Note By default, LAN1 is set to an IP address of 192.168.2.1 and uses the IP subnet of 192.168.2.0/24. If the WAN/ETH1 Ethernet device is being used by a WAN with the same IP subnet, you should change the default IP address and subnet of LAN1.

Additional configuration items

- Additional IPv4 configuration:
  - The metric for IPv4 routes associated with the LAN.
  - The relative weight for IPv4 routes associated with the LAN.
  - The IPv4 management priority of the LAN. The active interface with the highest management priority will have its address reported as the preferred contact address for central management and direct device access.
  - The IPv4 Maximum Transmission Unit (MTU) of the LAN.
  - IPv4 DHCP server configuration. See DHCP servers for more information.
- IPv6 configuration:
  - The metric for IPv6 routes associated with the LAN.
  - The relative weight for IPv6 routes associated with the LAN.

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- The IPv6 management priority of the LAN. The active interface with the highest management priority will have its address reported as the preferred contact address for central management and direct device access.
- The IPv6 Maximum Transmission Unit (MTU) of the LAN.
- The IPv6 prefix length and ID.
- IPv6 DHCP server configuration. See DHCP servers for more information.

- MAC address blacklist and whitelist.

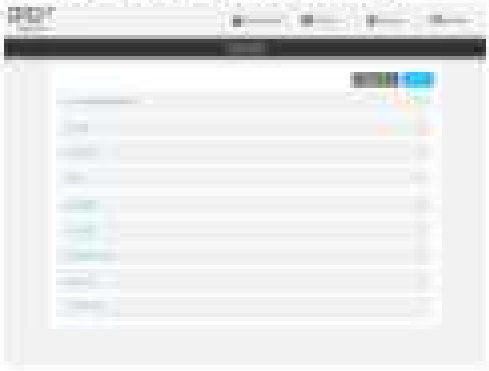
To create a new LAN or edit an existing LAN:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > Interfaces**.
4. Create the LAN or select an existing LAN:
   - To create a new LAN, for **Add Interface**, type a name for the LAN and click **+**.

   - To edit an existing LAN, click to expand the LAN.

The Interface configuration window is displayed.

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New LANs are enabled by default. To disable, click **Enable**.

5. For **Interface type**, leave at the default setting of **Ethernet**.
6. For **Zone**, select the appropriate firewall zone. See Firewall configuration for further information.
7. For **Device**, select an Ethernet device, a Wi-Fi access point, or a bridge. See Bridging for more information about bridging.
8. Configure IPv4 settings:
   a. Click to expand **IPv4**.

      IPv4 support is enabled by default.
   b. For **Type**, select **Static IP address**.
   c. For **Address**, type the IP address and subnet of the LAN interface. Use the format IPv4_address/netmask, for example, 192.168.2.1/24.
   d. Optional IPv4 configuration items:
      i. Set the **Metric**.
      ii. For **Weight**, type the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, **Weight** is used to load balance traffic to the interfaces.
      iii. Set the **Management priority**. This determines which interface will have priority for central management activity. The interface with the highest number will be used.
      iv. Set the **MTU**.
   e. Enable the DHCP server:
      i. Click to expand **DHCP server**.
      ii. Click **Enable**.

      See DHCP servers for information about configuring the DHCP server.
9. See Configure DHCP relay for information about configuring DHCP relay.
10. (Optional) Configure IPv6 settings:
    a. Click to expand **IPv6**.
    b. **Enable** IPv6 support.
    c. For **Type**, select **IPv6 prefix delegation**.
    d. For **Prefix length**, type the minimum length of the prefix to assign to this LAN. If the minimum length is not available, then a longer prefix will be used.
    e. For **Prefix ID**, type the identifier used to extend the prefix to the assigned length. Leave blank to use a random identifier.
    f. Set the **Metric**.

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g. For **Weight**, type the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, **Weight** is used to load balance traffic to the interfaces.

h. Set the **Management priority**. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

i. Set the **MTU**.

11. [Optional] Click to expand **MAC address blacklist**.

Incoming packets will be dropped from any devices whose MAC addresses is included in the **MAC address blacklist**.

a. Click to expand **MAC address blacklist**.

b. For **Add MAC address**, click **+**.

c. Type the MAC address.

12. [Optional] Click to expand **MAC address whitelist**.

If there whitelist entries are specified, incoming packets will only be accepted from the listed MAC addresses.

a. Click to expand **MAC address whitelist**.

b. For **Add MAC address**, click **+**.

c. Type the MAC address.

13. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Create a new LAN or edit an existing one:

- To create a new LAN named my_lan:

```
(config)> add network interface my_lan
(config network interface my_lan)>
```

- To edit an existing LAN named my_lan, change to the my_lan node in the configuration schema:

```
(config)> network interface my_lan
(config network interface my_lan)>
```


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4. Set the appropriate firewall zone:

```
(config network interface my_lan)> zone zone
(config network interface my_lan)>
```

See Firewall configuration for further information.

5. Select an Ethernet device, a Wi-Fi device, or a bridge. See Bridging for more information about bridging.

a. Enter device ? to view available devices and the proper syntax:

```
(config network interface my_lan)> device ?

Device: The network device used by this network interface.
Format:
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/loopback
  /network/bridge/hotspot_bridge
  /network/bridge/lan1
  /network/wireless/ap/digi_ap1
  /network/wireless/ap/digi_ap2
  /network/wireless/ap/digi_hotspot_ap1
  /network/wireless/ap/digi_hotspot_ap2
Current value:

(config network interface my_lan)> device
```

b. Set the device for the LAN:

```
(config network interface my_lan)> device device
(config network interface my_lan)>
```

6. Configure IPv4 settings:

- IPv4 support is enabled by default. To disable:

```
(config network interface my_lan)> ipv4 enable false
(config network interface my_lan)>
```

- The LAN is configured by default to use a static IP address for its IPv4 configuration. To configure the LAN to be a DHCP client, rather than using a static IP address:

```
(config network interface my_lan)> ipv4 type dhcp
(config network interface my_lan)>
```

These instructions assume that the LAN will use a static IP address for its IPv4 configuration.

a. Set the IPv4 address and subnet of the LAN interface. Use the format IPv4_address/netmask, for example, 192.168.2.1/24.

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```
(config network interface my_lan)> ipv4 address ip_address/netmask
(config network interface my_lan)>
```

b. Optional IPv4 configuration items:

i. Set the IP metric:

```
(config network interface my_lan)> ipv4 metric num
(config network interface my_lan)>
```

ii. Set the relative weight for default routes associated with this interface. For multiple active interfaces with the same metric, the weight is used to load balance traffic to the interfaces.

```
(config network interface my_lan)> ipv4 weight num
(config network interface my_lan)>
```

iii. Set the management priority. This determines which interface will have priority for central management activity. The interface with the highest number will be used.

```
(config network interface my_lan)> ipv4 mgmt num
(config network interface my_lan)>
```

iv. Set the MTU:

```
(config network interface my_lan)> ipv4 mtu num
(config network interface my_lan)>
```

c. Enable the DHCP server:

```
(config network interface my_lan)> ipv4 dhcp_server enable true
```

See DHCP servers for information about configuring the DHCP server.

7. (Optional) Configure IPv6 settings:

a. Enable IPv6 support:

```
(config network interface my_lan)> ipv6 enable true
(config network interface my_lan)>
```

b. Set the IPv6 type to DHCP:

```
(config network interface my_lan)> ipv6 type dhcpv6
(config network interface my_lan)>
```

c. Generally, the default settings for IPv6 support are sufficient. You can view the default IPv6 settings by using the question mark (?):

```
(config network interface my_lan)> ipv6 ?

IPv6:

 Parameters:                    Current Value:
```


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```
enable                  true                Enable
metric                  0                   Metric
mgmt                    0                   Management priority
mtu                     1500                MTU
prefix_id               1                   Prefix ID
prefix_length           48                  Prefix length
type                    prefix_delegation   Type
weight                  10                  Weight

Additional Configuration

connection_monitor      Active recovery
dhcpv6_server           DHCPv6 server

(config network interface my_lan)>
```

View default settings for the IPv6 DHCP server:

```
(config network interface my_lan)> ipv6 dhcpv6_server ?

DHCPv6 server: The DHCPv6 server settings for this network interface.

Parameters              Current Value

enable                  true            Enable

(config network interface my_lan)>
```

c. Modify any of the remaining default settings as appropriate. For example, to change the minimum length of the prefix:

```
(config network interface my_lan)> ipv6 prefix_length 60
(config network interface my_lan)>
```

If the minimum length is not available, then a longer prefix will be used.

See Configure WAN/WWAN priority and default route metrics for further information about metrics.

8. Save the configuration and apply the changes:

```
(config network interface my_lan)> save
Configuration saved.
>
```

9. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

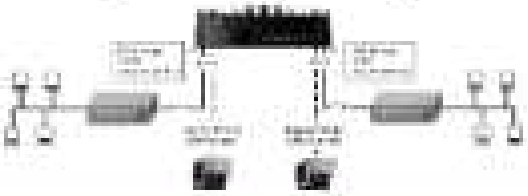
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Example: Configure two LANs

The default configuration of the TX64 consists of one LAN (LAN1), which is configured to use the LAN1 bridge. Its default IP address is 192.168.2.1, and it has its DHCP server enabled. The default configuration of the LAN1 bridge consists of the following devices:

- ETH2
- ETH3
- ETH4
- WWAN2 cellular modem.
- WWAN3 cellular modem.

In this example, we will create a second bridge, called LAN2. We will then create a second LAN, LAN2, and configure LAN2 to use the new bridge.



Note To avoid potential problems with access to the device while performing these procedures, you should use an Ethernet connection connected to LAN1 through the ETH2 Ethernet port, or, if using the command line, use the serial port.

Task one: Configure bridges

In this task, we will create a new bridge and configure the LAN1 and LAN2 bridges to use the following devices:

- LAN1 bridge:
  - ETH2
  - WWAN2 cellular modem.
- LAN2 bridge:
  - ETH3
  - Digi AP (Wi-Fi)

In task two, we will assign the new LAN2 bridge to a LAN.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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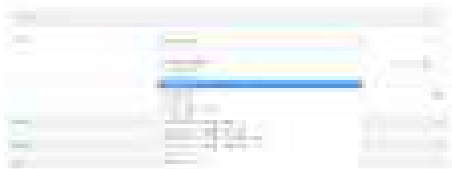


5. Click **Configuration** > **Network** > **Bridges** > **LAN1** > **Devices**.
4. Delete the **ETH3**, **ETH4**, and **Digi AP (WI-FI2)** devices from the bridge:
   a. Click the menu icon (...) next to the **ETH3** device and select **Delete**.

   b. Repeat for the **ETH4** and **Digi AP (WI-FI2)** devices.
5. Create a new bridge:
   a. For **Add Bridge**, type **LAN2** and click **+**.

   b. Add the **ETH3** and **Digi AP (WI-FI2)** devices to the bridge:
      i. Click to expand **Devices**.
      ii. For **Add Device**, click **+**.

      iii. For **Device**, select **Ethernet: ETH3**.



      iv. For **Add device**, click **+** again and select **WiFi access point: Digi AP (WI-FI2)**.

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6. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Display a list of devices currently configured for the LAN1 bridge:

```
(config)> show network bridge lan1 device
0 /network/device/eth2
1 /network/device/eth3
2 /network/device/eth4
3 /network/wireless/ap/digi_ap0
4 /network/wireless/ap/digi_ap2
(config)>
```

4. Remove devices from the LAN1 bridge that will be used by other interfaces in this configuration.
   a. Remove the Digi AP (Wi-Fi2) access point (/network/wireless/ap/digi_ap2) from the bridge, using its index number, 4, as determined above with the show command:

```
(config)> del network bridge lan1 device 4
(config)>
```

   b. Remove the ETH4 device (/network/device/eth4) from the bridge, using its index number, 2, as determined above with the show command:

```
(config)> del network bridge lan1 device 2
(config)>
```

   c. Remove the ETH3 device (/network/device/eth3) from the bridge, using its index number, 1, as determined above with the show command:

```
(config)> del network bridge lan1 device 1
(config)>
```

   d. Use the show command again to verify that the LAN1 bridge now has only two devices, ETH2 and Digi AP (Wi-Fi1):

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```
(config)> show network bridge lan3 device
0 /network/device/eth2
1 /network/wireless/ap/digi_ap1
(config)>
```

3. Create a new bridge, named LAN2:

```
(config)> add network bridge LAN2
(config network bridge LAN2)>
```

4. Add devices to the bridge:

   a. View available devices and the proper syntax by using the add device command with the TAB autocomplete feature:

```
(config network bridge LAN2)> add device end <TAB>
(config network bridge LAN2)> add device end /network/<TAB>
/network/device/eth1                /network/device/eth2
/network/device/eth3
/network/device/eth4                /network/device/loopback
/network/bridge/LAN2
/network/bridge/Lan1                /network/wireless/ap/digi_ap1
/network/wireless/ap/digi_ap2
(config network bridge LAN2)>
```

   b. Add the ETH3 device to the bridge:

```
(config network bridge LAN2)> add device end /network/device/eth3
(config network bridge LAN2)>
```

   c. Add the DigiAP (Wi-Fi2) access point to the bridge:

```
(config network bridge LAN2)> add device end /network/wireless/ap/digi_
ap2
(config network bridge LAN2)>
```

   d. Use the show command again to verify that the LAN2 bridge now has two devices, ETH3 and DigiAP (Wi-Fi2):

```
(config network bridge LAN2)> show network bridge lan2 device
0 /network/device/eth3
1 /network/wireless/ap/digi_ap2
(config network bridge LAN2)>
```

7. Save the configuration and apply the change:

```
(config network bridge LAN2)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Task two: Create a new LAN

In this task, we will create a new LAN, named LAN2, to use the LAN2 bridge created in task one.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



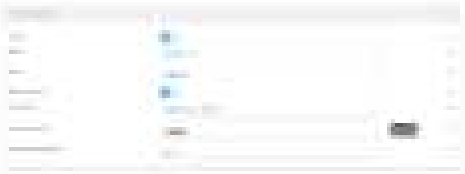
3. Click **Network** > **Interfaces**.
4. For **Add Interface:**, type LAN2 and click **+**.

5. Configure the LAN2 LAN:
   a. For **Zone**, select **Internal**.
   b. For **Device**, select **Bridge: LAN2**.
   c. Click to expand **IPv4**.
   d. For **Address**, type 192.168.3.1/24.
   e. Click to expand **DHCP server**.
   f. Click **Enable**.

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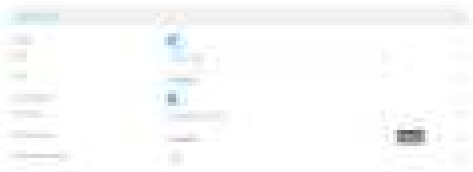


5. Enable the access points and set the SSIDs:
   a. Configure Digi AP (Wi-Fi1):
      i. Click Network > Wi-Fi > Access points > Digi AP (Wi-Fi1).
      ii. Click Enable.
      iii. For SSID, type Example1.
      iv. For Pre-shared key, enter a password that clients will use to connect to this access point.

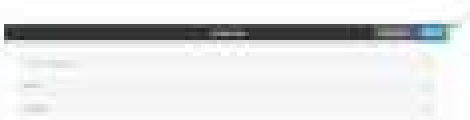


   b. Configure Digi AP (Wi-Fi2):
      i. Click Network > Wi-Fi > Access points > Digi AP (Wi-Fi2).
      ii. Click Enable.
      iii. For SSID, type Example2.
      iv. For Pre-shared key, enter a password that clients will use to connect to this access point.

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7. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add a new network interface named LAN2:

```
(config)> add network interface LAN2
(config network interface LAN2)>
```

4. Configure the device for the LAN2 interface:
   a. Enter device ? to view available devices and the proper syntax.

```
(config network interface LAN2)> device ?

Device: The network device used by this network interface.
Format:
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/Loopback
  /network/bridge/LAN1
  /network/bridge/Lan1
  /network/wireless/ap/digi_ap1
  /network/wireless/ap/digi_ap2
Current value:

(config network interface LAN2)> device
```


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b. Set the device for the LAN2 interface to the LAN2 bridge created in task one:

```
(config network interface LAN2)> device /network/bridge/LAN2
(config network interface LAN2)>
```

5. Configure the firewall zone for the LAN2 interface to internal:

```
(config network interface LAN2)> zone internal
(config network interface LAN2)>
```

6. Configure the IPv4 address for the LAN2 interface:

```
(config network interface LAN2)> ipv4 address 192.168.1.1/24
(config network interface LAN2)>
```

7. Enable the DHCP server for the LAN2 interface:

```
(config network interface LAN2)> ipv4 dhcp_server enable true
(config network interface LAN2)>
```

8. Enable the access points and set the SSIDs:

a. Move to the root of the configuration schema by typing three periods (...):

```
(config network interface LAN2)> ...
(config)>
```

b. Enable the Digi AP (Wi-Fi1) access point:

```
(config)> network wifi ap digi_ap1 enable true
(config)>
```

c. Set the SSID for the Digi AP (Wi-Fi1) access point:

```
(config)> network wifi ap digi_ap1 ssid Example1
(config)>
```

d. Set the password for the Digi AP (Wi-Fi1) access point:

```
(config)> network wifi ap digi_ap1 encryption key_psk2 password1
(config)>
```

e. Enable the Digi AP (Wi-Fi2) access point:

```
(config)> network wifi ap digi_ap2 enable true
(config)>
```

f. Set the SSID for the Digi AP (Wi-Fi2) access point:

```
(config)> network wifi ap digi_ap1 ssid Example2
(config)>
```


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g. Set the password for the Digi AP (Wi-Fi2) access point:

```
(config)> network wifi ap digi_ap2 encryption key_psk2 password2
(config)>
```

9. Save the configuration and apply the change:

```
(config network bridge LAN2)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Task three: Verify the new configuration

The final step in this example is to verify the new configuration.

1. Connect an Ethernet cable from an Internet-connected modem to WAN1 through the WAN/ETH1 Ethernet port.
2. Verify that LAN1 is operating correctly:
   a. Connect a device to LAN1 through the ETH3 Ethernet port, or by connecting to the Digi AP (Wi-Fi1) access point.
   b. Verify that the device has been provided an IP address from the LAN1 DHCP server in the 192.168.2.* subnet.
3. Verify that LAN2 is operating correctly:
   a. Connect a device to LAN2 through the ETH4 Ethernet port, or by connecting to the Digi AP (Wi-Fi2) access point.
   b. Verify that the device has been provided an IP address from the LAN2 DHCP server in the 192.168.3.* subnet.

Show LAN status and statistics

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. From the menu, click **Status**.
3. Under **Networking**, click **Interfaces**.

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. Enter the show network command at the Admin CLI prompt:

```
> show network

Interface          Proto  Status   Address
-----------------  -----  -------  ------------------------------------------
defaultip          IPv4   up       192.168.210.1/24
defaultlinklocal   IPv4   up       169.254.100.100/16
lan1               IPv4   up       192.168.3.1/24
lan1               IPv6   up       fd60:2704::1/48
loopback           IPv4   up       127.0.0.1/8
wan1               IPv4   up       10.10.10.10/24
wan1               IPv6   up       fe80:2404::240:f4ff:fe80:120/64
wwan1              IPv4   up       10.200.1.101/30
wwan1              IPv6   down
wwan2              IPv4   pending
wwan2              IPv6   down

>
```

3. Enter show network interface name at the Admin CLI prompt to display additional information about a specific LAN. For example, to display information about LAN1, enter show network interface lan1:

```
> show network interface lan1

lan1 Interface Status
---------------------
Device                : lan1
Zone                  : internal

IPv4 Status           : up
IPv4 Type             : static
IPv4 Address(es)      : 192.168.3.1/24
IPv4 Gateway          :
IPv4 MTU              : 1500
IPv4 Metric           : 5
IPv4 Weight           : 10
IPv4 DNS Server(s)    :

IPv6 Status           : up
IPv6 Type             : prefix
IPv6 Address(es)      : fd60:2704::1/48
IPv6 Gateway          :
IPv6 MTU              : 1500
IPv6 Metric           : 5
IPv6 Weight           : 10
IPv6 DNS Server(s)    :

>
```


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4. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete a LAN

Follow this procedure to delete any LANs that have been added to the system. You cannot delete the preconfigured LAN, LAN1.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Interfaces**.
4. Click the menu icon (⋮) next to the name of the LAN to be deleted and select **Delete**.

5. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
-> config
(config)->
```

2. Use the del command to delete the LAN. For example, to delete a LAN named my_lan:

```
(config)-> del network interface my_lan
```

3. Save the configuration and apply the change:

```
(config)-> save
Configuration saved.
->
```

4. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

DHCP servers

You can enable DHCP on your TX64 device to assign IP addresses to clients, using either:

- The DHCP server for the device's local network, which assigns IP addresses to clients on the device's local network. Addresses are assigned from a specified pool of IP addresses. For a local network, the device uses the DHCP server that has the IP address pool in the same IP subnet as the local network.

  When a host receives an IP configuration, the configuration is valid for a particular amount of time, known as the lease time. After this lease time expires, the configuration must be renewed. The host renews the lease time automatically.

- A DHCP relay server, which forwards DHCP requests from clients to a DHCP server that is running on a separate device.

Configure a DHCP server

Note These instructions assume you are configuring the device to use its local DHCP server. For instructions about configuring the device to use a DHCP relay server, see Configure DHCP relay.

Required configuration items

- Enable the DHCP server.

Additional configuration items

- The lease address pool: the range of IP addresses issued by the DHCP server to clients.
- Lease time: The length, in minutes, of the leases issued by the DHCP server.
- The Maximum Transmission Units (MTU).
- The domain name suffix appended to host names.
- The IP gateway address given to clients.

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- The IP addresses of the preferred and alternate Domain Name Server (DNS), NTP servers, and WINS servers that are given to clients.
- The TFTP server name.
- The filepath and name of the bootfile on the TFTP server.
- Custom DHCP options. See Configure DHCP options for information about custom DHCP options.
- Static leases. See Map static IP addresses to hosts for information about static leases.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > Interfaces**.
4. Click to expand an existing LAN, or create a new LAN. See Configure a LAN.
5. Click to expand **IPv4 > DHCP server**.
6. **Enable** the DHCP server.
7. (Optional) For **Lease time**, type the amount of time that a DHCP lease is valid.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

   For example, to set **Lease time** to ten minutes, enter **10m** or **600s**.

   The default is **12** hours.
8. (Optional) For **Lease range start** and **Lease range end**, type the lowest and highest IP address that the DHCP server will assign to a client. This value represents the low order byte of the address (the final triplet in an IPv4 address, for example, 192.168.2.*xxx*). The remainder of the IP address will be based on the LAN's static IP address as defined in the **Address** field.

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Allowed values are between 1 and 254, and the default is 100 for Lease range start and 200 for Lease range end.

8. Optional DHCP server settings:
   a. Click to expand Advanced settings.
   b. For Gateway, select either:
      - None: No gateway is broadcast by the DHCP server. Client destinations must be reachable without a gateway.
      - Automatic: Broadcasts the TX64 device's gateway.
      - Custom: Allows you to identify the IP address of a Custom gateway to be broadcast.

      The default is Automatic.
   c. For MTU,
      - None: An MTU of length 0 is broadcast. This is not recommended.
      - Automatic: No MTU is broadcast and clients will determine their own MTU.
      - Custom: Allows you to identify a Custom MTU to be broadcast.

      The default is Automatic.
   d. For Domain name suffix, type the domain name that should be appended to host names.
   e. For Primary and Secondary DNS, Primary and Secondary NTP server, and Primary and Secondary WINS server, select either:
      - None: No server is broadcast.
      - Automatic: Broadcasts the TX64 device's server.
      - Custom: Allows you to identify the IP address of the server.
   f. For Bootfile name, type the relative path and file name of the bootfile on the TFTP server.
   g. For TFTP server name, type the IP address or host name of the TFTP server.
10. See Configure DHCP options for information about Custom DHCP options.
11. See Map static IP addresses to hosts for information about Static leases.
12. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```


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3. Enable the DHCP server for an existing LAN. For example, to enable the DHCP server for a LAN named my_lan:

```
(config)> network interface my_lan ipv4 dhcp_server enable true
(config)>
```

See Configure a LAN for information about creating a LAN.

4. (Optional) Set the amount of time that a DHCP lease is valid:

```
(config)> network interface my_lan ipv4 dhcp_server lease_time value
(config)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format: number[w|d|h|m|s].

For example, to set network interface my_lan ipv4 dhcp_server lease_time to ten minutes, enter either 10m or 600s:

```
(config)> network interface my_lan ipv4 dhcp_server lease_time 600s
(config)>
```

5. (Optional) Set the lowest IP address that the DHCP server will assign to a client. This value represents the low order byte of the address (the final triplet in an IPv4 address, for example, 192.168.2.xxx). The remainder of the IP address will be based on the LAN's static IP address as defined in the address parameter.

```
(config)> network interface my_lan ipv4 dhcp_server lease_start num
(config)>
```

Allowed values are between 1 and 254, and the default is 100.

6. (Optional) Set the highest IP address that the DHCP server will assign to a client:

```
(config)> network interface my_lan ipv4 dhcp_server lease_end num
(config)>
```

Allowed values are between 1 and 254, and the default is 200.

7. Optional DHCP server settings:
   a. Click to expand Advanced settings.
   b. Determine how the DHCP server should broadcast the gateway server:

```
(config)> network interface my_lan ipv4 dhcp_server advanced gateway
value
(config)>
```

where value is one of:

- none: No gateway is broadcast by the DHCP server. Client destinations must be resolvable without a gateway.
- auto: Broadcasts the TX64 device's gateway.

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- custom: Allows you to identify the IP address of a custom gateway to be broadcast:

```
(config)> network interface my_lan ipv4 dhcp_server advanced
gateway_custom ip_address
(config)>
```

The default is auto.

c. Determine how the DHCP server should broadcast the the MTU:

```
(config)> network interface my_lan ipv4 dhcp_server advanced mtu value
(config)>
```

where value is one of:

- none: An MTU of length 0 is broadcast. This is not recommended.
- auto: No MTU is broadcast and clients will determine their own MTU.
- custom: Allows you to identify a custom MTU to be broadcast:

```
(config)> network interface my_lan ipv4 dhcp_server advanced mtu_
custom mtu
(config)>
```

The default is auto.

d. Set the domain name that should be appended to host names:

```
(config)> network interface my_lan ipv4 dhcp_server advanced domain_
suffix name
(config)>
```

e. Set the IP address or host name of the primary and secondary DNS, the primary and secondary NTP server, and the primary and secondary WINS servers:

```
(config)> network interface my_lan ipv4 dhcp_server advanced primary_dns
value
(config)> network interface my_lan ipv4 dhcp_server advanced secondary_
dns value
(config)> network interface my_lan ipv4 dhcp_server advanced primary_ntp
value
(config)> network interface my_lan ipv4 dhcp_server advanced secondary_
ntp value
(config)> network interface my_lan ipv4 dhcp_server advanced primary_
wins value
(config)> network interface my_lan ipv4 dhcp_server advanced secondary_
wins value
(config)>
```

where value is one of:

- none: No server is broadcast.
- auto: Broadcasts the TX64 device's server.

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- custom: Allows you to identify the IP address of the server. For example:

```
(config)> network interface my_lan ipv4 dhcp_server advanced
primary_dns_custom ip_address
(config)>
```

The default is auto.

f. Set the IP address or host name of the TFTP server:

```
(config)> network interface my_lan ipv4 dhcp_server advanced nfig_server
ip_address
(config)>
```

g. Set the relative path and file name of the bootfile on the TFTP server:

```
(config)> network interface my_lan ipv4 dhcp_server advanced bootfile
filename
(config)>
```

8. See Configure DHCP options for information about custom DHCP options.
9. See Map static IP addresses to hosts for information about static leases.
10. Save the configuration and apply the change:

```
(config network interface my_lan ipv4 dhcp_server advanced static_lease 9)>
save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Map static IP addresses to hosts

You can configure the DHCP server to assign static IP addresses to specific hosts.

Required configuration items

- IP address that will be mapped to the device.
- MAC address of the device.

Additional configuration items

- A label for this instance of the static lease.

To map static IP addresses:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Interfaces**.
4. Click to expand an existing LAN, or create a new LAN. See Configure a LAN.
5. Click to expand **IPv4** > **DHCP server** > **Advanced settings** > **Static leases**.
6. For **Add Static lease**, click **+**.
7. Type the **MAC address** of the device associated with this static lease.
8. Type the **IP address** for the static lease.

Note The IP address here should be outside of the DHCP server's configured lease range. See Configure a DHCP server for further information about the lease range.

9. (Optional) For **Hostname**, type a label for the static lease. This does not have to be the device's actual hostname.
10. Repeat for each additional DHCP static lease.
11. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add a static lease to the DHCP server configuration for an existing LAN. For example, to add static lease to a LAN named my_lan:

```
(config)> add network interface my_lan ipv4 dhcp_server advanced static_
lease end
(config network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
```

See Configure a LAN for information about creating a LAN.

4. Set the MAC address of the device associated with this static lease, using the colon-separated format:

```
(config network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
mac 00:40:D0:13:35:3E
(config network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
```

5. Set the IP address for the static lease:

```
(config network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
ip 10.01.01.10
(network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
```

Note The IP address here should be outside of the DHCP server's configured lease range. See Configure a DHCP server for further information about the lease range.

6. (Optional) Set a label for this static lease:

```
(config network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
name Label
(config network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
```

7. Save the configuration and apply the change:

```
(config network interface my_lan ipv4 dhcp_server advanced static_lease 0)>
save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show current static IP mapping

To view your current static IP mapping:

WebUI

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1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **Status**.
3. Under **Networking**, click **DHCP Leases**.

Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Show the static lease configuration. For example, to show the static leases for a lan named my_lan:

```
(config)> show network interface my_lan ipv4 dhcp_server advanced static_
lease
0
     ip 192.168.2.10
     mac 8F:C3:46:34:66:D0
     no name
1
     ip 192.168.2.11
     mac E3:C1:1F:65:C3:9E
     no name
(config)>
```

4. Type **cancel** to exit configuration mode:

```
(config)> cancel
>
```

5. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Delete static IP mapping entries

To delete a static IP entry:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



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The Configuration window is displayed.



3. Click Network > Interfaces.
4. Click to expand an existing LAN.
5. Click to expand IPv4 > DHCP server > Advanced settings > Static leases.
6. Click the menu icon (...) next to the name of the static lease to be deleted and select Delete.

7. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Show the static lease configuration. For example, to show the static leases for a lan named my_lan:

```
(config)> show network interface my_lan ipv4 dhcp_server advanced static_
lease
0
    ip 192.168.2.30
    mac 8F:C3:46:34:66:D9
    no name
1
```


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```
    ip 192.168.2.11
    mac 63:C1:1F:62:C3:66
    no name
(config)>
```

4. Use the **del /index_number** command to delete a static lease. For example, to delete the static lease for the device listed in the above output with a mac address of 6F:C3:46:C4:6E:C8 (index number 0):

```
(config)> del network interface lan1 ipv4 dhcp_server advanced static_lease
0
(config)>
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an **Access selection** menu. Type **quit** to disconnect from the device.

Configure DHCP options

You can configure DHCP servers running on your TX64 device to send certain specified DHCP options to DHCP clients. You can also set the user class, which enables you to specify which specific DHCP clients will receive the option. You can also force the command to be sent to the clients.

DHCP options can be set on a per-LAN basis, or can be set for all LANs. A total of 32 DHCP options can be configured.

Required configuration items

- DHCP option number.
- Value for the DHCP option.

Additional configuration items

- The data type of the value.
- Force the option to be sent to the DHCP clients.
- A label for the custom option.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



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The **Configuration** window is displayed.



3. Click **Network** > **Interfaces**.
4. Click to expand an existing LAN, or create a new LAN. See Configure a LAN.
5. Click to expand **IPv4** > **DHCP server** > **Advanced settings** > **Custom DHCP option**.
6. For **Add Custom option**, click ➕.
   Custom options are enabled by default. To disable, uncheck **Enable**.
7. For **Option number**, type the DHCP option number.
8. For **Value**, type the value of the DHCP option.
9. (Optional) For **Label**, type a label for the custom option.
10. (Optional) If **Forced send** is enabled, the DHCP option will always be sent to the client, even if the client does not ask for it.
11. (Optional) For **Data type**, select the data type that the option uses. If the incorrect data type is selected, the device will send the value as a string.
12. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add a custom DHCP option to the DHCP server configuration for an existing LAN. For example, to add static leases to a LAN named my_lan:

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```
(config)> add network interface my_lan ipv4 dhcp_server advanced custom_
option end
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)>
```

See Configure a LAN for information about creating a LAN.

4. Custom options are enabled by default. To disable:

```
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)> enable false
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)>
```

5. Set the option number for the DHCP option:

```
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)> option 210
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)>
```

6. Set the value for the DHCP option:

```
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)> value_str value
(network interface my_lan ipv4 dhcp_server advanced custom_option 0)>
```

7. (Optional) Set a label for this custom option:

```
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)> name label
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)>
```

8. (Optional) To force the DHCP option to always be sent to the client, even if the client does not ask for it:

```
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)> force true
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)>
```

9. (Optional) Set the data type that the option uses.

If the incorrect data type is selected, the device will send the value as a string.

```
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)> datatype value
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)>
```

where value is one of:

- 1byte
- 2byte

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- 4byte
- hex
- ipv4
- str

The default is str.

10. Save the configuration and apply the change:

```
(config network interface my_lan ipv4 dhcp_server advanced custom_option
0)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure DHCP relay

DHCP relay allows a router to forward DHCP requests from one LAN to a separate DHCP server, typically connected to a different LAN.

For the TX64 device, DHCP relay is configured by providing the IP address of a DHCP relay server, rather than an IP address range. If both the DHCP relay server and an IP address range are specified, DHCP relay is used, and the specified IP address range is ignored.

Multiple DHCP relay servers can be provided for each LAN. If multiple relay servers are provided, DHCP requests are forwarded to all servers without waiting for a response. Clients will typically use the IP address from the first DHCP response received.

Configuring DHCP relay involves the following items:

Required configuration items

- Disable the DHCP server, if it is enabled.
- IP address of the primary DHCP relay server, to define the relay server that will respond to DHCP requests.

Additional configuration items

- IP address of additional DHCP relay servers.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Network** > **Interfaces**.
4. Click to expand an existing LAN, or create a new LAN. See Configure a LAN.
5. Disable the DHCP server, if it is enabled:
   a. Click to expand **IPv4** > **DHCP server**.
   b. Click **Enable** to toggle off the DHCP server.
6. Click to expand **DHCP relay**.
7. For **Add DHCP Server**, click **+**.
8. For **DHCP server address**, type the IP address of the relay server.
9. Repeat for each additional DHCP relay server.
10. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add a DHCP relay server to an existing LAN. For example, to add a server to a LAN named **my_lan**:

```
(config)> add network interface my_lan ipv4 dhcp_relay end
(config network interface lan1 my_lan dhcp_relay 0)>
```

See Configure a LAN for information about creating a LAN.

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4. Set the IP address of the DHCP relay server:

```
(config network interface my_lan ipv4 dhcp_relay 0)> address 10.10.10.10
(config network interface my_lan ipv4 dhcp_relay 0)>
```

5. (Optional) Add additional DHCP relay servers:
   a. Move back one step in the configuration schema by typing two periods (..):

```
(config network interface my_lan ipv4 dhcp_relay 0)> ..
(config network interface my_lan ipv4 dhcp_relay)>
```

   b. Add the next server:

```
(config network interface lan1 ipv4 dhcp_relay)> add end
(config network interface lan1 ipv4 dhcp_relay 1)>
```

   c. Set the IP address of the DHCP relay server:

```
(config network interface my_lan ipv4 dhcp_relay 1)> address 10.10.10.11
(config network interface my_lan ipv4 dhcp_relay 1)>
```

   d. Repeat for each additional relay server.
6. Disable the DHCP server, if it is enabled:

```
(config network interface my_lan ipv4 dhcp_relay 1)> .. .. dhcp_server
enable false
(config network interface my_lan ipv4 dhcp_relay 1)>
```

8. Save the configuration and apply the change:

```
(config network interface lan1 ipv4 dhcp_relay 1)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show DHCP server status and settings

View DHCP status to monitor which devices have been given IP configuration by the TX64 device and to diagnose DHCP issues.

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click Status.
3. Under Networking, click DHCP Leases.

Command line

1. Log into the TX64 command line as a user with Admin access.

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Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

1. Enter the show dhcp-lease command at the Admin CLI prompt:

```
-> show dhcp-lease

IP Address      Hostname          Expires
--------------  ----------------  -------
192.168.2.194   MTK-DMG-USER1
192.168.2.195   MTK-DMG-USER2

->
```

2. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Create a Virtual LAN (VLAN) route

Virtual LANs (VLANs) allow splitting a single physical LAN into separate Virtual LANs. This is useful for security reasons, and also helps to reduce broadcast traffic on the LAN.

Required configuration items

- Device to be assigned to the VLAN.
- The VLAN ID. The TCP header uses the VLAN ID to identify the destination VLAN for the packet.

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To create a VLAN:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Virtual LAN**.
4. Type a name for the VLAN and click ➕.
5. Select the **Device**.
6. Type or select a unique numeric ID for the VLAN ID.
7. Click **Apply** to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add the VLAN:

```
(config)> add network vlan name
(config)>
```

4. Set the device to be used by the VLAN:
   a. View a list of available devices:

```
(config network vlan vlan1)> device ?

Device: The Ethernet device to use for this virtual LAN
Format:
   /network/device/wan1
   /network/device/lan1
   /network/device/eth2
   /network/device/eth4
   /network/device/loopback
   /network/vlan/vlan1
   /network/bridge/lan1
   /network/wireless/ap/digi_ap1
   /network/wireless/ap/digi_ap2
Current value:

(config network vlan vlan1)>
```

   b. Add the device:

```
(config network vlan vlan1)> device /network/device/eth4
(config network vlan vlan1)>
```

5. Set the VLAN ID:

```
(config network vlan vlan1)> id value
```

   where value is an integer between 1 and 4095.
6. Save the configuration and apply the change:

```
(config network vlan vlan1)> save
Configuration saved.
>
```


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Interfaces Local Area Networks (LANs)

1. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Bridging

Bridging is a mechanism to create a single network consisting of multiple devices, such as Ethernet devices and wireless access points.

By default, the TX64 has the following preconfigured bridges:

Interface type	Preconfigured interfaces	Devices	Default configuration
Bridges	• Bridge: LAN1	• Ethernet: ETH2 • Ethernet: ETH3 • Ethernet: ETH4 • Wi-Fi access point: Digi AP (Wi-Fi1) • Wi-Fi access point: Digi AP (Wi-Fi2)	• Enabled • Used by the LAN1 interface
	• hotspot_bridge	• Wi-Fi access point: Digi Hotspot AP (Wi-Fi1) • Wi-Fi access point: Digi Hotspot AP (Wi-Fi2)	• Disabled • Used by the hotspot interface

You can modify configuration settings for the existing bridge, and you can create new bridges.

This section contains the following topics:

Edit the preconfigured LAN1 bridge 142
Configure a bridge 143

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Edit the preconfigured LAN1 bridge

Required configuration items

- Enable or disable the bridge.
- Modify the devices included in the bridge.

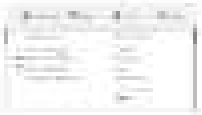
Additional configuration items

- Enable Spanning Tree Protocol (STP).

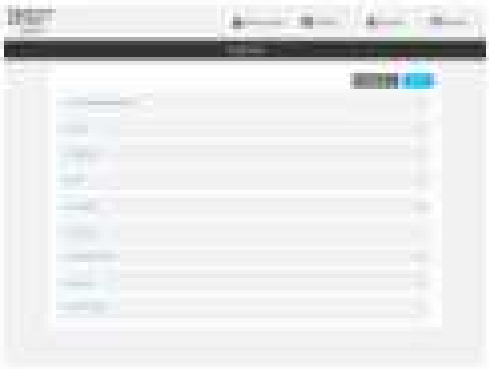
To edit the preconfigured LAN1 bridge:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > Bridges > LAN1**.
4. The LAN1 bridge is enabled by default. To disable, uncheck **Enable**.
5. Modify the list of devices that are a part of the bridge. By default, the LAN1 bridge includes the following devices:
   - Ethernet: ETH2
   - Ethernet: ETH3
   - Ethernet: ETH4
   - Wi-Fi access point: Digi AP (Wi-Fi1)
   - Wi-Fi access point: Digi AP (Wi-Fi2)

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a. To delete a device from the bridge, click the down arrow [▾] next to the field label and select **Delete**.



b. To add a device, for **Add device**, click **+** and select the **Device**.

6. (Optional) Enable Spanning Tree Protocol (STP).

STP is used when using multiple LANs on the same device, to prevent bridge loops and other routing conflicts.

a. Click **STP**.

b. Click **Enable**.

c. For **Forwarding delay**, enter the number of seconds that the device will spend in each of the listening and learning states before the bridge begins forwarding data. The default is 2 seconds.

7. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. The LAN1 bridge is enabled by default.

- To disable:

```
(config)> network bridge lan1 enable false
(config)>
```

- To enable if it has been disabled:

```
(config)> network bridge lan1 enable true
(config)>
```


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4. Modify the list of devices that are a part of the bridge. By default, the LAN1 bridge includes the following devices:
   - Ethernet: ETH2
   - Ethernet: ETH3
   - Ethernet: ETH4
   - Wi-Fi access point: Digi AP (Wi-Fi1)
   - Wi-Fi access point: Digi AP (Wi-Fi2)
   a. To delete a device from the bridge:
      i. Determine the index numbers of the devices included with the bridge:

```
(config)> show network bridge lan1 device
0 /network/device/eth2
1 /network/device/eth3
2 /network/device/eth4
3 /network/wireless/ap/digi_ap1
4 /network/wireless/ap/digi_ap2
(config)>
```

      ii. Use the index number to delete the appropriate device. For example, to delete the Digi AP (Wi-Fi2) Wi-Fi access point from the bridge:

```
(config)> del network bridge lan1 device 3
(config)>
```

      Note If you are deleting multiple devices from the bridge, the device index may be reordered after each deletion. As a result, best practice is to perform a show network bridge lan1 device command after each device is deleted to determine the new index numbering.

   b. Add devices to the bridge:
      i. Determine available devices:

```
(config network bridge my_bridge)> ... ... interface lan1 device ?

Device: The network device used by this network interface.
Format:
   /network/device/eth1
   /network/device/eth2
   /network/device/eth3
   /network/device/eth4
   /network/device/loopback
   /network/bridge/hotspot_bridge
   /network/bridge/lan1
   /network/wireless/ap/digi_ap1
   /network/wireless/ap/digi_ap2
   /network/wireless/ap/digi_hotspot_ap1
   /network/wireless/ap/digi_hotspot_ap2
```


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```
Default value:  /network/bridge/lan1
Current value:  /network/bridge/lan1

(config network bridge my_bridge)>
```

1. Add the appropriate device. For example, to add the Digi AP (IEEE 802.11) Wi-Fi access point:

```
(config network bridge my_bridge)> add device end
/network/wireless/ap/digi_ap1
(config)>
```

3. [Optional] Enable Spanning Tree Protocol (STP).

   STP is used when multiple LANs are configured on the same device, to prevent bridge loops and other routing conflicts.

   a. Enable STP:

   ```
   (config)> network bridge lan1 stp enable true
   ```

   b. Set the number of seconds that the device will spend in each of the listening and learning states before the bridge begins forwarding data:

   ```
   (config)> network bridge lan1 stp forward_delay num
   (config)>
   ```

   The default is 2 seconds.

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure a bridge

Required configuration items

- A name for the bridge.

  Bridges are enabled by default.

- Devices to be included in the bridge.

Additional configuration items

- Enable Spanning Tree Protocol (STP).

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To create a bridge:

Web UI

1. Log into the TX64 Web UI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Bridges**.
4. For **Add Bridge**, type a name for the bridge and click ➕.
5. Bridges are enabled by default. To disable, uncheck **Enable**.
6. Add devices to the bridge:
   a. Click to expand **Devices**.
   b. For **Add device**, click ➕.
   c. Select the **Device**.
   d. Repeat to add additional devices.
7. (Optional) Enable Spanning Tree Protocol (STP).

   STP is used when using multiple LANs on the same device, to prevent bridge loops and other routing conflicts.

   a. Click **STP**.
   b. Click **Enable**.
   c. For **Forwarding delay**, enter the number of seconds that the device will spend in each of the listening and learning states before the bridge begins forwarding data. The default is 2 seconds.
8. Click **Apply** to save the configuration and apply the changes.

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Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create the bridge:

```
(config)> add network bridge my_bridge
(config network bridge my_bridge)>
```

4. Bridges are enabled by default.
   - To disable:

```
(config network bridge my_bridge)> enable false
(config network bridge my_bridge)>
```

   - To enable if it has been disabled:

```
(config network bridge my_bridge)> enable true
(config network bridge my_bridge)>
```

5. Add devices to the bridge:
   a. Determine available devices:

```
(config network bridge my_bridge)> .. .. interface lan1 device ?

Device: The network device used by this network interface.
Format::
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/loopback
  /network/bridge/hotspot_bridge
  /network/bridge/lan1
  /network/wireless/ap/digi_ap1
  /network/wireless/ap/digi_ap2
  /network/wireless/ap/digi_hotspot_ap1
  /network/wireless/ap/digi_hotspot_ap2

Default value:  /network/bridge/lan1
Current value:  /network/bridge/lan1

(config network bridge my_bridge)>
```


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b. Add the appropriate device. For example, to add the Digi AP (WI-FI1) Wi-Fi access point:

```
(config network bridge my_bridge)> add device end
/network/wireless/ap/digi_ap1
(config)>
```

8. (Optional) Enable Spanning Tree Protocol (STP).

STP is used when using multiple LANs on the same device, to prevent bridge loops and other routing conflicts.

a. Enable STP:

```
(config network bridge my_bridge)> stp enable true
```

b. Set the number of seconds that the device will spend in each of the listening and learning states before the bridge begins forwarding data:

```
(config network bridge my_bridge)> stp forward_delay num
(config)>
```

The default is 2 seconds.

7. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Serial port

TX64 devices have a single serial port that provides access to the command-line interface.

Use an RS-232 serial cable to establish a serial connection from your TX64 to your local laptop or PC. Use a terminal emulator program to establish the serial connection. The terminal emulator's serial connection must be configured to match the configuration of the TX64 device's serial port. The default serial port configuration for the TX64 is:

- Baud rate: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

Configure the serial port

By default, the TX64 serial port is configured as follows:

- Enabled
- Serial mode: Login
- Label: None
- Baud rate: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

To change the configuration to match the serial configuration of the device to which you want to connect:

WebUI

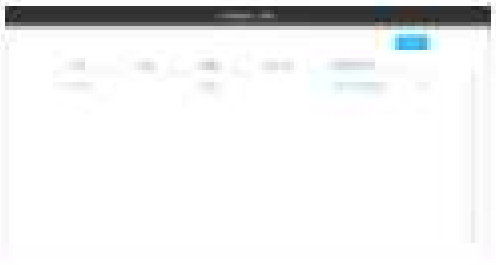
1. Log into the TX64 WebUI as a user with Admin access.

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1. On the menu, click **System**. Under **Configuration**, click **Serial Configuration**.

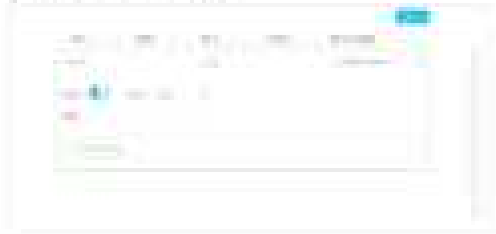


The **Serial Configuration** page is displayed.



Note You can also configure the serial port by using **Device Configuration > Serial**. Changes made by using either **Device Configuration** or **Serial Configuration** will be reflected in both.

2. Click to expand **Port 1**.



The serial port is enabled by default. To disable, toggle off **Enable**.

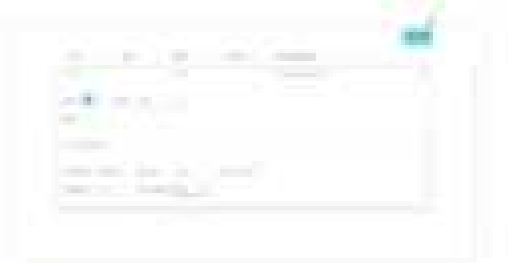
4. For **Mode**, one of the following:
   - **Login**: Allows the user to log into the device through the serial port.
   - **Remote access**: Allows for remote access to another device that is connected to the serial port.
   - **Application**: Provides access to the serial device from Python applications. See Add a USB serial port for information about creating serial ports in Application mode. See Use Python to access serial ports for information about creating Python applications that access the serial port.

   The default is **Login**.
5. (Optional) For **Label**, enter a label that will be used when referring to this port.
6. Click to expand **Serial Settings**.



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7. For **Baud rate**, select the baud rate used by the device to which you want to connect.
8. For **Data bits**, select the number of data bits used by the device to which you want to connect.
9. For **Parity**, select the type of parity used by the device to which you want to connect.
10. For **Stop bits**, select the number of stop bits used by the device to which you want to connect.
11. For **Flow control**, select the type of flow control used by the device to which you want to connect.
12. Click **Apply** to save the configuration and apply the change.
    The **Apply** button is located at the top of the WebUI page. You may need to scroll to the top of the page to locate it.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. The serial port is enabled by default. To disable:

```
(config)> serial port1 enable false
(config)>
```

4. Set the mode:

```
(config)> serial port1 mode mode
(config)>
```

Where *mode* is either:

- **login**: Allows the user to log into the device through the serial port.
- **remote**: Allows for remote access to another device that is connected to the serial port.
- **application**: Provides access to the serial device from Python applications. See Add a USB serial port for information about creating serial ports in Application mode. See Use Python to access serial ports for information about creating Python applications that access the serial port.

The default is **login**.

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5. (Optional) Set a label that will be used when referring to this port.

```
(config)> serial port1 label label
(config)>
```

6. If mode is set to login or remote:
   a. Set the baud rate used by the device to which you want to connect:

```
(config)> serial port1 baudrate rate
(config)>
```

   b. Set the number of data bits used by the device to which you want to connect:

```
(config)> serial port1 databits bits
(config)>
```

   c. Set the type of parity used by the device to which you want to connect:

```
(config)> serial port1 parity parity
(config)>
```

   Allowed values are:
   - even
   - odd
   - none

   The default is none.

   d. Set the stop bits used by the device to which you want to connect:

```
(config)> serial port1 stopbits bits
(config)>
```

   e. Set the type of flow control used by the device to which you want to connect:

```
(config)> serial port1 flow type
(config)
```

   Allowed values are:
   - none
   - rts/cts
   - xon/xoff

   The default is none.

7. If mode is set to remote:
   a. Set the characters used to start an escape sequence:

```
(config)> serial port1 escape string
(config)
```

   If no characters are defined, the escape sequence is disabled. The default is +b.

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b. Limit access to the serial port to a single active session:

```
(config)> serial port1 exclusive true
(config)
```

c. Set the number of bytes of output from the serial port that are written to buffer. These bytes are redisplayed when a user connects to the serial port.

```
(config)> serial port1 history bytes
(config)
```

The default is 4000 bytes.

d. Set the amount of time to wait before disconnecting due to user inactivity:

```
(config)> serial port1 idle_timeout value
(config)
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set idle_timeout to ten minutes, enter either 10m or 600s:

```
(config)> serial port1 idle_timeout 600s
(config)
```

The default is 15m.

e. [Optional] Enable monitoring of CTS (Clear to Send) changes on this port:

```
(config)> serial port1 monitor cts true
(config)
```

f. [Optional] Enable monitoring of DCD (Data Carrier Detect) changes on this port:

```
(config)> serial port1 monitor dcd true
(config)
```

2. Configure TCP access to this port:



CAUTION! This connection is not authenticated or encrypted.

a. Enable TCP access:

```
(config)> serial port1 service tcp enable false
(config)>
```

b. Set the TCP port:

```
(config)> serial port1 service tcp port port
(config)>
```

c. [Optional] Configure the access control list to limit access to the TCP connection:

- To limit access to specified IPv4 addresses and networks:

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```
(config)> add serial port1 service tcp acl address end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.2.0/24.
- any: No limit to IPv4 addresses that can access the tcp port.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

```
(config)> add serial port1 service tcp acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the tcp port.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add serial port1 service tcp acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------
  defaultip             Default IP
  defaultlinklocal      Default Link-local IP
  lan1                  LAN1
  loopback              Loopback
  wan1                  WAN1
  wwan1                 WWAN1
  wwan2                 WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add serial port1 service tcp acl zone end value
```


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Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can
be referred to by packet
filtering rules and access control lists.

  Additional Configuration

  ---------------------------------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

c. [Optional] Enable mDNS. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

```
(config)> serial port1 service tcp mdns enable true
(config)>
```

5. Configure telnet access to this port:

CAUTION! This connection is not authenticated or encrypted.

a. Enable telnet access:

```
(config)> serial port1 service telnet enable false
(config)>
```

b. Set the telnet port:

```
(config)> serial port1 service telnet port port
(config)>
```

c. [Optional] Configure the access control list to limit access to the telnet connection:

- To limit access to specified IPv4 addresses and networks:

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```
(config)> add serial port1 service telnet acl address end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.2.0/24.
- any: No limit to IPv4 addresses that can access the telnet port.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

```
(config)> add serial port1 service telnet acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the telnet port.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add serial port1 service telnet acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------
  defaultip             Default IP
  defaultlinklocal      Default link-local IP
  lan1                  LAN1
  loopback              Loopback
  wan1                  WAN1
  wwan1                 WWAN1
  wwan2                 WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add serial port1 service telnet acl zone end value
```


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Serial port Configure the serial port

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can
be referred to by packet
filtering rules and access control lists.

  Additional Configuration
  ------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

c. [Optional] Enable mDNS. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

```
(config)> serial port1 service telnet adv enable true
(config)>
```

10. Configure ssh access to this port:

a. Enable ssh access:

```
(config)> serial port1 service ssh enable false
(config)>
```

b. Set the ssh port:

```
(config)> serial port1 service ssh port port
(config)>
```

c. [Optional] Configure the access control list to limit access to the telnet connection:

- To limit access to specified IPv4 addresses and networks:

```
(config)> add serial port1 service ssh acl address end value
(config)>
```

Where value can be:

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- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the ssh port.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

```
(config)> add serial port1 service ssh acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the ssh port.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add serial port1 service ssh acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------------------------
 defaultip              Default IP
 defaultlinklocal       Default Link-local IP
 lan1                   LAN1
 loopback               Loopback
 wwan1                  WWAN1
 wwan2                  WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add serial port1 service ssh acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

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```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can
be referred to by packet
filtering rules and access control lists.

 Additional Configuration

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

d. (Optional) Enable mDNS. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

```
(config)> serial port1 service ssh mdns enable true
(config)>
```

11. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

12. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Add a USB serial port

Your TX64 can be configured to support USB-to-serial adapters for serial access to the device, remote serial out-of-band (OOB) access to other devices, or for use in python applications. The following USB-to-serial chipsets are supported:

- FTDI
- Prolific

To add a USB serial port:

WebUI

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1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Serial**.
4. For **Add Serial port**, type a name for the group and click **+**.

The serial port configuration window is displayed.



The new USB serial port is enabled by default. Toggle **Enable** off to disable. USB serial port is currently the only option for **Type**.

5. For **USB port**, select the appropriate USB port.

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6. (Optional) If the device's USB port is connected to a USB hub, for **USB hub path**, type the path to a USB-to-serial adapter on the hub. Leave this field blank if the if the USB-to-serial adapter is connected directly to the device's USB port.
7. (Optional) USB devices with multiple ports may identify ports by using an interface descriptor. For **USB interface descriptor**, type the appropriate descriptor number. Leave this option at the default of 0 for USB devices with only one serial port.
8. (Optional) USB devices with multiple ports may identify ports by using a port number. For **USB port number**, type or select the appropriate port number. Leave this option at the default of 0 for USB devices with only one serial port.
9. For **Serial mode**, select one of the following:
   - **Login**: Allows the user to log into the device through the serial port.
   - **Remote access**: Allows for remote access to another device that is connected to the serial port.
   - **Application**: Provides access to the serial device from Python applications. See Use Python to access serial ports for information about creating Python applications that access the serial port.
10. (Optional) For **Label**, type a descriptive label for this serial port.
11. If **Login** or **Remote access** is selected for **Serial mode**:
    a. For **Baud rate**, select the baud rate used by the device to which you want to connect.
    b. For **Data bits**, select the number of data bits used by the device to which you want to connect.
    c. For **Parity**, select the type of parity used by the device to which you want to connect.
    d. For **Stop bits**, select the number of stop bits used by the device to which you want to connect.
    e. For **Flow control**, select the type of flow control used by the device to which you want to connect.
12. If **Remote access** is selected for **Serial mode**:
    a. For **Escape sequence**, type the characters used to start an escape sequence. If no characters are defined, the escape sequence is disabled. The default is ~b.
    b. For **History size**, type or select the number of bytes of output from the serial port that are written to buffer. These bytes are redisplayed when a user connects to the serial port. The default is 4000 bytes.
    c. Enable **Exclusive access** to limit access to the serial port to a single active session.
    d. For **Idle timeout**, type the amount of time to wait before disconnecting due to user inactivity.

       Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

       For example, to set idle timeout to ten minutes, enter **10m** or **600s**.

       The default is **15m**.
    e. (Optional) Click to expand **Monitor**.
       i. Enable **CTS** to monitor CTS (Clear to Send) changes on this port.
       ii. Enable **DCD** to monitor DCD (Data Carrier Detect) changes on this port.

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f. Click to expand TCP connection.

i. Click **Enable** to allow TCP access to this port.



CAUTION! This connection is not authenticated or encrypted.

ii. For **Port**, type or select the appropriate TCP port.

iii. (Optional) Click to expand **Access control list** to limit access to the TCP connection.

- To limit access to specified IPv4 addresses and networks:
  i. Click **IPv4 Addresses**.
  ii. For **Add Address**, click +.
  iii. For **Address**, enter the IPv4 address or network that can access the device's service-type. Allowed values are:
    - A single IP address or host name.
    - A network designation in CIDR notation, for example, 192.168.1.0/24.
    - **any**: No limit to IPv4 addresses that can access the service-type.
  iv. Click + again to list additional IP addresses or networks.
- To limit access to specified IPv6 addresses and networks:
  i. Click **IPv6 Addresses**.
  ii. For **Add Address**, click +.
  iii. For **Address**, enter the IPv6 address or network that can access the device's service-type. Allowed values are:
    - A single IP address or host name.
    - A network designation in CIDR notation, for example, 2001:db8::/48.
    - **any**: No limit to IPv6 addresses that can access the service-type.
  iv. Click + again to list additional IP addresses or networks.
- To limit access to hosts connected through a specified interface on the TX64 device:
  i. Click **Interfaces**.
  ii. For **Add Interface**, click +.
  iii. For **Interface**, select the appropriate interface from the dropdown.
  iv. Click + again to allow access through additional interfaces.
- To limit access based on firewall zones:
  i. Click **Zones**.
  ii. For **Add Zone**, click +.
  iii. For **Zone**, select the appropriate firewall zone from the dropdown.

  See Firewall configuration for information about firewall zones.
  iv. Click + again to allow access through additional firewall zones.

iv. (Optional) Click to enable **mDNS**. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

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g. Click to expand **Telnet connection**.

i. Click **Enable** to allow telnet access to this port.



CAUTION! This connection is not authenticated or encrypted.

ii. For **Port**, type or select the appropriate telnet port.

iii. (Optional) Click to expand **Access control list** to limit access to the telnet connection.

- To limit access to specified IPv4 addresses and networks:
  i. Click **IPv4 Addresses**.
  ii. For **Add Address**, click +.
  iii. For **Address**, enter the IPv4 address or network that can access the device's service-type. Allowed values are:
    - A single IP address or host name.
    - A network designation in CIDR notation, for example, 192.168.1.0/24.
    - **any**: No limit to IPv4 addresses that can access the service-type.
  iv. Click + again to list additional IP addresses or networks.
- To limit access to specified IPv6 addresses and networks:
  i. Click **IPv6 Addresses**.
  ii. For **Add Address**, click +.
  iii. For **Address**, enter the IPv6 address or network that can access the device's service-type. Allowed values are:
    - A single IP address or host name.
    - A network designation in CIDR notation, for example, 2001:db8::/48.
    - **any**: No limit to IPv6 addresses that can access the service-type.
  iv. Click + again to list additional IP addresses or networks.
- To limit access to hosts connected through a specified interface on the TX64 device:
  i. Click **Interfaces**.
  ii. For **Add Interface**, click +.
  iii. For **Interface**, select the appropriate interface from the dropdown.
  iv. Click + again to allow access through additional interfaces.
- To limit access based on firewall zones:
  i. Click **Zones**.
  ii. For **Add Zone**, click +.
  iii. For **Zone**, select the appropriate firewall zone from the dropdown.

  See Firewall configuration for information about firewall zones.
  iv. Click + again to allow access through additional firewall zones.

h. (Optional) Click to enable **mDNS**. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

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h. Click to expand SSH connection.
   i. Click Enable to allow ssh access to this port.
   ii. For Port, type or select the appropriate ssh port.
   iii. (Optional) Click to expand Access control list to limit access to the ssh connection.
      - To limit access to specified IPv4 addresses and networks:
         i. Click IPv4 Addresses.
         ii. For Add Address, click +.
         iii. For Address, enter the IPv4 address or network that can access the device's service-type. Allowed values are:
            - A single IP address or host name.
            - A network designation in CIDR notation, for example, 192.168.1.0/24.
            - any: No limit to IPv4 addresses that can access the service-type.
         iv. Click + again to list additional IP addresses or networks.
      - To limit access to specified IPv6 addresses and networks:
         i. Click IPv6 Addresses.
         ii. For Add Address, click +.
         iii. For Address, enter the IPv6 address or network that can access the device's service-type. Allowed values are:
            - A single IP address or host name.
            - A network designation in CIDR notation, for example, 2001:db8::/48.
            - any: No limit to IPv6 addresses that can access the service-type.
         iv. Click + again to list additional IP addresses or networks.
      - To limit access to hosts connected through a specified interface on the TX64 device:
         i. Click Interfaces.
         ii. For Add Interface, click +.
         iii. For Interface, select the appropriate interface from the dropdown.
         iv. Click + again to allow access through additional interfaces.
      - To limit access based on firewall zones:
         i. Click Zones.
         ii. For Add Zone, click +.
         iii. For Zone, select the appropriate firewall zone from the dropdown.

            See Firewall configuration for information about firewall zones.
         iv. Click + again to allow access through additional firewall zones.
   iv. (Optional) Click to enable mDNS. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.
15. Click Apply to save the configuration and apply the changes.

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Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add the serial port:

```
(config)> add serial USB_port
(config serial USB_port)>
```

4. Set the mode:

```
(config serial USB_port)> mode mode
(config serial USB_port)>
```

   Where *mode* is either:

   - **login**: Allows the user to log into the device through the serial port.
   - **remote**: Allows for remote access to another device that is connected to the serial port.
   - **application**: Provides access to the serial device from Python applications. See Use Python to access serial ports for information about creating Python applications that access the serial port.

   The default is **remote**.

5. (Optional) Set a label that will be used when referring to this port.

```
(config serial USB_port)> label label
(config serial USB_port)>
```

6. If **mode** is set to **login** or **remote**:

   a. Set the baud rate used by the device to which you want to connect:

```
(config serial USB_port)> baudrate rate
(config serial USB_port)>
```

   b. Set the number of data bits used by the device to which you want to connect:

```
(config serial USB_port)> databits bits
(config serial USB_port)>
```


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c. Set the type of parity used by the device to which you want to connect:

```
(config serial USB_port)> parity parity
(config serial USB_port)>
```

Allowed values are:

- even
- odd
- none

The default is none.

d. Set the stop bits used by the device to which you want to connect:

```
(config serial USB_port)> stopbits bits
(config serial USB_port)>
```

e. Set the type of flow control used by the device to which you want to connect:

```
(config serial USB_port)> flow type
(config serial USB_port)
```

Allowed values are:

- none
- rts/cts
- xon/xoff

The default is none.

7. If mode is set to remote:

a. Set the characters used to start an escape sequence:

```
(config serial USB_port)> escape string
(config serial USB_port)
```

If no characters are defined, the escape sequence is disabled. The default is +++.

b. Limit access to the serial port to a single active session:

```
(config serial USB_port)> exclusive true
(config serial USB_port)
```

c. Set the number of bytes of output from the serial port that are written to buffer. These bytes are redisplayed when a user connects to the serial port.

```
(config serial USB_port)> history bytes
(config serial USB_port)
```

The default is 4000 bytes.

d. Set the amount of time to wait before disconnecting due to user inactivity:

```
(config serial USB_port)> idle_timeout value
(config serial USB_port)
```


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where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set idle_timeout to ten minutes, enter either 10m or 600s:

```
(config serial USB_port)> idle_timeout 600s
(config serial USB_port)
```

The default is 30m.

e. [Optional] Enable monitoring of CTS (Clear to Send) changes on this port:

```
(config serial USB_port)> monitor cts true
(config serial USB_port)
```

f. [Optional] Enable monitoring of DCD (Data Carrier Detect) changes on this port:

```
(config serial USB_port)> monitor dcd true
(config serial USB_port)
```

2. Configure TCP access to this port:

CAUTION! This connection is not authenticated or encrypted.

a. Enable TCP access:

```
(config serial USB_port)> service tcp enable false
(config serial USB_port)>
```

b. Set the TCP port:

```
(config serial USB_port)> service tcp port port
(config serial USB_port)>
```

c. [Optional] Configure the access control list to limit access to the TCP connection:

- To limit access to specified IPv4 addresses and networks:

```
(config serial USB_port)> add service tcp acl address end value
(config serial USB_port)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the tcp port.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

```
(config serial USB_port)> add service tcp acl address6 end value
(config serial USB_port)>
```

Where value can be:

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- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the tcp port.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config serial USB_port)> add service tcp acl interface end value
(config serial USB_port)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config serial USB_port)> ... network interface ?

Interfaces

Additional Configuration

-------------------------------------------------
defaultip                Default IP
defaultlinklocal         Default Link-local IP
lan1                     LAN1
loopback                 Loopback
wwan1                    WWAN1
wwan1                    WWAN1
wwan2                    WWAN2

(config serial USB_port)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config serial USB_port)> add service tcp acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config serial USB_port)> ... firewall zone ?

Zones: A list of groups of network interfaces that can
be referred to by packet
filtering rules and access control lists.

Additional Configuration

-------------------------------------------------
```


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```
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config serial USB_port)>
```

Repeat this step to list additional firewall zones.

d. (Optional) Enable mDNS. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

```
(config serial USB_port)> service tcp mdns enable true
(config serial USB_port)>
```

e. Configure telnet access to this port:

> **CAUTION!** This connection is not authenticated or encrypted.

a. Enable telnet access:

```
(config serial USB_port)> service telnet enable false
(config serial USB_port)>
```

b. Set the telnet port:

```
(config serial USB_port)> service telnet port port
(config serial USB_port)>
```

c. (Optional) Configure the access control list to limit access to the telnet connection:

- To limit access to specified IPv4 addresses and networks:

```
(config serial USB_port)> add service telnet acl address_and_value
(config serial USB_port)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the telnet port.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

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```
(config serial USB_port)> add service telnet acl address6 end
value
(config serial USB_port)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the telnet port.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config serial USB_port)> add service telnet acl interface end
value
(config serial USB_port)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config serial USB_port)> ... network interface ?

Interfaces

Additional Configuration

  defaultip              Default IP
  defaultlinklocal       Default Link-local IP
  lan1                   LAN1
  loopback               Loopback
  wan1                   WAN1
  wwan1                  WWAN1
  wwan2                  WWAN2

(config serial USB_port)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config serial USB_port)> add service telnet acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config serial USB_port)> ... firewall zone ?

Zones: A list of groups of network interfaces that can
```


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Serial port Add a USB serial port

```
be referred to by packet
filtering rules and access control lists.

Additional Configuration

any
dynamic_routes
edge
external
hotspot
internal
ipsec
loopback
setup

(config serial USB_port)>
```

Repeat this step to list additional firewall zones.

d. [Optional] Enable mDNS. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

```
(config serial USB_port)> service telnet mdns enable true
(config serial USB_port)>
```

10. Configure ssh access to this port:

a. Enable ssh access:

```
(config serial USB_port)> service ssh enable false
(config serial USB_port)>
```

b. Set the ssh port:

```
(config serial USB_port)> service ssh port port
(config serial USB_port)>
```

c. [Optional] Configure the access control list to limit access to the telnet connection:

- To limit access to specified IPv4 addresses and networks:

```
(config serial USB_port)> add service ssh acl address end value
(config serial USB_port)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the ssh port.

Repeat this step to list additional IP addresses or networks.

TX64 User Guide 172

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- To limit access to specified IPv6 addresses and networks:

```
(config serial USB_port)> add service ssh acl address6 end value
(config serial USB_port)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the ssh port.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX54 device:

```
(config serial USB_port)> add service ssh acl interface end value
(config serial USB_port)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config serial USB_port)> ... network interface ?

Interfaces

Additional Configuration

  defaultip             Default IP
  defaultlinklocal      Default Link-local IP
  lan1                  LAN1
  loopback              Loopback
  wwan1                 WWAN1
  wwan1                 WWAN1
  wwan2                 WWAN2

(config serial USB_port)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config serial USB_port)> add service ssh acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config serial USB_port)> ... firewall zone ?

Zones: A list of groups of network interfaces that can
```


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```
be referred to by packet
filtering rules and access control lists.

Additional Configuration

  arp
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config serial USB_port)>
```

Repeat this step to list additional firewall zones.

c. (Optional) Enable mDNS. mDNS is a protocol that resolves host names in small networks that do not have a DNS server.

```
(config serial USB_port)> service ssh mdns enable true
(config serial USB_port)>
```

11. Save the configuration and apply the change:

```
(config serial USB_port)> save
Configuration saved.
>
```

12. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show serial status and statistics

To show the status and statistics for the serial port:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **Status**.
3. Under **Connections**, click **Serial**.

Command Line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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Serial port Show serial status and statistics

2. Use the show serial command:

```
> show serial

Label     Port    Enable  Mode    Baudrate
--------  ------  ------  ------  --------
Serial 1  port1   true    login   115000
>
```

3. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

TX64 User Guide 173

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Wi-Fi

This chapter contains the following topics:

Wi-Fi configuration
Configure the Wi-Fi module channel
Configure the Wi-Fi module band and protocol
Configure a Wi-Fi access point with no security
Configure a Wi-Fi access point with personal security
Configure a Wi-Fi access point with enterprise security
Isolate Wi-Fi clients
Show Wi-Fi access point status and statistics
Configure a Wi-Fi client and add client networks
Show Wi-Fi client status and statistics

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Wi-Fi configuration

The TX64 device has two Wi-Fi radios. You can configure the Wi-Fi radios for Wi-Fi access point mode or Wi-Fi client mode. By default, the TX64 radios are configured to use access point mode.

A typical configuration is to configure one Wi-Fi radio in access point mode with one or multiple access points, and configure the other radio, connected to a separate set of antennas, as a Wi-Fi client to be used as a WAN interface.

Default access point SSID and password

By default, the TX64 device has two access points enabled. The default SSID for both of the access point is:

Digi-TX64-serial_number

The password for the default access point is the unique password as found on the device's label.

Prior to saving any configuration changes to the device, you will need to configure the access points to change the default SSID and password. See Reset default SSIDs and pre-shared keys for the preconfigured Wi-Fi access points for information about changing the default SSID and password.

Default Wi-Fi configuration

The default Wi-Fi configuration of the TX64 device is:

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- Radios:

	[illegible] radio	[illegible] radio
Enabled or disabled	Enabled	Enabled
Frequency band	2.4 GHz	5 GHz
Access point mode	802.11b/g/n	802.11ac/n
Channel	Automatic	Automatic
Channel width	20/40 MHz	40 MHz
Beacon interval	100	100

- Access points:

	Digi AP (Wi-Fi1)	Digi AP (Wi-Fi2)
Enabled or disabled	Enabled	Enabled
Radio	Wi-Fi1 radio	Wi-Fi2 radio
SSID	Digi-TX64_serial-number	Digi-TX64-serial_number
SSID broadcast	Enabled	Enabled
Encryption	WPA2 Personal [PSK]	WPA2 Personal [PSK]
Pre-shared key	Default password as found on the device's label	Default password as found on the device's label
Group rekey interval	10 minutes	10 minutes

- Client mode connections: none.

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Configure the Wi-Fi module channel

By default, each Wi-Fi radio is configured to automatically select the best channel to use with respect to other Wi-Fi networks. You can configure a specific channel to use for a Wi-Fi Wi-Fi radio by using the following steps.

Note For the 2.4 GHz band, only channels 1 to 11 are supported; channels 12, 13, and 14 are not supported. For the 5.0 GHz band, only non-Dynamic Frequency Selection (DFS) channels are supported.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Wi-Fi**.
4. Click to expand the appropriate Wi-Fi radio.
5. For **Channel**, select the channel. Only channels appropriate for the band are displayed.



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6. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set the channel for the radio:
   a. Determine available radios:

```
(config)> network wifi radio ?

Additional Configuration
-------------------------

wifi1                          Wi-Fi1 radio
wifi2                          Wi-Fi2 radio

(config)> network wifi radio
```

   b. Determine the band for the appropriate radio:

```
(config)> network wifi radio wifi1 band
2400mhz
(config)>
```

   c. Set the channel for the Wi-Fi radio:

```
(config)> network wifi radio wifi1 2400mhz channel value
(config)>
```

   where value is:
   - For 2.4 GHz:
     - 1 through 11
     - auto
   - For 5 GHz:
     - 36
     - 40
     - 44

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- 48
- auto

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the Wi-Fi module band and protocol

For Wi-Fi radios that support both 2.4 GHz and 5 GHz modes, you can configure the band. Wi-Fi1 radio defaults to use 2.4 GHz b/g/n band, and Wi-Fi2 radio only supports 5 GHz ac/n.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



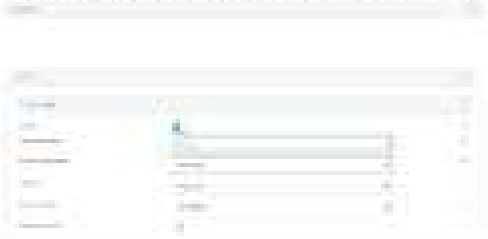
The **Configuration** window is displayed.



3. Click **Network** > **Wifi**.
4. Click to expand the appropriate Wi-Fi radio.
5. For **Frequency band**, select either 2.4 GHz or 5 GHz. Only channels appropriate for the band are displayed.

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6. For Access point mode, select the appropriate mode.



7. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set channel for the radio:
   a. Determine available radios:

```
(config)> network wifi radio ?

Additional Configuration

wifi1                          Wi-Fi1 radio
wifi2                          Wi-Fi2 radio

(config)> network wifi radio
```

   b. Set the frequency band for the appropriate radio:

```
(config)> network wifi radio wifi1 band value
(config)>
```

   where value is either 2400mhz or 5000mhz.

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c. Set the mode for the Wi-Fi radio. For example:

- If the Wi-Fi radio has a band of 2400mhz:

```
(config)> network wifi radio wifi1 2400mhz mode value
(config)>
```

where value is one of b, bg, bgn, g, gn, or n.

- If the Wi-Fi radio has a band of 5000mhz:

```
(config)> network wifi radio wifi1 5000mhz mode value
(config)>
```

where value is one of ac, acn, or n.

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure a Wi-Fi access point with no security

This procedure configures a Wi-Fi access point that does not require a password for client connections, and uses no security or encryption.

By default, the TX64 device comes with two preconfigured access points, Digi AP (Wi-Fi1) and Digi AP (Wi-Fi2). You cannot delete default access points, but you can modify them or you can create your own access points.

Required configuration items

- Enable the Wi-Fi access point
- Select a Wi-Fi radio for the access point.
- The Service Set Identifier (SSID) for the access point.
- Configure security for the access point to unencrypted.
- LAN/bridge assignment. Once you configure a Wi-Fi access point, you must assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

Additional configuration items

- Determine whether to broadcast the access point's SSID.
- Determine whether to isolate clients connected to this access point, so that they cannot communicate with each other.
- The amount of time to wait before changing the group key.

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To configure a Wi-Fi access point with no security:

Web UI

1. Log into the TX64 Web UI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



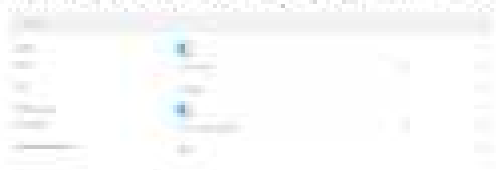
The **Configuration** window is displayed.



3. Click **Network** > **WiFi** > **Access points**.
4. Create a new access point or modify an existing access point:
   - To create a new access point, for **Add WiFi access point:**, type a name for the access point and click ➕.

   - To modify an existing access point, click to expand the access point.

The Wi-Fi access point configuration window is displayed.



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5. **Enable** the access point.
   New access points are enabled by default. The default preconfigured access points are disabled by default.
6. For **Radio**, select the appropriate Wi-Fi radio.
7. For **SSID**, type the SSID. Up to 32 characters are allowed.
8. Enable **SSID broadcast** to configure the radio to broadcast the SSID.
9. (Optional) Enable **Isolate clients** to prevent clients that are connected to this access point from communicating with each other. See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.
10. For **Encryption**, select **Open (Unencrypted)**.
11. (Optional) For **Group rekey interval**, type the amount of time to wait before changing the group key.
    The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.
    Allowed values are any number of days, hours, minutes, or seconds, and take the format *number*[d|h|m|s].
    For example, to set **Group rekey interval** to ten minutes, enter **10m** or **600s**.
    Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.
12. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.
    The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.
13. Click **Apply** to save the configuration and apply the change.



Command line

Configure a new Access point

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
>config
(config)>
```


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3. Create a new access point:

```
(config)> add network wifi ap new_AP
(config network wifi ap new_AP)>
```

New access points are enabled by default.

4. Set the Wi-Fi radio for the new access point:

   a. Show available radios:

```
(config network wifi ap new_AP)> radio ?

Radio: The Wi-Fi radio to run this access point on.
Format:
  wifi1
  wifi2
Current value:

(config network wifi ap new_AP)>
```

   b. Set the appropriate radio:

```
(config network wifi ap new_AP)> radio wifi1
(config network wifi ap new_AP)>
```

5. Set the SSID for the Wi-Fi access point. Up to 32 characters are allowed.

```
(config network wifi ap new_AP)> ssid my_SSID
(config network wifi ap new_AP)>
```

SSID broadcasting is enabled by default for new access points.

6. Set the security for the access point to none :

```
(config network wifi ap new_AP)> encryption type none
(config network wifi ap new_AP)>
```

7. [Optional] Determine whether to prevent clients that are connected to this access point from communicating with each other:

```
(config)> network wifi ap digi_ap1 isolate_client true
(config)>
```

See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.

8. [Optional] Set the amount of time to wait before changing the group key.

The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

```
(config network wifi ap new_AP)> encryption group_rekey value
(config network wifi ap new_AP)>
```

where value is any number of days, hours, minutes, or seconds, and takes the format *number*[d|h|m|s].

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For example, to set group rekey interval to ten minutes, enter either 10m or 600s:

```
(config network wireless ap new_AP)> encryption group_rekey 600s
(config network wireless ap new_AP)>
```

Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.

5. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

   The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.

6. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Edit an existing Access point

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Show available access points:

```
(config)> network wifi ap ?

  Additional Configuration

  ---------

  digi_ap1                  Digi AP (Wi-Fi1)
  digi_ap2                  Digi AP (Wi-Fi2)

(config)>
```

4. Set the SSID for the appropriate access point:

```
(config)> network wifi ap digi_ap1 ssid my_SSID
(config)>
```

5. SSID broadcasting is enabled by default for the preconfigured access points. If SSID broadcasting is disabled:

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```
(config)> network wifi ap digi_ap1 ssid_broadcast true
(config)>
```

5. Set the security for the access point to none :

```
(config)> network wifi ap digi_ap1 encryption type none
(config)>
```

7. [Optional] Determine whether to prevent clients that are connected to this access point from communicating with each other:

```
(config)> network wifi ap digi_ap1 isolate_client true
(config)>
```

See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.

8. [Optional] Change the Wi-Fi radio for the access point:

a. Show available radios:

```
(config)> network wifi radio ?

 Additional Configuration
 ------------------------

 wifi1                          Wi-Fi1 radio
 wifi2                          Wi-Fi2 radio

(config)>
```

b. Set the appropriate radio:

```
(config)> network wifi ap digi_ap1 radio wifi1
(config)>
```

9. [Optional] Set the amount of time to wait before changing the group key.

The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

```
(config)> network wifi ap digi_ap1 encryption group_rekey value
(config)>
```

where value is any number of days, hours, minutes, or seconds, and takes the format number [d|h|m|s].

For example, to set group rekey interval to ten minutes, enter either 10m or 600s:

```
(config)> network wireless ap digi_ap1 encryption group_rekey 600s
(config)>
```

Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.

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5. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

   The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure a Wi-Fi access point with personal security

The WPA and WPA2 personal security modes allow a Wi-Fi access point to authenticate clients by using a preshared key that the client enters when connecting to the access point.

By default, the TX64 device comes with two preconfigured access points, Digi AP (Wi-Fi1) and Digi AP (Wi-Fi2). You cannot delete default access points, but you can modify them or you can create your own access points.

Required configuration items

- Enable the Wi-Fi access point
- Select a Wi-Fi radio for the access point.
- The Service Set Identifier (SSID) for the access point.
- Configure security for the access point to WPA personal (PSK) or WPA2 personal (PSK).
- The password (preshared key) that clients will used to connect to the access point.
- LAN/bridge assignment. Once you configure a Wi-Fi access point, you must assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

Additional configuration items

- Determine whether to broadcast the access point's SSID.
- Determine whether to isolate clients connected to this access point, so that they cannot communicate with each other.
- The amount of time to wait before changing the group key.

To configure a Wi-Fi access point with WPA personal (PSK) or WPA2 personal (PSK) security:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



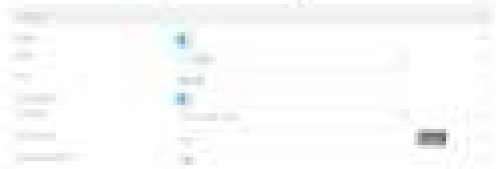
The **Configuration** window is displayed.



3. Click **Network > WiFi > Access points**.
4. Create a new access point or modify an existing access point:
   - To create a new access point, for **Add WiFi access point**, type a name for the access point and click ➕.

   - To modify an existing access point, click to expand the access point.

The Wi-Fi access point configuration window is displayed.



5. **Enable** the access point.

   New access points are enabled by default. The default preconfigured access points are disabled by default.

6. For **Radio**, select the appropriate Wi-Fi radio.

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7. For SSID, type the SSID. Up to 32 characters are allowed.
8. Enable SSID broadcast to configure the radio to broadcast the SSID.
9. [Optional] Enable Isolate clients to prevent clients that are connected to this access point from communicating with each other. See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.
10. For Encryption, select WPA Personal (PSK) or WPA2 Personal (PSK).
11. For Pre-shared key, enter the password that clients will use when connecting to the access point.
12. [Optional] For Group rekey interval, type the amount of time to wait before changing the group key.

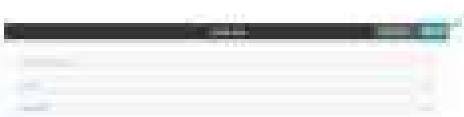
    The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

    Allowed values are any number of days, hours, minutes, or seconds, and take the format *number*{d|h|m|s}.

    For example, to set Group rekey interval to ten minutes, enter 10m or 600s.

    Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.
13. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

    The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.
14. Click Apply to save the configuration and apply the change.



Command line

Configure a new Access point

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create a new access point:

```
(config)> add network wifi ap new_AP
(config network wifi ap new_AP)>
```

   New access points are enabled by default.

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4. Set the Wi-Fi radio for the new access point:
   a. Show available radios:

```
(config network wifi ap new_AP)> radio ?

Radio: The Wi-Fi radio to run this access point on.
Format:
  wifi1
  wifi2
Current value:

(config network wifi ap new_AP)>
```

   b. Set the appropriate radio:

```
(config network wifi ap new_AP)> radio wifi1
(config network wifi ap new_AP)>
```

5. Set the SSID for the Wi-Fi access point. Up to 32 characters are allowed.

```
(config network wifi ap new_AP)> ssid my_SSID
(config network wifi ap new_AP)>
```

   SSID broadcasting is enabled by default for new access points.

6. Set the security for the access point to psk or psk2:

```
(config network wifi ap new_AP)> encryption type psk2
(config network wifi ap new_AP)>
```

7. (Optional) Determine whether to prevent clients that are connected to this access point from communicating with each other:

```
(config)> network wifi ap digi_ap1 isolate_client true
(config)>
```

   See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.

8. Set the password that clients will use when connecting to the access point:

```
(config network wifi ap new_AP)> encryption key_psk2 password
(config network wifi ap new_AP)>
```

9. (Optional) Set the amount of time to wait before changing the group key:

   The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

```
(config network wifi ap new_AP)> encryption group_rekey value
(config network wifi ap new_AP)>
```

   where value is any number of days, hours, minutes, or seconds, and takes the format number [d|h|m|s].

   For example, to set group rekey interval to ten minutes, enter either 10m or 600s:

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```
(config network wireless ap new_AP)> encryption group_rekey 6000
(config network wireless ap new_AP)>
```

Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.

5. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

   The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Edit an existing Access point

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Show available access points:

```
(config)> network wifi ap ?

  Additional Configuration

  ------

  digi_ap1                  Digi AP (Wi-Fi1)
  digi_ap2                  Digi AP (Wi-Fi2)

(config)>
```

4. Set the SSID for the appropriate access point:

```
(config)> network wifi ap digi_ap1 ssid my_SSID
(config)>
```

5. SSID broadcasting is enabled by default for the preconfigured access points. If SSID broadcasting is disabled:

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```
(config)> network wifi ap digi_ap1 ssid_broadcast true
(config)>
```

5. Set the security for the access point to psk or psk2 :

```
(config)> network wifi ap digi_ap1 encryption type psk2
(config)>
```

7. [Optional] Determine whether to prevent clients that are connected to this access point from communicating with each other:

```
(config)> network wifi ap digi_ap1 isolate_client true
(config)>
```

See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.

8. Set the password that clients will use when connecting to the access point:

```
(config)> network wifi ap digi_ap1 encryption key_psk2 password
(config)>
```

9. [Optional] Change the Wi-Fi radio for the access point:

a. Show available radios:

```
(config)> network wifi radio ?

 Additional Configuration
 ------------------------

 wifi1                          Wi-Fi1 radio
 wifi2                          Wi-Fi2 radio

(config)>
```

b. Set the appropriate radio:

```
(config)> network wifi ap digi_ap1 radio wifi1
(config)>
```

10. [Optional] Set the amount of time to wait before changing the group key.

The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

```
(config)> network wifi ap digi_ap1 encryption group_rekey value
(config)>
```

where value is any number of days, hours, minutes, or seconds, and takes the format *number* [d|h|m|s].

For example, to set group rekey interval to ten minutes, enter either 10m or 600s:

```
(config)> network wireless ap digi_ap1 encryption group_rekey 600s
(config)>
```


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Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.

5. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

   The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure a Wi-Fi access point with enterprise security

The WPA2 enterprise security mode allows a Wi-Fi access point to authenticate clients by using a RADIUS server. When the Wi-Fi access point receives a connection request from a client, it authenticates the client with the RADIUS server before allowing the client to connect.

Using enterprise security modes allows each client to have different usernames and passwords configured in the RADIUS server, rather than using preshared key on the TX64 device.

By default, the TX64 device comes with two preconfigured access points, Digi AP (Wi-Fi1) and Digi AP (Wi-Fi2). You cannot delete default access points, but you can modify them or you can create your own access points.

Required configuration items

- Enable the Wi-Fi access point
- Select a Wi-Fi radio for the access point.
- The Service Set Identifier (SSID) for the access point.
- Configure security for the access point to WPA2 enterprise.
- The RADIUS server IP address
- The RADIUS secret key.
- LAN/bridge assignment. Once you configure a Wi-Fi access point, you must assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

Additional configuration items

- Determine whether to broadcast the access point's SSID.
- Determine whether to isolate clients connected to this access point, so that they cannot communicate with each other.

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- The Radius server port.
- The amount of time to wait before changing the group key.

To configure a Wi-Fi access point with WPA2 enterprise security:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

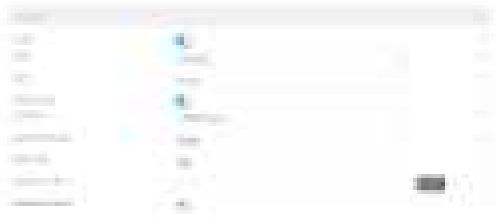


3. Click **Network** > **Wifi** > **Access points**.
4. Create a new access point or modify an existing access point:
   - To create a new access point, for **Add Wifi access point**, type a name for the access point and click **+**.

   - To modify an existing access point, click to expand the access point.

The Wi-Fi access point configuration window is displayed.

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5. Enable the access point.

   New access points are enabled by default. The default preconfigured access points are disabled by default.

6. For Radio, select the appropriate Wi-Fi radio.
7. For SSID, type the SSID. Up to 32 characters are allowed.
8. Enable SSID broadcast to configure the radio to broadcast the SSID.
9. (Optional) Enable Isolate clients to prevent clients that are connected to this access point from communicating with each other. See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.
10. For Encryption, select WPA2 Enterprise.
11. For RADIUS IP/hostname, type the IP address or hostname of the RADIUS server.
12. (Optional) Change the RADIUS port. The default port is 1812.
13. For RADIUS secret key, type the secret key as configured on the RADIUS server.
14. (Optional) For Group rekey interval, type the amount of time to wait before changing the group key.

    The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

    Allowed values are any number of days, hours, minutes, or seconds, and take the format number[d|h|m|s].

    For example, to set Group rekey interval to ten minutes, enter 10m or 600s.

    Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.

15. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

    The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.

16. Click Apply to save the configuration and apply the change.



Command line

Configure a new Access point

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create a new access point:

```
(config)> add network wifi ap new_AP
(config network wifi ap new_AP)>
```

   New access points are enabled by default.
4. Set the Wi-Fi radio for the new access point:
   a. Show available radios:

```
(config network wifi ap new_AP)> radio ?

Radio: The Wi-Fi radio to run this access point on.
Format:
  wifi1
  wifi2
Current value:

(config network wifi ap new_AP)>
```

   b. Set the appropriate radio:

```
(config network wifi ap new_AP)> radio wifi1
(config network wifi ap new_AP)>
```

5. Set the SSID for the Wi-Fi access point. Up to 32 characters are allowed.

```
(config network wifi ap new_AP)> ssid my_SSID
(config network wifi ap new_AP)>
```

   SSID broadcasting is enabled by default for new access points.
6. Set the security for the access point to wpa2:

```
(config network wifi ap new_AP)> encryption type wpa2
(config network wifi ap new_AP)>
```

7. (Optional) Determine whether to prevent clients that are connected to this access point from communicating with each other:

```
(config)> network wifi ap digi_ap1 isolate_client true
(config)>
```

   See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.

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8. Set the IP address or hostname of the RADIUS server:

```
(config network wifi ap new_AP)> encryption host_wpa2 hostname
(config network wifi ap new_AP)>
```

9. Set the secret key as configured on the RADIUS server:

```
(config network wifi ap new_AP)> encryption key_wpa2 secret_key
(config network wifi ap new_AP)>
```

10. [Optional] Set the RADIUS server's port. The default is 1812.

```
(config network wifi ap new_AP)> encryption port_wpa2 port
(config network wifi ap new_AP)>
```

11. [Optional] Set the amount of time to wait before changing the group key.

The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

```
(config network wifi ap new_AP)> encryption group_rekey value
(config network wifi ap new_AP)>
```

where value is any number of days, hours, minutes, or seconds, and takes the format *number*[d|h|m|s].

For example, to set group rekey interval to ten minutes, enter either 10m or 600s:

```
(config network wireless ap new_AP)> encryption group_rekey 600s
(config network wireless ap new_AP)>
```

Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.

9. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.

8. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Edit an existing Access point

1. Log into the TX64 command line as a user with full Admin access rights.

Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Show available access points:

```
(config)> network wifi ap ?

  Additional Configuration

  digi_ap1                  Digi AP (W1-F11)
  digi_ap2                  Digi AP (W1-F12)

(config)>
```

4. Set the SSID for the appropriate access point:

```
(config)> network wifi ap digi_ap1 ssid my_SSID
(config)>
```

5. SSID broadcasting is enabled by default for the preconfigured access points. If SSID broadcasting is disabled:

```
(config)> network wifi ap digi_ap1 ssid_broadcast true
(config)>
```

6. Set the security for the access point to wpa2:

```
(config)> network wifi ap digi_ap1 encryption type wpa2
(config)>
```

7. [Optional] Determine whether to prevent clients that are connected to this access point from communicating with each other:

```
(config)> network wifi ap digi_ap1 isolate_client true
(config)>
```

See Isolate Wi-Fi clients for information about how to prevent clients connected to different access points from communicating with each other.

8. Set the IP address or hostname of the RADIUS server:

```
(config)> network wifi ap digi_ap1 encryption host_wpa2 hostname
(config)>
```

9. Set the secret key as configured on the RADIUS server:

```
(config)> network wifi ap digi_ap1 encryption key_wpa2 secret_key
(config)>
```


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10. (Optional) Set the RADIUS server's port. The default is 1812.

```
(config)> network wifi ap digi_ap1 encryption port_wpa2 port
(config)>
```

11. (Optional) Change the Wi-Fi radio for the access point:
    a. Show available radios:

```
(config)> network wifi radio ?

 Additional Configuration

 ---------

 wifi1                          Wi-Fi1 radio
 wifi2                          Wi-Fi2 radio

(config)>
```

    b. Set the appropriate radio:

```
(config)> network wifi ap digi_ap1 radio wifi1
(config)>
```

12. (Optional) Set the amount of time to wait before changing the group key.

    The group key is shared by all in clients of the access point, and after a client has disconnected, it will be able to use the group key to decrypt broadcast packets until the key is changed.

```
(config)> network wifi ap digi_ap1 encryption group_rekey value
(config)>
```

    where value is any number of days, hours, minutes, or seconds, and takes the format *number*[d|h|m|s].

    For example, to set group rekey interval to ten minutes, enter either 10m or 600s:

```
(config)> network wireless ap digi_ap1 encryption group_rekey 600s
(config)>
```

    Increasing the time between rekeys can improve connectivity issues in noisy environments. To disable group rekeys, set to 0. This will allow any client that has previously connected see all broadcast traffic on the wireless network until the Wi-Fi radio is restarted. The default is 10 minutes.

13. Assign the Wi-Fi access point to a LAN interface or to a bridge. See Configure a LAN and Configure a bridge for more information.

    The access point must be assigned to an active LAN, or a bridge that is assigned to an active LAN.

14. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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7. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Isolate WI-FI clients

Client isolation prevents wireless clients connected to the TX64 device from communicating with other clients. There are two mechanisms for client isolation configuration:

- Isolate clients connected to the same access point
- Isolate clients connected to different access points

This section provides instructions for both mechanisms.

Isolate clients connected to the same access point

WebUI

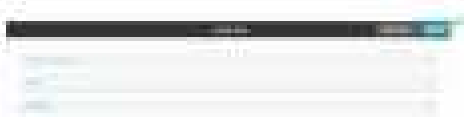
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > Wi-Fi > Access points**.
4. Create a new access point or modify an existing access point. See Configure a Wi-Fi access point with no security, Configure a Wi-Fi access point with personal security, or Configure a Wi-Fi access point with enterprise security.
5. Enable **Isolate clients**.
6. Click **Apply** to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Create a new access point or modify an existing access point. See Configure a Wi-Fi access point with no security, Configure a Wi-Fi access point with personal security, or Configure a Wi-Fi access point with enterprise security.
4. (Optional) Set the client isolation:

```
(config)> network wifi ap digi_ap1 isolate_client true
(config)>
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Isolate clients connected to different access points

Isolating clients that are on different access points involves the following steps:

1. Assign the access points to separate LAN interfaces.
2. Assign those LAN interfaces to separate firewall zones.
3. Create firewall filters to prevent traffic between the two firewall zones.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Configure the firewall:
   a. Click **Firewall** > **Zones**.
   b. In **Add Zone**, enter LAN2_isolation_zone for the name of the zone and click ✚.

Note: We will be creating LAN2 later in the procedure.

   c. Create a firewall filter to provide Internet access for the LAN2_isolation_zone:
      i. For **Add packet filter**, click ✚.
      ii. For **Label**, type Allow LAN2_isolation_zone to External.
      iii. For **Source zone**, select LAN2_isolation_zone.
      iv. For **Destination zone**, select External.

   d. Create a firewall filter to drop traffic from the Internal zone (used by the LAN1 interface) to the LAN2_isolation_zone:
      i. Click **Firewall** > **Packet filtering**.
      ii. For **Add packet filter**, click ✚.
      iii. For **Label**, type Drop traffic from Internal to LAN2_isolation_zone.
      iv. For **Action**, select **Drop**.
      v. For **Source zone**, select **Internal**.
      vi. For **Destination zone**, select LAN2_isolation_zone.

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a. Rearrange the firewall filters.

Firewall filters are applied in the order that they are listed. As a result, in order to drop traffic from the Internal zone to the LAN2_Isolation_zone, this filter must be listed prior to the Allow all outgoing traffic filter, which allows the Internal zone to have access to any zone.

To move the Drop traffic from Internal to LAN2_Isolation_zone filter to the top of the list:

i. Click the filter title.

ii. Drag-and-drop the filter to the top of the list.

4. Create a new LAN:

By default, the TX64 device comes with one preconfigured LAN, which includes the default access points. We will use that LAN for the Digi AP (Wi-Fi1) access point, and create a new LAN for the Digi AP (Wi-Fi2) access point. In this step, we create a new LAN for the Digi AP (Wi-Fi2) access point; in the next step, we will remove the Digi AP (Wi-Fi2) access point from the default bridge (and thus from the default LAN).

a. Click Configuration > Network > Interfaces.

b. For Add Interface, type a name for the LAN and click +.

c. For Zone, select LAN2_Isolation_zone.

d. For Device, select Wi-Fi access point: Digi AP (Wi-Fi2).

e. Click to expand IPv4.

f. For Address, type an IP address and subnet for the LAN.

g. Click to expand DHCP server.

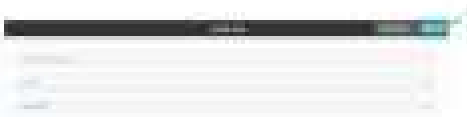
h. Enable the DHCP server.

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5. Remove the Digi AP (Wi-Fi2) access point from the LAN1 bridge:
   a. Click Network > Bridges > LAN1.
   b. Click the down arrow (▾) next to the the Digi AP (Wi-Fi2) access point and select Delete.



6. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Configure a new access point:
   a. Create a new access point:

```
(config)> add network wifi ap new_AP
(config network wifi ap new_AP)>
```

   New access points are enabled by default.
   b. Set the Wi-Fi radio for the new access point:
      i. Show available radios:

```
(config network wifi ap new_AP)> radio ?

Radio: The Wi-Fi radio to run this access point on.
Format:
  wifi1
  wifi2
Current value:

(config network wifi ap new_AP)>
```


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i. Set the appropriate radio:

```
(config network wifi ap new_AP)> radio wifi1
(config network wifi ap new_AP)>
```

c. Set the SSID for the Wi-Fi access point. Up to 32 characters are allowed.

```
(config network wifi ap new_AP)> ssid my_SSID
(config network wifi ap new_AP)>
```

d. Set the security for the access point:

```
(config network wifi ap new_AP)> encryption type value
(config network wifi ap new_AP)>
```

where value is one of:

- none
- psk
- psk2
- wpa2

e. Complete other encryption-related fields as appropriate based on the type of encryption. See Configure a Wi-Fi access point with no security, Configure a Wi-Fi access point with personal security, or Configure a Wi-Fi access point with enterprise security for details.

4. Configure the firewall:

a. Return to the root config prompt by typing three periods (...):

```
(config network wifi ap new_AP)> ...
(config)>
```

b. Add a new firewall zone named LAN2_isolation_zone. We will be creating LAN2 later in the procedure.

```
(config)> add firewall zone LAN2_isolation_zone
(config firewall zone LAN2_isolation_zone)>
```

c. Create a firewall filter to provide Internet access for the LAN2_isolation_zone.

i. Return to the root config prompt by typing three periods (...):

```
(config firewall zone LAN2_isolation_zone)> ...
(config)>
```

ii. Add the new packet filter:

```
(config)> add firewall filter end
(config firewall filter 2)>
```

iii. Set the label for the filter:

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```
(config firewall filter 2)> label "Allow LAN2_isolation_zone to
External"
(config firewall filter 2)>
```

iv. Set the source zone to LAN2_isolation_zone:

```
(config firewall filter 2)> src_zone LAN2_isolation_zone
(config firewall filter 2)>
```

v. Set the destination zone to external:

```
(config firewall filter 2)> dst_zone external
(config firewall filter 2)>
```

3. Create a firewall filter to drop traffic from the internal zone (used by the LAN1 interface) to the LAN2_isolation_zone:

Firewall filters are applied in the order that they are listed. As a result, in order to drop traffic from the internal zone to the LAN2_isolation_zone, this filter must be added before the Allow all outgoing traffic filter, which allows the internal zone to have access to any zone. In this example, we will add the new to the first position in the list (index position 0).

i. Add the new packet filter:

```
(config firewall filter 2)> add ... 0
(config firewall filter 0)>
```

ii. Set the label for the filter:

```
(config firewall filter 0)> label "Drop traffic from Internal to
LAN2_isolation_zone"
(config firewall filter 0>
```

iii. Set the source zone to internal:

```
(config firewall filter 0)> src_zone internal
(config firewall filter 0)>
```

iv. Set the destination zone to LAN2_isolation_zone:

```
(config firewall filter 0)> dst_zone LAN2_isolation_zone
(config firewall filter 0)>
```

v. Set the filter to drop traffic between the zones:

```
(config firewall filter 0)> action drop
(config firewall filter 0)>
```

5. Create a new LAN:

By default, the TX64 device comes with one preconfigured LAN, which includes the default access points. We will use that LAN for the Digi AP (Wi-Fi1) access point, and create a new LAN for the Digi AP (Wi-Fi2) access point. In this step, we create a new LAN for the Digi AP (Wi-

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Fi2) access point. In the next step, we will remove the Digi AP (Wi-Fi2) access point from the default bridge (and thus from the default LAN).

a. Return to the root config prompt by typing three periods (...):

```
(config firewall filter 4)> ...
(config)>
```

b. Add the new LAN:

```
(config)> add network interface LAN2
(config network interface LAN2)>
```

c. Set the device to digi_ap2:

```
(config network interface LAN2)> device /network/wifi/ap/digi_ap2
(config network interface LAN2)>
```

d. Set the zone to LAN2_isolation_zone:

```
(config network interface LAN2)> zone LAN2_isolation_zone
(config network interface LAN2)>
```

e. Set the IP address and subnet mask of the LAN:

```
(config network interface LAN2)> ipv4 address address/mask
(config network interface LAN2)>
```

f. Enable the DHCP server:

```
(config network interface LAN2)> ipv4 dhcp_server enable true
(config network interface LAN2)>
```

6. Remove the digi_ap2 access point from the LAN1 bridge:

a. View the devices configured for the LAN1 bridge:

```
(config network interface LAN2)> show .. .. bridge lan1 device
0 /network/device/eth2
1 /network/device/eth3
2 /network/device/eth4
3 /network/wifi/ap/digi_ap1
4 /network/wifi/ap/digi_ap2
(config network interface LAN2)>
```

b. Use the index number to delete digi_ap2:

```
(config network interface LAN2)> del .. .. bridge lan1 device 4
(config network interface LAN2)>
```

7. Save the configuration and apply the change:

```
(config network interface LAN2)> save
Configuration saved.
>
```


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2. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show Wi-Fi access point status and statistics

You can show summary status for all Wi-Fi access points, and detailed status and statistics for individual Wi-Fi access points.

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **Status**.
3. Under **Connections**, click **Wi-Fi** > **Access Points**.

Command line

Show summary of Wi-Fi access points

To show the status and statistics for Wi-Fi access points, use the show wifi command.

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the Admin CLI prompt, type **show wifi ap**:

```
> show wifi ap

AP          Enabled  Status  SSID          BSSID
----------  -------  ------  ------------  -----------------
ap_AP       true     up      ap_SSID       01:41:01:14:3C:3F
digi_ap1    true     up      Digi12        00:40:0B:13:35:36

>
```

3. To view information about both active and inactive access points, include the **all** parameter:

```
> show wifi ap all

AP          Enabled  Status  SSID          BSSID
----------  -------  ------  ------------  -----------------
ap_AP       true     up      ap_SSID       01:41:01:14:3C:3F
digi_ap1    true     up      Digi12        00:40:0B:13:35:36
digi_ap2    false    down

>
```

Show detailed status and statistics of a specific Wi-Fi access point

To show a detailed status and statistics of a Wi-Fi access point, use the **show wifi ap name** *name* command.

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1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the Admin CLI prompt, type **show wifi ap name** *name*:

```
> show wifi ap name my_AP

Enabled                 : true
Status                  : up

SSID                    : my_AP
Security                : none

Channel                 :
Channel Width           :
Radio                   : wifi1
BSSID                   : 01:41:01:14:36:37

Client                  Signal  RX      TX      Uptime
----------------------  ------  ------  ------  ------
cc:c0:79:34:d5:a2       -68     268997  279481  861

>
```

Configure a Wi-Fi client and add client networks

Required configuration items

- Create the Wi-Fi client.
- The TX64 device's Wi-Fi radio that the Wi-Fi client will use.
- The Wi-Fi network that the client will log into:
  - SSID of the Wi-Fi network's access point.
  - Type of security, and user name and/or password if applicable, used by the access point.
- WAN assignment. Once you configure a Wi-Fi client, you must assign the Wi-Fi client to a WAN. See Wide Area Networks (WANs) and Wireless Wide Area Networks (WWANs) for further information.

Additional configuration items

- Enable and configure background scanning, which allows the Wi-Fi client to move between access points that have the same SSID as their signal strength varies.
- Additional access points that client will attempt to use. If connection to one access point fails, the device will attempt to connect to the next access point in the list.

To configure a Wi-Fi client:



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1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network > WiFi > Client mode connections**.
4. For **Add WiFi client**, type the name of the client and click **+**.



The Wi-Fi client configuration window is displayed.

New Wi-Fi clients are enabled by default. To disable, or to enable a client if it has been disabled, click **Enable**.

5. For **Radio**, select the appropriate Wi-Fi radio.
6. Configure the Wi-Fi network that the client will use:
   a. Click to expand **SSID list**.
   b. Enter the SSID of the access point that the client will use to connect to the Wi-Fi network.
   c. Select the type of **Encryption** used by the access point.
      - If **WPA Personal (PSK)** or **WPA2 Personal (PSK)** is selected as the type of **Encryption**, for **Pre-shared key**, enter the password that the client will use to connect to the access point.

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- If WPA2 Enterprise is selected as the type of Encryption, enter the Username and Password that the client will use to connect to the access point.

7. (Optional) Configure Background scanning.

   Background scanning allows the device to scan for nearby access points and to move between access points that have the same SSID that is configured for the client connection, based on the signal strength of the access points.

   a. Click to expand Background scanning.

   b. Click Enable background scanning to enable.

   c. For Scan threshold, enter a value in dB that is used to determine the scanning frequency. The allowed value is an integer between -113 and 0.

      The Scan threshold works with the Short Interval and Long Interval options to determine how often the device should scan for available access points:

      - If the signal strength from the access point to which the client is currently connected is below the Scan threshold, it will use the Short Interval to determine how often to scan for available access points.
      - If the signal strength from the access point to which the client is currently connected is stronger the Scan threshold, it will use the Long Interval to determine how often to scan for available access points.
      - If Short Interval and Long Interval are set to the same value, Scan threshold is ignored. For example, the default configuration has both Short Interval and Long Interval set to 1 second, which means that the device will scan for access points once per second regardless of the Scan threshold.

   d. For Short Interval, type the number of seconds to wait between scans for access points, when the signal strength from the access point to which the client is currently connected is below the Scan threshold.

   e. For Long Interval, type the number of seconds to wait between scans for access points, when the signal strength from the access point to which the client is currently connected is stronger than the Scan threshold.

   f. Click to expand Scan frequencies list.

      The TX64 device has three preconfigured channels that will be scanned for available access points:

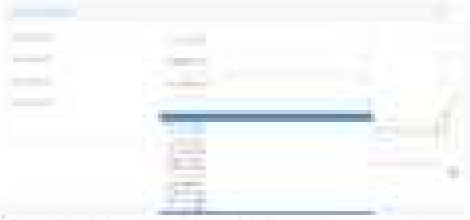
      - Channel 1 (2412 MHz)
      - Channel 6 (2437 MHz)
      - Channel 11 (2462 MHz)

      You can delete the preconfigured channels and add additional channels. At least one channel is required.

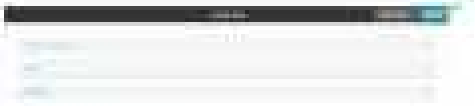
   g. To delete a preconfigured channel, click the menu icon (...) next to the channel and select Delete.

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h. To add a channel, click **Add Scan frequency** and select the appropriate channel.



2. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Create a new Wi-Fi client:

```
(config)> add network wifi client new_client
(config network wifi client new_client)>
```

   New access points are enabled by default.
4. Set the Wi-Fi radio for the new access point:
   a. Show available radios:

```
(config network wifi client new_client)> .. .. radio ?

 Additional Configuration

 ----------
 wifi1                          Wi-Fi1 radio
 wifi2                          Wi-Fi2 radio

(config network wifi client new_client)>
```


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b. Set the appropriate radio:

```
(config network wifi client new_client)> radio wifi1
(config network wifi client new_client)>
```

3. Configure the Wi-Fi network that the client will use:

a. Set the SSID of the access point that the client will use to connect to the Wi-Fi network:

```
(config network wifi client new_client)> ssid # ssid value
```

where value is the SSID of the access point.

b. Set the security for the access point:

```
(config network wifi client new_client)> ssid # encryption type value
(config network wifi client new_client)>
```

where value is the type of encryption used by the access point. Allowed values are:

- none: no encryption.
- psk: WPA personal encryption.
- psk2: WPA2 personal encryption.
- wpa2: WPA2 enterprise encryption.

c. If the type of encryption is set to:

- psk or psk2, set the password that the client will use to connect to the access point:

```
(config network wifi client new_client)> ssid # encryption key_
psk2 password
(config network wifi client new_client)>
```

- wpa2:

i. Set the username that the client will use to connect to the access point:

```
(config network wifi client new_client)> ssid # encryption id_
wpa2 username
(config network wifi client new_client)>
```

ii. Set the password that the client will use to connect to the access point:

```
(config network wifi client new_client)> ssid # encryption
password_wpa2 pwd
(config network wifi client new_client)>
```

4. (Optional) Configure background scanning.

Background scanning allows the device to scan for nearby access points and to move between access points that have the same SSID that is configured for the client connection, based on the signal strength of the access points.

a. Enable background scanning:

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```
(config network wifi client new_client)> background_scanning enable true
(config network wifi client new_client)>
```

b. Set the scan threshold (**bgscan_strength**), in dB, that is used to determine the scanning frequency.

```
(config network wifi client new_client)> bgscan_strength value
(config network wifi client new_client)>
```

where value is an integer between -113 and 0.

The scan threshold works with the short and long intervals (**bgscan_short_interval** and **bgscan_long_interval**) to determine how often the device should scan for available access points:

- If the signal strength from the access point to which the client is currently connected is below the value of **bgscan_strength**, it will use **bgscan_short_interval** to determine how often to scan for available access points.
- If the signal strength from the access point to which the client is currently connected is stronger than the value of **bgscan_strength**, it will use **bgscan_long_interval** to determine how often to scan for available access points.
- If **bgscan_short_interval** and **bgscan_long_interval** are set to the same value, **bgscan_strength** is ignored. For example, the default configuration has both **bgscan_short_interval** and **bgscan_long_interval** set to 1 second, which means that the device will scan for access points once per second regardless of the value of **bgscan_strength**.

c. Set the number of seconds to wait between scans for access points, when the signal strength from the access point to which the client is currently connected is below the value of **bgscan_strength**:

```
(config network wifi client new_client)> bgscan_short_interval value
(config network wifi client new_client)>
```

where value is any integer greater than 0. The default is 1.

d. Set the number of seconds to wait between scans for access points, when the signal strength from the access point to which the client is currently connected is greater than the value of **bgscan_strength**:

```
(config network wifi client new_client)> bgscan_long_interval value
(config network wifi client new_client)>
```

where value is any integer greater than 0. The default is 1.

e. Configure the frequencies that will be scanned for available access points.

The TX64 device has three preconfigured frequencies:

- 2412 MHz
- 2437 MHz
- 2462 MHz

You can delete the preconfigured frequencies and add additional frequencies. At least one frequencies is required.

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f. To delete a preconfigured frequencies:

i. Use the show command to determine the index number of the channel to be deleted:

```
(config network wifi client new_client)> show background_scanning
scan_freq
0 2412
1 2437
2 2462
(config network wifi client new_client)>
```

ii. Use the appropriate index number to delete the channel. For example, to delete the 2412 frequency:

```
(config network wifi client new_client)> del 0
(config network wifi client new_client)>
```

g. To add a frequency:

i. Use the ? with an existing index number to determine the allowed values for frequencies:

```
(config network wifi client new_client)> background_scanning scan_
freq ?

Scan frequency: Enable this frequency in the background scan.
Format:
  2412
  2417
  2422
  2427
  2432
  2437
  2442
  2447
  2452
  2457
  2462
Current value: 2437
```

ii. Add the appropriate frequency. For example, to add the 2457 frequency to the end of the list:

```
(config network wifi client new_client)> add background_scanning
scan_freq end 2457
(config network wifi client new_client)>
```

7. Save the configuration and apply the change:

```
(config network wireless client new_client)> save
Configuration saved.
>
```


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2. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show Wi-Fi client status and statistics

You can show summary status for all Wi-Fi clients, and detailed status and statistics for individual Wi-Fi clients.

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **Status**.
3. Under **Connections**, click **Wi-Fi** > **Clients**.

Command line

Show summary of Wi-Fi clients

To show the status and statistics for Wi-Fi client, use the show wifi command.

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the Admin CLI prompt, type **show wifi client**:

```
> show wifi client

Client      Enabled  SSID      Status  Sig  MAC
----------  -------  --------  ------  ---  -----------------
my_client   true     my_SSID   up      -43  91:fe:8C:d1:8e:81

>
```

3. To view information about both active and inactive clients, include the **all** parameter:

```
> show wifi client all

Client      Enabled  SSID      Status  Sig  MAC
----------  -------  --------  ------  ---  -----------------
my_client   true     my_SSID   up      -43  91:fe:8C:d1:8e:81
client2     true     SSID2     down
>
```

Show detailed status and statistics of a specific Wi-Fi client

To show a detailed status and statistics of a Wi-Fi client, use the **show wifi client name** *name* command.

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the Admin CLI prompt, type show wifi client name name:

```
> show wifi client name my_client

Client                : my_client
Enabled               : true
SSID                  : my_SSID
Status                : up
Signal                : -41
MAC                   : 91:fe:8C:d1:9e:83
Channel               : 48
Radio                 : wifi1
TX Power              : 23
Link Quality          : 67/70
BSSID                 : 00:00:00:00:00:04

>
```


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Hotspot

Your TX64 device offers the ability to create a publicly available hotspot, which allows you to provide Internet access to users while restricting their ability to access other functionality on the TX64 device, as well as applying bandwidth limits, authenticating users, and other features. The TX64 device's implementation of hotspot uses a "captive portal" page—a web page that is displayed to users when they first connect to the hotspot and requires users to perform some specific action before they are granted access to the Internet, such as accepting terms of use, logging in with a shared password or a username/password combination, or using a payment service to purchase web access via your hotspot.

Authentication of hotspot users can be performed by the device itself, by an external RADIUS server or other remote server, or by HotspotSystem (a cloud-based hotspot management and billing service). The device provides sample html pages to be used for authentication, and you can modify these pages, add your own pages, or host HTML login pages on a remote web server.

Note Sample HTML pages provided by your TX64 device are located in the /etc/config/hotspot directory on your device's filesystem. The files are created when you enable a hotspot and its associated access point or bridge for the first time, and cannot be accessed prior to that.

This chapter contains the following topics:

Hotspot authentication modes 222
Hotspot DHCP server 222
Hotspot security 223
Hotspot configuration 224
Show hotspot status and statistics 249
Customize the hotspot login page 267
Hotspot RADIUS attributes 278

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Hotspot authentication modes

During hotspot configuration, you select one the following authentication modes for the hotspot:

- **Click-through:** Requires each user to accept the terms and conditions. The sample HTML page included with your TX64 device for click-through authentication is terms.html.

  See Create a new hotspot for information about configuring hotspot for click-through authentication.

- **Local shared password:** Requires each user to enter a password. This password is validated locally on the TX64 device, and the password is the same for all users. The sample HTML page included with your TX64 device for local shared password authentication is password.html.

  See Configure the hotspot to use local shared password authentication for information about configuring hotspot for local shared password authentication.

- **RADIUS shared password:** Requires each user to enter a password. This password is validated by an external RADIUS server, and the password is the same for all users. The RADIUS server should be "white listed" by including it in the **Walled garden ▸ Allowed domains** or **Walled garden ▸ Allowed subnets** setting for the hotspot, which allows unauthenticated hotspot clients to access the server for authentication. The sample HTML page included with your TX64 device for RADIUS shared password authentication is password.html.

  See Configure the hotspot to use RADIUS shared password authentication for information about configuring hotspot for RADIUS shared password authentication.

- **RADIUS users:** Requires each user to enter username and password credentials that are established on an external RADIUS server. The credentials are validated by the RADIUS server. The RADIUS server should be "white listed" by including it in the **Walled garden ▸ Allowed domains** or **Walled garden ▸ Allowed subnets** setting for the hotspot, which allows unauthenticated hotspot clients to access the server for authentication. The sample HTML page included with your TX64 device for RADIUS shared password authentication is login.html.

  See Configure the hotspot to use RADIUS users authentication for information about configuring hotspot for RADIUS users authentication.

- **HotspotSystem:** Requires each user to be authenticated by HotspotSystem, a cloud hotspot service that supports various free and paid authentication methods, including social media account, SMS, voucher, and PayPal. Domains needed for HotspotSystem authentication, payment options, and social media login should be "white listed" by including them in the **Walled garden ▸ Allowed domains** or **Walled garden ▸ Allowed subnets** setting for the hotspot, which allows unauthenticated hotspot clients to access them for authentication. When **HotspotSystem** is selected for the authentication mode, the browser is redirected to the HotspotSystem web page.

  See Configure the hotspot to use HotspotSystem authentication for information about configuring hotspot for HotspotSystem authentication.

Prior to authentication, a hotspot client that attempts to make an HTTP request to any domain other than those included in white-listed sites in the **Walled garden ▸ Allowed domains** or **Walled garden ▸ Allowed subnets** settings will be redirected to the login webpage. HTTPS requests will time out, because the hotspot cannot provide a valid SSL certificate for the requested domain. Requests made via any other protocol will also time out. Most operating systems will detect this scenario and automatically notify users to open the login page in a web browser.

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Hotspot DHCP server

When the hotspot is enabled on the TX64 device, it automatically enables a DHCP server. During hotspot configuration, you assign an IPv4 address to the hotspot, and the DHCP server then uses the subnet of the hotspot's IP address, along with the hotspot's subnet mask, to assign IPv4 addresses to clients that connect to the hotspot.

To prevent the hotspot's DHCP server from assigning IP addresses that are already in use elsewhere in your local network, the hotspot must use a subnet that is not currently being used in your local network.

Hotspot security

A typical hotspot is an open network. This means that traffic transferred between the hotspot and the hotspot clients is not encrypted and can be intercepted by a packet sniffer or similar technology. However, the sample HTML login pages provided with your TX64 device use CHAP-MD5 authentication, providing a level of security during the authentication process. Additionally, websites that use the HTTPS protocol provide end-to-end encryption between the browser and the web server.

Hotspot clients are typically untrusted and only given access to the WAN interface on the device. The hotspot firewall zone settings prevent hotspot clients from accessing any of the other interfaces on the device (such as the LAN and VPN interfaces). Additionally, the hotspot zone prevents hotspot clients from accessing the device itself (for example, via the web interface or SSH).

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Hotspot configuration

This section provides information about enabling and configuring the default hotspot that is provided with your TX64 installation, as well as creating a new hotspot and configuring the type of authentication mode you select for your hotspot.

This section contains the following topics:

Enable hotspot using the default configuration
Change the default hotspot SSID
Change the default hotspot IP address and subnet
Change the default hotspot bandwidth limits
Add an Ethernet port to the default hotspot
Create a new hotspot
Configure the hotspot to use local shared password authentication
Configure the hotspot to use RADIUS shared password authentication
Configure the hotspot to use RADIUS users authentication
Configure the hotspot to use HotspotSystem authentication

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Enable hotspot using the default configuration

The default configuration of the TX64 device's hotspot is:

	Default configuration
Hotspot	• Name: hotspot • Disabled • Authentication mode: Click-through • IP address: 10.1.0.1/24 • DHCP server: Automatically enabled • DHCP server lease range: 100-250 • Bandwidth limits: ◦ Maximum download speed: 10000 Kbps ◦ Maximum upload speed: 10000 Kbps
Bridge	• Name: hotspot_bridge • Disabled • 2.4 GHz Wi-Fi access point: Digi Hotspot AP (Wi-Fi4) • 5 GHz Wi-Fi access point: Digi Hotspot AP (Wi-Fi2)
Access points	• Name: ◦ Digi Hotspot AP (Wi-Fi4) ◦ Digi Hotspot AP (Wi-Fi2) • Disabled • SSID: Digi Hotspot • Encryption: Open (unencrypted) • Hotspot access points should be set to open (unencrypted). See Hotspot security for further information.
LAN	• Name: LAN: hotspot • Disabled • Device: hotspot_bridge • IP address: 192.168.100.1/30 This IP address is not used by the hotspot or the hotspot's DHCP server. It must be a unique IP address that is not used elsewhere in your network. • DHCP server: Disabled • The hotspot will use the hotspot's DHCP server rather than the LAN's DHCP server.

To use the default hotspot with click-through authentication, enable the hotspot, the bridge, the access points, and the LAN.

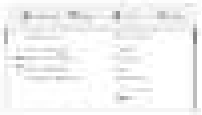
In additional to enabling the default hotspot configuration, you may also want to:

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- Change the default hotspot SSID.
- Change the default authentication method:
  - Configure the hotspot to use local shared password authentication.
  - Configure the hotspot to use RADIUS shared password authentication.
  - Configure the hotspot to use RADIUS users authentication.
  - Configure the hotspot to use HotspotSystem authentication.
- Change the default hotspot IP address and subnet.
- Modify the sample local HTML page that the TX64 device uses by default for click-through authentication. See Edit sample hotspot HTML pages for information.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Enable the hotspot:
   a. Click **Network** > **Hotspots** > **hotspot**.
   b. Click **Enable hotspot**.



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4. Enable the hotspot access points:
   a. Click Network > Wi-Fi > Access points > Digi Hotspot AP (Wi-Fi1).
   b. Click Enable.
   c. Click Digi Hotspot AP (Wi-Fi2).
   d. Click Enable.



5. Enable the hotspot bridge:
   a. Click Network > Bridges > hotspot_bridge.
   b. Click Enable.

6. Enable the hotspot LAN:
   a. Click Network > Interfaces > LAN > LAN hotspot.
   b. Click Enable.



7. Click Apply to save the configuration and apply the change.

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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable the hotspot:

```
(config)> network hotspot hotspot enable true
(config)>
```

4. Enable the hotspot access points:

```
(config)> network ap digi_hotspot_ap1 enable true
(config)> network ap digi_hotspot_ap2 enable true
(config)>
```

5. Enable the hotspot bridge:

```
(config)> network bridge hotspot_bridge enable true
(config)>
```

6. Enable the hotspot LAN:

```
(config)> network interface lan_hotspot enable true
(config)>
```

7. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

8. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Change the default hotspot SSID

Required configuration items

- Enable default hotspot configuration. See Enable hotspot using the default configuration for instructions.
- An SSID for the hotspot.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



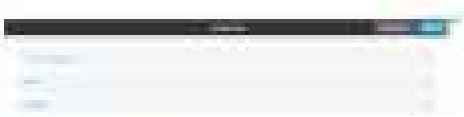
3. Click **Network** > **Wi-Fi** > **Access points** > **Digi Hotspot AP (Wi-Fi1)**.
4. Change the default SSID, **Digi Hotspot**, to your preferred value.
5. Click **Digi Hotspot AP (Wi-Fi2)**.

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6. Change the default SSID, Digi Hotspot, to your preferred value.



7. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Change the SSID for digi_hotspot_ap1 to your preferred value:

```
(config)> network wifi ap digi_hotspot_ap1 ssid value
```

   where value is a string of 1 to 32 characters. If the value contains spaces, enclose in quote marks (").
4. Change the SSID for digi_hotspot_ap2 to your preferred value:

```
(config)> network wifi ap digi_hotspot_ap1 ssid value
```

   where value is a string of 1 to 32 characters. If the value contains spaces, enclose in quote marks (").
5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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6. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Change the default hotspot IP address and subnet

Required configuration items

- Enable default hotspot configuration. See Enable hotspot using the default configuration for instructions.
- An IP address and subnet for the hotspot.

Additional configuration items

- Hotspot DHCP server settings:
  - Lease time.
  - Lease range start and end.

To change the default hotspot IP address and subnet:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



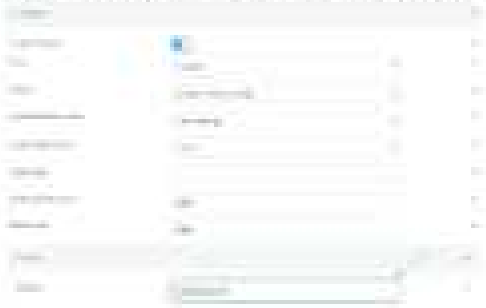
The **Configuration** window is displayed.



3. Click **Network > Hotspots > hotspot**.
4. Click to expand **IPv4**.

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5. For Address, enter a new IP address and subnet mask.



6. [Optional] Change the default DHCP server configuration.

Note The hotspot DHCP server is automatically enabled and cannot be disabled.

a. Click to expand DHCP server.



b. For Lease time, type the amount of time that a client DHCP lease is valid. The default is 10 minutes.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set Lease time to ten minutes, enter 10m or 600s.

c. For Lease range start, type the lowest IP address in the range to assign to hotspot clients. The value entered here represents the low order byte of the IP address, and is combined with the subnet of the hotspot's static IP address. The default is 100.

d. For Lease range end, type the highest IP address in the range to assign to hotspot clients. The value entered here represents the low order byte of the IP address, and when DHCP addresses are assigned to client, this number is combined with the subnet of the hotspot's static IP address. The default is 250.

7. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. Change the default hotspot IP address and subnet mask:

```
(config)> network hotspot hotspot ipv4 address ip_address/mask
(config)>
```

4. (Optional) Change the default DHCP server configuration.

Note The hotspot DHCP server is automatically enabled and cannot be disabled.

a. Set the amount of time that a client DHCP lease is valid:

```
(config)> network hotspot hotspot ipv4 address dhcp_server lease_time
value
(config)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set lease_time to ten minutes, enter either 10m or 600s:

```
(config)> network hotspot hotspot ipv4 dhcp_server lease_time 600s
(config)>
```

The default is 10 minutes.

b. Set the lowest IP address in the range to assign to hotspot clients. This value represents the low order byte of the IP address, and is combined with the subnet of the hotspot's static IP address.

```
(config)> network hotspot hotspot ipv4 address dhcp_server lease_start
value
(config)>
```

where value is any integer between 1 and 254. The default is 100.

c. Set the highest IP address in the range to assign to hotspot clients. This value represents the low order byte of the IP address, and is combined with the subnet of the hotspot's static IP address.

```
(config)> network hotspot hotspot ipv4 address dhcp_server lease_end
value
(config)>
```

where value is any integer between 1 and 254. The default is 250.

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5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Change the default hotspot bandwidth limits

Required configuration items

- Enable default hotspot configuration. See Enable hotspot using the default configuration for instructions.
- Maximum download speed, in Kbps.
- Maximum upload speed, in Kbps.

To change the default hotspot IP address and subnet:



1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

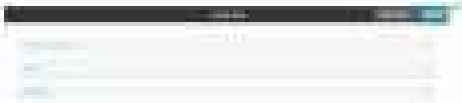


3. Click **Network** > **Hotspots** > **hotspot**.
4. For **Maximum download speed**, type the maximum download speed in kilobytes per second (Kbps).

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5. For **Maximum upload speed**, type the maximum upload speed in kilobytes per second (Kbps).

6. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Change the default maximum download speed:

```
(config)> network hotspot hotspot bandwidth_max_down value
(config)>
```

   where *value* is an integer between 1 and 100000 and represents the maximum download speed in Kbps.

4. Change the default maximum upload speed:

```
(config)> network hotspot hotspot bandwidth_max_up value
(config)>
```

   where *value* is an integer between 1 and 100000 and represents the maximum upload speed in Kbps.

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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6. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Add an Ethernet port to the default hotspot

Required configuration items

- Enable default hotspot configuration. See Enable hotspot using the default configuration for instructions.
- Ethernet port to be added to the hotspot.

To add an Ethernet port to the default hotspot:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

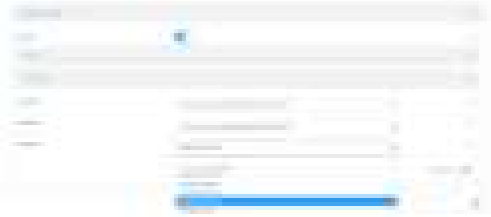


3. Click **Network** > **Bridges** > **hotspot_bridge** > **Devices**.

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4. Click the + to add a new device.

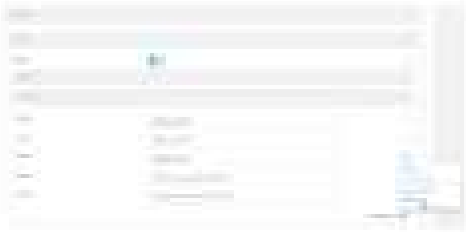
5. By default, for Device, select the appropriate Ethernet port.



By default, the ETH3 device is configured as the device for the WAN1 interface, and ETH2, ETH3, and ETH4 are configured as devices in the LAN1 bridge, which is used by the LAN1 interface. As a result, when you add an Ethernet port to the hotspot, you may need to reconfigure the Ethernet port configuration for other interfaces. For example, to remove the ETH4 port from the LAN1 bridge:

a. Click Network > Bridges > LAN1 > Devices.

b. Click the ... menu icon next to the Ethernet: ETH4 device entry and select Delete.



6. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Display a list of available devices by using the tab autocomplete feature:

```
(config)> add network bridge hotspot_bridge device end /network/<tab>
/network/device/eth1                    /network/device/eth2
/network/device/eth3                    /network/device/eth4
/network/device/loopback                /network/bridge/hotspot_bridge
/network/bridge/lan1                    /network/wifi/ap/digi_ap1
/network/wifi/ap/digi_ap3               /network/wifi/ap/digi_hotspot_ap1
/network/wifi/ap/digi_hotspot_ap2
(config)> add network bridge hotspot_bridge device end /network/
```

4. Add a new device. For example, to add the ETH4 device:

```
(config)> add network bridge hotspot_bridge device end /network/device/eth4
(config)>
```

By default, the ETH1 device is configured as the device for the WAN1 interface, and ETH2, ETH3, and ETH4 are configured as devices in the LAN1 bridge, which is used by the LAN1 interface. As a result, when you add an Ethernet port to the hotspot, you may need to reconfigure the Ethernet port configuration for other interfaces. For example, to remove the ETH4 port from the LAN1 bridge:

a. Display the current LAN1 bridge configuration:

```
(config)> show network bridge lan1 device
0 /network/device/eth2
1 /network/device/eth3
2 /network/device/eth4
3 /network/wifi/ap/digi_ap1
4 /network/wifi/ap/digi_ap2
(config)>
```

b. Use the index number, 2, to remove the ETH4 device from the LAN1 bridge:

```
(config)> del network bridge lan1 device 2
(config)>
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Create a new hotspot

Required configuration items

- A device or bridge for the hotspot.
  - If a bridge is used, it must be included in an interface with an assigned IP address.
- The authentication mode:
  - If Local shared password is selected for the authentication mode, include the password.
  - If RADIUS shared password or RADIUS users is selected for the authentication mode, include RADIUS configuration information.
  - If HotspotSystem is selected for the authentication mode, include HotspotSystem configuration information.

  See Hotspot authentication modes for more information about authentication modes.
- The login page source, either Local or Remote.
  - If Remote is selected, include the IP address of fully-qualified domain name of the remote web server that serves the login page.
- An IP address and subnet for the hotspot.

Additional configuration items

- If the login page source is Local, include the name of the local HTML file, if different than the default.
- If the login page source is Remote, include the shared secret that the remote server and the hotspot. Used with cloud-based hotspot providers.
- The Authentication port used by the hotspot.
- The Server port used by the hotspot.
- Hotspot DHCP server settings:
  - Lease time.
  - Lease range start and end.
- Walled garden configuration:
  - Domains that clients connected to the hotspot can access prior to the client being authenticated.
  - Subnets that clients connected to the hotspot can access prior to the client being authenticated.
- Maximum download speed, in Kbps.
- Maximum upload speed, in Kbps.
- Enable verbose logging.

To create a new hotspot:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. (Optional) Create new access points for the hotspot.

   You can also use existing access points for the hotspot. Access Points that are assigned to a hotspot or to a bridge used by a hotspot cannot be used for any other purposes.

   If more than one access point is being used by the hotspot, you must create a bridge that includes the access points.

   a. Click **Configuration** > **Network** > **WiFi** > **Access points**.

   b. For **Add WiFi access point**, type a name for the access point and click ✚.

   c. For **Radio**, select the appropriate Wi-Fi radio.

   d. For **SSID**, type the SSID. Up to 32 characters are allowed.

      This will be the SSID used by clients to connect to the hotspot. If you are creating multiple access points, each access point must have the same SSID.

   e. For **Encryption**, select **Open (Unencrypted)**.

      Hotspot access points must use open (unencrypted) communication. See Hotspot security for more information.

   f. Add additional access points by following the above instructions.

4. (Optional) Create a new bridge and interface for the hotspot.

   Note: Hotspot bridges must also be part of an interface with a configured IP address.

   a. Click **Network** > **Bridges**.

   b. For **Add Bridge:**, type a name for the bridge and click ✚.

   c. Add devices to the bridge:

      i. Click to expand **Devices**.

      ii. For **Add device**, click ✚.

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iii. Select the Device.

iv. Repeat to add additional devices.

d. Create an interface for the bridge:

i. Click Configuration > Network > Interfaces.

ii. For Add interface, create a new interface and click +.

iii. For Device, select the bridge created above.

iv. Click to expand IPv4.

v. For Address, enter an IP address and subnet mask for the LAN. This IP address must be unique from all other interfaces.

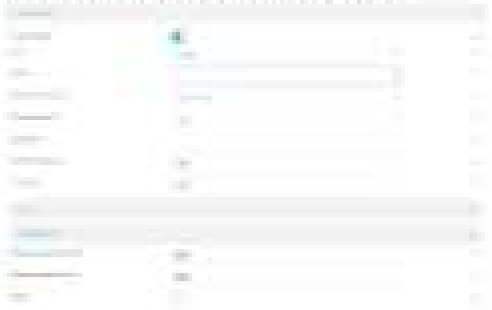
Note This IP address is not the IP address of the hotspot. The hotspot IP address is configured during hotspot configuration.

5. Click Network > Hotspots.

6. For Add Hotspot, enter a name for the hotspot and click +.



The new hotspot configuration appears.



7. Hotspots are enabled by default when they are created. To disable, click Enable hotspot.

8. For Zone, leave at the default setting of hotspot. The hotspot firewall zone provides the necessary firewall rules for hotspot functionality.

9. For Device, select an access point, and Ethernet port, or a bridge.

10. For Authentication Mode, select one of the following:

- Click-through: Requires each user to accept the terms and conditions.
- Local shared password: Requires each user to enter a password. This password is validated locally on the TX64 device, and the password is the same for all users.

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See Configure the hotspot to use local shared password authentication for information about configuring hotspot for local shared password authentication.

- RADIUS shared password: Requires each user to enter a password. This password is validated by an external RADIUS server, and the password is the same for all users.

  See Configure the hotspot to use RADIUS shared password authentication for information about configuring hotspot for RADIUS shared password authentication.

- RADIUS users: Requires each user to enter username and password credentials that are established on an external RADIUS server. The credentials are validated by the RADIUS server.

  See Configure the hotspot to use RADIUS users authentication for information about configuring hotspot for RADIUS users authentication.

- HotspotSystem: Requires each user to be authenticated by HotspotSystem, a cloud hotspot service that supports various free and paid authentication methods, including social media account, SMS, voucher, and PayPal.

  See Configure the hotspot to use HotspotSystem authentication for information about configuring hotspot for HotspotSystem authentication.

11. For **Login page source**, select either:
    - **Local**: Uses an HTML page for authentication that is stored locally on the TX64 device's filesystem, in the /etc/config/hotspot directory. Note that the hotspot directory is not visible until hotspot has been enabled for the first time.
    - **Remote**: Uses an HTML page for authentication that is served by a remote web server.

    This parameter is not available if **HotspotSystem** is selected for the **Authentication mode**.
12. [Optional] If **Local** is selected for **Login page source**, for **Login page**, type the name of the local HTML file used for authentication. This parameter is not available if **HotspotSystem** is selected for the **Authentication mode**.

    Normally, this field should be left blank, and the device will use the default authentication HTML page. See Hotspot authentication modes for information about the default authentication HTML page used for each authentication mode.

    If you upload a custom HTML file that uses a filename other than the default filename, type the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.
13. [Optional] For **Authentication port**, type the port number that the hotspot authentication server will used. The default is 3990.
14. [Optional] For **Server port**, type the port number of the hotspot server. The default is 4990.
15. If **Remote** is selected for **Login page source**, click to expand **Remote web server**.
    a. For **FQDN**, type the IP address or fully-qualified domain name of the remote web server that will be used for client authentication.
    b. [Optional] For **Secret**, type the shared secret that the remote server and the hotspot. Used with cloud-based hotspot providers.
    c. [Optional] Change the default DHCP server configuration.

    > Note: The hotspot DHCP server is automatically enabled and cannot be disabled.

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i. Click to expand DHCP server.

ii. For **Lease time**, type the amount of time that a client DHCP lease is valid. The default is 10 minutes.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set **Lease time** to ten minutes, enter **10m** or **600s**.

iii. For **Lease range start**, type the lowest IP address in the range to assign to hotspot clients. The value entered here represents the low order byte of the IP address, and is combined with the subnet of the hotspot's static IP address. The default is **100**.

iv. For **Lease range end**, type the highest IP address in the range to assign to hotspot clients. The value entered here represents the low order byte of the IP address, and when DHCP addresses are assigned to client, this number is combined with the subnet of the hotspot's static IP address. The default is **250**.

16. Click to expand **Walled garden**.

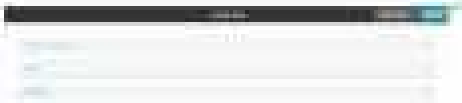
Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. If external servers are used for client authentication, such as a RADIUS server or HotspotSystem, they should be included in the walled garden settings. If **Remote** has been selected for **Login page source**, the domain for the web server that is being use to serve the remote HTML files must be included in the white list defined in these fields.

- To add domains that can be accessed by the client prior to authentication:
  a. Click to expand **Allowed domains**.
  b. Click **+** to add a domain.
  c. For **Domain**, type the hostname of the allowed domain.
  d. Repeat to add additional domains.
- To add subnets that can be accessed by the client prior to authentication:
  a. Click to expand **Allowed subnets**.
  b. Click **+** to add a subnet.
  c. For **Subnet**, type an IPv4 address and optional subnet mask, using the format *IPv4_address*[/*netmask*], or the keyword **any**.
  d. Repeat to add additional subnets.

17. (Optional) For **Maximum download speed**, type the maximum download speed in kilobytes per second (Kbps).
18. (Optional) For **Maximum upload speed**, type the maximum upload speed in kilobytes per second (Kbps).

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10. (Optional) Click **Debug** to enable verbose logging to the system log.
11. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. (Optional) Create new access points for the hotspot.

   You can also use existing access points for the hotspot. Access Points that are assigned to a hotspot or to a bridge used by a hotspot cannot be used for any other purpose.

   If more than one access point is being used by the hotspot, you must create a bridge that includes the access points.

   a. Create a new access point:

```
(config)> add network wifi ap new_hotspot_AP1
(config network wifi ap new_hotspot_AP1)>
```

   New access points are enabled by default.

   b. Set the Wi-Fi radio for the new access point:

      i. Show available radios:

```
(config network wifi ap new_hotspot_AP1)> radio ?

Radio: The Wi-Fi radio to run this access point on.
Format:
```


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```
  wifi1
  wifi2
Current value:

(config network wifi ap new_hotspot_API)>
```

i. Set the appropriate radio:

```
(config network wifi ap new_hotspot_API)> radio wifi1
(config network wifi ap new_hotspot_API)>
```

c. Set the SSID:

```
(config network wifi ap new_hotspot_API)> ssid my_SSID
(config network wifi ap new_hotspot_API)>
```

This will be the SSID used by clients to connect to the hotspot. If you are creating multiple access points, each access point must have the same SSID. Up to 32 characters are allowed.

d. Set the encryption to open:

```
(config network wifi ap new_hotspot_API)> encryption type none
(config network wifi ap new_hotspot_API)>
```

Hotspot access points must use open (unencrypted) communication. See Hotspot security for more information.

e. Type ... to return to the config prompt:

```
(config network wifi ap new_hotspot_API)> ...
(config)>
```

f. Add additional access points by following the above instructions.

4. [Optional] Create a new bridge and interface for the hotspot.

Note Hotspot bridges must also be part of an interface with a configured IP address.

a. Create a bridge:

```
(config)> add network bridge new_hotspot_bridge
(config network bridge new_hotspot_bridge)>
```

b. Add devices to the bridge:

i. Determine available devices:

```
(config network bridge new_hotspot_bridge)> .. .. interface lan1
device ?

Device: The network device used by this network interface.
Format:
  /network/device/eth1
  /network/device/eth2
```


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```
    /network/device/eth3
    /network/device/eth4
    /network/device/loopback
    /network/bridge/hotspot_bridge
    /network/bridge/lan1
    /network/wireless/ap/digi_ap1
    /network/wireless/ap/digi_ap2
    /network/wireless/ap/digi_hotspot_ap1
    /network/wireless/ap/digi_hotspot_ap2

  Default value: /network/bridge/lan1
  Current value: /network/bridge/lan1

  (config network bridge new_hotspot_bridge)>
```

f. Add the appropriate device. For example, to add the Digi AP (802.11b/g) Wi-Fi access point:

```
(config network bridge new_hotspot_bridge)> add device end
/network/wireless/ap/digi_ap1
(config)>
```

e. Type ... to return to the config prompt:

```
(config network bridge new_hotspot_bridge)> ...
(config)>
```

d. Create an interface for the bridge:

```
(config)> add network interface hotspot_bridge_interface
(config network interface hotspot_bridge_interface)>
```

e. Add the new bridge to the interface:

```
(config network interface hotspot_bridge_interface)> device
/network/bridge/new_hotspot_bridge
(config network interface hotspot_bridge_interface)>
```

f. Set an IP address for the interface.

Note This IP address is not the IP address of the hotspot. The hotspot IP address is configured during hotspot configuration.

```
(config network interface hotspot_bridge_interface)> ipv4 address ip_
address/netmask
(config network interface hotspot_bridge_interface)>
```

g. Type ... to return to the config prompt:

```
(config network interface hotspot_bridge_interface)> ...
(config)>
```


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5. Create a new hotspot:

```
(config)> add network hotspot new_hotspot
(config network hotspot new_hotspot)>
```

New hotspots are enabled by default.

- To disable:

```
(config network hotspot new_hotspot)> enable false
(config network hotspot new_hotspot)>
```

- To enable, if it has been disabled:

```
(config network hotspot new_hotspot)> enable true
(config network hotspot new_hotspot)>
```

6. Add devices to the bridge:

a. Determine available devices:

```
(config network bridge new_hotspot_bridge)> .. .. interface lan1 device
?

Device: The network device used by this network interface.
Format:
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/loopback
  /network/bridge/hotspot_bridge
  /network/bridge/lan1
  /network/wireless/ap/digi_ap1
  /network/wireless/ap/digi_ap2
  /network/wireless/ap/digi_hotspot_ap1
  /network/wireless/ap/digi_hotspot_ap2

Default value:  /network/bridge/lan1
Current value:  /network/bridge/lan1

(config network bridge new_hotspot_bridge)>
```

b. Add the appropriate devices. For example, to add the Digi AP (Wi-Fi1) Wi-Fi access point:

```
(config network bridge new_hotspot_bridge)> add device end
/network/wireless/ap/digi_ap1
(config)>
```


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7. Set an access point, and Ethernet port, or a bridge for the hotspot's device:
   a. Determine available devices:

```
(config network hotspot new_hotspot)> device ?

Device: Device to use for this hotspot interface.
Format:
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/Loopback
  /network/bridge/hotspot_bridge
  /network/bridge/Lan1
  /network/bridge/new_hotspot_bridge
  /network/wifi/ap/digi_ap1
  /network/wifi/ap/digi_ap2
  /network/wifi/ap/digi_hotspot_ap1
  /network/wifi/ap/digi_hotspot_ap2
  /network/wifi/ap/new_hotspot_ap1
  /network/wifi/ap/new_hotspot_ap2
Current value:

(config network hotspot new_hotspot)>
```

   b. Add the device:

```
(config network hotspot new_hotspot)> device /network/bridge/new_
hotspot_bridge
(config network hotspot new_hotspot)>
```

8. Set the authentication mode:

```
(config network hotspot new_hotspot)> auth value
(config network hotspot new_hotspot)>
```

   where value is one of:

   - click_through: Requires each user to accept the terms and conditions.
   - local_shared_password: Requires each user to enter a password. This password is validated locally on the TX64 device, and the password is the same for all users.

     See Configure the hotspot to use local shared password authentication for information about configuring hotspot for local shared password authentication.
   - radius_shared_password: Requires each user to enter a password. This password is validated by an external RADIUS server, and the password is the same for all users.

     See Configure the hotspot to use RADIUS shared password authentication for information about configuring hotspot for RADIUS shared password authentication.
   - radius_user: Requires each user to enter username and password credentials that are established on an external RADIUS server. The credentials are validated by the RADIUS server.

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See Configure the hotspot to use RADIUS users authentication for information about configuring hotspot for RADIUS users authentication.

- **hotspotsystem:** Requires each user to be authenticated by HotspotSystem, a cloud hotspot service that supports various free and paid authentication methods, including social media account, SMS, voucher, and PayPal.

  See Configure the hotspot to use HotspotSystem authentication for information about configuring hotspot for HotspotSystem authentication.

9. Set the login page source. (This option is not available if auth is set to hotspotsystem):

```
(config network hotspot new_hotspot)> login value
(config network hotspot new_hotspot)>
```

where value is either:

- **local:** Uses an HTML page for authentication that is stored locally on the TX64 device's filesystem, in the /etc/config/hotspot directory. Note that the hotspot directory is not visible until hotspot has been enabled for the first time.
- **remote:** Uses an HTML page for authentication that is served by a remote web server.

10. (Optional) If local is selected for login, set the name of the local HTML file used for authentication. (This option is not available if auth is set to hotspotsystem):

```
(config network hotspot new_hotspot)> local_page HTML_filename
(config network hotspot new_hotspot)>
```

Normally, this parameter should be left blank, and the device will use the default authentication HTML page. See Hotspot authentication modes for information about the default authentication HTML page used for each authentication mode.

If you upload a custom HTML file that uses a filename other than the default filename, type the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.

11. (Optional) Set the port number that the hotspot authentication server will used.

```
(config network hotspot new_hotspot)> auth_port port
(config network hotspot new_hotspot)>
```

The default is 5990.

12. (Optional) Set the port number of the hotspot server.

```
(config network hotspot new_hotspot)> server_port port
(config network hotspot new_hotspot)>
```

The default is 4990.

13. If remote is selected for login:

a. Set the IP address or fully-qualified domain name of the remote web server that will be used for client authentication:

```
(config network hotspot new_hotspot)> remote url address
(config network hotspot new_hotspot)>
```


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b. (Optional) Set the shared secret that the remote server and the hotspot. Used with cloud-based hotspot providers.

```
(config network hotspot new_hotspot)> remote secret secret
(config network hotspot new_hotspot)>
```

14. (Optional) Change the default DHCP server configuration.

Note The hotspot DHCP server is automatically enabled and cannot be disabled.

a. Set the amount of time that a client DHCP lease is valid:

```
(config network hotspot new_hotspot)> ipv4 address dhcp_server lease_
time value
(config network hotspot new_hotspot)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set lease_time to ten minutes, enter either 10m or 600s:

```
(config network hotspot new_hotspot)> ipv4 dhcp_server lease_time 600s
(config network hotspot new_hotspot)>
```

The default is 10 minutes.

b. Set the lowest IP address in the range to assign to hotspot clients. This value represents the low order byte of the IP address, and is combined with the subnet of the hotspot's static IP address.

```
(config network hotspot new_hotspot)> ipv4 address dhcp_server lease_
start value
(config network hotspot new_hotspot)>
```

where value is any integer between 1 and 254. The default is 100.

c. Set the highest IP address in the range to assign to hotspot clients. This value represents the low order byte of the IP address, and is combined with the subnet of the hotspot's static IP address.

```
(config network hotspot new_hotspot)> ipv4 address dhcp_server lease_end
value
(config network hotspot new_hotspot)>
```

where value is any integer between 1 and 254. The default is 250.

15. Set walled garden settings.

Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. If external servers are used for client authentication, such as a RADIUS server or HotspotSystem, they should be included in the walled garden settings.

a. Add domains that can be accessed by the client prior to authentication:

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```
(config network hotspot new_hotspot)> add walled_garden domains end
domain_name
                                                    (config network hotspot new_h
```

Repeat to add additional domains.

- Add IP addresses and subnets that can be accessed by the client prior to authentication:

```
(config network hotspot new_hotspot)> add walled_garden subnets end
value
                                                    (config network hotspot new_hotspot)>
```

where value is an IPv4 address and optional subnet mask, using the format IPv4_address [/netmask], or the keyword any.

Repeat to add additional IP addresses or subnets.

16. (Optional) Change the default maximum download speed:

```
(config network hotspot new_hotspot)> bandwidth_max_down value
(config network hotspot new_hotspot)>
```

where value is an integer between 1 and 100000 and represents the maximum download speed in Kbps.

17. (Optional) Change the default maximum upload speed:

```
(config network hotspot new_hotspot)> bandwidth_max_up value
(config network hotspot new_hotspot)>
```

where value is an integer between 1 and 100000 and represents the maximum upload speed in Kbps.

18. (Optional) Enable verbose logging to the system log:

```
(config network hotspot new_hotspot)> debug true
(config network hotspot new_hotspot)>
```

19. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

20. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the hotspot to use local shared password authentication

Local shared password authentication requires each user to enter a password. This password is validated locally on the TX64 device, and the password is the same for all users.

By default, the router redirects unauthenticated users to the HTML authentication page located on the router at etc/config/hotspot/password.html. You can customize the authentication page as needed, or host an authentication page on a remote server. See Customize the hotspot login page for further information.

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Required configuration items

- Create a new hotspot or Enable hotspot using the default configuration.
- Select local shared password authentication.
- The local password that will be used for authentication.

Additional configuration items

- Modify the local HTML authentication page, /etc/config/hotspot/password.html, or enter the name of an alternative HTML authentication page stored in the same directory, or identify a remote web server to host the HTML authentication page and include that server in the "white list" of servers that unauthenticated hotspot clients can access. See Customize the hotspot login page for further information.

Hotspot LAN configuration

Configure hotspot for local shared password authentication from the WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Create a new hotspot or Enable hotspot using the default configuration.
4. During hotspot configuration, for **Authentication mode**, select **Local shared password**.
5. For **Local shared password**, type the password that all users will be required to enter to authentication with the hotspot.
6. Click **Apply** to save the configuration and apply the change.

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Configure hotspot for local shared password authentication from the Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Create a new hotspot or Enable hotspot using the default configuration.
4. Set the authentication mode to **local-shared-password**:

```
(config)> network hotspot hotspot_name auth local-shared-password
(config)>
```

5. Set the password that all users will be required to enter to authenticate with the hotspot:

```
(config)> network hotspot hotspot_name local_shared_password password
(config)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configure the hotspot to use RADIUS shared password authentication

RADIUS shared password authentication requires each user to enter a password. This password is validated by an external RADIUS server, and the password is the same for all users.

Create a user on the RADIUS server with the username **guest**. The password assigned at the RADIUS server for the user **guest** is the shared password that your hotspot users should enter to authenticate to the hotspot via the RADIUS server.

By default, the router redirects unauthenticated users to the HTML authentication page located on the router at **etc/config/hotspot/password.html**. You can customize the authentication page as needed, or host an authentication page on a remote server. See Customize the hotspot login page for further information.

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Required configuration items

- Create a new hotspot or Enable hotspot using the default configuration.
- Select RADIUS shared password authentication.
- IP address or hostname of the primary RADIUS server.
- A user on the RADIUS server with the username guest.
- RADIUS server secret.
- RADIUS NAS ID.
- Domain name or subnet of the RADIUS server included in the "white list" of servers that unauthenticated hotspot clients can access.

Additional configuration items

- IP address or hostname of the secondary RADIUS server to be used if the primary RADIUS server is unreachable.
- Modify the local HTML authentication page, /etc/config/hotspot/password.html, or enter the name of an alternative HTML authentication page stored in the same directory, or identify a remote web server to host the HTML authentication page and include that server in the "white list" of servers that unauthenticated hotspot clients can access. See Customize the hotspot login page for further information.

Hotspot LAN configuration

Configure hotspot for RADIUS shared password authentication from the WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Create a new hotspot or Enable hotspot using the default configuration.

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4. During hotspot configuration, for **Authentication mode**, select **RADIUS shared password**.
5. Click to expand **Radius**.
   a. For **Primary server name**, enter the IP address or fully-qualified domain name of the primary RADIUS server to use to authenticate hotspot users.
   b. [Optional] For **Secondary server name**, enter the IP address or fully-qualified domain name of the backup RADIUS server to use to authenticate hotspot users if the primary RADIUS server is not available.
   c. [Optional] For **Port**, type the port number to use for RADIUS authentication requests. The default is **1812**.
   d. [Optional] For **Accounting port**, type the port number to use for RADIUS accounting requests. The default is **1813**.
   e. For **Secret**, enter the shared secret for the RADIUS server. This is configured on the RADIUS server.
   f. For **NAS ID**, enter the unique Network Access Server [NAS] identifier used by the RADIUS server. The default is **hotspot**.
   g. [Optional] Enable **Swap Octets** to swap the meaning of the input octets/packets and output octets/packets RADIUS attributes. This can fix issues if the data limits and/or accounting reports appear to be reversed on the RADIUS server. The default is disabled.
6. Click to expand **Walled garden**.

   Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. Include the domain or subnet of the RADIUS server[s] that are being used for authentication.
   - To add domains that can be accessed by the client prior to authentication:
     a. Click to expand **Allowed domains**.
     b. Click **+** to add a domain.
     c. For **Domain**, type the hostname of the allowed domain.
     d. Repeat to add additional domains.
   - To add subnets that can be accessed by the client prior to authentication:
     a. Click to expand **Allowed subnets**.
     b. Click **+** to add a subnet.
     c. For **Subnet**, type an IPv4 address and optional subnet mask, using the format IPv4_address[/netmask], or the keyword **any**.
     d. Repeat to add additional subnets.
7. Click **Apply** to save the configuration and apply the change.



Configure hotspot for RADIUS shared password authentication from the Command line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
-> config
(config)->
```

2. Create a new hotspot or Disable hotspot using the default configuration.
4. Set the authentication mode to radius-shared-password:

```
(config)-> network hotspot hotspot_name auth radius-shared-password
(config)->
```

5. Configure the RADIUS server:
   a. Set the fully qualified domain name or IP address of the primary RADIUS server:

```
(config)-> network hotspot hotspot_name radius primary_radius_server
address
(config)->
```

   b. [Optional] Set the fully qualified domain name or IP address of the secondary RADIUS server, used if the primary RADIUS server is unreachable:

```
(config)-> network hotspot hotspot_name radius backup_radius_server
address
(config)->
```

   c. [Optional] Set the port number to use for RADIUS authentication requests.

```
(config)-> network hotspot hotspot_name radius auth_port port
(config)->
```

   The default is 1812.
   d. [Optional] Set the port number to use for RADIUS accounting requests.

```
(config)-> network hotspot hotspot_name radius acct_port port
(config)->
```

   The default is 1813.
   e. Set the shared secret for the RADIUS server. This is configured on the RADIUS server.

```
(config)-> network hotspot hotspot_name radius secret secret
(config)->
```

   f. Set the unique Network Access Server [NAS] identifier used by the RADIUS server:

```
(config)-> network hotspot hotspot_name radius nas_id id
(config)->
```

   The default is hotspot.
   g. [Optional] Enable Swap Octets to swap the meaning of the input octets/packets and output octets/packets RADIUS attributes. This can fix issues if the data limits and/or

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accounting reports appear to be reversed on the RADIUS server:

```
(config)> network hotspot hotspot_name radius swap octets true
(config)>
```

The default is disabled.

6. Set walled garden settings.

   Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. Include the domain or subnet of the RADIUS server(s) that are being used for authentication.

   - Add domains that can be accessed by the client prior to authentication:

     ```
     (config network hotspot new_hotspot)> add walled_garden domains end
     domain_name
     (config network hotspot new_hotspot)>
     ```

     Repeat to add additional domains.

   - Add IP addresses and subnets that can be accessed by the client prior to authentication:

     ```
     (config network hotspot new_hotspot)> add walled_garden subnets end
     value
     (config network hotspot new_hotspot)>
     ```

     where value is an IPv4 address and optional subnet mask, using the format IPv4_address [/netmask], or the keyword any.

     Repeat to add additional IP addresses or subnets.

7. Save the configuration and apply the change:

   ```
   (config)> save
   Configuration saved.
   >
   ```

8. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the hotspot to use RADIUS users authentication

RADIUS users authentication requires each hotspot user to enter a username and password. Users are created on an external RADIUS server, and the username and password is validated by the external RADIUS server.

By default, the router redirects unauthenticated users to the HTML authentication page located on the router at etc/config/hotspot/login.html. You can customize the authentication page as needed, or host an authentication page on a remote server. See Customize the hotspot login page for further information.

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Required configuration items

- Create a new hotspot or Enable hotspot using the default configuration.
- Select RADIUS users authentication.
- IP address or hostname of the primary RADIUS server.
- Users configured on the RADIUS server.
- RADIUS server secret.
- RADIUS NAS ID.
- Domain name or subnet of the RADIUS server included in the "white list" of servers that unauthenticated hotspot clients can access.

Additional configuration items

- IP address or hostname of the secondary RADIUS server to be used if the primary RADIUS server is unreachable.
- Modify the local HTML authentication page, /etc/config/hotspot/login.html, or enter the name of an alternative HTML authentication page stored in the same directory, or identify a remote web server to host the HTML authentication page and include that server in the "white list" of servers that unauthenticated hotspot clients can access. See Customize the hotspot login page for further information.

Hotspot LAN configuration

Configure hotspot for RADIUS users authentication from the WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Create a new hotspot or Enable hotspot using the default configuration.

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4. During hotspot configuration, for **Authentication mode**, select **RADIUS users**.
5. Click to expand **Radius**.
   a. For **Primary server name**, enter the IP address or fully-qualified domain name of the primary RADIUS server to use to authenticate hotspot users.
   b. [Optional] For **Secondary server name**, enter the IP address or fully-qualified domain name of the backup RADIUS server to use to authenticate hotspot users if the primary RADIUS server is not available.
   c. [Optional] For **Port**, type the port number to use for RADIUS authentication requests. The default is **1812**.
   d. [Optional] For **Accounting port**, type the port number to use for RADIUS accounting requests. The default is **1813**.
   e. For **Secret**, enter the shared secret for the RADIUS server. This is configured on the RADIUS server.
   f. For **NAS ID**, enter the unique Network Access Server [NAS] identifier used by the RADIUS server. The default is **hotspot**.
   g. [Optional] Enable **Swap Octets** to swap the meaning of the input octets/packets and output octets/packets RADIUS attributes. This can fix issues if the data limits and/or accounting reports appear to be reversed on the RADIUS server. The default is disabled.
6. Click to expand **Walled garden**.

   Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. Include the domain or subnet of the RADIUS server[s] that are being used for authentication.
   - To add domains that can be accessed by the client prior to authentication:
     a. Click to expand **Allowed domains**.
     b. Click **+** to add a domain.
     c. For **Domain**, type the hostname of the allowed domain.
     d. Repeat to add additional domains.
   - To add subnets that can be accessed by the client prior to authentication:
     a. Click to expand **Allowed subnets**.
     b. Click **+** to add a subnet.
     c. For **Subnet**, type an IPv4 address and optional subnet mask, using the format IPv4_address[/netmask], or the keyword **any**.
     d. Repeat to add additional subnets.
7. Click **Apply** to save the configuration and apply the change.



Configure hotspot for RADIUS users authentication from the Command line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
-> config
(config)->
```

2. Create a new hotspot or Enable hotspot using the default configuration.
4. Set the authentication mode to radius-users:

```
(config)-> network hotspot hotspot_name auth radius-users
(config)->
```

5. Configure the RADIUS server:
   a. Set the fully qualified domain name or IP address of the primary RADIUS server:

```
(config)-> network hotspot hotspot_name radius primary_radius_server
address
(config)->
```

   b. [Optional] Set the fully qualified domain name or IP address of the secondary RADIUS server, used if the primary RADIUS server is unreachable:

```
(config)-> network hotspot hotspot_name radius backup_radius_server
address
(config)->
```

   c. [Optional] Set the port number to use for RADIUS authentication requests.

```
(config)-> network hotspot hotspot_name radius auth_port port
(config)->
```

   The default is 1812.
   d. [Optional] Set the port number to use for RADIUS accounting requests.

```
(config)-> network hotspot hotspot_name radius acct_port port
(config)->
```

   The default is 1813.
   e. Set the shared secret for the RADIUS server. This is configured on the RADIUS server.

```
(config)-> network hotspot hotspot_name radius secret secret
(config)->
```

   f. Set the unique Network Access Server [NAS] identifier used by the RADIUS server:

```
(config)-> network hotspot hotspot_name radius nas_id id
(config)->
```

   The default is hotspot.
   g. [Optional] Enable Swap Octets to swap the meaning of the input octets/packets and output octets/packets RADIUS attributes. This can fix issues if the data limits and/or

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accounting reports appear to be reversed on the RADIUS server:

```
(config)> network hotspot hotspot_name radius swap octets true
(config)>
```

The default is disabled.

6. Set walled garden settings.

   Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. Include the domain or subnet of the RADIUS server(s) that are being used for authentication.

   - Add domains that can be accessed by the client prior to authentication:

     ```
     (config network hotspot new_hotspot)> add walled_garden domains end
     domain_name
     (config network hotspot new_hotspot)>
     ```

     Repeat to add additional domains.

   - Add IP addresses and subnets that can be accessed by the client prior to authentication:

     ```
     (config network hotspot new_hotspot)> add walled_garden subnets end
     value
     (config network hotspot new_hotspot)>
     ```

     where value is an IPv4 address and optional subnet mask, using the format IPv4_address [/netmask], or the keyword any.

     Repeat to add additional IP addresses or subnets.

7. Save the configuration and apply the change:

   ```
   (config)> save
   Configuration saved.
   >
   ```

8. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the hotspot to use HotspotSystem authentication

You can configure TX64 hotspot to use HotspotSystem, a cloud hotspot service that supports various free and paid authentication methods, including social media account, SMS, voucher, and PayPal.

By default, the router redirects unauthenticated users to the HTML authentication page located on the router at /etc/config/hotspot/login.html. You can customize the authentication page as needed, or host an authentication page on a remote server. See Customize the hotspot login page for further information.

Required configuration items

- Create a new hotspot or Enable hotspot using the default configuration.
- Select HotspotSystem authentication.

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- Create and configure a HotspotSystem account.
- The Operator name and location ID for the HotspotSystem.

Additional configuration items

- Modify the local HTML authentication page, /etc/config/hotspot/login.html, or enter the name of an alternative HTML authentication page stored in the same directory, or identify a remote web server to host the HTML authentication page and include that server in the "walled garden" of servers that unauthenticated hotspot clients can access. See Customize the hotspot login page for further information.

Hotspot LAN configuration

Configure a HotspotSystem account

1. Sign up for an operator account. Go to HotspotSystem sign up.
2. Add a new location for the hotspot. Take care when selecting the Business Model because some options cannot be changed after you create the location. Go to Add a new location.
3. Click **Modify Hotspot Data & Settings**.
4. Click **Splash Page Settings**.
5. Set **Internal Login URL** to http://[UAMIP]:[UAMPORT]/prelogin.
6. Set **Internal Logout URL** to http://[UAMIP]:[UAMPORT]/logoff.
7. Click **Submit**.

Configure allowed domains

HotspotSystem uses various additional domains for payment processing and social media login. While unauthorized users are automatically able to access hotspotsystem.com, your hotspot configuration may require unauthorized users to have access to additional domains. These domains need to be listed by the **Allowed gardens > Allowed domains** option. For example, this may include sites like the following:

- PayPal and other payment processors require access to a number of domains, depending on which services you select. Contact HotspotSystem for an up-to-date list of domains that need to be whitelisted.
- FREE Social login requires a number of domains, depending on which services you select. Refer to the following page for an up-to-date list of social login domains that need to be whitelisted: Whitelist for Hotspot Free social login.

Configure hotspot for HotspotSystem authentication from the WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Create a new hotspot or Enable hotspot using the default configuration.
4. During hotspot configuration, for **Authentication mode**, select **HotspotSystem**.
5. Click to expand **HotspotSystem**.
   a. For **Operator name**, type the operator name that you registered with hotspotsystem.com.
   b. For **Location ID**, type the location ID of this hotspot. The default is 1.
6. Click to expand **Walled garden**.

   Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. Include the domain or subnet of supporting services for payment or other external login and authentication (such as social media sites).

   - To add domains that can be accessed by the client prior to authentication:
     a. Click to expand **Allowed domains**.
     b. Click + to add a domain.
     c. For **Domain**, type the hostname of the allowed domain.
     d. Repeat to add additional domains.
   - To add subnets that can be accessed by the client prior to authentication:
     a. Click to expand **Allowed subnets**.
     b. Click + to add a subnet.
     c. For **Subnet**, type an IPv4 address and optional subnet mask, using the format IPv4_address[/netmask], or the keyword any.
     d. Repeat to add additional subnets.
7. Click **Apply** to save the configuration and apply the change.

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Configure hotspot for HotspotSystem authentication from the Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Create a new hotspot or Enable hotspot using the default configuration.
4. Set the authentication mode to **hotspotsystem**:

```
(config)> network hotspot hotspot_name auth hotspotsystem
(config)>
```

5. Configure HotspotSystem:
   a. Set the operator name that you registered with **hotspotsystem.com**.

```
(config)> network hotspot hotspot_name hotspotsystem operator name
(config)>
```

   b. Set the location ID of this hotspot.

```
(config)> network hotspot hotspot_name hotspotsystem location value
(config)>
```

   where value is any integer. The default is 1.
6. Set walled garden settings.
   Walled garden settings define the "white list" of domains and subnets that unauthenticated clients are able to access. Include the domain or subnet of supporting servers for payment or other external login and authentication (such as social media sites).
   - Add domains that can be accessed by the client prior to authentication:

```
(config network hotspot new_hotspot)> add walled_garden domains end
domain_name
(config network hotspot new_hotspot)>
```

     Repeat to add additional domains.
   - Add IP addresses and subnets that can be accessed by the client prior to authentication:

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```
(config network hotspot new_hotspot)> add walled_garden subnets end
value
(config network hotspot new_hotspot)>
```

where value is an IPv4 address and optional subnet mask, using the format IPv4_address [/netmask], or the keyword any.

Repeat to add additional IP addresses or subnets.

7. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

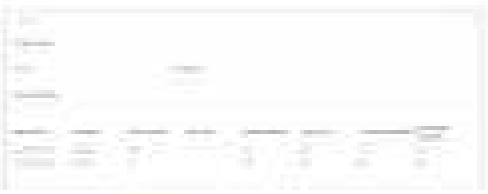
Show hotspot status and statistics

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **Status**.
3. Under **Networking**, click **Hotspot**.



The Hotspot status page is displayed.



Command line

1. Log into the TX64 command line as a user with Admin access.

Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. Enter the show hotspot command at the Admin CLI prompt:

```
> show hotspot
```


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```
Hotspot       Enabled  Device
------------  -------  ---------------
hotspot       true     hotspot_bridge
new_hotspot   false    new_hotspot_ap

>
```

3. Enter the **show hotspot name** *hotspot_name* command at the Admin CLI prompt to display information about clients connected to a specific hotspot:

```
> show hotspot name hotspot

MAC Address        IP Address    Auth  Username  Duration/max sec  Idle/max
sec  %/max up bandwidth  %/max down bandwidth
-----------------  ------------  ----  --------  ----------------  ---------
-----  ---------------  ---------------
8C-3D-28-C8-41-AA  10.1.8.101    yes   marlee    0/0               0/0
     0/0                0/0
E5-BA-FC-B3-DC-71  10.1.8.100    no    -         0/0               0/0
     0/0                0/0

>
```

4. Enter the **show hotspot ip** *ip_address* command at the Admin CLI prompt to display information about clients connected to a specific hotspot:

```
> show hotspot ip hotspot 10.1.8.101

MAC Address        IP Address    Auth  Username  Duration/max sec  Idle/max
sec  %/max up bandwidth  %/max down bandwidth
-----------------  ------------  ----  --------  ----------------  ---------
-----  ---------------  ---------------
8C-3D-28-C8-41-AA  10.1.8.101    yes   marlee    0/0               0/0
     0/0                0/0

>
```

5. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Customize the hotspot login page

The TX64 device provides three sample HTML webpages for use with the hotspot feature. When hotspot is enabled for the first time, the sample webpages are installed to the /etc/config/hotspot folder on the device's filesystem. By default, the hotspot redirects users to one of the sample webpages based on the authentication mode being used. See Hotspot authentication modes for information about which HTML file is used for each authentication mode. The sample HTML webpages use ChilliLibrary.js to perform authentication. Do not modify ChilliLibrary.js.

You can customize the sample HTML pages, or replace them with your own pages, so that hotspot users will be redirected to your custom HTML page when they log into the hotspot. You can also host

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the HTML pages on an external web server, rather than on the TX64 device. See Create a new hotspot for information about configuring the HTML page that the hotspot will use.

This section contains the following topics:

Edit sample hotspot HTML pages 378
Upload custom hotspot HTML pages 379
Restore hotspot default sample pages 379

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Edit sample hotspot HTML pages

To edit the sample HTML pages, download the files and edit the files on your local machine. After they have been edited, upload the edited files to the TX64 device.

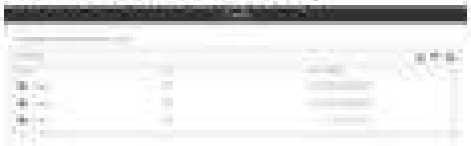
The edited HTML page should call the same JavaScript functions that the sample HTML pages do. Additional pages and assets can be uploaded to the hotspot folder, and additional subfolders can be created as needed. Supported file extensions include: .html, .gif, .js, .jpg, .mp4, .ogv, .png, .svf, .json, and .dat.

WebUI

1. Download the sample HTML file:
   a. Log into the TX64 WebUI as a user with Admin access.
   b. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.



   c. Highlight the **hotspot** directory and click to open the directory.
   d. Select the HTML file you want to edit and click (download).

> **Note** The files in the **hotspot** directory are only available after Hotspot has been enabled for the first time.

2. On your local machine, edit the file as needed.
3. Upload the edited file:
   a. In the TX64 WebUI, return to the **hotspot** directory.
   b. Click (upload).
   c. Use the local file system to browse to the location of the edited HTML file. Select the file and click **Open** to upload the file.

Command Line

Use the scp command to download and upload the sample HTML files using utilities.

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1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Download the file to your local machine. For example:

```
> scp host 192.168.4.1 user admin remote /home/admin/temp/ local
/etc/config/hotspot/login.html to remote
admin@192.168.4.1's password: adminpwd
login.html
>
```

Note: The files in the hotspot directory are only available after hotspot has been enabled for the first time.

3. On your local machine, edit the file as needed.
4. Upload the edited file from your local machine the the TX64 device. For example:

```
> scp host 192.168.4.1 user admin remote /home/admin/temp/ local
/etc/config/hotspot/login.html to local
admin@192.168.4.1's password: adminpwd
login.html
>
```

Upload custom hotspot HTML pages

Rather than editing the sample HTML pages, you can upload a custom login page with a different filename.

The new page should include ChiliLibrary.js and call the same JavaScript functions that the sample HTML pages do. Additional pages and assets can be uploaded to the hotspot folder, and additional subfolders can be created as needed. Supported file extensions include: .html, .gif, .js, .jpg, .mp4, .ogv, .png, .swf, .json, and .dat.

You can configure the TX64 device to use your custom HTML page using either the WebUI or the command line:

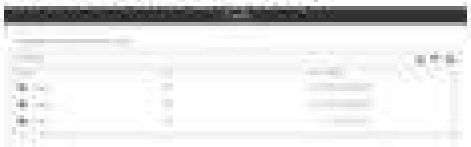
WebUI

1. Upload your custom HTML file to the TX64 device's filesystem:
   a. Log into the TX64 WebUI as a user with Admin access.
   b. On the menu, click **System**. Under **Administration**, click **File System**.



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The File System page appears.



c. Highlight the hotspot directory and click to open the directory.
d. Click (upload).
e. Browse to the location of the HTML file on your local machine. Select the file and click Open to upload the file.

2. Configure the hotspot to use your custom HTML file:
   a. On the menu, click Network > Hotspot.
   b. Click the name of the appropriate hotspot to expand.
   c. Ensure that Login page source is set to Local.
   d. For Login page, type the name of your custom HTML file.
   e. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. Use the scp command to upload the edited file from your local machine the the TX64 /etc/ca. For example:

```
> scp host 192.168.4.1 user admin remote /home/admin/temp/ local
/etc/config/hotspot/custom.html to local
```

3. Configure the hotspot to use your custom HTML file:
   a. Type config to change to configuration mode:

```
> config
(config)>
```

   b. Set login to local-page:

```
(config)> network hotspot hotspot_name login local
(config)>
```

   c. Set local-page to your custom HTML file:

```
(config)> network hotspot hotspot_name local-page custom.html
```


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d. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

e. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Restore hotspot default sample pages

If you have customized the sample HTML pages without making a backup of the samples, you may wish to restore the original version of the HTML pages without doing a factory reset.

The hotspot directory and files are loaded when the hotspot is enabled, and you can restore the default pages by doing the following:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. Use the mv command to change the name of the existing hotspot directory:

```
> mv /etc/config/hotspot /etc/config/hotspot_modified.
>
```

3. Use the WebUI or the command line to disable all hotspots and then reenable them. This will recreate the default hotspot directory. For example:

   a. Type config to change to configuration mode:

```
> config
(config)>
```

   b. Disable the hotspot:

```
(config)> network hotspot hotspot_name enabled false
(config)>
```

   c. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

   d. Type config again to change to configuration mode:

```
> config
(config)>
```

   e. Reenable the hotspot:

```
(config)> network hotspot hotspot_name enabled true
(config)>
```


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4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Hotspot RADIUS attributes

The RADIUS server may send attributes to the hotspot to affect the operation of a client session. For example, here are some of the RADIUS attributes that the hotspot handles:

- Session-Timeout
- Idle-Timeout
- Acct-Interim-Interval
- WISPr-Redirection-URL
- WISPr-Session-Terminate-Time
- ChilliSpot-Max-Input-Octets
- ChilliSpot-Max-Output-Octets
- ChilliSpot-Max-Total-Octets

Also, if the RADIUS server requests it, the hotspot will send accounting information back to the RADIUS server. For example, here are some of the RADIUS attributes that the hotspot sends:

- Acct-Input-Octets
- Acct-Output-Octets
- Acct-Session-Time
- Acct-Input-Packets
- Acct-Output-Packets
- Acct-Input-Gigawords
- Acct-Output-Gigawords

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Routing

This chapter contains the following topics:

IP routing
Show the routing table
Dynamic DNS
Virtual Router Redundancy Protocol (VRRP)

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IP routing

The TX64 device uses IP routes to decide where to send a packet it receives for a remote network. The process for deciding on a route to send the packet is as follows:

1. The device examines the destination IP address in the IP packet, and looks through the IP routing table to find a match for it.
2. If it finds a route for the destination, it forwards the IP packet to the configured IP gateway or interface.
3. If it cannot find a route for the destination, it uses a default route.
4. If there are two or more routes to a destination, the device uses the route with the longest mask.
5. If there are two or more routes to a destination with the same mask, the device uses the route with the lowest metric.

This section contains the following topics:

Configure a static route 274
Delete a static route 278
Policy-based routing 281
Configure a routing policy 282
Example: Dual WAN policy-based routing 290
Example: Route traffic to a specific WAN interface based on the client MAC address 292
Routing services 293
Configure routing services 294

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Configure a static route

A static route is a manually configured routing entry. Information about the route is manually entered rather than obtained from dynamic routing traffic.

Required configuration items

- The destination address or network.
- The interface to use to reach the destination.

Additional configuration items

- A label used to identify this route.
- The IPv4 address of the gateway used to reach the destination.
- The metric for the route. When multiple routes are available to reach the same destination, the route with the lowest metric is used.
- The Maximum Transmission Units (MTU) of network packets using this route.

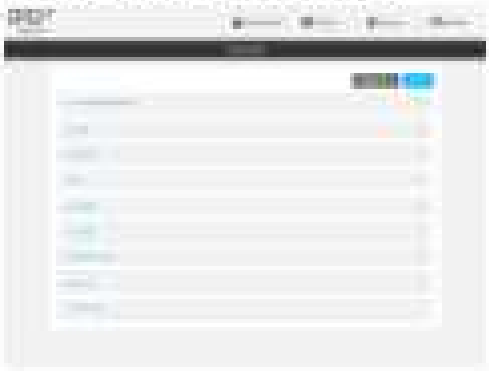
To configure a static route:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Routes** > **Static routes**.

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4. Click the + to add a new static route.

The new static route configuration page is displayed.

New static route configurations are enabled by default. To disable, click to toggle Enable to off.

5. (Optional) For Label, type a label that will be used to identify this route.
6. For Destination, type the IP address or network of the destination of this route.

   For example, to route traffic to the 192.168.47.0 network that uses a subnet mask of 255.255.255.0, type 192.168.47.0/24. The any keyword can also be used to route packets to any destination with this static route.
7. For Interface, select the interface on the TX64 device that will be used with this static route.
8. (Optional) For Gateway, type the IPv4 address of the gateway used to reach the destination. Set to blank if the destination can be accessed without a gateway.
9. (Optional) For Metric, type the metric for the route. When multiple routes are available to reach the same destination, the route with the lowest metric is used.
10. (Optional) For MTU, type the Maximum Transmission Units (MTU) of network packets using this route.
11. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```


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3. Add a new static route:

```
(config)> add network route static end
(config network route static 4)>
```

New static route instances are enabled by default. To disable:

```
(config network route static 4)> enable false
(config network route static 4)>
```

4. (Optional) set a label that will be used to identify this route. For example:

```
(config network route static 4)> label "route to accounting network"
(config network route static 4)>
```

5. Set the IP address or network of the destination of this route. For example:

```
(config network route static 4)> destination ip_address[/netmask]
(config network route static 4)>
```

For example, to route traffic to the 192.168.47.0 network that uses a subnet mask of 255.255.255.0:

```
(config network route static 4)> dst 192.168.47.0/24
(config network route static 4)>
```

The any keyword can also be used to route packets to any destination with this static route.

6. Set the interface on the TX64 device that will be used with this static route:
   a. Use the ? to determine available interfaces:

```
(config network route static 4)> interface ?

Interface: The network interface to use to reach the destination.
Format::
  /network/interface/defaultip
  /network/interface/defaultlinklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config network route static 4)> interface
```

   b. Set the interface. For example:

```
(config network route static 4)> interface /network/interface/wan1
(config network route static 4)>
```

7. (Optional) Set the IPv4 address of the gateway used to reach the destination. Set to blank if the destination can be accessed without a gateway.

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```
(config network route static 0)> gateway IPv4_address
(config network route static 0)>
```

8. (Optional) Set the metric for the route. When multiple routes are available to reach the same destination, the route with the lowest metric is used.

```
(config network route static 0)> metric value
(config network route static 0)>
```

where value is an integer between 0 and 65535. The default is 0.

9. (Optional) Set the Maximum Transmission Units (MTU) of network packets using this route:

```
(config network route static 0)> mtu integer
(config network route static 0)>
```

10. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

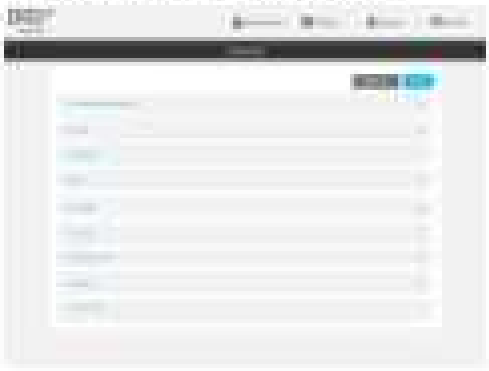
Delete a static route

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



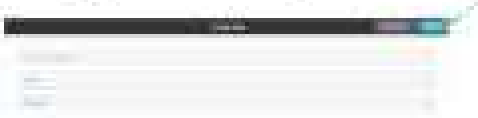
The **Configuration** window is displayed.



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3. Click **Network > Routes > Static routes**.
4. Click the menu icon (...) for a static route and select **Delete**.

5. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Determine the Index number of the static route to be deleted:

```
(config)> show network route static
0
     dst 10.0.0.1
     enable true
     no gateway
     interface /network/interface/lan1
     label new_static_route
     metric 0
     mtu 0
1
     dst 192.168.5.1
     enable true
     gateway 192.168.5.1
     interface /network/interface/lan2
     label new_static_route_1
     metric 0
     mtu 0
(config)>
```

4. Use the Index number to delete the static route:

```
(config)> del network route static 0
(config)>
```


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5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Policy-based routing

Normally, a routing device determines how to route a network packet based on its destination address. However, you can use policy-based routing to forward the packet based on other criteria, such as the source of the packet. For example, you can configure the TX64 device so that high-priority traffic is routed through the cellular connection, while all other traffic is routed through an Ethernet (WAN) connection.

Policy-based routing for the TX64 device uses the following criteria to determine how to route traffic:

- Firewall zone (for example, Internal/ outbound traffic, external/ inbound traffic, or IPSec tunnel traffic).
- Network interface (for example, the cellular connection, the WAN, or the LAN).
- IPv4 address.
- IPv6 address.
- MAC address.
- Domain.
- Protocol type (TCP, UDP, ICMP, or all).

The order of the policies is important. Routing policies are processed sequentially; as a result, if a packet matches an earlier policy, it will be routed using that policy's rules. It will not be processed by any subsequent rules.

Configure a routing policy

Required configuration items

- The packet matching parameters. It can any combination of the following:
  - Source interface.
  - Source address. This can be a firewall zone, an interface, a single IPv4/IPv6 address or network, or a MAC address.
  - Destination address. This can be a firewall zone, an interface, a single IPv4/IPv6 address or network, or a domain.
  - Protocol. This can be any, tcp, udp or icmp.
  - Source port. This is only used if the protocol is set to tcp or udp.
  - Destination port. This is only used if protocol is set to tcp or udp.
- The network interface used to reach the destination.

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Additional configuration items

- A label for the routing policy.
- Whether packets that match this policy should be dropped when the gateway interface is disconnected, rather than forwarded through other interfaces.

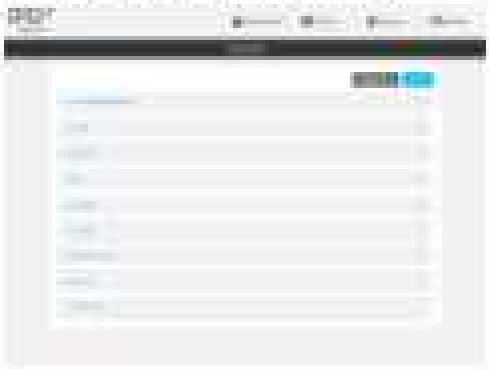
To configure a routing policy:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Routes** > **Policy-based routing**.
4. Click the **+** to add a new route policy.

The new route policy page is displayed.

New route policies are enabled by default. To disable, click to toggle **Enable** to off.

5. [Optional] For **Label**, type a label that will be used to identify this route policy.
6. For **Interface**, select the interface on the TX64 device that will be used with this route policy.
7. [Optional] Enable **Exclusive** to configure the policy to drop packets that match the policy when the gateway interface is disconnected, rather than forwarded through other interfaces.
8. For **IP version**, select **Any**, **IPv4**, or **IPv6**.

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3. For Protocol, select Any, TCP, UDP, or ICMP.
   - If TCP or UDP is selected for Protocol, type the port numbers of the Source port and Destination port, or set to any to match for any port.
   - If ICMP is selected for Protocol, type the ICMP type and optional code, or set to any to match for any ICMP type.

10. Configure source address information:
    a. Click to expand Source address.
    b. For Type, select one of the following:
       - Zone: Matches the source IP address to the selected firewall zone. See Firewall configuration for more information about firewall zones.
       - Interface: Matches the source IP address to the selected interface's network address.
       - IPv4 address: Matches the source IP address to the specified IP address or network. Use the format IPv4_address[/netmask], or use any to match any IPv4 address.
       - IPv6 address: Matches the source IP address to the specified IP address or network. Use the format IPv6_address[/prefix_length], or use any to match any IPv6 address.
       - MAC address: Matches the source MAC address to the specified MAC address.

11. Configure the destination address information:
    a. Click to expand Destination address.
    b. For Type, select one of the following:
       - Zone: Matches the destination IP address to the selected firewall zone. See Firewall configuration for more information about firewall zones.
       - Interface: Matches the destination IP address to the selected interface's network address.
       - IPv4 address: Matches the destination IP address to the specified IP address or network. Use the format IPv4_address[/netmask], or use any to match any IPv4 address.
       - IPv6 address: Matches the destination IP address to the specified IP address or network. Use the format IPv6_address[/prefix_length], or use any to match any IPv6 address.
       - Domain: Matches the destination IP address to the specified domain names. To specify domains:
         i. Click to expand Domains.
         ii. Click the + to add a domain.
         iii. For Domain, type the domain name.
         iv. Repeat to add additional domains.

12. Click Apply to save the configuration and apply the change.

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Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add a new routing policy:

```
(config)> add network route policy end
(config network route policy 4)>
```

   New route policies are enabled by default. To disable:

```
(config network route policy 4)> enable false
(config network route policy 4)>
```

4. (Optional) Set the label that will be used to identify this route policy:

```
(config network route policy 4)> label "New route policy"
(config network route policy 4)>
```

5. Set the interface on the TX64 device that will be used with this route policy:

   a. Use the **?** to determine available interfaces:

```
(config network route policy 4)> interface ?

Interface: The network interface used to reach the destination. Packets
that satisfy the matching criteria will be routed through this
interface. If the interface has a gateway then it will be used as the
next hop.
Format:
  /network/interface/defaultig
  /network/interface/defaultlinklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config network route policy 4)> interface
```


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b. Set the interface. For example:

```
(config network route policy 0)> interface /network/interface/wan1
(config network route policy 0)>
```

6. (Optional) Enable exclusive to configure the policy to drop packets that match the policy when the gateway interface is disconnected, rather than forwarded through other interfaces:

```
(config network route policy 0)> exclusive true
(config network route policy 0)>
```

7. Select the IP version:

```
(config network route policy 0)> ip_version value
(config network route policy 0)>
```

where value is one of any, ipv4, or ipv6.

8. Set the protocol:

```
(config network route policy 0)> protocol value
(config network route policy 0)>
```

where value is one of:

- any: All protocols are matched.
- tcp: Source and destination ports are matched:
  a. Set the source port:

  ```
  (config network route policy 0)> src_port value
  (config network route policy 0)>
  ```

  where value is the port number, or the keyword any to match any port as the source port.

  b. Set the destination port:

  ```
  (config network route policy 0)> dst_port value
  (config network route policy 0)>
  ```

  where value is the port number, or the keyword any to match any port as the destination port.
- udp: Source and destination ports are matched:
  a. Set the source port:

  ```
  (config network route policy 0)> src_port value
  (config network route policy 0)>
  ```

  where value is the port number, or the keyword any to match any port as the source port.

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c. Set the destination port:

```
(config network route policy 0)> dst_port value
(config network route policy 0)>
```

where value is the port number, or the keyword any to match any port as the destination port.

- Icmp: The ICMP protocol is matched. Identify the ICMP type:

```
(config network route policy 0)> icmp_type value
(config network route policy 0)>
```

where value is the ICMP type and optional code, or set to any to match for any ICMP type.

5. Set the source address type:

```
(config network route policy 0)> src type value
(config network route policy 0)>
```

where value is one of:

- zone: Matches the source IP address to the selected firewall zone. Set the zone:
  a. Use the ? to determine available zones:

```
(config network route policy 0)> src zone ?

Zone: Match the IP address to the specified firewall zone.
Format:
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

Default value: any
Current value: any

(config network route policy 0)> src zone
```

  b. Set the zone. For example:

```
(config network route policy 0)> src zone external
(config network route policy 0)>
```

  See Firewall configuration for more information about firewall zones.
- Interface: Matches the source IP address to the selected interface's network address. Set the interface:

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a. Use the ? to determine available interfaces:

```
(config network route policy 0)> src interface ?

Interface: The network interface.
Format:
  /network/interface/defaultip
  /network/interface/defaultlinklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config network route policy 0)> src interface
```

b. Set the interface. For example:

```
(config network route policy 0)> src interface
/network/interface/wan1
(config network route policy 0)>
```

- address: Matches the source IPv4 address to the specified IP address or network. Set the address that will be matched:

```
(config network route policy 0)> src address value
(config network route policy 0)>
```

where value uses the format IPv4_address[/netmask], or any to match any IPv4 address.

- address6: Matches the source IPv6 address to the specified IP address or network. Set the address that will be matched:

```
(config network route policy 0)> src address6 value
(config network route policy 0)>
```

where value uses the format IPv6_address[/prefix_length], or any to match any IPv6 address.

- mac: Matches the source MAC address to the specified MAC address. Set the MAC address to be matched:

```
(config network route policy 0)> src mac MAC_address
(config network route policy 0)>
```

10. Set the destination address type:

```
(config network route policy 0)> dst type value
(config network route policy 0)>
```


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where value is one of:

- zone: Matches the destination IP address to the selected firewall zone. Set the zone:
  a. Use the ? to determine available zones:

```
(config network route policy 4)> dst zone ?

Zone: Match the IP address to the specified firewall zone.
Format:
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

Default value: any
Current value: any

(config network route policy 4)> dst zone
```

  b. Set the zone. For example:

```
(config network route policy 4)> dst zone external
(config network route policy 4)>
```

  See Firewall configuration for more information about firewall zones.

- Interface: Matches the destination IP address to the selected interface's network address. Set the interface:
  a. Use the ? to determine available interfaces:

```
(config network route policy 4)> dst interface ?

Interface: The network interface.
Format:
  /network/interface/defaultip
  /network/interface/defaultiniklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config network route policy 4)> dst interface
```


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b. Set the interface. For example:

```
(config network route policy 4)> dst interface
/network/interface/wan1
(config network route policy 4)>
```

- address: Matches the destination IPv4 address to the specified IP address or network. Set the address that will be matched:

```
(config network route policy 4)> dst address value
(config network route policy 4)>
```

where value uses the format IPv4_address[/netmask], or any to match any IPv4 address.

- address6: Matches the destination IPv6 address to the specified IP address or network. Set the address that will be matched:

```
(config network route policy 4)> dst address6 value
(config network route policy 4)>
```

where value uses the format IPv6_address[/prefix_length], or any to match any IPv6 address.

- mac: Matches the destination MAC address to the specified MAC address. Set the MAC address to be matched:

```
(config network route policy 4)> dst mac MAC_address
(config network route policy 4)>
```

11. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

12. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Example: Dual WAN policy-based routing

This example routes traffic to a specific IP address to go through the cellular WWAN interface, while all other traffic uses the Ethernet WAN interface.



WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Routes** > **Policy-based routing**.
4. Click the **+** to add a new route policy.

5. For **Label**, enter **Route through cellular**.
6. For **Interface**, select **WWAN1**.

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7. Configure the source address:
   a. Click to expand **Source address**.
   b. For **Type**, select **Zone**.
   c. For **Zone**, select **Internal**.
8. Configure the destination address:
   a. Click to expand **Destination address**.
   b. For **Type**, select **IPv4 address**.
   c. For **IPv4 address**, type the IP address that will be the destination for outgoing traffic routed through the WWAN interface. In the above example, this is 240.255.182.59.



9. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Create the route policy:
   a. Add a new routing policy:

```
(config)> add network route policy end
(config network route policy 6)>
```


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b. Set the label that will be used to identify this route policy:

```
(config network route policy 0)> label "Route through cellular"
(config network route policy 0)>
```

c. Set the interface:

```
(config network route policy 0)> interface /network/interface/wwan1
(config network route policy 0)>
```

d. Configure the source address:

i. Set the source type to zone:

```
(config network route policy 0)> src type zone
(config network route policy 0)>
```

ii. Set the zone to internal:

```
(config network route policy 0)> src zone internal
(config network route policy 0)>
```

e. Configure the destination address:

i. Set the destination to use an IPv4 address:

```
(config network route policy 0)> dst type address
(config network route policy 0)>
```

ii. Set the IP address that will be the destination for outgoing traffic routed through the WWAN interface. In the above example, this is 241.206.162.59.

```
(config network route policy 0)> dst address 241.206.162.59
(config network route policy 0)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Example: Route traffic to a specific WAN interface based on the client MAC address

This example routes all data from a certain client device through a cellular WAN based on the device's MAC address, while all other client devices are routed through the Ethernet WAN.



WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



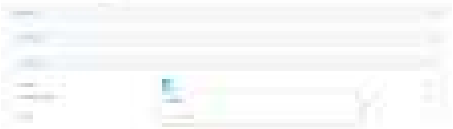
3. Create new firewall zones:
   a. Create a firewall zone named CellularWAN with Source NAT enabled:
      i. Click **Firewall** > **Zones**.
      ii. For **Add Zone**, type **CellularWAN** and click **+**.

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iii. Enable Source NAT.

b. Create second firewall zone named EthernetWAN with Source NAT enabled:
   i. For Add Zone, type EthernetWAN and click +.
   ii. Enable Source NAT.

4. Configure the WAN interfaces to use the new zones:
   a. Configure the cellular WAN interface:
      i. Click Network > Interfaces > WWAN1.
      ii. For Zone, select CellularWAN.



   b. Configure the Ethernet WAN interface:
      i. Click Network > Interfaces > WAN1.
      ii. For Zone, select EthernetWAN.

5. Configure the policy-based route for traffic from the client device that will be sent over the cellular WAN:
   a. Click Network > Routes > Policy-based routing.
   b. Click the + to add a new route policy.

   c. For Label, type VoIP phone.
   d. For Interface, select WWAN1.
   e. Configure the source as the MAC address of the VoIP phone:
      i. Click to expand Source address.
      ii. For Type, select MAC address.
      iii. For MAC address, type 00:0B:82:33:50:C2.
   f. Configure the destination zone:
      i. Click to expand Destination address.
      ii. For Type, select Zone.
      iii. For Zone, select CellularWAN.

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8. Create a packet filtering rule that rejects all other LAN packets on the cellular WAN interface.
   a. Click **Firewall** > **Packet filtering**.
   b. Click the **+** to add a new packet filtering rule.



   c. For **Label**, type **Reject LAN traffic to cellular WAN**.
   d. For **Action**, select **Drop**.
   e. For **Source zone**, select **Internal**.
   f. For **Destination zone**, select **Cellular/WAN**.



7. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create new firewall zones:
   a. Create a firewall zone named CellularWAN with Source NAT enabled:
      i. Create the firewall zone:

```
(config)> add firewall zone CellularWAN
(config firewall zone CellularWAN)>
```

      ii. Enable Source NAT on the new zone:

```
(config firewall zone CellularWAN)> src_nat true
(config firewall zone CellularWAN)>
```

   b. Create second firewall zone named EthernetWAN with Source NAT enabled:
      i. Type .. to move back one node in the configuration:

```
(config firewall zone CellularWAN)> ..
(config firewall zone)>
```

      ii. Create the firewall zone:

```
(config firewall zone)> add EthernetWAN
(config firewall zone EthernetWAN)>
```

      iii. Enable Source NAT on the new zone:

```
(config firewall zone EthernetWAN)> src_nat true
(config firewall zone EthernetWAN)>
```

4. Configure the WAN interfaces to use the new zones:
   a. Set the zone for the cellular WAN interface:
      i. Type ... to move to the root of the configuration:

```
(config firewall zone EthernetWAN)> ...
(config)>
```

      ii. Set the zone:

```
(config)> network interface wwan1 zone CellularWAN
(config)>
```

   b. Set the zone for the Ethernet WAN interface:

```
(config)> network interface wan1 zone EthernetWAN
(config)>
```

5. Configure the policy-based route for traffic from the client devices that will be sent over the cellular WAN:

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a. Add a new routing policy:

```
(config)> add network route policy end
(config network route policy 8)>
```

b. Set the label that will be used to identify this route policy:

```
(config network route policy 8)> label "VoIP phone"
(config network route policy 8)>
```

c. Set the interface:

```
(config network route policy 8)> interface /network/interface/wwan1
(config network route policy 8)>
```

d. Configure the source as the MAC address of the VoIP phone:

i. Set the source type to mac:

```
(config network route policy 8)> src type mac
(config network route policy 8)>
```

ii. Set the MAC address to the MAC address of the VoIP phone:

```
(config network route policy 8)> src mac 3C:BB:96:33:5B:C2
(config network route policy 8)>
```

e. Configure the destination zone:

i. Set the source destination to zone:

```
(config network route policy 8)> dst type zone
(config network route policy 8)>
```

ii. Set the zone to CellularWAN:

```
(config network route policy 8)> dst zone CellularWAN
(config network route policy 8)>
```

6. Create a packet filtering rule that rejects all other LAN packets on the cellular WAN interface:

a. Create a new packet filtering rule:

i. Type ... to move to the root of the configuration:

```
(config network route policy 8)> ...
(config)>
```

ii. Create the packet filtering rule:

```
(config)> add firewall filter end
(config firewall filter 2)>
```


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b. Set the label to Reject LAN traffic to cellular WAN:

```
(config firewall filter 2)> label "Reject LAN traffic to cellular WAN"
(config firewall filter 2)>
```

c. Set the action to drop:

```
(config firewall filter 2)> action drop
(config firewall filter 2)>
```

d. Set the source zone to internal:

```
(config firewall filter 2)> src_zone internal
(config firewall filter 2)>
```

e. Set the destination zone to CellularWAN:

```
(config firewall filter 2)> dst_zone CellularWAN
(config firewall filter 2)>
```

7. Save the configuration and apply the change:

```
(config firewall filter 2)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Routing services

Your TX64 includes support for dynamic routing services and protocols. The following routing services are supported:

Service or protocol	Information
RIP	The IPv4 Routing Information Protocol (RIP) service supports RIPv2 (RFC2453) and RIPv1 (RFC1058).
RIPng	The IPv6 Routing Information Protocol (RIP) service supports RIPng (RFC2080).
OSPFv2	The IPv4 Open Shortest Path First (OSPF) service supports OSPFv2 (RFC2328).
OSPFv3	The IPv6 Open Shortest Path First (OSPF) service supports OSPFv3 (RFC5340).
BGP	The Border Gateway Protocol (BGP) service supports BGP-4 (RFC4271).
Babel	The IPv4 and IPv6 Babel service.
IS-IS	The IPv4 and IPv6 Intermediate System to Intermediate System (IS-IS) service.

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Configure routing services

Required configuration items

- Enable routing services.
- Enable and configure the types of routing services that will be used.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Routes** > **Routing services**.
4. Click **Enable**.

The default firewall zone setting, **Dynamic routes**, is specifically designed to work with routing services and should be left as the default.

5. Configure the routing services that will be used:
   a. Click to expand a routing service.
   b. Enable the routing service.
   c. Complete the configuration of the routing service.

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6. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Enable routing services:

```
(config)> network route service enable true
(config)>
```

4. Configure routing services that will be used:
   a. Use the ? to display available routing services:

```
(config)> network route service ?

Routing services: Settings for dynamic routing services and protocols.

Parameters                Current Value
--------------------------------------------------------------------------------
enable                    true              Enable
zone                      dynamic_routes    Zone

Additional Configuration
--------------------------------------------------------------------------------
babel                     Babel
bgp                       BGP
isis                      IS-IS
ospfv2                    OSPFv2
ospfv3                    OSPFv3
rip                       RIP
ripng                     RIPng

(config)>
```


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b. Enable a routing service that will be used. For example, to enable the RIP service:

```
(config)> network route service rip enable true
(config)>
```

c. Complete the configuration of the routing service. For example, use the ? to view the available parameters for the RIP service:

```
(config)> network route service rip ?

Parameters                    Current Value
-------------------------------------------------------------------------------

ecmp                          false           Allow ECMP
enable                        true            Enable

Additional Configuration
-------------------------------------------------------------------------------

interface                     Interfaces
neighbour                     Neighbours
redis                         Route redistribution
timer                         Timers

(config)>
```

5. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show the routing table

To display the routing table:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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Routing Show the routing table



5. Click **Status > Routes**.
   The **Network Routing** window is displayed.



4. Click **IPv4 Load Balance** to view IPv4 load balancing.
5. Click **IPv6 Load Balance** to view IPv6 load balancing.

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the Admin CLI prompt, type show route:

```
-> show route
Destination                Gateway            Source          Metric
  Interface
-------------------------- ------------------ --------------- ------
default                    10.1.31.1                          1
10.1.14.25                 10.1.31.1          10.1.31.99      1
  /network/device/eth1
10.1.14.37                 10.1.31.1          10.1.31.99      1
  /network/device/eth1
10.1.35.0/24               10.1.31.99         1
  /network/device/eth1
```

```
127.0.0.0/8                                          127.0.0.1
  /network/device/loopback
fd99:2704::1              fe80::204:ff:fe89:a231                1
fd99:2704::/64                                                  1
fd99:2704::/48
2147483647
fe80::204:ff:fe89:a231    fe80::204:ff:fe89:a231                1
fe80::204:ff:fe89:c525    fe80::204:ff:fe89:a231                1
fe80::/64                                                       256
fe80::/64                                                       256
default                   fe80::204:ff:fe89:a231                1
default                                                         1024

IPv4 Route   Load Balance (%)
-----------  ---------------
wan1         75.0
wwan1        25.0

IPv6 Route   Load Balance (%)
-----------  ---------------
wan1         75.0
wwan1        25.0

>
```

You can limit the display to only IPv4 entries by using show route ipv4, or to IPv6 entries by using show route ipv6. You can also display more information by adding the verbose option to the show route and show route ip_type commands.

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Dynamic DNS

The Domain Name System (DNS) uses name servers to provide a mapping between computer-readable IP addresses and human-readable hostnames. This allows users to access websites and personal networks with easy-to-remember URLs. Unfortunately, IP addresses change frequently, invalidating these mappings when they do. Dynamic DNS has become the standard method of addressing this problem, allowing devices to update name servers with their new IP addresses.

By providing the TX64 device with the domain name and credentials obtained from a dynamic DNS provider, the router can automatically update the remote nameserver whenever your WAN or public IP address changes.

Your TX64 device supports a number of Dynamic DNS providers as well as the ability to provide a custom provider that is not included on the list of providers.

Configure dynamic DNS

This section describes how to configure dynamic DNS on a TX64 device.

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Required configuration items

- Add a new Dynamic DNS service.
- The interface that has its IP address registered with the Dynamic DNS provider.
- The name of a Dynamic DNS provider.
- The domain name that is linked to the interface's IP address.
- The username and password to authenticate with the Dynamic DNS provider.

Additional configuration items

- If the Dynamic DNS service provider is set to custom, identify the URL that should be used to update the IP address with the Dynamic DNS provider.
- The amount of time to wait to check if the interface's IP address needs to be updated.
- The amount of time to wait to force an update of the interface's IP address.
- The amount of time to wait for an IP address update to succeed before retrying the update.
- The number of times to retry a failed IP address update.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Network** > **Dynamic DNS**.

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4. Type a name for this Dynamic DNS instance in **Add Service** and click **+**.



The Dynamic DNS configuration page displays.

New Dynamic DNS configurations are enabled by default. To disable, click to toggle **Enable** to off.

5. For **Interface**, select the interface that has its IP address registered with the Dynamic DNS provider.
6. For **Service**, select the Dynamic DNS provider, or select **custom** to enter a custom URL for the Dynamic DNS provider.
7. If **custom** is selected for **Service**, type the **Custom URL** that should be used to update the IP address with the Dynamic DNS provider.
8. Type the **Domain** name that is linked to the Interface's IP address.
9. Type the **Username** and **Password** used to authenticate with the Dynamic DNS provider.
10. (Optional) For **Check Interval**, type the amount of time to wait to check if the Interface's IP address needs to be updated.

    Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

    For example, to set **Check Interval** to ten minutes, enter **10m** or **600s**.
11. (Optional) For **Forced update interval**, type the amount of time to wait to force an update of the Interface's IP address.

    Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

    For example, to set **Forced update interval** to ten minutes, enter **10m** or **600s**.

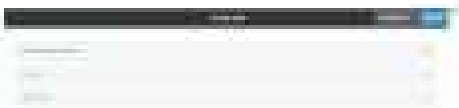
    The setting for **Forced update interval** must be larger than the setting for **Check Interval**.
12. (Optional) For **Retry Interval**, type the amount of time to wait for an IP address update to succeed before retrying the update.

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Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set Retry Interval to ten minutes, enter 10m or 600s.

13. (Optional) For Retry count, type the number of times to retry a failed IP address update.
14. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add a new Dynamic DNS instance. For example, to add an instance named new_ddns_instance:

```
(config)> add network ddns new_ddns_instance
(config network ddns new_ddns_instance)>
```

   New Dynamic DNS instances are enabled by default. To disable:

```
(config network ddns new_ddns_instance)> enable false
(config network ddns new_ddns_instance)>
```

4. Set the interface for the Dynamic DNS instance:
   a. Use the ? to determine available interfaces:

```
(config network ddns new_ddns_instance)> interface ?

Interface: The network interface from which to obtain the IP address to
register with the dynamic DNS service.
Format:
  defaultip
  defaultipinklocal
  lan1
  lan_hotspot
  loopback
  wan1
  wwan1
  wwan2
Current value:
```


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```
(config network ddns new_ddns_instance)> interface
```

b. Set the interface. For example:

```
(config network ddns new_ddns_instance)> interface wan1
(config network ddns new_ddns_instance)>
```

9. Set the Dynamic DNS provider service:

a. Use the ? to determine available services:

```
(config network ddns new_ddns_instance)> service ?

Service: The provider of the dynamic DNS service.
Format::
  custom
  3322.org
  changeip.com
  ddns.com.br
  dnsdynamic.org
  ...

Default value: custom
Current value: custom

(config network ddns new_ddns_instance)> service
```

b. Set the service:

```
(config network ddns new_ddns_instance)> service service_name
(config network ddns new_ddns_instance)>
```

8. If custom is configured for service, set the custom URL that should be used to update the IP address with the Dynamic DNS provider:

```
(config network ddns new_ddns_instance)> custom url
(config network ddns new_ddns_instance)>
```

7. Set the domain name that is linked to the interface's IP address:

```
(config network ddns new_ddns_instance)> domain domain_name
(config network ddns new_ddns_instance)>
```

6. Set the username to authenticate with the Dynamic DNS provider:

```
(config network ddns new_ddns_instance)> username name
(config network ddns new_ddns_instance)>
```

5. Set the password to authenticate with the Dynamic DNS provider:

```
(config network ddns new_ddns_instance)> password pwd
(config network ddns new_ddns_instance)>
```

10. (Optional) Set the amount of time to wait to check if the interface's IP address needs to be

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Updated:

```
(config network ddns new_ddns_instance)> check_interval value
(config network ddns new_ddns_instance)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set check_interval to ten minutes, enter either 10m or 600s:

```
(config network ddns new_ddns_instance)> check_interval 600s
(config network ddns new_ddns_instance)>
```

The default is 10m.

11. (Optional) Set the amount of time to wait to force an update of the interface's IP address:

```
(config network ddns new_ddns_instance)> force_interval value
(config network ddns new_ddns_instance)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set force_interval to ten minutes, enter either 10m or 600s:

```
(config network ddns new_ddns_instance)> force_interval 600s
(config network ddns new_ddns_instance)>
```

The default is 5d.

12. (Optional) Set the amount of time to wait for an IP address update to succeed before retrying the update:

```
(config network ddns new_ddns_instance)> retry_interval value
(config network ddns new_ddns_instance)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set retry_interval to ten minutes, enter either 10m or 600s:

```
(config network ddns new_ddns_instance)> retry_interval 600s
(config network ddns new_ddns_instance)>
```

The default is 60s.

13. (Optional) Set the number of times to retry a failed IP address update:

```
(config network ddns new_ddns_instance)> retry_count value
(config network ddns new_ddns_instance)>
```

where value is any integer. The default is 5.

14. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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15. Type exit to exit the Admin CLI.
    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Virtual Router Redundancy Protocol (VRRP)

Virtual Router Redundancy Protocol (VRRP) is a standard for gateway device redundancy and failover that creates a "virtual router" with a floating IP address. Devices connected to the LAN then use this virtual router as their default gateway. Responsibility for the virtual router is assigned to one of the VRRP-enabled devices on a LAN (the "master router"), and this responsibility transparently fails over to backup VRRP devices if the master router fails. This prevents the default gateway from being a single point of failure, without requiring configuration of dynamic routing or router discovery protocols on every host.

Multiple TX64 devices can be configured as VRRP devices and assigned a priority. The router with the highest priority will be used as the master router. If the master router fails, then the IP address of the virtual router is mapped to the backup device with the next highest priority. Each VRRP router is configured with a unique LAN IP address, and the same shared VRRP address.

Configure VRRP

This section describes how to configure VRRP on a TX64 device.

Required configuration items

- Enable VRRP.
- The interface used by VRRP.
- The Router ID that identifies the virtual router instance. The Router ID must be the same on all VRRP devices that participate in the same VRRP device pool.
- The VRRP priority of this device.
- The shared virtual IP address for the VRRP virtual router that devices connected to the LAN will use as their default gateway.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

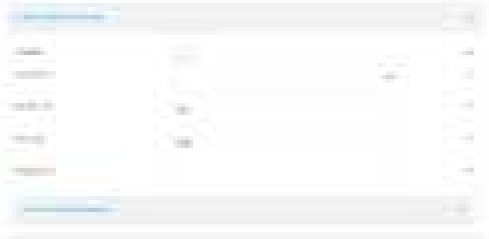
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5. Click Network > VRRP.
4. For Add VRRP Instance, type a name for the VRRP instance and click +.



The new VRRP instance configuration is displayed.



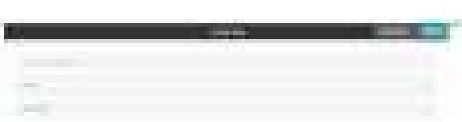
5. Click Enable.
6. For Interface, select the interface on which this VRRP instance should run.
7. For Router ID field, type the ID of the virtual router instance. The Router ID must be the same on all VRRP devices that participate in the same VRRP device pool. Allowed values are from 1 and 255, and it is configured to 99 by default.
8. For Priority, type the priority for this router in the group. The router with the highest priority will be used as the master router. If the master router fails, then the IP address of the virtual router is mapped to the backup device with the next highest priority. If this device's actual IP address is being used as the virtual IP address of the VRRP pool, then the priority of this device should be set to 255. Allowed values are from 1 and 255, and it is configured to 100 by default.

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9. (Optional) For Password, type a password that will be used to authenticate this VRRP router with VRRP peers. If the password length exceeds 8 characters, it will be truncated to 8 characters.
10. Configure the virtual IP addresses associated with this VRRP instance:
    a. Click to expand Virtual IP addresses.
    b. Click + to add a virtual IP address.



    c. For Virtual IP, type the IPv4 or IPv6 address for a virtual IP of this VRRP instance.
    d. (Optional) Repeat to add additional virtual IPs.
11. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add a VRRP instance. For example:

```
(config)> add network vrrp new_vrrp_instance
(config network vrrp new_vrrp_instance)>
```

4. Enable the VRRP instance:

```
(config network vrrp new_vrrp_instance)> enable true
(config network vrrp new_vrrp_instance)>
```

5. Set the interface on which this VRRP instance should run:
    a. Use the ? to determine available interfaces:

```
(config network vrrp new_vrrp_instance)> interface ?

Interface: The network interface to communicate with VRRP peers on and
listen for traffic to virtual IP addresses.
Format:
  /network/interface/defaultip
  /network/interface/defaultlinklocal
```


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```
    /network/interface/lan1
    /network/interface/lan_hotspot
    /network/interface/loopback
    /network/interface/wan1
    /network/interface/wwan1
    /network/interface/wwan2
Current value:

(config network vrrp new_vrrp_instance)> interface
```

5. Set the interface. For example:

```
(config network vrrp new_vrrp_instance)> interface
/network/interface/wan1
(config network vrrp new_vrrp_instance)>
```

6. Set the router ID. The Router ID must be the same on all VRRP devices that participate in the same VRRP device pool. Allowed values are from 1 and 255, and it is configured to 50 by default.

```
(config network vrrp new_vrrp_instance)> router_id int
(config network vrrp new_vrrp_instance)>
```

7. Set the priority for this router in the group. The router with the highest priority will be used as the master router. If the master router fails, then the IP address of the virtual router is mapped to the backup device with the next highest priority. If this device's actual IP address is being used as the virtual IP address of the VRRP pool, then the priority of this device should be set to 255 . Allowed values are from 1 and 255, and it is configured to 100 by default.

```
(config network vrrp new_vrrp_instance)> priority int
(config network vrrp new_vrrp_instance)>
```

8. (Optional) Set a password that will be used to authenticate this VRRP router with VRRP peers. If the password length exceeds 8 characters, it will be truncated to 8 characters.

```
(config network vrrp new_vrrp_instance)> password pwd
(config network vrrp new_vrrp_instance)>
```

9. Add a virtual IP address associated with this VRRP instance. This can be an IPv4 or IPv6 address.

```
(config network vrrp new_vrrp_instance)> add virtual_address end ip_address
(config network vrrp new_vrrp_instance)>
```

Additional virtual IP addresses can be added by repeating this step with different values for ip_address.

10. Save the configuration and apply the change:

```
(config network vrrp new_vrrp_instance)> save
Configuration saved.
>
```


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11. Type exit to exit the Admin CLI.
    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show VRRP status and statistics

This section describes how to display VRRP status and statistics for a TX64 device. VRRP status is available from the WebUI only.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Status** > **VRRP**.
   The **Virtual Router Redundancy Protocol** window is displayed.



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Virtual Private Networks (VPN)

Virtual Private Networks (VPNs) are used to securely connect two private networks together so that devices can connect from one network to the other using secure channels.

This chapter contains the following topics:

IPsec
OpenVPN
Generic Routing Encapsulation (GRE)

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IPsec

IPsec is a suite of protocols for creating a secure communication link—an IPsec tunnel—between a host and a remote IP network or between two IP networks across a public network such as the Internet.

IPsec data protection

IPsec protects the data being sent across a public network by providing the following:

Data origin authentication
Authentication of data to validate the origin of data when it is received.

Data integrity
Authentication of data to ensure it has not been modified during transmission.

Data confidentiality
Encryption of data sent across the IPsec tunnel to ensure that an unauthorized device cannot read the data.

Anti-Replay
Authentication of data to ensure an unauthorized device has not injected it into the IPsec tunnel.

IPsec modes

IPsec can run in two different modes: Tunnel and Transport.

Tunnel
The entire IP packet is encrypted and/or authenticated and then encapsulated as the payload in a new IP packet.

Transport
Only the payload of the IP packet is encrypted and/or authenticated. The IP header is left untouched. This mode has limitations when using an authentication header, because the IP addresses in the IP header cannot be translated (for example, with Network Address Translation (NAT)), as it would invalidate the authentication hash value.

Internet Key Exchange (IKE) settings

IKE is a key management protocol that allows IPsec to negotiate the security associations (SAs) that are used to create the secure IPsec tunnel. Both IKEv1 and IKEv2 are supported.

SA negotiations are performed in two phases, known as phase 1 and phase 2.

Phase 1

In phase 1, IKE creates a secure authenticated communication channel between the device and the peer (the remote device which is at the other end of the IPsec tunnel) using the configured pre-shared key and the Diffie-Hellman key exchange. This creates the IKE SAs that are used to encrypt further IKE communications.

For IKEv1, there are two modes for the phase 1 negotiation: Main mode and Aggressive mode. IKEv2 does not use these modes.

Main mode
Main mode is the default mode. It is slower than aggressive mode, but more secure, in that all sensitive information sent between the device and its peer is encrypted.

Aggressive mode
Aggressive mode is faster than main mode, but is not as secure as main mode, because the device and its peer exchange their IDs and hash information in clear text instead of being encrypted.

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Aggressive mode is usually used when one or both of the devices have a dynamic external IP address.

Phase 2

In phase 1, IKE negotiates the SAs for IPsec. This creates two unidirectional SAs, one for each direction. Once the phase 2 negotiation is complete, the IPsec tunnel should be fully functional.

IPsec and IKE renegotiation

To reduce the chances of an IPsec tunnel being compromised, the IPsec SAs and IKE SA are renegotiated at a regular interval. This results in different encryption keys being used in the IPsec tunnel.

Authentication

Client authentication

XAUTH (extended authentication) pre-shared key authentication mode provides additional security by using client authentication credentials in addition to the standard pre-shared key. The TX64 device can be configured to authenticate with the remote peer as an XAUTH client.

RSA Signatures

With RSA signatures authentication, the TX64 device uses a private RSA key to authenticate with a remote peer that is using a corresponding public key.

Certificate-based Authentication

X.509 certificate-based authentication makes use of private keys on both the server and client which are secured and never shared. Both the server and client have a certificate which is generated with their respective private key and signed by a Certificate Authority (CA).

The TX64 implementation of IPsec can be configured to use X.509 certificate-based authentication using the private keys and certificates, along with a root CA certificate from the signing authority and, if available, a Certificate Revocation List (CRL).

Configure an IPsec tunnel

Configuring an IPsec tunnel with a remote device involves configuring the following items:

Required configuration items

- **IPsec tunnel configuration items:**
  - The mode: either tunnel or transport.
  - Enable the IPsec tunnel.

    The IPsec tunnel is enabled by default.
  - The firewall zone of the IPsec tunnel.
  - The authentication type and pre-shared key or other applicable keys and certificates.

    If SCEP certificates will be selected as the Authentication type, create the SCEP client prior to configuring the IPsec tunnel. See Configure a Simple Certificate Enrollment Protocol client for instructions.

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- The local endpoint type and ID values, and the remote endpoint host and ID values.
- IKE configuration items
  - The IKE version, either IKEv1 or IKEv2.
  - Whether to initiate a key exchange or wait for an incoming request.
  - The IKE mode, either main aggressive.
  - The IKE authentication protocol to use for the IPsec tunnel negotiation during phase 1 and phase 2.
  - The IKE encryption protocol to use for the IPsec tunnel negotiation during phase 1 and phase 2.
  - The IKE Diffie-Hellman group to use for the IPsec tunnel negotiation during phase 1 and phase 2.
- Enable dead peer detection and configure the delay and timeout.
- Destination networks that require source NAT.
- Active recovery configuration. See Configure SureLinx active recovery for IPsec for information about IPsec active recovery.

Additional configuration items

The following additional configuration settings are not typically configured to get an IPsec tunnel working, but can be configured as needed:

- Determine whether the device should use UDP encapsulation even when it does not detect that NAT is being used.
- If using IPsec failover, identify the primary tunnel during configuration of the backup tunnel.
- The Network Address Translation (NAT) keep alive time.
- The protocol, either Encapsulating Security Payload (ESP) or Authentication Header (AH).
- The management priority for the IPsec tunnel interface. The active interface with the highest management priority will have its address reported as the preferred contact address for central management and direct device access.
- Enable XAUTH client authentication, and the username and password to be used to authenticate with the remote peer.
- Enable Mode-configuration (MODECFG) to receive configuration information, such as the private IP address, from the remote peer.
- Disable the padding of IKE packets. This should normally not be done except for compatibility purposes.
- Destination networks that require source NAT.
- Tunnel and key renegotiation
  - The lifetime of the IPsec tunnel before it is renegotiated.
  - The amount of time before the IKE phase 1 lifetime expires.
  - The amount of time before the IKE phase 2 lifetime expires.
  - The lifetime margin, a randomizing amount of time before the IPsec tunnel is renegotiated.

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Web UI

1. Log into the TX64 Web UI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **VPN** > **IPsec**.
4. [Optional] Change the **NAT keep alive time**.
   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].
   For example, to set **NAT keep alive time** to ten minutes, enter **10m** or **600s**.
   The default is 40 seconds.
5. Click to expand **Tunnels**.
6. For **Add IPsec tunnel**, type a name for the tunnel and click **+**.



The new IPsec tunnel configuration is displayed.

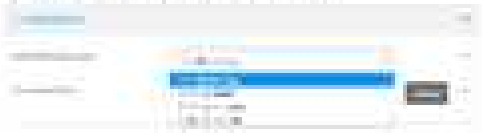
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7. The IPsec tunnel is enabled by default. To disable, click **Enable**.
8. (Optional) The **Preferred** tunnel option allows you to configure IPsec failover behavior. When configuring a backup IPsec tunnel, for **Preferred** tunnel, select the primary IPsec tunnel. This instructs the backup tunnel to only start when the primary tunnel is determined to have failed. It will continue to operate until the preferred tunnel returns to full operational status.
   When configuring the primary tunnel, and when configuring tunnels that will not fail over to a backup tunnel, leave this option blank.
9. (Optional) **Enable Force UDP encapsulation** to force the tunnel to use UDP encapsulation even when it does not detect that NAT is being used.
10. For **Zone**, select the firewall zone for the IPsec tunnel. Generally this should be left at the default of IPsec.
11. Select the **Mode**, either:
    - **Tunnel**: The entire IP packet is encrypted and/or authenticated and then encapsulated as the payload in a new IP packet.
    - **Transport**: Only the payload of the IP packet is encrypted and/or authenticated. The IP header is unencrypted.
12. Select the **Protocol**, either:
    - **ESP** (Encapsulating Security Payload): Provides encryption as well as authentication and integrity.
    - **AH** (Authentication Header): Provides authentication and integrity only.

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13. Click to expand **Authentication**.



a. For **Authentication type**, select one of the following:

- **Pre-shared key**: Uses a pre-shared key (PSK) to authenticate with the remote peer.
  i. Type the **Pre-shared key**.
- **RSA signatures**: Uses a private RSA key to authenticate with the remote peer.
  i. For **Private key**, paste the device's private RSA key in PEM format.
  ii. Type the **Private key passphrase** that is used to decrypt the private key. Leave blank if the private key is not encrypted.
  iii. For **Peer public key**, paste the peer's public RSA key in PEM format.
- **SCEP certificates**: Uses Simple Certificate Enrollment Protocol (SCEP) to download a private key, certificates, and an optional Certificate Revocation List (CRL) to the TX64 device from a SCEP server.
  You must create the SCEP client prior to configuring the IPsec tunnel. See Configure a Simple Certificate Enrollment Protocol client for instructions.
  i. For **SCEP Client**, select the SCEP client.
- **X.509 certificates**: Uses private key and X.509 certificates to authenticate with the remote peer.
  i. For **Private key**, paste the device's private RSA key in PEM format.
  ii. Type the **Private key passphrase** that is used to decrypt the private key. Leave blank if the private key is not encrypted.
  iii. For **Certificate**, paste the local X.509 certificate in PEM format.
  iv. For **Peer verification**, select either:
    - **Peer certificate**: For **Peer certificate**, paste the peer's X.509 certificate in PEM format.
    - **Certificate Authority**: For **Certificate Authority chain**, paste the Certificate Authority (CA) certificates. These must include all peer certificates in the chain up to the root CA certificate, in PEM format.

14. (Optional) For **Management Priority**, set the priority for this IPsec tunnel.

15. (Optional) To configure the device to connect to its remote peer as an XAUTH client:

a. Click to expand **XAUTH client**.

b. Click **Enable**.

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c. Type the Username and Password that the device will use to authenticate as an XAUTH client with the peer.

16. (Optional) Click Enable MODECFG client to receive configuration information, such as the private IP address, from the remote peer.
17. Click to expand Local endpoint.
    a. For Type, select either:
        - Default route: Uses the same network interface as the default route.
        - Interface: Select the interface to be used as the local endpoint.
    b. Click to expand ID.
        i. Select the ID type:
            - Auto: The ID will be automatically determined from the value of the tunnels endpoints.
            - Raw: Enter an ID and have it passed unmodified to the underlying IPsec stack.

              For Raw ID value, type the ID that will be passed.
            - Any: Any ID will be accepted.
            - IPv4: The ID will be interpreted as an IP address and sent as an ID_IPV4_ADDR IKE identity.

              For IPv4 ID value, type an IPv4 formatted ID. This can be a fully-qualified domain name or an IPv4 address.
            - IPv6: The ID will be interpreted as an IP address and sent as an ID_IPV6_ADDR IKE identity.

              For IPv6 ID value, type an IPv6 formatted ID. This can be a fully-qualified domain name or an IPv6 address.
            - RFC822/Email: The ID will be interpreted as an RFC822 (email address).

              For RFC822 ID value, type the ID in Internet email address format.
            - FQDN: The ID will be interpreted as FQDN (Fully Qualified Domain Name) and sent as an ID_FQDN IKE identity.

              For FQDN ID value, type the ID as an FQDN.
            - KeyID: The ID will be interpreted as a Key ID and sent as an ID_KEY_ID IKE identity.

              For KEYID ID value, type the key ID.
18. Click to expand Remote endpoint.
    a. For Hostname, select either a hostname or IP address. If your device is not configured to initiate the IPsec connection (see IKE > Initiate connection), you can also use the keyword any, which means that the hostname is dynamic or unknown.
    b. Click to expand ID.
        i. Select the ID type:
            - Auto: The ID will be automatically determined from the value of the tunnels endpoints.
            - Raw: Enter an ID and have it passed unmodified to the underlying IPsec stack.

              For Raw ID value, type the ID that will be passed.
            - Any: Any ID will be accepted.

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- IPv4: The ID will be interpreted as an IPv4 address and sent as an ID_IPV4_ADDR IKE identity.

  For IPv4 ID value, type an IPv4 formatted ID. This can be a fully-qualified domain name or an IPv4 address.
- IPv6: The ID will be interpreted as an IPv6 address and sent as an ID_IPV6_ADDR IKE identity.

  For IPv6 ID value, type an IPv6 formatted ID. This can be a fully-qualified domain name or an IPv6 address.
- RFC822/Email: The ID will be interpreted as an RFC822 (email address).

  For RFC822 ID value, type the ID in internet email address format.
- FQDN: The ID will be interpreted as FQDN (Fully Qualified Domain Name) and sent as an ID_FQDN IKE identity.

  For FQDN ID value, type the ID as an FQDN.
- KeyID: The ID will be interpreted as a Key ID and sent as an ID_KEY_ID IKE identity.

  For KEYID ID value, type the key ID.

10. Click to expand **Policies**.

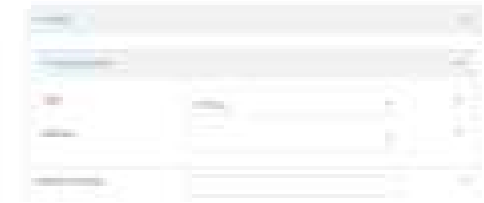
    Policies define the network traffic that will be encapsulated by this tunnel.

    a. Click **+** to create a new policy.

    The new policy configuration is displayed.

    b. Click to expand **Local network**.

    c. For **Type**, select one of the following:

    - **Address**: The address of a local network interface.

      For **Address**, select the appropriate interface.
    - **Network**: The subnet of a local network interface.

      For **Address**, select the appropriate interface.
    - **Custom network**: A user-defined network.

      For **Custom network**, enter the IPv4 address and optional netmask. The keyword any can also be used.
    - **Request a network**: Requests a network from the remote peer.

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d. For **Remote network**, enter the IP address and optional netmask of the remote network. The keyword any can also be used.

10. Click to expand **IKE**.



a. For **IKE version**, select either IKEv1 or IKEv2. This setting must match the peer's IKE version.

b. **Initiate connection** instructs the device to initiate the key exchange, rather than waiting for an incoming request. This must be disabled if **Remote endpoint** > Hostname is set to any.

c. For **Mode**, select either Main mode or Aggressive mode.

d. For **Enable padding**, click to disable the padding of IKE packets. This should normally not be disabled except for compatibility purposes.

e. For **Phase 1 lifetime**, enter the amount of time that the IKE security association expires after a successful negotiation and must be re-authenticated.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set Phase 1 lifetime to ten minutes, enter 10m or 600s.

f. For **Phase 2 lifetime**, enter the amount of time that the IKE security association expires after a successful negotiation and must be rekeyed.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set Phase 2 lifetime to ten minutes, enter 10m or 600s.

g. For **Lifetime margin**, enter a randomizing amount of time before the IPsec tunnel is renegotiated.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

For example, to set Lifetime margin to ten minutes, enter 10m or 600s.

h. Click to expand **Phase 1 Proposals**.

i. Click + to create a new phase 1 proposal.

ii. For **Cipher**, select the type of encryption.

iii. For **Hash**, select the type of hash to use to verify communication integrity.

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iv. For **Diffie-Hellman group**, select the type of Diffie-Hellman group to use for key exchange.

v. You can add additional Phase 1 proposals by clicking **+** next to **Add Phase 1 Proposal**.

f. Click to expand **Phase 2 Proposals**.

i. Click **+** to create a new phase 2 proposal.

ii. For **Cipher**, select the type of encryption.

iii. For **Hash**, select the type of hash to use to verify communication integrity.

iv. For **Diffie-Hellman group**, select the type of Diffie-Hellman group to use for key exchange.

v. You can add additional Phase 2 proposals by clicking **+** next to **Add Phase 2 Proposal**.

21. (Optional) Click to expand **Dead peer detection**. Dead peer detection is enabled by default. Dead peer detection uses periodic IKE transmissions to the remote endpoint to detect whether tunnel communications have failed, allowing the tunnel to be automatically restarted when failure occurs.

a. To enable or disable dead peer detection, click **Enable**.

b. For **Delay**, type the number of seconds between transmissions of dead peer packets. Dead peer packets are only sent when the tunnel is idle.

c. For **Timeout**, type the number of seconds to wait for a response from a dead peer packet before assuming the tunnel has failed.

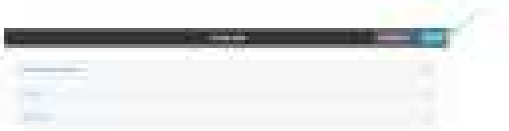
22. (Optional) Click to expand **NAT** to create a list of destination networks that require source NAT.

a. Click **+** next to **Add NAT destination**.

b. For **Destination network**, type the IPv4 address and optional netmask of a destination network that requires source NAT. You can also use **any**, meaning that any destination network connected to the tunnel will use source NAT.

23. See Configure Eurolink active recovery for IPsec for information about IPsec **Active recovery**.

24. Click **Apply** to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add an IPsec tunnel. For example, to add an IPsec tunnel named Ipsec_example:

```
(config)> add vpn ipsec tunnel ipsec_example
(config vpn ipsec tunnel ipsec_example)>
```

   The IPsec tunnel is enabled by default. To disable:

```
(config vpn ipsec tunnel ipsec_example)> enable false
(config vpn ipsec tunnel ipsec_example)>
```

4. [Optional] Configure the device to serve as a backup IPsec tunnel.
   When configuring a backup IPsec tunnel the ipsec_failover parameter instructs the backup tunnel to only start when the primary tunnel is determined to have failed. It will continue to operate until the preferred tunnel returns to full operational status.
   When configuring the primary tunnel, and when configuring tunnels that will not fail over to a backup tunnel, do not set this parameter.
   a. Use the **?** to view a list of available tunnels:

```
(config vpn ipsec tunnel ipsec_example)> ipsec_failover ?

Preferred tunnel: This tunnel will not start until the preferred tunnel
has failed. It will continue
to operate until the preferred tunnel returns to full operation status.
Format:
 primary_ipsec_tunnel
Optional: yes
Current value:

(config vpn ipsec tunnel ipsec_example)> ipsec_failover
```

   b. Set the primary IPsec tunnel:

```
(config vpn ipsec tunnel ipsec_example)> ipsec_failover primary_ipsec_
tunnel
(config vpn ipsec tunnel ipsec_example)>
```

5. [Optional] Set the tunnel to use UDP encapsulation even when it does not detect that NAT is being used:

```
(config vpn ipsec tunnel ipsec_example)> force_udp_encap true
(config vpn ipsec tunnel ipsec_example)>
```


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6. Set the firewall zone for the IPsec tunnel. Generally this should be left at the default of ipsec.

```
(config vpn ipsec tunnel ipsec_example)> zone zone
(config vpn ipsec tunnel ipsec_example)>
```

To view a list of available zones:

```
(config vpn ipsec tunnel ipsec_example)> zone ?

Zone: The firewall zone assigned to this IPsec tunnel. This can be used by
packet filtering rules
and access control lists to restrict network traffic on this tunnel.
Format:
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup
Default value: ipsec
Current value: ipsec

(config vpn ipsec tunnel ipsec_example)>
```

7. Set the mode:

```
(config vpn ipsec tunnel ipsec_example)> mode mode
(config vpn ipsec tunnel ipsec_example)>
```

where mode is either:

- tunnel: The entire IP packet is encrypted and/or authenticated and then encapsulated as the payload in a new IP packet.
- transport: Only the payload of the IP packet is encrypted and/or authenticated. The IP header is unencrypted.

The default is tunnel.

8. Set the protocol:

```
(config vpn ipsec tunnel ipsec_example)> type protocol
(config vpn ipsec tunnel ipsec_example)>
```

where protocol is either:

- esp (Encapsulating Security Payload): Provides encryption as well as authentication and integrity.
- ah (Authentication Header): Provides authentication and integrity only.

The default is esp.

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9. (Optional) Set the management priority for this IPsec tunnel:

```
(config vpn ipsec tunnel ipsec_example)> mgmt value
(config vpn ipsec tunnel ipsec_example)>
```

where value is any integer between 0 and 1000.

10. Set the authentication type:

```
(config vpn ipsec tunnel ipsec_example)> auth type value
(config vpn ipsec tunnel ipsec_example)>
```

where value is one of:

- secret: Uses a pre-shared key (PSK) to authenticate with the remote peer.
  a. Set the pre-shared key:

```
(config vpn ipsec tunnel ipsec_example)> auth secret key
(config vpn ipsec tunnel ipsec_example)>
```

- rsasig: Uses a private RSA key to authenticate with the remote peer.
  a. For the private_key parameter, paste the device's private RSA key in PEM format:

```
(config vpn ipsec tunnel ipsec_example)> auth private_key key
(config vpn ipsec tunnel ipsec_example)>
```

  b. Set the private key passphrase that is used to decrypt the private key. Leave blank if the private key is not encrypted.

```
(config vpn ipsec tunnel ipsec_example)> auth private_key_
passphrase passphrase
(config vpn ipsec tunnel ipsec_example)>
```

  c. For the peer_public_key parameter, paste the peer's public RSA key in PEM format:

```
(config vpn ipsec tunnel ipsec_example)> auth peer_public_key key
(config vpn ipsec tunnel ipsec_example)>
```

- x509: Uses private key and X.509 certificates to authenticate with the remote peer.
  a. For the private_key parameter, paste the device's private RSA key in PEM format:

```
(config vpn ipsec tunnel ipsec_example)> auth private_key key
(config vpn ipsec tunnel ipsec_example)>
```

  b. Set the private key passphrase that is used to decrypt the private key. Leave blank if the private key is not encrypted.

```
(config vpn ipsec tunnel ipsec_example)> auth private_key_
passphrase passphrase
(config vpn ipsec tunnel ipsec_example)>
```


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c. For the cert parameter, paste the local X.509 certificate in PEM format:

```
(config vpn ipsec tunnel ipsec_example)> auth cert certificate
(config vpn ipsec tunnel ipsec_example)>
```

d. Set the method for verifying the peer's X.509 certificate:

```
(config vpn ipsec tunnel ipsec_example)> auth peer_certify value
(config vpn ipsec tunnel ipsec_example)>
```

where value is either:

- cert: Uses the peer's X.509 certificate in PEM format for verification.
  - For the peer_cert parameter, paste the peer's X.509 certificate in PEM format:

    ```
    (config vpn ipsec tunnel ipsec_example)> auth peer_cert
    certificate
    (config vpn ipsec tunnel ipsec_example)>
    ```

- ca: Uses the Certificate Authority chain for verification.
  - For the ca_cert parameter, paste the Certificate Authority (CA) certificates. These must include all peer certificates in the chain up to the root CA certificate, in PEM format.

    ```
    (config vpn ipsec tunnel ipsec_example)> auth ca_cert cert_
    chain
    (config vpn ipsec tunnel ipsec_example)>
    ```

11. (Optional) Configure the device to connect to its remote peer as an XAUTH client:

a. Enable XAUTH client functionality:

```
(config vpn ipsec tunnel ipsec_example)> xauth_client enable true
(config vpn ipsec tunnel ipsec_example)>
```

b. Set the XAUTH client username:

```
(config vpn ipsec tunnel ipsec_example)> xauth_client username name
(config vpn ipsec tunnel ipsec_example)>
```

c. Set the XAUTH client password:

```
(config vpn ipsec tunnel ipsec_example)> xauth_client password pwd
(config vpn ipsec tunnel ipsec_example)>
```

12. (Optional) Enable MODECFG client functionality:

MODECFG client functionality configures the device to receive configuration information, such as the private IP address, from the remote peer.

a. Enable MODECFG client functionality:

```
(config vpn ipsec tunnel ipsec_example)> modecfg_client enable true
(config vpn ipsec tunnel ipsec_example)>
```


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13. Configure the local endpoint:
    a. Set the method for determining the local network interface:

```
(config vpn ipsec tunnel ipsec_example)> local type value
(config vpn ipsec tunnel ipsec_example)>
```

    where value is either:
    - defaultroute: Uses the same network interface as the default route.
    - interface: Select the interface to be used as the local endpoint.

    b. Set the ID type:

```
(config vpn ipsec tunnel ipsec_example)> local id type value
(config vpn ipsec tunnel ipsec_example)>
```

    where value is one of:
    - auto: The ID will be automatically determined from the value of the tunnel endpoints.
    - raw: Enter an ID and have it passed unmodified to the underlying IPsec stack.

      Set the unmodified ID that will be passed:

```
(config vpn ipsec tunnel ipsec_example)> local id raw_id id
(config vpn ipsec tunnel ipsec_example)>
```

    - any: Any ID will be accepted.
    - ipv4: The ID will be interpreted as an IPv4 address and sent as an ID_IPV4_ADDR IKE identity.

      Set an IPv4 formatted ID. This can be a fully-qualified domain name or an IPv4 address.

```
(config vpn ipsec tunnel ipsec_example)> local id ipv4_id id
(config vpn ipsec tunnel ipsec_example)>
```

    - ipv6: The ID will be interpreted as an IPv6 address and sent as an ID_IPV6_ADDR IKE identity.

      Set an IPv6 formatted ID. This can be a fully-qualified domain name or an IPv6 address.

```
(config vpn ipsec tunnel ipsec_example)> local id ipv6_id id
(config vpn ipsec tunnel ipsec_example)>
```

    - rfc822: The ID will be interpreted as an RFC822 (email address).

      Set the ID in Internet email address format:

```
(config vpn ipsec tunnel ipsec_example)> local id rfc822_id id
(config vpn ipsec tunnel ipsec_example)>
```

    - fqdn: The ID will be interpreted as FQDN (Fully Qualified Domain Name) and sent as an ID_FQDN IKE identity.

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Set the ID as an FQDN:

```
(config vpn ipsec tunnel ipsec_example)> local id rfc822_id id
(config vpn ipsec tunnel ipsec_example)>
```

- keyid: The ID will be interpreted as a Key ID and sent as an ID_KEY_ID IKE identity.

  Set the key ID:

  ```
  (config vpn ipsec tunnel ipsec_example)> local id keyid_id id
  (config vpn ipsec tunnel ipsec_example)>
  ```

14. Configure the remote endpoint:
    a. Set the hostname or IP address of the remote endpoint:

    ```
    (config vpn ipsec tunnel ipsec_example)> remote hostname value
    (config vpn ipsec tunnel ipsec_example)>
    ```

    If your device is not configured to initiate the IPsec connection (see ike initiate), you can also use the keyword any, which means that the hostname is dynamic or unknown.

    b. Set the ID type:

    ```
    (config vpn ipsec tunnel ipsec_example)> remote id type value
    (config vpn ipsec tunnel ipsec_example)>
    ```

    where value is one of:

    - auto: The ID will be automatically determined from the value of the tunnels endpoints.
    - raw: Enter an ID and have it passed unmodified to the underlying IPsec stack.

      Set the unmodified ID that will be passed:

      ```
      (config vpn ipsec tunnel ipsec_example)> remote id raw_id id
      (config vpn ipsec tunnel ipsec_example)>
      ```

    - any: Any ID will be accepted.
    - ipv4: The ID will be interpreted as an IPv4 address and sent as an ID_IPV4_ADDR IKE identity.

      Set an IPv4 formatted ID. This can be a fully-qualified domain name or an IPv4 address.

      ```
      (config vpn ipsec tunnel ipsec_example)> remote id ipv4_id id
      (config vpn ipsec tunnel ipsec_example)>
      ```

    - ipv6: The ID will be interpreted as an IPv6 address and sent as an ID_IPV6_ADDR IKE identity.

      Set an IPv6 formatted ID. This can be a fully-qualified domain name or an IPv6 address.

      ```
      (config vpn ipsec tunnel ipsec_example)> remote id ipv6_id id
      (config vpn ipsec tunnel ipsec_example)>
      ```


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- rfc822: The ID will be interpreted as an RFC822 (email address).

  Set the ID in Internet email address format:

```
(config vpn ipsec tunnel ipsec_example)> remote id rfc822_id id
(config vpn ipsec tunnel ipsec_example)>
```

- fqdn: The ID will be interpreted as FQDN (Fully Qualified Domain Name) and sent as an ID_FQDN IKE identity.

  Set the ID as an FQDN:

```
(config vpn ipsec tunnel ipsec_example)> remote id rfc822_id id
(config vpn ipsec tunnel ipsec_example)>
```

- keyid: The ID will be interpreted as a Key ID and sent as an ID_KEY_ID IKE identity.

  Set the key ID:

```
(config vpn ipsec tunnel ipsec_example)> remote id keyid_id id
(config vpn ipsec tunnel ipsec_example)>
```

18. Configure IKE settings:

a. Set the IKE version:

```
(config vpn ipsec tunnel ipsec_example)> ike version value
(config vpn ipsec tunnel ipsec_example)>
```

where value is either ikev1 or ikev2. This setting must match the peer's IKE version.

b. Determine whether the device should initiate the key exchange, rather than waiting for an incoming request. By default, the device will initiate the key exchange. This must be disabled if remote hostname is set to any. To disable:

```
(config vpn ipsec tunnel ipsec_example)> ike initiate false
(config vpn ipsec tunnel ipsec_example)>
```

c. Set the IKE phase 1 mode:

```
(config vpn ipsec tunnel ipsec_example)> ike mode value
(config vpn ipsec tunnel ipsec_example)>
```

where value is either **aggressive** or **main**.

d. Padding of IKE packets is enabled by default and should normally not be disabled except for compatibility purposes. To disable:

```
(config vpn ipsec tunnel ipsec_example)> ike pad false
(config vpn ipsec tunnel ipsec_example)>
```

e. Set the amount of time that the IKE security association expires after a successful negotiation and must be re-authenticated:

```
(config vpn ipsec tunnel ipsec_example)> ike phase1_lifetime value
(config vpn ipsec tunnel ipsec_example)>
```


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where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set phase1_lifetime to ten minutes, enter either 10m or 600s:

```
(config vpn ipsec tunnel ipsec_example)> ike phase1_lifetime 600s
(config vpn ipsec tunnel ipsec_example)>
```

The default is three hours.

f. Set the amount of time that the IKE security association expires after a successful negotiation and must be renewed.

```
(config vpn ipsec tunnel ipsec_example)> ike phase2_lifetime value
(config vpn ipsec tunnel ipsec_example)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set phase2_lifetime to ten minutes, enter either 10m or 600s:

```
(config vpn ipsec tunnel ipsec_example)> ike phase2_lifetime 600s
(config vpn ipsec tunnel ipsec_example)>
```

The default is one hour.

g. Set a randomizing amount of time before the IPsec tunnel is renegotiated:

```
(config vpn ipsec tunnel ipsec_example)> ike lifetime_margin value
(config vpn ipsec tunnel ipsec_example)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set lifetime_margin to ten minutes, enter either 10m or 600s:

```
(config vpn ipsec tunnel ipsec_example)> ike lifetime_margin 600s
(config vpn ipsec tunnel ipsec_example)>
```

The default is nine minutes.

h. Configure the types of encryption, hash, and Diffie-Hellman group to use during phase 1:

i. Add a phase 1 proposal:

```
(config vpn ipsec tunnel ipsec_example)> add ike phase1_proposal end
(config vpn ipsec tunnel ipsec_example ike phase1_proposal 0)>
```

ii. Set the type of encryption to use during phase 1:

```
(config vpn ipsec tunnel ipsec_example ike phase1_proposal 0)>
cipher value
(config vpn ipsec tunnel ipsec_example ike phase1_proposal 0)>
```

where value is one of 3des, aes128, aes192, aes256, or null. The default is 3des.

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iii. Set the type of hash to use during phase 1 to verify communication integrity:

```
(config vpn ipsec tunnel ipsec_example ike phase1_proposal #)> hash
value
(config vpn ipsec tunnel ipsec_example ike phase1_proposal #)>
```

where value is one of md5, sha1, sha256, sha384, or sha512. The default is sha1.

iv. Set the type of Diffie-Hellman group to use for key exchange during phase 1:

```
(config vpn ipsec tunnel ipsec_example ike phase1_proposal #)> dh_
group value
(config vpn ipsec tunnel ipsec_example ike phase1_proposal #)>
```

where value is one of ecp384, modp768, modp1024, modp1536, modp2048, modp3072, modp4096, modp6144, or modp8192, . The default is modp1024.

v. (Optional) Add additional phase 1 proposals:

1. Move back one level in the schema:

```
(config vpn ipsec tunnel ipsec_example ike phase1_proposal #)>
..
(config vpn ipsec tunnel ipsec_example ike phase1_proposal)>
```

2. Add an additional proposal:

```
(config vpn ipsec tunnel ipsec_example ike phase1_proposal)> add
end
(config vpn ipsec tunnel ipsec_example ike phase1_proposal 1)>
```

Repeat the above steps to set the type of encryption, hash, and Diffie-Hellman group for the additional proposal.

3. Repeat to add more phase 1 proposals.

i. Configure the types of encryption, hash, and Diffie-Hellman group to use during phase 2:

1. Move back two levels in the schema:

```
(config vpn ipsec tunnel ipsec_example ike phase1_proposal #)> .. ..
(config vpn ipsec tunnel ipsec_example ike)>
```

2. Add a phase 2 proposal:

```
(config vpn ipsec tunnel ipsec_example ike)> add ike phase2_proposal
end
(config vpn ipsec tunnel ipsec_example ike phase2_proposal #)>
```

3. Set the type of encryption to use during phase 2:

```
(config vpn ipsec tunnel ipsec_example ike phase2_proposal #)>
cipher value
(config vpn ipsec tunnel ipsec_example ike phase2_proposal #)>
```

where value is one of 3des, aes128, aes192, aes256, or null. The default is 3des.

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h. Set the type of hash to use during phase 2 to verify communication integrity:

```
(config vpn ipsec tunnel ipsec_example ike phase2_proposal 6)> hash
value
(config vpn ipsec tunnel ipsec_example ike phase2_proposal 6)>
```

where value is one of md5, sha1, sha256, sha384, or sha512. The default is sha1.

i. Set the type of Diffie-Hellman group to use for key exchange during phase 2:

```
(config vpn ipsec tunnel ipsec_example ike phase2_proposal 6)> dh_
group value
(config vpn ipsec tunnel ipsec_example ike phase2_proposal 6)>
```

where value is one of ecp384, modp768, modp1024, modp1536, modp2048, modp3072, modp4096, modp6144, or modp8192, . The default is modp1024.

j. (Optional) Add additional phase 2 proposals:

I. Move back one level in the schema:

```
(config vpn ipsec tunnel ipsec_example ike phase2_proposal 6)>
..
(config vpn ipsec tunnel ipsec_example ike phase2_proposal)>
```

II. Add an additional proposal:

```
(config vpn ipsec tunnel ipsec_example ike phase2_proposal)> add
end
(config vpn ipsec tunnel ipsec_example ike phase2_proposal 1)>
```

Repeat the above steps to set the type of encryption, hash, and Diffie-Hellman group for the additional proposal.

III. Repeat to add more phase 2 proposals.

16. (Optional) Configure dead peer detection:

Dead peer detection is enabled by default. Dead peer detection uses periodic IKE transmissions to the remote endpoint to detect whether tunnel communications have failed, allowing the tunnel to be automatically restarted when failure occurs.

a. Change to the root of the configuration schema:

```
(config vpn ipsec tunnel ipsec_example ike phase2_proposal 6)> ...
(config)>
```

b. To disable dead peer detection:

```
(config)> vpn ipsec tunnel ipsec_example dpd enable false
(config)>
```

c. Set the number of seconds between transmissions of dead peer packets. Dead peer packets are only sent when the tunnel is idle. The default is 60.

```
(config)> vpn ipsec tunnel ipsec_example dpd delay value
(config)>
```


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c. Set the number of seconds to wait for a response from a dead peer packet before assuming the tunnel has failed. The default is 90.

```
(config)> vpn ipsec tunnel ipsec_example dpd timeout value
(config)>
```

17. (Optional) Create a list of destination networks that require source NAT:

a. Add a destination network:

```
(config)> add vpn ipsec tunnel ipsec_example nat end
(config vpn ipsec tunnel ipsec_example nat 0)>
```

b. Set the IPv4 address and optional netmask of a destination network that requires source NAT. You can also use any, meaning that any destination network connected to the tunnel will use source NAT.

```
(config vpn ipsec tunnel ipsec_example nat 0)> dst value
(config vpn ipsec tunnel ipsec_example nat 0)>
```

18. Configure policies that define the network traffic that will be encapsulated by this tunnel:

a. Change to the root of the configuration schema:

```
(config vpn ipsec tunnel ipsec_example nat 0)> ...
(config)>
```

b. Add a policy:

```
(config)> add vpn ipsec tunnel ipsec_example policy end
(config vpn ipsec tunnel ipsec_example policy 0)>
```

c. Set the type of local network policy:

```
(config vpn ipsec tunnel ipsec_example policy 0)> local type value
(config vpn ipsec tunnel ipsec_example policy 0)>
```

where value is one of:

- address: The address of a local network interface.

  Set the address:

  i. Use the ? to determine available interfaces:

```
(config vpn ipsec tunnel ipsec_example policy 0)> local
address ?

Address: The local network interface to use the address of.
This field must be set when 'Type' is set to 'Address'.
Format:
  defaultip
  defaultlinklocal
  lan1
  lan_hotspot
  loopback
```


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```
  wan1
  wwan1
  wwan2
Current value:

(config vpn ipsec tunnel ipsec_example policy 0)> local
address
```

1. Set the interface. For example:

```
(config vpn ipsec tunnel ipsec_example policy 0)> local
address wan1
(config vpn ipsec tunnel ipsec_example policy 0)>
```

- network: The subnet of a local network interface.

  Set the network:

  1. Use the ? to determine available interfaces:

```
(config vpn ipsec tunnel ipsec_example policy 0)> local
network ?

Interface: The network interface.
Format:
  defaultip
  defaultlinklocal
  lan1
  lan_hotspot
  loopback
  wan1
  wwan1
  wwan2
Current value:

(config vpn ipsec tunnel ipsec_example policy 0)> local
network
```

  1. Set the interface. For example:

```
(config vpn ipsec tunnel ipsec_example policy 0)> local
network wan1
(config vpn ipsec tunnel ipsec_example policy 0)>
```

- custom: A user-defined network.

  Set the custom network:

```
(config vpn ipsec tunnel ipsec_example policy 0)> local custom
value
(config vpn ipsec tunnel ipsec_example policy 0)>
```

  where value is the IPv4 address and optional netmask. The keyword any can also be used.

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- request: Requests a network from the remote peer.

c. Set the IP address and optional netmask of the remote network. The keyword any can also be used.

```
(config vpn ipsec tunnel ipsec_example policy 0)> remote network value
(config vpn ipsec tunnel ipsec_example policy 0)>
```

18. (Optional) Change the NAT keep alive time:

a. Change to the root of the configuration schema:

```
(config vpn ipsec tunnel ipsec_example policy 0)> ...
(config)>
```

b.

```
(config)> vpn ipsec advanced keep_alive value
(config)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

For example, to set keep_alive to ten minutes, enter either 10m or 600s:

```
(config)> vpn ipsec advanced keep_alive 600s
(config)>
```

The default is 40 seconds.

20. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

21. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Configure IPsec failover

You can configure the TX64 device to fail over from a primary IPsec tunnel to a backup tunnel.

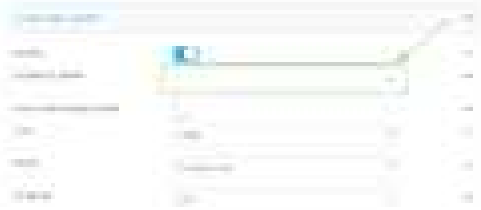
During configuration of the backup IPsec tunnel, identify the primary IPsec tunnel in the **Preferred tunnel** parameter. The **Preferred tunnel** parameter instructs the backup IPsec tunnel to start only when the preferred tunnel has been determined to have failed. It will continue to operate until the preferred tunnel returns to full operational status.

Required configuration items

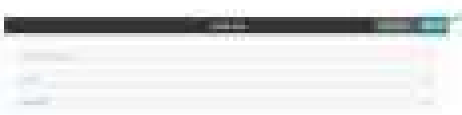
- Two configured IPsec tunnels: The primary tunnel, and the backup tunnel.
- Identify the primary tunnel during configuration of the backup tunnel.

WebUI

1. Configure the primary IPsec tunnel. See Configure an IPsec tunnel for instructions.
2. Create a backup IPsec tunnel. See Configure an IPsec tunnel for instructions.
3. During configuration of the backup IPsec tunnel, identify the primary IPsec tunnel in the **Preferred tunnel** parameter.



4. Click **Apply** to save the configuration and apply the change.



Command Line

1. Configure the primary IPsec tunnel. See Configure an IPsec tunnel for instructions.
2. Create a backup IPsec tunnel. See Configure an IPsec tunnel for instructions.
3. During configuration of the backup IPsec tunnel, identify the primary IPsec tunnel:
   a. Use the ? to view a list of available tunnels:

```
(config vpn ipsec tunnel backup_ipsec_tunnel)> ipsec_failover ?

Preferred tunnel: This tunnel will not start until the preferred tunnel
has failed. It will continue
to operate until the preferred tunnel returns to full operation status.
```


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```
Format:
  primary_ipsec_tunnel
  backup_ipsec_tunnel
Optional: yes
Current value:

(config vpn ipsec tunnel backup_ipsec_tunnel)> ipsec_failover
```

b. Set the primary IPsec tunnel:

```
(config vpn ipsec tunnel backup_ipsec_tunnel)> ipsec_failover primary_
ipsec_tunnel
(config vpn ipsec tunnel backup_ipsec_tunnel)>
```

4. Save the configuration and apply the change:

```
(config vpn ipsec tunnel backup_ipsec_tunnel)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure SureLink active recovery for IPsec

You can configure the TX64 device to regularly probe IPsec client connections to determine if the connection has failed and take remedial action.

You can also configure the IPsec tunnel to fail over to a backup tunnel. See Configure IPsec failover for further information.

Required configuration items

- A valid IPsec configuration. See Configure an IPsec tunnel for configuration instructions.
- Enable IPsec active recovery.
- The behavior of the TX64 device upon IPsec failure, either:
  - Restart the IPsec interface.
  - Reboot the device.

Additional configuration items

- The interval between connectivity tests.
- Whether the interface should be considered to have failed if one of the test targets fails, or all of the test targets fail.
- The number of probe attempts before the IPsec connection is considered to have failed.
- The amount of time that the device should wait for a response to a probe attempt before considering it to have failed.

To configure the TX64 device to regularly probe the IPsec connection:

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Web UI

1. Log into the TX64 Web UI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **VPN** > **IPsec**.
4. Create a new IPsec tunnel or select an existing one:
   - To create a new IPsec tunnel, see Configure an IPsec tunnel.
   - To edit an existing IPsec tunnel, click to expand the appropriate tunnel.
5. After creating or selecting the IPsec tunnel, click **Active recovery**.



6. **Enable** active recovery.

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7. For **Restart interface**, enable to configure the device to restart the interface when its connection is considered to have failed. This is useful for interfaces that may regain connectivity after restarting, such as a cellular modem.
8. For **Reboot device**, enable to instruct the device to reboot when the WAN connection is considered to have failed.
9. Change the **Interval** between connectivity tests.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

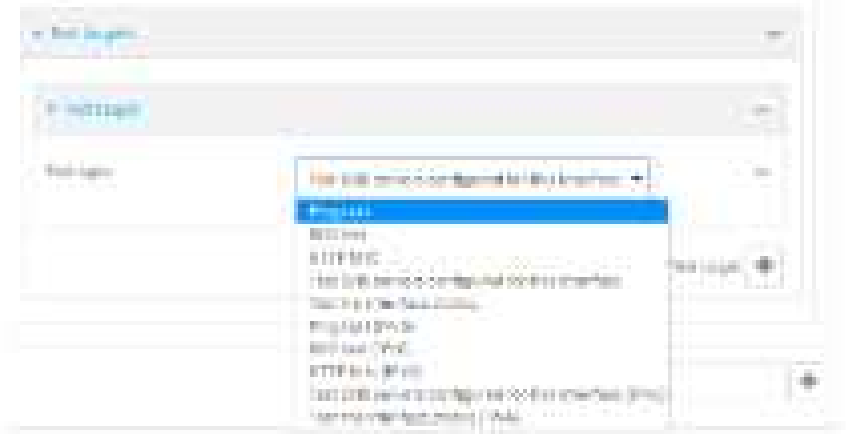
   For example, to set **Interval** to ten minutes, enter **10m** or **600s**.

   The default is **15** minutes.
10. For **Success condition**, determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets.
11. For **Attempts**, type the number of probe attempts before the WAN is considered to have failed.
12. For **Response timeout**, type the amount of time that the device should wait for a response to a probe attempt before considering it to have failed.

    Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

    For example, to set **Response timeout** to ten minutes, enter **10m** or **600s**.

    The default is **15** seconds.
13. Add a test target:
    a. Click to expand **Test targets**.



    b. For **Add Test target**, click **+**.
    c. Select the **Test type**:
       - **Ping test** or **Ping test (IPv6)**: Tests connectivity by sending an ICMP echo request to the hostname or IP address specified in **Ping host**. You can also optionally change the number of bytes in the **Ping payload size**.
       - **DNS test** or **DNS test (IPv6)**: Tests connectivity by sending a DNS query to the specified DNS server.

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- **HTTP test**/**HTTP test (IPv6)**: Tests connectivity by sending an HTTP or HTTPS GET request to the URL specified in Web servers. The URL should take the format of http[s]://hostname/[path].
- **Test DNS servers configured for this interface** or **Test DNS servers configured for this interface (IPv6)**: Tests connectivity by sending a DNS query to the DNS servers configured for this interface.
- **Test the interface status** or **Test the interface status IPv6**: The interface is considered to be down based on:
  - **Down time**: The amount of time that the interface can be down before this test is considered to have failed.

    Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

    For example, to set Down time to ten minutes, enter 10m or 600s.

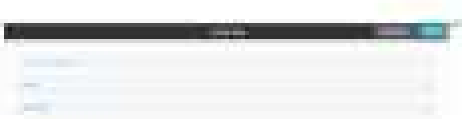
    The default is 60 seconds.
  - **Initial connection time**: The amount of time to wait for an initial connection to the interface before this test is considered to have failed.

    Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

    For example, to set Initial connection time to ten minutes, enter 10m or 600s.

    The default is 60 seconds.

14. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Create a new IPsec tunnel, or edit an existing one:
   - To create a new IPsec tunnel, see Configure an IPsec tunnel.
   - To edit an existing IPsec tunnel, change to the IPsec tunnels node in the configuration schema. For example, for an IPsec tunnel named ipsec_example, change to the ipsec_example node in the configuration schema:

```
(config)> vpn ipsec tunnel ipsec_example
(config vpn ipsec tunnel ipsec_example)>
```


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4. Enable active recovery:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor enable true
(config vpn ipsec tunnel ipsec_example)>
```

5. To configure the device to restart the interface when its connection is considered to have failed:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor restart true
(config vpn ipsec tunnel ipsec_example)>
```

This is useful for interfaces that may regain connectivity after restarting, such as a cellular modem.

6. To configure the device to reboot when the interface is considered to have failed:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor reboot enable
(config vpn ipsec tunnel ipsec_example)>
```

7. Set the interval between connectivity tests:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor interval value
(config vpn ipsec tunnel ipsec_example)>
```

Where value is any number of weeks, days, hours, minutes, or seconds, and takes the format: *number*[w|d|h|m|s].

For example, to set interval to ten minutes, enter either 10m or 600s:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor interval 600s
(config vpn ipsec tunnel ipsec_example)>
```

The default is 15 minutes.

8. Determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor success_
condition value
(config vpn ipsec tunnel ipsec_example)>
```

Where value is either one or all.

9. Set the number of probe attempts before the VPN is considered to have failed:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor attempts num
(config vpn ipsec tunnel ipsec_example)>
```

The default is 3.

10. Set the amount of time that the device should wait for a response to a probe attempt before considering it to have failed:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor timeout value
(config vpn ipsec tunnel ipsec_example)>
```


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where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set timeout to ten minutes, enter either 10m or 600s:

```
(config vpn ipsec tunnel ipsec_example)> connection_monitor interval 600s
(config vpn ipsec tunnel ipsec_example)>
```

The default is 15 seconds.

11. Configure test targets:

a. Add a test target:

```
(config vpn ipsec tunnel ipsec_example)> add connection_monitor target
end
(config vpn ipsec tunnel ipsec_example connection_monitor target 0)>
```

b. Set the test type:

```
(config vpn ipsec tunnel ipsec_example connection_monitor target 0)>
test value
(config vpn ipsec tunnel ipsec_example connection_monitor target 0)>
```

where value is one of:

- ping (IPv4) or ping6 (IPv6): Tests connectivity by sending an ICMP echo request to a specified hostname or IP address.
  - Specify the hostname or IP address by using ping_host or ping_host6:

    ```
    (config vpn ipsec tunnel ipsec_example connection_monitor
    target 0)> ping_host host
    (config vpn ipsec tunnel ipsec_example connection_monitor
    target 0)>
    ```

  - (Optional) Set the size, in bytes, of the ping packet by using ping_size or ping_size6:

    ```
    (config vpn ipsec tunnel ipsec_example connection_monitor
    target 0)> ping_size [num]
    (config vpn ipsec tunnel ipsec_example connection_monitor
    target 0)>
    ```

- dns (IPv4) or dns6 (IPv6): Tests connectivity by sending a DNS query to the specified DNS server.
  - Specify the DNS server. Allowed value is the IP address of the DNS server.

    ```
    (config vpn ipsec tunnel ipsec_example connection_monitor
    target 0)> dns_server ip_address
    (config vpn ipsec tunnel ipsec_example connection_monitor
    target 0)>
    ```

- dns_configured (IPv4) or dns_configured6 (IPv6): Tests connectivity by sending a DNS query to the DNS servers configured for this interface.

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- http (IPv4) or http6 (IPv6): Tests connectivity by sending an HTTP or HTTPS GET request to the specified URL.
  - Specify the url. Allowed value uses the format http[s]://hostname/[path].

```
(config vpn ipsec tunnel ipsec_example connection_monitor
target 0)> http_url url
(config vpn ipsec tunnel ipsec_example connection_monitor
target 0)>
```

- interface_up (IPv4) or interface_up6 (IPv6): : The interface is considered to be down based on the interfaces down time, and the amount of time an initial connection to the interface takes before this test is considered to have failed.
  - [Optional] Set the amount of time that the interface can be down before this test is considered to have failed:

```
(config vpn ipsec tunnel ipsec_example connection_monitor
target 0)> interface_down_time value
(config vpn ipsec tunnel ipsec_example connection_monitor
target 0)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set interface_down_time to ten minutes, enter either 10m or 600s:

```
(config ipsec tunnel ipsec_example connection_monitor target
0)> interface_down_time 600s
(config ipsec tunnel ipsec_example connection_monitor target
0)>
```

The default is 60 seconds.

  - [Optional] Set the amount of time to wait for an initial connection to the interface before this test is considered to have failed:

```
(config vpn ipsec tunnel ipsec_example connection_monitor
target 0)> interface_timeout value
(config vpn ipsec tunnel ipsec_example connection_monitor
target 0)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set interface_timeout to ten minutes, enter either 10m or 600s:

```
(config network interface my_wan ipv4 connection_monitor target
0)> interface_timeout 600s
(config network interface my_wan ipv4 connection_monitor target
0)>
```

The default is 60 seconds.

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12. Save the configuration and apply the change:

```
(config tpsec tunnel tpsec_example connection_monitor target 0)> save
Configuration saved.
>
```

13. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show IPsec status and statistics

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, select Status > IPsec.
The IPsec page appears.
3. To view configuration details about an IPsec tunnel, click the (configuration) icon in the upper right of the tunnel's status pane.

Command line

1. Log into the TX64 command line as a user with Admin access.
Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. To display details about all configured OpenVPN servers, type the following at the prompt:

```
> show ipsec all

Name     Enable  Status   Hostname
-------  ------  -------  -------------
ipsec1   true    up       192.168.2.1
vpn1     false   pending  192.168.3.1

>
```

3. To display details about a specific server:

```
> show ipsec tunnel ipsec1

Tunnel                  : ipsec1
Enable                  : true
Status                  : pending
Hostname                : 192.168.2.1
Zone                    : ipsec
Mode                    : tunnel
Type                    : esp

>
```


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4. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configure a Simple Certificate Enrollment Protocol client

Simple Certificate Enrollment Protocol (SCEP) is a mechanism that allows for large-scale X.509 certificate deployment. You can configure TX64 devices to function as a SCEP client that will connect to a SCEP server that is used to sign Certificate Signing Requests (CSRs), provide Certificate Revocation Lists (CRLs), and distribute valid certificates from a Certificate Authority (CA).

Required configuration

- Enable the SCEP client.
- The fully-qualified domain name of the SCEP server to be used for certificate requests.
- The challenge password provided by the SCEP server that the SCEP client will use when making SCEP requests.
- The distinguished name to be used for the CSR.
- The file name of the Certificate Revocation List (CRL) from the Certificate Authority (CA).

Additional configuration

- The number of days that the certificate enrollment can be renewed, prior to the request expiring.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



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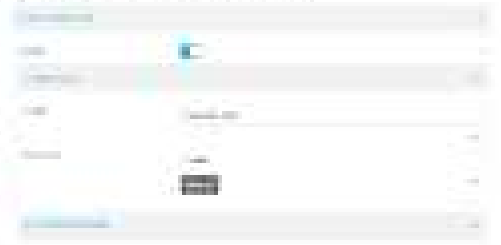
5. Click **Network > SCEP Client**.
4. For **Add clients**, enter a name for the SCEP client and click **+**.



The new SCEP client configuration is displayed.



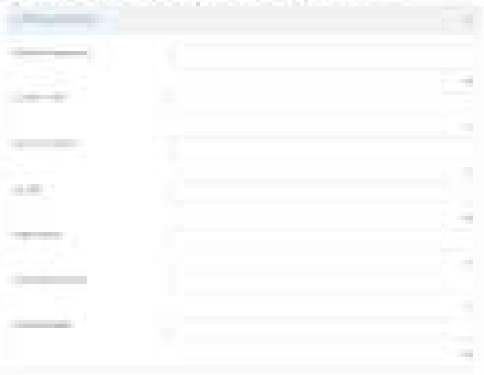
5. Click **Enable** to enable the SCEP client.
6. For **Renewable Time**, type the number of days that the certificate enrollment can be renewed, prior to the request expiring. This value is configured on the SCEP server, and is used by the TX64 device to determine when to start attempting to auto-renew an existing certificate. The default is 7.
7. [Optional] For **CRL file name**, type the filename of the Certificate Revocation List (CRL) from the CA.
   The CRL is stored on the TX64 device in the */etc/config/scep_client/client_name* directory.
8. Click to expand **SCEP server**.



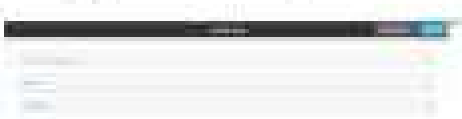
9. For **FQDN**, type the fully qualified domain name or IP address of the SCEP server.
10. For **Password**, type the challenge password as configured on the SCEP server.

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11. Click to expand Distinguished Name.



12. Type the value for each appropriate Distinguished Name attribute.
13. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add a new SCEP client:

```
(config)> add network scep_client scep_client_name
(config network scep_client scep_client_name
)>
```

4. Enable the SCEP client:

```
(config network scep_client scep_client_name)> enable true
(config network scep_client scep_client_name)>
```

5. Set the url parameter to the fully qualified domain name or IP address of the SCEP server:

```
(config network scep_client scep_client_name)> server_url
https://scep.example.com
(config network scep_client scep_client_name)>
```

6. Set the challenge password as configured on the SCEP server:

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```
(config network scep_client scep_client_name)> server password challenge_
password
(config network scep_client scep_client_name)>
```

7. Set Distinguished Name attributes:
   a. Set the Domain Component:

```
(config network scep_client scep_client_name)> distinguished_name dc
value
(config network scep_client scep_client_name)>
```

   b. Set the two letter Country Code:

```
(config network scep_client scep_client_name)> distinguished_name c
value
(config network scep_client scep_client_name)>
```

   c. Set the State or Province:

```
(config network scep_client scep_client_name)> distinguished_name st
value
(config network scep_client scep_client_name )>
```

   d. Set the Locality:

```
(config network scep_client scep_client_name)> distinguished_name l
value
(config network scep_client scep_client_name)>
```

   e. Set the Organization:

```
(config network scep_client scep_client_name)> distinguished_name o
value
(config network scep_client scep_client_name)>
```

   f. Set the Organizational Unit:

```
(config network scep_client scep_client_name)> distinguished_name ou
value
(config network scep_client scep_client_name)>
```

   g. Set the Common Name:

```
(config network scep_client scep_client_name)> distinguished_name cn
value
(config network scep_client scep_client_name)>
```

8. Set the number of days that the certificate enrollment can be renewed, prior to the request expiring. This value is configured on the SCEP server, and is used by the TX64 device to determine when to start attempting to auto-renew an existing certificate. The default is 7.

```
(config network scep_client scep_client_name)> renewable_time integer
(config network scep_client scep_client_name)>
```


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9. (Optional) Set the filename of the Certificate Revocation List (CRL) from the CA.
   The CRL is stored on the TX64 device in the /etc/config/scep_client/client_name directory.

```
(config network scep_client scep_client_name)> crl_name name
(config network scep_client scep_client_name)>
```

10. Save the configuration and apply the change:

```
(config network scep_client scep_client_name)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.
    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Example: SCEP client configuration with Fortinet SCEP server

In this example configuration, we will configure the TX64 device as a SCEP client that will connect to a Fortinet SCEP server.

Fortinet configuration

On the Fortinet server:

1. Enable ports for SCEP services:
   a. From the menu, select Network > Interfaces.
   b. Select the appropriate port and click Edit.
   c. For Access Rights > Services, enable the following services:
      - HTTPS > SCEP
      - HTTPS > CRL Downloads
      - HTTP > SCEP
      - HTTP > CRL Downloads
   d. The remaining fields can be left at their defaults or changed as appropriate.
   e. Click OK.
2. Create a Certificate Authority (CA):
   a. From the menu, click Certificate Authorities > Local CAs.
   b. Click Create New.
   c. Type a Certificate ID for the CA, for example, fortinet_example_ca.
   d. Complete the Subject Information fields.
   e. The remaining fields can be left at their defaults or changed as appropriate.
   f. Click OK.
3. Edit SCEP settings:
   a. From the menu, click SCEP > General.
   b. Click Enable SCEP if it is not enabled.
   c. For Default enrollment password, enter a password. The password entered here must correspond to the challenge password configured for the SCEP client on the TX64 device.

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c. The remaining fields can be left at their defaults or changed as appropriate.
d. Click OK.

4. Create an Enrollment Request:
   a. From the menu, click SCEP > Enrollment Requests.
   b. Click Create New.
   c. For Automatic request type, select Wildcard.
   d. For Certificate authority, select the CA created in step 1, above.
   e. Complete the Subject Information fields. The Distinguished Name (DN) attributes entered here must correspond to the Distinguished Name attributes configured for the SCEP client on the TX64 device.
   f. For Renewal > Allow renewal x days before the certified is expired, type the number of days that the certificate enrollment can be renewed, prior to the request expiring. The Renewable Time setting on the TX64 device must match the setting of this parameter.
   g. The remaining fields can be left at their defaults or changed as appropriate.
   h. Click OK.

TX64 configuration

On the TX64 device:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click System. Under Configuration, click Device Configuration.



The Configuration window is displayed.



3. Click Network > SCEP Client.

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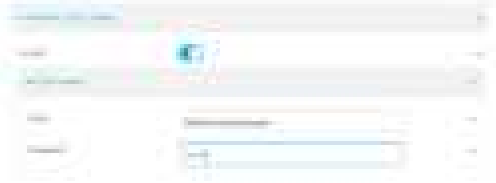
4. For **Add clients**, enter a name for the SCEP client and click **+**.



The new SCEP client configuration is displayed.



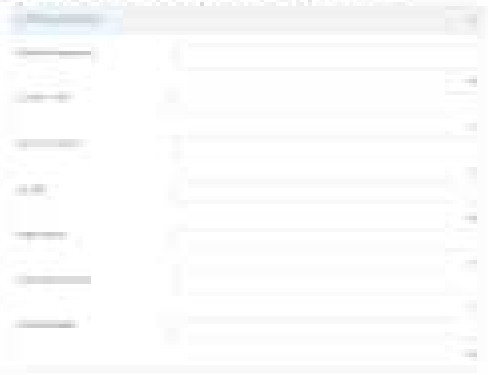
5. Click **Enable** to enable the SCEP client.
6. For **Renewable Time**, type the number of days that the certificate enrollment can be renewed, prior to the request expiring. This value must match the setting of the **Allow renewal x days before the certified is expired** option on the Fortinet server.
7. [Optional] For **CRL file name**, type the filename of the Certificate Revocation List (CRL) from the CA. The filename of the CRL corresponds to the Certificate ID of the CA created on the Fortinet server, for example, **fortinet_example_ca.crt**.
8. Click to expand **SCEP server**.



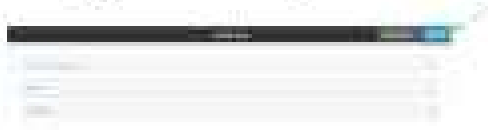
9. For **FQDN**, type the fully qualified domain name or IP address of the Fortinet server.
10. For **Password**, type the challenge password. This corresponds to the **Default enrollment password** on the Fortinet server.

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11. Click to expand Distinguished Name.



12. Type the value for each appropriate Distinguished Name attribute. The values entered here must correspond to the DN attributes in the Enrollment Request on the Fortinet server.
13. Click Apply to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add a new SCEP client, for example, Fortinet_SCEP_client:

```
(config)> add network scep_client Fortinet_SCEP_client
(config network scep_client Fortinet_SCEP_client
)>
```

4. Enable the SCEP client:

```
(config network scep_client Fortinet_SCEP_client)> enable true
(config network scep_client Fortinet_SCEP_client)>
```

5. Set the url parameter to the fully qualified domain name or IP address of the SCEP server:

```
(config network scep_client Fortinet_SCEP_client)> server url
https://fortinet.example.com
(config network scep_client Fortinet_SCEP_client)>
```

6. Set the challenge password as configured on the SCEP server. This corresponds to the Default enrollment password on the Fortinet server.

```
(config network scep_client Fortinet_SCEP_client)> server password
challenge_password
(config network scep_client Fortinet_SCEP_client)>
```

7. Set Distinguished Name attributes. The values entered here must correspond to the DN attributes in the Enrollment Request on the Fortinet server.
   a. Set the Domain Component:

```
(config network scep_client Fortinet_SCEP_client)> distinguished_name dc
value
(config network scep_client Fortinet_SCEP_client)>
```

   b. Set the two letter Country Code:

```
(config network scep_client Fortinet_SCEP_client)> distinguished_name c
value
(config network scep_client Fortinet_SCEP_client)>
```

   c. Set the State or Province:

```
(config network scep_client Fortinet_SCEP_client)> distinguished_name st
value
(config network scep_client Fortinet_SCEP_client)>
```


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e. Set the Locality:

```
(config network scep_client Fortinet_SCEP_client)> distinguished_name l
value
(config network scep_client Fortinet_SCEP_client)>
```

e. Set the Organization:

```
(config network scep_client Fortinet_SCEP_client)> distinguished_name o
value
(config network scep_client Fortinet_SCEP_client)>
```

f. Set the Organizational Unit:

```
(config network scep_client Fortinet_SCEP_client)> distinguished_name ou
value
(config network scep_client Fortinet_SCEP_client)>
```

g. Set the Common Name:

```
(config network scep_client Fortinet_SCEP_client)> distinguished_name cn
value
(config network scep_client Fortinet_SCEP_client)>
```

8. Set the number of days that the certificate enrollment can be renewed, prior to the request expiring. This value must match the setting of the Allow renewal x days before the certificate is expired option on the Fortinet server:

```
(config network scep_client Fortinet_SCEP_client)> renewable_time integer
(config network scep_client Fortinet_SCEP_client)>
```

9. (Optional) Set the filename of the Certificate Revocation List (CRL) from the CA.

The CRL is stored on the TX64 device in the /etc/config/scep_client/client_name directory.

```
(config network scep_client Fortinet_SCEP_client)> crl_name name
(config network scep_client Fortinet_SCEP_client)>
```

10. Save the configuration and apply the changes:

```
(config network scep_client Fortinet_SCEP_client)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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OpenVPN

OpenVPN is an open-source Virtual Private Network (VPN) technology that creates secure point-to-point or site-to-site connections in routed or bridged configurations. OpenVPN uses a custom security protocol that is Secure Socket Layer (SSL) / Transport Layer Security (TLS) for key exchange. It uses standard encryption and authentication algorithms for data privacy and authentication over TCP or UDP.

The OpenVPN server can push the network configuration, such as the topology and IP routes, to OpenVPN clients. This makes OpenVPN simpler to configure as it reduces the chances of a configuration mismatch between the client and server. OpenVPN also supports cipher negotiation between the client and server. This means you can configure the OpenVPN server and clients with a range of different cipher options and the server will negotiate with the client on the cipher to use for the connection.

For more information on OpenVPN, see www.openvpn.net.

OpenVPN modes:

There are two modes for running OpenVPN:

- Routing mode, also known as TUN.
- Bridging mode, also known as TAP.

Routing (TUN) mode

In routing mode, each OpenVPN client is assigned a different IP subnet from the OpenVPN server and other OpenVPN clients. OpenVPN clients use Network Address Translation (NAT) to route traffic from devices connected on its LAN interfaces to the OpenVPN server.

The manner in which the IP subnets are defined depends on the OpenVPN topology in use. The TX64 device supports two types of OpenVPN topology:

OpenVPN Topology	Subnet definition method
net30	Each OpenVPN client is assigned a /30 subnet within the IP subnet specified in the OpenVPN server configuration. With net30 topology, pushed routes are used, with the exception of the default route. Automatic route pushing (redirect-gateway) is not allowed, because this would not inform the firewall and would be blocked.
subnet	Each OpenVPN client connected to the OpenVPN server is assigned an IP address within the IP subnet specified in the OpenVPN server configuration. For the TX64 device, pushed routes are not allowed; you will need to manually configure routes on the device.

For more information on OpenVPN topologies, see OpenVPN topology.

Bridging (TAP) mode

In bridging mode, a LAN interface on the OpenVPN server is assigned to OpenVPN. The LAN interfaces of the OpenVPN clients are on the same IP subnet as the OpenVPN server's LAN interface. This means that devices connected to the OpenVPN client's LAN interface are on the same IP subnet as devices. The TX64 device supports two mechanisms for configuring an OpenVPN server in TAP mode:

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- OpenVPN managed—The TX64 device creates the interface and then uses its standard configuration to set up the connection (for example, its standard DHCP server configuration).
- Device only—IP addressing is controlled by the system, not by OpenVPN.

Additional OpenVPN information

For more information on OpenVPN, see these resources:

Bridging vs. routing

OpenVPN Routing

Configure an OpenVPN server

Required configuration items

- Enable the OpenVPN server.

  The OpenVPN server is enabled by default.
- The mode used by the OpenVPN server, one of:
  - TUN (OpenVPN managed)—Also known as routing mode. Each OpenVPN client is assigned a different IP subnet from the OpenVPN server and other OpenVPN clients. OpenVPN clients use Network Address Translation (NAT) to route traffic from devices connected on its LAN interfaces to the OpenVPN server.
  - TAP - OpenVPN managed—Also known as bridging mode. A more advanced implementation of OpenVPN. The TX64 device creates an OpenVPN interface and uses standard interface configuration (for example, a standard DHCP server configuration).
  - TAP - Device only—An alternate form of OpenVPN bridging mode, in which the device, rather than OpenVPN, controls the interface configuration. If this method is is, the OpenVPN server must be included as a device in either an interface or a bridge.
- The firewall zone to be used by the OpenVPN server.
- The IP network and subnet mask of the OpenVPN server.
- The server's Certificate authority (CA) certificate, and public, private and Diffie-Hellman (DH) keys.
- An OpenVPN authentication group and an OpenVPN user.
- Determine the method of certificate management:
  - Certificates managed by the server.
  - Certificates created externally and added to the server.
- If certificates are created and added to the server, determine the level of authentication:
  - Certificate authentication only.
  - Username and password authentication only.
  - Certificate and username and password authentication.

  If username and password authentication is used, you must create an OpenVPN authentication group and user. See Configure an OpenVPN Authentication Group and User for instructions.
- Certificates and keys:
  - The CA certificate (usually in a ca.crt file).
  - The Public key (for example, server.crt)

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- The Private key (for example, server.key).
- The Diffie Hellman key (usually in dh2048.pem).

- Active recovery configuration. See Configure active recovery for OpenVPN for information about OpenVPN active recovery.

Additional configuration items

- The route metric for the OpenVPN server.
- The range of IP addresses that the OpenVPN server will provide to clients.
- The TCP/UDP port to use. By default, the TX64 device uses port 1194.
- Access control list configuration to restrict access to the OpenVPN server through the firewall.
- Additional OpenVPN parameters.

WebUI

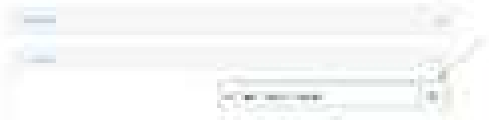
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **VPN** > **OpenVPN** > **Servers**.
4. For **Add**, type a name for the OpenVPN server and click **+**.



The new OpenVPN server configuration is displayed.

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The OpenVPN server is enabled by default. To disable, click **Enable**.

5. For **Device type**, select the mode used by the OpenVPN server, either:
   - **TUN (OpenVPN managed)**
   - **TAP - OpenVPN managed**
   - **TAP - Device only**

   See OpenVPN for information about OpenVPN server modes.
6. If **TUN (OpenVPN managed)** or **TAP - OpenVPN managed** is selected for **Device type**:
   a. For **Zone**, select the firewall zone for the OpenVPN server. For TUN device types, this should be set to **Internal** to treat clients as LAN devices.
   b. [Optional] Select the **Metric** for the OpenVPN server. If multiple active routes match a destination, the route with the lowest metric will be used. The default setting is 0.
   c. For **Address**, type the IP address and subnet mask of the OpenVPN server.
   d. [Optional] For **First IP address** and **Last IP address**, set the range of IP addresses that the OpenVPN server will use when providing IP addresses to clients. The default is from 50 to 99.
7. [Optional] Set the VPN port that the OpenVPN server will use. The default is 1194.
8. For **Server managed certificates**, determine the method of certificate management. If enabled, the server will manage certificates. If not enabled, certificates must be created externally and added to the server.
9. If **Server managed certificates** is not enabled:
   a. Select the **Authentication** type:
      - **Certificate only**: Uses only certificates for client authentication. Each client requires a public and private key.
      - **Username/password only**: Uses a username and password for client authentication. You must create an OpenVPN authentication group and user. See Configure an OpenVPN Authentication Group and User for instructions.
      - **Certificate and username/password**: Uses both certificates and a username and password for client authentication. Each client requires a public and private key, and you must create an OpenVPN authentication group and user. See Configure an OpenVPN Authentication Group and User for instructions.

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b. Paste the contents of the CA certificate (usually in a ca.crt file), the Public key (for example, server.crt), the Private key (for example, server.key), and the Diffie Hellman key (usually in dh2048.pem) into their respective fields. The contents will be hidden when the configuration is saved.

10. [Optional] Click to expand Access control list to restrict access to the OpenVPN server:
    - To limit access to specified IPv4 addresses and networks:
      a. Click IPv4 Addresses.
      b. For Add Address, click +.
      c. For Address, enter the IPv4 address or network that can access the device's service-type. Allowed values are:
         - A single IP address or host name.
         - A network designation in CIDR notation, for example, 192.168.2.0/24.
         - any: No limit to IPv4 addresses that can access the service-type.
      d. Click + again to list additional IP addresses or networks.
    - To limit access to specified IPv6 addresses and networks:
      a. Click IPv6 Addresses.
      b. For Add Address, click +.
      c. For Address, enter the IPv6 address or network that can access the device's service-type. Allowed values are:
         - A single IP address or host name.
         - A network designation in CIDR notation, for example, 2001:db8::/48.
         - any: No limit to IPv6 addresses that can access the service-type.
      d. Click + again to list additional IP addresses or networks.
    - To limit access to hosts connected through a specified interface on the TX64 device:
      a. Click Interfaces.
      b. For Add Interface, click +.
      c. For Interface, select the appropriate interface from the dropdown.
      d. Click + again to allow access through additional interfaces.
    - To limit access based on firewall zones:
      a. Click Zones.
      b. For Add Zone, click +.
      c. For Zone, select the appropriate firewall zone from the dropdown.
         See Firewall configuration for information about firewall zones.
      d. Click + again to allow access through additional firewall zones.
11. [Optional] Click to expand Advanced Options to manually set additional OpenVPN parameters.
    a. Click Enable to enable the use of additional OpenVPN parameters.
    b. Click Override if the additional OpenVPN parameters should override default options.
    c. For OpenVPN parameters, type the additional OpenVPN parameters.
12. Click Apply to save the configuration and apply the change.

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Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> add vpn openvpn server name
(config vpn openvpn server name)>
```

   where *name* is the name of the OpenVPN server.

   The OpenVPN server is enabled by default. To disable the server, type:

```
(config vpn openvpn server name)> enable false
(config vpn openvpn server name)>
```

4. Set the mode used by the OpenVPN server:

```
(config vpn openvpn server name)> device_type value
(config vpn openvpn server name)>
```

   where *value* is one of:

   - **TUN (OpenVPN managed)**—Also known as routing mode. Each OpenVPN client is assigned a different IP subnet from the OpenVPN server and other OpenVPN clients. OpenVPN clients use Network Address Translation (NAT) to route traffic from devices connected on its LAN interfaces to the OpenVPN server.
   - **TAP - OpenVPN managed**—Also know as bridging mode. A more advanced implementation of OpenVPN. The TX64 device creates an OpenVPN interface and uses standard interface configuration (for example, a standard DHCP server configuration).
   - **TAP - Device only**—An alternate form of OpenVPN bridging mode, in which the device, rather than OpenVPN, controls the interface configuration. If this method is is, the OpenVPN server must be included as a device in either an interface or a bridge.

   See OpenVPN for information about OpenVPN modes. The default is tun.

5. If tap or tun are set for device_type:

   a. Set the IP address and subnet mask of the OpenVPN server.

```
(config vpn openvpn server name)> address ip_address/netmask
(config vpn openvpn server name)>
```


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b. Set the firewall zone for the OpenVPN server. For TUN device types, this should be set to internal to treat clients as LAN devices.

```
(config vpn openvpn server name)> zone value
(config vpn openvpn server name)>
```

To view a list of available zones:

```
(config vpn openvpn server name)> firewall zone ?

Zone: The zone for the local TUN interface. To treat clients as LAN
devices this would usually be
set to internal.
Format:
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup
Current value:

(config vpn openvpn server name)>
```

c. [Optional] Set the route metric for the OpenVPN server. If multiple active routes match a destination, the route with the lowest metric will be used.

```
(config vpn openvpn server name)> metric value
(config vpn openvpn server name)>
```

where value is an integer between 0 and 65535. The default is 0.

d. [Optional] Set the range of IP addresses that the OpenVPN server will use when providing IP addresses to clients:

i. Set the first address in the range limit:

```
(config vpn openvpn server name)> server_first_ip value
(config vpn openvpn server name)>
```

where value is a number between 2 and 255. The number entered here will represent the first client IP address. For example, if address is set to 192.168.3.1/24 and server_first_ip is set to 50, the first client IP address will be 192.168.3.50.

The default is from 50.

ii. Set the last address in the range limit:

```
(config vpn openvpn server name)> server_last_ip value
(config vpn openvpn server name)>
```


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where value is a number between 1 and 255. The number entered here will represent the last client IP address. For example, if address is set to 192.168.1.1/24 and server_last_ip is set to 99, the last client IP address will be 192.168.1.99.

The default is from 50.

8. (Optional) Set the port that the OpenVPN server will use:

```
(config vpn openvpn server name)> port port
(config vpn openvpn server name)>
```

The default is 1194.

7. Determine the method of certificate management:

a. To allow the server to manage certificates:

```
(config vpn openvpn server name)> autogenerate true
(config vpn openvpn server name)>
```

b. To create certificates externally and add them to the server:

```
(config vpn openvpn server name)> autogenerate false
(config vpn openvpn server name)>
```

The default setting is false.

c. If autogenerate is set to false:

i. Set the authentication type:

```
(config vpn openvpn server name)> authentication value
(config vpn openvpn server name)>
```

where value is one of:

- cert: Uses only certificates for client authentication. Each client requires a public and private key.
- passwd: Uses a username and password for client authentication. You must create an OpenVPN authentication group and user. See Configure an OpenVPN Authentication Group and User for instructions.
- cert_passwd: Uses both certificates and a username and password for client authentication. Each client requires a public and private key, and you must create an OpenVPN authentication group and user. See Configure an OpenVPN Authentication Group and User for instructions.

ii. Paste the contents of the CA certificate (usually in a ca.crt file) into the value of the cacert parameter:

```
(config vpn openvpn server name)> cacert value
(config vpn openvpn server name)>
```

iii. Paste the contents of the public key (for example, server.crt) into the value of the server_cert parameter:

```
(config vpn openvpn server name)> server_cert value
(config vpn openvpn server name)>
```


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iv. Paste the contents of the private key (for example, server.key) into the value of the server_key parameter:

```
(config vpn openvpn server name)> server_key value
(config vpn openvpn server name)>
```

v. Paste the contents of the Diffie Hellman key (usually in dh2048.pem) into the value of the diffie parameter:

```
(config vpn openvpn server name)> diffie value
(config vpn openvpn server name)>
```

8. (Optional) Set the access control list to restrict access to the OpenVPN server:

- To limit access to specified IPv4 addresses and networks:

```
(config vpn openvpn server name)> add acl address end value
(config vpn openvpn server name)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the service-type.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

```
(config vpn openvpn server name)> add acl address6 end value
(config vpn openvpn server name)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the service-type.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config vpn openvpn server name)> add acl interface end value
(config vpn openvpn server name)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config vpn openvpn server name)> ... network interface ?

Interfaces

Additional Configuration
```


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```
defaultip                Default IP
defaultiplinklocal       Default Link-local IP
lan1                     LAN1
loopback                 Loopback
wan1                     WAN1
wwan1                    WWAN1
wwan2                    WWAN2

(config vpn openvpn server name)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config vpn openvpn server name)> add acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config vpn openvpn server name)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config vpn openvpn server name)>
```

Repeat this step to list additional firewall zones.

2. (Optional) Set additional OpenVPN parameters.
   a. Enable the use of additional OpenVPN parameters:

```
(config vpn openvpn server name)> advanced_options enable true
(config vpn openvpn server name)>
```


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b. Configure whether the additional OpenVPN parameters should override default options:

```
(config vpn openvpn server name)> advanced_options override true
(config vpn openvpn server name)>
```

c. Set the additional OpenVPN parameters:

```
(config vpn openvpn server name)> extra_parameters
(config vpn openvpn server name)>
```

10. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure an OpenVPN Authentication Group and User

If username and password authentication is used for the OpenVPN server, you must create an OpenVPN authentication group and user.

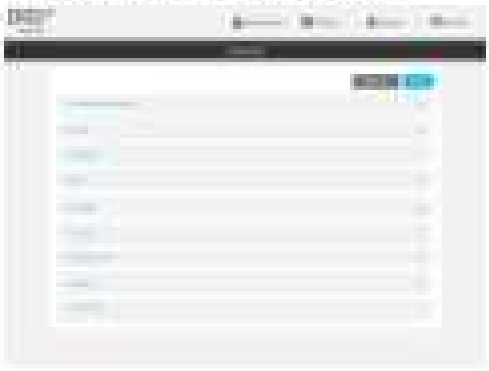
See Configure an OpenVPN server for information about configuring an OpenVPN server to use username and password authentication. See TX64 user authentication for more information about creating authentication groups and users.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



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3. Add an OpenVPN authentication group:
   a. Click **Authentication** > **Groups**.
   b. For **Add Group**, type a name for the group (for example, **OpenVPN_Group**) and click **+**.



The new authentication group configuration is displayed.



   c. Click **OpenVPN access** to enable OpenVPN access rights for users of this group.
   d. Click to expand the **OpenVPN** node.
   e. Click **+** to add a tunnel.



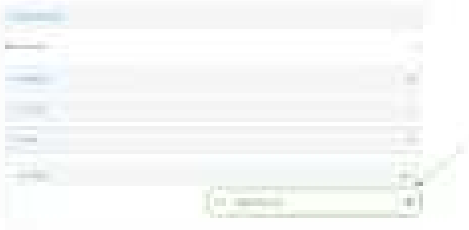
   f. For **Tunnel**, select an OpenVPN tunnel to which users of this group will have access.



   g. Repeat to add additional OpenVPN tunnels.

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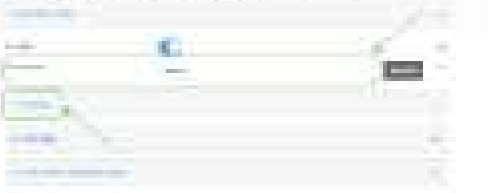
4. Add an OpenVPN authentication user:
   a. Click **Authentication** > **Users**.
   b. For **Add**, type a name for the user (for example, OpenVPN_User) and click **+**.



   c. Type a password for the user.

      This password is used for local authentication of the user. You can also configure the user to use RADIUS or TACACS+ authentication by configuring authentication methods. See User authentication methods for information.

   d. Click to expand the **Groups** node.



   e. Click **+** to add a group to the user.



   f. Select a Group with OpenVPN access enabled.



5. Click **Apply** to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Use the **add auth group** command to add a new authentication. For example, to add a group named OpenVPN_Group:

```
(config)> add auth group OpenVPN_Group
(config auth group OpenVPN_Group)>
```

4. Enable OpenVPN access rights for users of this group:

```
(config auth group OpenVPN_Group)> acl openvpn enable true
```

5. Add an OpenVPN tunnel to which users of this group will have access:
   a. Determine available tunnels:

```
(config auth group OpenVPN_Group)> .. .. .. vpn openvpn server ?

Servers: A list of openvpn servers

 Additional Configuration

 OpenVPN_server1              OpenVPN server

(config auth group OpenVPN_Group)>
```

   b. Add a tunnel:

```
(config auth group OpenVPN_Group)> add auth group test acl openvpn
tunnels add /vpn/openvpn/server/OpenVPN_server1
(config auth group OpenVPN_Group)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Configure an OpenVPN client by using an .ovpn file

Required configuration items

- Enable the OpenVPN client.
  The OpenVPN client is enabled by default.
- The firewall zone to be used by the OpenVPN client.

Additional configuration items

- The route metric for the OpenVPN client.
- The login credentials for the OpenVPN client, if configured on the OpenVPN server.

See Configure active recovery for OpenVPN for information about OpenVPN active recovery.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **VPN** > **OpenVPN** > **Clients**.
4. For **Add**, type a name for the OpenVPN client and click **+**.



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The new OpenVPN client configuration is displayed.



5. The OpenVPN client is enabled by default. To disable, click **Enable**.
6. The default behavior is to use an OVPN file for client configuration. To disable this behavior and configure the client manually, click **Use .ovpn file** to disable. If **Use .ovpn file** is disabled, see Configure an OpenVPN client without using an .ovpn file for configuration information.
7. For **Zone**, select the firewall zone for the OpenVPN client.
8. (Optional) Select the **Metric** for the OpenVPN client. If multiple active routes match a destination, the route with the lowest metric will be used.
9. (Optional) For **Username** and **Password**, type the login credentials as configured on the OpenVPN server.
10. For **OVPN file**, paste the content of the client.ovpn file.
11. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> add vpn openvpn client name
(config vpn openvpn client name)>
```

   where *name* is the name of the OpenVPN server.

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The OpenVPN client is enabled by default. To disable the client, type:

```
(config vpn openvpn client name)> enable false
(config vpn openvpn client name)>
```

4. Set the firewall zone for the OpenVPN client:

```
(config vpn openvpn client name)> zone value
(config vpn openvpn client name)>
```

To view a list of available zones:

```
(config vpn openvpn client name)> zone ?

Desc: The zone for the openvpn client interface.
Format:
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup
Current value:

(config vpn openvpn client name)>
```

5. (Optional) Set the route metric for the OpenVPN server. If multiple active routes match a destination, the route with the lowest metric will be used.

```
(config vpn openvpn client name)> metric value
(config vpn openvpn client name)>
```

where value is an integer between 0 and 65535. The default is 0.

6. (Optional) Set the login credentials as configured on the OpenVPN server:

```
(config vpn openvpn client name)> username value
(config vpn openvpn client name)> password value
(config vpn openvpn client name)>
```

7. Paste the content of the client.ovpn file into the value of the config_file parameter:

```
(config vpn openvpn client name)> config_file value
(config vpn openvpn client name)>
```

8. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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3. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure an OpenVPN client without using an .ovpn file

Required configuration items

- Enable the OpenVPN client.
  The OpenVPN client is enabled by default.
- The mode used by the OpenVPN server, either routing (TUN), or bridging (TAP).
- The firewall zone to be used by the OpenVPN client.
- The IP address of the OpenVPN server.
- Certificates and keys:
  - The CA certificate (usually in a ca.crt file).
  - The Public key (for example, client.crt)
  - The Private key (for example, client.key).

Additional configuration items

- The route metric for the OpenVPN client.
- The login credentials for the OpenVPN client, if configured on the OpenVPN server.
- Additional OpenVPN parameters.

See Configure active recovery for OpenVPN for information about OpenVPN active recovery.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click VPN > OpenVPN > Clients.
4. For Add, type a name for the OpenVPN client and click +.



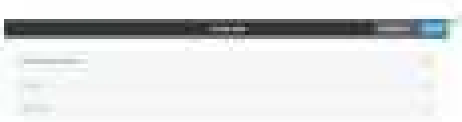
The new OpenVPN client configuration is displayed.



5. The OpenVPN client is enabled by default. To disable, click Enable.
6. The default behavior is to use an OVPN file for client configuration. To disable this behavior and configure the client manually, click Use .ovpn file to disable.
7. For Device type, select the mode used by the OpenVPN server, either TUN or TAP.

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9. For **Zone**, select the firewall zone for the OpenVPN client.
8. (Optional) Select the **Metric** for the OpenVPN client. If multiple active routes match a destination, the route with the lowest metric will be used.
10. (Optional) For **Username** and **Password**, type the login credentials as configured on the OpenVPN server.
11. For **VPN server IP**, type the IP address of the OpenVPN server.
12. (Optional) Set the **VPN port** used by the OpenVPN server. The default is 1194.
13. Paste the contents of the CA certificate (usually in a .crt file), the Public key (for example, client.crt), and the Private key (for example, client.key) into their respective fields. The contents will be hidden when the configuration is saved.
14. (Optional) Click to expand **Advanced Options** to manually set additional OpenVPN parameters.
    a. Click **Enable** to enable the use of additional OpenVPN parameters.
    b. Click **Override** if the additional OpenVPN parameters should override default options.
    c. For **OpenVPN parameters**, type the additional OpenVPN parameters. For example, to override the configuration by using a configuration file, enter --config filename, for example, --config /etc/config/openvpn_config.
15. Click **Apply** to save the configuration and apply the changes.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> add vpn openvpn client name
(config vpn openvpn client name)>
```

   where *name* is the name of the OpenVPN server.
   The OpenVPN client is enabled by default. To disable the client, type:

```
(config vpn openvpn client name)> enable false
(config vpn openvpn client name)>
```

4. The default behavior is to use an OVPN file for client configuration. To disable this behavior and configure the client manually:

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```
(config vpn openvpn client name)> use_file false
(config vpn openvpn client name)>
```

5. Set the mode used by the OpenVPN server:

```
(config vpn openvpn client name)> device_type value
(config vpn openvpn client name)>
```

where value is either tun or tap. The default is tun.

6. Set the firewall zone for the OpenVPN client:

```
(config vpn openvpn client name)> zone value
(config vpn openvpn client name)>
```

To view a list of available zones:

```
(config vpn openvpn client name)> zone ?

Desc: The zone for the openvpn client interface.
Format:
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup
Current value:

(config vpn openvpn client name)>
```

7. (Optional) Set the route metric for the OpenVPN server. If multiple active routes match a destination, the route with the lowest metric will be used.

```
(config vpn openvpn client name)> metric value
(config vpn openvpn client name)>
```

where value is an integer between 0 and 65535. The default is 0.

8. (Optional) Set the login credentials as configured on the OpenVPN server:

```
(config vpn openvpn client name)> username value
(config vpn openvpn client name)> password value
(config vpn openvpn client name)>
```

9. Set the IP address of the OpenVPN server:

```
(config vpn openvpn client name)> server ip_address
(config vpn openvpn client name)>
```


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10. (Optional) Set the port used by the OpenVPN server:

```
(config vpn openvpn client name)> port port
(config vpn openvpn client name)>
```

The default is 1194.

11. Paste the contents of the CA certificate (usually in a ca.crt file) into the value of the cacert parameter:

```
(config vpn openvpn client name)> cacert value
(config vpn openvpn client name)>
```

12. Paste the contents of the public key (for example, client.crt) into the value of the public_cert parameter:

```
(config vpn openvpn client name)> public_cert value
(config vpn openvpn client name)>
```

13. Paste the contents of the private key (for example, client.key) into the value of the private_key parameter:

```
(config vpn openvpn client name)> private_key value
(config vpn openvpn client name)>
```

14. (Optional) Set additional OpenVPN parameters.

    a. Enable the use of additional OpenVPN parameters:

    ```
    (config vpn openvpn client name)> advanced_options enable true
    (config vpn openvpn client name)>
    ```

    b. Configure whether the additional OpenVPN parameters should override default options:

    ```
    (config vpn openvpn client name)> advanced_options override true
    (config vpn openvpn client name)>
    ```

    c. Set the additional OpenVPN parameters:

    ```
    (config vpn openvpn client name)> advanced_options extra_parameters
    (config vpn openvpn client name)>
    ```

15. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

16. Type exit to exit the Admin CLI.

    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure active recovery for OpenVPN

You can configure the TX64 device to regularly probe OpenVPN client connections to determine if the connection has failed and take remedial action.

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Required configuration items

- A valid OpenVPN client configuration. See Configure an OpenVPN client by using an .ovpn file or Configure an OpenVPN client without using an .ovpn file for configuration instructions.
- Enable OpenVPN active recovery.
- The behavior of the TX64 device upon OpenVPN failure: either
  - Restart the OpenVPN interface
  - Reboot the device.

Additional configuration items

- The interval between connectivity tests.
- Whether the interface should be considered to have failed if one of the test targets fails, or all of the test targets fail.
- The number of probe attempts before the OpenVPN connection is considered to have failed.
- The amount of time that the device should wait for a response to a probe attempt before considering it to have failed.

To configure the TX64 device to regularly probe the OpenVPN connection:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **VPN** > **OpenVPN** > **Clients**.
4. Create a new OpenVPN client or select an existing one:
   - To create a new OpenVPN client, see Configure an OpenVPN client by using an .ovpn file or Configure an OpenVPN client without using an .ovpn file.
   - To edit an existing OpenVPN client, click to expand the appropriate client.

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5. After creating or selecting the OpenVPN client, click **Active recovery**.



6. **Enable** active recovery.
7. For **Restart interface**, enable to configure the device to restart the interface when its connection is considered to have failed. This is useful for interfaces that may regain connectivity after restarting, such as a cellular modem.
8. For **Reboot device**, enable to instruct the device to reboot when the WAN connection is considered to have failed.
9. Change the **Interval between connectivity tests**.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

   For example, to set **Interval** to ten minutes, enter 10m or 600s.

   The default is 15 minutes.
10. For **Success condition**, determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets.
11. For **Attempts**, type the number of probe attempts before the WAN is considered to have failed.
12. For **Response timeout**, type the amount of time that the device should wait for a response to a probe attempt before considering it to have failed.

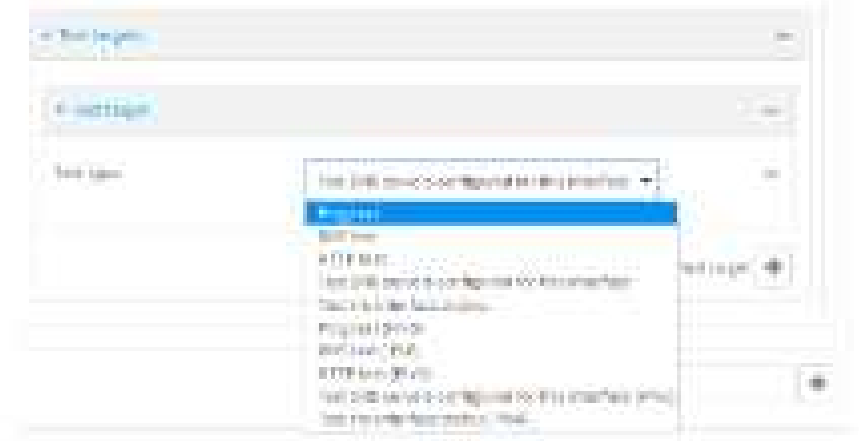
    Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

    For example, to set **Response timeout** to ten minutes, enter 10m or 600s.

    The default is 15 seconds.

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13. Add a test target:
    a. Click to expand **Test targets**.



    b. For **Add Test target**, click **+**.
    c. Select the **Test type**:
        - **Ping test** or **Ping test (IPv6)**: Tests connectivity by sending an ICMP echo request to the hostname or IP address specified in **Ping host**. You can also optionally change the number of bytes in the **Ping payload size**.
        - **DNS test** or **DNS test (IPv6)**: Tests connectivity by sending a DNS query to the specified **DNS server**.
        - **HTTP test**/**HTTP test (IPv6)**: Tests connectivity by sending an HTTP or HTTPS GET request to the URL specified in **Web servers**. The URL should take the format of http[s]://hostname/[path].
        - **Test DNS servers configured for this interface** or **Test DNS servers configured for this interface (IPv6)**: Tests connectivity by sending a DNS query to the DNS servers configured for this interface.
        - **Test the interface status** or **Test the interface status IPv6**: The interface is considered to be down based on:
            - **Down time**: The amount of time that the interface can be down before this test is considered to have failed.

              Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

              For example, to set **Down time** to ten minutes, enter 10m or 600s.

              The default is 60 seconds.
            - **Initial connection time**: The amount of time to wait for an initial connection to the interface before this test is considered to have failed.

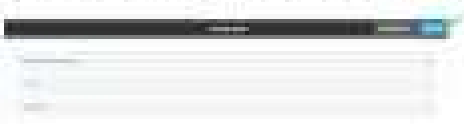
              Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

              For example, to set **Initial connection time** to ten minutes, enter 10m or 600s.

              The default is 60 seconds.

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14. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Create a new OpenVPN client, or edit an existing one:
   - To create a new OpenVPN client, see Configure an OpenVPN client by using an .ovpn file or Configure an OpenVPN client without using an .ovpn file.
   - To edit an existing OpenVPN client, change to the OpenVPN client's node in the configuration schema. For example, for an OpenVPN client named openvpn_client1, change to the openvpn_client1 node in the configuration schema:

```
(config)> vpn openvpn client openvpn_client1
(config vpn openvpn client openvpn_client1)>
```

4. Enable active recovery:

```
(config vpn openvpn client openvpn_client1)> connection_monitor enable true
(config vpn openvpn client openvpn_client1)>
```

5. To configure the device to restart the interface when its connection is considered to have failed:

```
(config vpn openvpn client openvpn_client1)> connection_monitor restart
true
(config vpn openvpn client openvpn_client1)>
```

   This is useful for interfaces that may regain connectivity after restarting, such as a cellular modem.
6. To configure the device to reboot when the interface is considered to have failed:

```
(config vpn openvpn client openvpn_client1)> connection_monitor reboot
enable
(config vpn openvpn client openvpn_client1)>
```

7. Set the interval between connectivity tests:

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```
(config vpn openvpn client openvpn_client1)> connection_monitor interval
value
(config vpn openvpn client openvpn_client1)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set interval to ten minutes, enter either 10m or 600s:

```
(config vpn openvpn client openvpn_client1)> connection_monitor interval
600s
(config vpn openvpn client openvpn_client1)>
```

The default is 15 minutes.

8. Determine whether the interface should fail over based on the failure of one of the test targets, or all of the test targets:

```
(config vpn openvpn client openvpn_client1)> connection_monitor success_
condition value
(config vpn openvpn client openvpn_client1)>
```

Where value is either one or all.

9. Set the number of probe attempts before the WAN is considered to have failed:

```
(config vpn openvpn client openvpn_client1)> connection_monitor attempts
num
(config vpn openvpn client openvpn_client1)>
```

The default is 3.

10. Set the amount of time that the device should wait for a response to a probe attempt before considering it to have failed:

```
(config vpn openvpn client openvpn_client1)> connection_monitor timeout
value
(config vpn openvpn client openvpn_client1)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set timeout to ten minutes, enter either 10m or 600s:

```
(config vpn openvpn client openvpn_client1)> connection_monitor interval
600s
(config vpn openvpn client openvpn_client1)>
```

The default is 15 seconds.

11. Configure test targets:

a. Add a test target:

```
(config vpn openvpn client openvpn_client1)> add connection_monitor
target end
(config vpn openvpn client openvpn_client1 connection_monitor target 6)>
```


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5. Set the test type:

```
(config vpn openvpn client openvpn_client1 connection_monitor target 6)>
test value
(config vpn openvpn client openvpn_client1 connection_monitor target 6)>
```

where value is one of:

- ping (IPv4) or ping6 (IPv6): Tests connectivity by sending an ICMP echo request to a specified hostname or IP address.
  - Specify the hostname or IP address by using ping_host or ping_host6:

```
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)> ping_host host
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)>
```

  - (Optional) Set the size, in bytes, of the ping packet by using ping_size or ping_size6:

```
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)> ping_size [num]
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)>
```

- dns (IPv4) or dns6 (IPv6): Tests connectivity by sending a DNS query to the specified DNS server.
  - Specify the DNS server. Allowed value is the IP address of the DNS server.

```
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)> dns_server ip_address
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)>
```

- dns_configured (IPv4) or dns_configured6 (IPv6): Tests connectivity by sending a DNS query to the DNS servers configured for this interface.
- http (IPv4) or http6 (IPv6): Tests connectivity by sending an HTTP or HTTPS GET request to the specified URL.
  - Specify the url. Allowed value uses the format http[s]://hostname/[path].

```
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)> http_url url
(config vpn openvpn client openvpn_client1 connection_monitor
target 6)>
```

- interface_up (IPv4) or interface_up6 (IPv6): : The interface is considered to be down based on the interfaces down time, and the amount of time an initial connection to the interface takes before this test is considered to have failed.
  - (Optional) Set the amount of time that the interface can be down before this test is considered to have failed:

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```
(config vpn openvpn client openvpn_client1 connection_monitor
target 0)> interface_down_time value
(config vpn openvpn client openvpn_client1 connection_monitor
target 0)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set interface_down_time to ten minutes, enter either 10m or 600s:

```
(config openvpn client openvpn_client1 connection_monitor
target 0)> interface_down_time 600s
(config openvpn client openvpn_client1 connection_monitor
target 0)>
```

The default is 60 seconds.

- (Optional) Set the amount of time to wait for an initial connection to the interface before this test is considered to have failed:

```
(config vpn openvpn client openvpn_client1 connection_monitor
target 0)> interface_timeout value
(config vpn openvpn client openvpn_client1 connection_monitor
target 0)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set interface_timeout to ten minutes, enter either 10m or 600s:

```
(config network interface my_wwan ipv4 connection_monitor
target 0)> interface_timeout 600s
(config network interface my_wwan ipv4 connection_monitor
target 0)>
```

The default is 60 seconds.

11. Save the configuration and apply the change:

```
(config openvpn client openvpn_client1 connection_monitor target 0)> save
Configuration saved.
>
```

12. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Show OpenVPN server status and statistics

You can view status and statistics for OpenVPN servers from either the web interface or the command line:



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1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, select **Status** > **OpenVPN** > **Servers**.

   The **OpenVPN Servers** page appears.
3. To view configuration details about an OpenVPN server, click the (configuration) icon in the upper right of the OpenVPN server's status pane.

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. To display details about all configured OpenVPN servers, type the following at the prompt:

```
> show openvpn server all

Server           Enable  Type  Zone      Address          Port
---------------  ------  ----  --------  ---------------  ----
OpenVPN_server1  true    tun   internal  192.168.36.1/24  1194
OpenVPN_server2  false   tun   internal  192.168.48.1/24  1194

>
```

3. To display details about a specific server:

```
> show openvpn server name OpenVPN_server1

Server          : OpenVPN_server1
Enable          : true
Type            : tun
Zone            : internal
Address         : 192.168.36.1/24
Port            : 1194
Use File        : true
Metric          : 0
Protocol        : udp
First IP        : 88
Last IP         : 99

>
```

4. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Show OpenVPN client status and statistics

You can view status and statistics for OpenVPN clients from either web interface or the command line:

WebUI

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1. Log into the TX64 Web UI as a user with Admin access.
2. On the menu, select **Status > OpenVPN > Clients**.

   The **OpenVPN Clients** page appears.
3. To view configuration details about an OpenVPN client, click the (configuration) icon in the upper right of the OpenVPN client's status pane.

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. To display details about all configured OpenVPN clients, type the following at the prompt:

```
> show openvpn client all

Client              Enable  Status      Username  Use File  Zone
------------------  ------  ----------  --------  --------  --------
OpenVPN_Client1     true    connected             true      internal
OpenVPN_Client2     true    pending               true      internal

>
```

3. To display details about a specific server:

```
> show openvpn client name OpenVPN_client1
```

4. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Generic Routing Encapsulation (GRE)

Generic Routing Encapsulation (GRE) is an IP packet encapsulation protocol that allow for networks and routes to be advertised from one network device to another. You can use GRE to encapsulate a wide variety of network layer protocols inside virtual point-to-point links over an IP network.

Configuring a GRE tunnel

Configuring a GRE tunnel involves the following items:

Required configuration items

- A GRE loopback endpoint interface.
- GRE tunnel configuration:
  - Enable the GRE tunnel.

    The GRE tunnels are enabled by default.
  - The local endpoint interface.
  - The IP address of the remote device/peer.

Additional configuration items

- A GRE key.
- Enable the device to respond to keepalive packets.

Task One: Create a GRE loopback endpoint interface

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Network > Interfaces**.
4. For **Add interface**, type a name for the GRE loopback endpoint interface and click **+**.
3. **Enable** the interface.

   New interfaces are enabled by default. To disable, or to enable if it has been disabled, click **Enable**.
6. For **Interface type**, select **Ethernet**.
7. For **Zone**, select **Internal**.
8. For **Device**, select **Ethernet: Loopback**.
9. Click to expand **IPv4**.
10. For **Address**, enter the IP address and subnet mask of the local GRE endpoint, for example **10.10.1.1/24**.
11. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add the GRE endpoint interface. For example, to add an interface named **gre_endpoint**:

```
(config)> add network interface gre_interface
(config network interface gre_interface)>
```


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4. Set the Interface zone to **Internal**:

```
(config network interface gre_interface)> zone internal
(config network interface gre_interface)>
```

5. Set the Interface device to **loopback**:

```
(config network interface gre_interface)> device /network/device/loopback
(config network interface gre_interface)>
```

6. Set the IP address and subnet mask of the local GRE endpoint. For example, to set the local GRE endpoint's IP address and subnet mask to 10.10.1.1/24:

```
(config network interface gre_interface)> ipv4 address 10.10.1.1/24
(config network interface gre_interface)>
```

7. Save the configuration and apply the change:

```
(config network interface gre_interface)> save
Configuration saved.
>
```

8. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Task Two: Configure the GRE tunnel

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



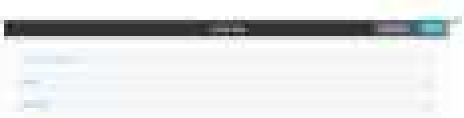
The **Configuration** window is displayed.

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5. Click **VPN** > **IP Tunnels**.
4. For **Add IP tunnel**, type a name for the GRE tunnel and click **+**.
3. **Enable** the tunnel.

   New tunnels are enabled by default. To disable, or to enable if it has been disabled, click **Enable**.
6. For **Local endpoint**, select the GRE endpoint interface created in Task One.
7. For **Remote endpoint**, type the IP address of the GRE endpoint on the remote peer.
8. (Optional) For **Key**, enter a key that will be inserted in GRE packets created by this tunnel. It must match the key set by the remote endpoint. Allowed value is an integer between 0 and 4294967295, or an IP address.
9. (Optional) **Enable keepalive reply** to enable the device to reply to Cisco GRE keepalive packets.
10. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add the GRE endpoint tunnel. For example, to add a tunnel named gre_example:

```
(config)> add vpn iptunnel gre_example
(config vpn iptunnel gre_example)>
```


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GRE tunnels are enabled by default. To disable:

```
(config vpn tptunnel gre_example)> enable false
(config vpn tptunnel gre_example)>
```

4. Set the local endpoint to the GRE endpoint interface created in Task One, for example:

```
(config vpn tptunnel gre_example)> local /network/interface/gre_endpoint
(config vpn tptunnel gre_example)>
```

To view configured interfaces and proper syntax:

```
(config vpn tptunnel gre_example)> local ?

Local endpoint: The local network interface to connect to peer device.
Format:
   /network/interface/ethernet
   /network/interface/default_ip
   /network/interface/default_linklocal
   /network/interface/gre_endpoint
   /network/interface/lan1
   /network/interface/loopback
   /network/interface/wan1
   /network/interface/wwan1
   /network/interface/wwan2
Current value:

(config vpn tptunnel gre_example)>
```

5. Set the IP address of the GRE endpoint on the remote peer:

```
(config vpn tptunnel gre_example)> remote ip_address
(config vpn tptunnel gre_example)>
```

6. (Optional) Set a key that will be inserted in GRE packets created by this tunnel.

The key must match the key set by the remote endpoint.

```
(config vpn tptunnel gre_example)> key value
(config vpn tptunnel gre_example)>
```

where value is an integer between 0 and 4294967295, or an IP address.

7. (Optional) Enable the device to reply to Cisco GRE keepalive packets:

```
(config vpn tptunnel gre_example)> keepalive true
(config vpn tptunnel gre_example)>
```

8. Save the configuration and apply the changes:

```
(config vpn tptunnel gre_example)> save
Configuration saved.
>
```


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a. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Show GRE tunnels

To view information about currently configured GRE tunnels:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **Status** > **IP tunnels**.
   The **IP Tunnels** page appears.
3. To view configuration details about a GRE tunnel, click the (configuration) icon in the upper right of the tunnel's status pane.

Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Use the **show vpn iptunnel** command:

```
(config)> show vpn iptunnel
gre_tunnel
        enable true
        keepalive false
        no key
        local /network/interface/gre_endpoint
        remote 172.168.1.3
        type gre
(config)>
```

4. Type **cancel** to exit configuration mode:

```
(config)> cancel
>
```

5. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Example: GRE tunnel over an IPSec tunnel

The TX64 device can be configured as an advertised set of routes through an IPSec tunnel. This allows you to leverage the dynamic route advertisement of GRE tunnels through a secured IPSec tunnel.

The example configuration provides instructions for configuring the TX64 device with a GRE tunnel through IPsec.



TX64-1 configuration tasks

1. Create an IPsec tunnel named **ipsec_gre1** with:
   - A pre-shared key.
   - Remote endpoint set to the public IP address of the TX64-2 device.
   - A policy with:
     - Local network set to the IP address and subnet of the local GRE tunnel, 172.30.0.1/32.
     - Remote network set to the IP address and subnet of the remote GRE tunnel, 172.30.0.2/32.
2. Create an IPsec endpoint interface named **ipsec_endpoint1**:
   a. Zone set to **Internal**.
   b. Device set to **Ethernet: Loopback**.
   c. IPv4 Address set to the IP address of the local GRE tunnel, 172.30.0.1/32.
3. Create a GRE tunnel named **gre_tunnel1**:
   a. Local endpoint set to the IPsec endpoint interface, **Interface: ipsec_endpoint1**.
   b. Remote endpoint set to the IP address of the GRE tunnel on TX64-2, 172.30.0.2.
4. Create an interface named **gre_interface1** and add it to the GRE tunnel:
   a. Zone set to **Internal**.
   b. Device set to **IP tunnel: gre_tunnel1**.
   c. IPv4 Address set to a virtual IP address on the GRE tunnel, 172.31.0.1/30.

TX64-2 configuration tasks

1. Create an IPsec tunnel named **ipsec_gre2** with:
   - The same pre-shared key as the **ipsec_gre1** tunnel on TX64-1.
   - Remote endpoint set to the public IP address of TX64-1.
   - A policy with:
     - Local network set to the IP address and subnet of the local GRE tunnel, 172.30.0.2/32.
     - Remote network set to the IP address of the remote GRE tunnel, 172.30.0.1/32.

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2. Create an IPsec endpoint interface named ipsec_endpoint2:
   a. Zone set to Internal.
   b. Device set to Ethernet: Loopback.
   c. IPv4 Address set to the IP address of the local GRE tunnel, 172.30.8.2/32.
3. Create a GRE tunnel named gre_tunnel2:
   a. Local endpoint set to the IPsec endpoint interface, interface: ipsec_endpoint2.
   b. Remote endpoint set to the IP address of the GRE tunnel on TX64-1, 172.30.8.1.
4. Create an interface named gre_interface2 and add it to the GRE tunnel:
   a. Zone set to Internal.
   b. Device set to IP tunnel: gre_tunnel2.
   c. IPv4 Address set to a virtual IP address on the GRE tunnel, 172.31.1.1/30.

Configuration procedures

Configure the TX64-1 device
Task one: Create an IPsec tunnel

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **VPN** > **IPsec** > **Tunnels**.

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4. For **Add IPsec Tunnel**, type **ipsec_gre1** and click **+**.

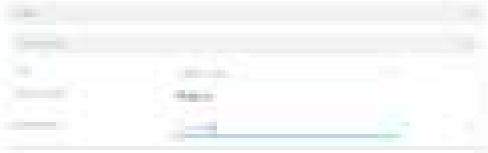


5. Click to expand **Authentication**.
6. For **Pre-shared key**, type **testkey**.

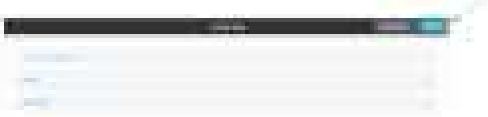
7. Click to expand **Remote endpoint**.
8. For **Hostname**, type public IP address of the TX64-2 device.

9. Click to expand **Policies**.
10. For **Add Policy**, click **+** to add a new policy.

11. Click to expand **Local network**.
12. For **Type**, select **Custom network**.
13. For **Address**, type the IP address and subnet of the local GRE tunnel, 172.30.0.1/32.
14. For **Remote network**, type the IP address and subnet of the remote GRE tunnel, 172.30.0.2/32.



15. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add an IPsec tunnel named ipsec_gre1:

```
(config)> add vpn ipsec tunnel ipsec_gre1
(config vpn ipsec tunnel ipsec_gre1)>
```

4. Set the pre-shared key to testkey:

```
(config vpn ipsec tunnel ipsec_gre1)> auth secret testkey
(config vpn ipsec tunnel ipsec_gre1)>
```

5. Set the remote endpoint to public IP address of the TX64-2 device:

```
(config vpn ipsec tunnel ipsec_gre1)> remote hostname 192.168.101.1
(config vpn ipsec tunnel ipsec_gre1)>
```

6. Add a policy:

```
(config vpn ipsec tunnel ipsec_gre1)> add policy end
(config vpn ipsec tunnel ipsec_gre1 policy 0)>
```

7. Set the local network policy type to custom:

```
(config vpn ipsec tunnel ipsec_gre1 policy 0)> local type custom
(config vpn ipsec tunnel ipsec_gre1 policy 0)>
```

8. Set the local network address to the IP address and subnet of the local GRE tunnel, 172.30.0.1/32:

```
(config vpn ipsec tunnel ipsec_gre1 policy 0)> local custom 172.30.0.1/32
(config vpn ipsec tunnel ipsec_gre1 policy 0)>
```

9. Set the remote network address to the IP address and subnet of the remote GRE tunnel, 172.30.0.2/32:

```
(config vpn ipsec tunnel ipsec_gre1 policy 0)> remote network 172.30.0.2/32
(config vpn ipsec tunnel ipsec_gre1 policy 0)>
```

10. Save the configuration and apply the change:

```
(config ipsec tunnel ipsec_gre1 policy 0)> save
Configuration saved.
>
```


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Task two: Create an IPsec endpoint interface

Web UI

1. Click Network > Interfaces.
2. For Add interface, type ipsec_endpoint1 and click +.



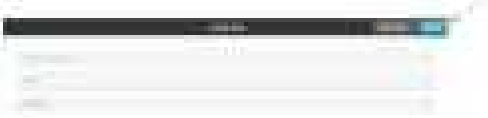
3. For Zone, select internal.
4. For Device, select Ethernet: loopback.



5. Click to expand IPv4.
6. For Address, type the IP address of the local GRE tunnel, 172.30.0.1/32.



7. Click Apply to save the configuration and apply the change.



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Command line

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. Add an interface named ipsec_endpoint1:

```
(config)> add network interface ipsec_endpoint1
(config network interface ipsec_endpoint1)>
```

3. Set the zone to Internal:

```
(config network interface ipsec_endpoint1)> zone internal
(config network interface ipsec_endpoint1)>
```

4. Set the device to /network/device/loopback:

```
(config network interface ipsec_endpoint1)> device /network/device/loopback
(config network interface ipsec_endpoint1)>
```

5. Set the IPv4 address to the IP address of the local GRE tunnel, 172.30.0.1/32:

```
(config network interface ipsec_endpoint1)> ipv4 address 172.30.0.1/32
(config network interface ipsec_endpoint1)>
```

6. Save the configuration and apply the change:

```
(config vpn ipsec tunnel ipsec_endpoint1 policy 0)> save
Configuration saved.
>
```

Task three: Create a GRE tunnel

WebUI

1. Click VPN > IP Tunnels.
2. For Add IP Tunnel, type gre_tunnel1 and click +.

3. For Local endpoint, select the IPsec endpoint interface created in Task two (interface: ipsec_endpoint1).

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4. For **Remote endpoint**, type the IP address of the GRE tunnel on TX64-2, 172.30.0.2.

5. Click **Apply** to save the configuration and apply the change.



Command line

1. At the command line, type `config` to enter configuration mode:

```
> config
(config)>
```

2. Add a GRE tunnel named gre_tunnel1:

```
(config)> add vpn iptunnel gre_tunnel1
(config vpn iptunnel gre_tunnel1)>
```

3. Set the local endpoint to the IPsec endpoint interface created in Table here (/network/interface/ipsec_endpoint1):

```
(config vpn iptunnel gre_tunnel1)> local /network/interface/ipsec_endpoint1
(config vpn iptunnel gre_tunnel1)>
```

4. Set the remote endpoint to the IP address of the GRE tunnel on TX64-2, 172.30.0.2:

```
(config vpn iptunnel gre_tunnel1)> remote 172.30.0.2
(config vpn iptunnel gre_tunnel1)>
```

5. Save the configuration and apply the change:

```
(config vpn iptunnel gre_tunnel1)> save
Configuration saved.
>
```


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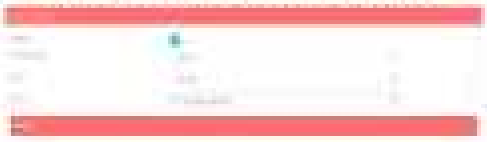
Task four: Create an interface for the GRE tunnel device

Web UI

1. Click **Network** > **Interfaces**.
2. For **Add interface**, type **gre_interface1** and click **+**.



3. For **Zone**, select **Internal**.
4. For **Device**, select the GRE tunnel created in Task three (IP tunnel: gre_tunnel1).



5. Click to expand **IPv4**.
6. For **Address**, type 172.31.0.1/30 for a virtual IP address on the GRE tunnel.



7. Click **Apply** to save the configuration and apply the change.



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Command line

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. Add an interface named gre_interface1:

```
(config)> add network interface gre_interface1
(config network interface gre_interface1)>
```

3. Set the zone to Internal:

```
(config network interface gre_interface1)> zone internal
(config network interface gre_interface1)>
```

4. Set the device to the GRE tunnel created in Task three (/vpn/iptunnel/gre_tunnel1):

```
(config network interface gre_interface1)> device /vpn/iptunnel/gre_tunnel1
(config network interface gre_interface1)>
```

5. Set 172.31.0.1/30 as the virtual IP address on the GRE tunnel:

```
(config network interface gre_interface1)> ipv4 address 172.31.0.1/30
(config network interface gre_interface1)>
```

6. Save the configuration and apply the change:

```
(config network interface gre_interface1)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the TX64-2 device

Task one: Create an IPsec tunnel

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click System. Under Configuration, click Device Configuration.



The Configuration window is displayed.

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5. Click VPN > IPsec > Tunnels.
4. For Add IPsec Tunnel, type ipsec_gre2 and click +.

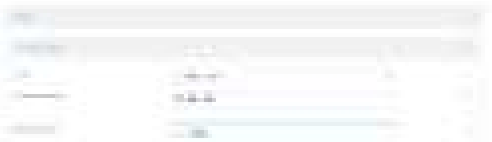
5. Click to expand Authentication.
6. For Pre-shared key, type the same pre-shared key that was configured for the TX64-1 (backup).

7. Click to expand Remote endpoint.
8. For Hostname, type public IP address of the TX64-1 device.

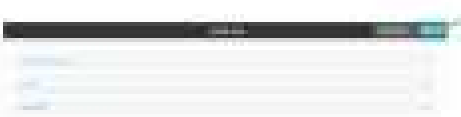
9. Click to expand Policies.
10. For Add Policy, click + to add a new policy.

11. Click to expand Local network.
12. For Type, select Custom network.
13. For Address, type the IP address and subnet of the local GRE tunnel, 172.30.0.2/32.
14. For Remote network, type the IP address and subnet of the remote GRE tunnel, 172.30.0.1/32.

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15. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add an IPsec tunnel named Ipsec_gre2:

```
(config)> add vpn ipsec tunnel ipsec_gre2
(config vpn ipsec tunnel ipsec_gre2)>
```

4. Set the pre-shared key to the same pre-shared key that was configured for the TX64-1 (testkey):

```
(config vpn ipsec tunnel ipsec_gre2)> auth secret testkey
(config vpn ipsec tunnel ipsec_gre2)>
```

5. Set the remote endpoint to public IP address of the TX64-1 device:

```
(config vpn ipsec tunnel ipsec_gre2)> remote hostname 192.168.209.1
(config vpn ipsec tunnel ipsec_gre2)>
```

6. Add a policy:

```
(config vpn ipsec tunnel ipsec_gre2)> add policy end
(config vpn ipsec tunnel ipsec_gre2 policy 6)>
```

7. Set the local network policy type to custom:

```
(config vpn ipsec tunnel ipsec_gre2 policy 6)> local type custom
(config vpn ipsec tunnel ipsec_gre2 policy 6)>
```

8. Set the local network address to the IP address and subnet of the local GRE tunnel, 172.30.6.2/32:

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```
(config vpn ipsec tunnel ipsec_gre2 policy 8)> local custom 172.30.8.2/32
(config vpn ipsec tunnel ipsec_gre2 policy 8)>
```

9. Set the remote network address to the IP address and subnet of the remote GRE tunnel, 172.30.8.1/32:

```
(config vpn ipsec tunnel ipsec_gre2 policy 8)> remote network 172.30.8.1/32
(config vpn ipsec tunnel ipsec_gre2 policy 8)>
```

10. Save the configuration and apply the change:

```
(config vpn ipsec tunnel ipsec_gre2 policy 8)> save
Configuration saved.
>
```

Task two: Create an IPsec endpoint interface

WebUI

1. Click **Network > Interfaces**.
2. For **Add Interface**, type **ipsec_endpoint2** and click **+**.



3. For **Zone**, select **Internal**.
4. For **Device**, select **Ethernet: loopback**.



5. Click to expand **IPv4**.

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6. For Address, type the IP address of the local GRE tunnel, 172.30.0.2/32.



7. Click Apply to save the configuration and apply the change.



Command line

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. Add an interface named ipsec_endpoint2:

```
(config)> add network interface ipsec_endpoint2
(config network interface ipsec_endpoint2)>
```

3. Set the zone to internal:

```
(config network interface ipsec_endpoint2)> zone internal
(config network interface ipsec_endpoint2)>
```

4. Set the device to /network/device/loopback:

```
(config network interface ipsec_endpoint2)> device /network/device/loopback
(config network interface ipsec_endpoint2)>
```

5. Set the IPv4 address to the IP address of the local GRE tunnel, 172.30.0.2/32:

```
(config network interface ipsec_endpoint2)> ipv4 address 172.30.0.2/32
(config network interface ipsec_endpoint2)>
```

6. Save the configuration and apply the change:

```
(config vpn ipsec tunnel ipsec_endpoint2)> save
Configuration saved.
>
```

Task three: Create a GRE tunnel

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Web UI

1. Click VPN > IP Tunnels.
2. For Add IP Tunnel, type gre_tunnel2 and click +.

3. For Local endpoint, select the IPsec endpoint interface created in Task two (interface: ipsec_endpoint2).
4. For Remote endpoint, type the IP address of the GRE tunnel on TX64-1, 172.30.0.1.

5. Click Apply to save the configuration and apply the change.



Command Line

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. Add a GRE tunnel named gre_tunnel2:

```
(config)> add vpn iptunnel gre_tunnel2
(config vpn iptunnel gre_tunnel2)>
```

3. Set the local endpoint to the IPsec endpoint interface created in Task two (/network/interface/ipsec_endpoint2):

```
(config vpn iptunnel gre_tunnel2)> local /network/interface/ipsec_endpoint2
(config vpn iptunnel gre_tunnel2)>
```

4. Set the remote endpoint to the IP address of the GRE tunnel on TX64-1, 172.30.0.1:

```
(config vpn iptunnel gre_tunnel2)> remote 172.30.0.1
(config vpn iptunnel gre_tunnel2)>
```


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5. Save the configuration and apply the change:

```
(config vpn iptunnel gre_tunnel2)> save
Configuration saved.
>
```

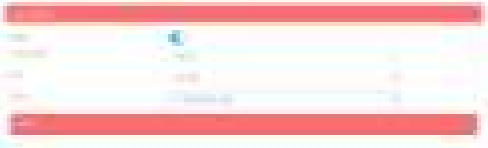
Task four: Create an interface for the GRE tunnel device

WebUI

1. Click **Network > Interfaces**.
2. For **Add interface**, type **gre_interface2** and click **+**.



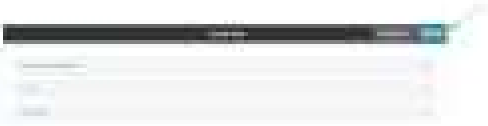
3. For **Zone**, select **internal**.
4. For **Device**, select the GRE tunnel created in Task three (IP tunnel: **gre_tunnel2**).



5. Click to expand **IPv4**.
6. For **Address**, type 172.31.1.1/30 for a virtual IP address on the GRE tunnel.



7. Click **Apply** to save the configuration and apply the change.



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Command line

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. Add an interface named gre_interface2:

```
(config)> add network interface gre_interface2
(config network interface gre_interface2)>
```

3. Set the zone to Internal:

```
(config network interface gre_interface2)> zone internal
(config network interface gre_interface2)>
```

4. Set the device to the GRE tunnel created in Task three (/vpn/iptunnel/gre_tunnel2):

```
(config network interface gre_interface2)> device /vpn/iptunnel/gre_tunnel2
(config network interface gre_interface2)>
```

5. Set 172.31.0.1/30 as the virtual IP address on the GRE tunnel:

```
(config network interface gre_interface2)> ipv4 address 172.31.1.1/30
(config network interface gre_interface2)>
```

6. Save the configuration and apply the change:

```
(config network interface gre_interface2)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Services

This chapter contains the following topics:

Allow remote access for web administration and SSH 411
Configure the web administration service 414
Configure SSH access 416
Use SSH with key authentication 420
Configure telnet access 423
Configure DNS 425
Simple Network Management Protocol (SNMP) 427
Location information 434
System time 436
Configure the system time 438
Network Time Protocol 439
Configure the device as an NTP server 440
Configure a multicast route 442
Enable service discovery (mDNS) 444
Use the iPerf service 446

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Allow remote access for web administration and SSH

By default, only devices connected to the TX64's LAN have access to the device via web administration and SSH. To enable these services for access from remote devices:

- The TX64 device must have a publicly reachable IP address.
- The External firewall zone must be added to the web administration or SSH service. See Firewall configuration for information on zones.
- See Set the Idle Timeout for TX64 users for information about setting the inactivity timeout for the web administration and SSH services.

To allow web administration or SSH for the External firewall zone:

Add the External firewall zone to the web administration service

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



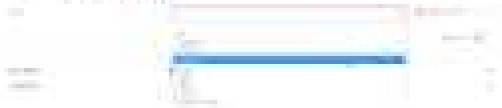
3. Click **Services** > **Web administration** > **Access Control List** > **Zones**.

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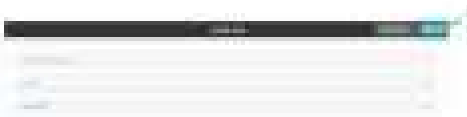
Services: Allow remote access for web administration and SSH

4. For Add Zone, click ➕.

5. Select External.



6. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add the external zone to the web administration service:

```
(config)> add service web_admin acl zone end external
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Add the External Firewall zone to the SSH service

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Services Allow remote access for web administration and SSH

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click System. Under Configuration, click Device Configuration.



The Configuration window is displayed.



3. Click Configuration > Services > SSH > Access Control List > Zones.
4. For Add Zone, click ➕.

5. Select External.

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Services Allow remote access for web administration and SSH

8. Click Apply to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add the External zone to the SSH service:

```
(config)> add service ssh acl zone end external
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the web administration service

The web administration service allows you to monitor and configure the TX64 device by using the WebUI, a browser-based interface.

By default, the web administration service is enabled and uses the standard HTTPS port, 443. The default access control for the service uses the Internal firewall zone, which means that only devices connected to the TX64's LAN can access the WebUI. If this configuration is sufficient for your needs, no further configuration is required. See Allow remote access for web administration and SSH for information about configuring the web administration service to allow access from remote devices.

Required configuration items

- The web administration service is enabled by default.
- Configure access control for the service.

Additional configuration items

- Port to use for web administration service communication.
- Multicast DNS (mDNS) support.
- An SSL certificate to use for communications with the service.
- Support for legacy encryption protocols.

See Set the idle timeout for TX64 users for information about setting the inactivity timeout for the web administration services.

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Enable or disable the web administration service

The web administration service is enabled by default. To disable the service, or enable it if it has been disabled:

WebUI

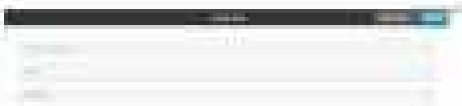
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **Web administration**.
4. Click **Enable**.
5. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```


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3. Enable or disable the web administration service:
   - To enable the service:

```
(config)> service web_admin enable true
(config)>
```

   - To disable the service:

```
(config)> service web_admin enable false
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the service

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **Web administration**.
4. [Optional] For **Port**, enter the port number for the service. Normally this should not be changed.
5. Click **Access control list** to configure access control:
   - To limit access to specified IPv4 addresses and networks:

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a. Click **IPv4 Addresses**.
b. For **Add Address**, click ✚.
c. For **Address**, enter the IPv4 address or network that can access the device's web administration service. Allowed values are:
   - A single IP address or host name.
   - A network designation in CIDR notation, for example, 192.168.1.0/24.
   - **any**: No limit to IPv4 addresses that can access the web administration service.
d. Click ✚ again to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:
  a. Click **IPv6 Addresses**.
  b. For **Add Address**, click ✚.
  c. For **Address**, enter the IPv6 address or network that can access the device's web administration service. Allowed values are:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 2001:db8::/48.
     - **any**: No limit to IPv6 addresses that can access the web administration service.
  d. Click ✚ again to list additional IP addresses or networks.
- To limit access to hosts connected through a specified interface on the TX64 device:
  a. Click **Interfaces**.
  b. For **Add Interface**, click ✚.
  c. For **Interface**, select the appropriate interface from the dropdown.
  d. Click ✚ again to allow access through additional interfaces.
- To limit access based on firewall zones:
  a. Click **Zones**.
  b. For **Add Zone**, click ✚.
  c. For **Zone**, select the appropriate firewall zone from the dropdown.

     See Firewall configuration for information about firewall zones.
  d. Click ✚ again to allow access through additional firewall zones.

8. Multicast DNS (mDNS) is enabled by default. mDNS is a protocol that resolves host names in small networks that do not have a DNS server. To disable mDNS, or enable it if it has been disabled, click **Enable mDNS**.
7. For **SSL certificate**, if you have your own signed SSL certificate, type the certificate and private key in PEM format. If **SSL certificate** is blank, the device will use an automatically-generated, self-signed certificate.
8. For **Allow legacy encryption protocols**, enable this option to allow clients to connect to the HTTPS session by using encryption protocols older than TLS 1.2, in addition to TLS 1.2 and later protocols. This option is disabled by default, which means that only TLS 1.2 and later encryption protocols are allowed with HTTPS connections.
9. **Www** is set to **Auto** by default and normally should not be changed.

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10. Legacy port redirection is used to redirect client HTTP requests to the HTTPS service. Legacy port redirection is enabled by default, and normally these settings should not be changed. To disable legacy port redirection, click to expand Legacy port redirection and deselect Enable.
11. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add service web_admin acl address end value
(config)>
```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 192.168.1.0/24.
     - any: No limit to IPv4 addresses that can access the web administration service.

     Repeat this step to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:

```
(config)> add service web_admin acl address6 end value
(config)>
```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 2001:db8::/48.
     - any: No limit to IPv6 addresses that can access the web administration service.

     Repeat this step to list additional IP addresses or networks.
   - To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service web_admin acl interface end value
(config)>
```

     Where value is an interface defined on your device.

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Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------------------------------
 defaultip              Default IP
 defaultlinklocal       Default Link-local IP
 lan1                   LAN1
 loopback               Loopback
 wan1                   WAN1
 wwan1                  WWAN1
 wwan2                  WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service web_admin act zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration
-------------------------------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

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4. (Optional) If you have your own signed SSL certificate, set the certificate and private key in PEM format. If not set, the device will use an automatically-generated key.

```
(config)> service web_admin cert cert.pem
(config)>
```

5. (Optional) Configure Multicast DNS (mDNS):

mDNS is a protocol that resolves host names in small networks that do not have a DNS server. mDNS is enabled by default. To disable mDNS, or enable it if it has been disabled:

- To enable the mDNS protocol:

```
(config)> service web_admin mdns enable true
(config>
```

- To disable the mDNS protocol:

```
(config)> service web_admin mdns enable false
(config)>
```

6. (Optional) Set the port number for this service.

The default setting of 443 normally should not be changed.

```
(config)> service web_admin port 444
(config)>
```

7. (Optional) Configure the device to allow legacy encryption protocols.

Legacy encryption protocols allow clients to connect to the HTTPS session by using encryption protocols older than TLS 1.2, in addition to TLS 1.2 and later protocols. This option is disabled by default, which means that only TLS 1.2 and later encryption protocols are allowed with HTTPS connections.

To enable legacy encryption protocols:

```
(config)> service web_admin legacy_encryption true
(config)>
```

8. (Optional) Disable legacy port redirection.

Legacy port redirection is used to redirect client HTTP requests to the HTTPS service. Legacy port redirection is enabled by default, and normally these settings should not be changed.

To disable legacy port redirection:

```
(config)> service web_admin legacy enable false
(config)>
```

9. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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Services Configure the web administration service

10. Type exit to exit the Admin CLI.
    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Configure SSH access

The TX64's default configuration has SSH access enabled, and allows SSH access to the device from authorized users within the internal firewall zone. If this configuration is sufficient for your needs, no further configuration is required. See Allow remote access for web administration and SSH for information about configuring the SSH service to allow access from remote devices.

Required configuration items

- Enable SSH access.
- Configure access control for the SSH service.

Additional configuration items

- Port to use for communications with the SSH service.
- Multicast DNS (mDNS) support.
- A private key to use for communications with the SSH service.

See Set the idle timeout for TX64 users for information about setting the inactivity timeout for the SSH service.

Enable or disable the SSH service

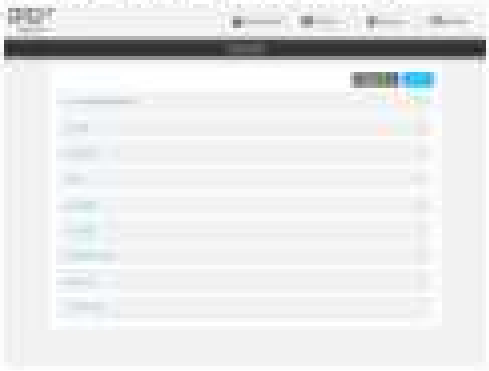
The SSH service is enabled by default. To disable the service, or enable it if it has been disabled:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



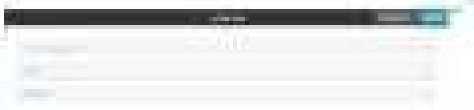
The **Configuration** window is displayed.



3. Click **Services** > **SSH**.

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4. Click **Enable**.
5. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable or disable the SSH service:
   - To enable the service:

```
(config)> service ssh enable true
(config)>
```

   - To disable the service:

```
(config)> service ssh enable false
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configure the service

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Services** > **SSH**.
4. (Optional) For **Port**, enter the port number for the service. Normally this should not be changed.
5. Click **Access control list** to configure access control:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access the device's SSH service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any**: No limit to IPv4 addresses that can access the SSH service.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv6 address or network that can access the device's SSH service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 2001:db8::/48.
        - **any**: No limit to IPv6 addresses that can access the SSH service.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to hosts connected through a specified interface on the TX64 device:
     a. Click **Interfaces**.
     b. For **Add Interface**, click **+**.
     c. For **Interface**, select the appropriate interface from the dropdown.
     d. Click **+** again to allow access through additional interfaces.
   - To limit access based on firewall zones:
     a. Click **Zones**.
     b. For **Add Zone**, click **+**.

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c. For Zone, select the appropriate firewall zone from the dropdown.

See Firewall configuration for information about firewall zones.

d. Click ✚ again to allow access through additional firewall zones.

6. Multicast DNS (mDNS) is enabled by default. mDNS is a protocol that resolves host names in small networks that do not have a DNS server. To disable mDNS, or enable it if it has been disabled, click Enable mDNS.
7. For Private key, type the private key in PEM format. If Private key is blank, the device will use an automatically-generated key.
8. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add service ssh acl address end value
(config)>
```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 192.168.1.0/24.
     - any: No limit to IPv4 addresses that can access the SSH service.

     Repeat this step to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:

```
(config)> add service ssh acl address6 end value
(config)>
```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 2001:db8::/48.
     - any: No limit to IPv6 addresses that can access the SSH service.

     Repeat this step to list additional IP addresses or networks.

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- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service ssh act interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
------------------------------------------------

 defaultip              Default IP
 defaultlinklocal       Default Link-local IP
 lan1                   LAN1
 loopback               Loopback
 wan1                   WAN1
 wwan1                  WWAN1
 wwan2                  WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service ssh act zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zonesc: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration
 ------------------------------------------------

 any
 dynamic_routing
 edge
 external
 hotspot
 internal
```


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```
    ipsec
    loopback
    setup

(config)>
```

Repeat this step to list additional firewall zones.

4. [Optional] Set the private key in PEM format. If not set, the device will use an automatically-generated key.

```
(config)> service ssh key key.pem
(config)>
```

5. [Optional] Configure Multicast DNS (mDNS)

mDNS is a protocol that resolves host names in small networks that do not have a DNS server. mDNS is enabled by default. To disable mDNS, or enable it if it has been disabled:

- To enable the mDNS protocol:

```
(config)> service ssh mdns enable true
(config)>
```

- To disable the mDNS protocol:

```
(config)> service ssh mdns enable false
(config)>
```

6. [Optional] Set the port number for this service.

The default setting of 22 normally should not be changed.

```
(config)> service ssh port 24
(config)>
```

7. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Use SSH with key authentication

Rather than using passwords, you can use SSH keys to authenticate users connecting via SSH, SFTP, or SCP. SSH keys provide security and scalability:

- Security: Using SSH keys for authentication is more secure than using passwords. Unlike a password that can be guessed by an unauthorized user, SSH key pairs provide more sophisticated security. A public key configured on the TX64 device is paired with a private key on the user's PC. The private key, once generated, remains on the user's PC.
- Scalability: SSH keys can be used on more than one TX64 device.

Generating SSH key pairs

On a Microsoft Windows PC, you can generate SSH key pairs using a terminal emulator application, such as PuTTY or Tera Term.

On a Linux host, an SSH key pair is usually created automatically in the user's .ssh directory. The private and public keys are named id_rsa and id_rsa.pub. If you need to generate an SSH key pair, you can use the ssh-keygen application.

For example, the following entry generates an RSA key pair in the user's .ssh directory:

```
ssh-keygen -t rsa -f ~/.ssh/id_rsa
```

The private key file is named id_rsa and the public key file is named id_rsa.pub. (The .pub extension is automatically appended to the name specified for the private key output file.)

Required configuration items

- Name for the user
- SSH public key for the user

Additional configuration items

- If you want to access the TX64 device using SSH over a WAN interface, configure the access control list for the SSH service to allow SSH access for the External firewall zone.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click Authentication > Users.
4. Select an existing user or create a new user. See User authentication for information about creating a new user.
5. Click SSH keys.
6. In Add SSH key, enter a name for the SSH key and click +.
7. Enter the public SSH key by pasting or typing a public encryption key that this user can use for passwordless SSH login.
8. Click Apply to save the configuration and apply the change.



Command line

You can add configure passwordless SSH login for an existing user or include the support when creating a new user. See User authentication for information about creating a new user. These instructions assume an existing user named beep_user.

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add an SSH key for the user by using the ssh_key command and pasting or typing a public encryption key:

```
(config)> add auth user beep_user ssh_key key_name key
(config)>
```

Where:

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- key_name is a name for the key.
- key is a public SSH key, which you can enter by pasting or typing a public encryption key that this user can use for passwordless SSH login.

4. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Configure telnet access

By default, the telnet service is disabled.

Note Telnet is an insecure protocol and should only be used for backward-compatibility reasons, and only if the network connection is otherwise secured.

Required configuration items

- Enable telnet access.
- Configure access control for the telnet service.

Additional configuration items

- Port to use for communications with the telnet service.
- Multicast DNS (mDNS) support.

See Set the Idle timeout for TX64 users for information about setting the inactivity timeout for the telnet service.

Enable the telnet service

The telnet service is disabled by default. To enable the service:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **telnet**.
4. Click **Enable**.

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5. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Enable the telnet service:

```
(config)> service telnet enable true
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the service

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click System. Under Configuration, click Device Configuration.



The Configuration window is displayed.

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5. Click **Services > telnet**.
4. (Optional) For **Port**, enter the port number for the service. Normally this should not be changed.
5. Click **Access control list** to configure access control:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access the device's telnet service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any**: No limit to IPv4 addresses that can access the telnet service.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv6 address or network that can access the device's telnet service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 2001:db8::/48.
        - **any**: No limit to IPv6 addresses that can access the telnet service.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to hosts connected through a specified interface on the TX64 device:
     a. Click **Interfaces**.
     b. For **Add Interface**, click **+**.
     c. For **Interface**, select the appropriate interface from the dropdown.
     d. Click **+** again to allow access through additional interfaces.
   - To limit access based on firewall zones:
     a. Click **Zones**.
     b. For **Add Zone**, click **+**.

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c. For Zone, select the appropriate firewall zone from the dropdown.
See Firewall configuration for information about firewall zones.
d. Click ➕ again to allow access through additional firewall zones.

6. Multicast DNS (mDNS) is disabled by default. mDNS is a protocol that resolves host names in small networks that do not have a DNS server. To enable mDNS, click Enable mDNS.
7. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add service telnet acl address end value
(config)>
```

Where value can be:
- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the telnet service.

Repeat this step to list additional IP addresses or networks.

   - To limit access to specified IPv6 addresses and networks:

```
(config)> add service telnet acl address6 end value
(config)>
```

Where value can be:
- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the telnet service.

Repeat this step to list additional IP addresses or networks.

   - To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service telnet acl interface end value
(config)>
```


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Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------------------
 defaultip              Default IP
 defaultlinklocal       Default Link-local IP
 lan1                   LAN1
 loopback               Loopback
 wan1                   WAN1
 wwan1                  WWAN1
 wwan2                  WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service telnet acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zonesc: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration
 ------------------------------------------------------------

   any
   dynamic_routes
   edge
   external
   hotspot
   internal
   ipsec
   loopback
   setup

(config)>
```


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Repeat this step to list additional firewall zones.

4. [Optional] Configure Multicast DNS (mDNS)

   mDNS is a protocol that resolves host names in small networks that do not have a DNS server. mDNS is disabled by default. To enable:

```
(config)> service telnet adms enable true
(config)>
```

5. [Optional] Set the port number for this service.

   The default setting of 23 normally should not be changed.

```
(config)> service telnet port 23
(config)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure DNS

The TX64 device includes a caching DNS server which forwards queries to the DNS servers that are associated with the network interfaces, and caches the results. This server is used within the device, and cannot be disabled. Use the access control list to restrict external access to this server.

Required configuration items

- Configure access control for the DNS service.

Additional configuration items

- Whether the device should cache negative responses.
- Whether the device should always perform DNS queries to all available DNS servers.
- Whether to prevent upstream DNS servers from returning private IP addresses.
- Additional DNS servers, in addition to the ones associated with the device's network interfaces.
- Specific host names and their IP addresses.

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To configure the DNS server:

Web UI

1. Log into the TX64 Web UI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services > DNS**.
4. Click **Access control list** to configure access control:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access the device's DNS service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any**: No limit to IPv4 addresses that can access the DNS service.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv6 address or network that can access the device's DNS service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 2001:db8::/48.

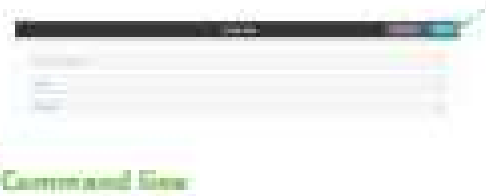
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- any: No limit to IPv6 addresses that can access the DNS service.

d. Click ➕ again to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:
  a. Click Interfaces.
  b. For Add Interface, click ➕.
  c. For Interface, select the appropriate interface from the dropdown.
  d. Click ➕ again to allow access through additional interfaces.
- To limit access based on firewall zones:
  a. Click Zones.
  b. For Add Zone, click ➕.
  c. For Zone, select the appropriate firewall zone from the dropdown.
     See Firewall configuration for information about firewall zones.
  d. Click ➕ again to allow access through additional firewall zones.

9. (Optional) Cache negative responses is enabled by default. Disabling this option may improve performance on networks with transient DNS results, when one or more DNS servers may have positive results. To disable, click Cache negative responses.
8. (Optional) Query all servers is enabled by default. This option is useful when only some DNS servers will be able to resolve hostnames. To disable, click Query all servers.
7. (Optional) Rebind protection, if enabled, prevents upstream DNS servers from returning private IP addresses. To enable, click Rebind protection.
6. (Optional) Allow localhost rebinding is enabled by default if Rebind protection is enabled. This is useful for Real-time Black List (RBL) servers.
5. (Optional) To add additional DNS servers:
   a. Click DNS servers.
   b. For Add Server, click ➕.
   c. (Optional) Enter a label for the DNS server.
   d. For DNS server, enter the IP address of the DNS server.
   e. Domain restricts the device's use of this DNS server based on the domain. If no domain are listed, then all queries may be sent to this server.
10. (Optional) To add host names and their IP addresses that the device's DNS server will resolve:
    a. Click Additional DNS hostnames.
    b. For Add Host, click ➕.
    c. Type the IP address of the host.
    d. For Name, type the hostname.
11. Click Apply to save the configuration and apply the change.



Command line

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1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add service dns acl address end value
(config)>
```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 192.168.1.0/24.
     - any: No limit to IPv4 addresses that can access the DNS service.

     Repeat this step to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:

```
(config)> add service dns acl address6 end value
(config)>
```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 2001:db8::/48.
     - any: No limit to IPv6 addresses that can access the DNS service.

     Repeat this step to list additional IP addresses or networks.
   - To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service dns acl interface end value
(config)>
```

     Where value is an interface defined on your device.

     Display a list of available interfaces:

     Use ... network interface ? to display interface information:

```
(config)> .... network interface ?

Interfaces

Additional Configuration
-------------------------------------------
defaultip               Default IP
defaultlinklocal        Default Link-local IP
lan1                    LAN1
```


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```
Loopback                    Loopback
wan1                        WAN1
wwan1                       WWAN1
wwan2                       WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service dns acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

4. [Optional] Cache negative responses

By default, the device's DNS server caches negative responses. Disabling this option may improve performance on networks with transient DNS results, when one or more DNS servers may have positive results. To disable:

```
(config)> service dns cache_negative_responses false
(config>
```

5. [Optional] Query all servers

By default, the device's DNS server queries all available DNS servers. Disabling this option may improve performance on networks with transient DNS results, when one or more DNS servers may have positive results. To disable:

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```
(config)> service dns query_all_servers false
(config)>
```

5. [Optional] Rebind protection

   By default, rebind protection is disabled. If enabled, this prevents upstream DNS servers from returning private IP addresses. To enable:

```
(config)> service dns stop_dns_rebind false
(config)>
```

7. [Optional] Allow localhost rebinding

   By default, localhost rebinding is enabled by default if rebind protection is enabled. This is useful for Real-time Black List (RBL) servers. To disable:

```
(config)> service dns rebind_localhost_ok false
(config)>
```

8. [Optional] Add additional DNS servers

   a. Add a DNS server:

```
(config)> add service dns server end
(config service dns server 8)>
```

   b. Set the IP address of the DNS server:

```
(config service dns server 8)> address ip-addr
(config service dns server 8)>
```

   c. To restrict the device's use of this DNS server based on the domain, use the domain command. If no domain are listed, then all queries may be sent to this server.

```
(config service dns server 8)> domain domain
(config service dns server 8)>
```

   d. [Optional] Set a label for this DNS server.

```
(config service dns server 8)> label label
(config service dns server 8)>
```

9. [Optional] Add host names and their IP addresses that the device's DNS server will resolve

   a. Add a host:

```
(config)> add service dns host end
(config service dns host 8)>
```

   b. Set the IP address of the host:

```
(config service dns host 8)> address ip-addr
(config service dns host 8)>
```


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c. Set the host name:

```
(config service dns host 0)> name host-name
(config service dns host 0)>
```

10. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Simple Network Management Protocol (SNMP)

Simple Network Management Protocol (SNMP) is a protocol for remotely managing and monitoring network devices. Network administrators can use the SNMP architecture to manage nodes, including servers, workstations, routers, switches, hubs, and other equipment on an IP network, manage network performance, find and solve network problems, and plan for network growth.

The TX64 device supports SNMPv3, read-only mode. SNMPv1 and v2 are not supported.

SNMP Security

By default, the TX64 device automatically blocks SNMP packets from being received over WAN and LAN interfaces. As a result, if you want a TX64 device to receive SNMP packets, you must configure the SNMP access control list to allow the device to receive the packets. See Configure Simple Network Management Protocol (SNMP).

Configure Simple Network Management Protocol (SNMP)

Required configuration items

- Enable SNMP.
- Firewall configuration using access control to allow remote connections to the SNMP agent.
- The user name and password used to connect to the SNMP agent.

Additional configuration items

- The port used by the SNMP agent.
- Authentication type (either MD5 or SHA).
- Privacy protocol (either DES or AES).
- Privacy passphrase, if different that the SNMP user password.
- Enable Multicast DNS (mDNS) support.

To configure the SNMP agent on your TX64 device:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Services > SNMP**.
4. Click **Enable**.
3. Click **Access control list** to configure access control:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access the device's SNMP agent. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any**: No limit to IPv4 addresses that can access the SNMP agent.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv6 address or network that can access the device's SNMP agent. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 2001:db8::/48.
        - **any**: No limit to IPv6 addresses that can access the SNMP agent.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to hosts connected through a specified interface on the TX64 device:
     a. Click **Interfaces**.
     b. For **Add Interface**, click **+**.
     c. For **Interface**, select the appropriate interface from the dropdown.
     d. Click **+** again to allow access through additional interfaces.
   - To limit access based on firewall zones:
     a. Click **Zones**.
     b. For **Add Zone**, click **+**.

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c. For Zone, select the appropriate firewall zone from the dropdown.
See Firewall configuration for information about firewall zones.
d. Click ✚ again to allow access through additional firewall zones.

6. Type the Username used to connect to the SNMP agent.
7. Type the Password used to connect to the SNMP agent.
8. (Optional) For Port, type the port number. The default is 161.
9. (Optional) Multicast DNS (mDNS) is disabled by default. mDNS is a protocol that resolves host names in small networks that do not have a DNS server. To enable mDNS, click Enable mDNS.
10. (Optional) Select the Authentication type, either MD5 or SHA. The default is MD5.
11. (Optional) Type the Privacy passphrase. If not set, the password, entered above, is used.
12. (Optional) Select the Privacy protocol, either DES or AES. The default is DES.
13. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Enable the SNMP agent:

```
(config)> service snmp enable true
(config)>
```

4. Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add service snmp acl address end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the SNMP service.

Repeat this step to list additional IP addresses or networks.

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- To limit access to specified IPv6 addresses and networks:

```
(config)> add service snmp acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the SNMP service.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service snmp acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------------------

 defaultip              Default IP
 defaultlinklocal       Default Link-local IP
 lan1                   LAN1
 loopback               Loopback
 wan1                   WAN1
 wwan1                  WWAN1
 wwan2                  WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service snmp acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zoneac: A list of groups of network interfaces that can be
referred to by packet
```


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Services Simple Network Management Protocol (SNMP)

```
filtering rules and access control lists.

Additional Configuration
------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

5. Set the name of the user that will be used to connect to the SNMP agent.

```
(config)> service snmp username name
(config)>
```

6. Set the password for the user that will be used to connect to the SNMP agent:

```
(config)> service snmp password pwd
(config)>
```

7. [Optional] Set the port number for the SNMP agent. The default is 161.

```
(config)> service snmp port port
(config)>
```

8. [Optional] Configure Multicast DNS (mDNS)

mDNS is a protocol that resolves host names in small networks that do not have a DNS server. For the SNMP agent, mDNS is disabled by default. To enable:

```
(config)> service snmp mdns enable true
(config>
```

9. [Optional] Set the authentication type. Allowed values are MD5 or SHA. The default is MD5.

```
(config)> service snmp auth_type SHA
(config)>
```

10. [Optional] Set the privacy passphrase. If not set, the password, entered above, is used.

```
(config)> service snmp privacy pwd
(config)>
```

11. [Optional] Set the privacy protocol, either DES or AES. The default is DES.

```
(config)> service snmp privacy_protocol AES
```


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```
(config)>
```

12. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

13. Type exit to exit the Admin CLI.

    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Download MIBs

This procedure is available from the WebUI only.

Required configuration items

- Enable SNMP.

To download a .zip archive of the SNMP MIBs supported by this device:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. Enable SNMP.

   See Configure Simple Network Management Protocol (SNMP) for information about enabling and configuring SNMP support on the TX64 device.
3. On the main menu, click **Status**. Under **Services**, click **SNMP**.



The SNMP page is displayed.



4. Click **Download**.

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Location Information

The TX64 device contains a Global Navigation Satellite System (GNSS) module that provides information about the current location of the device. The device can also be configured to:

- Dead reckoning by using an external USB GNSS receiver. External dead reckoning USB GNSS receivers are available to be purchased separately from Digi International Inc.
- Accept location messages from other location-enabled devices.
- Forward location messages, either from the TX64 device or from external sources, to a remote host.

This section contains the following topics:

Configure the location server 452
Enable or disable the internal GNSS module 452
Use a dead reckoning external USB GNSS receiver 453
Configure the device to accept location messages from external sources 453
Forward location information to a remote host 454
Show location information 455

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Configure the location server

The location server is enabled by default. You can disable it, or you can enable it if it has been disabled. You can also optionally configure the UDP listening port for location information.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **Location**.
4. The location server is enabled by default. To disable, or to enable if it has been disabled, click **Enable the location server**.
5. [Optional] For **Location server port**, type the port number that should be used to listen for location messages. The default is 2948.
6. [Optional] Configure the **Access control list**:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access this device's service-type. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any**: No limit to IPv4 addresses that can access the service-type.
     d. Click **+** again to list additional IP addresses or networks.

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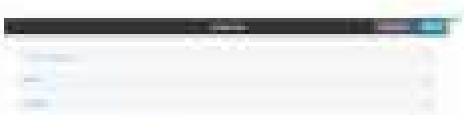
- To limit access to specified IPv6 addresses and networks:
  a. Click IPv6 Addresses.
  b. For Add Address, click +.
  c. For Address, enter the IPv6 address or network that can access the device's service-type. Allowed values are:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 2001:db8::/48.
     - any: No limit to IPv6 addresses that can access the service-type.
  d. Click + again to list additional IP addresses or networks.
- To limit access to hosts connected through a specified interface on the TX64 device:
  a. Click Interfaces.
  b. For Add Interface, click +.
  c. For Interface, select the appropriate interface from the dropdown.
  d. Click + again to allow access through additional interfaces.
- To limit access based on firewall zones:
  a. Click Zones.
  b. For Add Zone, click +.
  c. For Zone, select the appropriate firewall zone from the dropdown.
     See Firewall configuration for information about firewall zones.
  d. Click + again to allow access through additional firewall zones.

7. See Enable or disable the internal GNSS module for more information about Enable GNSS module.
8. See Use a dead-reckoning external USB GNSS receiver for more information about Enable USB GNSS module.
9. (Optional) For Location update interval, set the amount of time that the TX64 device will wait between updating location information, and sending location information to a destination server.

   Allowed values are any number of hours, minutes, or seconds, and take the format number [h|m|s].

   For example, to set Location update interval to ten minutes, enter 10m or 600s.

   The default is 15 seconds.
10. See Forward location information to a remote host for more information about Destination servers.
11. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with Full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
-> config
(config)->
```

2. Enable or disable the GNSS module:
   - To enable the module:

```
(config)-> service location gnss true
(config)->
```

   - To disable the module:

```
(config)-> service location gnss false
(config)->
```

4. (Optional) Set the port number that should be used to listen for location messages.

```
(config)-> service location port port_num
(config)->
```

where port_num is the port number of the listening port. The default is 2948.

5. (Optional) Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)-> add service location acl address end value
(config)->
```

Where value can be:
   - A single IP address or host name.
   - A network designation in CIDR notation, for example, 192.168.1.0/24.
   - any: No limit to IPv4 addresses that can access the service-type.

Repeat this step to list additional IP addresses or networks.

   - To limit access to specified IPv6 addresses and networks:

```
(config)-> add service location acl address6 end value
(config)->
```

Where value can be:
   - A single IP address or host name.
   - A network designation in CIDR notation, for example, 2001:db8::/48.
   - any: No limit to IPv6 addresses that can access the service-type.

Repeat this step to list additional IP addresses or networks.

   - To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)-> add service location acl interface end value
(config)->
```


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Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------------------
defaultip               Default IP
defaultlinklocal        Default Link-local IP
lan1                    LAN1
loopback                Loopback
wan1                    WAN1
wwan1                   WWAN1
wwan2                   WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service location acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zonesc: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration
 ------------------------------------------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```


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Repeat this step to list additional firewall zones.

8. (Optional) Set the amount of time that the TX64 device will wait between updating location information, and sending location information to a destination server.

```
(config)> service location interval value
(config)>
```

where value is any number of hours, minutes, or seconds, and takes the format number[h|m|s].

For example, to set interval to ten minutes, enter either 10m or 600s:

```
(config)> service location interval 600s
(config)>
```

The default is 10 seconds.

7. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Enable or disable the internal GNSS module

The internal GNSS module is enabled by default. You can disable it, or you can enable it if it has been disabled.

Note In order for the GNSS module to be able to provide location information, you must connect an antenna to the GNSS antenna connector.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



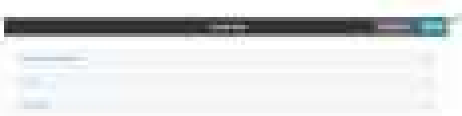
The **Configuration** window is displayed.

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Services Location Information



5. Click **Services** > **Location**.
4. Click **Enable GNSS module** to disable the internal GNSS module, or to enable it if it has been disabled.
5. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable or disable the GNSS module:
   - To enable the module:

```
(config)> service location gnss true
(config)>
```

   - To disable the module:

```
(config)> service location gnss false
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

TX64 User Guide 457

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5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Use a dead reckoning external USB GNSS receiver

The TX64 device supports an external USB GNSS receiver to provide dead reckoning-based location information. The USB GNSS receiver is available for purchase from Digi International Inc.

The ability to use an external USB GNSS receiver is enabled by default. After purchasing the USB GNSS receiver, plug it into a USB port on the TX64, and it will begin providing location information.

Note If both the internal GNSS module and the external dead reckoning USB receiver are used simultaneously, the TX64 device will determine the device's location by using the source that returns the information first. Therefore, if you want to guarantee that the dead reckoning USB receiver is used to return the device's location, you should either remove the GNSS antenna from the device, or disable the internal GNSS module. See Enable or disable the internal GNSS module for further information.

To disable support for the external GNSS receiver, or enable it if it has been disabled:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



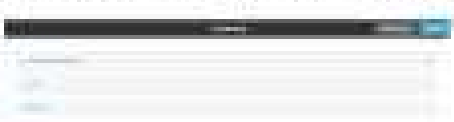
The **Configuration** window is displayed.



3. Click **Services** > **Location**.
4. Click **Enable USB GNSS module** to disable the USB GNSS receiver, or to enable it if it has been disabled.

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5. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Enable or disable the USB GNSS receiver:
   - To enable the USB GNSS receiver:

```
(config)> service location usb true
(config)>
```

   - To disable the USB GNSS receiver:

```
(config)> service location usb false
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure the device to accept location messages from external sources

You can configure the TX64 device to accept NMEA or TAIP messages from external sources. For example, location-enabled devices connected to the TX64 device can forward their location information to the device, and then the TX64 device can serve as a central repository for this location information and forward it to a remote host. See Forward location information to a remote host for information about configuring the TX64 device to forward location messages.

This procedure configures a UDP port on the TX64 device that will be used to listen for incoming messages.

Note The location server functionality is enabled by default on the TX64 device. However, because the default configuration of the access control list for the location server only allows connections for the

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loopback firewall zone, the location server by default can only collect information from the device's local GNSS module. To enable the device to receive location messages from external hosts, you must modify the access control list to allow the hosts to connect to the location server's UDP port.

Required configuration items

- The location server must be enabled.
- UDP port that the TX64 device will listen to for incoming location messages.
- Access control list configuration to provide access to the port through the firewall.

Additional configuration items

- Location update interval, which determines how often the device will poll the specified UDP port for incoming location messages.

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To configure the device to accept location messages from external sources:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **Location**.
4. The location server is enabled by default. If it has been disabled, enable the server by clicking **Enable the location server**.
5. For **Location server port**, type the number of the UDP port that will receive incoming location messages. The default is 3048.
6. Click **Access control list** to configure access control:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click +.
     c. For **Address**, enter the IPv4 address or network that can access the device's location server UDP port. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any** to limit to IPv4 addresses that can access the location server UDP port.
     d. Click + again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click +.
     c. For **Address**, enter the IPv6 address or network that can access the device's location server UDP port. Allowed values are:

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- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the location server UDP port.

d. Click + again to list additional IP addresses or networks.

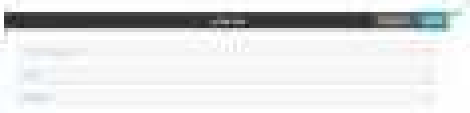
- To limit access to hosts connected through a specified interface on the TX64 device:
  a. Click Interfaces.
  b. For Add interface, click +.
  c. For Interface, select the appropriate interface from the dropdown.
  d. Click + again to allow access through additional interfaces.
- To limit access based on firewall zones:
  a. Click Zones.
  b. For Add Zone, click +.
  c. For Zone, select the appropriate firewall zone from the dropdown.

  See Firewall configuration for information about firewall zones.
  d. Click + again to allow access through additional firewall zones.

7. (Optional) For Location update interval, type the amount of time to wait between polling the specified UDP port for incoming location messages. The default is ten seconds.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s].

   For example, to set Location update interval to ten minutes, enter 10m or 600s.
8. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. The location server is enabled by default. If it has been disabled, enable the server:

```
(config)> service location enable true
(config)>
```

4. Set the UDP port that will receive incoming location messages. The default is 2948.

```
(config)> service location port 5555
(config)>
```


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5. Click Access control list to configure access control:
   - To limit access to specified IPv4 addresses and networks:

     ```
     (config)> add service location acl address end value
     (config)>
     ```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 192.168.1.0/24.
     - any: No limit to IPv4 addresses that can access the location server UDP port.

     Repeat this step to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:

     ```
     (config)> add service location acl address6 end value
     (config)>
     ```

     Where value can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 2001:db8::/48.
     - any: No limit to IPv6 addresses that can access the location server UDP port.

     Repeat this step to list additional IP addresses or networks.
   - To limit access to hosts connected through a specified interface on the TX64 device:

     ```
     (config)> add service location acl interface end value
     (config)>
     ```

     Where value is an interface defined on your device.

     Display a list of available interfaces:

     Use ... network interface ? to display interface information:

     ```
     (config)> ... network interface ?

     Interfaces

     Additional Configuration

     defaultip              Default IP
     defaultlinklocal       Default Link-local IP
     lan1                   LAN1
     loopback               Loopback
     wan1                   WAN1
     wwan1                  WWAN1
     wwan2                  WWAN2

     (config)>
     ```

     Repeat this step to list additional interfaces.

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- To limit access based on firewall zones:

```
(config)> add service location acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration
 ------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

6. (Optional) Set the amount of time to wait between polling the specified UPD port for incoming location messages. The default is ten seconds.

```
(config)> service location interval value
                          (config)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set the location update interval to ten minutes, enter either 10m or 600s:

```
(config)> service location interval 600s
(config)>
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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4. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Forward location information to a remote host

You can configure location clients on the TX64 device that forward location messages in either NMEA or TAIP format to a remote host.

Depending on how the TX64 device's location feature is enabled, you can forward the device's location information based on its GNSS module, or location information from an external source, or both:

- If the location server is enabled, location information from external sources is forwarded.
- If the GNSS module is enabled, the device's location information based on its GNSS module is forwarded.

Required configuration items

- Enable either the location server, or the GNSS module, or both.
- The hostname or IP address of the remote host to which the location messages will be forwarded.
- The destination UDP port on the remote host to which the messages will be forwarded.
- Protocol type of the messages being forwarded, either NMEA or TAIP.

Additional configuration items

- Additional remote hosts to which the location messages will be forwarded.
- Location update interval, which determines how often the device will forward location information to the remote hosts.
- A description of the remote hosts.
- Specific types of NMEA or TAIP messages that should be forwarded.
- Text that will be prepended to the forwarded message.
- A vehicle ID that is used in the TAIP ID message and can also be prepended to the forwarded message.

Configure the TX64 device to forward location information:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



   The **Configuration** window is displayed.

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5. Click **Services** > **Location**.
4. Location features are enabled by default. If they have been disabled, enable the appropriate features:
   - Click **Enable the location server** to forward information that the TX64 device receives from external location sources. See Configure the device to accept location messages from external sources for more information.
   - Click **Enable GNSS module** to forward the device's location information based on its GNSS module.
5. (Optional) For **Location update interval**, type the amount of time to wait to forward location information to remote hosts. The default is ten seconds.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

   For example, to set **Location update interval** to ten minutes, enter **10m** or **600s**.
6. Click **Destination servers**.
7. For **Add destination server**, click **+**.
8. (Optional) For **Label**, type a description of the location destination server.
9. For **Destination server**, enter the hostname or IP address of the remote host to which location messages will be sent.
10. For **Destination server port**, enter the UDP port on the remote host to which location messages will be sent.
11. For **Outgoing message type**, select the protocol type for the messages, either **TAIP** or **NMEA**.
12. (Optional) For **NMEA** and **TAIP filters**, select the filters that represent the types of messages that will be forwarded. By default, all message types are forwarded.
    - To remove a filter:
      a. Click the down arrow (▾) next to the appropriate message type.
      b. Click **Delete**.
    - To add a message type:
      a. For **Add NMEA filter** or **Add TAIP filter**, click **+**.
      b. Select the message type.

    Allowed values depend on the protocol type:

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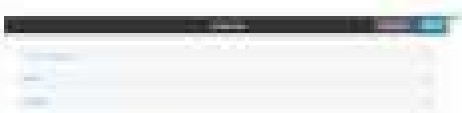
- If the protocol type is NMEA, allowed values are:
  - GGA: Reports time, position, and fix related data.
  - GLL: Reports position data: position fix, time of position fix, and status.
  - GSA: Reports GPS DOP and active satellites.
  - GSV: Reports the number of SVs in view, PRN, elevation, azimuth, and SNR.
  - RMC: Reports position, velocity, and time.
  - VTG: Reports direction and speed over ground.
- If the protocol type is TAIP, allowed values are:
  - AL: Reports altitude and vertical velocity.
  - CP: Compact position: reports time, latitude, and longitude.
  - ID: Reports the vehicle ID.
  - LN: Long navigation: reports the latitude, longitude, and altitude, the horizontal and vertical speed, and heading.
  - PN: Position/velocity: reports the latitude, longitude, and heading.

13. (Optional) For Prepend text, enter text to prepend to the forwarded message. Two variables can be included in the prepended text:
    - %s: Includes the TX64 device's serial number in the prepended text.
    - %v: Includes the vehicle ID in the prepended text.

    For example, to include both the device's serial number and vehicle ID in the prepend message, you can enter the following in the Prepend field:

    ```
    __[%s]__[%v]__
    ```

14. Type a four-digit alphanumeric Vehicle ID that will be included with to location messages. If no vehicle ID is configured, this setting defaults to 0000.
15. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

   ```
   > config
   (config)>
   ```

3. Location features are enabled by default. If they have been disabled, enable the appropriate features:

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- Enable the TX64 device to forward information that it receives from external location sources:

```
(config)> service location enable true
(config)>
```

See Configure the device to accept location messages from external sources for more information.

- Configure the TX64 device to forward the device's location information based on its GNSS module:

```
(config)> service location gpss true
(config)>
```

4. (Optional) Set the amount of time to wait to forward location information to remote hosts. The default is ten seconds.

```
(config)> service location interval value
(config)>
```

where *value* is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

For example, to set the location update interval to ten minutes, enter either 10m or 600s:

```
(config)> service location interval 600s
(config)>
```

5. Add a remote host to which location messages will be sent:

```
(config)> add service location forward end
(config service location forward 0)>
```

6. Set the hostname or IP address of the remote host to which location messages will be sent:

```
(config service location forward 0)> server_host
(config service location forward 0)>
```

7. Set the UDP port on the remote host to which location messages will be sent:

```
(config service location forward 0)> server_port 9999
(config service location forward 0)>
```

8. Set the protocol type for the messages. Allowed values are telp or nmea; the default is telp:

```
(config service location forward 0)> type nmea
(config service location forward 0)>
```

9. (Optional) Set the text to prepend to the forwarded message. Two variables can be included in the prepended text:
   - %s: Includes the TX64 device's serial number in the prepended text.
   - %v: Includes the vehicle ID in the prepended text.

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Services Location Information

```
(config service location forward 0)> prompt __(%s)__(%s)__
(config service location forward 0)>
```

10. (Optional) Set the vehicle ID.

    Allowed value is a four digit alphanumerical string (for example, 3145 or 1234). If no vehicle ID is configured, this setting defaults to 0000.

    ```
    (config service location forward 0)> vehicle-id 1234
    (config service location forward 0)>
    ```

11. (Optional) Provide a description of the remote host.

    ```
    (config service location forward 0)> label "Remote host 1"
    (config service location forward 0)>
    ```

12. (Optional) Specify types of messages that will be forwarded. Allowed values vary depending on the protocol type. By default, all message types are forwarded.

    - If the protocol type is NMEA:

      Allowed values are:

      - gga: Reports time, position, and fix related data.
      - gll: Reports position data: position fix, time of position fix, and status.
      - gsa: Reports GPS DOP and active satellites.
      - gsv: Reports the number of SVs in view, PRN, elevation, azimuth, and SNR.
      - rmc: Reports position, velocity, and time.
      - vtg: Reports direction and speed over ground.

      To remove a message type:

      a. Use the show command to determine the index number of the message type to be deleted:

         ```
         (config service location forward 0)> show filter_nmea
         0 gga
         1 gll
         2 gsa
         3 gsv
         4 rmc
         5 vtg
         (config service location forward 0)>
         ```

      b. Use the index number to delete the message type. For example, to delete the gsa (index number 2) message type:

         ```
         (config service location forward 0)> del filter_nmea 2
         (config service location forward 0)>
         ```

      To add a message type:

      a. Change to the filter_nmea node:

         ```
         (config service location forward 0)> filter_nmea
         (config service location forward 0 filter_nmea)>
         ```

TX64 User Guide 465

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b. Use the add command to add the message type. For example, to add the gps message type:

```
(config service location forward 0 filter_name)> add gps end
(config service location forward 0 filter_name)>
```

- If the protocol type is TAIP:

Allowed values are:

- all: Reports altitude and vertical velocity.
- cpc: Compact position: reports time, latitude, and longitude.
- id: Reports the vehicle ID.
- ln: Long navigation: reports the latitude, longitude, and altitude, the horizontal and vertical speed, and heading.
- pvc: Position/velocity: reports the latitude, longitude, and heading.

To remove a message type:

a. Use the show command to determine the index number of the message type to be deleted:

```
(config service location forward 0)> show filter_taip
0 all
1 cp
2 id
3 ln
4 pv
(config service location forward 0)>
```

b. Use the index number to delete the message type. For example, to delete the id [index number 2] message type:

```
(config service location forward 0)> del filter_taip 2
(config service location forward 0)>
```

To add a message type:

a. Change to the filter_taip node:

```
(config service location forward 0)> filter_taip
(config service location forward 0 filter_taip)>
```

b. Use the add command to add the message type. For example, to add the id message type:

```
(config service location forward 0 filter_taip)> add id end
(config service location forward 0 filter_taip)>
```

13. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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Services Location Information

14. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Show location information

You can view status and statistics about location information from either the WebUI or the command line.

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. At the Status page, click Location.

Command Line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Use the show location command at the system prompt:

```
> show location

Location Status
---------------
State              : enabled
Source             : 192.168.2.3
Latitude           : 40° 45' 28.800" N (40.833240)
Longitude          : 73° 17' 32.880" E (-73.309048)
Altitude           : 15 meters
Velocity           : 0 meters per second
Direction          : None
Quality            : Standard GNSS (2D/3D)
UTC Date and Time  : Fri, 29 May 2020 21:14:12 GMT
No. of Satellites  : 7

>
```

3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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System time

By default, the TX64 device synchronizes the system time by periodically connecting to the Digi NTP server, time.devicecloud.com. In this mode, the device queries the time server based on following events and schedule:

- At boot time.
- Once a day.

The default configuration has the system time zone set to UTC. No additional configuration is required for the system time if the default configuration is sufficient. However, you can change the default time zone and the default NTP server, as well as configuring additional NTP servers. If multiple servers are configured, a number of time samples are obtained from each of the servers and a subset of the NTP clock filter and selection algorithms are applied to select the best of these. See Configure the system time for details about changing the default configuration.

The TX64 device can also be configured to use Network Time Protocol (NTP). In this configuration, the device serves as an NTP server, providing NTP services to downstream devices. See Network Time Protocol for more information about NTP server support.

Configure the system time

This procedure is optional.

The TX64 device's default system time configuration uses the Digi NTP server, time.devicecloud.com, and has the time zone set to UTC. You can change the default NTP server and the default time zone, as well as configuring additional NTP servers.

Required Configuration Items

- The time zone for the TX64 device.
- At least one upstream NTP server for synchronization.

Additional Configuration Options

- Additional upstream NTP servers.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **System** > **Time**.
4. (Optional) Select the **Timezone** for the location of your TX64 device.
3. (Optional) Add upstream NTP servers that the device will use to synchronize its time. The default setting is **time.devicecloud.com**.
   - To change the default value of the NTP server:
     a. Click **NTP servers**.
     b. For **Server**, type a new server name.
   - To add an NTP server:
     a. Click **NTP servers**.
     b. For **Add Server**, click **+**.
     c. For **Server**, enter the hostname of the upstream NTP server that the device will use to synchronize its time.
     d. Click **+** to add additional NTP servers. If multiple servers are included, servers are tried in the order listed until one succeeds.

Note This list is synchronized with the list of servers included with NTP server configuration, and changes made to one will be reflected in the other. See Configure the device as an NTP server for more information about NTP server configuration.

8. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. (Optional) Set the timezone for the location of your TX64 device. The default is UTC.

```
(config)> system time timezone value
(config)>
```

Where value is the timezone using the format specified with the following command:

```
(config)> system time timezone ?

Timezone: The timezone for the location of this device. This is used to
adjust the time for log
messages. It also affects actions that occur at a specific time of day.
Format:
  Africa/Abidjan
  Africa/Accra
  Africa/Addis_Ababa
  ...

(config)>
```

4. (Optional) Add an upstream NTP server that the device will use to synchronize its time to the appropriate location in the list of NTP servers. The default setting is time.devicecloud.com.
   - To delete the default NTP server, time.devicecloud.com:

     ```
     (config)> del service ntp server 0
     ```

   - To add the NTP server to the beginning of the list, use the Index value of 0 to indicate that it should be added as the first server:

     ```
     (config)> add service ntp server 0 time.server.com
     (config)>
     ```

   - To add the NTP server to the end of the list, use the Index keyword end:

     ```
     (config)> add service ntp server end time.server.com
     (config)>
     ```

   - To add the NTP server in another location in the list, use an Index value to indicate the appropriate position. For example:

     ```
     (config)> add service ntp server 1 time.server.com
     (config)>
     ```

Note: This list is synchronized with the list of servers included with NTP server configuration, and changes made to one will be reflected in the other. See Configure the device as an NTP server for more information about NTP server configuration.

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5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Network Time Protocol

Network Time Protocol (NTP) enables devices connected on local and worldwide networks to synchronize their internal software and hardware clocks to the same time source. The TX64 device can be configured as an NTP server, allowing downstream hosts that are attached to the device's Local Area Networks to synchronize with the device.

When the device is configured as an NTP server, it also functions as an NTP client. The NTP client will be consistently synchronized with one or more upstream NTP servers, which means that NTP packets are transferred every few seconds. A minimum of one upstream NTP server is required. Additional NTP servers can be configured. If multiple servers are configured, a number of time samples are obtained from each of the servers and a subset of the NTP clock filter and selection algorithms are applied to select the best of these.

See Configure the device as an NTP server for information about configuring your device as an NTP server.

Configure the device as an NTP server

Required Configuration Items

- Enable the NTP service.
- At least one upstream NTP server for synchronization. The default setting is the Digi NTP server, time.devicecloud.com.

Additional Configuration Options

- Additional upstream NTP servers.
- Access control list to limit downstream access to the TX64 device's NTP service.
- The time zone setting, if the default setting of UTC is not appropriate.

To configure the TX64 device's NTP service:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **NTP**.
4. Enable the TX64 device's NTP service by clicking **Enable**.
5. [Optional] Configure the access control list to limit downstream access to the TX64 device's NTP service.
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access the device's NTP service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any**: No limit to IPv4 addresses that can access the NTP service.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv6 address or network that can access the device's NTP service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 2001:db8::/48.
        - **any**: No limit to IPv6 addresses that can access the NTP service.
     d. Click **+** again to list additional IP addresses or networks.

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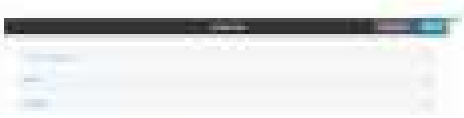
- To limit access to hosts connected through a specified interface on the TX64 device:
  a. Click **Interfaces**.
  b. For **Add Interface**, click **+**.
  c. For **Interface**, select the appropriate interface from the dropdown.
  d. Click **+** again to allow access through additional interfaces.
- To limit access based on firewall zones:
  a. Click **Zones**.
  b. For **Add Zone**, click **+**.
  c. For **Zone**, select the appropriate firewall zone from the dropdown.
     See Firewall configuration for information about firewall zones.
  d. Click **+** again to allow access through additional firewall zones.

Note By default, the access control list for the NTP service is empty, which means that all downstream hosts connected to the TX64 device can use the NTP service.

6. (Optional) Add upstream NTP servers that the device will use to synchronize its time. The default setting is **time.devicecloud.com**.
   - To change the default value of the NTP server:
     a. Click **NTP servers**.
     b. For **Server**, type a new server name.
   - To add an NTP server:
     a. Click **NTP servers**.
     b. For **Add Server**, click **+**.
     c. For **Server**, enter the hostname of the upstream NTP server that the device will use to synchronize its time.
     d. Click **+** to add additional NTP servers. If multiple servers are included, servers are tried in the order listed until one succeeds.

Note This list is synchronized with the list of servers included with NTP client configuration, and changes made to one will be reflected in the other. See Configure the system time for more information about NTP client configuration.

7. (Optional) Configure the system time zone. The default is UTC.
   a. Click **System > Time**.
   b. Select the **Timezone** for the location of your TX64 device.
8. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

1. At the command line, type **config** to enter configuration mode:

```
-> config
(config)->
```

2. Enable the NTP service:

```
(config)-> service NTP enable true
(config)->
```

3. [Optional] Add an upstream NTP server that the device will use to synchronize its time to the appropriate location in the list of NTP servers. The default setting is **time.devicecloud.com**.
   - To delete the default NTP server, **time.devicecloud.com**:

     ```
     (config)-> del service ntp server 0
     ```

   - To add the NTP server to the beginning of the list, use the Index value of **0** to indicate that it should be added as the first server:

     ```
     (config)-> add service ntp server 0 time.server.com
     (config)->
     ```

   - To add the NTP server to the end of the list, use the Index keyword **end**:

     ```
     (config)-> add service ntp server end time.server.com
     (config)->
     ```

   - To add the NTP server in another location in the list, use an Index value to indicate the appropriate position. For example:

     ```
     (config)-> add service ntp server 1 time.server.com
     (config)->
     ```

Note This list is synchronized with the list of servers included with NTP client configuration, and changes made to one will be reflected in the other. See Configure the system time for more information about NTP client configuration.

4. [Optional] Configure the access control list to limit downstream access to the TX64 device's NTP service.
   - To limit access to specified IPv4 addresses and networks:

     ```
     (config)-> add service ntp acl address end value
     (config)->
     ```

     Where *value* can be:
     - A single IP address or host name.
     - A network designation in CIDR notation, for example, 192.168.1.0/24.
     - **any**: No limit to IPv4 addresses that can access the NTP server agent.

     Repeat this step to list additional IP addresses or networks.

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- To limit access to specified IPv6 addresses and networks:

```
(config)> add service ntp acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the NTP server agent.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service ntp acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
-------------------------------------------------------------

 defaultip                Default IP
 defaultlinklocal         Default Link-local IP
 lan1                     LAN1
 loopback                 Loopback
 wan1                     WAN1
 wwan1                    WWAN1
 wwan2                    WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service ntp acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
```


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Services Configure the device as an NTP server

```
filtering rules and access control lists.

 Additional Configuration
 ------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

Note: By default, the access control list for the NTP service is empty, which means that all downstream hosts connected to the TX64 device can use the NTP service.

6. (Optional) Set the timezone for the location of your TX64 device. The default is UTC.

```
(config)> system time timezone value
(config)>
```

Where value is the timezone using the format specified with the following command:

```
(config)> system time timezone ?

Timezone: The timezone for the location of this device. This is used to
adjust the time for log
messages. It also affects actions that occur at a specific time of day.
Format:
  Africa/Abidjan
  Africa/Accra
  Africa/Addis_Ababa
  ...

(config)>
```

7. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Configure a multicast route

Multicast routing allows a device to transmit data to a single multicast address, which is then distributed to a group of devices that are configured to be members of that group.

To configure a multicast route:

WebUI

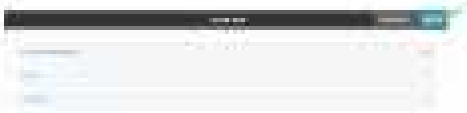
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **Multicast**.
4. For **Add Multicast route**, type a name for the route and click **+**.
5. The new route is enabled by default. To disable, uncheck **Enable**.
6. Type the **Source address** for the route. This must be a multicast IP address between 224.0.0.1 and 239.255.255.255.
7. Type the **Source port**. Ensure the port is not used by another protocol.
8. Select a **Source Interface** where multicast packets will arrive.
9. Select a **Destination Interface** that the TX64 device will use to send multicast packets.
10. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
-> config
(config)>
```

2. Add the multicast route. For example, to add a route named test:

```
(config)> add service multicast test
(config service multicast test)>
```

3. The multicast route is enabled by default. If it has been disabled, enable the route:

```
(config service multicast test)> enable true
(config service multicast test)>
```

4. Set the source address for the route. This must be a multicast IP address between 224.0.0.1 and 239.255.255.255.

```
(config service multicast test)> dst_ip-address
(config service multicast test)>
```

5. Set the source port for the route. Ensure the port is not used by another protocol.

```
(config service multicast test)> port port
(config service multicast test)>
```

6. Set the source interface for the route where multicast packets will arrive:

   a. Use the ? to determine available interfaces:

```
(config service multicast test)> src_interface ?

Source interface: Where the multicast packets will arrive. IP routes do
not have an effect in the incoming stream.
Format:
  /network/interface/defaultip
  /network/interface/defaultlinklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config service multicast test)> src_interface
```

   b. Set the interface. For example:

```
(config service multicast test)> src_interface /network/interface/wan1
(config service multicast test)>
```


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8. Set the destination interface that the TX64 device will use to send multicast packets.

```
(config service multicast test)> interface interface
(config service multicast test)>
```

a. Use the ? to determine available interfaces:

```
(config service multicast test)> interface ?

Destination interface: Which interface to send the multicast packets.
Format:
  /network/interface/defaultip
  /network/interface/defaultiplinklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config service multicast test)> interface
```

b. Set the interface. For example:

```
(config service multicast test)> interface /network/interface/wwan1
(config service multicast test)>
```

9. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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TESSOL Technical Library TS-TL-DGI-091

Enable service discovery (mDNS)

Multicast DNS mDNS is a protocol that resolves host names in small networks that do not have a DNS server. You can enable the TX64 device to use mDNS.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **Service Discovery (mDNS)**.
4. **Enable** the mDNS service.
5. Click **Access control list** to configure access control:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access the device's mDNS service. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.1.0/24.
        - **any**: No limit to IPv4 addresses that can access the mDNS service.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv6 address or network that can access the device's mDNS service. Allowed values are:

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Services Enable service discovery (mDNS)

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the mDNS service.

d. Click ✚ again to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:
  a. Click **Interfaces**.
  b. For **Add Interface**, click ✚.
  c. For **Interface**, select the appropriate interface from the dropdown.
  d. Click ✚ again to allow access through additional interfaces.
- To limit access based on firewall zones:
  a. Click **Zones**.
  b. For **Add Zone**, click ✚.
  c. For **Zone**, select the appropriate firewall zone from the dropdown.
  See Firewall configuration for information about firewall zones.
  d. Click ✚ again to allow access through additional firewall zones.

6. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable the mDNS service:

```
(config)> service adns enable true
(config)>
```

4. Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add service adns acl address end value
(config)>
```

Where value can be:

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- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the mDNS service.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

```
(config)> add service admx acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the mDNS service.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service admx acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
------------------------------------------------
 defaultip              Default IP
 defaultlinklocal       Default Link-local IP
 lan1                   LAN1
 loopback               Loopback
 wan1                   WAN1
 wwan1                  WWAN1
 wwan2                  WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service admx acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

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```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

5. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Use the IPerf service

Your TX64 device includes an IPerf3 server that you can use to test the performance of your network. IPerf3 is a command-line tool that measures the maximum network throughput an interface can handle. This is useful when diagnosing network speed issues, to determine, for example, whether a cellular connection is providing expected throughput.

The TX64 implementation of IPerf3 supports testing with both TCP and UDP.

Note Using IPerf clients that are at a version earlier than IPerf3 to connect to the TX64 device's IPerf3 server may result in unpredictable results. As a result, Digi recommends using an IPerf client at version 3 or newer to connect to the TX64 device's IPerf3 server.

Required configuration items

- Enable the IPerf server on the TX64 device.
- An IPerf3 client installed on a remote host. IPerf3 software can be downloaded at:

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Services	Use the IPerf service

Additional configuration items

- The port that the TX64 device's IPerf server will use to listen for incoming connections.
- The access control list for the IPerf server.

  When the IPerf server is enabled, the TX64 device will automatically configure its firewall rules to allow incoming connections on the configured listening port. You can restrict access by configuring the access control list for the IPerf server.

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To enable the Iperf3 server:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Services** > **IPerf**.
4. Click **Enable**.
5. [Optional] For **Iperf Server Port**, type the appropriate port number for the iPerf server listening port.
6. [Optional] Click to expand **Access control list** to restrict access to the iPerf server:
   - To limit access to specified IPv4 addresses and networks:
     a. Click **IPv4 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv4 address or network that can access this device's service-type. Allowed values are:
        - A single IP address or host name.
        - A network designation in CIDR notation, for example, 192.168.2.0/24.
        - **any**: No limit to IPv4 addresses that can access the service-type.
     d. Click **+** again to list additional IP addresses or networks.
   - To limit access to specified IPv6 addresses and networks:
     a. Click **IPv6 Addresses**.
     b. For **Add Address**, click **+**.
     c. For **Address**, enter the IPv6 address or network that can access this device's service-type. Allowed values are:

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- A single IP address or host name.
- A network designation in CIDR notation, for example, 203.0.113.0/24.
- any: No limit to IPv6 addresses that can access the service-type.

d. Click ➕ again to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:
  a. Click Interfaces.
  b. For Add Interface, click ➕.
  c. For Interface, select the appropriate interface from the dropdown.
  d. Click ➕ again to allow access through additional interfaces.
- To limit access based on firewall zones:
  a. Click Zones.
  b. For Add Zone, click ➕.
  c. For Zone, select the appropriate firewall zone from the dropdown.
  See Firewall configuration for information about firewall zones.
  d. Click ➕ again to allow access through additional firewall zones.

7. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Enable the iPerf server:

```
(config)> service iperf enable true
(config)>
```

4. (Optional) Set the port number for the iPerf server listening port. The default is 5201.

```
(config)> service iperf port port_number
(config)>
```

5. (Optional) Set the access control list to restrict access to the iPerf server.
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add service iperf acl address end value
(config)>
```


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Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the service-type.

Repeat this step to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:

```
(config)> add service iperf acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the service-type.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add service iperf acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration
------------------------------------------------
 defaultip              Default IP
 defaultlinklocal       Default Link-local IP
 lan1                   LAN1
 loopback               Loopback
 wan1                   WAN1
 wwan1                  WWAN1
 wwan2                  WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add service iperf acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

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Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

 Additional Configuration
 ------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

8. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Example performance test using iperf3

On a remote host with iperf3 installed, enter the following command:

```
$ iperf3 -c device_ip
```

where device_ip is the IP address of the TX64 device. For example:

```
$ iperf3 -c 192.168.2.1
Connecting to host 192.168.2.1, port 5201
[  4] local 192.168.3.100 port 54934 connected to 192.168.1.1 port 5201
[ ID] Interval           Transfer     Bandwidth       Retr  Cwnd
[  4]   0.00-1.00   sec  36.7 MBytes   224 Mbits/sec    8   2.68 MBytes
[  4]   1.00-2.00   sec  38.4 MBytes   238 Mbits/sec   29   1.33 MBytes
[  4]   2.00-3.00   sec  29.8 MBytes   250 Mbits/sec    0   1.45 MBytes
[  4]   3.00-4.00   sec  31.2 MBytes   262 Mbits/sec    0   1.52 MBytes
[  4]   4.00-5.00   sec  32.1 MBytes   269 Mbits/sec    0   1.56 MBytes
[  4]   5.00-6.00   sec  32.5 MBytes   273 Mbits/sec    0   1.58 MBytes
[  4]   6.00-7.00   sec  33.9 MBytes   284 Mbits/sec    0   1.68 MBytes
[  4]   7.00-8.00   sec  33.7 MBytes   282 Mbits/sec    0   1.68 MBytes
```


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Services Use the iPerf service

```
[  4]   8.00-9.00   sec  33.5 MBytes   281 Mbits/sec    0   1.48 MBytes
[  4]   9.00-10.00  sec  33.2 MBytes   279 Mbits/sec    0   1.48 MBytes
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth       Retr
[  4]   0.00-10.00  sec   315 MBytes   264 Mbits/sec   37             sender
[  4]   0.00-10.00  sec   313 MBytes   262 Mbits/sec                  receiver

iperf Done.
$
```

TX64 User Guide 494

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Applications

The TX64 supports Python 3.8 and provides you with the ability to run Python applications on the device interactively or from a file. You can also specify Python applications and other scripts to be run each time the device system restarts, at specific intervals, or at a specified time.

This chapter contains the following topics:

Configure applications to run automatically 496
Run a Python application at the shell prompt 500
Start an interactive Python session 504
Digi.cellular module 505
rci module 507
Use Python to access serial ports 508

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Configure applications to run automatically

You can configure an application to run automatically when the system restarts, at specific intervals, or at a specified time.

Required configuration items

- Upload or create the Python application.
- Enable the Python application to be run automatically.
- Select whether the application should run:
  - When the device boots.
  - At a specified time.
  - At a specified interval.
  - During system maintenance.

Additional configuration items

- A label used to identify the application.
- The action to take if the Python application finishes. The actions that can be taken are:
  - None.
  - Restart the script.
  - Reboot the device.
- The arguments for the Python application.
- Whether to write the application output and errors to the system log.
- The memory available to be used by the application.
- Whether the script should run one time only.

Task one: Upload the application

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.

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Applications Configure applications to run automatically



3. Highlight the scripts directory and click to open the directory.
4. Click (upload).
5. Browse to the location of the script on your local machine. Select the file and click Open to upload the file.

The uploaded file is uploaded to the /etc/config/scripts directory.

Command Line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, use the scp command to upload the Python application script to the TX64 device:

   ```
   > scp host hostname-or-ip user username remote remote-path local local-path
   to local
   ```

   where:

   - hostname-or-ip is the hostname or ip address of the remote host.
   - username is the name of the user on the remote host.
   - remote-path is the path and filename of the file on the remote host that will be copied to the TX64 device.
   - local-path is the location on the TX64 device where the copied file will be placed.

   For example:

   To upload a Python application from a remote host with an IP address of 192.168.4.1 to the /etc/config/scripts directory on the TX64 device, issue the following command:

   ```
   > scp host 192.168.4.1 user admin remote /home/admin/bin/test.py local
   /etc/config/scripts/ to local
   admin@192.168.4.1's password: adminpwd
   test.py                       100%   3048    11.1KB/s   00:03
   >
   ```
3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Note You can also create Python applications by using the vi command when logged in with shell access.

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Task two: Configure the application to run automatically

Note This feature does not provide syntax or error checking. Certain commands can render the device inoperable. Use with care.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Applications**.
   Scripts created here are also automatically entered in **System** > **Scheduled tasks** > **Custom scripts**.
4. For **Add Script**, click **+**.

The schedule script configuration window is displayed.

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Scheduled scripts are enabled by default. To disable, click Enable to toggle off.

5. (Optional) For Label, provide a label for the script.
6. For Run mode, select the mode that will be used to run the script. Available options are:
   - On boot: The script will run once each time the device boots.
     - If On boot is selected, select the action that will be taken when the script completes in Exit action. Available options are:
       - None: Action taken when the script exits.
       - Restart script: Runs the script repeatedly.
       - Reboot: The device will reboot when the script completes.
   - Interval: The script will start running at the specified interval, within 30 seconds after the configuration change is saved.
     - If Interval is selected, in Interval, type the interval.

       Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

       For example, to set interval to ten minutes, enter 10m or 600s.
     - Click to enable Run single to run only a single instance of the script at a time.

       If Run single is not selected, a new instance of the script will be started at every interval, regardless of whether the script is still running from a previous interval.
   - Set time: Runs the script at a specified time of the day.
     - If Set Time is selected, specify the time that the script should run in Run time, using the format *HH:MM*.
   - During system maintenance: The script will run during the system maintenance time window.
7. For Commands, enter the commands that will execute the script.

   If the script begins with #!, then the script will be invoked in the location specified by the path for the script command. Otherwise, the default shell will be used (equivalent to #!/bin/sh).
8. Script logging options:
   a. Click to enable Log script output to log the script's output to the system log.
   b. Click to enable Log script errors to log script errors to the system log.

   If neither option is selected, only the script's exit code is written to the system log.
9. For Maximum memory, enter the maximum amount of memory available to be used by the script and its subprocesses, using the format *number*[b|bytes|KB|kB|MB|mB|M|GB|gB|TB|T].

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10. Click to enable Once to configure the script to run only once at the specified time.
    If Once is enabled, rebooting the device will cause the script to not run again. The only way to re-run the script is to:
    - Remove the script from the device and add it again.
    - Make a change to the script.
    - Uncheck Once.
11. Sandbox is enabled by default. This option protects the script from accidentally destroying the system it is running on.
12. Click Apply to save the configuration and apply the changes.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add a script:

```
(config)> add system schedule script end
(config system schedule script 6)>
```

Scheduled scripts are enabled by default. To disable:

```
(config system schedule script 6)> enable false
(config system schedule script 6)>
```

4. (Optional) Provide a label for the script.

```
(config system schedule script 6)> label value
(config system schedule script 6)>
```

where value is any string. If spaces are used, enclose value within double quotes.

5. Set the mode that will be used to run the script:

```
(config system schedule script 6)> when mode
(config system schedule script 6)>
```

where mode is one of the following:

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- boot: The script will run once each time the device boots.
  - If boot is selected, set the action that will be taken when the script completes:

```
(config system schedule script 0)> exit_action action
(config system schedule script 0)>
```

where action is one of the following:

- none: Action taken when the script exits.
- restart: Runs the script repeatedly.
- reboot: The device will reboot when the script completes.

- interval: The script will start running at the specified interval, within 30 seconds after the configuration change is saved. If interval is selected:
  - Set the interval:

```
(config system schedule script 0)> on_interval value
(config system schedule script 0)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set on_interval to ten minutes, enter either 10m or 600s:

```
(config system schedule script 0)> on_interval 600s
(config system schedule script 0)>
```

  - (Optional) Configure the script to run only a single instance at a time:

```
(config system schedule script 0)> once true
(config system schedule script 0)>
```

If once is set to false, a new instance of the script will be started at every interval, regardless of whether the script is still running from a previous interval.

- set_time: Runs the script at a specified time of the day.
  - If set_time is set, set the time that the script should run, using the format HH:MM:

```
(config system schedule script 0)> run_time HH:MM
(config system schedule script 0)>
```

- maintenance_time: The script will run during the system maintenance time window.

5. Set the commands that will execute the script:

```
(config system schedule script 0)> commands filename
(config system schedule script 0)>
```

where filename is the path and filename of the script, and any related command line information.

If the script begins with #!, then the script will be invoked in the location specified by the path for the script command. Otherwise, the default shell will be used (equivalent to #!/bin/sh).

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7. Script logging options:
   - To log the script's output to the system log:

     ```
     (config system schedule script 6)> syslog_stdout true
     (config system schedule script 6)>
     ```

   - To log script errors to the system log:

     ```
     (config system schedule script 6)> syslog_stderr true
     (config system schedule script 6)>
     ```

   If syslog_stdout and syslog_stderr are not enabled, only the script's exit code is written to the system log.
8. Set the maximum amount of memory available to be used by the script and its subprocesses:

   ```
   (config system schedule script 6)> max_memory value
   (config system schedule script 6)>
   ```

   where value uses the syntax number[b|bytes|KB|k|KiB|MB|M|GB|G|TB|T].
9. To run the script only once at the specified time:

   ```
   (config system schedule script 6)> once true
   (config system schedule script 6)>
   ```

   If once is enabled, rebooting the device will cause the script to run again. The only way to re-run the script is to:
   - Remove the script from the device and add it again.
   - Make a change to the script.
   - Disable once.
10. Sandbox is enabled by default. This option protects the script from accidentally destroying the system it is running on.

    ```
    (config system schedule script 6)> sandbox true
    (config system schedule script 6)>
    ```

11. Save the configuration and apply the change:

    ```
    (config)> save
    Configuration saved.
    >
    ```

12. Type exit to exit the Admin CLI.

    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Run a Python application at the shell prompt

Python applications can be run from a file at the shell prompt. The Python application will run until it completes, displaying output and prompting for additional user input if needed. To interrupt the application, enter CTRL-C.

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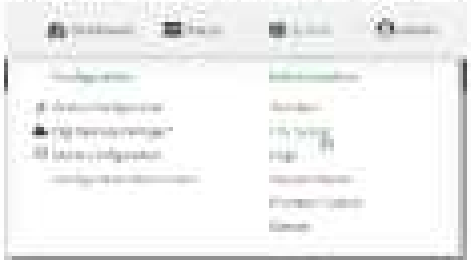
Note: Python applications cannot be run from the Admin CLI. You must access the device shell in order to run Python applications from the command line. See Authentication groups for information about configuring authentication groups that include shell access.

1. Upload the Python application to the TX64 device:

WebUI

a. Log into the TX64 WebUI as a user with Admin access.

b. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.



c. Highlight the **scripts** directory and click to open the directory.

d. Click (upload).

e. Browse to the location of the script on your local machine. Select the file and click **Open** to upload the file.

The uploaded file is uploaded to the */etc/config/scripts* directory.

Command line

a. Log into the TX64 command line as a user with Admin access.

Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

b. At the command line, use the scp command to upload the Python application script to the TX64 device:

```
> scp host hostname-or-ip user username remote remote-path local local-path to local
```

where:

- *hostname-or-ip* is the hostname or ip address of the remote host.
- *username* is the name of the user on the remote host.

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- remote-path is the path and filename of the file on the remote host that will be copied to the TX64 device.
- local-path is the location on the TX64 device where the copied file will be placed.

For example:

To upload a Python application from a remote host with an IP address of 192.168.4.1 to the /etc/config/scripts directory on the TX64 device, issue the following command:

```
> scp host 192.168.4.1 user admin remote /home/admin/bin/test.py local
/etc/config/scripts/ to local
admin@192.168.4.1's password: adminpwd
test.py                                   100%   3298     11.3KB/s   00:00
>
```

c. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Note You can also create Python applications by using the vi command when logged in with shell access.

3. Log into the TX64 command line as a user with shell access.

Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

5. Use the python command to run the Python application. In the following example, the Python application, test.py, takes 3 parameters: 128, ports and storage:

```
# python test.py 128 ports storage
```

Start an Interactive Python session

Use the python command without specifying any parameters to start an interactive Python session. The Python session operates interactively using REPL (Read Evaluate Print Loop) to allow you to write Python code on the command line.

Note The Python interactive session is not available from the Admin CLI. You must access the device shell in order to run Python applications from the command line. See Authentication groups for information about configuring authentication groups that include shell access.

1. Log into the TX64 command line as a user with shell access.

Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 11 2020, 08:45:19)
[GCC 8.3.0] on linux
```


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```
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

5. Type Python commands at the Python prompt. For example, to view help for the digidevice module, type:

```
>>> help("digidevice")
Help on package digidevice:

NAME
    digidevice - Digi device python extensions

DESCRIPTION
    This module includes various extensions that allow Python
    to interact with additional features offered by the device.
...
```

4. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

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Digidevice module

The Python digidevice module provides platform-specific extensions that allow you to interact with the device's configuration and interfaces. The following submodules are included with the digidevice module:

This section contains the following topics:

Use digidevice.cli to execute CLI commands 507
Use digidevice.datapoint to upload custom datapoints to Digi Remote Manager 508
Use digidevice.config for device configuration 510
Use Python to respond to Digi Remote Manager SCI requests 512
Use digidevice.runtime to access the runtime database 513
Using Python to upload the device name to Digi Remote Manager 520
The digidevice.led submodule 529

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Use digidevice.cli to execute CLI commands

Use the digidevice.cli Python module to issue CLI commands from Python to retrieve status and statistical information about the device.

For example, to display the system status and statistics by using an interactive Python session, use the show system command with the cli module:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the cli submodule:

```
>>> from digidevice import cli
>>>
```

4. Execute a CLI command using the cli.execute(command) function. For example, to print the system status and statistics to stdout using the show system command:

```
>>> response = cli.execute("show system")
>>>
>>> print (response)

  Model                    : Digi TX64
  Serial Number            : TX64-000005
  SKU                      : TX64
  Hostname                 : TX64
  MAC                      : 0F:00:12:AE:21:18

  Hardware Version         : 50001547-01 1F
  Firmware Version         : 20.5.38.39
  Alt. Firmware Version    : 20.5.38.39
  Bootloader Version       : 10.7.23.8-15F93$WRed

  Current Time             : Fri, 29 May 2020 21:14:13 +0000
  CPU                      : 1.45
  Uptime                   : 6 days, 6 hours, 21 minutes, 57 seconds
(548337s)
  Temperature              : 46C

>>>
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

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Help for using Python to execute TX64 CLI commands

Get help executing a CLI command from Python by accessing help for cli.execute:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the cli submodule:

```
>>> from digidevice import cli
>>>
```

4. Use the help command with cli.execute:

```
>>> help(cli.execute)
Help on function execute in module digidevice.cli:

execute(command, timeout=5)
Execute a CLI command with the timeout specified returning the results.
...
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

Use digidevice.datapoint to upload custom datapoints to Digi Remote Manager

Use the datapoint Python module to upload custom datapoints to Digi Remote Manager.

The following characteristics can be defined for a datapoint:

- Stream ID
- Value
- [Optional] Data type
  - Integer
  - long
  - float
  - double
  - string
  - binary
- Units (optional)
- Timestamp (optional)

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- Location (optional)
  - Tuple of latitude, longitude and altitude
- Description (optional)
- Quality (optional)
  - An integer describing the quality of the data point

For example, to use an interactive Python session to upload datapoints related to velocity, temperature, and the state of the emergency door:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.
2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:19)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the datapoint submodule and other necessary modules:

```
>>> from digidevice import datapoint
>>> import time
>>>
```

4. Upload the datapoints to Remote Manager:

```
>>> datapoint.upload("Velocity", 60, units="mph")
>>> datapoint.upload("Temperature", 24, geo_location=(34.469469, -1.758836,
128))
>>> datapoint.upload("Emergency_Door", "closed", timestamp=time.time())
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

Once the datapoints have been uploaded to Remote Manager, they can be viewed via Remote Manager or accessed using Web Services calls. See the Digi Remote Manager Programmers Guide for more information on web services and datapoints.

Help for using Python to upload custom datapoints to Remote Manager

Get help for uploading datapoints to your Digi Remote Manager account by accessing help for **datapoint.upload**:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.
2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

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```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the datapoint submodule and other necessary modules:

```
>>> from digidevice import datapoint
>>>
```

4. Use the help command with datapoint.upload:

```
>>> help(datapoint.upload)
Help on function upload in module digidevice.datapoint:

upload(stream_id:str, data, *, description:str=None, timestamp:float=None,
unit:str=None,
geo_location:Tuple[float, float, float]=None, quality:int=None,
data_type:digidevice.datapoint.DataType=None, timeout:float=None)
...
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

Use digidevice.config for device configuration

Use the config Python module to access and modify the device configuration.

Read the device configuration

Use the get() method to read the device configuration:

1. Log into the TX64 command line as a user with shell access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.
2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the config submodule:

```
>>> from digidevice import config
>>>
```

4. Use config.load() and the get() method to return the device's configuration:

```
>>> cfg = config.load()
>>> print(cfg)
```


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```
...
network.interface.lan1.device=/network/bridge/lan1
network.interface.lan1.enable=true
network.interface.lan1.ipv4.address=192.168.3.1/24
network.interface.lan1.ipv4.connection_monitor.attempts=3
...
>>> interfaces = cfg.get("network.interface")
>>> print(interfaces.keys())
['defaultip', 'defaultlinklocal', 'lan1', 'loopback', 'wan1', 'wwan1',
'wwan2']
>>> print(interfaces.get("lan.ipv4.address"))
192.168.2.1/24
>>>
```

Modify the device configuration

Use the set() and commit() methods to modify the device configuration:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the config submodule:

```
>>> from digidevice import config
>>>
```

4. Use config.load(writable=True) to enable write mode for the configuration:

```
>>> cfg = config.load(writable=True)
>>>
```

5. Use the set() method to make changes to the configuration:

```
>>> cfg.set("system.name", "New Name")
>>>
```

6. Use the commit() method to save the changes:

```
>>> cfg.commit()
True
>>>
```


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7. Use the get() method to verify the change:

```
>>> print(cfg.get("system.name"))
New Name
>>>
```

Help for using Python to read and modify device configuration

Get help for reading and modifying the device configuration by accessing help for digidevice.config:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:19)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the config submodule:

```
>>> from digidevice import config
>>>
```

4. Use the help command with config:

```
>>> help(config)
Help on module acl.config in acl:

NAME
acl.config - Python interface to ACL configuration (libconfig).
....
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

Use Python to respond to Digi Remote Manager SCI requests

The device_request Python module allows you to interact with Digi Remote Manager by using Remote Manager's Server Command Interface (SCI), a web service that allows users to access information and perform commands that relate to their devices.

Use Remote Manager's SCI interface to create SCI requests that are sent to your TX64 device, and use the device_request module to send responses to those requests to Remote Manager.

See the Digi Remote Manager Programmer's Guide for more information on SCI.

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Task one: Use the device_request module on your TX64 device to create a response

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the device_request module:

```
>>> from digidevice import device_request
>>>
```

4. Create a function to handle the request from Remote Manager:

```
>>> def handler(target, request):
...     print ("received request %s for target %s" % (request, target))
...     return "OK"
...
>>>
```

5. Register a callback function that will be called when the device receives a SCI request from Remote Manager:

```
>>> device_request.register("myTarget", handler)
>>>
```

Note: Leave the interactive Python session active while completing task two, below. Once you have completed task two, exit the interactive session by using Ctrl-D. You can also exit the session using exit() or quit().

Task two: Create and send an SCI request from Digi Remote Manager

The second step in using the device_request module is to create an SCI request that Remote Manager will forward to the device. For example, you can create in SCI request a the Remote Manager API explorer:

1. In Remote Manager, click **Documentation > API Explorer**.
2. Select the device to use as the SCI target:
   a. Click **SCI Targets**.
   b. Click **Add Targets**.
   c. Enter or select the device ID of the device.
   d. Click **Add**.
   e. Click **OK**.

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3. Click **Examples > SCI > Data Service > Send Request**.

   Code similar to the following will be displayed in the HTTP message body text box:

```
<sci_request version="1.0">
  <data_service>
  <targets>
    <device id="00000000-00000000-00000FFF-ABCDEGAI"/>
  </targets>
    <requests>
      <device_request target_name="myTarget">
        my payload string
      </device_request>
    </requests>
  </data_service>
</sci_request>
```

   Note The value of the target_name parameter in the device_request element must correspond to the target parameter of the device_request.register function in the Python script. In this example, the two are the same.

4. Click **Send**.

   Once that the request has been sent to the device, the handler on the device is executed.

   - On the device, you will receive the following output:

```
>>> received request:
        my payload string
    for target myTarget
```

   - In Remote Manager, you will receive a response similar to the following:

```
<sci_reply version="1.0">
  <data_service>
    <device id="00000000-00000000-00000FFF-ABCDEGAI"/>
      <requests>
        <device_request target_name="myTarget" status="0">OK</device_
request>
      </requests>
    </device>
  </data_service>
</sci_request>
```

Example: Use digidevice.cli with digidevice.device_request

In this example, we will use the digidevice.cli module in conjunction with the digidevice.device_request module to return information about multiple devices to Remote Manager.

1. Create a Python application, called showsysteminfo.py, that uses the digidevice.cli module to create a response containing information about device and the device_request module to respond with this information to a request from Remote Manager.

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```
from digidevice import device_request
from digidevice import cli
import time

def handler(target, request):
    return cli.execute("show system verbose")

def status_cb(error_code, error_description):
    if error_code != 0:
        print("error handling showSystem device request: %s" % error_
description)

device_request.register("showSystem", handler, status_callback = status_cb)

# Do not let the process finish so that it handles device requests
while True:
    time.sleep(10)
```

2. Upload the showsystem.py application to the /etc/config/scripts directory on two or more Digi devices. In this example, we will upload it to two devices, and use the same request in Remote Manager to query both devices.

   See Configure applications to run automatically for information about uploading Python applications to your device. You can also create the script on the device by using the vi command when logged in with shell access.

3. For both devices:

   a. Configure the device to automatically run the showsystem.py application on reboot, and to restart the application if it crashes. This can be done from either the WebUI or the command line:

   WebUI

   i. Log into the TX64 WebUI as a user with full Admin access rights.

   ii. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.

   The **Configuration** window is displayed.

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iii. Click System > Scheduled tasks > Custom scripts.

iv. Click + to add a custom script.

v. For Label, type Show system application.

vi. For Run mode, select On boot.

vii. For Exit action, select Restart script.

viii. For Commands, type python /etc/config/scripts/showsystem.py.

ix. Click Apply to save the configuration and apply the change.



Command line

i. Log into the TX64 command line as a user with full Admin access rights. Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

ii. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

iii. Add an application entry:

```
(config)> add system schedule script end
(config system schedule script 4)>
```


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Scheduled scripts are enabled by default. To disable:

```
(config system schedule script 0)> enable false
(config system schedule script 0)>
```

b. Provide a label for the script:

```
(config system schedule script 0)> label "Show system application"
```

c. Configure the application to run automatically when the device reboots:

```
(config system schedule script 0)> when boot
(config system schedule script 0)>
```

d. Configure the application to restart if it crashes:

```
(config system schedule script 0)> exit_action restart
(config system schedule script 0)>
```

e. Set the command that will execute the application:

```
(config system schedule script 0)> command "python
/etc/config/scripts/showsystem.py"
(config system schedule script 0)>
```

f. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

5. Run the showsystem.py application. You can run the application by either rebooting the device, or by running it from the shell prompt.
   - To reboot the device:
     i. From the WebUI:
        1. From the main menu, click **System**.
        2. Click **Reboot**.
     ii. From the command line, at the Admin CLI prompt, type:

```
> reboot
```

   - To run the application from the shell prompt:
     i. Log into the TX64 command line as a user with shell access.

     Depending on your device configuration, you may be presented with an Access selection menu. Type **shell** to access the device shell.

     ii. Type the following at the shell prompt:

```
# python /etc/config/scripts/showsystem.py &
#
```


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11. Exit the shell:

```
# exit
```

4. In Remote Manager, click **Documentation > API Explorer**.
5. Select the devices to use as the SCI targets:
   a. Click **SCI Targets**.
   b. Click **Add Targets**.
   c. Enter or select the device ID of one of the devices.
   d. Click **Add**.
   e. Enter or select the device ID of the second device and click **Add**.
   f. Click **OK**.
6. Click **Examples > SCI > Data Service > Send Request**.
   Code similar to the following will be displayed in the HTTP message body text box:

```
<sci_request version="1.0">
  <data_service>
  <targets>
    <device id="00000000-00000000-00000FFF-AE3CFCA3"/>
    <device id="00000000-00000000-00000FFF-485740BC"/>
  </targets>
    <requests>
      <device_request target_name="myTarget">
        my payload string
      </device_request>
    </requests>
  </data_service>
</sci_request>
```

7. For the device_request element, replace the value of target_name with showSystem. This matches the target parameter of the device_request.register function in the showsystem.py application.

```
      <device_request target_name="showSystem">
```

8. Click **Send**.
   You should receive a response similar to the following:

```
<sci_reply version="1.0">
  <data_service>
    <device id="00000000-00000000-00000FFF-AE3CFCA3">
      <requests>
        <device_request target_name="showSystem" status="0">Model
         : Digi TX64
          Serial Number          : TX64-000C3
          Hostname               : TX64
          MAC                    : 00:40:9D:13:35:3C

          Hardware Version       : 58001B1B-01 A
          Firmware Version       : 20.5.38.30
          Bootloader Version     : 1
```


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```
            Firmware Build Date       : Fri, 29 May 2020 21:14:12
            Schema Version            : 461

            Timezone                  : UTC
            Current Time              : Fri, 29 May 2020 21:14:12
            CPU                       : 1.1
            Uptime                    : 1 day, 21 hours, 49 minutes, 47
seconds (164987s)
            Temperature               : 39C

            Contact                   : Jane Smith

            Disk
            ----
            Load Average              : 0.18, 0.85, 0.69
            RAM Usage                 : 85.17MB/250.48MB(34%)
            Disk /etc/config Usage    : 0.06MB/13.48MB(1%)
            Disk /opt Usage           : 47.72MB/5389.75MB(1%)
            Disk /overlay Usage       : MB/MB(%)
            Disk /tmp Usage           : 0.00MB/49.9GB(0%)
            Disk /var Usage           : 0.02MB/32.76MB(0%)</device_request>
        </requests>
      </device>
      <device id="00000000-00000000-0000ffff-ffffffff">
        <requests>
          <device_request target_name="showSystem" status="0">Model
          : Digi TX64
            Serial Number             : TX64-000023
            Hostname                  : TX64
            MAC                       : 00:40:9D:26:7B:1C

            Hardware Version          : 50001059-01 A
            Firmware Version          : 20.5.38.39
            Bootloader Version        : 1
            Firmware Build Date       : Fri, 29 May 2020 21:14:12
            Schema Version            : 461

            Timezone                  : UTC
            Current Time              : Fri, 29 May 2020 21:14:12
            CPU                       : 1.1
            Uptime                    : 4 day, 13 hours, 43 minutes, 22
seconds (395402s)
            Temperature               : 37C

            Contact                   : Omar Ahmad
            Disk
            ----
            Load Average              : 0.18, 0.85, 0.69
            RAM Usage                 : 85.17MB/250.48MB(34%)
            Disk /etc/config Usage    : 0.06MB/13.48MB(1%)
            Disk /opt Usage           : 47.72MB/5389.75MB(1%)
            Disk /overlay Usage       : MB/MB(%)
            Disk /tmp Usage           : 0.00MB/49.9GB(0%)
            Disk /var Usage           : 0.02MB/32.76MB(0%)</device_request>
        </requests>
      </device>
    </data_service>
```


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```
</sci_request>
```

Help for using Python to respond to Digi Remote Manager SCI requests

Get help for respond to Digi Remote Manager Server Command Interface (SCI) requests by accessing help for digidevice.device_request:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

   ```
   # python
   Python 3.6.10 (default, Jan 31 2020, 08:45:10)
   [GCC 8.3.0] on linux
   Type "help", "copyright", "credits" or "license" for more information.
   >>>
   ```

3. Import the device_request submodule:

   ```
   >>> from digidevice import device_request
   >>>
   ```

4. Use the help command with device_request:

   ```
   >>> help(device_request)
   Help on module digidevice.device_request in digidevice:

   NAME
   digidevice.device_request - APIs for registering device request handlers
   ...
   ```

   You can also use the help command with available device_request functions:

   - Use the help command with device_request.register:

     ```
     >>> help(device_request.register)
     Help on function register in module digidevice.device_request:

     register(target:str, response_callback:Callable[[str, str], str],
     status_callback:Callable[[int, str], NoneType]=None, xml_
     encoding:str='UTF-8')
     ...
     ```

   - Use the help command with device_request.unregister:

     ```
     >>> help(device_request.unregister)
     Help on function unregister in module digidevice.device_request:

     unregister(target:str) -> bool
     ...
     ```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

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Use digidevice runtime to access the runtime database

Use the runt submodule to access and modify the device runtime database.

Read from the runtime database

Use the keys() and get() methods to read the device configuration:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:19)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the runt submodule:

```
>>> from digidevice import runt
>>>
```

4. Use start() method to open the runtime database:

```
>>> runt.start()
>>>
```

5. Display available keys in the runtime database:

```
>>> print(runt.keys(""))
['advanced', 'dns', 'firmware', 'location', 'manufacture', 'metrics', 'mm',
'network', 'pam', 'serial', 'system']
>>> print(runt.keys("system"))
['boot_count', 'chassis', 'cpu_temp', 'cpu_usage', 'disk', 'load_avg',
'local_time', 'mac', 'mcu', 'model', 'ram', 'serial', 'uptime']
>>> print(runt.get("system.mac"))
00:40:2D:11:35:36
```

6. Close the runtime database:

```
>>> runt.stop()
>>>
```

Modify the runtime database

Use the set() method to modify the runtime database:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive

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Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:19)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

5. Import the runt submodule:

```
>>> from digidevice import runt
>>>
```

6. Use start() method to open the runtime database:

```
>>> runt.start()
>>>
```

7. Use the set() method to make changes to the runtime database:

```
>>> runt.set("my-variable", "my-value")
>>>
```

8. Use the get() method to verify the change:

```
>>> print(runt.get("my-variable"))
my-variable
>>>
```

9. Close the runtime database:

```
>>> runt.stop()
>>>
```

10. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

Help for using Python to access the runtime database

Get help for reading and modifying the device runtime database by accessing help for **digidevice.runt**:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:19)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the runt submodule:

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```
>>> from digidevice import runt
>>>
```

4. Use the help command with runt:

```
>>> help(runt)

Help on module ac1.runt in digidevice:

NAME
ac1.runt - Python interface to AC1 runtime database (runtd).
...
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

Using Python to upload the device name to Digi Remote Manager

The name submodule can be used to upload a custom name for your device to Digi Remote Manager. When you use the name submodule to upload a custom device name to Remote Manager, the following issues apply:

- If the name is being used by to another device in your Remote Manager account, the name will be removed from the previous device and added to the new device.
- If Remote Manager is configured to apply a profile to a device based on the device name, changing the name of the device may cause Remote Manager to automatically push a profile onto the device.

Together, these two features allow you to swap one device for another by using the name submodule to change the device name, while guaranteeing that the new device will have the same configuration as the previous one.

Note Because causing a profile to be automatically pushed from Remote Manager may change the behavior of the device, including overwriting existing usernames and passwords, the name submodule should be used with caution. As a result, support for this functionality is disabled by default on Remote Manager.

Enable support on Digi Remote Manager for uploading custom device names

1. In Remote Manager, select **Documentation > API Explorer**.
2. For **Path**, type */ws/v1/settings/Inventory/AllowDeviceToSetOwnNameEnabled*.
3. For **HTTP Method**, select **POST**.
4. In the **HTTP message body** text box, type the following:

```
{
   "name" : "AllowDeviceToSetOwnNameEnabled",
   "value" : "true"
}
```

5. Click **Send**.

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Upload a custom name

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the name submodule:

```
>>> from digidevice import name
```

4. Upload the name to Remote Manager:

```
>>> name.upload("my_name")
```

   Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

5.

Help for upload the device name to Digi Remote Manager

Get help for uploading the device name to Digi Remote Managerby accessing help for **digidevice.name**:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the name submodule:

```
>>> from digidevice import name
>>>
```

4. Use the help command with name:

```
>>> help(name)

Help on module digidevice.name in digidevice:
```


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```
NAME
    digidevice_name - API for uploading name from the device
...
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

The digidevice led submodule

Use the led submodule to redefine the purpose of any front-panel LED on the TX64 device. With this submodule, you can:

- Gain control of the LED with the led.acquire() function.
- Define the state of the LED with the led.set() function.
- Use the use() function to create a function that acquires, sets, and releases an LED.
- Optionally release control of the LED with the led.release() function.

See Use Python to set the state of LEDs for instructions on using these methods.

Available LEDs

LED	Available options	Attribute name
Power	Blue	Led.POWER
GNSS	Green	Led.GNSS
WiFi1	Green	Led.WiFi1
WiFi2	Green	Led.WiFi2
WWAN1 Signal	Green Yellow	Led.WWAN1_SIGNAL_GREEN Led.WWAN1_SIGNAL_YELLOW
WWAN1 Service	Green Yellow	Led.WWAN1_SERVICE_GREEN Led.WWAN1_SERVICE_YELLOW
WWAN2 Signal	Green Yellow	Led.WWAN2_SIGNAL_GREEN Led.WWAN2_SIGNAL_YELLOW
WWAN2 Service	Green Yellow	Led.WWAN2_SERVICE_GREEN Led.WWAN2_SERVICE_YELLOW
All available LEDs		Led.ALL

Available LED states

State	Attribute name
Solid on	State.ON
Off	State.OFF

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State	Attribute name
Slow flash	State.FLASH_SLOW
Fast flash	State.FLASH_FAST

Use Python to set the state of LEDs

The following example uses an interactive Python session to set the state of all LEDs to flashing:

1. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:19)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

2. Import the led submodule:

```
>>> from digidevice import led
```

3. Import the Led and State objects from the led submodule:

```
>>> from digidevice.led import Led, State
```

4. Use led.acquire() to gain control of the all LEDs:

```
>>> led.acquire(Led.ALL)
```

5. Use led.set() to set the state of the LEDs:

```
>>> led.set(Led.ALL, State.FLASH_FAST)
```

6. (Optional) Use led.release() to release the LEDs to system control:

```
>>> led.release(Led.ALL)
```

7. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

The use(led) function

The use(led) function can be used to acquire control of LEDs and then release them back to system control.

To create a function that acquires control of the power LED, sets it to a state of fast flashing, and then releases control when the function has completed, use the following code in a python application:

```
with use(led.POWER) as pwr:
    pwr(State.FLASH)
```

Releasing the LEDs to system control

During a Python interactive session, or from within a Python script, you can release control of the LED from Python to system control using the led.release() method.

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If the Python script or session terminates prior to releasing control to the system, the LEDs will continue to have the state that Python set to them, until the device is rebooted. See Configure applications to run automatically for information about configuring the device so that the LED state is controlled by the Python script even after reboot.

If any system processes attempt to take control of the LED while Python is in control of it, the state information from the system process is recorded but the LED state is not updated until Python releases control of the LED. When the LED is returned to system control, the state of the LED will reflect the correct, recorded state information.

Hid module

The Python hid module provides a programmatic access to a USB Human Interface Device (HID) from within a Python script.

For example, to determine information about a USB-connected keyboard:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the hid module:

```
>>> import hid
>>>
```

4. Use the enumerate() function to return information about the keyboard:

```
>>> hid.enumerate()
[{'path': b'/dev/hidraw0', 'vendor_id': 1008, 'product_id': 36, 'serial_
number': "", 'release_number': 256,
'manufacturer_string': "CHICONY", 'product_string': 'Basic USB Keyboard',
'usage_page': 65332, 'usage': 17481,
'interface_number': 0}]>>>
```

5. Use the vendor_id and product_id to return specific information about the keyboard, or to read input from the keyboard:

```
>>> hid.Device(1008,36).product
'Basic USB Keyboard'
>>>
>>> hid.Device(1008,36).read(64)
b'\x00\x00\x00\x00\x00\x00\x00\x00'
>>>
```

6. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

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Help for the hid module

Get help for the hid module:

1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

3. Import the hid module:

```
>>> import hid
>>>
```

4. Use the help command with hid:

```
>>> help(hid)
Help on package hid:

NAME
    hid

PACKAGE CONTENTS

CLASSES
    _ctypes.Structure(_ctypes._CData)
        DeviceInfo
    builtins.Exception(builtins.BaseException)
        HIDException
    builtins.object
        Device
...
>>>
```

5. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

Use Python to access serial ports

You can use the Python serial module to access serial ports on your TX64 device that are configured to be in Application mode. For example, you can configure USB ports to function serial ports and interact programmatically with those ports. See Configure the serial port for information about configuring a serial port in Application mode, and see Add a USB serial port for information about configuring USB ports on the device to function as serial ports.

To use Python to access serial ports:

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1. Log into the TX64 command line as a user with shell access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type shell to access the device shell.

2. Determine the path to the serial port:

```
# ls /dev/serial/
by-id   by-path   by-usb   port1   USB_port1   USB_port2
#
```

3. At the shell prompt, use the python command with no parameters to enter an interactive Python session:

```
# python
Python 3.6.10 (default, Jan 31 2020, 08:45:10)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

4. Import the serial module:

```
>>> import serial
>>>
```

5. You can now perform operations on the serial port. For example, to write a message to the serial port:

```
>>> s = serial.Serial("/dev/serial/USB_port1", 115200)
>>> s.write(b"Hello from USB serial port")
26
>>>
```

6. Use Ctrl-D to exit the Python session. You can also exit the session using exit() or quit().

User authentication

This chapter contains the following topics:

TX64 user authentication 531
User authentication methods 531
Authentication groups 535
Local users 540
Terminal Access Controller Access-Control System Plus (TACACS+) 545
Remote Authentication Dial-In User Service (RADIUS) 560
LDAP 574
Disable shell access 588
Set the idle timeout for TX64 users 590
Example user configuration 591

원문: Digi TX64 사용설명서(영문) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

TX64 user authentication

User authentication on the TX64 has the following features and default configuration:

Feature	Description	Default configuration
Idle timeout	Determines how long a user session can be idle before the system automatically disconnects.	10 minutes.
Allow shell	If disabled, prevents all authentication profiles access to the shell prompt for all authentication groups. This does not prevent access to the Admin CLI. Note If shell access is disabled, re-enabling it will erase the device's configuration and perform a factory reset.	Enabled.
Methods	Determines how users are authenticated for access: local users, TACACS+, or RADIUS.	local users.
Groups	Associates access permissions for a group. You can modify the released groups and create additional groups as needed for your site. A user can be assigned to more than one group.	admin: Provides the logged-in user with administrative and shell access. serial: Provides the logged-in user with access to serial ports.
Users	Defines local users for the TX64.	admin: Belongs to both the admin and serial groups.
TACACS+	Configures support for TACACS+ (Terminal Access Controller Access-Control System Plus) servers and users.	Not configured.
RADIUS	Configures support for RADIUS (Remote Authentication Dial-In User Service) servers and users.	Not configured.
LDAP	Configures support for LDAP (Lightweight Directory Access Protocol) servers and users.	Not configured.

User authentication methods

Authentication methods determine how users of the TX64 device are authenticated. Available authentication methods are:

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- **Local users:** User are authenticated on the local device.
- **RADIUS:** Users authenticated by using a remote RADIUS server for authentication.

  See Remote Authentication Dial-In User Service (RADIUS) for information about configuring RADIUS authentication.
- **TACACS+:** Users authenticated by using a remote TACACS+ server for authentication.

  See Terminal Access Controller Access-Control System Plus (TACACS+) for information about configuring TACACS+ authentication.
- **LDAP:** Users authenticated by using a remote LDAP server for authentication.

  See LDAP for information about configuring LDAP authentication.

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Add a new authentication method

Required configuration items

- The types of authentication method to be used.

To add an authentication method:

WebUI

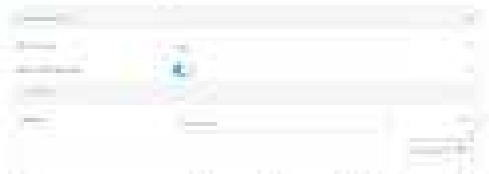
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **Methods**.
4. For **Add Method**, click **+**.



5. Select the appropriate authentication type for the new method from the **Method** drop-down.

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Note: Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. See Rearrange the position of authentication methods for information about how to reorder the authentication methods.

6. Repeat these steps to add additional methods.
7. Click Apply to save the configuration and apply the change.



Command line

Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. This procedure describes how to add methods to various places in the list.

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Add the new authentication method to the appropriate location in the list:
   - To determine the current list of authentication methods:
     a. Log into the TX64 command line as a user with full Admin access rights.
        Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
     b. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

     c. Use the show auth method command to display the current authentication methods configuration:

```
(config)> show auth method
0 local
(config)>
```

   - To add the new authentication method to the beginning of the list, use the Index value of 0 to indicate that it should be added as the first method:

```
(config)> add auth method 0 auth_type
(config)>
```

   where auth_type is one of local, radius, tacacs+, or ldap.

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- To add the new authentication method to the end of the list, use the index keyword end:

```
(config)> add auth method end auth_type
(config)>
```

where auth_type is one of local, radius, tacacs+, or ldap.

- To add the new authentication in another location in the list, use an index value to indicate the appropriate position. For example:

```
(config)> add auth method 1 auth_type
(config)>
```

where auth_type is one of local, radius, tacacs+, or ldap.

- You can also use the move command to rearrange existing methods. See Rearrange the position of authentication methods for information about how to reorder the authentication methods.

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete an authentication method

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click System. Under Configuration, click Device Configuration.



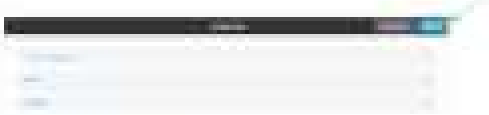
The Configuration window is displayed.

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5. Click **Authentication > Methods**.
4. Click the menu icon (...) next to the method and select **Delete**.

3. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Use the **show auth method** command to determine the index number of the authentication method to be deleted:

```
(config)> show auth method
# local
1 radius
2 tacacs+
(config)>
```

4. Delete the appropriate authentication method:

```
(config)> del auth method n
```


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Where n is index number of the authentication method to be deleted. For example, to delete the TACACS+ authentication method as displayed by the example show command, above:

```
(config)> del auth method 3
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Rearrange the position of authentication methods

WebUI

Authentication methods are reordered by changing the method type in the Method drop-down for each authentication method to match the appropriate order.

For example, the following configuration has Local users as the first method, and RADIUS as the second.

To reorder these so that RADIUS is first and Local users is second:

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.

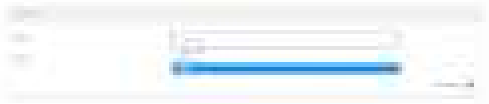


The **Configuration** window is displayed.

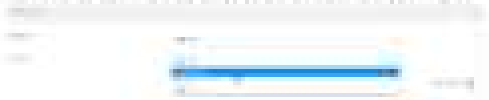
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5. Click to expand the first Method.
4. In the Method drop-down, select RADIUS.



5. Click to expand the second Method.
6. In the Method drop-down, select Local users.



7. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Use the show command to display current configuration:

```
(config)> show auth method
# local
1 radius
(config)>
```

4. Use the move command to rearrange the methods:

```
(config)> move auth method 1 0
(config)>
```

5. Use the show command again to verify the change:

```
(config)> show auth method
0 radius
1 local
(config)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Authentication groups

Authentication groups are used to assign access rights to TX64 users. Three types of access rights can be assigned:

- **Admin access:** Users with Admin access can be configured to have either:
  - The ability to manage the TX64 device by using the WebUI or the Admin CLI.
  - Read-only access to the WebUI and Admin CLI.
- **Shell access:** Users with Shell access have the ability to access the shell when logging into the TX64 via ssh, telnet, or the serial console.

  Shell access is not available if the Allow shell parameter has been disabled. See Disable shell access for more information about the Allow shell parameter.
- **Serial access:** Users with Serial access have the ability to log into the TX64 device by using the serial console.

Preconfigured authentication groups

The TX64 device has two preconfigured authentication groups:

- The admin group is configured by default to have full Admin access and Shell access.

  Shell access is not available if the Allow shell parameter has been disabled. See Disable shell access for more information about the Allow shell parameter.
- The serial group is configured by default to have Serial access.

The preconfigured authentication groups cannot be deleted, but the access rights defined for the group are configurable.

This section contains the following topics:

Change the access rights for a predefined group 540
Add an authentication group 542

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Delete an authentication group

Change the access rights for a predefined group

By default, two authentication groups are predefined: admin and serial. To change the access rights of the predefined groups:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **Groups**.
4. Click the authentication group to be changed, either **admin** or **serial**, to expand its configuration node.
5. Click the box next to the following options, as appropriate, to enable or disable access rights for each:
   - **Admin access**

     For groups assigned Admin access, you can also determine whether the Access level should be **Full access** or **Read-only access**.
     - **Full access** provides users of this group with the ability to manage the TX64 device by using the WebUI or the Admin CLI.
     - **Read-only access** provides users of this group with read-only access to the WebUI and Admin CLI.

     The default is **Full access**.
   - **Interactive shell access**

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Shell access is not available if the Allow shell parameter has been disabled. See Disable shell access for more information about the Allow shell parameter.

- Serial access



5. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Enable or disable access rights for the group. For example:
   - Admin access:
     - To set the access level for Admin access of the admin group:

```
(config)> auth group admin acl admin level value
(config)>
```

       Where value is either:

       - full: provides users of this group with the ability to manage the TX64 device by using the WebUI or the Admin CLI.
       - read-only: provides users of this group with read-only access to the WebUI and Admin CLI.

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The default is full.

- To disable Admin access for the admin group:

```
(config)> auth group admin act admin enable false
(config)>
```

- Shell access:
  - To enable Shell access for the serial group:

```
(config)> auth group serial act shell enable true
(config)>
```

Shell access is not available if the Allow shell parameter has been disabled. See Disable shell access for more information about the Allow shell parameter.

- Serial access:
  - To enable Serial access for the admin group:

```
(config)> auth group admin act serial enable true
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Add an authentication group

Required configuration items

- The access rights to be assigned to users that are assigned to this group.

Additional configuration items

- Access rights to OpenVPN tunnels, and the tunnels to which they have access.
- Access rights to captive portals, and the portals to which they have access.
- Access rights to query the device for Wi-Fi scan monitoring.

To add an authentication group:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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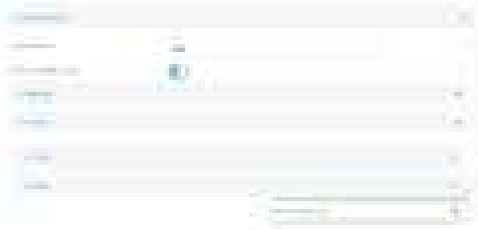
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **Groups**.
4. For **Add**, type a name for the group and click **+**.



The group configuration window is displayed.

5. Click the following options, as appropriate, to enable or disable access rights for each:
   - **Admin access**

     For groups assigned Admin access, you can also determine whether the Access level should be Full access or Read-only access.

     Where value is either:
     - **Full access**: **full**: provides users of this group with the ability to manage the TX64 device by using the WebUI or the Admin CLI.

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- **Read-only access read-only**: provides users of this group with read-only access to the WebUI and Admin CLI.

The default is **Full access full**.

- **Shell access**

Shell access is not available if the **Allow shell** parameter has been disabled. See Disable shell access for more information about the **Allow shell** parameter.

- **Serial access**

6. (Optional) Configure OpenVPN access. See for further information.
7. (Optional) Configure captive portal access:
   a. Enable captive portal access rights for users of this group by checking the box next to **Captive portal access**.
   b. Click **Captive portals** to expand the **Captive portal** menu.
   c. For **Add Captive portal**, click ➕.
   d. In the **Captive portal** dropdown, select a captive portal to which users of this group will have access.
   e. Click ➕ again to add additional captive portals.
8. (Optional) Enable users that belong to this group to query the device for Nagios monitoring by checking the box next to **Nagios access**.
9. (Optional) Enable users that belong to this group to access the Bluetooth scanning service by checking the box next to **Bluetooth scanner access**.
10. (Optional) Enable users that belong to this group to access the Wi-Fi scanning service by checking the box next to **Wi-Fi scanner access**.
11. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Use the **add auth group** command to add a new authentication. For example, to add a group named **test**:

```
(config)> add auth group test
(config auth group test)>
```


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4. Enable access rights for the group:
   - Admin access:

```
(config auth group test)> acl admin enable true
(config)>
```

   - Set the access level for Admin access:

```
(config)> auth group admin acl admin level value
(config)>
```

     where value is either:
     - full: provides users of this group with the ability to manage the TX64 device by using the WebUI or the Admin CLI.
     - read-only: provides users of this group with read-only access to the WebUI and Admin CLI.

     The default is full.
   - Shell access:

```
(config auth group test)> acl shell enable true
(config)>
```

     Shell access is not available if the Allow shell parameter has been disabled. See Disable shell access for more information about the Allow shell parameter.
   - Serial access:

```
(config auth group test)> acl serial enable true
(config)>
```

5. [Optional] Configure captive portal access:
   a. Return to the config prompt by typing three periods (...):

```
(config auth group test)> ...
(config)>
```

   b. Enable captive portal access rights for users of this group:

```
(config)> auth group test acl portal enable true
(config)>
```

   c. Add a captive portal to which users of this group will have access:
      i. Determine available portals:

```
(config)> show firewall portal
portal1
        auth none
        enable true
        http redirect
        no interface
        no message
```


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```
        no redirect_url
        no terms
        timeout 24h
        no title
(config)>
```

1. Add a captive portal:

```
(config)> add auth group test acl portal portal1 end portal1
(config)>
```

6. [Optional] Configure Nagios monitoring:

```
(config)> auth group test acl nagios enable true
(config)>
```

7. [Optional] Enable users that belong to this group to access the Bluetooth scanning service:

```
(config)> auth group test acl bluetooth_scanner enable true
(config)>
```

8. [Optional] Enable users that belong to this group to access the Wi-Fi scanning service:

```
(config)> auth group group test acl wifi_scanner enable true
(config)>
```

9. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete an authentication group

By default, the TX64 device has two preconfigured authentication groups: admin and serial. These groups cannot be deleted.

To delete an authentication group that you have created:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Authentication** > **Groups**.
4. Click the menu icon (...) next to the group to be deleted and select **Delete**.

3. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> del auth group groupname
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Local users

Local users are authenticated on the device without using an external authentication mechanism such as TACACS+ or RADIUS. Local user authentication is enabled by default, with one preconfigured default user.

Default user

At manufacturing time, each TX64 device comes with a default user configured as follows:

- Username: admin.
- Password: The default password is displayed on the label on the bottom of the device.

> Note The default password is a unique password for the device, and is the most critical security feature for the device. If you reset the device to factory defaults, you must log in using the default user and password, and you should immediately change the password to a custom password. Before deploying or mounting the TX64 device, record the default password, so you have the information available when you need it even if you cannot physically access the label on the bottom of the device.

The default admin user is preconfigured with both Admin and Serial access. You can configure the admin user account to fit with the needs of your environment.

This section contains the following topics:

Change a local user's password
Configure a local user
Delete a local user

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Change a local user's password

To change a user's password:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **Users**.
4. Click the username to expand the user's configuration node.
5. For **Password**, enter the new password.



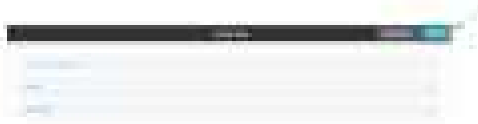
You can also change the password for the active user by clicking the user name in the menu bar.

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The active user must have full Admin access rights to be able to change the password.

8. Click Apply to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> auth user username password pwd
```

   Where:
   - username is the name of the user.
   - pwd is the new password for the user.
4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure a local user

Required configuration items

- A username.
- A password. For security reasons, passwords are stored in hash form. There is no way to get or display passwords in clear-text form, although prior to saving the configuration, the password can be shown by clicking Reveal.
- The authentication group or groups from which the user will inherit access rights. See Authentication groups for information about configuring groups.

Additional configuration items

- An optional public ssh key, to authenticate the user when using passwordless SSH login.
- Two-factor authentication information for user login over SSH, telnet, and the serial console:
  - The verification type for two-factor authentication: Either time-based or counter-based.
  - The security key.
  - Whether to allow passcode reuse (time based verification only).
  - The passcode refresh interval (time based verification only).
  - The valid code window size.
  - The login limit.

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- The login limit period.
- One-time use eight-digit emergency scratch codes.

To configure a local user:

WebUI

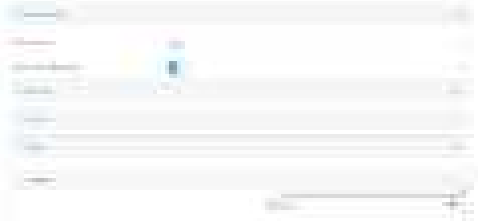
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **Users**.
4. In **Add User**, type a name for the user and click **+**.



The user configuration window is displayed.

The user is enabled by default. To disable, click to toggle off **Enable**.

5. Enter a password for the user.

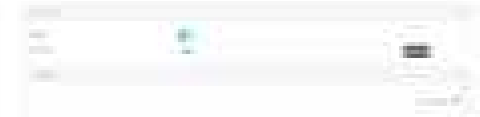
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6. Add groups for the user.

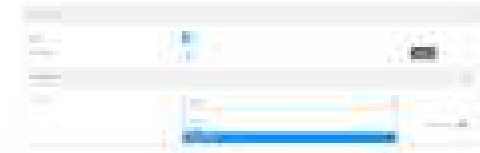
   Groups define user access rights. See Authentication groups for information about configuring groups.

   a. Click **Groups**.

   b. For **Add Group**, click **+**.

   c. For **Group**, select an appropriate group.

   Note: Every user must be configured with at least one group. You can add multiple groups to a user by clicking **Add** again and selecting the next group.

7. (Optional) Add SSH keys for the user to use passwordless SSH login:

   a. Click **SSH keys**.

   b. In **Add SSH key**, paste or type a public encryption key that this user can use for passwordless SSH login and click **+**.

8. (Optional) Configure two-factor authentication for SSH, telnet, and serial console login:

   a. Click **Two-factor authentication**.

   b. Check **Enable** to enable two-factor authentication for this user.

   c. Select the **Verification type**:

      - **Time-based (TOTP)**: Time-based One-Time Password (TOTP) authentication uses the current time to generate a one-time password.
      - **Counter-based (HOTP)**: HMAC-based One-Time Password (HOTP) uses a counter to validate a one-time password.

   d. Generate a **Secret key**:

      i. Click ... next to the field label and select **Generate secret key**.

      ii. To display the QR code for the secret key, click ... next to the field label and select **Show secret key QR code**.

      iii. Copy the secret key, or scan or copy the QR code, for use with an application or mobile device to generate passcodes.

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Note: To copy the QR code, right-click the QR code and select your browser's save image functionality.

e. For time-based verification only, select Disallow code reuse to prevent a code from being used more than once during the time that it is valid.

f. For time-based verification only, in Code refresh interval, type the amount of time that a code will remain valid.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s]. For example, to set Code refresh interval to ten minutes, enter 10m or 600s.

g. In Valid codes window size, type the allowed number of concurrently valid codes. In cases where TOTP is being used, increasing the Valid codes window size may be necessary when the clocks used by the server and client are not synchronized.

h. For Login limit, type the number of times that the user is allowed to attempt to log in during the Login limit period. Set Login limit to 0 to allow an unlimited number of login attempts during the Login limit period.

i. For Login limit period, type the amount of time that the user is allowed to attempt to log in.

Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s]. For example, to set Login limit period to ten minutes, enter 10m or 600s.

j. Scratch codes are emergency codes that may be used once, at any time. To add a scratch code:

i. Click Scratch codes.

ii. For Add Code, click ➕.

iii. For Code, enter the scratch code. The code must be eight digits, with a minimum of 10000000.

iv. Click ➕ again to add additional scratch codes.

k. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
[config]>
```


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3. Add a user. For example, to create a user named new_user:

```
(config)> add auth user new_user
(config auth user new_user)>
```

The user is enabled by default. To disable the user, type:

```
(config auth user new_user)> enable false
(config auth user new_user)>
```

4. Assign a password to the user:

```
(config auth user new_user)> password pwd
(config auth user new_user)>
```

5. Add groups for the user.

Groups define user access rights. See Authentication groups for information about configuring groups.

a. Add a group to the user. For example, to add the admin group to the user:

```
(config auth user new_user)> add group end admin
(config auth user new_user)>
```

Note Every user must be configured with at least one group.

b. (Optional) Add additional groups by repeating the add group command:

```
(config auth user new_user)> add group end serial
(config auth user new_user)>
```

To remove a group from a user:

a. Use the show command to determine the index number of the group to be deleted:

```
(config auth user new_user)> show group
0 admin
1 serial
(config auth user new_user)>
```

b. Type the following:

```
(config auth user new_user)> del group n
(config auth user new_user)>
```

Where n is index number of the authentication method to be deleted. For example, to delete the serial group as displayed by the example show command, above:

```
(config auth user new_user)> del group 1
(config auth user new_user)>
```

6. (Optional) Add SSH keys for the user to use passwordless SSH login:

a. Change to the user's ssh_key node:

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```
(config auth user new_user)> ssh_key
(config auth user new_user ssh_key)>
```

b. Add the key by using the ssh_key command and pasting or typing a public encryption key that this user can use for passwordless SSH login:

```
(config auth user new_user ssh_key)> ssh_key key
(config auth user new_user ssh_key)>
```

7. (Optional) Configure two-factor authentication for SSH, telnet, and serial console login:

a. Change to the user's two-factor authentication node:

```
(config auth user new_user)> 2fa
(config auth user new_user 2fa)>
```

b. Enable two-factor authentication for this user:

```
(config auth user new_user 2fa)> enable true
(config auth user new_user 2fa)>
```

c. Configure the verification type. Allowed values are:

- totp: Time-based One-Time Password (TOTP) authentication uses the current time to generate a one-time password.
- hotp: HMAC-based One-Time Password (HOTP) uses a counter to validate a one-time password.

The default value is totp.

```
(config auth user new_user 2fa)> type totp
(config auth user new_user 2fa)>
```

d. Add a secret key:

```
(config auth user new_user 2fa)> secret key
(config auth user new_user 2fa)>
```

This key should be used by an application or mobile device to generate passcodes.

e. For time-based verification only, enable disallow_reuse to prevent a code from being used more than once during the time that it is valid.

```
(config auth user new_user 2fa)> disallow_reuse true
(config auth user new_user 2fa)>
```

f. For time-based verification only, configure the code refresh interval. This is the amount of time that a code will remain valid.

```
(config auth user new_user 2fa)> refresh_interval value
(config auth user new_user 2fa)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set refresh_interval to ten minutes, enter either 10m or 600s:

```
(config auth user name 2fa)> refresh_interval 600s
(config auth user name 2fa)>
```

The default is 30s.

g. Configure the valid code window size. This represents the allowed number of concurrently valid codes. In cases where TOTP is being used, increasing the valid code window size may be necessary when the clocks used by the server and client are not synchronized.

```
(config auth user new_user 2fa)> window_size 3
(config auth user new_user 2fa)>
```

h. Configure the login limit. This represents the number of times that the user is allowed to attempt to log in during the Login limit period. Set to 0 to allow an unlimited number of login attempts during the Login limit period.

```
(config auth user new_user 2fa)> login_limit 3
(config auth user new_user 2fa)>
```

i. Configure the login limit period. This is the amount of time that the user is allowed to attempt to log in.

```
(config auth user new_user 2fa)> login_limit_period value
(config auth user new_user 2fa)>
```

Where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set login_limit_period to ten minutes, enter either 10m or 600s:

```
(config auth user name 2fa)> login_limit_period 600s
(config auth user name 2fa)>
```

The default is 30s.

j. Scratch codes are emergency codes that may be used once, at any time. To add a scratch code:

i. Change to the user's scratch code node:

```
(config auth user new_user 2fa)> scratch_code
(config auth user new_user 2fa scratch_code)>
```

ii. Add a scratch code:

```
(config auth user new_user 2fa scratch_code)> add end code
(config auth user new_user 2fa scratch_code)>
```

Where code is an eight number, with a minimum of 10000000.

iii. To add additional scratch codes, use the add end code command again.

k. Save the configuration and apply the change:

```
(config auth user new 2fa scratch_code)> save
Configuration saved.
>
```

6. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Delete a local user

To delete a user from your TX64:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **Users**.
4. Click the menu icon (...) next to the name of the user to be deleted and select **Delete**.

5. Click **Apply** to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> del auth user username
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Terminal Access Controller Access-Control System Plus (TACACS+)

Your TX64 device supports Terminal Access Controller Access-Control System Plus (TACACS+), a networking protocol that provides centralized authentication and authorization management for users who connect to the device. With TACACS+ support, the TX64 device acts as a TACACS+ client, which sends user credentials and connection parameters to a TACACS+ server over TCP. The TACACS+ server then authenticates the TACACS+ client requests and sends back a response message to the device.

When you are using TACACS+ authentication, you can have both local users and TACACS+ users able to log in to the device. To use TACACS+ authentication, you must set up a TACACS+ server that is accessible by the TX64 device prior to configuration. The process of setting up a TACACS+ server varies by the server environment.

This section contains the following topics:

TACACS+ user configuration 561
TACACS+ server failover and fallback to local authentication 562
Configure your TX64 device to use a TACACS+ server 562

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TACACS+ user configuration

When configured to use TACACS+ support, the TX64 device uses a remote TACACS+ server for user authentication (password verification) and authorization (assigning the access level of the user). Additional TACACS+ servers can be configured as backup servers for user authentication.

This section outlines how to configure a TACACS+ server to be used for user authentication on your TX64 device.

Example TACACS+ configuration

With TACACS+, users are defined in the server configuration file. On Ubuntu, the default location and filename for the server configuration file is */etc/tacacs+/tac_plus.conf*.

Note TACACS+ configuration, including filenames and locations, may vary depending on your platform and installation. This example assumes a Ubuntu installation.

To define users:

1. Open the TACACS+ server configuration file in a text editor. For example:

```
$ sudo gedit /etc/tacacs+/tac_plus.conf
```

2. Add users to the file using the following format. This example will create two users, one with admin and serial access, and one with only serial access.

```
user = user1 {
        name ="User1 for TX64"
        pap = cleartext password1
        service = system {
          groupname = admin,serial
        }
}
user = user2 {
        name ="User2 for TX64"
        pap = cleartext password2
        service = system {
          groupname = serial
        }
}
```

The groupname attribute is optional. If used, the value must correspond to authentication groups configured on your TX64. Alternatively, if the user is also configured as a local user on the TX64 device and the LDAP server authenticates the user but does not return any groups, the local configuration determines the list of groups. See Authentication groups for more information about authentication groups. The groupname attribute can contain one group or multiple groups in a comma-separated list.

3. Save and close the file.
4. Verify that your changes did not introduce any syntax errors:

```
$ sudo tac_plus -C /etc/tacacs+/tac_plus.conf -P
```

If successful, this command will echo the configuration file to standard out. If the command encounters any syntax errors, a message similar to this will display:

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```
Error: Unrecognized token on line 1
```

5. Restart the TACACS+ server:

```
$ sudo /etc/init.d/tacacs_plus restart
```

TACACS+ server failover and fallback to local authentication

In addition to the primary TACACS+ server, you can also configure your TX64 device to use backup TACACS+ servers. Backup TACACS+ servers are used for authentication requests when the primary TACACS+ server is unavailable.

Failing back to local authentication

With user authentication methods, you can configure your TX64 device to use multiple types of authentication. For example, you can configure both TACACS+ authentication and local authentication, so that local authentication can be used as a failback mechanism if the primary and backup TACACS+ servers are unavailable. Additionally, users who are configured locally but are not configured on the TACACS+ server are still able to log into the device. Authentication methods are attempted in the order they are listed until the first successful authentication result is returned; therefore if you want to ensure that users are authenticated first through the TACACS+ server, and only authenticated locally if the TACACS+ server is unavailable or if the user is not defined on the TACACS+ server, then you should list the TACACS+ authentication method prior to the Local users authentication method.

See User authentication methods for more information about authentication methods.

If the TACACS+ servers are unavailable and the TX64 device fails back to local authentication, only users defined locally on the device are able to log in. TACACS+ users cannot log in until the TACACS+ servers are brought back online.

Configure your TX64 device to use a TACACS+ server

This section describes how to configure a TX64 device to use a TACACS+ server for authentication and authorization.

Required configuration items

- Define the TACACS+ server IP address or domain name.
- Define the TACACS+ server shared secret.
- The group attribute configured in the TACACS+ server configuration.
- The service field configured in the TACACS+ server configuration.
- Add TACACS+ as an authentication method for your TX64 device.

Additional configuration items

- The TACACS+ server port. It is configured to 49 by default.
- Add additional TACACS+ servers in case the first TACACS+ server is unavailable.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.

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2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **TACACS+** > **Servers**.
4. For **Add server**, click ➕.



The TACACS+ server configuration window is displayed.



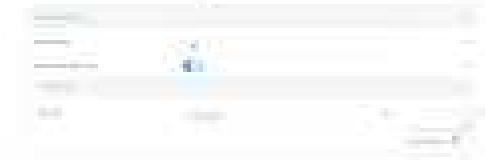
5. For **Hostname**, type the hostname or IP address of the TACACS+ server.
6. (Optional) Change the default **Port** setting to the appropriate port. Normally this should be left at the default setting of port 49.

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7. For **Secret**, type the TACACS+ server's shared secret. This is configured in the key parameter of the TACACS+ server's tac_plus.conf file, for example:

```
key = testing123
```

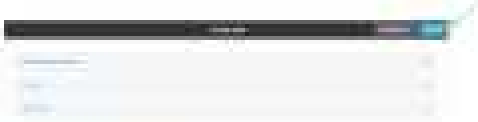
8. (Optional) For **Group attribute**, type the name of the attribute used in the TACACS+ server's configuration to identify the TX64 authentication group or groups that the user is a member of. For example, in TACACS+ user configuration, the group attribute in the sample tac_plus.conf file is groupname, which is also the default setting in the TX64 configuration.
9. (Optional) For **Service**, type the value of the service attribute in the the TACACS+ server's configuration. For example, in TACACS+ user configuration, the value of the service attribute in the sample tac_plus.conf file is system, which is also the default setting in the TX64 configuration.
10. (Optional) Click ✚ again to add additional TACACS+ servers.
11. Add TACACS+ to the authentication methods:
    a. Click **Authentication > Methods**.
    b. For **Add method**, click ✚.



    c. Select **TACACS+** for the new method from the **Method** drop-down.

Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. See Rearrange the position of authentication methods for information about rearranging the position of the methods in the list.

12. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```


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3. Set the type of TLS connection used by the LDAP server:

```
(config)> auth ldap tls value
(config)>
```

where value is one of:

- off: Uses a non-secure TCP connection on the LDAP standard port, 389.
- on: Uses an SSL/TLS encrypted connection on port 636.
- start_tls: Makes a non-secure TCP connection to the LDAP server on port 389, then sends a request to upgrade the connection to a secure TLS connection. This is the preferred method for LDAP.

The default is off.

4. If tls is set to on or start_tls, configure whether to verify the server certificate:

```
(config)> auth ldap verify_server_cert value
(config)>
```

where value is either:

- true: Verifies the server certificate with a known Certificate Authority.
- false: Does not verify the certificate. Use this option if the server is using a self-signed certificate.

The default is true.

5. Set the distinguished name (DN) that is used to bind to the LDAP server and search for users. Leave this option unset if the server allows anonymous connections.

```
(config)> auth ldap bind_dn dn_value
(config)>
```

For example:

```
(config)> auth ldap bind_dn cn=user,dc=example,dc=com
(config)>
```

6. Set the password used to log into the LDAP server. Leave this option unset if the server allows anonymous connections.

```
(config)> auth ldap bind_password password
(config)>
```

7. Set the distinguished name (DN) on the server to search for users. This can be the root of the directory tree (for example, dc=example,dc=com) or a sub-tree (for example, ou=People,dc=example,dc=com).

```
(config)> auth ldap base_dn value
(config)>
```

8. (Optional) Set the name of the user attribute that contains the list of TX64 authentication groups that the authenticated user has access to. See LDAP user configuration for further information about the group attribute.

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```
(config)> auth ldap group_attribute value
(config)>
```

For example:

```
(config)> auth ldap group_attribute ou
(config)>
```

9. Configure the amount of time in seconds to wait for the TACACS+ server to respond.

```
(config)> auth ldap timeout value
(config)>
```

where value is any integer from 3 to 60. The default value is 3.

10. Add an TACACS+ server:

```
(config)> add auth tacacs+ server end
(config auth tacacs+ server 0)>
```

11. Enter the TACACS+ server's IP address or hostname:

```
(config auth tacacs+ server 0)> hostname hostname|ip-address
(config auth tacacs+ server 0)>
```

12. (Optional) Change the default port setting to the appropriate port:

```
(config auth tacacs+ server 0)> port port
(config auth tacacs+ server 0)>
```

13. Enter the TACACS+ server's shared secret. This is configured in the key parameter of the TACACS+ server's tac_plus.conf file. For example:

```
(config auth tacacs+ server 0)> secret testing123
(config auth tacacs+ server 0)>
```

14. Return to the config prompt by typing three periods:

```
(config auth tacacs+ server 0)> ...
(config)>
```

15. (Optional) Configure the group_attribute. This is the name of the attribute used in the TACACS+ server's configuration to identify the TX64 authentication group or groups that the user is a member of. For example, in TACACS+ user configuration, the group attribute in the sample tac_plus.conf file is groupname, which is also the default setting for the group_attribute in the TX64 configuration.

```
(config)> auth tacacs+ group_attribute attribute-name
(config)>
```

16. (Optional) Configure the type of service. This is the value of the service attribute in the the TACACS+ server's configuration. For example, in TACACS+ user configuration, the value of the service attribute in the sample tac_plus.conf file is system, which is also the default setting in the TX64 configuration.

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```
(config)> auth tacacs+ service service-name
(config)>
```

17. (Optional) Repeat the above steps to add additional TACACS+ servers.
18. Add TACACS+ to the authentication methods. Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. This example will add TACACS+ to the end of the list. See User authentication methods for information about adding methods to the beginning or middle of the list.

```
(config)> add auth method end tacacs+
(config)>
```

19. Save the configuration and apply the changes.

```
(config)> save
Configuration saved.
>
```

20. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Remote Authentication Dial-In User Service (RADIUS)

Your TX64 device supports Remote Authentication Dial-In User Service (RADIUS), a networking protocol that provides centralized authentication and authorization management for users who connect to the device. With RADIUS support, the TX64 device acts as a RADIUS client, which sends user credentials and connection parameters to a RADIUS server over UDP. The RADIUS server then authenticates the RADIUS client requests and sends back a response message to the device.

When you are using RADIUS authentication, you can have both local users and RADIUS users able to log in to the device. To use RADIUS authentication, you must set up a RADIUS server that is accessible by the TX64 device prior to configuration. The process of setting up a RADIUS server varies by the server environment. An example of a RADIUS server is FreeRADIUS.

This section contains the following topics:

RADIUS user configuration 568
RADIUS server failover and fallback to local configuration 568
Configure your TX64 device to use a RADIUS server 570

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RADIUS user configuration

When configured to use RADIUS support, the TX64 device uses a remote RADIUS server for user authentication (password verification) and authentication (assigning the access level of the user). Additional RADIUS servers can be configured as backup servers for user authentication.

This section outlines how to configure a RADIUS server to be used for user authentication on your TX64 device.

Example FreeRADIUS configuration

With FreeRADIUS, users are defined in the users file in your FreeRADIUS installation. To define users:

1. Open the FreeRadius user file in a text editor. For example:

   ```
   $ sudo gedit /etc/freeradius/3.0/users
   ```

2. Add users to the file using the following format:

   ```
   user1 Cleartext-Password := "user1"
         Unix-FTP-Group-Names := "admin"

   user2 Cleartext-Password := "user2"
         Unix-FTP-Group-Names := "serial"
   ```

   The Unix-FTP-Group-Names attribute is optional. If used, the value must correspond to authentication groups configured on your TX64. Alternatively, if the user is also configured as a local user on the TX64 device and the RADIUS server authenticates the user but does not return any groups, the local configuration determines the list of groups. See Authentication groups for more information about authentication groups. The Unix-FTP-Group-Names attribute can contain one group or multiple groups in a comma-separated list.

3. Save and close the file.
4. Verify that your changes did not introduce any syntax errors:

   ```
   $ sudo freeradius -CX
   ```

   This should return a message that completes similar to:

   ```
   ...
   Configuration appears to be OK
   ```

5. Restart the FreeRADIUS server:

   ```
   $ sudo /etc/init.d/freeradius restart
   ```

RADIUS server failover and fallback to local configuration

In addition to the primary RADIUS server, you can also configure your TX64 device to use backup RADIUS servers. Backup RADIUS servers are used for authentication requests when the primary RADIUS server is unavailable.

Falling back to local authentication

With user authentication methods, you can configure your TX64 device to use multiple types of authentication. For example, you can configure both RADIUS authentication and local authentication, so that local authentication can be used as a fallback mechanism if the primary and backup RADIUS

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servers are unavailable. Additionally, users who are configured locally but are not configured on the RADIUS server are still able to log into the device. Authentication methods are attempted in the order they are listed until the first successful authentication result is returned; therefore if you want to ensure that users are authenticated first through the RADIUS server, and only authenticated locally if the RADIUS server is unavailable or if the user is not defined on the RADIUS server, then you should list the RADIUS authentication method prior to the local users authentication method.

See User authentication methods for more information about authentication methods.

If the RADIUS servers are unavailable and the TX64 device falls back to local authentication, only users defined locally on the device are able to log in. RADIUS users cannot log in until the RADIUS servers are brought back online.

Configure your TX64 device to use a RADIUS server

This section describes how to configure a TX64 device to use a RADIUS server for authentication and authorization.

Required configuration items

- Define the RADIUS server IP address or domain name.
- Define the RADIUS server shared secret.
- Add RADIUS as an authentication method for your TX64 device.

Additional configuration items

- The RADIUS server port. It is configured to 1812 by default.
- Add additional RADIUS servers in case the first RADIUS server is unavailable.
- The server NAS ID. If left blank, the default value is used:
  - If you are access the TX64 device by using the WebUI, the default value is for NAS ID is **httpd**.
  - If you are access the TX64 device by using ssh, the default value is **sshd**.
- Time in seconds before the request to the server times out. The default is 5 seconds and the maximum possible value is 60 seconds.
- Enable additional debug messages from the RADIUS client.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Authentication** > **RADIUS** > **Servers**.
4. For **Add server**, click **+**.



The RADIUS server configuration window is displayed.



5. For **Hostname**, type the hostname or IP address of the RADIUS server.
6. [Optional] Change the default **Port** setting to the appropriate port. Normally this should be left at the default setting of port 1812.
7. For **Secret**, type the RADIUS server's shared secret. This is configured in the secret parameter of the RADIUS server's client.conf file, for example:

```
secret=testing123
```

8. For **Timeout**, type or select the amount of time in seconds to wait for the RADIUS server to respond. Allowed value is any integer from 1 to 60. The default value is 3.

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9. (Optional) Click **RADIUS debug** to enable additional debug messages from the RADIUS client.
10. (Optional) For **NAS ID**, type the unique identifier for this network access server (NAS). You can use the fully-qualified domain name of the NAS or any arbitrary string. If not set, the default value is used:
    - If you are accessing the TX64 device by using the WebUI, the default value is for NAS ID is **httpd**.
    - If you are accessing the TX64 device by using ssh, the default value is **sshd**.
11. (Optional) Click **+** again to add additional RADIUS servers.
12. Add RADIUS to the authentication methods:
    a. Click **Authentication** > **Methods**.
    b. For **Add method**, click **+**.

    c. Select **RADIUS** for the new method from the **Method** drop-down.

    Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. See Rearrange the position of authentication methods for information about rearranging the position of the methods in the list.
13. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Set the type of TLS connection used by the LDAP server:

```
(config)> auth ldap tls value
(config)>
```


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where value is one of:

- off: Uses a non-secure TCP connection on the LDAP standard port, 389.
- on: Uses an SSL/TLS encrypted connection on port 636.
- start_tls: Makes a non-secure TCP connection to the LDAP server on port 389, then sends a request to upgrade the connection to a secure TLS connection. This is the preferred method for LDAP.

The default is off.

4. If tls is set to on or start_tls, configure whether to verify the server certificate:

```
(config)> auth ldap verify_server_cert value
(config)>
```

where value is either:

- true: Verifies the server certificate with a known Certificate Authority.
- false: Does not verify the certificate. Use this option if the server is using a self-signed certificate.

The default is true.

5. Set the distinguished name (DN) that is used to bind to the LDAP server and search for users. Leave this option unset if the server allows anonymous connections.

```
(config)> auth ldap bind_dn dn_value
(config)>
```

For example:

```
(config)> auth ldap bind_dn cn=user,dc=example,dc=com
(config)>
```

6. Set the password used to log into the LDAP server. Leave this option unset if the server allows anonymous connections.

```
(config)> auth ldap bind_password password
(config)>
```

7. Set the distinguished name (DN) on the server to search for users. This can be the root of the directory tree (for example, dc=example,dc=com) or a sub-tree (for example, ou=People,dc=example,dc=com).

```
(config)> auth ldap base_dn value
(config)>
```

8. (Optional) Set the name of the user attribute that contains the list of TX64 authentication groups that the authenticated user has access to. See LDAP user configuration for further information about the group attribute.

```
(config)> auth ldap group_attribute value
(config)>
```

For example:

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```
(config)> auth ldap group_attribute ou
(config)>
```

8. Configure the amount of time in seconds to wait for the RADIUS server to respond.

```
(config)> auth ldap timeout value
(config)>
```

where value is any integer from 3 to 60. The default value is 3.

10. Add an RADIUS server:

```
(config)> add auth radius server end
(config auth radius server 0)>
```

11. Enter the RADIUS server's IP address or hostname:

```
(config auth radius server 0)> hostname hostname|ip-address
(config auth radius server 0)>
```

12. [Optional] Change the default port setting to the appropriate port:

```
(config auth radius server 0)> port port
(config auth radius server 0)>
```

13. Enter the RADIUS server's shared secret. This is configured in the secret parameter of the RADIUS server's client.conf file. For example:

```
(config auth radius server 0)> secret testing123
(config auth radius server 0)>
```

14. Configure the amount of time in seconds to wait for the RADIUS server to respond. Allowed value is any integer from 3 to 60. The default value is 3.

```
(config auth radius server 0)> timeout value
(config auth radius server 0)>
```

15. Return to the config prompt by typing three periods:

```
(config auth radius server 0)> ...
(config)>
```

16. [Optional] Enable debug messages from the RADIUS client:

```
(config)> auth radius debug true
```

17. [Optional] Configure the NAS ID. This is a unique identifier for this network access server (NAS). You can use the fully-qualified domain name of the NAS or any arbitrary string. If not set, the default value is used:

- If you are accessing the TX64 device by using the WebUI, the default value is for NAS ID is httpd.
- If you are accessing the TX64 device by using ssh, the default value is sshd.

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```
(config)> auth radius mas_id id
(config)>
```

18. (Optional) Repeat the above steps to add additional RADIUS servers.
19. Add RADIUS to the authentication methods. Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. This example will add RADIUS to the end of the list. See User authentication methods for information about adding methods to the beginning or middle of the list.

```
(config)> add auth method end radius
(config)>
```

20. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

21. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

LDAP

Your TX64 device supports LDAP (Lightweight Directory Access Protocol), a protocol used for directory information services over an IP network. LDAP can be used with your TX64 device for centralized authentication and authorization management for users who connect to the device. With LDAP support, the TX64 device acts as an LDAP client, which sends user credentials and connection parameters to an LDAP server. The LDAP server then authenticates the LDAP client requests and sends back a response message to the device.

When you are using LDAP authentication, you can have both local users and LDAP users able to log in to the device. To use LDAP authentication, you must set up a LDAP server that is accessible by the TX64 device prior to configuration. The process of setting up a LDAP server varies by the server environment.

This section contains the following topics:

LDAP user configuration 575
LDAP server failover and fallback to local configuration 577
Configure your TX64 device to use an LDAP server 577

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LDAP user configuration

When configured to use LDAP support, the TX64 device uses a remote LDAP server for user authentication (password verification) and authentication (assigning the access level of the user). Additional LDAP servers can be configured as backup servers for user authentication.

This section outlines how to configure a LDAP server to be used for user authentication on your TX64 device.

There are several different implementations of LDAP, including Microsoft Active Directory. This section uses OpenLDAP as an example configuration. Other implementations of LDAP will have different configuration methods.

Example OpenLDAP configuration

With OpenLDAP, users can be configured in a text file using the LDAP Data Interchange Format (LDIF). In this case, we will be using a file called add_user.ldif.

1. Create the add_user.ldif file in a text editor. For example:

```
$ gedit ./add_user.ldif
```

2. Add users to the file using the following format:

```
dn: uid=john,dc=example,dc=com
objectClass: inetOrgPerson
cn: John Smith
sn: Smith
uid: john
userPassword: password
ou: admin serial
```

   - The value of uid and userPassword must correspond to the username and password used to log into the TX64 device.
   - The ou attribute is optional. If used, the value must correspond to authentication groups configured on your TX64. Alternatively, if the user is also configured as a local user on the TX64 device and the LDAP server authenticates the user but does not return any groups, the local configuration determines the list of groups. See Authentication groups for more information about authentication groups.

   Other attributes may be required by the user's objectClass. Any objectClass may be used as long it allows the uid, userPassword, and ou attributes.

3. Save and close the file.
4. Add the user to the OpenLDAP server:

```
$ ldapadd -x -H 'ldap:///' -D 'cn=admin,dc=example,dc=com' -W -f add_
user.ldif
adding new entry "uid=john,dc=example,dc=com"
```

5. Verify that the user has been added by performing an LDAP search:

```
$ ldapsearch -x -LLL -H 'ldap:///' -b 'dc=example,dc=com'
uid=john
dn: uid=john,dc=example,dc=com
objectClass: inetOrgPerson
```


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```
cn: John Smith
sn: Smith
uid: john
auc: admin serial
```

LDAP server failover and fallback to local configuration

In addition to the primary LDAP server, you can also configure your TX64 device to use backup LDAP servers. Backup LDAP servers are used for authentication requests when the primary LDAP server is unavailable.

Failing back to local authentication

With user authentication methods, you can configure your TX64 device to use multiple types of authentication. For example, you can configure both LDAP authentication and local authentication, so that local authentication can be used as a failback mechanism if the primary and backup LDAP servers are unavailable. Additionally, users who are configured locally but are not configured on the LDAP server are still able to log into the device. Authentication methods are attempted in the order they are listed until the first successful authentication result is returned; therefore if you want to ensure that users are authenticated first through the LDAP server, and only authenticated locally if the LDAP server is unavailable or if the user is not defined on the LDAP server, then you should list the LDAP authentication method prior to the Local users authentication method.

See User authentication methods for more information about authentication methods.

If the LDAP servers are unavailable and the TX64 device falls back to local authentication, only users defined locally on the device are able to log in. LDAP users cannot log in until the LDAP servers are brought back online.

Configure your TX64 device to use an LDAP server

This section describes how to configure a TX64 device to use an LDAP server for authentication and authorization.

Required configuration items

- Define the LDAP server IP address or domain name.
- Add LDAP as an authentication method for your TX64 device.

Additional configuration items

- The LDAP server port. It is configured to 389 by default.
- Whether to use Transport Layer Security (TLS) when communicating with the LDAP server.
- The distinguished name (DN) and password used to communicate with the server.
- The distinguished name used to search to user base.
- The group attribute.
- The number of seconds to wait to receive a message from the server.
- Add additional LDAP servers in case the first LDAP server is unavailable.



1. Log into the TX64 WebUI as a user with full Admin access rights.

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3. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



5. Click **Authentication** > **LDAP** > **Servers**.
4. For **Add server**, click ＋.

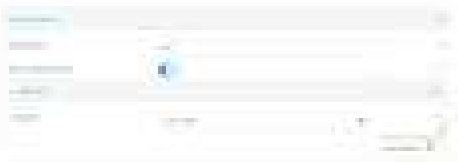


The **LDAP server configuration** window is displayed.



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5. For **Hostname**, type the hostname or IP address of the LDAP server.
6. (Optional) Change the default **Port** setting to the appropriate port. Normally this should be left at the default setting of port 389.
7. (Optional) Click ✚ again to add additional LDAP servers.
8. For **TLS connection**, select the type of TLS connection used by the server:
   - **Disable TLS**: Uses a non-secure TCP connection on the LDAP standard port, 389.
   - **Enable TLS**: Uses an SSL/TLS encrypted connection on port 636.
   - **Start TLS**: Makes a non-secure TCP connection to the LDAP server on port 389, then sends a request to upgrade the connection to a secure TLS connection. This is the preferred method for LDAP.
9. If **Enable TLS** or **Start TLS** are selected for TLS connection:
   - Leave **Verify server certificate** at the default setting of enabled to verify the server certificate with a known Certificate Authority.
   - Disable **Verify server certificate** if the server is using a self-signed certificate.
10. (Optional) For **Server login**, type a distinguished name (DN) that is used to bind to the LDAP server and search for users, for example cn=user,dc=example,dc=com. Leave this field blank if the server allows anonymous connections.
11. (Optional) For **Server password**, type the password used to log into the LDAP server. Leave this field blank if the server allows anonymous connections.
12. For **User search base**, type the distinguished name (DN) on the server to search for users. This can be the root of the directory tree (for example, dc=example,dc=com) or a sub-tree (for example, ou=People,dc=example,dc=com).
13. (Optional) For **Group attribute**, type the name of the user attribute that contains the list of TX64 authentication groups that the authenticated user has access to. See LDAP user configuration for further information about the group attribute.
14. For **Timeout**, type or select the amount of time in seconds to wait for the LDAP server to respond. Allowed value is between 3 and 60 seconds.
15. Add LDAP to the authentication methods:
    a. Click **Authentication** > **Methods**.
    b. For **Add method**, click ✚.



    c. Select **LDAP** for the new method from the **Method** drop-down.

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Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. See Rearrange the position of authentication methods for information about rearranging the position of the methods in the list.

16. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set the type of TLS connection used by the LDAP server:

```
(config)> auth ldap tls value
(config)>
```

   where value is one of:
   - off: Uses a non-secure TCP connection on the LDAP standard port, 389.
   - on: Uses an SSL/TLS encrypted connection on port 636.
   - start_tls: Makes a non-secure TCP connection to the LDAP server on port 389, then sends a request to upgrade the connection to a secure TLS connection. This is the preferred method for LDAP.

   The default is off.
4. If tls is set to on or start_tls, configure whether to verify the server certificate:

```
(config)> auth ldap verify_server_cert value
(config)>
```

   where value is either:
   - true: Verifies the server certificate with a known Certificate Authority.
   - false: Does not verify the certificate. Use this option if the server is using a self-signed certificate.

   The default is true.
5. Set the distinguished name (DN) that is used to bind to the LDAP server and search for users. Leave this option unset if the server allows anonymous connections.

```
(config)> auth ldap bind_dn dn_value
(config)>
```

   For example:

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```
(config)> auth ldap bind_dn cn=user,dc=example,dc=com
(config)>
```

6. Set the password used to log into the LDAP server. Leave this option unset if the server allows anonymous connections.

```
(config)> auth ldap bind_password password
(config)>
```

7. Set the distinguished name (DN) on the server to search for users. This can be the root of the directory tree (for example, dc=example,dc=com) or a sub-tree (for example, ou=People,dc=example,dc=com).

```
(config)> auth ldap base_dn value
(config)>
```

8. (Optional) Set the name of the user attribute that contains the list of TX64 authentication groups that the authenticated user has access to. See LDAP user configuration for further information about the group attribute.

```
(config)> auth ldap group_attribute value
(config)>
```

For example:

```
(config)> auth ldap group_attribute ou
(config)>
```

9. Configure the amount of time in seconds to wait for the LDAP server to respond.

```
(config)> auth ldap timeout value
(config)>
```

where value is any integer from 3 to 60. The default value is 3.

10. Add an LDAP server:

```
(config)> add auth ldap server end
(config auth ldap server 0)>
```

11. Enter the LDAP server's IP address or hostname:

```
(config auth ldap server 0)> hostname hostname|ip-address
(config auth ldap server 0)>
```

12. (Optional) Change the default port setting to the appropriate port:

```
(config auth ldap server 0)> port port
(config auth ldap server 0)>
```

13. (Optional) Repeat the above steps to add additional LDAP servers.

14. Add LDAP to the authentication methods. Authentication methods are attempted in the order they are listed until the first successful authentication result is returned. This example will add LDAP to the end of the list. See User authentication methods for information about adding

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methods to the beginning or middle of the list.

```
(config)> add auth method end ldap
(config)>
```

13. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

14. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Disable shell access

To prohibit access to the shell prompt for all authentication groups, disable the Allow shell parameter. This does not prevent access to the Admin CLI.

Note If shell access is disabled, re-enabling it will erase the device's configuration and perform a factory reset.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click System. Under Configuration, click Device Configuration.



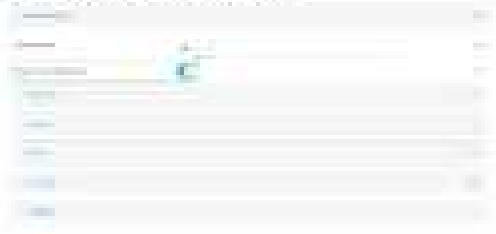
The Configuration window is displayed.



3. Click Authentication.

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4. Click to disable Allow shell.



Note: If shell access is disabled, re-enabling it will erase the device's configuration and perform a factory reset.

5. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set the allow_shell parameter to false:

```
(config)> auth allow_shell false
```

Note: If shell access is disabled, re-enabling it will erase the device's configuration and perform a factory reset.

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Set the Idle timeout for TX64 users

To configure the amount of time that the user's active session can be inactive before it is automatically disconnected, set the Idle timeout parameter.

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By default, the Idle timeout is set to 10 minutes.

Web UI

1. Log into the TX64 Web UI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



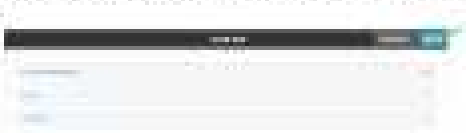
3. Click **Authentication**.
4. For **Idle timeout**, enter the amount of time that the active session can be idle before the user is automatically logged out.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

   For example, to set Idle timeout to ten minutes, enter **10m** or **600s**.



5. Click **Apply** to save the configuration and apply the change.



Command Line

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1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)# auth idle_timeout value
```

   where *value* is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

   For example, to set idle_timeout to ten minutes, enter either 10m or 600s:

```
(config)> auth idle_timeout 600s
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Example user configuration

Example 1: Administrator user with local authentication

Goal: To create a user with administrator rights who is authenticated locally on the device.

WebUI

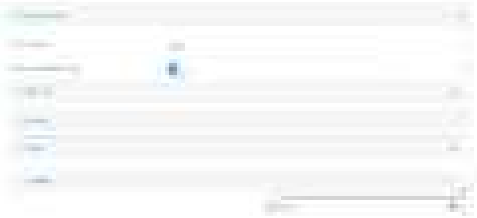
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Authentication** > **Users**.
4. In **Add User**, enter a name for the user and click **+**.



The user configuration window is displayed.

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5. Enter a Password for the user.
6. Assign the user to the admin group:
   a. Click Groups.
   b. For Add Group, click ✚.
   c. For Group, select the admin group.
   d. Verify that the admin group has full administrator rights:
      i. Click Authentication ▸ Groups.
      ii. Click admin.
      iii. Verify that the admin group has Admin access enabled. If not, click Admin access to enable.
      iv. Verify that Access level is set to Full access. If not, select Full access.
   e. Verify that Local users is one of the configured authentication methods:
      i. Click Authentication ▸ Methods.
      ii. Verify that Local users is one of the methods listed in the list. If not:
         i. For Add Method, click ✚.
         ii. For Method, select Local users.
7. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Verify that the admin group has full administrator rights:

```
(config)> show auth group admin acl
admin
        enable true
        level full
...
(config)>
```

If admin ▸ enable is set to false:

```
(config)> auth group admin acl admin enable true
(config)>
```


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If admin + level is set to read-only:

```
(config)> auth group admin acl admin level full
(config)>
```

4. Verify that local is one of the configured authentication methods:

```
(config)> show auth method
# local
(config)>
```

If local is not listed:

```
(config)> add auth method end local
(config)>
```

5. Create the user. In this example, the user is being created with the username adminuser:

```
(config)> add auth user adminuser
(config auth user adminuser)>
```

6. Assign a password to the user:

```
(config auth user adminuser)> password pwd
(config auth user adminuser)>
```

7. Assign the user to the admin group:

```
(config auth user adminuser)> add group end admin
(config auth user adminuser)>
```

8. Save the configuration and apply the changes:

```
(config auth user adminuser)> save
Configuration saved.
>
```

9. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Example 2: RADIUS, TACACS+, and local authentication for one user

Goal: To create a user with administrator rights who is authenticated by using all three authentication methods.

In this example, when the user attempts to log in to the TX54 device, user authentication will occur in the following order:

1. The user is authenticated by the RADIUS server. If the RADIUS server is unavailable,
2. The user is authenticated by the TACACS+ server. If both the RADIUS and TACACS+ servers are unavailable,
3. The user is authenticated by the TX54 device using local authentication.

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User authentication Example user configuration

This example uses a FreeRadius 3.0 server running on Ubuntu, and a TACACS+ server running on Ubuntu. Server configuration may vary depending on the platforms or type of servers used in your environment.

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WebUI

1. Configure a user on the RADIUS server:
   a. On the ubuntu machine hosting the FreeRadius server, open the /etc/freeradius/3.0/users file:

   ```
   $ sudo gedit /etc/freeradius/3.0/users
   ```

   b. Add a RADIUS user to the users file:

   ```
   admin1 Cleartext-Password := "password1"
          Unix-FTP-Group-Name := "admin"
   ```

   In this example:
   - The user's username is admin1.
   - The user's password is password1.
   - The authentication group on the TX64 device, admin, is identified in the Unix-FTP-Group-Name parameter.

   c. Save and close the users file.
2. Configure a user on the TACACS+ server:
   a. On the ubuntu machine hosting the TACACS+ server, open the /etc/tacacs+/tac_plus.conf file:

   ```
   $ sudo gedit /etc/tacacs+/tac_plus.conf
   ```

   b. Add a TACACS+ user to the tac_plus.conf file:

   ```
   user = admin1 {
          name ="Admin1 for TX64"
          pap = cleartext password1
          service = system {
                  groupname = admin
                  }
          }
   }
   ```

   In this example:
   - The user's username is admin1.
   - The user's password is password1.
   - The authentication group on the TX64 device, admin, is identified in the groupname parameter.

   c. Save and close the tac_plus.conf file.
3. Log into the TX64 WebUI as a user with full Admin access rights.
4. On the menu, click System. Under Configuration, click Device Configuration.

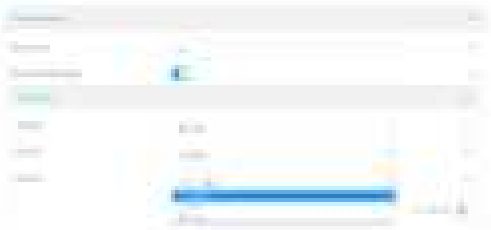


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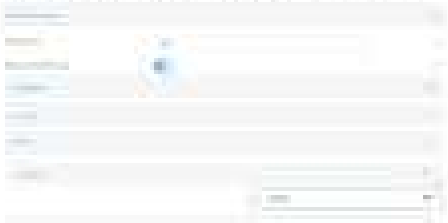
The Configuration window is displayed.



3. Configure the authentication methods:
   a. Click Authentication > Methods.
   b. For Method, select RADIUS.
   c. For Add Method, click + to add a new method.
   d. For the new method, select TACACS+.
   e. Click + to add another new method.
   f. For the new method, select Local users.



5. Create the local user:
   a. Click Authentication > Users.
   b. In Add User:, type admin1 and click +.



   c. For password, type password1.

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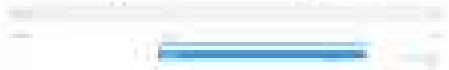
d. Assign the user to the admin group:

i. Click **Groups**.

ii. For **Add Group**, click ➕.



iii. For **Group**, select the admin group.



e. Verify that the admin group has full administrator rights:

i. Click **Authentication** > **Groups**.

ii. Click **admin**.

iii. Verify that the admin group has **Admin access** enabled. If not, click **Admin access** to enable.

iv. Verify that **Access level** is set to **Full access**. If not, select **Full access**.

f. Click **Apply** to save the configuration and apply the change.



Command Line

1. Configure a user on the RADIUS server:

a. On the ubuntu machine hosting the FreeRadius server, open the /etc/freeradius/3.0/users file:

```
$ sudo gedit /etc/freeradius/3.0/users
```

b. Add a RADIUS user to the users file:

```
admin1 Cleartext-Password := "password1"
       Unix-FTP-Group-Names := "admin"
```

In this example:

- The user's username is **admin1**.
- The user's password is **password1**.
- The authentication group on the TX64 device, **admin**, is identified in the **Unix-FTP-Group-Names** parameter.

c. Save and close the users file.

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2. Configure a user on the TACACS+ server:
   a. On the ubuntu machine hosting the TACACS+ server, open the /etc/tacacs+/tac_plus.conf file:

```
$ sudo gedit /etc/tacacs+/tac_plus.conf
```

   b. Add a TACACS+ user to the tac_plus.conf file:

```
user = admin1 {
        name = "Admin1 for TX64"
        pap = cleartext password1
        service = system {
                groupname = admin
                }
        }
}
```

   In this example:
   - The user's username is admin1.
   - The user's password is password1.
   - The authentication group on the TX64 device, admin, is identified in the groupname parameter.

   c. Save and close the tac_plus.conf file.
3. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
4. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

5. Configure the authentication methods:
   a. Determine the current authentication method configuration:

```
(config)> show auth method
0 local
(config)>
```

   This output indicates that on this example system, only local authentication is configured.
   b. Add RADIUS authentication to the beginning of the list:

```
(config)> add auth method 0 radius
(config)>
```

   c. Add TACACS+ authentication second place in the list:

```
(config)> add auth method 1 tacacs+(config)>
```


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d. Verify that authentication will occur in the correct order:

```
(config)> show auth method
0 radius
1 tacacs+
2 local
(config)>
```

6. Verify that the admin group has full administrator rights:

```
(config)> show auth group admin acl
admin
        enable true
        level full
...
(config)>
```

If admin = enable is set to false:

```
(config)> auth group admin acl admin enable true
(config)>
```

If admin = level is set to read-only:

```
(config)> auth group admin acl admin level full
(config)>
```

7. Configure the local user:

a. Create a local user with the username admin1:

```
(config)> add auth user admin1
(config auth user admin1)>
```

b. Assign a password to the user:

```
(config auth user admin1)> password password1
(config auth user admin1)>
```

c. Assign the user to the admin group:

```
(config auth user admin1)> add group end admin
(config auth user admin1)>
```

8. Save the configuration and apply the changes:

```
(config auth user admin1)> save
Configuration saved.
>
```

9. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Firewall

This chapter contains the following topics:

Firewall configuration
Port forwarding rules
Packet filtering
Configure custom firewall rules
Configure captive portals
Configure Quality of Service options
Web filtering

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Firewall configuration

Firewall configuration includes the following configuration options:

- **Zones:** A zone is a firewall access group to which network interfaces can be added. You then use zones to configure packet filtering and access control lists for interfaces that are included in the zone. Preconfigured zones include:
  - **Any:** Matches any network interface, even if they are not assigned to this zone.
  - **Loopback:** Zone for interfaces that are used for communication between processes running on the device.
  - **Internal:** Used for interfaces connected to trusted networks. By default, the firewall will allow most access from this zone.
  - **External:** Used for interfaces to connect to untrusted zones, such as the Internet. This zone has Network Address Translation (NAT) enabled by default. By default, the firewall will block most access from this zone.
  - **Edge:** Used for interfaces connected to trusted networks, where the device is a client on the edge of the network rather than a router or gateway.
  - **Setup:** Used for interfaces involved in the initial setup of the device. By default, the firewall will only allow this zone to access administration services.
  - **IPsec:** The default zone for IPsec tunnels.
  - **Hotspot:** The default zone for hotspots.
  - **Dynamic routes:** Used for routes learned using routing services.
- **Port forwarding:** A list of rules that allow network connections to the TX64 to be forwarded to other servers by translating the destination address.
- **Packet filtering:** A list of packet filtering rules that determine whether to accept or reject network connections that are forwarded through the TX64.
- **Custom rules:** A script that is run to install advanced firewall rules beyond the scope/capabilities of the standard device configuration.
- **Captive portals:** A list of captive portals that restrict traffic on network interfaces until access is granted. Captive portals are commonly used on public-access networks to require users to login or accept terms and conditions before accessing the Internet.
- **Quality Of Service:** Quality of Service (QOS) options for bandwidth allocation and policy-based traffic shaping and prioritizing.

Create a custom firewall zone

In addition to the preconfigured zones, you can create your custom zones that can be used to configure packet filtering and access control lists for network interfaces.

To create a zone:

WebUI

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1. Log into the TX64 Webui as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Firewall** > **Zones**.
4. In **Add Zone**, enter a name for the zone and click ➕.

The firewall configuration window is displayed.

5. (Optional) If traffic on this zone will be forwarded from a private network to the Internet, enable Network Address Translation (NAT).
6. Click **Apply** to save the configuration and apply the change.



See Configure the firewall zone for a network interface for information about how to configure network interfaces to use a zone.

Command line

1. Log into the TX64 command line as a user with full Admin access rights.

Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

1. At the command line, type **config** to enter configuration mode:

```
-> config
(config)->
```

2. Add the new zone. For example, to add a zone named my_zone:

```
(config)-> add firewall zone my_zone
(config firewall zone my_zone)->
```

3. (Optional) Enable Network Address Translation (NAT):

```
(config firewall zone my_zone)-> src_nat true
(config firewall zone my_zone)->
```

4. Save the configuration and apply the change:

```
(config firewall zone my_zone)-> save
Configuration saved.
->
```

5. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

See Configure the firewall zone for a network interface for information about how to configure network interfaces to use a zone.

Configure the firewall zone for a network interface

Firewall zones allow you to group network interfaces for the purpose of packet filtering and access control. There are several preconfigured firewall zones, and you can create custom zones as well. The firewall zone that a network interface uses is selected during interface configuration.

This example procedure uses an existing network interface named LAN1 and changes the firewall zone from the default zone, **Internal**, to **External**.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.

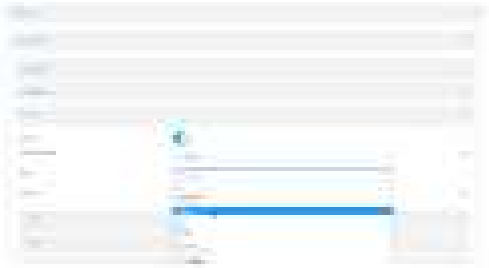


The **Configuration** window is displayed.

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5. Click Network > Interfaces > LAN1.
4. For Zone, select External.



5. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> network interface lan1 zone my_zone
(config)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete a custom firewall zone

You cannot delete preconfigured firewall zones. To delete a custom firewall zone:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Firewall > Zones**.
4. Click the menu icon (...) next to the appropriate custom firewall zone and select **Delete**.

5. Click **Apply** to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Use the del command to delete a custom firewall rule. For example:

```
(config)> del firewall zone my_zone
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Port forwarding rules

Most computers are protected by a firewall that prevents users on a public network from accessing servers on the private network. To allow a computer on the Internet to connect to a specific server on a private network, set up one or more port forwarding rules. Port forwarding rules provide mapping instructions that direct incoming traffic to the proper device on a LAN.

Configure port forwarding

Required configuration items

- The network interface for the rule.
  Network connections will only be forwarded if their destination address matches the IP address of the selected network interface.
- The public-facing port number that network connections must use for their traffic to be forwarded.
- The IP address of the server to which traffic should be forwarded.
- The port on the server to which traffic should be forwarded.

Additional configuration items

- A label for the port forwarding rule.
- The IP version (either IPv4 or IPv6) that incoming network connections must match.
- The protocols that incoming network connections must match.

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- A white list of devices, based on either IP address or firewall zone, that are authorized to leverage this forwarding rule.

To configure a port forwarding rule:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Firewall** > **Port forwarding**.
4. For **Add port forward**, click **+**.

The port forwarding rule configuration window is displayed.



Port forwarding rules are enabled by default. To disable, click to toggle off **Enable**.

5. (Optional) Type a **Label** that will be used to identify the rule.

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6. For **Interface**, select the network interface for the rule.

   Network connections will only be forwarded if their destination address matches the IP address of the selected network interface.

7. For **IP version**, select either IPv4 or IPv6.

   Network connections will only be forwarded if they match the selected IP version.

8. For **Protocol**, select the type of Internet protocol.

   Network connections will only be forwarded if they match the selected protocol.

9. For **Port**, type the public-facing port number that network connections must use for their traffic to be forwarded.

10. For **To Address**, type the IP address of the server to which traffic should be forwarded.

11. For **To port**, type the port number of the port on the server to which traffic should be forwarded.

12. (Optional) Click **Access control list** to create a white list of devices that are authorized to leverage this forwarding rule, based on either the IP address or firewall zone:

    - To white list IP addresses:
      a. Click **Addresses**.
      b. For **Add Address**, enter an IP address and click **+**.
      c. Repeat for each additional IP address that should be white listed.
    - To specify firewall zones for white listing:
      a. Click **Zones**.
      b. For **Add zone**, click **+**.
      c. For **Zone**, select the appropriate zone.
      d. Repeat for each additional zone.

13. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> add firewall dnat end
(config firewall dnat 0)>
```


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Port forwarding rules are enabled by default. To disable the rule:

```
(config firewall dnat 0)> enable false
(config firewall dnat 0)>
```

4. Set the network interface for the rule.

```
(config firewall dnat 0)> interface eth0
(config firewall dnat 0)>
```

Network connections will only be forwarded if their destination address matches the IP address of this network interface.

a. Use the ? to determine available interfaces:

```
(config firewall dnat 0)> interface ?

Interface: Network connections will only be forwarded if their
destination address matches the IP address of this network interface.
Format::
  defaultip
  defaultlinklocal
  lan1
  lan_hotspot
  loopback
  wan1
  wwan1
  wwan2
Current value:

(config firewall dnat 0)> interface
```

b. Set the interface. For example:

```
(config firewall dnat 0)> interface wan1
(config firewall dnat 0)>
```

5. Set the IP version. Allowed values are ipv4 and ipv6. The default is ipv4.

```
(config firewall dnat 0)> ip_version ipv6
(config firewall dnat 0)>
```

6. Set the public-facing port number that network connections must use for their traffic to be forwarded.

```
(config firewall dnat 0)> port port
(config firewall dnat 0)>
```

7. Set the type of Internet protocol.

```
(config firewall dnat 0)> protocol value
(config firewall dnat 0)>
```


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Network connections will only be forwarded if they match the selected protocol. Allowed values are custom, tcp, tcpudp, or udp. The default is tcp.

8. Set the IP address of the server to which traffic should be forwarded:
   - For IPv4 addresses:

```
(config firewall dnat 0)> to_address ip-address
(config firewall dnat 0)>
```

   - For IPv6 addresses:

```
(config firewall dnat 0)> to_address6 ip-address
(config firewall dnat 0)>
```

9. Set the public-facing port number that network connections must use for their traffic to be forwarded.

```
(config firewall dnat 0)> to_port port
(config firewall dnat 0)>
```

10. (Optional) To create a white list of devices that are authorized to leverage this forwarding rule, based on either the IP address or firewall zone, change to the acl mode:

```
(config firewall dnat 0)> acl
(config firewall dnat 0 acl)>
```

    - To white list an IP address:
      - For IPv4 addresses:

```
(config firewall dnat 0 acl)> add address end ip-address
(config firewall dnat 0 acl)>
```

      - For IPv6 addresses:

```
(config firewall dnat 0 acl)> add address6 end ip-address
(config firewall dnat 0 acl)>
```

      Repeat for each appropriate IP address.
    - To specify the firewall zone for white listing:

```
(config firewall dnat 0 acl)> add zone end zone
```

      Repeat for each appropriate zone.

      To view a list of available zones:

```
(config firewall dnat 0 acl)> .. .. .. zone ?

Zones: A list of groups of network interfaces that can be referred to
by packet filtering rules
and access control lists.,

 Additional Configuration
```


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```
any
dynamic_routes
edge
external
hotspot
internal
ipsec
loopback
setup

(config firewall dnat 0 acl)>
```

11. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

12. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete a port forwarding rule

To delete a port forwarding rule:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

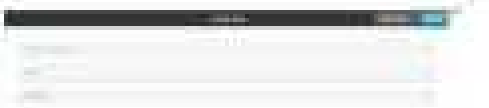
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Firewall Port forwarding rules



5. Click **Firewall** > **Port forwarding**.
4. Click the menu icon (...) next to the appropriate port forwarding rule and select **Delete**.

5. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Determine the index number of the port forwarding rule you want to delete:

```
(config)> show firewall dnat
#
        acl
                no address
                no zone
        enable true
        interface eth2
        ip_version ipv4
        label IPv4 port forwarding rule
        port 10000
        protocol tcp
```

TX64 User Guide 607

```
        to_address6 10.10.10.10
        to_port 10001

    1
        act
                no address6
                no zone
        enable false
        interface eth0
        ip_version ipv6
        label IPv6 port forwarding rule
        port 10002
        protocol tcp
        to_address6 c997:4533:bd63:bb13:9a67:5b09:4a53:c29a
        to_port 10002
(config)>
```

4. To delete the rule, use the index number with the del command. For example:

```
(config)> del firewall dnat 1
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Packet filtering

By default, there are two preconfigured packet filtering rules:

- **Allow all outgoing traffic:** Monitors traffic going to and from the TX64 device. The predefined settings are intended to block unauthorized inbound traffic while providing an unrestricted flow of outgoing data.
- **Allow Hotspot to External:** Allows traffic that uses the Hotspot firewall zone to be forwarded to interfaces that use the External zone. You should not modify this packet filtering rule.

Configure packet filtering

Required configuration items

- The action that the packet filtering rule will perform, either **Accept**, **Reject**, or **Drop**.
- The source firewall zone: Packets originating from interfaces on this zone will be monitored by this rule.
- The destination firewall zone: Packets destined for interfaces on this zone will be accepted, rejected, or dropped by this rule.

Additional configuration requirements

- A label for the rule.
- The IP version to be matched, either IPv4, IPv6, or Any.
- The protocol to be matched, one of:
  - TCP
  - UDP
  - ICMP
  - ICMP6
  - Any

To configure a packet filtering rule:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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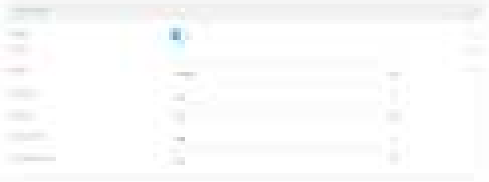
Firewall Packet filtering



5. Click **Firewall > Packet filtering**.
   - To create a new packet filtering rule, for **Add packet filter**, click **+**.

   - To edit the default packet filtering rule or another existing packet filtering rule, click to expand the rule.

The packet filtering rule configuration window is displayed.



Packet filters are enabled by default. To disable, click to toggle off **Enable**.

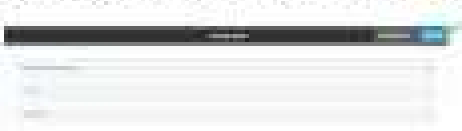
4. (Optional) Type a **Label** that will be used to identify the rule.
5. For **Action**, select one of:
   - **Accept**: Allows matching network connections.
   - **Reject**: Blocks matching network connections, and sends an ICMP error if appropriate.
   - **Drop**: Blocks matching network connections, and does not send a reply.
6. Select the **IP version**.
7. Select the **Protocol**.
8. For **Source zone**, select the firewall zone that will be monitored by this rule for incoming connections from network interfaces that are a member of this zone.

   See Firewall configuration for more information about firewall zones.
9. For **Destination zone**, select the firewall zone. Packets destined for network interfaces that are members of this zone will either be accepted, rejected or dropped by this rule.

   See Firewall configuration for more information about firewall zones.

TX64 User Guide 610

10. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

To edit the default packet filtering rule or another existing packet filtering rule:

a. Determine the index number of the appropriate packet filtering rule:

```
(config)> show firewall filter
0
    action accept
    dst_zone any
    enable true
    ip_version any
    label Allow all outgoing traffic
    protocol any
    src_zone internal
1
    action drop
    dst_zone internal
    enable true
    ip_version any
    label myfilter
    protocol any
    src_zone external
(config)>
```

b. Select the appropriate rule by using its index number:

```
(config)> firewall filter 1
(config firewall filter 1)>
```

To create a new packet filtering rule:

```
(config)> add firewall filter end
(config firewall filter 1)>
```


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Packet filtering rules are enabled by default. To disable the rule:

```
(config firewall filter 1)> enable false
(config firewall filter 1)>
```

3. (Optional) Set the label for the rule.

```
(config firewall filter 1)> label "My filter rule"
(config firewall filter 1)>
```

4. Set the action to be performed by the filter rule.

```
(config firewall filter 1)> action value
(config firewall filter 1)>
```

where value is one of:

- accept: Allows matching network connections.
- reject: Blocks matching network connections, and sends an ICMP error if appropriate.
- drop: Blocks matching network connections, and does not send a reply.

5. Set the firewall zone that will be monitored by this rule for incoming connections from network interfaces that are a member of this zone:

See Firewall configuration for more information about firewall zones.

```
(config firewall filter 1)> src_zone my_zone
(config firewall filter 1)>
```

6. Set the destination firewall zone. Packets destined for network interfaces that are members of this zone will either be accepted, rejected or dropped by this rule.

See Firewall configuration for more information about firewall zones.

```
(config firewall filter 1)> dst_zone my_zone
(config firewall filter 1)>
```

7. Set the IP version.

```
(config firewall filter 1)> ip_version value
(config firewall filter 1)>
```

where value is one of:

- any
- ipv4
- ipv6
- The default is any.

8. Set the protocol.

```
(config firewall filter 1)> protocol value
(config firewall filter 1)>
```


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where value is one of:

- any
- icmp
- icmpv6
- tcp
- upd

The default is any.

9. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Enable or disable a packet filtering rule

To enable or disable a packet filtering rule:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Firewall** > **Packet filtering**.
4. Click the appropriate packet filtering rule.

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5. Click **Enable** to toggle the rule between enabled and disabled.

6. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Determine the Index number of the appropriate port forwarding rule:

```
(config)> show firewall filter
0
    action accept
    dst_zone any
    enable true
    ip_version any
    label Allow all outgoing traffic
    protocol any
    src_zone internal
1
    action drop
    dst_zone internal
    enable true
    ip_version any
    label My packet filter
    protocol any
    src_zone external
(config)>
```

4. To enable a packet filtering rule, use the Index number with the **enable true** command. For example:

```
(config)> firewall filter 1 enable true
```


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5. To disable a packet filtering rule, use the index number with the enable false command. For example:

```
(config)> firewall filter 1 enable false
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete a packet filtering rule

To delete a packet filtering rule:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Firewall** > **Packet filtering**.
4. Click the menu icon (...) next to the appropriate packet filtering rule and select **Delete**.

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5. Click Apply to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Determine the index number of the packet filtering rule you want to delete:

```
(config)> show firewall filter
0
    action accept
    dst_zone any
    enable true
    ip_version any
    label Allow all outgoing traffic
    protocol any
    src_zone internal
1
    action drop
    dst_zone internal
    enable true
    ip_version any
    label My packet filter
    protocol any
    src_zone external
(config)>
```

4. To delete the rule, use the index number with the del command. For example:

```
(config)> del firewall filter 1
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Configure custom firewall rules

Custom firewall rules consist of a script of shell commands that can be used to install firewall rules, ipsets, and other system configuration. These commands are run whenever system configuration changes occur that might cause changes to the firewall.

To configure custom firewall rules:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.

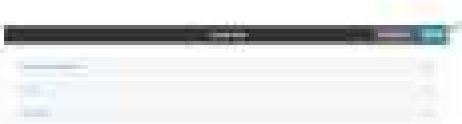


The **Configuration** window is displayed.



3. Click **Firewall** > **Custom rules**.

4. **Enable** the custom rules.
5. (Optional) **Enable Override** to override all preconfigured firewall behavior and rely solely on the custom firewall rules.
6. For **Rules**, type the shell command that will execute the custom firewall rules script.
7. Click **Apply** to save the configuration and apply the changes.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable custom firewall rules:

```
(config)> firewall custom enable true
(config)>
```

4. (Optional) Instruct the device to override all preconfigured firewall behavior and rely solely on the custom firewall rules:

```
(config)> firewall custom override true
(config)>
```

5. Set the shell command that will execute the custom firewall rules script:

```
(config)> firewall custom rules shell-command
(config)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Configure captive portals

Captive portals are commonly used on public-access networks to require users to login or accept terms and conditions before accessing the Internet.

To configure captive portals:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Firewall** > **Captive portals**.
4. For **Add captive portal**, enter a name for the portal and click ✚.

The captive portal configuration window is displayed.

The captive portal is enabled by default. To disable, click to toggle off **Enable**.

5. For **Interface**, select the network interface for the portal.

Traffic received on this interface's network device will not be forwarded unless the client has been granted access.

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6. For **Session timeout**, type the amount of time that a user session remains valid. After the session times out, the user will be required to log in again.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

   For example, to set **Session timeout** to ten minutes, enter 10m or 600s.

7. For **Portal HTTP access**, configure whether the portal can be accessed over an insecure connection.

   - **Allow**: Allows access to the portal page over an insecure connection (HTTP port 80).
   - **Redirect to HTTPS**: Automatically redirects the request to a secure connection (HTTPS port 443).
   - **Disallow**: Does not allow access over an insecure connection (HTTP port 80).

   Note: This setting does not affect access to HTTP port 80 after the client has been granted access to the portal.

8. For **Authorization**, select the method that will be used to authorize the user:

   - **None**: Users are not required to enter any information to access the portal.
   - **User login**: Users are required to authenticate with an account on this device. Users must be part of a user group that allows access to this portal.
   - **Collect user information**: Users are required to complete a form to continue. The form fields may be customized.

9. (Optional) For **Title**, enter the title of the portal page that the user will see when accessing the portal.

10. (Optional) For **Message**, enter a message that will appear on the portal page.

11. (Optional) For **Terms and Conditions**, enter the terms and conditions that will appear on the portal page. Users will be required to agree to the terms and conditions before being granted access to the portal.

12. (Optional) For **Redirect to URL**, enter the URL to which the user will be directed when granted access to the portal. If left blank, the user will be directed to the domain of the URL in the original access request.

13. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. To create an active portal called portal1:

```
(config)> add firewall portal portal1
(config firewall portal portal1)>
```

Captive portals are enabled by default. To disable the portal:

```
(config firewall portal portal1)> enable false
(config firewall portal portal1)>
```

4. Set the network interface for the portal. Traffic received on this interface's network device will not be forwarded unless the client has been granted access.
   a. Use the ? to determine available interfaces:

```
(config firewall portal portal1)> interface ?

Interface: The network interface to run the portal on. Traffic received
on this interface's network device will not be forwarded unless the
client has been granted access.
Format::
  /network/interface/defaultip
  /network/interface/defaultlinklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value::

(config firewall portal portal1)> interface
```

   b. Set the interface. For example:

```
(config firewall portal portal1)> interface /network/interface/wan1
(config firewall portal portal1)>
```

5. Set the amount of time that a user session remains valid. After the session times out, the user will be required to log in again.

```
(config firewall portal portal1)> timeout value
(config firewall portal portal1)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set Session timeout to ten minutes, enter either 10m or 600s:

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```
(config firewall portal portal1)> timeout 600
(config firewall portal portal1)>
```

5. Configure whether the portal can be accessed over an insecure connection.

```
(config firewall portal portal1)> http value
(config firewall portal portal1)>
```

where value is one of:

- allow: Allows access to the portal page over an insecure connection (HTTP port 80).
- redirect: Automatically redirects the request to a secure connection (HTTPS port 443).
- disallow: Does not allow access over an insecure connection (HTTP port 80).

Note: This setting does not affect access to HTTP port 80 after the client has been granted access to the portal.

7. Set the method that will be used to authorize the user:

```
(config firewall portal portal1)> auth value
(config firewall portal portal1)>
```

where value is one of:

- none: Users are not required to enter any information to access the portal.
- login: Users are required to authenticate with an account on this device. Users must be part of a user group that allows access to this portal.
- info: Users are required to complete a form to continue. The form fields may be customize.

8. (Optional) Set the title of the portal page that the user will see when accessing the portal:

```
(config firewall portal portal1)> title "Corporate portal"
(config firewall portal portal1)>
```

9. (Optional) Set a message that will appear on the portal page:

```
(config firewall portal portal1)> message "Welcome to the corporate web
portal"
(config firewall portal portal1)>
```

10. (Optional) Set the terms and conditions that ll appear on the portal page. Users will be required to agree to the terms and conditions before being granted access to the portal.

```
(config firewall portal portal1)> terms "Accept the terms and conditions of
this portal"
(config firewall portal portal1)>
```

11. (Optional) Set the URL to which the user will be directed when granted access to the portal. If left blank, the user will be directed to the domain of the URL in the original access request.

```
(config firewall portal portal1)> url https://myportal.com
(config firewall portal portal1)>
```


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12. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

13. Type exit to exit the Admin CLI.
Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Delete captive portals

To delete captive portals:

WebUI

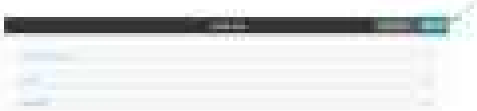
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click System. Under Configuration, click Device Configuration.



The Configuration window is displayed.



3. Click Firewall > Captive portals.
4. Click the down carat (^) next to the appropriate captive portal and select Delete.
5. Click Apply to save the configuration and apply the change.



Command line

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1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. To delete a captive portal, use the **del** command. For example:

```
(config)> del firewall portal portal1
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configure Quality of Service options

Quality of Service (QoS) options allow you to manage the traffic performance of various services, such as Voice over IP (VoIP), cloud computing, traffic shaping, traffic prioritizing, and bandwidth allocation. When configuring QOS, you can only control the queue for outgoing packets on each interface (egress packets), not what is received on the interface (packet ingress).

A QoS binding contains the policies and rules that apply to packets exiting the TX64 device on the binding's interface. By default, the TX64 device has two preconfigured QoS bindings, Outbound and Inbound. These bindings are an example configuration designed for a typical VoIP site:

- Outbound provides an example of matching packets as they are routed from the device onto the WAN interface.
- Inbound provides an example of matching packets as they are routed from the device onto a LAN interface.

These example bindings are disabled by default.

Enable the preconfigured bindings

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Firewall > Quality of Service**.
4. Click to expand either **Outbound** or **Inbound**.
3. **Enable** the binding.
6. Select an **Interface**.
7. Examine the remaining default settings and modify as appropriate for your network.
8. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an **Access selection** menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable one of the preconfiged bindings:
   - To enable the Outbound binding:

```
(config)> firewall qos 0 enable true
(config)>
```

   - To enable the Inbound binding:

```
(config)> firewall qos 1 enable true
(config)>
```

4. Set the Interface for the binding. Use the Index number of the binding for example, to set the Interface for the Outbound binding:
   a. Use the ? to determine available Interfaces:

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```
(config)> firewall qos 0 interface ?

Interface: The network interface.
Format:
  /network/interface/defaultip
  /network/interface/defaultiktolocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config)> firewall qos 0 interface
```

5. Set the Interface. For example:

```
(config)> firewall qos 0 interface /network/interface/wan1
(config)>
```

5. Examine the remaining default settings and modify as appropriate for your network.
6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

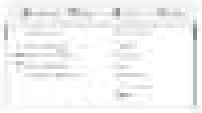
7. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Create a new binding

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



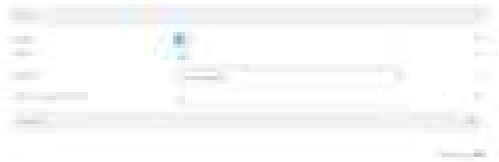
The **Configuration** window is displayed.

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5. Click **Firewall > Quality of Service**.
4. For **Add Binding**, click **+**.

The quality of service binding configuration window is displayed.

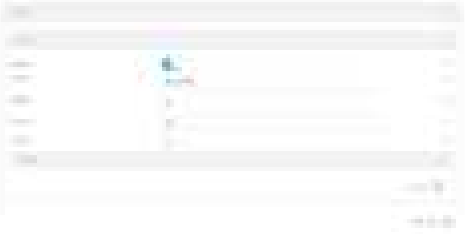


5. **Enable** the binding.
6. (Optional) Type a **Label** for the binding.
7. Select an **Interface** to queue egress packets on. The binding will only match traffic that is being sent out on this interface.
8. (Optional) For **Interface bandwidth (Mbit)**, set the maximum egress bandwidth of the interface, in megabits, allocated to this binding. Typically, this should be 95% of the available bandwidth. Allowed value is any integer between 1 and 9999.
9. Create a policy for the binding:
   At least one policy is required for each binding. Each policy can contain up to 50 rules.

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a. Click to expand **Policy**.
b. For **Add Policy**, click **+**.

The QoS binding policy configuration window is displayed.



New QoS binding policies are enabled by default. To disable, click **Enable**.

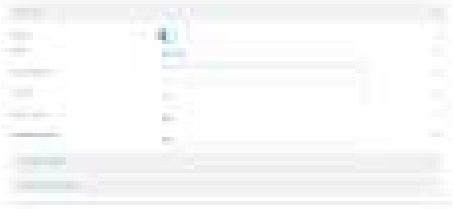
c. (Optional) Type a **Label** for the binding policy.
d. For **Weight**, type a value for the amount of available bandwidth allocated to the policy, relative to other policies for this binding.

   The larger the weight, with respect to the other policy weights, the larger portion of the maximum bandwidth is available for this policy. For example, if a binding contains three policies, and each policy contains a weight of 10, each policy will be allocated one third of the total interface bandwidth.

e. For **Latency**, type the maximum delay before the transmission of packets. A lower latency means that the packets will be scheduled more quickly for transmission.
f. Select **Default** to identify this policy as a fall-back policy. The fall-back policy will be used for traffic that is not matched by any other policy. If there is no default policy associated with this binding, packets that do not match any policy rules will be dropped.
g. If **Default** is disabled, you must configure at least one rule:
   i. Click to expand **Rule**.
   ii. For **Add Rule**, click **+**.

The QoS binding policy rule configuration window is displayed.

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New QoS binding policy rules are enabled by default. To disable, click **Enable**.

iii. (Optional) Type a **Label** for the binding policy rule.

iv. For **Type Of Service**, type the value of the Type of Service (ToS) packet header that defines packet priority. If unspecified, this field is ignored.

See https://www.iana.org/ for a list of common TOS values.

v. For **Protocol**, select the IP protocol matching criteria for this rule.

vi. For **Source port**, type the port, or any, as a source traffic matching criteria.

vii. For **Destination port**, type the port, or any, as a destination traffic matching criteria.

viii. Click to expand **Source address** and select the **Type**:

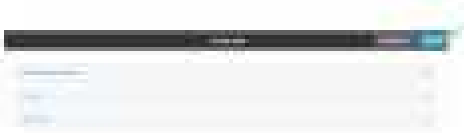
- **Any**: Source traffic from any address will be matched.
- **Interface**: Only traffic from the selected **Interface** will be matched.
- **IPv4 address**: Only traffic from the IP address typed in **IPv4 address** will be matched. Use the format *IPv4_address[/netmask]*, or use any to match any IPv4 address.
- **IPv6 address**: Only traffic from the IP address typed in **IPv6 address** will be matched. Use the format *IPv6_address[/prefix_length]*, or use any to match any IPv6 address.
- **MAC address**: Only traffic from the MAC address typed in **MAC address** will be matched.

ix. Click to expand **Destination address** and select the **Type**:

- **Any**: Traffic destined for anywhere will be matched.
- **Interface**: Only traffic destined for the selected **Interface** will be matched.
- **IPv4 address**: Only traffic destined for the IP address typed in **IPv4 address** will be matched. Use the format *IPv4_address[/netmask]*, or use any to match any IPv4 address.
- **IPv6 address**: Only traffic destined for the IP address typed in **IPv6 address** will be matched. Use the format *IPv6_address[/prefix_length]*, or use any to match any IPv6 address.

Repeat to add a new rule. Up to 50 rules can be configured.

10. Click **Apply** to save the configuration and apply the change.



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Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add a binding:

```
(config)> add firewall qos end
(config firewall qos 2)>
```

   New binding are enabled by default. To disable:

```
(config firewall qos 2)> enable false
(config firewall qos 2)>
```

4. [Optional] Set a label for the new binding:

```
(config firewall qos 2)> label my_binding
(config firewall qos 2)>
```

5. Set the interface to queue egress packets on. This binding will only match traffic that is being sent out on this interface:
   a. Use the **?** to determine available interfaces:

```
(config firewall qos 2)> interface ?

Interface: The network interface.
Format:
  /network/interface/defaultip
  /network/interface/defaultlinklocal
  /network/interface/lan1
  /network/interface/lan_hotspot
  /network/interface/loopback
  /network/interface/wan1
  /network/interface/wwan1
  /network/interface/wwan2
Current value:

(config firewall qos 2)> interface
```

   b. Set the interface. For example:

```
(config firewall qos 2)> interface /network/interface/wan1
(config firewall qos 2)>
```

6. [Optional] Set the maximum egress bandwidth of the interface, in megabits, allocated to this binding.

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```
(config firewall qos 2)> bandwidth int
(config firewall qos 2)>
```

where *int* is an integer between 1 and 1000. Typically, this should be 95% of the available bandwidth. The default is 95.

7. Create a policy for the binding:

   At least one policy is required for each binding. Each policy can contain up to 30 rules.

   a. Change to the policy node of the configuration:

   ```
   (config firewall qos 2)> policy
   (config firewall qos 2 policy)>
   ```

   b. Add a policy:

   ```
   (config firewall qos 2 policy)> add end
   (config firewall qos 2 policy 0)>
   ```

   New QoS binding policies are enabled by default. To disable:

   ```
   (config firewall qos 2 policy 0)> enable false
   (config firewall qos 2 policy 0)>
   ```

   c. [Optional] Set a label for the new binding policy:

   ```
   (config firewall qos 2 policy 0)> label my_binding_policy
   (config firewall qos 2 policy 0)>
   ```

   d. Set a value for the amount of available bandwidth allocated to the policy, relative to other policies for this binding.

   The larger the weight, with respect to the other policy weights, the larger portion of the maximum bandwidth is available for this policy. For example, if a binding contains three policies, and each policy contains a weight of 10, each policy will be allocated one third of the total interface bandwidth.

   ```
   (config firewall qos 2 policy 0)> weight int
   (config firewall qos 2 policy 0)>
   ```

   where *int* is any integer between 1 and 65535. The default is 10.

   e. Set the maximum delay before the transmission of packets. A lower number means that the packets will be scheduled more quickly for transmission.

   ```
   (config firewall qos 2 policy 0)> latency int
   (config firewall qos 2 policy 0)>
   ```

   where *int* is any integer, 1 or greater. The default is 100.

   f. To identify this policy as a fall-back policy:

   ```
   (config firewall qos 2 policy 0)> default true
   (config firewall qos 2 policy 0)>
   ```


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The fall-back policy will be used for traffic that is not matched by any other policy. If there is no default policy associated with this binding, packets that do not match any policy rules will be dropped. If the policy is not a fall-back policy, you must configure at least one rule:

i. Change to the rule mode of the configuration:

```
(config firewall qos 2 policy 0)> rule
(config firewall qos 2 policy 0 rule)>
```

ii. Add a rule:

```
(config firewall qos 2 policy 0 rule)> add end
(config firewall qos 2 policy 0 rule 0)>
```

New QoS binding policy rules are enabled by default. To disable:

```
(config firewall qos 2 policy 0 rule 0)> enable false
(config firewall qos 2 policy 0 rule 0)>
```

iii. (Optional) Set a label for the new binding policy rule:

```
(config firewall qos 2 policy 0 rule 0)> label my_binding_policy_
rule
(config firewall qos 2 policy 0 rule 0)>
```

iv. Set the value of the Type of Service (ToS) packet header that defines packet priority. If unspecified, this field is ignored.

```
(config firewall qos 2 policy 0 rule 0)> tos value
(config firewall qos 2 policy 0 rule 0)>
```

where value is a hexadecimal number. See https://www.iana.org/assignments/dscp-tos for a list of common TOS values.

v. Set the IP protocol matching criteria for this rule:

```
(config firewall qos 2 policy 0 rule 0)> protocol value
(config firewall qos 2 policy 0 rule 0)>
```

where value is one of tcp, udp, or any.

vi. Set the source port to define a source traffic matching criteria:

```
(config firewall qos 2 policy 0 rule 0)> srcport value
(config firewall qos 2 policy 0 rule 0)>
```

where value is the IP port number, a range of port numbers using the format IP_port-IP_port, or any.

vii. Set the destination port to define a destination matching criteria:

```
(config firewall qos 2 policy 0 rule 0)> dstport value
(config firewall qos 2 policy 0 rule 0)>
```

where value is the IP port number, a range of port numbers using the format IP_port-IP_port, or any.

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vii. Set the source address type:

```
(config network qos 2 policy 0 rule 0)> src type value
(config network qos 2 policy 0 rule 0)>
```

where value is one of:

- any: Source traffic from any address will be matched.

  See Firewall configuration for more information about firewall zones.

- interface: Only traffic from the selected interface will be matched. Set the interface:

  i. Use the ? to determine available interfaces:

  ```
  (config network qos 2 policy 0 rule 0)> src interface ?

  Interface: Match the IP address with the specified
  interface's network address.
  Format:
    /network/interface/defaultip
    /network/interface/defaultlinklocal
    /network/interface/lan1
    /network/interface/lan_hotspot
    /network/interface/loopback
    /network/interface/wan1
    /network/interface/wwan1
    /network/interface/wwan2
  Current value:

  (config network qos 2 policy 0 rule 0)> src interface
  ```

  ii. Set the interface. For example:

  ```
  (config network qos 2 policy 0 rule 0)> src interface
  /network/interface/wan2
  (config network qos 2 policy 0 rule 0)>
  ```

- address: Only traffic from the IP address typed in IPv4 address will be matched. Set the address that will be matched:

  ```
  (config network qos 2 policy 0 rule 0)> src address value
  (config network qos 2 policy 0 rule 0)>
  ```

  where value uses the format IPv4_address[/netmask], or any to match any IPv4 address.

- address6: Only traffic from the IP address typed in IPv6 address will be matched. Set the address that will be matched:

  ```
  (config network qos 2 policy 0 rule 0)> src address6 value
  (config network qos 2 policy 0 rule 0)>
  ```


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where value uses the format IPv6_address[/prefix_length], or any to match any IPv6 address.

- mac: Only traffic from the MAC address typed in MAC address will be matched. Set the MAC address to be matched:

```
(config network qos 2 policy 0 rule 0)> src mac MAC_address
(config network qos 2 policy 0 rule 0)>
```

b. Set the destination address type:

```
(config network qos 2 policy 0 rule 0)> dst type value
(config network qos 2 policy 0 rule 0)>
```

where value is one of:

- any: Traffic destined for anywhere will be matched.

  See Firewall configuration for more information about firewall zones.

- interface: Only traffic destined for the selected interface will be matched. Set the interface:

  i. Use the ? to determine available interfaces:

  ```
  (config network qos 2 policy 0 rule 0)> dst interface ?

  Interface: Match the IP address with the specified
  interface's network address.
  Format:
    /network/interface/defaultip
    /network/interface/defaultlinklocal
    /network/interface/lan1
    /network/interface/lan_hotspot
    /network/interface/loopback
    /network/interface/wan1
    /network/interface/wwan1
    /network/interface/wwan2
  Current value:

  (config network qos 2 policy 0 rule 0)> dst interface
  ```

  ii. Set the interface. For example:

  ```
  (config network qos 2 policy 0 rule 0)> dst interface
  /network/interface/wan1
  (config network qos 2 policy 0 rule 0)>
  ```

- address: Only traffic destined for the IP address typed in IPv4 address will be matched. Set the address that will be matched:

```
(config network qos 2 policy 0 rule 0)> src address value
(config network qos 2 policy 0 rule 0)>
```

where value uses the format IPv4_address[/netmask], or any to match any IPv4 address.

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- **address6**: Only traffic destined for the IP address typed in IPv6 address will be matched. Set the address that will be matched:

```
(config network qos 2 policy 0 rule 0)> src address6 value
(config network qos 2 policy 0 rule 0)>
```

  where value uses the format IPv6_address[/prefix_length], or any to match any IPv6 address.

Repeat to add a new rule. Up to 50 rules can be configured.

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Web filtering

Web filtering allows you to control access to services that can be accessed through the TX64 device by forwarding all Domain Name System (DNS) traffic to a web filtering service. This allows the network security administrator to configure a set of policies with the web filtering service that are applied to all routing devices with web filtering enabled. For example, a policy may allow or deny access to a specific service or type of service such as social media, gaming, and so on.

Your TX64 device supports two methods for configuring web filtering:

- Cisco Umbrella (formally known as OpenDNS).
- Manual DNS server entry.

Configure web filtering with Cisco Umbrella

Required configuration items

- Enable web filtering.
- A Cisco Umbrella account.

  See https://umbrella.cisco.com for information about how to create a Cisco Umbrella account. A 14 day trial account is available.
- A customer-specific API token.

Task one: Generate a Cisco Umbrella API token

1. Log into the Cisco Umbrella Dashboard (https://dashboard.umbrella.com).
2. On the menu, select **Admin** > **API Keys**.

   The API Keys page displays.
3. Click ⊕ (**Create**).
4. Select **Legacy Network Devices**.

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5. Click **Create**.
6. Copy the token.

Task two: Configure web filtering

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Firewall > Web filtering service**.

4. Click **Enable web filtering** to enable.
5. For **Web filtering service**, select **Cisco Umbrella**.
6. Paste the API token that was generated in Task one: Generate a Cisco Umbrella API token.
7. Click **Apply** to save the configuration and apply the change.



Command line

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1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable web filtering:

```
(config)> firewall web-filter enable true
(config)>
```

4. Set the web filter service type to umbrella:

```
(config)> firewall web-filter service umbrella
(config)>
```

5. Set umbrella_token to the API token generated in Task one: Generate a Cisco Umbrella API token:

```
(config)> firewall web-filter umbrella_token token
(config)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Clear the Cisco Umbrella device ID

If the Cisco Umbrella device ID being used by your TX64 is invalid, you can clear the device ID.

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the Admin CLI prompt, use the **rm** command to delete the **web-filter-id** file, and confirm the deletion:

```
> rm /etc/config/web-filter-id
rm: remove '/etc/config/web-filter-id'? yes
>
```


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3. Restart the web filtering service:

```
> config firewall web-filter enable false
> config firewall web-filter enable true
>
```

Configure web filtering with manual DNS servers

Required configuration items

- Enable web filtering.
- The IP address of one or more DNS servers. Cisco provides two open DNS servers for web filtering:
  - 208.67.222.222
  - 208.67.220.220

  See https://www.opendns.com/setupguide for more information about using Cisco DNS servers for web filtering.

To configure web filtering with manual DNS servers:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



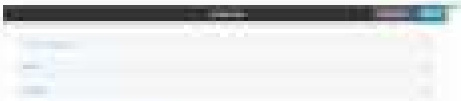
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3. Click **Firewall** > **Web filtering** service.

4. Click **Enable web filtering** to enable.
5. For **Web filtering service**, select **Manual**.
6. Click to expand **Servers**.
7. Click **+** to add a server.

8. For **IP address**, enter the IP address of the DNS server.

9. (Optional) Repeat for additional DNS servers.
10. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable web filtering:

```
(config)> firewall web-filter enable true
(config)>
```


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Firewall Web filtering

4. Set the web filter service type to manual:

```
(config)> firewall web-filter service manual
(config)>
```

5. Add a DNS server:

```
(config)> add firewall web-filter server end
(config firewall web-filter server 0)>
```

6. Set the DNS server's IP address:

```
(config firewall web-filter server 0)> ip ip_address
(config firewall web-filter server 0)>
```

7. [Optional] Repeat for additional DNS servers.

   For example, to configure manual web filtering using Cisco's open DNS servers:

   a. Enable web filtering:

   ```
   (config)> firewall web-filter enable true
   (config)>
   ```

   b. Set the web filter service type to manual:

   ```
   (config)> firewall web-filter service manual
   (config)>
   ```

   c. Add the first DNS server:

      i. Add the server:

      ```
      (config)> add firewall web-filter server end
      (config firewall web-filter server 0)>
      ```

      ii. Set the server's IP address:

      ```
      (config firewall web-filter server 0)> ip 208.67.222.220
      (config firewall web-filter server 0)>
      ```

   d. Add the second DNS server:

      i. Move back one node in the configuration tree:

      ```
      (config firewall web-filter server 0)> ..
      (config firewall web-filter server)>
      ```

      ii. Add the server:

      ```
      (config firewall web-filter server)> add end
      (config firewall web-filter server 1)>
      ```

TX64 User Guide 640

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5. Set the server's IP address:

```
(config firewall web-filter server 1)> ip 208.67.222.222
(config firewall web-filter server 0)>
```

6. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

7. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Verify your web filtering configuration

If your web filtering implementation has the service set to Cisco Umbrella, or if it is configured to use manual DNS servers and uses the Cisco open DNS servers, you can verify the web filtering implementation by using the Cisco test site www.internetbadguys.com.

To verify the implementation:

WebUI

This procedure assumes you have already configured web filtering to use either Cisco Umbrella or the Cisco open DNS servers.

- See Configure web filtering with Cisco Umbrella for information about configuring web filtering with Cisco Umbrella.
- See Configure web filtering with manual DNS servers for information about configuring web filtering to use Cisco open DNS servers.

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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Firewall Web filtering

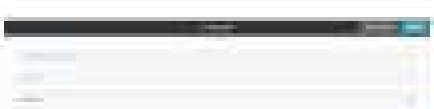


5. Disable web filtering:
   a. Click **Firewall** > **Web filtering service**.
   b. Click **Enable web filtering** to disable.

   c. Click **Apply** to save the configuration and apply the change.



4. From a new tab in your browser, attempt to connect to the Cisco test URL [redacted].
   The connection should be successful.
5. Return to the TX64 WebUI and enable web filtering:
   a. Click **Firewall** > **Web filtering service**.
   b. Click **Enable web filtering** to enable.
   c. Click **Apply** to save the configuration and apply the change.



6. From your browser, attempt to connect to [redacted] again.
   The connection attempt should fail with the message, "This site is blocked due to a phishing threat."

Command line

This procedure assumes you have already configured web filtering to use either Cisco Umbrella or the Cisco open DNS servers.

TX64 User Guide 642

- See Configure web filtering with Cisco Umbrella for information about configuring web filtering with Cisco Umbrella.
- See Configure web filtering with manual DNS servers for information about configuring web filtering to use Cisco open DNS servers.

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Disable web filtering:

```
> config firewall web-filter enable false
>
```

3. Attempt to connect to the Cisco test URL http://www.internetbadguys.com by using either a web browser or the curl command from a Linux shell:

```
$ curl -I http://www.internetbadguys.com
HTTP/1.1 200 OK
Server: Apache
Content-Type: text/html; charset=UTF-8
Accept-Ranges: bytes
Date: Fri, 29 May 2020 21:14:12
X-Varnish: 429613934492
Age: 0
Via: 1.1 varnish
Connection: keep-alive

$
```

You should receive an "HTTP/1.1 200 OK" message, as highlighted above.

4. Return to the Admin CLI and enable web filtering:

```
> config firewall web-filter enable true
>
```

5. Attempt to connect to http://www.internetbadguys.com again:

```
$ curl -I www.internetbadguys.com
HTTP/1.1 403 Forbidden
Server: openresty/1.9.7.3
Date: Fri, 29 May 2020 21:14:12
Content-Type: text/html
Connection: keep-alive

$
```

You should receive an "HTTP/1.1 403 Forbidden" message, as highlighted above.

Show web filter service information

To view information about the web filter service:

Command Line

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1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the Admin CLI prompt, use the show web filter command to view information about the web-filter service:

```
> show web-filter

Enabled     : true
Service     : umbrella
Device ID   : [redacted]

>
```

If the device is configured to use Cisco Umbrella for web filtering, a device ID is displayed. The device ID is a unique ID assigned to the device by Cisco Umbrella. If there is a problem with the device ID, you can clear the ID. See Clear the Cisco Umbrella device ID for instructions.

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System administration

This chapter contains the following topics:

Review device status 645
Configure system information 647
Update system firmware 649
Update cellular module firmware 651
Reboot your TX64 device 653
Reset the device to factory defaults 654
Configure power delays for power ignition sensor 656
Configure power button behavior 657
Configure automatic reboot behavior for temporary power drop 658
Configuration files 659
Schedule system maintenance tasks 670

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Review device status

You can review the system of your device from either the Status page of the Web Interface, or from the command line:

WebUI

To display system information:

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **Status**.
   A secondary menu appears, along with a status panel.
3. On the secondary menu, click to display the details panel for the status you want to view.

Command Line

To display system information, use the show system command.

- Show basic system information:
  1. Log into the TX64 command line as a user with Admin access.
     Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
  2. Enter **show system** at the prompt:

```
> show system

  Model                  : Digi TX64
  Serial Number          : TX64-000003
  SKU                    : TX64
  Hostname               : TX64
  MAC                    : 00:00:00:00:00:00

  Hardware Version       : 50001947-01 00
  Firmware Version       : 20.5.30.30
  Alt. Firmware Version  : 20.5.30.30
  Bootloader Version     : 00.7.33.0-15f03e0ed

  Current Time           : Fri, 29 May 2020 21:34:12 +0000
  CPU                    : 1.4%
  Uptime                 : 6 days, 6 hours, 21 minutes, 57 seconds
(548337s)
  Temperature            : 48C

>
```

- Show more detailed system information:

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1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Enter show system verbose at the prompt:

```
> show system verbose

  Model                       : Digi TX64
  Serial Number               : TX64-[illegible]
  SKU                         : TX64
  Hostname                    : TX64
  MAC                         : 0F:0D:E3:AE:21:18

  Hardware Version            : 50001947-01 IF
  Firmware Version            : 20.5.38.39
  Alt. Firmware Version       : 20.5.38.39
  Bootloader Version          : 20.7.23.0-15f93e6ed

  Schema Version              : 715
  Timezone                    : UTC
  Current Time                : Fri, 29 May 2020 21:14:12 +0000
  CPU                         : 1.4%
  Uptime                      : 6 days, 6 hours, 21 minutes, 57 seconds
(541317s)
  Temperature                 : 49C

  Disk
  ----
  Load Average                : 0.09, 0.10, 0.08
  RAM Usage                   : 127.84MB/1858.42MB(6%)
  Disk /etc/config Usage      : 38.42MB/4546.33MB(0%)
  Disk /opt Usage             : -4522.-4GB/549.38MB(-823%)
  Disk /overlay Usage         : MB/MB(%)
  Disk /tmp Usage             : 0.00MB/256.0MB(0%)
  Disk /var Usage             : 1.76MB/256.0MB(1%)

>
```

Configure system Information

You can configure information related to your TX64 device, such as providing a name and location for the device.

Configuration items

- A name for the device.
- The name of a contact for the device.
- The location of the device.
- A description of the device.
- A banner that will be displayed when users access terminal services on the device.

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To enter system information:

WebUI

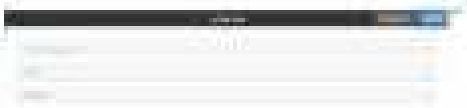
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **System**.
4. For **Name**, type a name for the device. This name will appear in log messages and at the command prompt.
5. For **Contact**, type the name of a contact for the device.
6. For **Location**, type the location of the device.
7. For **Banner**, type a banner message that will be displayed when users log into terminal services on the device.
8. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set a name for the device. This name will appear in log messages and at the command prompt.

```
(config)> system name 192.168.3.1
192.168.3.1(config)>
```

4. Set the contact for the device:

```
192.168.3.1(config)> system contact "Jane User"
192.168.3.1(config)>
```

5. Set the location for the device:

```
192.168.3.1(config)> system location "9350 Excelsior Blvd., Suite 700,
Hopkins, MN"
192.168.3.1(config)>
```

6. Set the banner for the device. This is displayed when users access terminal services on the device.

```
192.168.3.1(config)> system banner "Welcome to the Digi TX64."
192.168.3.1(config)>
```

7. Save the configuration and apply the changes:

```
192.168.3.1(config)> save
Configuration saved.
192.168.3.1>
```

8. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Update system firmware

The TX64 operating system firmware image consist of a single file with the following naming convention:

platform-version.bin

For example, TX64-20.5.35.39.bin.

Manage firmware updates using Digi Remote Manager

If you have a network of many devices, you can use Digi Remote Manager Profiles to manage firmware updates. Profiles ensure all your devices are running the correct firmware version and that all newly installed devices are updated to that same version. For more information, see the Profiles section of the Digi Remote Manager User Guide.

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Certificate management for firmware images

The system firmware files are signed to ensure that only Digi-approved firmware load onto the device. The TX64 device validates the system firmware image as part of the update process and only successfully updates if the system firmware image can be authenticated.

WebUI

Install firmware from the Digi firmware server

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **System**. Under **Administration**, click **Firmware Update**.



3. Click **Download from server**.



4. For **Version:**, select the appropriate version of the device firmware.
5. Click **Update Firmware**.

Update firmware from a local file

1. Download the TX64 operating system firmware from the Digi Support FTP site to your local machine.
2. Log into the TX64 WebUI as a user with Admin access.
3. On the main menu, click **System**. Under **Administration**, click **Firmware Update**.



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4. Click **Choose file**.
5. Browse to the location of the firmware on your local file system and select the file.
6. Click **Update firmware**.

Command line

1. Download the TX64 operating system firmware from the Digi Support FTP site to your local machine.
2. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
3. Load the firmware image onto the device:

```
> scp host hostname-or-ip user username remote remote-path local local-path
to local
```

   where:

   - *hostname-or-ip* is the hostname or ip address of the remote host.
   - *username* is the name of the user on the remote host.
   - *remote-path* is the path and filename of the file on the remote host that will be copied to the TX64 device.
   - *local-path* is the location on the TX64 device where the copied file will be placed.

   For example:

```
> scp host 192.168.4.1 user admin remote /home/admin/bin/TX64-
20.5.38.39.bin local /etc/config/ to local
admin@192.168.4.1's password: adminpwd
TX64->20.5.38.39.bin                          100%   32MB    11.1MB/s   00:03
>
```

4. Verify that the firmware file has been successfully uploaded to the device:

```
> ls /etc/config/
-rw-r--r--    1 root     root      37511229 May 16 20:10 TX64-
20.5.38.39.bin
-rw-r--r--    1 root     root          2588 May 16 16:44 accns.json
drw-------    2 root     root          4096 Apr 29 18:51 analyzer
-rw-r--r--    1 root     root            47 Apr 30 06:59 dhcp.leases
drwxr-xr-x    3 root     root          4096 May 15 17:53 ftcron
...
>
```

5. Update the firmware by entering the update firmware command, specifying the firmware file name:

```
> update firmware file TX64-20.5.38.39.bin
366336
```


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```
netflash: got "/etc/config/TX64-20.5.38.20.bin", length=37511229
netflash: authentication successful
netflash: programming FLASH device /dev/flash/image
300336 100%
Firmware update completed, reboot device
>
```

8. Reboot the device to run the new firmware image using the reboot command.

```
> reboot
Rebooting system
>
```

7. Once the device has rebooted, log into the TX64's command line as a user with Admin access and verify the running firmware version by entering the show system command.

```
> show system

  Hostname                : TX64
  FW Version              : 20.5.38.20
  MAC                     : 00408F000128
  Model                   : Digi TX64
  Current Time            : Fri, 29 May 2020 21:14:13 +0000
  Uptime                  : 42 seconds (42s)

>
```

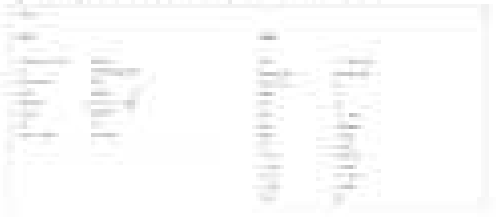
Update cellular module firmware

You can update modem firmware by downloading firmware from the Digi firmware repository, or by uploading firmware from your local storage onto the device.

WebUI

This operation is available from the WebUI only. There is no equivalent functionality at the CLI.

1. (Optional) Download the appropriate modem firmware from the Digi repository to your local machine.
2. Log into the TX64 WebUI as a user with Admin access.
3. From the main menu, click **Status > Modems**.
4. Click the modem firmware version.



The **Modem firmware update** window opens.

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5. To update using firmware from the Digi firmware repository:
   a. Click to view available versions.
   b. For Available firmware, select the firmware.
6. To update using firmware from your local filesystem:
   a. Click **Choose File**.
   b. Select the firmware.
7. Click **Update**.

Reboot your TX64 device

You can reboot the TX64 device immediately or schedule a reboot for a specific time every day.

Note You may want to save your configuration settings to a file before rebooting. See Save configuration to a file.

Reboot your device immediately

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. From the main menu, click **System**.
3. Click **Reboot**.



4. Click **Reboot** to confirm that you want to reboot the device.

Command Line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the prompt, type:

```
> reboot
```

Schedule reboots of your device

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Select **System > Scheduled tasks**.
4. For **Reboot time**, enter the time of the day that the device should reboot, using the format HH:MM. The device will reboot at this time every day.

   If a value is set for **Reboot time** but the device is unable to synchronize its time with an NTP server, the device will reboot after it has been up for 24 hours. See System time for information about configuring NTP servers.
5. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Set the reboot time:

```
(config)> system schedule reboot_time time
(config)>
```

where time is the time of the day that the device should reboot, using the format HH:MM. For example, the set the device to reboot at two in the morning every day:

```
(config)> system schedule reboot_time 02:00
(config)>
```

If a value is set for reboot_time but the device is unable to synchronize its time with an NTP server, the device will reboot after it has been up for 24 hours. See System time for information about configuring NTP servers.

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Reset the device to factory defaults

Resetting the device to factory defaults performs the following actions:

- Clears all configuration settings. When the device restarts, it uses the default configuration.
- Deletes all user files including Python scripts.
- Erases all automatically generated keys.
- Clears event and system log files.

You can reset the device in the WebUI, at the command line, or by using the Reset button on the device. You can also reset the device to the default configuration without removing scripts, keys, and logfiles by using the revert command.

WebUI

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1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **System**. Under **Configuration**, click **Configuration Maintenance**.



The **Configuration Maintenance** window is displayed.



3. In the **Erase configuration** section, click **ERASE**.



4. Click **CONFIRM**.
5. After resetting the device:
   a. Connect to the TX64 by using the serial port or by using an Ethernet cable to connect the TX64 LAN1 port to your PC.
   b. Log into the TX64:
      User name: Use the default user name: **admin**.
      Password: Use the unique password printed on the bottom label of the device (or the printed label included in the package).
   c. Reset the default password for the admin account. See Reset default password for the default admin user for further information.

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. Enter the following:

```
> system factory-erase
```


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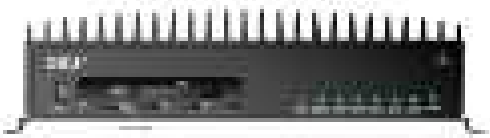
3. After resetting the device:
   a. Connect to the TX64 by using the serial port or by using an Ethernet cable to connect the TX64 LAN1 port to your PC.
   b. Log into the TX64:

      User name: Use the default user name: **admin**.

      Password: Use the unique password printed on the bottom label of the device (or the printed label included in the package).
   c. Reset the default password for the admin account. See Reset default password for the default admin user for further information.

Reset the device by using the RESET button

1. Locate the **RESET** button on your device.



2. Press and hold the **RESET** button perform a device reset. The **RESET** button has two modes:
   - **Configuration reset:**
     - Press and release the **RESET** button.
     - Press and hold the **RESET** button for 5 seconds.
     - The device reboots automatically and resets to factory defaults. This does not remove any automatically generated certificates and keys.
   - **Full device reset:**
     - After the device reboots from the first button press, immediately press and hold the **RESET** button for 5 seconds again.
     - The device reboots again and resets to factory defaults, as well as also removing generated certificates and keys.
3. After resetting the device:
   a. Connect to the TX64 by using the serial port or by using an Ethernet cable to connect the TX64 LAN1 port to your PC.
   b. Log into the TX64:

      User name: Use the default user name: **admin**.

      Password: Use the unique password printed on the bottom label of the device (or the printed label included in the package).
   c. Reset the default password for the admin account. See Reset default password for the default admin user for further information.

Reset the device with the revert command

You can reset the device to the default configuration without removing scripts, keys, and logfiles by using the revert command:

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1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, enter **revert**:

```
(config)> revert
(config)>
```

4. Set the password for the admin user prior to saving the changes:

```
(config)> auth user admin password pwd
(config)>
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configure power delays for power ignition sensor

By default, the TX64 device automatically powers on when it detects power on the ignition sensor, and powers off when it detects that there is no power on the ignition sensor, and there is no delay for either power on or power off based on the power ignition sensor.

You can configure delays for powering on or off the system based on the state of the ignition sensor.

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WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **System > Power > Ignition sense control**.
4. For **Ignition power on delay**, type the amount of time to wait to power on the device, after the device detects that there is power on the ignition sensor.
   Allowed values are any number of hours, minutes, or seconds, and take the format *number*[h|m|s].
   For example, to set ignition power on delay to ten minutes, enter 10m or 600s.
   The default is 0s, meaning that there is no power on delay.
5. For **Ignition power off delay**, type the amount of time to wait to power off the device, after the device detects that there is no longer power on the ignition sensor.
   Allowed values are any number of hours, minutes, or seconds, and take the format *number*[h|m|s].
   For example, to set ignition power off delay to ten minutes, enter 10m or 600s.
   The default is 0s, meaning that there is no power off delay.
6. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. To set the ignition power on delay:

```
(config)> system power ignition on_delay value
```

where value is any number of hours, minutes, or seconds, and takes the format number[h|m|s].

For example, to set the ignition power on delay to ten minutes, enter either 10m or 600s:

```
(config)> system power ignition on_delay 600s
(config)>
```

The default is 0s, meaning that there is no power on delay.

4. To set the ignition power off delay:

```
(config)> system power ignition off_delay value
```

where value is any number of hours, minutes, or seconds, and takes the format number[h|m|s].

For example, to set the ignition power off delay to ten minutes, enter either 10m or 600s:

```
(config)> system power ignition off_delay 600s
(config)>
```

The default is 0s, meaning that there is no power off delay.

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure power button behavior

The TX64 device's front panel includes a Power button.

- If the device is off, pressing the Power button will turn on the device.
- If the device is on, the Power button includes two options to power down the device: short-press and long-press options. By default, both short-press and long-press Power button actions will shut down the device.

You can disable the short-press power down behavior, to prevent powering down the device when the Power button is accidentally pressed. You can also disable the power button entirely, so that both the short- and long-press power down behavior is disabled and the device cannot be powered down by using the Power button.

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System administration Configure power button behavior

TX64 User Guide 661

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Web UI

1. Log into the TX64 Web UI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **System > Power**.
4. For **Power button control**, select one of the following options:
   - **Normal operation**—The default behavior, in which both short-press and long-press Power button actions shut down the device.
   - **Graceful shutdown disabled**—Disables the short-press behavior of the Power button. A long-press action will still shut down the device.
   - **Disabled**—Disables the Power button entirely, so that neither the short- or long-press actions will shut down the device.
5. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an **Access selection** menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```


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3. At the config prompt, type:

```
(config)> system power button value
```

where value is one of:

- **normal**—The default behavior, in which both short-press and long-press Power button actions shut down the device.
- **forced_poby**—Disables the short-press behavior of the Power button. A long-press action will still shut down the device.
- **disabled**—Disables the Power button entirely, so that neither the short- or long-press actions will shut down the device.

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type **exit** to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Configure automatic reboot behavior for temporary power drop

By default, the TX64 device will automatically reboot if the ignition sense line is high and the device experiences a temporary power drop.

To disable the automatic reboot behavior:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.

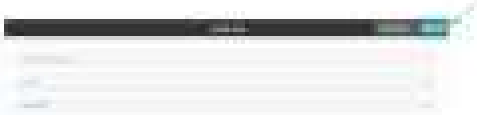


The **Configuration** window is displayed.

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5. Click **System** > **Power**.
4. Click **Auto reboot** to disable.
3. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, type:

```
(config)> system power auto_reboot false
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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Configuration files

The TX64 configuration file, /etc/config/access.json, contains all configuration changes that have been made to the device. It does not contain the complete device configuration; it only contains changes to the default configuration. Both the default configuration and the changes contained in the access.json file are applied when the device reboots.

Save configuration changes

When you make changes to the TX64 configuration, the changes are not automatically saved. You must explicitly save configuration changes, which also applies the changes. If you do not save configuration changes, the system discards the changes.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Make any necessary configuration changes.
4. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

1. At the command line, type **config** to enter configuration mode:

```
-> config
(config)->
```

2. Make any necessary configuration changes.
3. Save the configuration and apply the change:

```
(config)-> save
Configuration saved.
->
```

4. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

Save configuration to a file

You can save your TX64 device's configuration to a file and use this file to restore the configuration, either to the same device or to similar devices.

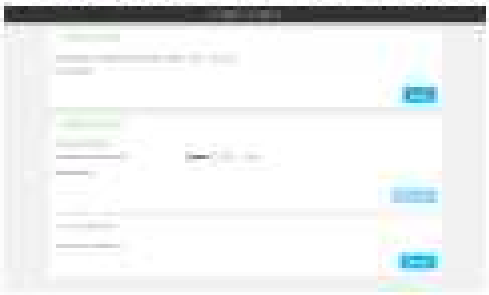
WebUI

This procedure creates a binary archive file containing the device's configuration, certificates and keys, and other information.

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **System**. Under **Configuration**, click **Configuration Maintenance**.



The **Configuration Maintenance** window is displayed.



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3. In the **Configuration backup** section:
   a. [Optional] To encrypt the configuration using a passphrase, for **Passphrase [save/restore]**, enter the passphrase.
   b. Click **SAVE**.

The file will be downloaded using your browser's standard download process.

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. Enter the following:

```
> system backup path [passphrase passphrase] type type
```

   where:

   - *path* is the location on the TX64's filesystem where the configuration backup file should be saved.
   - *passphrase* [optional] is a passphrase used to encrypt the configuration backup.
   - *type* is the type of backup, either:
     - **archive**: Creates a binary archive file containing the device's configuration, certificates and keys, and other information.
     - **cli-config**: Creates a text file containing only the configuration changes.

   For example:

```
> system backup /etc/config/ type archive
```

3. [Optional] Use **scp** to copy the file from your device to another host:

```
> scp host hostname-or-ip user username remote remote-path local local-path
to remote
```

   where:

   - *hostname-or-ip* is the hostname or ip address of the remote host.
   - *username* is the name of the user on the remote host.
   - *remote-path* is the location on the remote host where the file will be copied.
   - *local-path* is the path and filename on the TX64 device.

   For example:

```
> scp host 192.168.4.1 user admin remote /home/admin/bin/ local
/etc/config/backup-archive-0040FF099136-19.05.17-19.01.17.bin to remote
```

Restore the device configuration

You can restore a configuration file to your TX64 device by using a backup from the device, or a backup from a similar device.

WebUI

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1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **System**. Under **Configuration**, click **Configuration Maintenance**.



The **Configuration Maintenance** window is displayed.



3. In the **Configuration Restore** section:
   a. If a passphrase was used to create the configuration backup, for **Passphrase [save/restore]**, enter the passphrase.
   b. Under **Configuration Restore**, click **Choose File**.
   c. Browse to the system firmware file location on your local computer and select the file.
   d. Click **RESTORE**.
4. Click **CONFIRM**.

   The configuration will be restored and the device will be rebooted.

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. If the configuration backup is on a remote host, use **scp** to copy the file from the host to your device:

```
> scp host hostname-or-ip user username remote remote-path local local-path
to local
```

   where:
   - *hostname-or-ip* is the hostname or ip address of the remote host.
   - *username* is the name of the user on the remote host.
   - *remote-path* is the path and filename of the file on the remote host that will be copied to the TX64 device.
   - *local-path* is the location on the TX64 device where the copied file will be placed.

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For example:

```
> scp host 192.168.4.1 user admin remote /home/admin/bin/backup-archive-
00401B0B0D26-19.05.17-09.01.17.bin local /etc/config/ to local
```

5. Enter the following:

```
> system restore path [passphrase passphrase]
```

where:

- path is the location of configuration backup file on the TX64's filesystem (local-path in the previous step).
- passphrase [optional] is the passphrase to restore the configuration backup file passphrase was used when the backup was created.

For example:

```
> system restore /etc/config/
```


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Schedule system maintenance tasks

You can configure tasks and custom scripts to be run during a specified maintenance window.

Required configuration items

- The time that the system maintenance tasks will start.
- The duration window during which the system maintenance tasks can run.
- The frequency (either daily or weekly) that the tasks will run.
- The tasks to be performed. Options are:
  - Modem firmware update.
  - Configuration check.

Additional configuration items

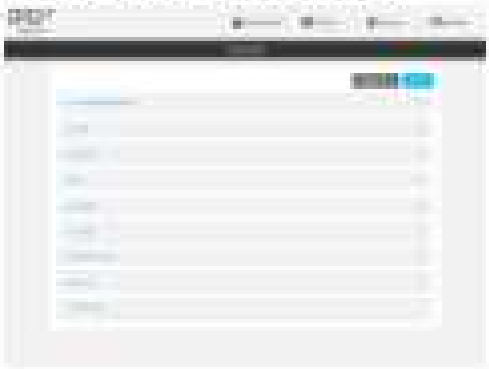
- Custom scripts that should be run as part of the configuration check.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **System** > **Scheduled tasks** > **System maintenance**.
4. For **Start time**, type the time of day that the maintenance window should start, using the syntax HH:MM. If **Start time** is not set, maintenance tasks are not scheduled and will not be run.

   The behavior of **Start time** varies depending on the setting of **Duration window**, which is configured in the next step.

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TESSOL Technical Library TS-TL-DGI-091

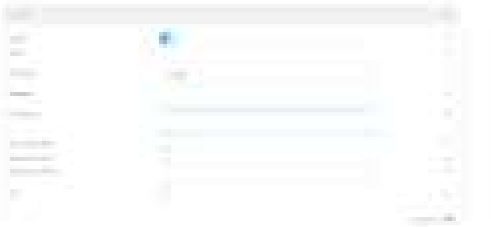
- If **Duration window** is set to **Immediately**, all scheduled tasks will begin at the exact time specified in **Start time**.
- If **Duration window** is set to **24 hours**, **Start time** is effectively obsolete and the maintenance tasks will be scheduled to run at any time. Setting **Duration window** to **24 hours** can potentially overstress the device and should be used with caution.
- If **Duration window** is set to any value other than to **Immediately** or **24 hours**, the maintenance tasks will run at a random time during the time allotted for the duration window.
- If **Duration window** is set to one or more hours, the minutes field in **Start time** is ignored and the duration window will begin at the beginning of the specified hour.

5. For **Duration window**, select the amount of time that the maintenance tasks will be run. If **Immediately** is selected, all scheduled tasks will begin at the exact time specified in **Start time**.
6. For **Frequency**, select either **Daily** or **Weekly** for the frequency that the maintenance tasks should be run.
7. [Optional] Click to enable **Modem firmware update** to instruct the system to look for any updated modem firmware during the maintenance window. If updated firmware is found, it will then be installed. **Modem firmware update** looks for updated firmware both on the local device and over the network, using either a WAN or cellular connection.
8. [Optional] Click to enable **Configuration check** to allow for the configuration to be updated, including by custom scripts, during the maintenance window.
9. [Optional] To schedule custom scripts:
   a. Click **Custom scripts**.

   > Note This feature does not provide syntax or error checking. Certain commands can render the device inoperable. Use with care. Scripts created here are also automatically entered in **Configuration > Applications**.

   b. For **Add Script**, click **+**.

The schedule script configuration window is displayed.



Scheduled scripts are enabled by default. To disable, click **Enable** to toggle off.

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c. (Optional) For Label, provide a label for the script.

d. For Run mode, select the mode that will be used to run the script. Available options are:

- On boot: The script will run once each time the device boots.
  - If On boot is selected, select the action that will be taken when the script completes in Exit action. Available options are:
    - None: Action taken when the script exits.
    - Restart script: Runs the script repeatedly.
    - Reboot: The device will reboot when the script completes.
- Interval: The script will start running at the specified interval, within 30 seconds after the configuration change is saved.
  - If Interval is selected, in Interval, type the interval.

    Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

    For example, to set Interval to ten minutes, enter 10m or 600s.
  - Click to enable Run single to run only a single instance of the script at a time.

    If Run single is not selected, a new instance of the script will be started at every interval, regardless of whether the script is still running from a previous interval.
- Set time: Runs the script at a specified time of the day.
  - If Set Time is selected, specify the time that the script should run in Run time, using the format *HH:MM*.
- During system maintenance: The script will run during the system maintenance time window.

e. For Commands, enter the commands that will execute the script.

If the script begins with #!, then the script will be invoked in the location specified by the path for the script command. Otherwise, the default shell will be used (equivalent to #!/bin/sh).

f. Script logging options:

i. Click to enable Log script output to log the script's output to the system log.

ii. Click to enable Log script errors to log script errors to the system log.

If neither option is selected, only the script's exit code is written to the system log.

g. For Maximum memory, enter the maximum amount of memory available to be used by the script and its subprocesses, using the format *number*[b|bytes|KB|k|MB|M|GB|G|TB|T].

h. Click to enable Once to configure the script to run only once at the specified time.

If Once is enabled, rebooting the device will cause the script to not run again. The only way to re-run the script is to:

- Remove the script from the device and add it again.
- Make a change to the script.
- Uncheck Once.

i. Sandbox is enabled by default. This option protects the script from accidentally destroying the system it is running on.

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10. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Schedule system maintenance:
   a. Configure the time of day that the maintenance window should start, using the syntax **HH:MM**. If the start time is not set, maintenance tasks are not scheduled and will not be run.

```
(config)> system schedule maintenance from HH:MM
(config)>
```

   The behavior of the start time varies depending on the setting of the duration length, which is configured in the next step.

   - If the duration length is set to 0, all scheduled tasks will begin at the exact time specified in the start time.
   - If the duration length is set to 24 hours, the start time is effectively obsolete and the maintenance tasks will be scheduled to run at any time. Setting the duration length to 24 hours can potentially overstress the device and should be used with caution.
   - If the duration length is set to any value other than to 0 or 24 hours, the maintenance tasks will run at a random time during the time allotted for the duration window.
   - If the duration length is set to one or more hours, the minutes field in the start time is ignored and the duration window will begin at the beginning of the specified hour.

   b. Configure the duration length (the amount of time that the maintenance tasks will be run). If 0 is used, all scheduled tasks will begin at the start time, defined in the previous step.

```
system schedule maintenance length num
(config)>
```

   where num is any whole number between 0 and 24.

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c. Configure the frequency that the maintenance tasks should be run:

```
system schedule maintenance frequency value
(config)>
```

where value is either daily or weekly. Daily is the default.

d. Configure the device to look for any updated modem firmware during the maintenance window. If updated firmware is found, it will then be installed. The device will look for updated firmware both on the local device and over the network, using either a WAN or cellular connection.

```
system schedule maintenance modem_fw_update value
(config)>
```

where value is either true or false. yes or no, and 1 or 0 are also allowed.

e. Allow for the configuration to be updated, including by custom scripts, during the maintenance window:

```
system schedule maintenance config_check value
(config)>
```

where value is either true or false. yes or no, and 1 or 0 are also allowed.

4. [Optional] Schedule custom scripts:

a. Add a script:

```
(config)> add system schedule script end
(config system schedule script 0)>
```

Scheduled scripts are enabled by default. To disable:

```
(config system schedule script 0)> enable false
(config system schedule script 0)>
```

b. [Optional] Provide a label for the script.

```
(config system schedule script 0)> label value
(config system schedule script 0)>
```

where value is any string. If spaces are used, enclose value within double quotes.

c. Set the mode that will be used to run the script:

```
(config system schedule script 0)> when mode
(config system schedule script 0)>
```

where mode is one of the following:

- boot: The script will run once each time the device boots.
  - If boot is selected, set the action that will be taken when the script completes:

```
(config system schedule script 0)> exit_action action
(config system schedule script 0)>
```

where action is one of the following:

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- name: Action taken when the script exits.
- restart: Runs the script repeatedly.
- reboot: The device will reboot when the script completes.

- Interval: The script will start running at the specified interval, within 30 seconds after the configuration change is saved. If Interval is selected:
  - Set the interval:

```
(config system schedule script 4)> on_interval value
(config system schedule script 4)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set on_interval to ten minutes, enter either 10m or 600s:

```
(config system schedule script 4)> on_interval 600s
(config system schedule script 4)>
```

  - [Optional] Configure the script to run only a single instance at a time:

```
(config system schedule script 4)> once true
(config system schedule script 4)>
```

If once is set to false, a new instance of the script will be started at every interval, regardless of whether the script is still running from a previous interval.

- set_time: Runs the script at a specified time of the day.
  - If set_time is set, set the time that the script should run, using the format HH:MM:

```
(config system schedule script 4)> run_time HH:MM
(config system schedule script 4)>
```

- maintenance_time: The script will run during the system maintenance time window.

d. Set the commands that will execute the script:

```
(config system schedule script 4)> commands filename
(config system schedule script 4)>
```

where filename is the path and filename of the script, and any related command line information.

If the script begins with #!, then the script will be invoked in the location specified by the path for the script command. Otherwise, the default shell will be used (equivalent to #!/bin/sh).

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e. Script logging options:

- To log the script's output to the system log:

```
(config system schedule script 0)> syslog_stdout true
(config system schedule script 0)>
```

- To log script errors to the system log:

```
(config system schedule script 0)> syslog_stderr true
(config system schedule script 0)>
```

If syslog_stdout and syslog_stderr are not enabled, only the script's exit code is written to the system log.

f. Set the maximum amount of memory available to be used by the script and its subprocesses:

```
(config system schedule script 0)> max_memory value
(config system schedule script 0)>
```

Where value uses the syntax: number[b|bytes|KB|k|MB|M|MiB|GB|G|TB|T].

g. To run the script only once at the specified time:

```
(config system schedule script 0)> once true
(config system schedule script 0)>
```

If once is enabled, rebooting the device will cause the script to run again. The only way to re-run the script is to:

- Remove the script from the device and add it again.
- Make a change to the script.
- Disable once.

h. Sandbox is enabled by default. This option protects the script from accidentally destroying the system it is running on.

```
(config system schedule script 0)> sandbox true
(config system schedule script 0)>
```

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Monitoring

This chapter contains the following topics:

IntelliFlow 678
Configure NetFlow Probe 685
Enable the Bluetooth scanner 690
Enable the Wi-Fi scanner 697

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IntelliFlow

IntelliFlow monitors system information, network data usage, and traffic information, and displays the information in a series of charts available in the local WebUI. To use IntelliFlow, the TX64 must be powered on and you must have access to the local WebUI. Once you enable IntelliFlow, the Status > IntelliFlow option is available in the main menu. By default, IntelliFlow is disabled.

IntelliFlow provides charts on the following information:

- System utilization
- Top data usage by host
- Top data usage by server
- Top data usage by service
- Host data usage over time

IntelliFlow charts are dynamic; at any point, you can click inside the chart to drill down to view more granular information, and menu options allow you to change various aspects of the information being displayed.

Note When IntelliFlow is enabled, it adds an estimated 50MB of data usage for the device by reporting the metrics to Digi Remote Manager.

Enable IntelliFlow

Required configuration items

- Enable IntelliFlow.

Additional configuration items

- The firewall zone for internal clients being monitored by IntelliFlow.

To enable IntelliFlow:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



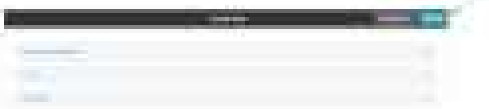
The **Configuration** window is displayed.

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5. Click **Monitoring > IntelliFlow**.
   The IntelliFlow configuration window is displayed.

4. Click **Enable IntelliFlow**.
5. For **Zone**, select the firewall zone. Internal clients that are being monitored by IntelliFlow should be present on the specified zone.
6. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable IntelliFlow:

```
(config)> monitoring intelliflow enable true
```

4. Set the firewall zone. Internal clients that are being monitored by IntelliFlow should be present on the specified zone:

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a. Determine available zones:

```
(config)> monitoring intelliflow zone ?

Zone: The firewall zone which is assigned to the network interface(s)
that
intelliFlow will see as internal clients.  intelliFlow relies on an
internal to
external relationship, where the internal clients are present on the
zone specified.
Format:
  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup
Default value: internal
Current value: internal

(config)>
```

b. Set the zone to be used by IntelliFlow:

```
(config)> monitoring intelliflow zone my_zone
```

3. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

4. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Use intelliFlow to display average CPU and RAM usage

This procedure is only available from the WebUI.

To display display average CPU and RAM usage:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. If you have not already done so, enable IntelliFlow. See Enable IntelliFlow.
3. From the menu, click **Status** > **IntelliFlow**.

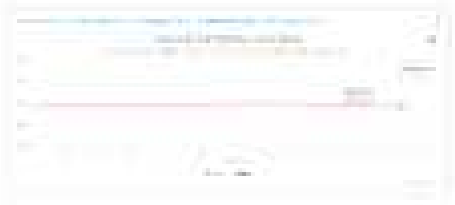
The System Utilization chart is displayed:



- Display more granular information:
  1. Click and drag over an area in the chart to zoom into that area and provide more granular information.



  2. Release to display the selected portion of the chart:



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5. Click **Reset zoom** to return to the original display.

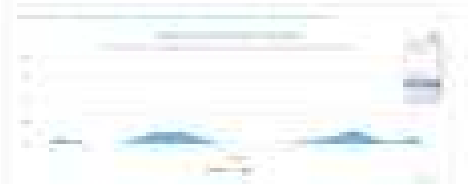


- Change the time period displayed by the chart.

  By default, the *System utilization* chart displays the average CPU and RAM usage over the last minute. You can change this to display the average CPU and RAM usage:

  - Over the last hour.
  - Over the last day.
  - Over the last 30 days.
  - Over the last 180 days.

  1. Click the menu icon (☰).
  2. Select the time period to be displayed.



- Save or print the chart.

  1. Click the menu icon (☰).
  2. To save the chart to your local filesystem, select **Export to PNG**.
  3. To print the chart, select **Print chart**.

Use IntelliFlow to display top data usage information

With IntelliFlow, you can display top data usage information based on the following:

- Top data usage by host
- Top data usage by server
- Top data usage by service

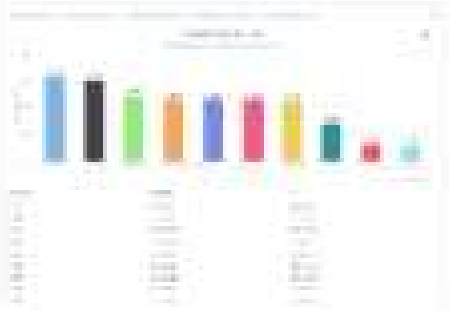
To generate a top data usage chart:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. If you have not already done so, enable IntelliFlow. See Enable IntelliFlow.
3. From the menu, click **Status** > **IntelliFlow**.

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4. Display a data usage chart:
   - To display the **Top Data Usage by Host** chart, click **Top Data Usage by Host**.



   - To display the **Top Data Usage by Server** chart, click **Top Data Usage by Server**.



   - To display the **Top Data Usage by Service** chart, click **Top Data Usage by Service**.



5. Change the type of chart that is used to display the data:
   a. Click the menu icon (≡).
   b. Select the type of chart.

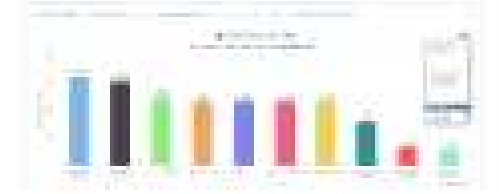


6. Change the number of top users displayed.

   You can display the top five, top ten, or top twenty data users.

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a. Click the menu icon (☰).
b. Select the number of top users to displayed.



7. Save or print the chart.
   a. Click the menu icon (☰).
   b. To save the chart to your local filesystem, select Export to PNG.
   c. To print the chart, select Print chart.

Use intelliFlow to display data usage by host over time

To generate a chart displaying a host's data usage over time:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. If you have not already done so, enable IntelliFlow. See Enable IntelliFlow.
3. From the menu, click **Status > IntelliFlow**.
4. Click **Host Data Usage Over Time**.



a. Display more granular information:
   a. Click and drag over an area in the chart to zoom into that area and provide more granular information.

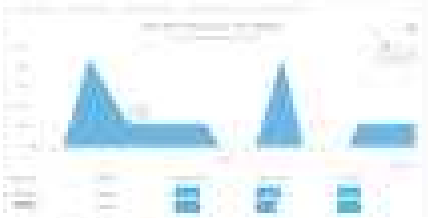


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b. Release to display the selected portion of the chart:



c. Click **Reset zoom** to return to the original display:



- Save or print the chart.
  a. Click the menu icon.
  b. To save the chart to your local filesystem, select **Export to PNG**.
  c. To print the chart, select **Print chart**.

Configure NetFlow Probe

NetFlow probe is used to probe network traffic on the TX64 device and export statistics to NetFlow collectors.

Required configuration items

- Enable NetFlow.
- The IP address of a NetFlow collector.

Additional configuration items

- The NetFlow version.
- Enable flow sampling and select the flow sampling technique.
- The number of flows from which the flow sampler can sample.
- The number of seconds that a flow is inactive before it is exported to the NetFlow collectors.
- The number of seconds that a flow is active before it is exported to the NetFlow collectors.
- The maximum number of simultaneous flows.
- A label for the NetFlow collector.
- The port of the NetFlow collector.
- Additional NetFlow collectors.

To probe network traffic and export statistics to NetFlow collectors:

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WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Monitoring** > **Netflow probe**.



4. **Enable** Netflow probe.
5. **Protocol version**: Select the Protocol version. Available options are:
   - **NetFlow v5**—Supports IPv4 only.
   - **NetFlow v9**—Supports IPv4 and IPv6.
   - **NetFlow v10 (IPFIX)**—Supports both IPv4 and IPv6 and includes IP Flow Information Export (IPFIX).

   The default is **NetFlow v10 (IPFIX)**.
6. **Enable Flow sampler** by selecting a sampling technique. Flow sampling can reduce flow processing and transmission overhead by providing a representative subset of all flows. Available options are:
   - **None**—No flow sampling method is used. Each flow is accounted.
   - **Deterministic**—Selects every nth flow, where n is the value of **Flow sampler population**.

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- **Random**—Randomly selects one out of every *n* flows, where *n* is the value of **Flow sampler population**.
- **Hash**—Randomly selects one out of every *n* flows using the hash of the flow key, where *n* is the value of **Flow sampler population**.

7. For **Flow sampler population**, if you selected a flow sampler, enter the number of flows for the sampler. Allowed value is any number between 2 and 65535. The default is 100.
8. For **Inactive timeout**, type the the number of seconds that a flow can be inactive before sent to a collector. Allowed value is any number between 5 and 15. The default is 15.
9. For **Active timeout**, type the number of seconds that a flow can be active before sent to a collector. Allowed value is any number between 5 and 3600. The default is 3600.
10. For **Maximum flows**, type the maximum number of flows to probe simultaneously. Allowed value is any number between 8 and 2000000. The default is 2000000.
11. Add collectors:
    a. Click to expand **Collectors**.
    b. For **Add Collector**, click **+**.
    c. [Optional] Type a **Label** for the collector.
    d. For **Address**, type the IP address of the collector.
    e. [Optional] For **Port**, enter the port number used by the collector. The default is 2055.

    Repeat to add additional collectors.
12. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Enable NetFlow:

```
(config)> monitoring netflow enable true
(config)>
```

4. Set the protocol version:

```
(config)> monitoring netflow protocol version
                                                (config)>
```


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where version is one of:

- v5—NetFlow v5 supports IPv4 only.
- v9—NetFlow v9 supports IPv4 and IPv6.
- v10—NetFlow v10 (IPFIX) supports both IPv4 and IPv6 and includes IP flow information Export (IPFIX).

The default is v10.

4. Enable flow sampling by selecting a sampling technique. Flow sampling can reduce flow processing and transmission overhead by probing a representative subset of all flows.

```
(config)> monitoring netflow sampler type
(config)>
```

where type is one of:

- none—No flow sampling method is used. Each flow is accounted.
- deterministic—Selects every nth flow, where n is the value of the flow sample population.
- random—Randomly selects one out of every n flows, where n is the value of the flow sample population.
- hash—Randomly selects one out of every n flows using the hash of the flow key, where n is the value of the flow sample population.

5. If you are using a flow sampler, set the number of flows for the sampler:

```
(config)> monitoring netflow sampler_population value
(config)>
```

where value is any number between 2 and 16383. The default is 100.

6. Set the number of seconds that a flow can be inactive before sent to a collector:

```
(config)> monitoring netflow inactive_timeout value
(config)>
```

where value is any is any number between 5 and 15. The default is 15.

7. Set the number of seconds that a flow can be active before sent to a collector:

```
(config)> monitoring netflow active_timeout value
(config)>
```

where value is any is any number between 5 and 3600. The default is 1800.

8. Set the maximum number of flows to probe simultaneously:

```
(config)> monitoring netflow max_flows value
(config)>
```

where value is any is any number between 0 and 2000000. The default is 2000000.

a. Add collectors:

a. Add a collector:

```
(config)> add monitoring netflow collector end
(config monitoring netflow collector 0)>
```

b. Set the IP address of the collector:

```
(config monitoring netflow collector 0)> address ip_address
(config monitoring netflow collector 0)>
```

c. [Optional] Set the port used by the collector:

```
(config monitoring netflow collector 0)> port port
(config monitoring netflow collector 0)>
```

d. [Optional] Set a label for the collector:

```
(config monitoring netflow collector 0)> label "This is a collector."
(config monitoring netflow collector 0)>
```

Repeat to add additional collectors.

10. Save the configuration and apply the change:

```
(config monitoring netflow collector 0)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Enable the Bluetooth scanner

The Bluetooth scanner allows you to configure your TX64 device to detect BLE-enabled devices that are nearby, and can be configured to open an SSH port that remote hosts can access to read basic information about those devices.

For users to view the output of the Bluetooth scanner, they must be a member of an authentication group that has Bluetooth scanner access enabled. See Add an authentication group for authentication group configuration information.

Required configuration

- Enable the Bluetooth scanner.

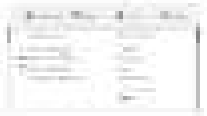
Additional configuration

- The amount of time that the record of a device connection is kept before the device is considered out of range, and the record is expired from the database.
- A remote host to view the output of the service.
- The SSH port used by the Bluetooth scanner to stream output to a remote host.
- The access control list for the SSH port used by the Bluetooth scanner to stream output to a remote host.

  When the Bluetooth scanner is enabled, the TX64 device will automatically configure its firewall rules to allow incoming connections on the configured listening port. You can restrict access by configuring the access control list for the Bluetooth scanner's listening port.
- Multicast DNS (mDNS) support.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **Monitoring** > **Bluetooth scanner**.

4. Click **Enable**.
5. (Optional) For **Update interval**, type the amount of time that the record of a device connection is kept before the device is considered out of range, and the record is expired from the database.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format number[w|d|h|m|s].

   For example, to set Update interval to ten minutes, enter 10m or 600s.

   The minimum value is 5 seconds, and the default is 15 seconds.
6. Configure the device to open an SSH port that remote hosts can access:
   a. Click to expand **SSH stream service**.

   b. Click **Enable**.
   c. (Optional) For **Port**, type the port that the Bluetooth scanner will use. The default is 3992.
   d. Click **Access control list** to configure access control:
      a. To limit access to specified IPv4 addresses and networks:
         i. Click **IPv4 Addresses**.
         ii. For **Add Address**, click **+**.

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iii. For **Address**, enter the IPv4 address or network that can access the device's SSH service. Allowed values are:
- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- **any**: No limit to IPv4 addresses that can access the SSH service.

iv. Click ✚ again to list additional IP addresses or networks.

- To limit access to specified IPv6 addresses and networks:
  i. Click **IPv6 Addresses**.
  ii. For **Add Address**, click ✚.
  iii. For **Address**, enter the IPv6 address or network that can access the device's SSH service. Allowed values are:
  - A single IP address or host name.
  - A network designation in CIDR notation, for example, 2001:db8::/48.
  - **any**: No limit to IPv6 addresses that can access the SSH service.

  iv. Click ✚ again to list additional IP addresses or networks.
- To limit access to hosts connected through a specified interface on the TX64 device:
  i. Click **Interfaces**.
  ii. For **Add Interface**, click ✚.
  iii. For **Interface**, select the appropriate interface from the dropdown.
  iv. Click ✚ again to allow access through additional interfaces.
- To limit access based on firewall zones:
  i. Click **Zones**.
  ii. For **Add Zone**, click ✚.
  iii. For **Zone**, select the appropriate firewall zone from the dropdown.
  See Firewall configuration for information about firewall zones.
  iv. Click ✚ again to allow access through additional firewall zones.

7. Multicast DNS (mDNS) is disabled by default. mDNS is a protocol that resolves host names in small networks that do not have a DNS server. To enable mDNS, click **Enable mDNS**.
8. Confirm that users who will use the Bluetooth scanner server are members of an authentication group that has Bluetooth scanner access enabled. See Add an authentication group for authentication group configuration information.
9. Click **Apply** to save the configuration and apply the changes.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

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Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

1. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

2. Enable the Bluetooth scanner:

```
(config)> monitoring bluetooth_scanner enable true
(config)>
```

3. [Optional] Set the number of seconds between scans:

```
(config)> monitoring bluetooth_scanner update_interval value
(config)>
```

Where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set update_interval to ten minutes, enter either 10m or 600s:

```
(config)> monitoring bluetooth_scanner update_interval 600s
(config)>
```

The minimum value is 5 seconds, and the default is 15 seconds.

4. Enable the device to open an SSH port that remote hosts can access:

```
(config)> monitoring bluetooth_scanner ssh enable true
(config)>
```

5. [Optional] Set the number of the port that the Bluetooth scanner will use. The default is 3582.

```
(config)> monitoring bluetooth_scanner ssh port port
(config)>
```

6. Configure access control:
   - To limit access to specified IPv4 addresses and networks:

```
(config)> add monitoring bluetooth_scanner ssh acl address end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the SSH service.

Repeat this step to list additional IP addresses or networks.

   - To limit access to specified IPv6 addresses and networks:

```
(config)> add monitoring bluetooth_scanner ssh acl address6 end value
(config)>
```


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Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the SSH service.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add monitoring bluetooth_scanner ssh acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration

defaultip                Default IP
defaultlinklocal         Default Link-local IP
lan1                     LAN1
loopback                 Loopback
wan1                     WAN1
wwan1                    WWAN1
wwan2                    WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add monitoring bluetooth_scanner ssh acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
filtering rules and access control lists.

Additional Configuration
```


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```
    any
    dynamic_routes
    edge
    external
    hotspot
    internal
    ipsec
    loopback
    setup

(config)>
```

Repeat this step to list additional firewall zones.

8. (Optional) Configure Multicast DNS (mDNS)

   mDNS is a protocol that resolves host names in small networks that do not have a DNS server. mDNS is disabled by default. To enable:

```
(config)> monitoring bluetooth_scanner ssh admin enable true
(config)>
```

9. Confirm that users who will use the Bluetooth scanner server are members of an authentication group that has Bluetooth scanner access enabled. See Add an authentication group for authentication group configuration information.
10. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

11. Type exit to exit the Admin CLI.

    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Display the output of the Bluetooth scanner.

You can use one of the following methods to view the output of the Bluetooth scanner:

- From the Status page of the WebUI.
- From the System Logs page of the WebUI. You can also search the output, as well as download the output in text format, from the System Logs page.
- From the command line when logged into the TX64 device.
- From a remote host, by connecting to the TX64 device by using the scanner's SSH port.

To view the output of the Bluetooth scanner, you must first enable the service. See Enable the Bluetooth scanner for instructions. For users to view the output of the Bluetooth scanner, they must be a member of an authentication group that has Bluetooth scanner access enabled. See Add an authentication group for authentication group configuration information.

WebUI

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To view the output of the Bluetooth scanner from the Status page:

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, select Status > Bluetooth.
   The Bluetooth scanner page displays.

Note The Bluetooth scanner status page does not update automatically. You must refresh the page to display the latest output from the Bluetooth scanner.

To view the output of the Bluetooth scanner from the System Logs page:

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, select System > Logs.
3. Click to expand Bluetooth Scanner Logs.
4. To search the output for a text string:
   a. In the Find text box, type the search string.
   b. Press Enter.
      The displayed output will be filtered to only display those items in the search string.
   c. To return to displaying the entire output log, delete the search string from the Find text box.
5. To download the output, click the download (📥) icon. The output will be downloaded to your local filesystem in text format.

See Bluetooth scanner output for information about the displayed fields.

Command line

To view output of the Bluetooth scanner from the command line, the user must be a member of an authentication group that has Bluetooth scanner access enabled. See Add an authentication group for details.

1. Log into the TX64 command line.
2. At the Access selection menu, type bluetooth.
   The bluetooth option is only available if the Bluetooth scanner is enabled. See Enable the Bluetooth scanner for instructions.

See Bluetooth scanner output for information about the displayed fields.

View the Bluetooth scanner output from a remote host

Use SSH from a remote host to connect to the device by using the configure Bluetooth scanner port. For example, to view the output of the scanner by using the default Bluetooth scanner port of 3182:

```
$ ssh user@device-ip -p 3182
Password:
```

After logging into your device, it will display the output from the Bluetooth scanner in your shell. For example:

```
TX64|Hopkins, MN|2019-06-28 17:48:57|38-97-31-BC-4F-7C|Unknown
Manufacturer|VOID|VOID|-62
TX64|Hopkins, MN|2019-06-28 17:48:58|3C-28-A5-7B-8F-61|Apple, Inc.|VOID|VOID|-88
```


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```
TX64|Hopkins, MM|2019-06-28 17:08:58|EF-CB-3E-D3-E5-04|Digi International Inc
(R)|VOID|VOID|-55
TX64|Hopkins, MM|2019-06-28 17:08:58|BE-31-4B-33-AE-FC|Apple, Inc.|VOID|VOID|-75
```

Bluetooth scanner output

The output from the Bluetooth scanner includes the following information:

Field	Description
Field 1	The name of the device, as configured for the system.
Field 2	The location of the device, as configured for the system.
Field 3	The date and time of the connection attempt.
Field 4	MAC address of the Bluetooth device that attempted the connection.
Field 5	The Bluetooth manufacturer ID.
Field 6	The device type.
Field 7	The device class.
Field 8	The Received Signal Strength Indicator (RSSI).

Enable the WI-FI scanner

The Wi-Fi scanner allows you to configure your device to detect Wi-Fi-enabled devices that are nearby, and then opens an SSH port that remote hosts can access to read basic information about those devices.

For users to view the output of the Wi-Fi scanner, they must be a member of an authentication group that has Wi-Fi scanner access enabled. See Add an authentication group for authentication group configuration information.

Required configuration

- Enable the Wi-Fi scanner.
- The wireless radio to use for scanning.

Additional configuration

- The SSH port used by the Wi-Fi scanner for reporting information to the remote host.
- The Wi-Fi channels to be scanned.
- The frequency with which the service hops from one channel to the next.
- The number of seconds that the service waits before updating its output.
- Whether to use the secondary Wi-Fi antenna in addition to the primary antenna.
- A remote host to view the output of the service.
- The SSH port used by the Wi-Fi scanner to stream output to a remote host.

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- The access control list for the SSH port used by the Wi-Fi scanner to stream output to a remote host.

  When the Wi-Fi scanner is enabled, the TX64 device will automatically configure its firewall rules to allow incoming connections on the configured listening port. You can restrict access by configuring the access control list for the Wi-Fi scanner's listening port.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Monitoring** > **Wi-Fi scanner**.



4. Click **Enable**.
5. (Optional) For **Channels**, type the Wi-Fi channels that will be scanned by this instance of the service.

   Allowed value is a comma-separated list of channel numbers, or **all** to scan all channels. The default is **all**.

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6. (Optional) For **Hop frequency**, type the frequency, in milliseconds, that the Wi-Fi scanner will hop from one channel to the next during scanning.

   Allowed values are any number of seconds or milliseconds, and take the format *number*[s|ms]. For example, to set Hop frequency to one second, enter 1s or 1000ms.

   The default is 150ms, and the maximum is 10000ms (10s).

7. (Optional) For **Update interval**, type the number of seconds between scans.

   Allowed values are any number of hours, minutes, or seconds, and take the format *number*[h|m|s].

   For example, to set Update interval to ten minutes, enter 10m or 600s.

   The default is 15 seconds.

8. (Optional) Click **Secondary antenna** to disable the use of the secondary Wi-Fi antenna.

9. For **Wi-Fi Radio**, select the appropriate Wi-Fi radio.

10. Configure the device to open an SSH port that remote hosts can access:

    a. Click to expand **SSH stream monitoring**.

    b. Click **Enable**.

    c. (Optional) For **Port**, type the port that the Wifi scanner will use. The default is 3402.

    d. Click **Access control list** to configure access control:

       - To limit access to specified IPv4 addresses and networks:
         i. Click **IPv4 Addresses**.
         ii. For **Add Address**, click ✚.
         iii. For **Address**, enter the IPv4 address or network that can access the device's SSH service. Allowed values are:
              - A single IP address or host name.
              - A network designation in CIDR notation, for example, 192.168.1.0/24.
              - **any**: No limit to IPv4 addresses that can access the SSH service.
         iv. Click ✚ again to list additional IP addresses or networks.
       - To limit access to specified IPv6 addresses and networks:
         i. Click **IPv6 Addresses**.
         ii. For **Add Address**, click ✚.
         iii. For **Address**, enter the IPv6 address or network that can access the device's SSH service. Allowed values are:

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- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the SSH service.

iv. Click + again to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:
  i. Click Interfaces.
  ii. For Add Interface, click +.
  iii. For Interface, select the appropriate interface from the dropdown.
  iv. Click + again to allow access through additional interfaces.
- To limit access based on firewall zones:
  i. Click Zones.
  ii. For Add Zone, click +.
  iii. For Zone, select the appropriate firewall zone from the dropdown.

  See Firewall configuration for information about firewall zones.
  iv. Click + again to allow access through additional firewall zones.

11. Confirm that users who will use the Wi-Fi scanner server are members of an authentication group that has Wi-Fi scanner access enabled. See Add an authentication group for authentication group configuration information.
12. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Enable the Wi-Fi scanner:

```
(config)> monitoring wifi_scanner enable true
(config)>
```

4. Set the appropriate Wi-Fi radio:

```
(config)> monitoring wifi_scanner radio value
(config)>
```

where value is either wifi1 or wifi2.

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5. (Optional) Set the Wi-Fi channels that will be scanned by this instance of the service:

```
(config)> monitoring wifi_scanner channels value
(config)>
```

where value is a comma-separated list of channel numbers, or all to scan all channels. The default is all.

6. (Optional) Set the frequency, in milliseconds, that the Wi-Fi scanner will hop from one channel to the next during scanning:

```
(config)> monitoring wifi_scanner hop_frequency value
```

The default is 250.

7. (Optional) Set the number of seconds between scans.

```
(config)> monitoring wifi_scanner update_interval value
```

where value is any number of hours, minutes, or seconds, and takes the format *number*[h|m|s]. For example, to set update_interval to ten minutes, enter either 10m or 600s:

```
(config)> monitoring wifi_scanner update_interval 600s
(config)>
```

The default is 15 seconds.

8. (Optional) Disable the use of the secondary Wi-Fi antenna:

```
(config)> monitoring wifi_scanner enable false
```

9. Enable the device to open an SSH port that remote hosts can access:

```
(config> monitoring wifi_scanner ssh enable true
(config)>
```

10. (Optional) Set the number of the port that the Wi-Fi scanner will use. The default is 3488.

```
(config)> monitoring wifi_scanner ssh port port
(config)>
```

11. Configure access control:
    - To limit access to specified IPv4 addresses and networks:

```
(config)> add wifi scanner ssh acl address end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 192.168.1.0/24.
- any: No limit to IPv4 addresses that can access the SSH service.

Repeat this step to list additional IP addresses or networks.

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- To limit access to specified IPv6 addresses and networks:

```
(config)> add wifi scanner ssh acl address6 end value
(config)>
```

Where value can be:

- A single IP address or host name.
- A network designation in CIDR notation, for example, 2001:db8::/48.
- any: No limit to IPv6 addresses that can access the SSH service.

Repeat this step to list additional IP addresses or networks.

- To limit access to hosts connected through a specified interface on the TX64 device:

```
(config)> add wifi scanner ssh acl interface end value
(config)>
```

Where value is an interface defined on your device.

Display a list of available interfaces:

Use ... network interface ? to display interface information:

```
(config)> ... network interface ?

Interfaces

Additional Configuration

  defaultip             Default IP
  defaultlinklocal      Default Link-local IP
  lan1                  LAN1
  loopback              Loopback
  wan1                  WAN1
  wwan1                 WWAN1
  wwan2                 WWAN2

(config)>
```

Repeat this step to list additional interfaces.

- To limit access based on firewall zones:

```
(config)> add wifi scanner ssh acl zone end value
```

Where value is a firewall zone defined on your device, or the any keyword.

Display a list of available firewall zones:

Type ... firewall zone ? at the config prompt:

```
(config)> ... firewall zone ?

Zones: A list of groups of network interfaces that can be
referred to by packet
```


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```
filtering rules and access control lists.

Additional Configuration
------------------------

  any
  dynamic_routes
  edge
  external
  hotspot
  internal
  ipsec
  loopback
  setup

(config)>
```

Repeat this step to list additional firewall zones.

12. Confirm that users who will use the Wi-Fi scanner server are members of an authentication group that has Wi-Fi scanner access enabled. See Add an authentication group for authentication group configuration information.
13. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

14. Type exit to exit the Admin CLI.

    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Display the output of the Wi-Fi scanner.

You can use one of the following methods to view the output of the Wi-Fi scanning service:

- From the Status page of the WebUI.
- From the System Logs page of the WebUI. You can also search the output, as well as download the output in text format, from the System Logs page.
- From the command line when logged into the TX64 device.
- From a remote host, by connecting to the TX64 device by using the scanning service's SSH port.

To view the output of the Wi-Fi scanning service, you must first enable the service. See Enable the Wi-Fi scanner for instructions. For users to view the output of the Wi-Fi scanner, they must be a member of an authentication group that has Wi-Fi scanner access enabled. See Add an authentication group for authentication group configuration information.

WebUI

To view the output of the Wi-Fi scanning service from the Status page:

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1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, select **Status** > **Wi-Fi**.

   The **Wi-Fi scanner** page displays.

To view the output of the Wi-Fi scanning service from the **System Logs** page:

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, select **System** > **Logs**.
3. Click to expand **Wi-Fi Scanner Logs**.
4. To search the output for a text string:
   a. In the **Find** text box, type the search string.
   b. Press **Enter**.

      The displayed output will be filtered to only display those items in the search string.
   c. To return to displaying the entire output log, delete the search string from the **Find** text box.
5. To download the output, click the download (📥) icon. The output will be downloaded to your local filesystem in text format.

See Wi-Fi scanning service output for information about the displayed fields.

Command line

To view output of the Wi-Fi scanner from the command line, the user must be a member of an authentication group that has Wi-Fi scanner access enabled. See Add an authentication group for details.

1. Log into the TX64 command line.
2. At the Access selection menu, type **Wi-Fi**.

   The **Wi-Fi** option is only available if the Wi-Fi scanning service is enabled. See Enable the Wi-Fi scanner for instructions.

See Wi-Fi scanning service output for information about the displayed fields.

View the Wi-Fi scanning service output from a remote host

Use SSH from a remote host to connect to the device by using the configure Wi-Fi scanning service port. For example, to view the output of the scanner by using the default Wi-Fi scanning service port of 3161:

```
$ ssh username@device-ip -p 3161
Password:
```

After logging into your device, it will display the output from the Wi-Fi scanning service in your shell. For example:

```
TX64|Hopkins, MN|1561754337|D8-B1-C8-B5-E3-B8|D8-B1-C8-B5-E3-B8|48|<hidden-ssid>|-1
TX64|Hopkins, MN|1561754369|27-9C-1C-79-C8-9C|27-9C-1C-79-C8-9C|48|TX64-669488-1|-76
TX64|Hopkins, MN|1561754384|8A-3C-8E-CA-62-78||48||-78
TX64|Hopkins, MN|1561754392|B5-94-3C-14-C8-34||48||-84
```


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Wi-Fi scanning service output

The output from the Wi-Fi scanner includes the following information:

Field	Description
Field 1	The name of the device, as configured for the system.
Field 2	The location of the device, as configured for the system.
Field 3	The most recent time this device was seen by the scanner. Time is in seconds since January 1, 1970.
Field 4	The MAC address of the Wi-Fi access point or the Wi-Fi client.
Field 5	If the device is a Wi-Fi client, the MAC address of the access point to which the Wi-Fi client is connected.
Field 6	The channel being used by the access point or the client. If the device is a Wi-Fi access point that uses a hidden SSID, the channel will be listed as -1.
Field 7	If the device is a Wi-Fi access point, the SSID of the access point.
Field 8	The Received Signal Strength Indicator (RSSI).

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Central management with Digi Remote Manager

This chapter contains the following topics:

Digi Remote Manager support 707
Configure Digi Remote Manager 707
Collect device health data and set the sample interval 713
Log into Digi Remote Manager 713
Use Digi Remote Manager to view and manage your device 716
Add a device to Digi Remote Manager 717
View Digi Remote Manager connection status 717
Use the Digi Remote Manager mobile app 718
Configure multiple devices using profiles 718
Learn more 718

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Digi Remote Manager support

Digi Remote Manager is a hosted remote configuration and management system that allows you to remotely manage a large number of devices. Remote Manager includes a web-based interface that you can use to perform device operations, such as viewing and changing device configurations and performing firmware updates. Remote Manager servers also provide a data storage facility.

To use Remote Manager, you must set up a Remote Manager account. To set up a Remote Manager account and learn more about Digi Remote Manager, go to www.digi.com/products/cloud/digi-remote-manager.

To learn more about Remote Manager features and functions, see the Digi Remote Manager User Guide.

Configure Digi Remote Manager

By default, your TX64 device is configured to use central management using Digi Remote Manager.

Additional configuration options

These additional configuration settings are not typically configured, but you can set them as needed:

- Disable the Digi Remote Manager connection if it is not required. You can also configure an alternate cloud-based central management application.
- Change the reconnection timer.
- The non-cellular keepalive timeout.
- The cellular keepalive timeout.
- The keepalive count before the Remote Manager connection is dropped.
- SMS support.
- HTTP proxy server support.

To configure Digi Remote Manager:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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Central management with Digi Remote Manager

Configure Digi Remote Manager



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3. Click **Central management**.

   The Central management configuration window is displayed.



   Digi Remote Manager support is enabled by default. To disable, click **Enable central management**.

4. [Optional] For **Management server**, type the URL for the central management server. The default is the Digi Remote Manager server, my.devicecloud.com.

5. [Optional] For **Management port**, type the destination port for the remote cloud services connection. The default is 3199.

6. [Optional] For **Retry interval**, type the amount of time that the TX64 device should wait before reattempting to connect to remote cloud services after being disconnected. The default is 30 seconds.

   Allowed values are any number of hours, minutes, or seconds, and take the format *number* [h|m|s].

   For example, to set **Retry interval** to ten minutes, enter 10m or 600s.

7. [Optional] For **Keep-alive interval**, type the amount of time that the TX64 device should wait between sending keep-alive messages to remote cloud services when using a non-cellular interface. The default is 60 seconds.

   Allowed values are any number of hours, minutes, or seconds, and take the format *number* [h|m|s].

   For example, to set **Keep-alive interval** to ten minutes, enter 10m or 600s.

8. [Optional] For **Cellular keep-alive interval**, type the amount of time that the TX64 device should wait between sending keep-alive messages to remote cloud services when using a cellular interface. The default is 290 seconds.

   Allowed values are any number of hours, minutes, or seconds, and take the format *number* [h|m|s].

   For example, to set **Cellular keep-alive interval** to ten minutes, enter 10m or 600s.

9. [Optional] For **Allowed keep-alive misses**, type the number of allowed keep-alive misses. The default is 3.

10. **Enable watchdog** is used to monitor the connection to remote cloud services. If the connection is down, you can configure the device to restart the connection, or to reboot. The watchdog is enabled by default.

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11. If **Enable watchdog** is enabled:
    a. [Optional] For **Restart Timeout**, type the amount of time to wait before restarting the connection to the remote cloud services, once the connection is down.

    Allowed values are any number of hours, minutes, or seconds, and take the format *number* [h|m|s].

    For example, to set **Restart Timeout** to ten minutes, enter *10m* or *600s*.

    The minimum value is 30 minutes and the maximum is 48 hours. If not set, this option is disabled. The default is 30 minutes.
    b. [Optional] For **Reboot Timeout**, type the amount of time to wait before rebooting the device, once the connection to the remote cloud services is down. By default, this option is not set, which means that the option is disabled.

    Allowed values are any number of hours, minutes, or seconds, and take the format *number* [h|m|s].

    For example, to set **Reboot Timeout** to ten minutes, enter *10m* or *600s*.

    The minimum value is 30 minutes and the maximum is 48 hours. If not set, this option is disabled. The default is disabled.
12. [Optional] Enable **Locally authenticate CLI** to require a login and password to authenticate the user from the remote cloud services CLI. If disabled, no login prompt will be presented and the user will be logged in as admin. The default is disabled.
13. [Optional] Configure the TX64 device to communicate with remote cloud services by using SMS:

    a. Click to expand **Short message service**.
    b. Enable **SMS messaging**.
    c. For **Destination phone number**, type the phone number for the remote cloud services.
    d. [Optional] Type the **Service identifier**.
14. [Optional] Configure the TX64 device to communicate with remote cloud services by using an HTTP proxy server:
    a. Click to expand **HTTP Proxy**.
    b. Enable the use of an HTTP proxy server.
    c. For **Server**, type the hostname of the HTTP proxy server.
    d. For **Port**, type or select the port number on the HTTP proxy server that the device should connect to. The default is *3128*.
15. Click **Apply** to save the configuration and apply the change.



Command Line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. Digi Remote Manager support is enabled by default. To disable Digi Remote Manager support:

```
(config)> cloud enable false
(Config)>
```

4. [Optional] Set the URL for the central management server. The default is the Digi Remote Manager server, [redacted].

```
(config)> cloud drm drm_url url
(config)>
```

5. [Optional] Set the amount of time that the TX64 device should wait before reattempting to connect to the remote cloud services after being disconnected. The minimum value is ten seconds. The default is 30 seconds.

```
(config)> cloud drm retry_interval value
```

where value is any number of hours, minutes, or seconds, and takes the format *number*[h|m|s]. For example, to set the retry interval to ten minutes, enter either 10m or 600s:

```
(config)> cloud drm retry_interval 600s
(config)>
```

6. [Optional] Set the amount of time that the TX64 device should wait between sending keep-alive messages to the Digi Remote Manager when using a non-cellular interface. Allowed values are from 30 seconds to two hours. The default is 60 seconds.

```
(config)> cloud drm keep_alive value
(config)>
```

where value is any number of hours, minutes, or seconds, and takes the format *number*[h|m|s]. For example, to set the keep-alive interval to ten minutes, enter either 10m or 600s:

```
(config)> cloud drm keep_alive 600s
(config)>
```

7. [Optional] Set the amount of time that the TX64 device should wait between sending keep-alive messages to the Digi Remote Manager when using a cellular interface. Allowed values are from 30 seconds to two hours. The default is 240 seconds.

```
(config)> cloud drm cellular_keep_alive value
(config)>
```

where value is any number of hours, minutes, or seconds, and takes the format *number*[h|m|s]. For example, to set the cellular keep-alive interval to ten minutes, enter either 10m or 600s:

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```
(config)> cloud dns cellular_keep_alive 600s
(config)>
```

8. Set the number of allowed keep-alive misses. Allowed values are any integer between 2 and 64. The default is 5.

```
(config)> cloud dns keep_alive_misses integer
(config)>
```

9. The watchdog is used to monitor the connection to remote cloud services. If the connection is down, you can configure the device to restart the connection, or to reboot. The watchdog is enabled by default. To disable:

```
(config)> cloud dns watchdog false
(config)>
```

10. If watchdog is enabled:
    a. [Optional] Set the amount of time to wait before restarting the connection to the remote cloud services, once the connection is down.
    where value is any number of hours, minutes, or seconds, and takes the format number [h|m|s].
    For example, to set restart_timeout to ten minutes, enter either 10m or 600s:

```
(config)> cloud dns restart_timeout 600s
(config)>
```

    The minimum value is 30 minutes and the maximum is 48 hours. If not set, this option is disabled. The default is 30 minutes.
    b. [Optional] Set the amount of time to wait before rebooting the device, once the connection to the remote cloud services is down. By default, this option is not set, which means that the option is disabled.
    where value is any number of hours, minutes, or seconds, and takes the format number [h|m|s].
    For example, to set reboot_timeout to ten minutes, enter either 10m or 600s:

```
(config)> cloud dns reboot_timeout 600s
(config)>
```

    The minimum value is 30 minutes and the maximum is 48 hours. If not set, this option is disabled. The default is disabled.

11. [Optional] Determine whether to require a login and password to authenticate the user from the remote cloud services CLI:

```
(config)> cloud dns cli_local_auth true
(config)>
```

If set to false, no login prompt will be presented and the user will be logged in as admin. The default is false.

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12. (Optional) Configure the TX64 device to communicate with remote cloud services by using SMS:
    a. Enable SMS messaging:

```
(config)> cloud drm sms enable true
(config)>
```

    b. Set the phone number for Digi Remote Manager:

```
(config)> cloud drm sms destination drm_phone_number
(config)>
```

    c. (Optional) Set the service identifier:

```
(config)> cloud drm sms service_id id
(config)>
```

13. (Optional) Configure the TX64 device to communicate with remote cloud services by using an HTTP proxy server:
    a. Enable the use of an HTTP proxy server:

```
(config)> cloud drm proxy enable true
(config)>
```

    b. Set the hostname of the proxy server:

```
(config)> cloud drm proxy host hostname
(config)>
```

    c. (Optional) Set the port number on the proxy server that the device should connect to. The default is 3128.

```
(config)> cloud drm proxy port integer
(config)>
```

15. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

14. Type exit to exit the Admin CLI.

    Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Collect device health data and set the sample interval

You can enable or disable the collection of device health data to upload to Digi Remote Manager, and configure the interval between health sample uploads. By default, device health data upload is enabled, and the health sample interval is set to 60 minutes.

To avoid a situation where several devices are uploading health metrics information to Remote Manager at the same time, the TX64 device includes a preconfigured randomization of two minutes for uploading metrics. For example, if Health sample interval is set to five minutes, the metrics will be uploaded to Remote Manager at a random time between five and seven minutes.

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To disable the collection of device health data or enable it if it has been disabled, or to change the health sample interval:

WebUI

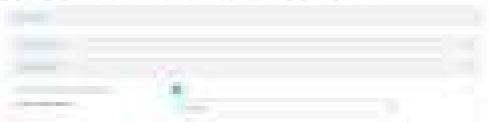
1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **Monitoring > Device Health**.



Device health data upload is enabled by default. To disable, click to toggle off **Enable Device Health samples upload**.

4. For **Health sample interval**, select the interval between health sample uploads.
5. Click **Apply** to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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3. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

5. Device health data upload is enabled by default. To enable or disable:
   - To enable:

```
(config)> monitoring devicehealth enable true
(config)>
```

   - To disable:

```
(config)> monitoring devicehealth enable false
(config)>
```

4. The interval between health sample uploads is set to 60 minutes by default. To change:

```
(config)> monitoring devicehealth interval value
```

   where value is one of 1, 5, 15, 30, or 60, and represents the number of minutes between uploads of health sample data.

5. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

6. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Log Into Digi Remote Manager

To start Digi Remote Manager:

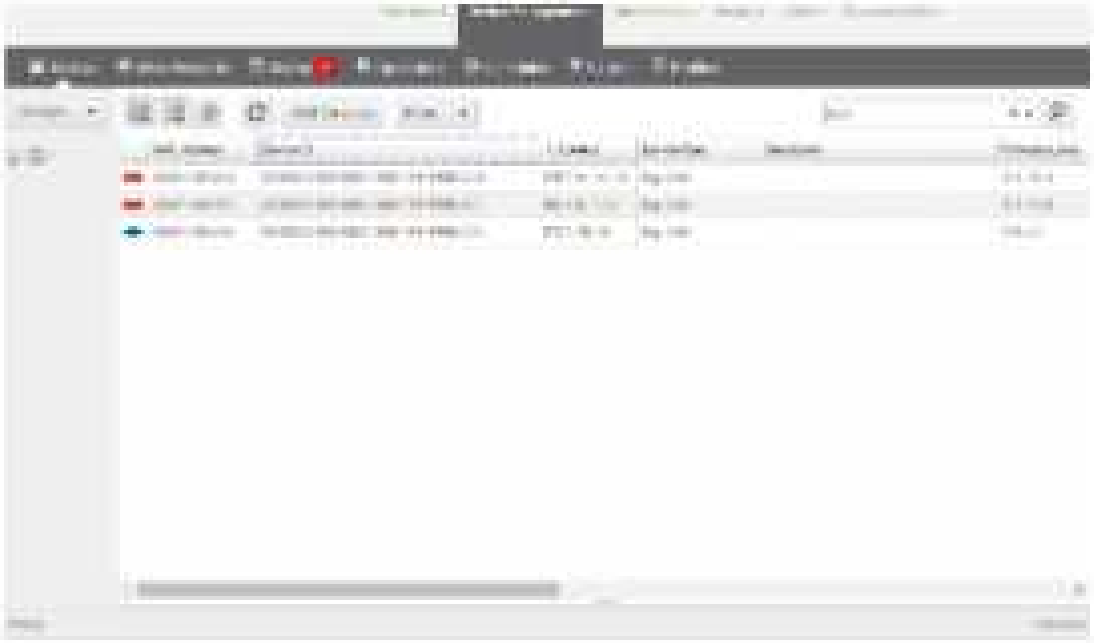
1. If you have not already done so, click here to sign up for a Digi Remote Manager account.
2. Check your email for Digi Remote Manager login instructions.
3. Go to remotemanager.digi.com.
4. Log into your Digi Remote Manager account.

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Use Digi Remote Manager to view and manage your device

To view and manage your device:

1. If you have not already done so, connect to your Digi Remote Manager account.
2. Click **Device Management** to display a list of your devices.
3. Use the Search bar to locate the device you want to manage.



4. Select the device and click **Properties** to view general information for the device.
5. Click the **More** menu to perform a task.



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Add a device to Digi Remote Manager

1. If you have not already done so, connect to your Digi Remote Manager account.
2. Click **Device Management** to display a list of your devices.
3. Click **Add Devices**.
4. Select **MAC Address** and enter the Ethernet MAC address for your device.
5. For **Install Code**, enter the default password on the printed label packaged with your device. The same default password is also shown on the label affixed to the bottom of the device.
6. Click **Add**.
7. Click **OK**.

Digi Remote Manager adds your TX64 device to your account and it appears in the **Device Management** view.

View Digi Remote Manager connection status

To view the current Digi Remote Manager configuration:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. The dashboard includes a Digi Remote Manager status panel:



Command line

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```


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3. View the central management configuration:

```
(config)> show cloud
dra
        cellular_keep_alive 298s
        dra_url my.devicecloud.com
        keep_alive 68s
        keep_alive_misses 3
        retry_interval 38s
enable true
(config)>
```

4. Type cancel to exit configuration mode:

```
(config)> cancel
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

To view the status of your device's connection to Remote Manager, use the show cloud command at the command line:

Command Line

```
> show cloud

Device Cloud Status
-------------------

  Status      : Connected
  Server      : my.devicecloud.com
  Device ID   : [redacted]
>
```

The Device ID is the unique identifier for the device, as used by the Remote Manager.

Use the Digi Remote Manager mobile app

If you have a smart phone or tablet, you can use the Digi Remote Manager mobile app to automatically provision a new devices and monitor devices in your account.

To download the mobile app:

- For iPhone, go to the App Store
- For Android phones, go to Google Play

To sign up for a new Digi Remote Manager account using the mobile app:

1. From the menu, click Log In or Sign Up.
2. Click Sign up to create a new account.

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3. You'll receive an email with login instructions.
4. From the **Digi Remote Manager** mobile app, click **Log In** and log into your new account.

To register a new device:

1. From the menu, select **Install a device with a QR or bar code** and scan the installation QR code on the label.
2. Follow the prompts to complete your TX64 registration.

Digi Remote Manager registers your TX64 and adds it to your Digi Remote Manager device list. You can now manage the device remotely using Digi Remote Manager.

Configure multiple devices using profiles

Digi recommends you take advantage of Digi Remote Manager profiles to manage multiple TX64 routers. Typically, if you want to provision multiple TX64 routers:

1. Using the TX64 local WebUI, configure one TX64 router to use as the model configuration for all subsequent TX64s you need to manage.
2. Register the configured TX64 device in your Digi Remote Manager account.
3. In Digi Remote Manager, create a profile based on the configured TX64.
4. Apply the profile to the TX64 devices you need to configure.

Digi Remote Manager provides multiple methods for applying profiles to registered devices. You can also include site-specific settings with a profile to override settings on a device-by-device basis.

Learn more

- For information on using Digi Remote Manager to configure and manage TX64 routers, see the Digi Remote Manager User Guide.
- For information on using Digi Remote Manager APIs to develop custom applications, see the Digi Remote Manager Programmer Guide.

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File system

This chapter contains the following topics:

The TX64 local file system
Display directory contents
Create a directory
Display file contents
Copy a file or directory
Move or rename a file or directory
Delete a file or directory
Upload and download files

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The TX64 local file system

The TX64 local file system has approximately 4.5 GB of space available for storing files, such as Python programs, alternative configuration files and firmware versions, and release files, such as cellular module images. The writable directories within the filesystem are:

- /tmp
- /opt
- /etc/config

Files stored in the /tmp directory do not persist across reboots. Therefore, /tmp is a good location to upload temporary files, such as files used for firmware updates. Files stored in /opt and /etc/config do persist across reboots, but are deleted if a factory reset of the system is performed. See Reset the device to factory defaults for more information.

Display directory contents

To display directory contents by using the WebUI or the Admin CLI:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.



3. Highlight a directory and click to open the directory and view the files in the directory.

Command Line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the Admin CLI prompt, type `ls /path/dir_name`. For example, to display the contents of the /etc/config directory:

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```
> ls /etc/config
-rw-r---r--    1 root     root           856 Nov 28 20:17 access.json
drw----------  2 root     root           160 Sep 23 04:02 analyzer
drwxr-xr-x    3 root     root           224 Sep 23 04:02 cc_acl
-rw-r---r--    1 root     root            47 Sep 23 04:02 dhcp.leases
...
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Create a directory

Command line

This procedure is not available through the WebUI. To make a new directory, use the mkdir command, specifying the name of the directory.

For example:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the Admin CLI prompt, type mkdir /path/dir_name. For example, to create a directory named temp in /etc/config:

```
> mkdir /etc/config/temp
>
```

3. Verify that the directory was created:

```
> ls /etc/config
...
-rw-r---r--    1 root     root          1436 Aug 12 21:36 ssl.crt
-rw----------  1 root     root          1895 Aug 12 21:36 ssl.pem
-rw-r---r--    1 root     root            10 Aug  5 06:41 start
drwxr-xr-x    2 root     root           160 Aug 25 17:49 temp
>
```

4. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Display file contents

This procedure is not available through the WebUI. To display the contents of a file by using the Admin CLI, use the more command, specifying the name of the directory.

For example:

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the Admin CLI prompt, type more /path/filename. For example, to view the contents of the file access.json in /etc/config:

```
> more /etc/config/access.json
{
    "auth":
        "user": {
            "admin": {
                "password":
"$2a$05$MSs1s1ocxudf/n43KKT.RgrGwe1yerIIXQtbeFuahCuwRg9Fle"
            }
        }
    },
    "schema": {
        "version": "463"
    }
}
>
```

3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Copy a file or directory

This procedure is not available through the WebUI. To copy a file or directory by using the Admin CLI, use the cp command, specifying the existing path and filename followed by the path and filename of the new file, or specifying the existing path and directory name followed by the path and directory name of the new directory.

Command line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the Admin CLI prompt, type cp /path/filename dir_name /path[filename]dir_name. For example:

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- To copy the file /etc/config/access.json to a file named backup_cfg.json in a directory named /etc/config/test, enter the following:

```
> cp /etc/config/access.json /etc/config/test/backup_cfg.json
>
```

- To copy a directory named /etc/config/test to /opt:

```
> cp /etc/config/test/ /opt/
>
```

3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Move or rename a file or directory

This procedure is not available through the WebUI. To move or rename a file or directory by using the Admin CLI, use the mv command.

Command line

To rename a file named test.py in /etc/config/scripts to final.py:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the Admin CLI prompt, type:

```
> mv /etc/config/scripts/test.py /etc/config/scripts/final.py
>
```

3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

To move test.py from /etc/config/scripts to /opt:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the Admin CLI prompt, type:

```
> mv /etc/config/scripts/test.py /opt/
>
```

3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Delete a file or directory

To delete a file or directory by using the WebUI or the Admin CLI:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.



3. Highlight the directory containing the file to be deleted and click to open the directory.
4. Highlight the file to be deleted and click 🗑.
5. Click **OK** to confirm.

Command line

To delete a file named test.py in /etc/config/scripts:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the Admin CLI prompt, type:

```
> rm /etc/config/scripts/test.py
rm: remove '/etc/config/scripts/test.py'? yes
>
```

3. Type **exit** to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

To delete a directory named temp from /opt:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

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2. At the Admin CLI prompt, type:

```
> rm /opt/temp/
rm: descend into directory '/opt/temp'? yes
rm: remove directory '/opt/temp'? yes
>
```

3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Upload and download files

You can download and upload files by using the WebUI or from the command line by using the scp Secure Copy command, or by using a utility such as SSH File Transfer Protocol (SFTP) or an SFTP application like FileZilla.

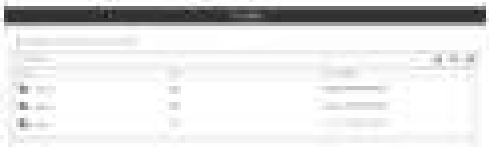
Upload and download files by using the WebUI

Upload files

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.



3. Highlight the directory to which the file will be uploaded and click to open the directory.
4. Click (upload).
5. Browse to the location of the file on your local machine. Select the file and click **Open** to upload the file.

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Download files

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.



3. Highlight the directory to which the file will be uploaded and click to open the directory.
4. Highlight the appropriate file and click (download).

Upload and download files by using the Secure Copy command

Copy a file from a remote host to the TX64 device

To copy a file from a remote host to the TX64 device, use the scp command as follows:

```
> scp host hostname-or-ip user username remote remote-path local local-path to
local
```

where:

- *hostname-or-ip* is the hostname or ip address of the remote host.
- *username* is the name of the user on the remote host.
- *remote-path* is the path and filename of the file on the remote host that will be copied to the TX64 device.
- *local-path* is the location on the TX64 device where the copied file will be placed.

For example:

To copy firmware from a remote host with an IP address of 192.168.4.1 to the /etc/config directory on the TX64 device, issue the following command:

```
> scp host 192.168.4.1 user admin remote /home/admin/bin/TX64-20.5.38.39.bin
local /etc/config/ to local
admin@192.168.4.1's password: adminpwd
TX64-20.5.38.39.bin                          100%   30MB    11.1MB/s   00:03
>
```


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Transfer a file from the TX64 device to a remote host

To copy a file from the TX64 device to a remote host, use the scp command as follows:

```
> scp host hostname-or-ip user username remote remote-path local local-path to
remote
```

where:

- hostname-or-ip is the hostname or ip address of the remote host.
- username is the name of the user on the remote host.
- remote-path is the location on the remote host where the file will be copied.
- local-path is the path and filename on the TX64 device.

For example:

To copy a support report from the TX64 device to a remote host at the IP address of 192.168.4.1:

1. Use the system support-report command to generate the report:

```
> system support-report /etc/config/
Saving support report to /etc/config/support-report-[redacted]-13.22.15.bin
Support report saved.
>
```

2. Use the scp command to transfer the report to a remote host:

```
> scp host 192.168.4.1 user admin remote /home/admin/tmp/ local
/etc/config/support-report-00:40:9D:13:35:36-20-05-29-13.22.15.bin to
remote
admin@192.168.4.1's password: adminpwd
support-report-[redacted]-13.22.15.bin
>
```

Upload and download files using SFTP

Transfer a file from a remote host to the TX64 device

This example uploads firmware from a remote host to the TX64 device with an IP address of 192.168.2.1, using the username ahmed:

```
$ sftp ahmed@192.168.2.1
Password:
Connected to 192.168.2.1
sftp> put TX64-20.5.38.39
Uploading TX64-20.5.38.39 to TX64-20.5.38.39
TX64-20.5.38.39
    100%  24M  838.4KB/s   00:00
sftp> exit
$
```

Transfer a file from the TX64 device to a remote host

This example downloads a file named test.py from the TX64 device at the IP address of 192.168.2.1 with a username of ahmed to the local directory on the remote host:

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```
$ sftp ahmed@192.168.2.1
Password:
Connected to 192.168.2.1
sftp> get test.py
Fetching test.py to test.py
test.py
  100%  254     6.3KB/s   00:00
sftp> exit
$
```


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Diagnostics

This chapter contains the following topics:

Generate a support report 730
View system event logs 730
Configure syslog servers 731
Configure options for the event and system logs 732
Analyze network traffic 734
Use the ping command to troubleshoot network connections 737
Use the traceroute command to diagnose IP routing problems 737

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Generate a support report

To generate and download a support report:

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **System**. Under **Administration**, click **Support Report**.



3. Click to generate and download the support report.



Attach the support report to any support requests.

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. Use the **system support-report** command to generate the report:

```
> system support-report /etc/config/
Saving support report to /etc/config/support-report-[illegible]-13.22.15.bin
Support report saved.
>
```

3. Use the **scp** command to transfer the report to a remote host:

```
> scp host 192.168.4.1 user admin remote /home/admin/temp/ local
/etc/config/support-report-[illegible]-13.22.15.bin to
remote
admin@192.168.4.1's password: adminpwd
support-report-[illegible]-13.22.15.bin
>
```

4. Type **exit** to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **quit** to disconnect from the device.

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View system event logs

See Configure options for the event and system logs for information about configuring the information displayed in event and system logs.

View System Logs

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click System > Logs.



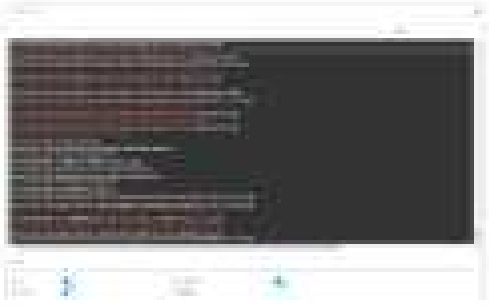
The system log displays:



3. Limit the display in the system log by using the Find search tool.



4. Use filters to configure the types of information displayed in the system logs.



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Diagnostics View system event logs

5. Click to download the system log.



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Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Use show log at the Admin CLI prompt:

```
> show log

Timestamp          Message
-------------------------------------------------------------------------------
...
Nov 26 21:54:34  TX64 netifd: Interface 'interface_wan' is setting up now
Nov 26 21:54:35  TX64 firewall[621]: reloading status
....
>
```

3. (Optional) Use the show log number num command to limit the number of lines that are displayed. For example, to limit the log to the most recent ten lines:

```
> show log number 10

Timestamp          Message
-------------------------------------------------------------------------------
...
Nov 26 21:54:34  TX64 netifd: Interface 'interface_wan' is setting up now
Nov 26 21:54:35  TX64 firewall[621]: reloading status
....
>
```

4. (Optional) Use the show log filter value command to limit the number of lines that are displayed. Allowed values are critical, warning, info, and debug. For example, to limit the event list to only info messages:

```
> show log filter info

Timestamp          Type     Category  Message
-------------------------------------------------------------------------------
...
Nov 26 22:01:26  info     user
name=admin-service=cli-state=opened-remote=192.168.1.2
Nov 26 22:01:25  info     user
name=admin-service=cli-state=closed-remote=192.168.1.2
....
>
```

5. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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TESSOL Technical Library TS-TL-DGI-091

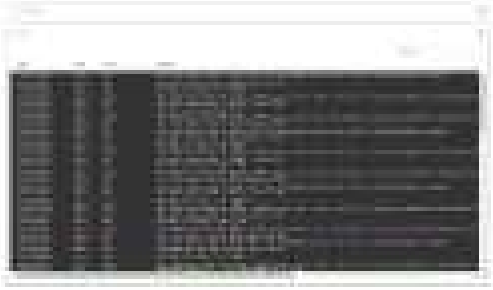
View Event Logs

WebUI

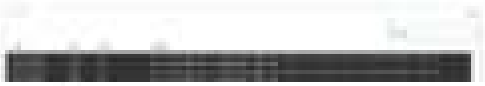
1. Log into the TX64 WebUI as a user with Admin access.
2. On the main menu, click **System** > **Logs**.



3. Click ▾ **System Logs** to collapse the system logs viewer, or scroll down to **Events**.
4. Click ▸ **Events** to expand the event viewer.



5. Limit the display in the event log by using the **Find** search tool.



6. Click 🖧 to download the event log.



Command Line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. Use `show event` at the Admin CLI prompt:

```
> show event
```


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TESSOL Technical Library TS-TL-DGI-091

```
Timestamp          Type     Category  Message
-------------------------------------------------------------------------------
...
Nov 26 21:42:37  status  stat
intf=wlan1-type=ethernet-rx=11111405-tx=5638762
Nov 26 21:42:35  status  system    local_time=Thu, 08 Aug 2019 21:42:35
+0000-uptime=3 hours, 9 minutes, 48 seconds
...
>
```

3. (Optional) Use the show event number num command to limit the number of lines that are displayed. For example, to limit the event list to the most recent ten lines:

```
> show event number 10

Timestamp          Type     Category  Message
-------------------------------------------------------------------------------
...
Nov 26 21:42:37  status  stat
intf=wlan1-type=ethernet-rx=11111405-tx=5638762
Nov 26 21:42:35  status  system    local_time=Thu, 08 Aug 2019 21:42:35
+0000-uptime=3 hours, 9 minutes, 48 seconds
...
>
```

4. (Optional) Use the show event table value command to limit the number of lines that are displayed. Allowed values are error, info, and status. For example, to limit the event list to only info messages:

```
> show event table info

Timestamp          Type     Category  Message
-------------------------------------------------------------------------------
...
Nov 26 22:01:36  info    user
name=admin-service=cli-state=opened-remote=192.168.1.2
Nov 26 22:01:35  info    user
name=admin-service=cli-state=closed-remote=192.168.1.2
...
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Configure syslog servers

You can configure remote syslog servers for storing event and system logs.

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.



3. Click **System > Log**.

4. Add and configure a remote syslog server:
   a. Click to expand **Server list**.
   b. For **Add Server**, click **+**.

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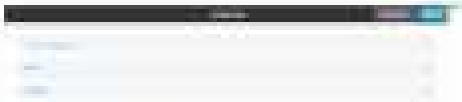
The log server configuration window is displayed.

Log servers are enabled by default. To disable, click to toggle off Enable.

c. Type the host name or IP address of the Server.

d. Select the event categories that will be sent to the server.

3. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. (Optional) To configure remote syslog servers:
   a. Add a remote server:

```
(config)> add system log remote end
(config system log remote 1)>
```

   b. Enable the server:

```
(config system log remote 1)> enable true
(config system log remote 1)>
```

   c. Set the host name or IP address of the server:

```
(config system log remote 1)> server hostname
(config system log remote 1)>
```

   d. The event categories that will be sent to the server are automatically enabled when the server is enabled. To disable:
      - To disable informational event messages:

```
(config system log remote 1)> info false
(config system log remote 1)>
```


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- To disable status event messages:

```
(config system log remote 1)> status false
(config system log remote 1)>
```

- To disable informational event messages:

```
(config system log remote 1)> error false
(config system log remote 1)>
```

4. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Configure options for the event and system logs

The default configuration for event and system logging is:

- The heartbeat interval, which determines the amount of time to wait before sending a heartbeat event if no other events have been sent, is set to 30 minutes.
- All event categories are enabled.

To change or disable the heartbeat interval, or to disable event categories, and to perform other log configuration:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

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5. Click **System > Log**.

4. (Optional) To change the **Heartbeat Interval** from the default of 60 minutes, type a new value. The heartbeat interval determines the amount of time to wait before sending a heartbeat event if no other events have been sent.

   Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

   For example, to set **Heartbeat Interval** to ten minutes, enter 10m or 600s.

   To disable the **Heartbeat Interval**, enter 0s.

5. (Optional) To disable event categories, or to enable them if they have been disabled:
   a. Click to expand **Event Categories**.
   b. Click an event category to expand.
   c. Depending on the event category, you can enable or disable informational events, status events, and error events. Some categories also allow you to set the **Status Interval**, which is the time interval between periodic status events.

6. (Optional) See Configure syslog servers for information about configuring remote syslog servers to which log messages will be sent.

7. Enable **Preserve system logs** to save the current session's system log after a reboot.

   By default, the TX64 device erases system logs each time the device is powered off or rebooted.

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Note You should only enable Preserve system logs temporarily to debug issues. Once you are finished debugging, immediately disable Preserve system logs to avoid unnecessary wear to the flash memory.

6. Click Apply to save the configuration and apply the change.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```

3. (Optional) To change the heartbeat interval from the default of 30 minutes, set a new value. The heartbeat interval determines the amount of time to wait before sending a heartbeat event if no other events have been sent.

```
(config)> system log heartbeat_interval value
(config)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].
For example, to set the heartbeat interval to ten minutes, enter either 10m or 600s:

```
(config)> system log heartbeat_interval 600s
(config)>
```

To disable the heartbeat interval, set the value to 0s

4. Enable preserve system logs functionality to save the current session's system log after a reboot. By default, the TX64 device erases system logs each time the device is powered off or rebooted.

Note You should only enable Preserve system logs temporarily to debug issues. Once you are finished debugging, immediately disable Preserve system logs to avoid unnecessary wear to the flash memory.

```
(config)> system log persistent true
(config)>
```


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5. (Optional) To disable event categories, or to enable them if they have been disabled:
   a. Use the question mark (?) to determine available event categories:

```
(config)> system log event ?

Event categories: Settings to enable individual event categories.

Additional Configuration

------------

arping          ARP ping
config          Configuration
dhcpserver      DHCP server
firmware        Firmware
location        Location
modem           Modem
netcon          Active recovery
network         Network interfaces
openvpn         OpenVPN
portal          Captive portal
remote          Remote control
restart         Restart
serial          Serial
sms             SMS commands
speed           Speed
stat            Network statistics
user            User
wireless        WiFi
wol             Wake-On-LAN

(config)> system log event
```

   b. Depending on the event category, you can enable or disable informational events, status events, and error events. Some categories also allow you to set the status interval, which is the time interval between periodic status events. For example, to configure DHCP server logging:
      i. Use the question mark (?) to determine what events are available for DHCP server logging configuration:

```
(config)> system log event dhcpserver ?
...
DHCP server: Settings for DHCP server events. Informational events
are generated
when a lease is obtained or released. Status events report the
current list of
leases.

  Parameters                    Current Value

  ------------
```


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info	true	Enable informational events
status	true	Enable status events
status_interval	30s	Status interval

```
(config)> system log event dhcpserver
```

i. To disable informational messages for the DHCP server:

```
(config)> system log event dhcpserver info false
(config)>
```

ii. To change the status interval:

```
(config)> system log event dhcpserver status_interval value
(config)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format *number*[w|d|h|m|s].

For example, to set the status interval to ten minutes, enter either 10m or 600s:

```
(config)> system log event dhcpserver status_interval 600s
(config)>
```

6. (Optional) See Configure syslog servers for information about configuring remote syslog servers to which log messages will be sent.
7. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

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Analyze network traffic

The TX64 device includes a network analyzer tool that captures data traffic on any interface and decodes the captured data traffic for diagnostics. You can capture data traffic on multiple interfaces at the same time and define capture filters to reduce the captured data. You can capture up to 10 MB of data traffic in two 5 MB files per interface.

To perform a more detailed analysis, you can download the captured data traffic from the device and view it using a third-party application.

Note Data traffic is captured to RAM and the captured data is lost when the device reboots unless you save the data to a file. See Save captured data traffic to a file.

This section contains the following topics:

Configure packet capture for the network analyzer
Example filters for capturing data traffic
Capture packets from the command line
Stop capturing packets
Show captured traffic data
Save captured data traffic to a file
Download captured data to your PC
Clear captured data

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Configure packet capture for the network analyzer

To use the network analyzer, you must create one or more packet capture configuration.

Required configuration items

- The interface used by this packet capture configuration.

Additional configuration items

- The filter expression for this packet capture configuration.
- Schedule the analyzer to run based on a specified event or at a particular time:
  - The events or time that will trigger the analyzer to run, using this capture configuration.
  - The amount of time that the analyzer session will run.
  - The frequency with which captured events will be saved.

To configure a packet capture configuration:

WebUI

1. Log into the TX64 WebUI as a user with full Admin access rights.
2. On the menu, click **System**. Under **Configuration**, click **Device Configuration**.



The **Configuration** window is displayed.

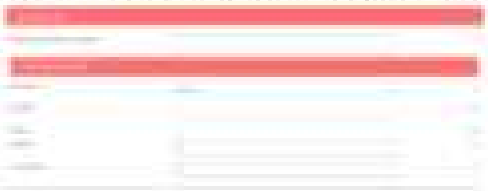


3. Click **Network > Analyzer**.

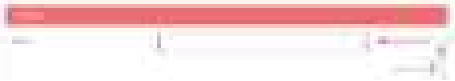
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4. For **Add Capture settings**, type a name for the capture filter and click **+**.

The new capture filter configuration is displayed.



5. Add one or more interface to the capture filter:
   a. Click to expand **Device**.
   b. Click **+** to add an interface to the capture setting instance.



   c. For **Device**, select an interface.
   d. Repeat to add additional interfaces to the capture filter.
6. (Optional) For **Berkeley packet filter expression**, type a filter using Berkeley Packet Filter (BPF) syntax. See Example filters for capturing data traffic for examples of filters using BPF syntax.
7. (Optional) Schedule the analyzer to run, using this capture filter, based on a specified event or at a particular time:
   a. For **Run mode**, select the mode that will be used to run the capture filter. Available options are:
      - **On boot**: The capture filter will run once each time the device boots.
      - **Interval**: The capture filter will start running at the specified interval, within 60 seconds after the configuration change is saved.
        - If Interval is selected, in **Interval**, type the interval.

          Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].

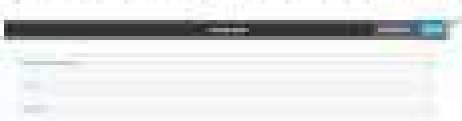
          For example, to set Interval to ten minutes, enter 10m or 600s.
      - **Set time**: Runs the capture filter at a specified time of the day.
        - If **Set Time** is selected, specify the time that the capture filter should run in **Run time**, using the format *hh:mm*.
      - **During system maintenance**: The capture filter will run during the system maintenance time window.
   b. **Enable** the capture filter schedule.

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c. For Duration, type the amount of time that the scheduled analyzer session will run.
Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].
For example, to set Duration to ten minutes, enter 10m or 600s.

d. For Save Interval, type the frequency with which captured events will be saved.
Allowed values are any number of weeks, days, hours, minutes, or seconds, and take the format *number*[w|d|h|m|s].
For example, to set Save Interval to ten minutes, enter 10m or 600s.

2. Click Apply to save the configuration and apply the changes.



Command line

1. Log into the TX64 command line as a user with full Admin access rights.
Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Add a new capture filter:

```
(config)> add network analyzer name
(config network analyzer name)>
```

4. Add an interface to the capture filter:

```
(config network analyzer name)> add device end device
(config network analyzer name)>
```

Determine available devices and the proper syntax.
To determine available devices and proper syntax, use the space bar autocomplete feature:

```
(config network analyzer name)> add device end <space>
/network/device/eth1                    /network/device/eth2
/network/device/eth3                    /network/device/eth4
/network/device/loopback                /network/bridge/hotspot_bridge
/network/bridge/lan1                    /network/wifi/ap/digi_ap1
/network/wifi/ap/digi_ap3               /network/wifi/ap/digi_hotspot_ap1
/network/wifi/ap/digi_hotspot_ap3       /network/interface/default ip
/network/interface/default linklocal    /network/interface/lan1
/network/interface/lan_hotspot          /network/interface/loopback
/network/interface/wwan1                /network/interface/wwan1
```


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```
/network/interface/wwan2
(config network analyzer name)> add interface end /network/
```

Repeat to add additional interfaces.

5. (Optional) Set a filter for the capture filter:

```
(config network analyzer name)> filter value
(config network analyzer name)>
```

where value is a filter using Berkeley Packet Filter (BPF) syntax. Values that contain spaces must be enclosed in double quotes (").

See Example filters for capturing data traffic for examples of filters using BPF syntax.

6. (Optional) Schedule the analyzer to run, using this capture filter, based on a specified event or at a particular time:

   a. Enable scheduling for this capture filter:

```
(config network analyzer name)> schedule enable true
(config network analyzer name)>
```

   b. Set the mode that will be used to run the capture filter:

```
(config network analyzer name)> when mode
(config network analyzer name)>
```

   where mode is one of the following:

   - boot: The script will run once each time the device boots.
   - interval: The script will start running at the specified interval, within 30 seconds after the configuration change is saved. If interval is selected, set the interval:

```
(config add network analyzer name)> on_interval value
(config add network analyzer name)>
```

     where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

     For example, to set on_interval to ten minutes, enter either 10m or 600s:

```
(config network analyzer name)> on_interval 600s
(config network analyzer name)>
```

   - set_time: Runs the script at a specified time of the day. If set_time is set, set the time that the script should run, using the format HH:MM:

```
(config network analyzer name)> run_time HH:MM
(config network analyzer name)>
```

   - maintenance_time: The script will run during the system maintenance time window.

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c. Set the amount of time that the scheduled analyzer session will run:

```
(config network analyzer name)> duration value
(config network analyzer name)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set duration to ten minutes, enter either 10m or 600s:

```
(config network analyzer name)> save_interval 600s
(config network analyzer name)>
```

d. Set the frequency with which captured events will be saved:

```
(config network analyzer name)> save_interval value
(config network analyzer name)>
```

where value is any number of weeks, days, hours, minutes, or seconds, and takes the format number[w|d|h|m|s].

For example, to set save_interval to ten minutes, enter either 10m or 600s:

```
(config network analyzer name)> save_interval 600s
(config network analyzer name)>
```

7. Save the configuration and apply the changes:

```
(config)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Example filters for capturing data traffic

The following are examples of filters using Berkeley Packet Filter (BPF) syntax for capturing several types of network data. See https://biot.com/capstats/bpf.html for detailed information about BPF syntax.

Example IPv4 capture filters

- Capture traffic to and from IP host 192.168.1.1:

```
ip host 192.168.1.1
```

- Capture traffic from IP host 192.168.1.1:

```
ip src host 192.168.1.1
```

- Capture traffic to IP host 192.168.1.1:

```
ip dst host 192.168.1.1
```


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- Capture traffic for a particular IP protocol:

```
ip proto protocol
```

where protocol is a number in the range of 1 to 255 or one of the following keywords: icmp, icmp6, igmp, pim, ah, esp, vrrp, udp, or tcp.

- Capture traffic to and from a TCP port 80:

```
ip proto tcp and port 80
```

- Capture traffic to UDP port 53:

```
ip proto udp and dst port 53
```

- Capture traffic from UDP port 53:

```
ip proto udp and src port 53
```

- Capture to and from IP host 10.0.0.1 but filter out ports 22 and 80:

```
ip host 10.0.0.1 and not (port 22 or port 80)
```

Example Ethernet capture filters

- Capture Ethernet packets to and from a host with a MAC address of 00:40:D0:13:35:36:

```
ether host 00:40:D0:13:35:36
```

- Capture Ethernet packets from host 00:40:D0:13:35:36:

```
ether src 00:40:D0:13:35:36
```

- Capture Ethernet packets to host 00:40:D0:13:35:36:

```
ether dst 00:40:D0:13:35:36
```

Capture packets from the command line

You can start packet capture at the command line with the analyzer start command. Alternatively, you can schedule the network analyzer to run based on a specified event or at a particular time. See Configure packet capture for the network analyzer for information about scheduling packet capturing.

Additional analyzer commands allow you to:

- Stop capturing packets.
- Save captured data traffic to a file.
- Clear captured data.

Required configuration items

- A configured packet capture. See Configure packet capture for the network analyzer for packet capture configuration information.

To start packet capture from the command line:

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Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Type the following at the Admin CLI prompt:

```
> analyzer start name capture_filter
>
```

where capture_filter is the name of a packet capture configuration. See Configure packet capture for the network analyzer for more information.

To determine available packet capture configurations, use the ?:

```
> analyzer start name ?

name: Name of the capture filter to use.
Format:
  test_capture
  capture_ping

> analyzer start name
```

You can capture up to 10 MB of data traffic in two 5 MB files per interface.

Note: Data traffic is captured to RAM and the captured data is lost when the device reboots unless you save the data to a file. See Save captured data traffic to a file.

Stop capturing packets

You can stop packet capture at the command line with the analyzer stop command.

To stop packet capture from the command line:

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Type the following at the Admin CLI prompt:

```
> analyzer stop name capture_filter
>
```

where capture_filter is the name of a packet capture configuration. See Configure packet capture for the network analyzer for more information.

To determine available packet capture configurations, use the ?:

```
> analyzer stop name ?
```


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```
name: Name of the capture filter to use.
Format:
  test_capture
  capture_ping

> analyzer stop name
```

Show captured traffic data

To view captured data traffic, use the show analyzer command. The command output show the following information for each packet:

- The packet number.
- The timestamp for when the packet was captured.
- The length of the packet and the amount of data captured.
- Whether the packet was sent or received by the device.
- The interface on which the packet was sent or received.
- A hexadecimal dump of the packet of up to 256 bytes.
- Decoded information of the packet.

To show captured data traffic:

Command Line

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.
2. Type the following at the Admin CLI prompt:

```
> show analyzer name capture_filter

Packet 1 : May-29-2020 20:24:20.287682, Length 60 bytes (Captured Length 60
bytes)

Received on interface eth1

        00 40 ff 09 01 20 b4 b6  86 21 b5 73 08 00 45 00   .@... .. .!.s..E.
        00 28 3d 36 40 00 80 06  14 bc 0a 0a 4a 82 0a 0a   .(=6@... ....J...
        4a 48 cd ae 00 16 a4 4b  ff 5f ee 1f d8 23 50 10   JH.....K ._...#P.
        08 02 c7 49 00 00 00 00  00 00 00 00               ...I.... ....

    Ethernet Header
      Destination MAC Addr  : 00:40:09:12:35:36
      Source MAC Addr       : fb:60:53:65:11:1f
      Ethernet Type         : IP (0x0800)
    IP Header
      IP Version            : 4
      Header Length         : 20 bytes
      ToS                   : 0x00
```


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```
    Total Length        : 48 bytes
    ID                  : 15678 (0x3D3E)
    Flags               : Do not fragment
    Fragment Offset     : 0 (0x0000)
    TTL                 : 128 (0x80)
    Protocol            : TCP (6)
    Checksum            : 0x14bc
    Source IP Address   : 10.10.74.138
    Dest. IP Address    : 10.10.74.72
  TCP Header
    Source Port         : 52654
    Destination Port    : 22
    Sequence Number     : 2750443999
    Ack Number          : 3995864355
    Data Offset         : 5
    Flags               : ACK
    Window              : 3859
    Checksum            : 0xc748
    Urgent Pointer      : 0
  TCP Data
    00 00 00 00 00 00
>
```

where capture_filter is the name of a packet capture configuration. See Configure packet capture for the network analyzer for more information.

To determine available packet capture configurations, use the ?:

```
> show analyzer name ?

name: Name of the capture filter to use.
Format:
  test_capture
  capture_ping

> show analyzer name
```

Save captured data traffic to a file

Data traffic is captured to RAM and when the device reboots, the data is lost. To retain the captured data, first save the data to a file and then upload the file to a PC.

To save captured traffic data to a file, use the analyzer save command:

Command Syntax

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

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2. Type the following at the Admin CLI prompt:

```
> analyzer save filename filename name capture_filter
>
```

where:

- filename is the name of the file that the captured data will be saved to.

  Determine filenames already in use:

  Use the tab autocomplete feature to determine filenames that are currently in use:

  ```
  > analyzer save name <tab>
  test1_analyzer_capture      test2_analyzer_capture
  > analyzer save name
  ```

- capture_filter is the name of a packet capture configuration. See Configure packet capture for the network analyzer for more information.

  To determine available packet capture configurations, use the ?:

  ```
  > analyzer save name ?

  name: Name of the capture filter to use.
  Format:
    test_capture
    capture_ping

  > analyzer save name
  ```

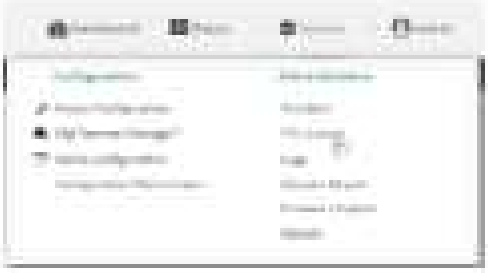
The file is stored in the /etc/config/analyzer directory. To transfer the file to your PC, see Download captured data to your PC.

Download captured data to your PC

After saving captured data to a file (see Save captured data traffic to a file), you can download the file from the WebUI or from the command line by using the scp (secure copy file) command.

WebUI

1. Log into the TX64 WebUI as a user with Admin access.
2. On the menu, click **System**. Under **Administration**, click **File System**.



The **File System** page appears.

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3. Highlight the analyzer directory and click (📂 to open the directory).
4. Select the saved analyzer report you want to download and click 📥 (download).

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. Type **scp** to use the Secure Copy program to copy the file to your PC:

```
> scp host hostname-or-ip user username remote remote-path local local-path
to remote
```

   where:
   - *hostname-or-ip* is the hostname or ip address of the remote host.
   - *username* is the name of the user on the remote host.
   - *remote-path* is the location on the remote host where the file will be copied.
   - *local-path* is the path and filename on the TX64 device.

   For example:

   To download the traffic saved in the file */etc/config/analyzer/eth0.pcpng* to a PC with the IP 192.168.210.2, for a user named **maria**, to the */home/maria* directory:

```
> scp host 192.168.210.2 user maria remote /home/maria local
/etc/config/analyzer/eth0.pcpng to remote

maria@192.168.210.2's password:
eth0.pcpng                                    100%  1180   851.2KB/s   00:00
```

Clear captured data

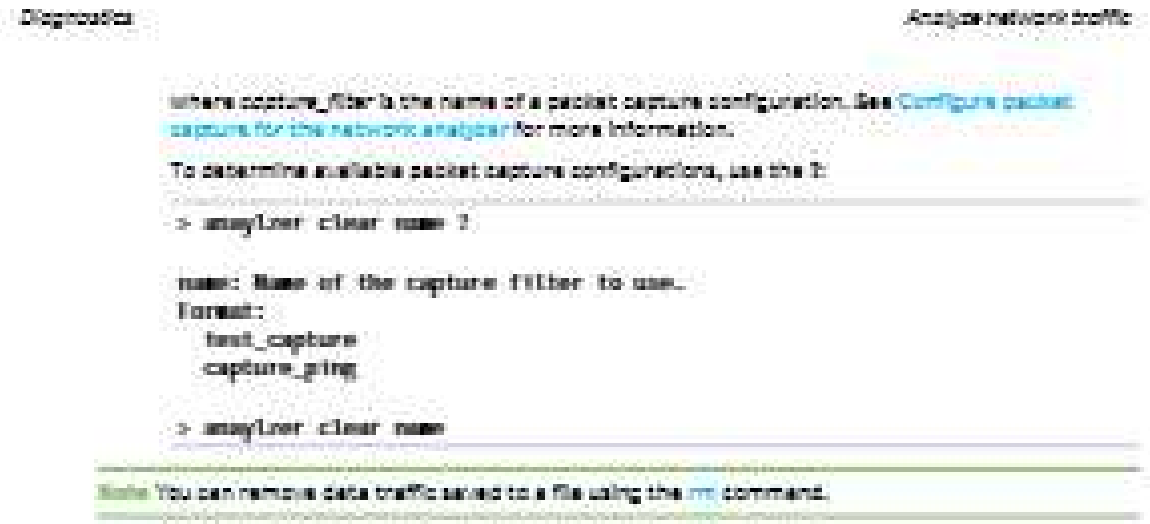
To clear captured data traffic in RAM, use the analyzer clear command:

Command line

1. Log into the TX64 command line as a user with Admin access.
   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.
2. Type the following at the Admin CLI prompt:

```
> analyzer clear name capture_filter
>
```


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Use the ping command to troubleshoot network connections

Use the ping command troubleshoot connectivity problems.

Ping to check internet connection

To check your Internet connection:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the Admin CLI prompt, type the ping command followed by the host name or IP address of the server to be pinged:

```
> ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=11.1 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=10.8 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=54 time=10.7 ms
....
>
```

3. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Stop ping commands

To stop pings when the number of pings to send (the count parameter) has been set to a high value, enter Ctrl+C.

Use the traceroute command to diagnose IP routing problems

Use the traceroute command to diagnose IP routing problems. This command traces the route to a remote IP host and displays results. The traceroute command differs from ping in that traceroute shows where the route fails, while ping simply returns a single error on failure.

See the traceroute command description for command syntax and examples. The traceroute command has several parameters. Only host is required.

- host: The IP address of the destination host.
- bypass: Send directly to a host on an attached network.
- debug: Enable socket level debugging.
- dontfragment: Do not fragment probe packets.
- first_ttl: Specifies with what TTL to start. [Default: 1]
- gateway: Route the packet through a specified gateway.
- icmp: Use ICMP ECHO for probes.
- interface: Specifies the interface.

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- ipchecksums: Calculate ip checksums.
- max_ttl: Specifies the maximum number of hops. (Default: 30)
- nomap: Do not map IP addresses to host names.
- nqueries: Sets the number of probe packets per hop. (Default: 3)
- packetlen: Total size of the probing packet. (Default: -1)
- pausemsecs: Minimal time interval between probes (Default: 0)
- port: Specifies the destination port. (Default: -1)
- src_addr: Chooses an alternative source address.
- tos: Set Type of Service. (Default: -1)
- verbose: Verbose output.
- waittime: Max wait for a response to a probe. (Default: 5)

Example

This example shows using traceroute to verify that the TX64 device can route to host 8.8.8.8 (www.google.com) through the default gateway. The command output shows that 15 routing hops were required to reach the host:

1. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the Admin CLI prompt, use the traceroute command to view IP routing information:

```
> traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 52 byte packets
 1  192.168.8.1 (192.168.8.1)  0 ms  0 ms  0 ms
 2  10.10.10.10 (10.10.10.10)  0 ms  2 ms  2 ms
 3  * 10.10.8.33 (10.10.8.33)  1 ms  1 ms
 4  96.34.84.22 (96.34.84.22)  1 ms  1 ms  1 ms
 5  96.34.81.198 (96.34.81.198)  2 ms  2 ms  2 ms
 6  * * *
 7  96.34.2.17 (96.34.2.17)  11 ms  11 ms  11 ms
 8  * * *
 9  8.8.8.8 (8.8.8.8)  11 ms  11 ms  11 ms
>
```

By entering a whois command on a Unix device, the output shows that the route is as follows:

1. 192/8: The local network of the TX64 device.
2. 192.168.8.1: The local network gateway to the Internet.
3. 96/8: Charter Communications, the network provider.
4. 216/8: Google Inc.

Stop the traceroute process

To stop the traceroute process, enter Ctrl-C.

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Digi TX64 regulatory and safety statements

RF exposure statement

In order to comply with RF exposure limits established in the ANSI C95.1 standards, the distance between the antenna or antennas and the user should not be less than 20 cm.

Federal Communication (FCC) Part 15 Class B

Radio Frequency Interference (RFI) (FCC 15.105)

The Digi TX64 has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet that is on a circuit different from the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

Labeling Requirements (FCC 15.19)

TX64 complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

If the FCC ID is not visible when installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module FCC ID.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Digi may void the user's authority to operate this equipment.

European Community - CE Mark Declaration of Conformity (DoC)

Digi has issued Declarations of Conformity for the TX64 concerning emissions, EMC, and safety. For more information, see www.digi.com/resources/certifications.

Important note

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Digi customers assume full responsibility for learning and meeting the required guidelines for each country in their distribution market. Refer to the radio regulatory agency in the desired countries of operation for more information.

CE mark (Europe)

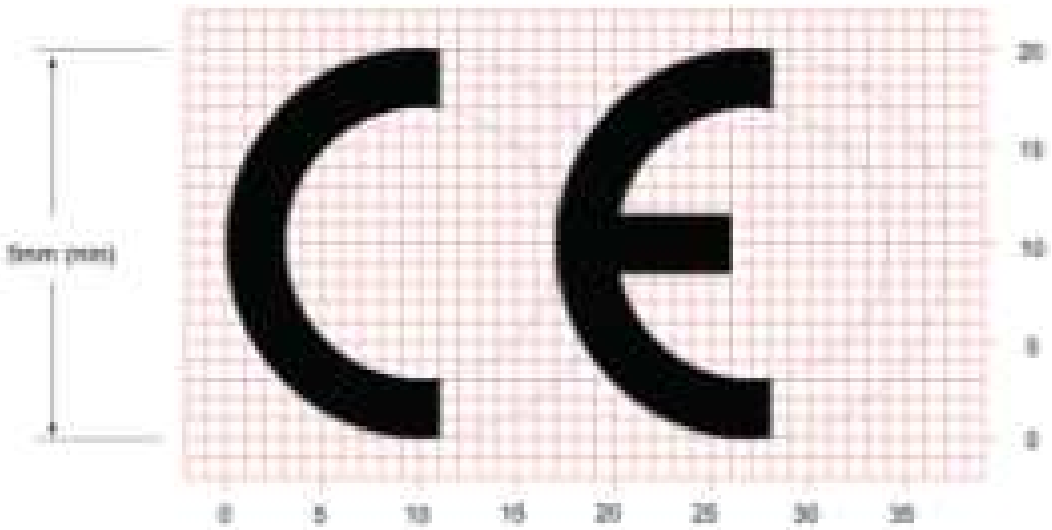
The TX64 is certified for use in several European countries. For information, visit www.digi.com/resources/certifications.

If the TX64 is incorporated into a product, the manufacturer must ensure compliance of the final product with articles 3.1a and 3.1b of the RE Directive (Radio Equipment Directive). A Declaration of Conformity must be issued for each of these standards and kept on file as described in the RE Directive (Radio Equipment Directive). Furthermore, the manufacturer must maintain a copy of the [product name] user manual documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual.

OEM labeling requirements

The "CE" marking must be affixed to a visible location on the OEM product.

CE labeling requirements



The CE mark shall consist of the initials "CE" taking the following form:

- If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
- The CE marking must have a height of at least 5mm except where this is not possible on account of the nature of the apparatus.
- The CE marking must be affixed visibly, legibly, and indelibly.

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Maximum transmit power for radio frequencies

The following tables show the maximum transmit power for frequency bands.

Cellular frequency bands

Frequency bands	Maximum transmit power
Cellular LTE 700 MHz Cellular LTE 800 MHz Cellular LTE 850 MHz Cellular LTE 900 MHz Cellular LTE 1700 MHz Cellular LTE 1800 MHz Cellular LTE 1900 MHz Cellular LTE 2100 MHz	200 mW
Cellular LTE 2500 MHz Cellular LTE 2600 MHz Cellular LTE 2500 MHz	158.49 mW

Wi-Fi frequency bands

Frequency bands	Maximum transmit power
11 overlapping channels at 22 MHz or 40 MHz wide spaced at 5 MHz Centered at 2.412 MHz to 2.472 MHz	631.764 mW
169 overlapping channels at 22 MHz or 40 MHz or 80 MHz wide spaced at 5 MHz Centered at 5180 MHz to 5825 MHz	501.395 mW

Innovation, Science, and Economic Development Canada (IC) certifications

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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RoHS compliance statement

All Digi International Inc. products that are compliant with the RoHS Directive (EU Directive 2002/95/EC and subsequent amendments) are marked as RoHS COMPLIANT. RoHS COMPLIANT means that the substances restricted by the EU Directive 2002/95/EC and subsequent amendments of the European Parliament are not contained in a finished product above threshold limits mandated by EU Directive 2002/95/EC and subsequent amendments, unless the restrictive substance is subject of an exemption contained in the RoHS Directive. Digi International Inc. cannot guarantee that inventory held by distributors or other third parties is RoHS compliant.

Safety notices

- Read all instructions before installing and powering the router. You should keep these instructions in a safe place for future reference.
- If the power supply shows signs of damage or malfunction, stop using it immediately, turn off the power and disconnect the power supply before contacting your supplier for a repair or replacement.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Use only the accessories, attachments, and power supplies provided by the manufacturer-connecting non-approved antennas or power supplies may damage the router, cause interference or create an electric shock hazard, and will void the warranty.
- Do not attempt to repair the product. The router contains no electronic components that can be serviced or replaced by the user. Any attempt to service or repair the router by the user will void the product warranty.
- Ports that are capable of connecting to other apparatus are defined as SELV ports. To ensure conformity with IEC60950 ensure that these ports are only connected to ports of the same type on other apparatus.

Safety statements

WARNING! RISK OF EXPLOSION IF BATTERY IS REPLACED BY INCORRECT BATTERY TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

ATTENTION! IL Y A RISQUE D'EXPLOSION SI LA BATTERIE EST REMPLACÉE PAR UNE BATTERIE DE TYPE INCORRECT. METTRE AU REBUT LES BATTERIES USAGÉES CONFORMÉMENT AUX INSTRUCTIONS

WARNING! For ambient temperatures above 60°C, this equipment must be installed in a Restricted Access Location only.

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AVERTISSEMENT! Cet équipement est destiné à être installé dans un lieu d'accès restreint uniquement.

CAUTION! Hot parts!
To avoid burns when handling device parts, wait at least one half hour after switching off the device before handling parts.

PRUDENCE! Pièces chaudes!
Délais brûlures lors de la manipulation des pièces. Attendez une demi-heure après la mise hors tension avant de manipuler les pièces.

Special safety notes for wireless routers

Digi International products are designed to the highest standards of safety and international standards compliance for the markets in which they are sold. However, cellular-based products contain radio devices which require specific consideration. Take the time to read and understand the following guidance. Digi International assumes no liability for an end user's failure to comply with these precautions.



Wireless routers incorporate a wireless radio module. Users should ensure that the antenna(s) is (are) positioned at least 1 meter away from themselves and other persons in normal operation.
When in a hospital or other health care facility, observe the restrictions on the use of mobile phones. Do not use the router in areas where guidelines posted in sensitive areas instruct users to switch off mobile phones. Medical equipment may be sensitive to RF energy.
The operation of cardiac pacemakers, other implanted medical equipment and hearing aids can be affected by interference from cellular terminals such as the wireless routers when placed close to the device. If in doubt about potential danger, contact the physician or the manufacturer of the device to verify that the equipment is properly shielded. Pacemaker patients are advised to keep the wireless router away from the pacemaker while it is on.



Wireless routers must NOT be operated on aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communications systems. Failure to observe these instructions may lead to the suspension or denial of cellular services to the offender, legal action, or both.



As with any electrical equipment, do not operate the router in the presence of flammable gases, fumes or potentially explosive atmospheres. Do not use radio devices anywhere that blasting operations occur.



Wireless routers receive and transmit radio frequency energy when power is on. Interference can occur when using the router close to TV sets, radios, computers or inadequately shielded equipment. Follow any special regulations and always power off your router wherever forbidden or when it may cause interference or danger.

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SOS IMPORTANT! Wireless routers operate using radio signals and cellular networks cannot be guaranteed to connect in all possible conditions. Therefore, never rely solely upon any wireless device for life critical communications.

Product disposal instructions

The WEEE (Waste Electrical and Electronic Equipment: 2002/96/EC) directive has been introduced to ensure that electrical/ electronic products are recycled using the best available recovery techniques to minimize the impact on the environment.

This product contains high quality materials and components which can be recycled. At the end of its life this product MUST NOT be mixed with other commercial waste for disposal. Check with the terms and conditions of your supplier for disposal information.

Digi International Ltd WEEE Registration number: WEE/HF1551/U

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DigiTX64 Certifications

International EMC (Electromagnetic Compatibility) and safety standards

This product complies with the requirements of the following Electromagnetic Compatibility standards.

There are no user-serviceable parts inside the product. Contact your Digi representative for repair information.

Certification category	Standards
Electromagnetic Compatibility (EMC) compliance standards	• EN 300 328 v2.2.2 • EN 301 893 v2.1.1 • EN 301 489 • FCC Part 15 Subpart B Class B
Safety compliance standards	EN 62368
E-UTRA CA, E-UTRA FDD, E-UTRA TDD, UMTS FDD	PTCRB
Cellular carriers	See the current list of carriers on the TX64 datasheet, available on the Digi TX64 Specifications page.

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Command line interface

This chapter contains the following topics:

Access the command line interface 767
Log in to the command line interface 767
Exit the command line interface 768
Execute a command from the web interface 768
Display help for commands and parameters 768
Auto-complete commands and parameters 771
Available commands 772
Use the scp command 774
Display status and statistics using the show command 775
Device configuration using the command line interface 777
Execute configuration commands at the root Admin CLI prompt 777
Configuration mode 778
Command line reference 804

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Access the command line Interface

You can access the TX64 command line interface using an SSH connection, a telnet connection, or a serial connection. You can use an open-source terminal software, such as PuTTY or TeraTerm, to access the device through one of these mechanisms.

You can also access the command line interface in the WebUI by using the **Terminal**, or the Digi Remote Manager by using the **Console**.

To access the command line, your device must be configured to allow access, and you must log in as a user who has been configured for the appropriate access. For further information about configuring access to these services, see:

- Serial: Configure the serial port
- WebUI: Configure the web administration service
- SSH: Configure SSH access
- Telnet: Configure telnet access

Log In to the command line Interface

Command line

1. Connect to the TX64 device by using a serial connection, SSH or telnet, or the **Terminal** in the WebUI or the **Console** in the Digi Remote Manager. See Access the command line interface for more information.
   - For serial connections, the default configuration is:
     - 115200 baud rate
     - 8 data bits
     - no parity
     - 1 stop bit
     - no flow control
   - For SSH and telnet connections, the default IP address of the device is 192.168.2.1 on the ETH2, ETH3, and ETH4 Ethernet ports.
2. At the login prompt, enter the username and password of a user with Admin access:

```
login: admin
Password: **********
```

   The default username is **admin**. The default unique password for your device is printed on the device label.
3. Depending on the device configuration, you may be presented with another menu, for example:

```
Access selection menu:

        a: Admin CLI
        s: Shell
        q: Quit

Select access or quit [admin] :
```


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Type **admin** to access the TX64 command line.

You will now be connected to the Admin CLI:

```
Connecting now, 'exit' to disconnect from Admin CLI ...

>
```

See Command line interface for detailed instructions on using the command line interface.

Exit the command line interface

Command line

1. At the command prompt, type **exit**.

   ```
   > exit
   ```

2. Depending on the device configuration, you may be presented with another menu, for example:

   ```
   Access selection menu:

           a: Admin CLI
           s: Shell
           q: Quit

   Select access or quit [admin] :
   ```

   Type **q** or **quit** to exit.

Execute a command from the web interface

1. Log into the TX64 WebUI as a user with Admin access.
2. At the main menu, click **Terminal**. The device console appears.

   ```
   TX64 login:
   ```

3. Log into the TX64 command line as a user with Admin access.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

   The Admin CLI prompt appears.

   ```
   >
   ```


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Display help for commands and parameters

The help command

When executed from the root command prompt, help displays information about autocomplete operations, how to move the cursor on the TX64 command line, and other keyboard shortcuts:

```
> help

  Commands
  ------------------------------------------------------------------------------
  ?               Show commands help
  <tab>           Tab completion, displays all valid commands to complete command,
                  if only one command is possible, it is used
  <Space>         Like tab except shortest prefix is used if command is valid
  <Enter>         Enter an input. If quoting then a new line is created instead. If
                  the input is invalid then characters will be deleted until a
                  prefix for a valid command is found.
  Ctrl + A        Move cursor to start of line
  Ctrl + E        Move cursor to end of line
  Ctrl + W        Delete word under cursor until start of line or [\',",=,:,\,/,-]
  Ctrl + R        If the current input is invalid then characters will be deleted
                  until a prefix for a valid command is found.
  Ctrl + left     Jump cursor left until start of line or [\',",=,:,\,/,-]
  Ctrl + right    Jump cursor right until start of line or [\',",=,:,\,/,-]

>
```

The question mark (?) command

When executed from the root command prompt, ? displays available commands:

```
> ?

  Commands
  ------------------------------------------------------------------------------
  config          View and modify the configuration
  exit            Exit the CLI
  analyzer        Analyzer commands.
  cp              Copy a file or directory.
  help            Show CLI editing and navigation commands.
  ls              List a directory.
  mkdir           Create a directory.
  modem           Modem commands.
  more            View a file.
  mv              Move a file or directory.
  ping            Ping a host.
  reboot          Reboot the system.
  rm              Remove a file or directory.
  scp             Copy a file or directory over SSH.
  show            Show instance statistics.
  system          System commands.
  traceroute      Print the route packets trace to network host.
  update          Update firmware.
```


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```
>
```

Display help for individual commands

When included with a command name, both ? and help provide further information about the command. For example:

1. To display further information about the show command, type either show ? or show help:

```
> show ?

Commands
--------

arp             Show ARP tables
cloud           Show dns statistics
config          Show config deltas.
dhcp-lease      Show DHCP leases.
event           Show event list
ipsec           Show IPsec statistics.
location        Show location information.
log             Show syslog.
manufacturer    Show manufacturer information.
modem           Show modem statistics.
network         Show network interface statistics.
openvpn         Show OpenVPN statistics.
route           Show IP routing information.
serial          Show serial statistics.
system          Show system statistics.
version         Show firmware version.
wifi            Show Wi-Fi statistics.

> show
```

2. To display additional information about a specific command:

```
> show wifi ?

Commands
--------

ap          Show Wi-Fi access points.
client      Show Wi-Fi client mode connections.

> show wifi
```

3. To display a syntax diagram and parameter information:

```
> show wifi ap ?

Display details for Wi-Fi access points.

Syntax: ap [all] [name {digi_ap1|digi_ap2}]
```


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```
Parameters

all          Display all Wi-Fi access points.
name         Investigate a Wi-Fi access point

> show wifi ap
```

Use the Tab key or the space bar to display abbreviated help

When executed from the root command prompt, pressing the Tab key or the space bar displays an abbreviated list of available commands:

```
><space>
config      exit        cp          help        ls          mkdir       modem
more        mv          ping        reboot      rm          scp         show
system      traceroute  update
>
```

Similar behavior is available with any command name:

```
> config network interface <space>
..          ...             defaultip       defaultiniklocal  lan1
loopback    wan1            wan2            wan3
> config network interface
```

Auto-complete commands and parameters

When entering a command and parameter, press the Tab key to cause the command line interface to auto-complete as much of the command and parameter as possible. Typing the space bar has similar behavior. If multiple commands are available that will match the entered text, auto-complete is not performed and the available commands are displayed instead.

Auto-complete applies to these command elements only:

- Command names. For example, typing net<Tab> auto-completes the command as network.
- Parameter names. For example:
  - ping /hostname int<Tab> auto-completes the parameter as interface.
  - system b<Tab> auto-completes the parameter as backup.
- Parameter values, where the value is one of an enumeration or an on/off type; for example:

```
(config)> serial port1 enable t<Tab>
```

auto-completes to:

```
(config)> serial port1 enable true
```

Auto-complete does not function for:

- Parameter values that are string types.
- Integer values.

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Command Shell Interface Auto-complete commands and parameters

- File names.
- Select parameters passed to commands that perform an action.

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Available commands

The following commands are available from the Admin CLI prompt:

Command	Description
config	Used to view and modify the configuration. See Device configuration using the command line interface for more information about using the config command.
edit	Edits the CLI.
cp	Copies a file or directory.
help	Displays: • CLI editing and navigation commands, when executed from the root of the Admin CLI prompt. • Available commands, syntax diagram, and parameter information, when executed in conjunction with another command. See Display help for commands and parameters for information about the help command.
ls	Lists the contents of a directory.
mkdir	Creates a directory.
modem	Executes modem commands.
more	Displays the contents of a file.
mv	Moves a file or directory.
ping	Pings a remote host using Internet Control Message Protocol (ICMP) Echo Request messages.
reboot	Reboots the TX64 device.
rm	Removes a file.
scp	Uses the secure copy protocol (SCP) to transfer files between the TX64 device and a remote host. See Use the scp command for information about using the scp command.
show	Displays information about the device and the device's configuration. See Display status and statistics using the show command for more information about the show command.
system	Issues commands related to system functionality.
traceroute	Sends and tracks route packets to a destination host.
update	Updates the device firmware.

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Note For commands that operate on the TX64's file system, such as the cp, ls, and mkdir commands, see File system for information about the file system, including how to copy, move and delete files and directories.

Use the scp command

The scp command uses Secure Copy Protocol (SCP) to transfer files between the TX64 device and a remote host.

Required configuration items

- The hostname or IP address of the remote host.
- The username and password of the user on the remote host.
- Whether the file is being copied to the TX64 device from a remote host, or to the remote host from the TX64 device.
  - If the file is being copied to the TX64 device from a remote host:
    - The path and filename of the file on the remote host that will be copied to the TX64 device.
    - The location on the TX64 device where the file will be copied.
  - If the file is being copied to a remote host from the TX64 device:
    - The path and filename of the file on the TX64 device that will be copied to the remote host.
    - The location on the remote host where the file will be copied.

Copy a file from a remote host to the TX64 device

To copy a file from a remote host to the TX64 device, use the scp command as follows:

```
> scp host hostname-or-ip user username remote remote-path local local-path to
local
```

where:

- hostname-or-ip is the hostname or ip address of the remote host.
- username is the name of the user on the remote host.
- remote-path is the path and filename of the file on the remote host that will be copied to the TX64 device.
- local-path is the location on the TX64 device where the copied file will be placed.

For example:

To copy firmware from a remote host with an IP address of 192.168.4.1 to the /etc/config directory on the TX64 device, issue the following command:

```
> scp host 192.168.4.1 user admin remote /home/admin/bin/TX64-38.5.38.39.bin
local /etc/config/ to local
admin@192.168.4.1's password: adminpwd
TX64-38.5.38.39.bin                    100%   30MB    11.1MB/s        00:03
>
```


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Transfer a file from the TX64 device to a remote host

To copy a file from the TX64 device to a remote host, use the scp command as follows:

```
> scp host hostname-or-ip user username remote remote-path local local-path to
remote
```

where:

- hostname-or-ip is the hostname or ip address of the remote host.
- username is the name of the user on the remote host.
- remote-path is the location on the remote host where the file will be copied.
- local-path is the path and filename on the TX64 device.

For example:

To copy a support report from the TX64 device to a remote host at the IP address of 192.168.4.1:

1. Use the system support-report command to generate the report:

```
> system support-report /etc/config/
Saving support report to /etc/config/support-report-[illegible]-13.22.15.bin
Support report saved.
>
```

2. Use the scp command to transfer the report to a remote host:

```
> scp host 192.168.4.1 user admin remote /home/admin/tmp/ local
/etc/config/support-report-00:40:9D:13:35:36-20-05-29-13.22.15.bin to
remote
admin@192.168.4.1's password: adminpwd
support-report-[illegible]-13.22.15.bin
>
```

Display status and statistics using the show command

The TX64 show command display status and statistics for various features.

For example:

show config

The show config command displays all the configuration settings for the device that have been changed from the default settings. This is a particularly useful when troubleshooting the device.

```
> show config

auth tacacs+ service "login"
auth user admin password
"$2a$05$[illegible]"
add auth user test
add auth user test group end "admin"
add auth user test group end "serial"
auth user test password
"$2a$05$[illegible]"
```


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```
network interface lan ipv4 type "dhcp"
network interface lan zone "external"
network interface modem modem apn 0 apn "00000.000"
network interface modem modem apn_lock "true"
system version "445"

>
```

show system

The show system command displays system information and statistics for the device, including CPU usage.

```
> show system

  Model                    : Digi TX64
  Serial Number            : TX64-000005
  SKU                      : TX64
  Hostname                 : TX64
  MAC                      : 00:00:E3:AE:21:18

  Hardware Version         : 50002347-01 IP
  Firmware Version         : 20.5.38.39
  Alt. Firmware Version    : 20.5.38.35
  Bootloader Version       : 20.7.23.4-15P81Ga4ed

  Current Time             : Fri, 29 May 2020 21:04:12 +0000
  CPU                      : 1.4%
  Uptime                   : 6 days, 6 hours, 31 minutes, 57 seconds (541317s)
  Temperature              : 40C

>
```

show network

The show network command displays status and statistics for network interfaces.

```
> show network

  Interface          Proto   Status    Address
  ------------------ ------- --------- ------------------------------------------
  defaultip          IPv4    up        192.168.210.1/24
  defaultlinklocal   IPv4    up        169.254.100.100/16
  lan1               IPv4    up        192.168.2.1
  lan1               IPv6    up        0:0:0:0:0:ffff:c0a8:201
  loopback           IPv4    up        127.0.0.1/8
  wan1               IPv4    up        192.168.3.1/24
  wan1               IPv6    up        fd00:2704::340:ffff:fe00:120/64
  wwan1              IPv4    up        192.168.4.1/24
  wwan1              IPv6    up        0:0:0:0:0:ffff:c0a8:501/64
  wwan2              IPv4    down
  wwan2              IPv6    down

>
```


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Device configuration using the command line interface

The config command allows for device configuration from the command line. All configuration tasks that can be performed by using the WebUI can also be performed by using the config command.

There are two ways to invoke the config command from the CLI:

- Execute the config command and parameters at the root prompt. See Execute configuration commands at the root Admin CLI prompt for more information.
- Enter configuration mode by executing the config command without any parameters. See Configuration mode for more information.

Execute configuration commands at the root Admin CLI prompt

You can execute the config command at the root Admin CLI prompt with any appropriate parameters. When the config command is used in this way, changes to the device's configuration are automatically saved when the command is executed.

For example, to disable the SSH service from the root prompt, enter the following command:

```
> config service ssh enable false
>
```

The TX64 device's ssh service is now disabled.

Note When the config command is executed at the root prompt, certain configuration actions that are available in configuration mode cannot be performed. This includes validating configuration changes, canceling and reverting configuration changes, and performing actions on elements in lists. See Configuration mode for information about using configuration mode.

Display help for the config command from the root Admin CLI prompt

Display additional configuration commands, as well as available parameters and values, by entering the question mark (?) character after the config command.

1. For example:

   ```
   > config ?
   ```

   Will display the following help information:

   ```
   > config ?

   Additional Configuration

   application          Custom scripts
   auth                 Authentication
   cloud                Central management
   firewall             Firewall
   monitoring           Monitoring
   network              Network
   serial               Serial
   ```


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```
service          Services
system           System
vpn              VPN

Run "config" with no arguments to enter the configuration editing mode.

> config
```

2. You can then display help for the additional configuration commands. For example, to display help for the config service command:

```
> config service ?
Services

Additional Configuration

dns              DNS
mdns             Service Discovery (mDNS)
multicast        Multicast
ntp              NTP
remote_control   Remote control
snmp             SNMP
ssh              SSH
telnet           Telnet
web_admin        Web administration

> config service
```

3. Next, display help for the config service ssh command:

```
> config service ssh ?

SSH: An SSH server for managing the device.

Parameters       Current Value

enable           true            Enable
key              [private]       Private key
port             22              Port

Additional Configuration

acl              Access control list
mdns

> config service ssh
```

4. Lastly, display the allowed values and other information for the enable parameter:

```
> config service ssh enable ?

Enable: Enable the service.
```


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```
Format: true, false, yes, no, 1, 0
Default value: true
Current value: true

> config service ssh enable
```

Configuration mode

Configuration mode allows you to perform multiple configuration tasks and validate the changes prior to saving them. You can cancel all changes without saving them at any time. Configuration changes do not take effect until the configuration is saved.

Enable configuration mode

To enable configuration mode, at the root prompt, enter the **config** command without any parameters:

```
> config
(config)>
```

When the command line is in configuration mode, the prompt will change to include **(config)**, to indicate that you are currently in configuration mode.

Enter configuration commands in configuration mode

There are two ways to enter configuration commands while in configuration mode:

- Enter the full command string from the config prompt.

  For example, to disable the ssh service by entering the full command string at the config prompt:

  ```
  (config)> service ssh enable false
  (config)>
  ```

- Execute commands by moving through the configuration schema.

  For example, to disable the ssh service by moving through the configuration and then executing the **enable false** command:

  1. At the config prompt, enter **service** to move to the service node:

     ```
     (config)> service
     (config service)>
     ```

  2. Enter **ssh** to move to the ssh node:

     ```
     (config service)> ssh
     (config service ssh)>
     ```

  3. Enter **enable false** to disable the ssh service:

     ```
     (config service ssh)> enable false
     (config service ssh)>
     ```


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See Move within the configuration schema for more information about moving within the configuration.

Save changes and exit configuration mode

To save changes that you have made to the configuration while in configuration mode, use save. The save command automatically validates the configuration changes; the configuration will not be saved if it is not valid. Note that you can also validate configuration changes at any time while in configuration mode by using the validate command.

```
(config)> save
Configuration saved.
>
```

After using save to save changes to the configuration, you will automatically exit configuration mode. To return to configuration mode, type config again.

Exit configuration mode without saving changes

You can discard any unsaved configuration changes and exit configuration mode by using the cancel command:

```
(config)> cancel
>
```

After using cancel to discard unsaved changes to the configuration, you will automatically exit configuration mode.

Configuration actions

In configuration mode, configuration actions are available to perform tasks related to saving or canceling the configuration changes, and to manage items and elements in data. The commands can be listed by entering a question mark (?) at the config prompt.

The following actions are available:

Configuration action	Description
cancel	Discards unsaved configuration changes and exits configuration mode.
save	Saves configuration changes and exits configuration mode.
validate	Validates configuration changes.
revert	Reverts the configuration to default settings. See The revert command for more information.
show	Displays configuration settings.

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Configuration actions	Description
add	Adds a named element, or an element in a list. See Manage elements in Data for information about using the add command with Data.
del	Deletes a named element, or an element in a list. See Manage elements in Data for information about using the del command with Data.
move	Moves elements in a list. See Manage elements in Data for information about using the move command with Data.

Display command line help in configuration mode

Display additional configuration commands, as well as available parameters and values, by entering the question mark (?) character at the config prompt. For example:

1. Enter ? at the config prompt:

```
(config)> ?
```

This will display the following help information:

```
(config)> ?

Additional Configuration

application             Custom scripts
auth                    Authentication
cloud                   Central management
firewall                Firewall
monitoring              Monitoring
network                 Network
serial                  Serial
service                 Services
system                  System
vpn                     VPN

(config)>
```

2. You can then display help for the additional configuration commands. For example, to display help for the config service command, use one of the following methods:
   - At the config prompt, enter service ?:

```
(config)> service ?
```


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- At the config prompt:
  a. Enter service to move to the service node:

```
(config)> service
(config service)>
```

  b. Enter ? to display help for the service node:

```
(config service)> ?
```

Either of these methods will display the following information:

```
config> service ?

Services

  Additional Configuration

dns                  DNS
edns                 Service Discovery (mDNS)
multicast            Multicast
ntp                  NTP
remote_control       Remote control
snmp                 SNMP
ssh                  SSH
telnet               Telnet
web_admin            Web administration

(config)> service
```

3. Next, to display help for the service ssh command, use one of the following methods:
   - At the config prompt, enter service ssh ?:

```
(config)> service ssh ?
```

   - At the config prompt:
     a. Enter service to move to the service node:

```
(config)> service
(config service)>
```

     b. Enter ssh to move to the ssh node:

```
(config service)> ssh
(config service ssh)>
```

     c. Enter ? to display help for the ssh node:

```
(config service ssh)> ?
```


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Either of these methods will display the following information:

```
(config)> service ssh ?

SSH: An SSH server for managing the device.

Parameters                      Current Value

enable                          true            Enable
key                             [private]       Private key
port                            22              Port

Additional Configuration

acl                             Access control list
mdns

(config)> service ssh
```

4. Lastly, to display allowed values and other information for the enable parameter, use one of the following methods:
   - At the config prompt, enter service ssh enable ?:

     ```
     (config)> service ssh enable ?
     ```

   - At the config prompt:
     a. Enter service to move to the service node:

        ```
        (config)> service
        (config service)>
        ```

     b. Enter ssh to move to the ssh node:

        ```
        (config service)> ssh
        (config service ssh)>
        ```

     c. Enter enable ? to display help for the enable parameter:

        ```
        (config service ssh)> enable ?
        (config service ssh)>
        ```

Either of these methods will display the following information:

```
(config)> service ssh enable ?

Enable: Enable the service.
Format: true, false, yes, no, 1, 0
Default value: true
Current value: true

(config)> service ssh enable
```


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Move within the configuration scheme

You can perform configuration tasks at the CLI by moving within the configuration.

- Move forward one node in the configuration by entering the name of an Additional Configuration option:
  1. At the config prompt, type service to move to the service node:

     ```
     (config)> service
     (config service)>
     ```

  2. Type ssh to move to the ssh node:

     ```
     (config service)> ssh
     (config service ssh)>
     ```

  3. Type acl to move to the acl node:

     ```
     (config service ssh)> acl
     (config service ssh acl)>
     ```

  4. Type zone to move to the zone node:

     ```
     (config service ssh acl)> zone
     (config service ssh acl zone)>
     ```

  You can also enter multiple nodes at once to move multiple steps in the configuration:

  ```
  (config)> service ssh acl zone
  (config service ssh acl zone)>
  ```

- Move backward one node in the configuration by entering two periods (..):

  ```
  (config service ssh acl zone)> ..
  (config service ssh acl)>
  ```

  You can also move back multiples nodes in the configuration by typing multiple sets of two periods:

  ```
  (config service ssh acl zone)> .. .. ..
  (config service)>
  ```

- Move to the root of the config prompt from anywhere within the configuration by entering three periods (...):

  ```
  (config service ssh acl zone)> ...
  (config)>
  ```

Manage elements in lists

While in configuration mode, you can use the add, del, and move action commands to manage elements in a list. When working with lists, these actions require an index number to identify the list item that will be acted on.

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Add elements to a list

When used with parameters that contains lists of elements, the add command is used to add an element to the list.

For example, to add an authentication method:

1. Display current authentication method by using the show command:

```
(config)> show auth method
0 local
(config)>
```

2. Add an authentication method by using the add index_item command. For example:
   - To add the TACACS+ authentication method to the beginning of the list, use the index number 0:

```
(config)> add auth method 0 tacacs+
(config)> show auth method
0 tacacs+
1 local
(config)>
```

   - To add the TACACS+ authentication method to the end of the list, use the end keyword:

```
(config)> add auth method end tacacs+
(config)> show auth method
0 local
1 tacacs+
(config)>
```

The end keyword

As demonstrated above, the end keyword is used to add an element to the end of a list. Additionally, the end keyword is used to add an element to a list that does not have any elements.

For example, to add an authentication group to a user that has just been created:

1. Use the show command to verify that the user is not currently a member of any groups:

```
(config)> show auth user new-user group
(config)>
```

2. Use the end keyword to add the admin group to the user's configuration:

```
(config)> add auth user new-user group end admin
(config)>
```

3. Use the show command again to verify that the admin group has been added to the user's configuration:

```
(config)> show auth user new-user group
0 admin
(config)>
```


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Delete elements from a list

When used with parameters that contains lists of elements, the del command is used to delete an element in the list.

For example, to delete an authentication method:

1. Use the show command to display current authentication method configuration:

```
(config)> show auth method
0 local
1 tacacs+
2 radius
(config)>
```

2. Delete one of the authentication methods by using the del *index_number* command. For example:
   a. To delete the local authentication method, use the index number 0:

```
(config)> del auth method 0
(config)>
```

   b. Use the show command to verify that the local authentication method was removed:

```
(config)> show auth method
0 tacacs+
1 radius
(config)>
```

Move elements within a list

Use the move command to reorder elements in a list.

For example, to reorder the authentication methods:

1. Use the show command to display current authentication method configuration:

```
(config)> show auth method
0 local
1 tacacs+
2 radius
(config)>
```

2. To configure the device to use TACACS+ authentication first to authenticate a user, use the **move** *index_number_1 index_number_2* command:

```
(config)> move auth method 1 0
(config)>
```

3. Use the show command again to verify the change:

```
(config)> show auth method
0 tacacs+
1 local
2 radius
(config)>
```


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The revert command

The revert command is used to revert changes to the TX64 device's configuration and restore default configuration settings. The behavior of the revert command varies depending on where in the configuration hierarchy the command is executed, and whether the optional path parameter is used. After executing the revert command, you must save the configuration changes by using the save command. You can also discard the configuration changes by using the cancel command.



CAUTION! The revert command reverts all changes to the default configuration, not only unsaved changes.

Revert all configuration changes to default settings

To discard all configuration changes and revert to default settings, use the revert command at the config prompt without the optional path parameter:

1. At the config prompt, enter revert:

```
(config)> revert
(config)>
```

2. Set the password for the admin user prior to saving the changes:

```
(config)> auth user admin password pwd
(config)>
```

3. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```

4. Type exit to exit the Admin CLI.
   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Revert a subset of configuration changes to the default settings

There are two methods to revert a subset of configuration changes to the default settings:

- Enter the revert command with the path parameter. For example, to revert all changes to the authentication methods configuration:
  1. Enter the revert command with the path set to auth method:

```
(config)> revert auth method
(config)>
```

  2. Save the configuration and apply the change:

```
(config)> save
Configuration saved.
>
```


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5. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

- Move to the location in the configuration and enter the revert command without the path parameter. For example:

  1. Change to the auth method node:

     ```
     (config)> auth method
     (config auth method)>
     ```

  2. Enter the revert command:

     ```
     (config auth method)> revert
     (config auth method)>
     ```

  3. Save the configuration and apply the change:

     ```
     (config auth method)> save
     Configuration saved.
     >
     ```

  4. Type exit to exit the Admin CLI.

     Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

- You can also use a combination of both of these methods:

  1. Change to the auth node:

     ```
     (config)> auth
     (config auth)>
     ```

  2. Enter the revert command with the path set to method:

     ```
     (config auth)> revert method
     (config auth)>
     ```

  3. Save the configuration and apply the change:

     ```
     (config auth)> save
     Configuration saved.
     >
     ```

  4. Type exit to exit the Admin CLI.

     Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Enter strings in configuration commands

For string parameters, if the string value contains a space, the value must be enclosed in quotation marks. For example, to assign a descriptive name for the device using the system command, enter:

```
(config)> system description "Digi TX64"
```


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Example: Create a new user by using the command line

In this example, you will use the TX64 command line to create a new user, provide a password for the user, and assign the user to authentication groups.

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. At the config prompt, create a new user with the username **user1**:
   - Method one: Create a user at the root of the config prompt:

```
(config)> add auth user user1
(config auth user user1)>
```

   - Method two: Create a user by moving through the configuration:
     a. At the config prompt, enter **auth** to move to the auth node:

```
(config)> auth
(config auth)>
```

     b. Enter **user** to move to the user node:

```
(config auth)> user
(config auth user)>
```

     c. Create a new user with the username **user1**:

```
(config auth user)> add user1
(config auth user user1)>
```

4. Configure a password for the user:

```
(config auth user user1)> password pwd1
(config auth user user1)>
```

5. List available authentication groups:

```
(config auth user user1)> show .. ... group

admin
    acl
        admin
            enable true
        nagios
            enable false
        openvpn
            enable false
            no tunnels
```


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```
            portal
                enable false
                no portals
            serial
                enable false
                no ports
            shell
                enable false

        serial
            acl
                admin
                    enable true
                nagios
                    enable false
                openvpn
                    enable false
                    no tunnels
                portal
                    enable false
                    no portals
                serial
                    enable true
                        ports
                            1 port1
                shell
                    enable false
(config auth user user1)>
```

8. Add the user to the admin group:

```
(config auth user user1)> add group end admin
(config auth user user1)>
```

9. Save the configuration and apply the change:

```
(config auth user user1)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Example: Configure multiple WANs and LANs by using the command line

The default configuration of the TX64 consists of one WAN (WAN1), two Wireless WANs (WWAN1 and WWAN2), and one LAN (LAN1). The WANs are configured to use the following devices:

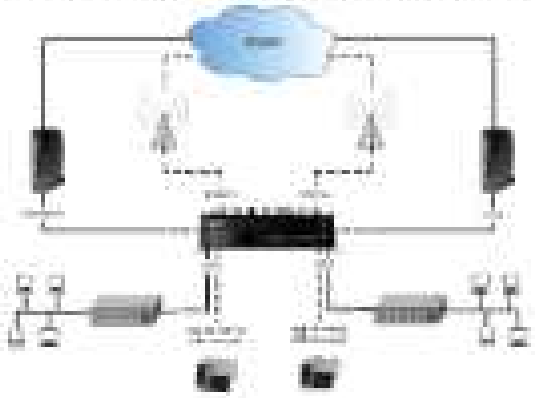
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- MAN1: WAN/ETH1 Ethernet port
- WWAN1: WWAN1 cellular modem
- WWAN2: WWAN2 cellular modem.

LAN1 is configured to use the LAN1 bridge. Its default IP address is 192.168.0.1, and it has its DHCP server enabled. . The default configuration of the LAN1 bridge consists of the following devices:

- ETH2
- ETH3
- ETH4
- WWAN1 cellular modem.
- WWAN2 cellular modem

In this example, we will use the command line to create a second bridge, called LAN2. We will then create a second LAN, LAN2, and configure LAN2 to use the new bridge. We will also create a second WAN that uses the ETH4 Ethernet port to provide additional redundant failover WAN capabilities.



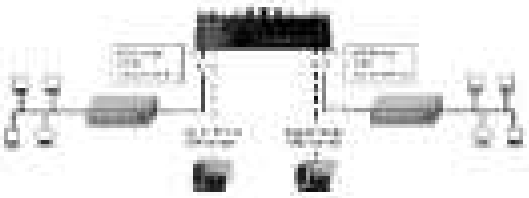
Notice To avoid potential problems with access to the device while performing these procedures, you should use the serial port to perform these tasks, or, if you are using an Ethernet connection, it should be connected to LAN1 through the ETH2 Ethernet port.

Task one: Configure bridges

In this task, we will create a new bridge and configure the LAN1 and LAN2 bridges to use the following devices:

- LAN1 bridge:
  - ETH2
  - WWAN2 cellular modem.
- LAN2 bridge:
  - ETH3
  - Digi AP (Wi-Fi)

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In task two, we will assign the new LAN3 bridge to a LAN.

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type **admin** to access the Admin CLI.

2. At the command line, type **config** to enter configuration mode:

```
> config
(config)>
```

3. Display a list of devices currently configured for the LAN3 bridge:
   - Method one: Enter the full command at the config prompt:

```
(config)> show network bridge lan1 device
0 /network/device/eth2
1 /network/device/eth3
2 /network/device/eth4
3 /network/wireless/ap/digi_ap0
4 /network/wireless/ap/digi_ap2
(config)>
```

   - Method two: Move within the configuration to the **network bridge lan1 device** location and the use the **show** command display the list of devices:
     a. Change to the **network** node:

```
(config)> network
(config network)>
```

     b. Change to the **bridge** node:

```
(config network)> bridge
(config network bridge)>
```

     c. Change to the **lan1** node:

```
(config network bridge)> lan1
(config network bridge lan1)>
```

     d. Change to the **device** node:

```
(config network bridge lan1)> device
(config network bridge lan1 device)>
```


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a. Enter show:

```
(config network bridge lan1 device)> show
0 /network/device/eth3
1 /network/device/eth3
2 /network/device/eth4
3 /network/wireless/ap/digi_ap3
4 /network/wireless/ap/digi_ap2
(config network bridge lan1 device)>
```

Note For the rest of this example configuration, command line examples will use a single command entered at the root config prompt (method one above). However, any command line example in this example configuration can also be performed by moving within the configuration to the appropriate location (method two above).

4. Remove devices from the LAN1 bridge that will be used by other interfaces in this configuration.
   a. Remove the Digi AP (Wi-Fi2) access point (/network/wireless/ap/digi_ap2) from the bridge, using its index number, 4, as determined above with the show command:

```
(config)> del network bridge lan1 device 4
(config)>
```

   b. Remove the ETH4 device (/network/device/eth4) from the bridge, using its index number, 2, as determined above with the show command:

```
(config)> del network bridge lan1 device 2
(config)>
```

   c. Remove the ETH3 device (/network/device/eth3) from the bridge, using its index number, 0, as determined above with the show command:

```
(config)> del network bridge lan1 device 1
(config)>
```

   d. Use the show command again to verify that the LAN1 bridge now has only two devices, ETH3 and Digi AP (Wi-Fi1):

```
(config)> show network bridge lan1 device
0 /network/device/eth3
1 /network/wireless/ap/digi_ap3
(config)>
```

5. Create a new bridge, named LAN2:

```
(config)> add network bridge LAN2
(config network bridge LAN2)>
```

6. Add devices to the bridge:
   a. View available devices and the proper syntax by using the add device command with the TAB autocomplete feature:

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```
(config network bridge LAN2)> add device end <TAB>
(config network bridge LAN2)> add device end /network/<TAB>
/network/device/eth1              /network/device/eth2
/network/device/eth3
/network/device/eth4              /network/device/loopback
/network/bridge/LAN2
/network/bridge/Lan1              /network/wireless/ap/digi_ap3
/network/wireless/ap/digi_ap2
(config network bridge LAN2)>
```

b. Add the ETH3 device to the bridge:

```
(config network bridge LAN2)> add device end /network/device/eth3
(config network bridge LAN2)>
```

c. Add the Digi AP (Wi-Fi2) access point to the bridge:

```
(config network bridge LAN2)> add device end /network/wireless/ap/digi_
ap2
(config network bridge LAN2)>
```

d. Use the show command again to verify that the LAN2 bridge now has two devices, ETH3 and Digi AP (Wi-Fi2):

```
(config network bridge LAN2)> show network bridge lan2 device
0 /network/device/eth3
1 /network/wireless/ap/digi_ap2
(config network bridge LAN2)>
```

7. Save the configuration and apply the change:

```
(config network bridge LAN2)> save
Configuration saved.
>
```

8. Type exit to exit the Admin CLI.

   Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Task two: Create a new LAN

In this task, we will create a new LAN, named LAN3, to use the LAN2 bridge created in task one.

1. Log into the TX64 command line as a user with full Admin access rights.

   Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```


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3. Add a new network interface named LAN2:

```
(config)> add network interface LAN2
(config network interface LAN2)>
```

4. Configure the device for the LAN2 interface:
   a. Enter device ? to view available devices and the proper syntax:

```
(config network interface LAN2)> device ?

Device: The network device used by this network interface.
Format:
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/loopback
  /network/bridge/LAN2
  /network/bridge/Lan1
  /network/wireless/ap/digi_ap1
  /network/wireless/ap/digi_ap2
Current value:

(config network interface LAN2)> device
```

   b. Set the device for the LAN2 interface to the LAN2 bridge created in task one:

```
(config network interface LAN2)> device /network/bridge/LAN2
(config network interface LAN2)>
```

5. Configure the firewall zone for the LAN2 interface to Internal:

```
(config network interface LAN2)> zone internal
(config network interface LAN2)>
```

6. Configure the IPv4 address for the LAN2 interface:

```
(config network interface LAN2)> ipv4 address 192.168.3.1/24
(config network interface LAN2)>
```

7. Enable the DHCP server for the LAN2 interface:

```
(config network interface LAN2)> ipv4 dhcp_server enable true
(config network interface LAN2)>
```

8. Enable the access points and set the SSIDs:
   a. Move to the root of the configuration schema by typing three periods [...]:

```
(config network interface LAN2)> ...
(config)>
```


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b. Enable the Digi AP (Wi-Fi1) access point:

```
(config)> network wifi ap digi_ap1 enable true
(config)>
```

c. Set the SSID for the Digi AP (Wi-Fi1) access point:

```
(config)> network wifi ap digi_ap1 ssid Example1
(config)>
```

d. Set the password for the Digi AP (Wi-Fi1) access point:

```
(config)> network wifi ap digi_ap1 encryption key_psk2 password1
(config)>
```

e. Enable the Digi AP (Wi-Fi2) access point:

```
(config)> network wifi ap digi_ap2 enable true
(config)>
```

f. Set the SSID for the Digi AP (Wi-Fi2) access point:

```
(config)> network wifi ap digi_ap1 ssid Example2
(config)>
```

g. Set the password for the Digi AP (Wi-Fi2) access point:

```
(config)> network wifi ap digi_ap2 encryption key_psk2 password2
(config)>
```

9. Save the configuration and apply the change:

```
(config network bridge LAN2)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Task three: Create a new WAN

In this task, we will create a second WAN interface, named WAN2, using the ETH4 device.

1. Log into the TX64 command line as a user with full Admin access rights.

Depending on your device configuration, you may be presented with an Access selection menu. Type admin to access the Admin CLI.

2. At the command line, type config to enter configuration mode:

```
> config
(config)>
```


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3. Add the WAN2 network interface:

```
(config)> add network interface WAN2
(config network interface WAN2)>
```

4. Enter device ? to view available devices and the proper syntax:

```
(config network interface WAN2)> device ?

Device: The network device used by this network interface.
Format:
  /network/device/eth1
  /network/device/eth2
  /network/device/eth3
  /network/device/eth4
  /network/device/loopback
  /network/bridge/LAN2
  /network/bridge/lan1
  /network/wireless/ap/digi_ap3
  /network/wireless/ap/digi_ap2
Current value:

(config network interface WAN2)> device
```

5. Configure the WAN to use the eth4 device:

```
(config network interface WAN2)> device /network/device/eth4
(config network interface WAN2)>
```

6. Change the zone for the WAN to external:

```
(config network interface WAN2)> zone external
(config network interface WAN2)>
```

7. Configure the WAN as an IPv4 DHCP client:
   a. Enter ipv4 ? to determine the available settings for ipv4 (the appropriate setting is highlighted in the example output):

```
(config network interface WAN2)> ipv4 ?

IPv4

Parameters                Current Value
------------------------------------------------------------
address                                 Address
enable                    true          Enable
gateway                                 Default gateway
metric                    0             Metric
mgmt                      0             Management priority
mtu                       1500          MTU
type                      static        Type
```


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```
weight                  10          Weight

Additional Configuration

connection_monitor      Active recovery
dhcp_relay              DHCP relay
dhcp_server             DHCP server
dns                     DNS servers

(config network interface WAN2)> ipv4
```

b. Enter ipv4 type ? to determine available settings for the ipv4 type:

```
(config network interface WAN2)> ipv4 type ?

Type: The method for configuring IPv4 on this interface.
Format:
  dhcp
  static
Default value: static
Current value: static

(config network interface WAN2)> ipv4 type
```

c. Set the IPv4 type to dhcp:

```
(config network interface WAN2)> ipv4 type dhcp
(config network interface WAN2)>
```

5. Configure the IPv4 WAN priority.

Because the TX64 device now has two WANs, we need to determine which WAN will be the default route when both WANs are active. In this example configuration, WAN1 should be the primary WAN, and WAN2 only used when WAN1 is down. Additionally, the Wireless WANs will provide additional failover capabilities and will be used only when both WAN1 and WAN2 are unable to connect to the Internet.

To do this, we will set the metric for WAN2 to a value that is higher than the metric for WAN1, and lower than the metric for the WWANs.

a. Determine the metric for WAN1:

```
(config network interface WAN2)> show .. wan1 ipv4 metric
1
(config network interface WAN2)>
```

b. Determine the metric for WWAN1:

```
config network interface WAN2)> show .. wwan1 ipv4 metric
2
(config network interface WAN2)>
```


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c. Determine the metric for WWAN2:

```
config network interface WAN2)> show .. wan2 ipv4 metric
3
(config network interface WAN2)>
```

d. Set the metric for WAN2 to 2, which is higher than the WAN1 metric and lower than the WWAN metrics:

```
(config network interface WAN2)> ipv4 metric 2
(config network interface WAN2)>
```

9. Save the configuration and apply the change:

```
(config network bridge bridge2)> save
Configuration saved.
>
```

10. Type exit to exit the Admin CLI.

Depending on your device configuration, you may be presented with an Access selection menu. Type quit to disconnect from the device.

Task four: Verify the new configuration

The final step in this example is to verify the new configuration.

1. Connect an Ethernet cable from an Internet-connected modem to WAN1 through the WAN/ETH1 Ethernet port.
2. Verify that WAN1 and LAN1 are operating correctly:
   a. Connect a device to LAN1 through the ETH2 Ethernet port, or by connecting to the Digi AP [Wi-Fi1] access point.
   b. Verify that the device has been provided an IP address from the LAN1 DHCP server in the 192.168.2.* subnet.
   c. Verify that the device has access to the Internet.
3. Verify that LAN2 is operating correctly:
   a. Connect a device to LAN2 through the ETH3 Ethernet port, or by connecting to the Digi AP [Wi-Fi2] access point.
   b. Verify that the device has been provided an IP address from the LAN2 DHCP server in the 192.168.3.* subnet.
   c. Verify that the device has access to the Internet.
4. Verify that WAN priority and failover are operating correctly between WAN1 and WAN2:
   a. Connect an Ethernet cable from an alternate Internet-connected modem to WAN2 through the ETH4 Ethernet port.
   b. Verify that when both WANs are connected to the Internet, devices connected to the TX64 have Internet access through WAN1.
   c. Verify that failover functions correctly between WAN1 and WAN2:
      i. Disconnect the WAN1 Ethernet cable from the WAN/ETH1 Ethernet port and verify that devices connected to the TX64 have Internet access through WAN2.

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i. Reconnect the WAN1 Ethernet cable to the WAN/ETH1 Ethernet port and verify that devices connected to the TX64 have Internet access through WAN1.

2. Verify that failover functions correctly if both WAN1 and WAN2 are not working:

   i. Insert at least one SIM in one of the cellular modems.

   ii. When the WWAN's Service LED indicates that the device is connected to the cellular network, unplug both the WAN1 Ethernet cable from the WAN/ETH1 Ethernet port, and the WAN2 Ethernet cable from the ETH4 Ethernet port.

   iii. Verify that devices connected to the TX64 have Internet access through the WWAN.

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Command line reference

analyzer
cp
help
ls
mkdir
modem
modem pdk status [bmaF STRING] [name STRING]
more
mv
ping
reboot
rm
scp
show
system
traceroute
update

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analyzer

Analyzer commands.

analyzer clear name STRING

Clears the traffic captured by the analyzer.

Parameters

name

Name of the capture filter to use.

Syntax: STRING

analyzer save filename STRING name STRING

Saves the current captured traffic to a file.

Parameters

filename

The filename to save captured traffic to. The file will be saved to the device's /etc/config/analyzer directory.

Syntax: STRING

name

Name of the capture filter to use.

Syntax: STRING

analyzer start name STRING

Start a capture session of packets on this device's interfaces.

Parameters

name

Name of the capture filter to use.

Syntax: STRING

analyzer stop name STRING

Stops the traffic capture session.

Parameters

name

Name of the capture filter to use.

Syntax: STRING

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cp

cp commands.

[force] SOURCE DESTINATION

Copy a file or directory.

Parameters

source
The source file or directory to copy.
Syntax: STRING

destination
The destination path to copy the source file or directory to.
Syntax: STRING

force
Do not ask to overwrite the destination file if it exists.
Syntax: BOOLEAN
Default: False
Optional: True

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help

Show CLI editing and navigation commands.

Parameters

None

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ls

Directory listing command.

ls [show-hidden] PATH

List a directory.

Parameters

path

List files and directories under this path.

Syntax: STRING

show-hidden

Show hidden files and directories. Hidden filenames begin with '.'.

Syntax: BOOLEAN

Default: False

Optional: True

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mkdir

***mkdir** PATH*

Create a directory. Parent directories are created as needed.

Parameters

path
The directory path to create.
Syntax: STRING

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modem

Modem commands.

modem at [imei STRING] [name STRING] CMD

Send an AT command to the modem and display the response.

Parameters

cmd
The AT command string.
Syntax: STRING

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

modem at-interactive [imei STRING] [name STRING]

Start an AT command session on the modem's AT serial port.

Parameters

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

modem pin

PIN commands.

pin change [imei STRING] [name STRING] OLD-PIN NEW-PIN

Change the SIM's PIN code. Warning: Attempting to use an incorrect PIN code may PUK lock the SIM.

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Parameters

old-pin
The SIM's PIN code.
Syntax: STRING

new-pin
The PIN code to change to.
Syntax: STRING

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

pin disable [imei *STRING*] [name *STRING*] PIN
Disable the PIN lock on the SIM card that is active in the modem. Warning: Attempting to use an incorrect PIN code may PUK lock the SIM.

Parameters

pin
The SIM's PIN code.
Syntax: STRING

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

pin enable [imei *STRING*] [name *STRING*] PIN
Enable the PIN lock on the SIM card that is active in the modem. The SIM card will need to be unlocked before each use. Warning: Attempting to use an incorrect PIN code may PUK lock the SIM.

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Parameters

pin
The SIM's PIN code.
Syntax: STRING

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

pin status [imei STRING] [name STRING]

Print the PIN lock status and the number of PIN enable/disable/unlock attempts remaining. The SIM will be PUK locked when there are no remaining retries

Parameters

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

pin unlock [imei STRING] [name STRING] PIN

Temporarily unlock the SIM card with a PIN code. Set the PIN field in the modem interface's configuration to unlock the SIM card automatically before use. Warning: Attempting to use an incorrect PIN code may PUK lock the SIM.

Parameters

pin
The SIM's PIN code.
Syntax: STRING

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

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name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

modem puk
PUK commands.

puk status [imei *STRING*] [name *STRING*]
Print the PUK status and the number of PUK unlock attempts remaining.

Parameters

modem puk status [*imei* STRING] [*name* STRING]

Print the PUK status and the number of PUK unlock attempts remaining.

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

puk unlock [imei *STRING*] [name *STRING*] PUK NEW-PIN
Unlock the SIM with a PUK code from the SIM provider.

Parameters

puk
The SIM's PUK code.
Syntax: STRING

new-pin
The PIN code to change to.
Syntax: STRING

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.

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Syntax: STRING

Optional: True

modem reset [imei STRING] [name STRING]

Reset the modem hardware (reboot it). This can be useful if the modem has stopped responding to the network or is behaving inconsistently.

Parameters

imei

The IMEI of the modem to execute this CLI command on.

Syntax: STRING

Optional: True

name

The configured name of the modem to execute this CLI command on.

Syntax: STRING

Optional: True

modem sim-slot [imei STRING] [name STRING] SLOT

Show or change the modem's active SIM slot. This applies only to modems with multiple SIM slots.

Parameters

slot

The SIM slot to change to.

Syntax: [1|2|show]

imei

The IMEI of the modem to execute this CLI command on.

Syntax: STRING

Optional: True

name

The configured name of the modem to execute this CLI command on.

Syntax: STRING

Optional: True

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Command line interface

Command line reference

more

path
The file to view.
Syntax: STRING

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mv

Move a file or directory.

mv [force] SOURCE DESTINATION

Parameters

source
The source file or directory to move.
Syntax: STRING

destination
The destination path to move the source file or directory to.
Syntax: STRING

force
Do not ask to overwrite the destination file if it exists.
Syntax: BOOLEAN
Default: False
Optional: True

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ping

Ping a host using ICMP echo.

ping [ipv6] [count INTEGER] [interface STRING] [size INTEGER] HOST

Parameters

host

The name or address of the remote host to send ICMP ping requests to. If broadcast is enabled, can be the broadcast address.

Syntax: STRING

broadcast

Enable broadcast ping functionality

Syntax: BOOLEAN

Default: False

Optional: True

count

The number of ICMP ping requests to send before terminating.

Syntax: INT

Minimum: 1

Default: 100

interface

The network interface to send ping packets from when the host is reachable over a default route. If not specified, the system's primary default route will be used.

Syntax: STRING

Optional: True

ipv6

If a hostname is defined as the value of the 'host' parameter, use the host's IPv6 address.

Syntax: BOOLEAN

Default: False

Optional: True

size

The number of bytes sent in the ICMP ping request.

Syntax: INT

Minimum: 0

Default: 56

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reboot

Reboot the system.

Parameters

None

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rm

Remove a file or directory.

rm [force] PATH

Parameters

path
The path to remove.
Syntax: STRING

force
Force the file to be removed without asking.
Syntax: BOOLEAN
Default: False
Optional: True

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scp

Copy a file or directory over SSH.

scp hostSTRINGlocalSTRING [portINTEGER] remoteSTRINGtoSTRINGuserSTRING

Parameters

host
The name or address of the remote host.
Syntax: STRING

local
The file to copy to or from on the local device.
Syntax: STRING

port
The SSH port to use to connect to the remote host.
Syntax: INT
Maximum: 65535
Minimum: 1
Default: 22

remote
The file to copy to or from on the remote host.
Syntax: STRING

to
Copy the file from the local device to the remote host, or from the remote host to the local device.
Syntax: [remote|local]

user
The username to use when connecting to the remote host.
Syntax: STRING

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show

Show instance status statistics.

show analyser name STRING

Show packets from a specified analyser capture.

Parameters

name
Name of the capture filter to use.
Syntax: STRING

show arp [ipv4|ipv6|verbose]

Show ARP tables, if no IP version is specified IPv4 IPV6 will be displayed.

Parameters

ipv4
Display IPv4 routes. If no IP version is specified IPv4 and IPV6 will be displayed
Syntax: BOOLEAN
Default: False
Optional: True

ipv6
Display IPv6 routes. If no IP version is specified IPv4 and IPV6 will be displayed
Syntax: BOOLEAN
Default: False
Optional: True

verbose
Display more information (less concise, more detail).
Syntax: BOOLEAN
Default: False
Optional: True

show cloud

Show Digi Remote Manager status statistics.

Parameters
None.

show config

Show changes made to default configuration.

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Parameters

None

show dhcp-lease [all|verbose]

Show DHCP leases.

Parameters

all

Show all leases (active and inactive (not in /etc/config/dhcp.*lease)).

Syntax: BOOLEAN

Default: False

Optional: True

verbose

Display more information (less concise, more detail).

Syntax: BOOLEAN

Default: False

Optional: True

show event [number INTEGER] [table STRING]

Show event list (High level).

Parameters

number

Number of lines to retrieve from log.

Syntax: INT

Minimum: 1

Default: 20

table

Type of event log to be displayed (status, error, info).

Syntax: [status|error|info]

Optional: True

show hotspot [ip STRING] [name STRING]

Show hotspot statistics.

Parameters

ip

IP address of a specific client, to limit the status display to only this client.

Syntax: STRING

Optional: True

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name
The configured instance name of the hotspot.
Syntax: STRING
Optional: True

show ipsec [all] [tunnel STRING]

Show IPsec status statistics.

Parameters

all
Display all tunnels including disabled tunnels.
Syntax: BOOLEAN
Default: False
Optional: True

tunnel
Display more details and config data for a specific IPsec tunnel.
Syntax: STRING
Optional: True

verbose
Display status of one or all tunnels in plain text.
Syntax: BOOLEAN
Default: False
Optional: True

show location

Show location information.

Parameters
None

show log [filter STRING] [number INTEGER]

Show system log [low level].

Parameters

filter
Filters for type of log message displayed (critical, warning, info, debug). Note, filters from the number of messages retrieved not the whole log (this can be very time consuming). If you require more messages of the filtered type, increase the number of messages retrieved using 'number'.
Syntax: [critical|warning|debug|info]
Optional: True

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number
Number of lines to retrieve from log.
Syntax: INT
Minimum: 1
Default: 20

show manufacture [verbose]

Show manufacturer information.

Parameters

verbose
Display more information (less concise, more detail).
Syntax: BOOLEAN
Default: False
Optional: True

show modem [verbose] [imei STRING] [name STRING]

Show modem status and statistics.

Parameters

imei
The IMEI of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

name
The configured name of the modem to execute this CLI command on.
Syntax: STRING
Optional: True

verbose
Display more information (less concise, more detail).
Syntax: BOOLEAN
Default: False
Optional: True

show network [all|verbose] [interface STRING]

Show network interface status and statistics.

Parameters

all
Display all interfaces including disabled interfaces.
Syntax: BOOLEAN

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Default: False
Optional: True

interface
Display more details and config data for a specific network interface.
Syntax: STRING
Optional: True

verbose
Display more information (less concise, more detail).
Syntax: BOOLEAN
Default: False
Optional: True

show openvpn
Show OpenVPN status and statistics.

openvpn client [all] [name *STRING*]
Show OpenVPN client status statistics.

Parameters

all
Display all clients including disabled clients.
Syntax: BOOLEAN
Default: False
Optional: True

name
Display more details and config data for a specific OpenVPN client.
Syntax: STRING
Optional: True

openvpn server [all] [name *STRING*]
Show OpenVPN server status and statistics.

Parameters

all
Display all servers including disabled servers.
Syntax: BOOLEAN
Default: False
Optional: True

name
Display more details and config data for a specific OpenVPN server.
Syntax: STRING

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Optional: True

show route [ipv4|ipv6|verbose]

Show IP routing information.

Parameters

ipv4
Display IPv4 routes.
Syntax: BOOLEAN
Default: False
Optional: True

ipv6
Display IPv6 routes.
Syntax: BOOLEAN
Default: False
Optional: True

verbose
Display more information (less condse, more detail).
Syntax: BOOLEAN
Default: False
Optional: True

show serial PORT

Show serial status and statistics.

Parameters

port
Display more details and config data for a specific serial port.
Syntax: STRING
Optional: True

show system [verbose]

Show system status and statistics.

Parameters

verbose
Display more information (disk usage, etc)
Syntax: BOOLEAN
Default: False
Optional: True

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show usb

Show USB information.

Parameters

None

show version [verbose]

Show firmware version.

Parameters

verbose

Display more information (build date)

Syntax: BOOLEAN

Default: False

Optional: True

show web-filter

Show web filter status and statistics.

Parameters

None

show wifi

Show Wi-Fi status and statistics.

wifi ap [all] [name STRING]

Display details for Wi-Fi access points.

Parameters

all

Display all Wi-Fi access points including disabled Wi-Fi access points.

Syntax: BOOLEAN

Default: False

Optional: True

name

Display more details for a specific Wi-Fi access point.

Syntax: STRING

Optional: True

wifi client [all] [name STRING]

Display details for Wi-Fi client mode connections.

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Parameters

all
Display all Wi-Fi clients including disabled Wi-Fi client mode connections.
Syntax: BOOLEAN
Default: False
Optional: True

name
Display more details for a specific Wi-Fi client mode connection.
Syntax: STRING
Optional: True

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system

System commands.

system backup [passphrase STRING] type STRING PATH

Save the device's configuration to a file. Archives are full backups including generated SSH keys and dynamic DHCP lease information. Command backups are a list of CLI commands required to build the device's configuration.

Parameters

path

The file path to save the backup to.

Syntax: STRING

passphrase

Encrypt the archive with a passphrase.

Syntax: STRING

Optional: True

Depends on: type equals 'archive'

type

The type of backup file to create. Archives are full backups including generated SSH keys and dynamic DHCP lease information. CLI configuration backups are a list of CLI commands used to build the device's configuration.

Syntax: [cli-config|archive]

Default: archive

system disable-cryptography

Erase the device's configuration and reboot into a limited mode with no cryptography available. The device's shell will be accessible over Telnet (port 23) at IP address 192.168.210.1. To return the device to normal operation, perform the configuration erase procedure with the device's ERASE button twice consecutively.

Parameters

None

system factory-erase

Erase the device to restore to factory defaults. All configuration and automatically generated keys will be erased.

Parameters

None

system restore [passphrase STRING] PATH

Restore the device's configuration from a backup archive or CLI commands file.

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Parameters

path
The path to the backup file.
Syntax: STRING

passphrase
Decrypt the archive with a passphrase.
Syntax: STRING
Optional: True

system support-report *PATH*
Save a support report to a file and include with support requests.

Parameters

path
The file path to save the support report to.
Syntax: STRING

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traceroute

Print the route packets trace to network host.

traceroute [bypass|debug|dontfragment|icmp|ipchecksums|nomap|verbose] [first_ttl:INTEGER] [gateway:STRING] [interface:STRING] [max_ttl:INTEGER] [nqueries:INTEGER] [packetlen:INTEGER] [pausemsecs:INTEGER] [port:INTEGER] [src_addr:STRING] [tos:INTEGER] [waittime:INTEGER] HOST

Parameters

host
The host that we wish to trace the route packets for.
Syntax: STRING

bypass
Bypass the normal routing tables and send directly to a host on an attached network.
Syntax: BOOLEAN
Default: False
Optional: True

debug
Enable socket level debugging.
Syntax: BOOLEAN
Default: False
Optional: True

dontfragment
Do not fragment probe packets.
Syntax: BOOLEAN
Default: False
Optional: True

first_ttl
Specifies with what TTL to start.
Syntax: INT
Minimum: 1
Default: 1

gateway
Tells traceroute to add an IP source routing option to the outgoing packet that tells the network to route the packet through the specified gateway.
Syntax: STRING
Optional: True

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icmp
Use ICMP ECHO for probes.
Syntax: BOOLEAN
Default: False
Optional: True

interface
Specifies the interface through which traceroute should send packets. By default, the interface is selected according to the routing table.
Syntax: STRING
Optional: True

ipv6
If a hostname is defined as the value of the 'host' parameter, use the hosts IPV6 address.
Syntax: BOOLEAN
Default: False
Optional: True

max_ttl
Specifies the maximum number of hops (max time-to-live value) traceroute will probe.
Syntax: INT
Minimum: 1
Default: 30

nomap
Do not try to map IP addresses to host names when displaying them.
Syntax: BOOLEAN
Default: False
Optional: True

nqueries
Sets the number of probe packets per hop. A value of -1 indicated
Syntax: INT
Minimum: 1
Default: 3

packetlen
Total size of the probing packet. Default 60 bytes for IPv4 and 80 for ipv6. A value of -1 specifies that the default value will be used.
Syntax: INT
Minimum: -1
Default: -1

pausemsecs
Minimal time interval between probes

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Syntax: INT

Minimum: 0

Default: 0

port

Specifies the destination port base traceroute will use (the destination port number will be incremented by each probe). A value of -1 specifies that no specific port will be used.

Syntax: INT

Minimum: -1

Default: -1

src_addr

Chooses an alternative source address. Note that you must select the address of one of the interfaces. By default, the address of the outgoing interface is used.

Syntax: STRING

Optional: True

tos

For IPv4, set the Type of Service (ToS) and Precedence value. Useful values are 16 (low delay) and 8 (high throughput). Note that in order to use some TOS precedence values, you have to be super user. For IPv6, set the Traffic Control value. A value of -1 specifies that no value will be used.

Syntax: INT

Minimum: -1

Default: -1

waittime

Determines how long to wait for a response to a probe.

Syntax: INT

Minimum: 1

Default: 5

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update

Update firmware.

update firmware file STRING

Update device firmware

Parameters

file

Firmware filename and path.

Syntax: STRING

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