Digi WR Routers

for models LR54, WR54, and WR64

User Guide

원문: Digi LR54 사용설명서(영문) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

Revision history—90002282

Revision	Date	Description
G	March 2019	Digi WR router firmware version 4.6 includes the following new features and enhancements: ■ EM7511U support. ■ EM7511 support for Verizon. ■ Support for IPsec probing and failover. ■ Support for VRRP+, an extension to the VRRP standard that uses network probing to monitor connections through VRRP-enabled devices. ■ Support for USB-to-serial adapters. ■ Ability to control the behavior of LEDs via a Python script. ■ Improvements to the show ipsec command

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Revision	Date	Description
H	July 2019	Digi WR router firmware version 4.8 includes the following new features and enhancements: ■ IPsec certificate authentication support, including support for chained certificates. ■ Support for IPsec to failover to a backup tunnel. ■ SCEP client support, to allow for the automatic updating of PEM format certificates and certificate revocation lists (CRLs). ■ iperf3 performance server support that allows the user to test the performance of networks. ■ Support for a Wi-Fi scanner that allows the device to report what Wi-Fi devices are close by. ■ Support for a Bluetooth scanner that allows the device to report what Bluetooth (BLE) devices are close. ■ Support to allow the GNSS module to be used as a time source for the NTP server. ■ Support for EAP-TLS certificate authentication for WPA-Enterprise security when in Wi-Fi client mode. ■ The supported version of Python has been updated to 3.5.7. ■ A new Python module, digidevice.device_request, has been added to support callbacks to Digi Remote Manager. ■ Support for clearing the DHCP server cache has been added.
J	August 2019	Digi WR router firmware release 4.8.1.
K	November 2019	Digi WR router firmware release 4.8.4.
L	January 2020	Digi WR router firmware release 4.8.6.

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Applicable models

Digi WR router firmware version 4.8.6 supports the following Digi routers:

- Digi LR54
  See the Digi LR54 Hardware Reference
- Digi WR54
  See the Digi WR54 Hardware Reference
- Digi WR64
  See the Digi WR64 Hardware Reference

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www.digi.com/howtobuy/terms

Customer support

Gather support information: Before contacting Digi technical support for help, gather the following information:

- ✔ Product name and model
- ✔ 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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techcomm@digi.com

Include the document title and part number (Digi WR Routers User Guide, 90002282 L) in the subject line of your email.

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What's new in Digi Digi WR version 4.8.6

Digi WR router firmware release 4.8.6.

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Using the web interface

The first time you power on a Digi WR device, the **Getting Started Wizard** steps you through the process of initial configuration. After the wizard completes, the next time you access the device, a login prompt appears. See Log in to the web interface for login instructions.

After you log in, the **Dashboard** appears. The **Dashboard** provides a snapshot of current activity for the device. See Dashboard for details.

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

Web

Shows how to perform a task using the web interface.

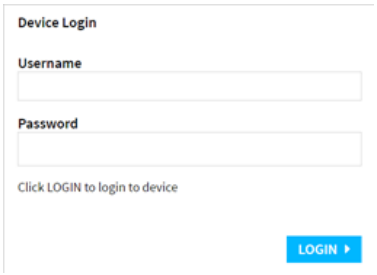
Command line

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

Log in to the web interface

The first time you access your Digi WR device, the **Getting Started Wizard** runs. The wizard steps through initial device configuration. After you run the Getting Started Wizard, the next time you access the device, a login prompt for the web interface appears.

1. Open a browser and enter the default address for the Digi WR device: **http://192.168.1.1.** The Device Login prompt appears.



2. Enter your username and password, and click **Login**.

Note If you did not change the username or password during initial setup, use the default username **admin** and the unique password printed on the device label. The device label is also attached to the bottom of the device.

The **Dashboard** appears. See Dashboard.

Log out of the web interface

- Click the **Logout** button in the upper right corner of the web interface.

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Using the command line

Digi WR devices provide a command line interface that you can use to configure the device, display status and statistics, as well as update firmware and manage device files. See Command reference for details on all available commands.

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

Web

Shows how to perform a task using the web interface.

Command line

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

Access the command line interface

You can access the Digi WR device using the serial port or an SSH connection. You can use open-source terminal software, such as PuTTY and TeraTerm.

Alternatively, you can open the command line interface in the web interface via the **Device Console:**

- On the menu, click **System > Device Console**. The **Device Console** appears.

Log in to the command line interface

1. Connect to the Digi WR device via the serial port or with an SSH connection.
   - For serial connections, the baud rate is **115200**, **8** data bits, **no** parity, **1** stop bit, and **no** flow control.
   - For SSH connections, the default IP address of the device is **192.168.1.1**.
2. At the login prompt, enter the username and password. The default username is **admin**. The unique password for your device is printed on the device label.

```
Username: admin
Password: **********
```

A welcome message appears, followed by the current access permission level for your username and the timeout for the command session, followed by the system command prompt.

```
Welcome admin
Access Level: super
Timeout     : 3600 seconds
digi.router>
```

Exit the command line interface

Enter the exit command.

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Execute a command from the web interface

On the menu, click **System > Device console**. The device console appears.

```
digi.router>
```

Display command and parameter help using the ? character

The question mark (**?**) character can display help text for all commands, individual commands, and command parameters.

1. To display the currently supported list of commands for the device, type the question mark (?) character after the system prompt:

   ```
   digi.router> ?
   ```

2. To display help for a specific command, enter the command followed by the question mark (?) character. For example, to get help for the eth command, enter:

   ```
   digi.router> eth ?

   Configures an Ethernet interface

   Syntax:
   eth <1 - 4> <parameter> <value>

   Available Parameters:
    Parameter     Description
   ------------------------------------------------------------------------------
   -
   description    Ethernet interface description
   duplex         Ethernet interface duplex mode
   mtu            Ethernet interface MTU
   speed          Ethernet interface speed
   state          Enables or disables Ethernet interface

   digi.router> eth
   ```

3. To display help on parameters, enter the command, the interface number as needed, and parameter name, followed by the ? character. For example, to display help for the eth command speed parameter, enter:

   ```
   digi.router> eth 1 speed ?

   Syntax           : eth 1 speed <value>
   Description      : Ethernet interface speed
   Current Value    : auto
   Valid Values     : auto, 10, 100, 1000
   Default value    : auto

   digi.router> eth 1 speed
   ```


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To use the **?** character in a parameter value, enclose it within **"** characters. For example, to display the help text for the **system** command's **description** parameter:

```
digi.router> system 1 description ?
```

To set the **system** command **description** parameter to **?**:

```
digi.router> system 1 description "?"
```

Revert command settings using the ! character

To revert command settings to their defaults, use the exclamation mark (!) character.

To revert the default setting of the interfaces parameter on the lan command, enter:

```
digi.router> lan 1 interfaces !
```

To use the **!** character in a parameter value, enclose it within **"** characters. For example, to reset the Wi-Fi SSID to the default (blank):

```
wifi 1 ssid !
```

To set the Wi-Fi SSID to **!abc**:

```
wifi 1 ssid "!abc"
```

Auto-complete commands and parameters

When entering a command and parameter, pressing the **Tab** key causes the command-line interface to auto-complete as much of the command and parameter as possible.

Auto-complete applies to these command elements only :

- Command names. For example, entering **cell<Tab>** auto-completes the command as **cellular**
- Parameter names. For example:
  - **ping int<Tab>** auto-completes the parameter as **interface**
  - **system loc<Tab>**auto-completes the parameter as **location**.
- Parameter values, where the value is one of an enumeration or an on|off type; for example, **eth 1 duplex auto|full|half**

Auto-complete does not function for:

- Parameter values that are string types
- Integer values
- File names
- Select parameters passed to commands that perform an action

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Enter configuration commands

Configuration commands configure settings for various device features. Configuration commands have the following format:

```
<command> <instance> <parameter> <value>
```

Where <instance> is the index number associated with the feature. For example, this command configures the **eth1** Ethernet interface:

```
digi.router> eth 1 ip-address 10.1.2.3
```

For commands with only one instance, you do not need to enter the instance. For example:

```
digi.router> system timeout 100
```

Display status and statistics using show commands

The **show** commands display status and statistics for various features.

For example:

- show config displays all the current configuration settings for the device. This is a particularly useful during initial device startup after running the Getting Started Wizard, or when troubleshooting the device.
- show system displays system information and statistics for the device, including CPU usage.
- show eth displays status and statistics for specific or all Ethernet interfaces.
- show cellular displays status and statistics for specific or all cellular interfaces.

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:

```
digi.router> system description "HQ router"
```


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Interfaces

Digi WR devices have several physical communications interfaces. The available interfaces vary by device model. These interfaces can be bridged in a Local Area Network (LAN) or assigned to a Wide Area Network (WAN).

Ethernet interfaces 24
Cellular interfaces 28
Wi-Fi interfaces 35
Serial interface 47

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Ethernet interfaces

Ethernet interfaces can be used in LAN or WAN. There is no IP configuration set on the individual Ethernet interfaces. Instead, the IP configuration is set as part of configuring the LAN or WAN.

For more information on WANs, see Wide Area Networks (WANs).

For more information on LANs and their configuration, see About Local Area Networks (LANs).

Configure Ethernet interfaces

To configure an Ethernet interface, you must configure the following items:

Required configuration items

- Enable the Ethernet interface. The Ethernet interfaces are all enabled by default. You can set the Ethernet interface to **enabled or disabled**.
- Once configured, the Ethernet interface must be assigned to a LAN or a WAN. For more information, see About Local Area Networks (LANs) and Configure a LAN or Wide Area Networks (WANs) and Configure a Wide Area Network (WAN).

Additional configuration items

The following items are not required to configure a working Ethernet interface, but can be configured as needed:

- A description of the Ethernet interface.
- The duplex mode of the Ethernet interface. This defines how the Ethernet interface communicates with the device to which it is connected. The duplex mode defaults to **auto**, which means the Digi WR device negotiates with the connected device on how to communicate.
- The speed of the Ethernet interface. This defines the speed at which the Ethernet interface communicates with the device to which it is connected. The Ethernet speed defaults to **auto**, which means it negotiates with the connected device as to what speed should be used.

Web

1. On the menu, click **Network > Interfaces > Ethernet**.
2. Select the Ethernet interface to configure.
3. In the **Edit Selected** box, enter the configuration settings:
   - **State**: Enable or disable the Ethernet interface. By default, all of the Ethernet interfaces are enabled.
   - **Description**: Optional: Enter a description for the Ethernet interface.
   - **Speed**: Optional: Select the speed for the Ethernet interface.
   - **Duplex**: Optional: Select the duplex mode for the Ethernet interface.
4. Click **Apply**.

Command line

1. Enable the Ethernet interface. By default, all of the Ethernet interfaces are enabled.

```
digi.router> eth 1 state on
```

2. Optional: Set the description for the Ethernet interface. For example:

```
digi.router> eth 1 description “Connected to Ethernet WAN router”
```

3. Optional: Set the duplex mode.

```
digi.router> eth 1 duplex {auto | full | half}
```

4. Optional: Set the speed.

```
digi.router> eth 1 speed {auto | 1000 | 100 | 10}
```

5. Save the configuration.

```
digi.router> save config
```

Show Ethernet status and statistics

You can view the status and statistics of Ethernet interfaces from either the Dashboard of the web interface, or from the command line:

Web

1. On the menu, click **Dashboard**.

   The **Interface** section of the dashboard shows the status of all interfaces.
2. Click on an interface, or click **Network** > **Interfaces** > **Ethernet** to view detailed status and statistics for each interface.

Command line

To show the status and statistics for the Ethernet interface, use the show eth command. For example:

```
digi.router> show eth


Eth Status and Statistics Port 1
-------------------------------------
 Description     : Factory default configuration for Ethernet 1
 Admin Status    : Up
 Oper Status     : Up
 Up Time         : 1 Day, 13 Hours, 30 Minutes, 23 Seconds

 MAC Address     : 00:50:18:21:E2:82
 DHCP            : off
 IP Address      : 10.52.19.242
 Netmask         : 255.255.255.0
 DNS Server(s)   :
```


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```
 Link            : 1000Base-T Full-Duplex

 Received                                Sent
 --------                                ----
 Rx Unicast Packet    : 6198             Tx Unicast Packet    : 651
 Rx Broadcast Packet  : 316403           Tx Broadcast Packet  : 2
 Rx Multicast Packet  : 442690           Tx Multicast Packet  : 6
 Rx CRC Error         : 0                Tx CRC Error         : 0
 Rx Drop Packet       : 0                Tx Drop Packet       : 0
 Rx Pause Packet      : 0                Tx Pause Packet      : 0
 Rx Filtering Packet  : 1                Tx Collision Event   : 0
 Rx Alignment Error   : 0
 Rx Undersize Error   : 0
 Rx Fragment Error    : 0
 Rx Oversize Error    : 0
 Rx Jabber Error      : 0

Eth Status and Statistics Port 2
-------------------------------------
 Description     :
 Admin Status    : Up
 Oper Status     : Up
 Up Time         : 1 Day, 13 Hours, 30 Minutes, 23 Seconds

 MAC Address     : 00:50:18:21:E2:83
 DHCP            : off
 IP Address      : 10.2.4.20
 Netmask         : 255.255.255.0
 DNS Server(s)   :
 Link            : 100Base-T Full-Duplex

 Received                                   Sent
 --------                                   ----
 Rx Unicast Packet    : 5531             Tx Unicast Packet    : 2
 Rx Broadcast Packet  : 316403           Tx Broadcast Packet  : 2
 Rx Multicast Packet  : 442694           Tx Multicast Packet  : 2
 Rx CRC Error         : 0                Tx CRC Error         : 0
 Rx Drop Packet       : 0                Tx Drop Packet       : 0
 Rx Pause Packet      : 0                Tx Pause Packet      : 0
 Rx Filtering Packet  : 0                Tx Collision Event   : 0
 Rx Alignment Error   : 0
 Rx Undersize Error   : 0
 Rx Fragment Error    : 0
 Rx Oversize Error    : 0
 Rx Jabber Error      : 0

Eth Status and Statistics Port 3
-------------------------------------
 Description     :
 Admin Status    : Up
 Oper Status     : Up
 Up Time         : 1 Day, 13 Hours, 30 Minutes, 23 Seconds

 MAC Address     : 00:50:18:21:E2:84
 DHCP            : on
 IP Address      : 82.68.87.20
 Netmask         : 255.255.255.0
 DNS Server(s)   :
 Link            : 100Base-T Full-Duplex
```


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```
 Received                                  Sent
 --------                                  ----
 Rx Unicast Packet    : 5530           Tx Unicast Packet    : 2
 Rx Broadcast Packet  : 316405         Tx Broadcast Packet  : 2
 Rx Multicast Packet  : 442699         Tx Multicast Packet  : 4
 Rx CRC Error         : 0              Tx CRC Error         : 0
 Rx Drop Packet       : 0              Tx Drop Packet       : 0
 Rx Pause Packet      : 0              Tx Pause Packet      : 0
 Rx Filtering Packet  : 0              Tx Collision Event   : 0
 Rx Alignment Error   : 0
 Rx Undersize Error   : 0
 Rx Fragment Error    : 0
 Rx Oversize Error    : 0
 Rx Jabber Error      : 0

Eth Status and Statistics Port 4
------------------------------------
 Description     :
 Admin Status    : Up
 Oper Status     : Down
 Up Time         : 0 Seconds

 MAC Address     : 00:50:18:21:E2:85
 DHCP            : on
 IP Address      : Not Assigned
 Netmask         : Not Assigned
 DNS Server(s)   :
 Link            : No connection


 Received                                  Sent
 --------                                  ----
 Rx Unicast Packet    : 0              Tx Unicast Packet    : 0
 Rx Broadcast Packet  : 0              Tx Broadcast Packet  : 0
 Rx Multicast Packet  : 0              Tx Multicast Packet  : 0
 Rx CRC Error         : 0              Tx CRC Error         : 0
 Rx Drop Packet       : 0              Tx Drop Packet       : 0
 Rx Pause Packet      : 0              Tx Pause Packet      : 0
 Rx Filtering Packet  : 0              Tx Collision Event   : 0
 Rx Alignment Error   : 0
 Rx Undersize Error   : 0
 Rx Fragment Error    : 0
 Rx Oversize Error    : 0
 Rx Jabber Error      : 0

digi.router>
```


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Cellular interfaces

Depending on the model, Digi WR devices can support one or two cellular modules, and each module supports two SIMs. This means that a Digi WR device can have either two or four cellular interfaces:

- cellular1-sim1
- cellular1-sim2
- cellular2-sim1 (only on models with two cellular modules)
- cellular2-sim2 (only on models with two cellular modules)

Each cellular module can have only one interface up at any one time (for example, cellular module 1 can have either SIM1 or SIM2 up at one time). Cellular interface priority is determined by how the cellular interfaces are assigned to the WAN interface.

Typically, an administrator would configure cellular1-sim1 as the primary cellular interface and cellular1-sim2 as the backup cellular interface. In this way, if the device cannot connect to the network using cellular1-sim1, it automatically fails over to cellular1-sim2. Digi WR devices automatically use the correct cellular module firmware for each carrier when switching SIMs.

A device that has two cellular modules can have two cellular interfaces up at one time—one for each module. Typically, an administrator would route traffic to different destinations over a specific cellular interface.

For more information on WAN interfaces and their configuration, see Wide Area Networks (WANs).

Configure cellular interfaces

Required configuration items

- **Access Point Name (APN):** The APN is specific to your cellular service.
- **APN username and password:** Depending on your cellular service, you may need to configure an APN username and password. This information is provided by your cellular provider.
- **WAN assignment:** Once configured, if the cellular interface is not already assigned to a WAN interface, assign it to a WAN interface. For more information, see Wide Area Networks (WANs).

Additional configuration items

See Interfaces—cellular page for a complete list of configuration options.

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Web

1. On the menu, click **Network > Interfaces > Cellular**.
2. Select the cellular interface to edit (**Cellular 1** or **Cellular 2**, and then select the SIM you want to configure, for example **SIM1** or **SIM2**.
3. In the **Edit Selected** box, provide configuration settings for the cellular interfaces. See Interfaces—cellular page for details.
4. Click **Apply**.

Command line

1. Configure an APN.

```
digi.router> cellular 1 sim1-apn your-apn
```

2. If necessary, enter the APN username and password.

```
digi.router> cellular 1 sim1-apn-username your-apn-username
digi.router> cellular 1 sim1-apn-password your-apn-password
```

3. If necessary, enter the PIN for the SIM.

```
digi.router> cellular 1 sim1-pin your-sim-pin
```

4. Optional: Set the preferred mode.

```
digi.router> cellular 1 sim1-preferred-mode 3g
```

5. Optional: Set a description for the cellular interface.

```
digi.router> cellular 1 description “AT&T Connection”
```

6. Optional: Configure the number of connection attempts. For example, to set the number of attempts to 10, enter:

```
digi.router> cellular 1 sim1-connection-attempts 10
```

7. Save the configuration.

```
digi.router> save config
```

Show cellular status and statistics

You can view a summary status for all cellular interfaces, or view detailed status and statistics for a specific cellular interface, from either the web interface or the command line:

Web

1. On the menu, click **Dashboard**.

   The **Interface** section of the dashboard shows the summary status of all interfaces.
2. Click on an interface, or click **Network** > **Interfaces** > **Cellular** to view detailed status and statistics for each interface.

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Command line

Show summary status for cellular interfaces

To show the status and statistics for a cellular interface, use the show cellular command. See show cellular for a description of the output fields.

```
digi.router> show cellular

SIM  Status  APN         Signal Quality        PIN Status
------------------------------------------------------------
1-1  Up      broadband   Excellent (-67dB)     No PIN required
1-2  Down                                      No PIN required
2-1  Down    12655.mcs   Good (-90dB)          No PIN required
2-2  Down                                      No PIN required

digi.router>
```

Show detailed status and statistics for a cellular interface

To show the status and statistics for a particular cellular interface, enter show cellular and specify the cellular module for which you want to show status.

```
digi.router> show cellular 1

Cellular Status and Statistics
------------------------------
Oper status             : Up
SIM status              : Using SIM2 (Ready)
SIM1 PIN                : PIN is OK
SIM2 PIN                : PIN is OK
Signal strength         : Fair (-108dB)
Signal quality          : Fair to Poor (-14dB)
Module                  : Telit LM940
Firmware version        : 24.01.501 / Verizon 24.01.521
Hardware version        : 0.04
Temperature             : 35C
IMEI                    : 354375090000272
IMSI                    : 311480264298668
ICCID                   : 89148000002636797356
Registration status     : Registered
Attachment status       : Attached
Phone number            : 6122973200
Network provider        : Verizon
PLMN                    : 311480
Location                : TAC = 3802 CID = DACB03
Roaming Status          : Home
Connection type         : 4G
Radio Technology        : LTE
Preferred Technology    : Automatic
Band                    : B13
Channel                 : 5230
APN in use              : Context 3: vzwinternet
IP address              : 100.103.109.8
Mask                    : 255.255.255.240
Gateway                 : 100.103.109.9
DNS Servers             : 198.224.186.135, 198.224.187.135
TX Bytes                : 1440
RX Bytes                : 890

digi.router>
```


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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 device cannot make a cellular connection.

Command line

To unlock a SIM card:

1. Use the show cellular command to see the status of a SIM card. In the show cellular output, look for the fields **SIM1 PIN status**, **SIM2 PIN status**, and **SIM status**.
2. Use the unlock command to set a new PIN for the SIM card using the following syntax:

   ```
   unlock <sim1 | sim2> <puk code> <new sim pin>
   ```

   For example, to unlock a SIM card in SIM slot SIM **1** with PUK code **12345678**, and set the new SIM PIN to **1234**:

   ```
   digi.router> unlock sim1 12345678 1234
   ```

3. Save the configuration.

   ```
   digi.router> save config
   ```

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

Specify the cellular MTU

The Maximum Transmission Unit (MTU) determines the largest packet size that a network can transmit. The default MTU settings for cellular interfaces with Digi WR devices is:

- Verizon: 1428 bytes.
- AT&T and other carriers: 1430 bytes.

You can change the default MTU for your carrier by creating a file on the Digi WR device, named **carrier_mtu_list.txt**, that uses the format:

```
# default is 1430
# Carrier       mtu
carrier         MTU
```

where:

- *carrier* is one of:
  - VERIZON
  - ATT
  - GENERIC
- *MTU* is the MTU, in bytes, that should be used.

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For example:

```
# default is 1430
# Carrier       mtu
VERIZON         1360
```

To create the **carrier_mtu_list.txt** file:

Web

1. Confirm that you have the most recent cellular modem firmware installed. See Update cellular module firmware.
2. On an external host, create the **carrier_mtu_list.txt** file as specified above.
3. Upload the **carrier_mtu_list.txt** file to the Digi WR device:
   a. On the menu, click **System > Administration > File System**. The **File System** page appears.
   b. Click .
   c. Use the local file system to browse to the location of the file to upload. Select the file and click **Open** to start the upload.
   d. A progress dialog appears. When the upload operation is complete, the file is displayed in the file list.

Note The file must be uploaded to the primary directory of the filesystem. Do not upload it to a sub-directory.

Command line

1. Confirm that you have the most recent cellular modem firmware installed. See Update cellular module firmware.
2. On an external host, create the **carrier_mtu_list.txt** file as specified above.
3. Upload the **carrier_mtu_list.txt** file to the Digi WR device, using a utility such as Secure Copy (SCP) or SSH File Transfer Protocol (SFTP).

   For example, to upload the file using SCP, use this syntax:

   ```
   scp carrier_mtu_list.txt username@ip_address:carrier_mtu_list.txt
   ```

   where:

   - *username* is the name of the user on the Digi WR device.
   - *ip_address* is the IP address of the device.

Note The file must be uploaded to the primary directory of the filesystem. Do not upload it to a sub-directory.

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Test the performance of your service provider

Your Digi WR device includes an Iperf3 server that you can use to test the performance of your cellular providers.

This functionality is not available from the Web UI.

Command line

1. Enable the Iperf3 server:

```
digi-router> perf-server state on
digi-router>
```

2. (Optional) Set the port that will be used for incoming connections to the Iperf3 server. The default port is 5102.

```
digi-router> perf-server port port-number
digi-router>
```

Signal strength and quality for 4G cellular connections

For 4G connections, the **RSRP** value determines signal strength. To view this value, enter the show cellular command.

Signal strength:

- **Excellent**: > **-90 dBm**
- **Good**: **-90 dBm** to **-105 dBm**
- **Fair**: **-106 dBm** to **-115 dBm**
- **Poor**: **-116 dBm** to **-120 dBm**:
- **No service**: **< -120 dBm**

Signal quality:

- Excellent > **-9 dB**
- Good: **-12 dB to -9 dB**
- Poor < **< -12 dB**

Signal strength and quality for 3G and 2G cellular connections

For 3G and 2G cellular connections, the current **RSSI** value determines signal strength. To view this value, enter the show cellular command.

Signal strength:

- **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**

Signal quality:

- Excellent > **-7 dB**
- Good: **-10 dB to -7 dB**
- Poor < **< -10 dB**

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
  - Antenna Extender Kit, 3m

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Wi-Fi interfaces

Depending on the model, a Digi WR router has one or two Wi-Fi modules. You can configure a Wi-Fi module as either a Wi-Fi access point or a Wi-Fi client. By default, both Wi-Fi modules are configured as access points.

Typically, you configure one Wi-Fi module as one or multiple access points and configure the other module, connected to a separate set of antennas, as a Wi-Fi client to be used as a WAN interface.

Access point mode

If you configure a Wi-Fi module in access point mode, the module can support up to four access points. If both Wi-Fi modules are configured in access point mode, the router can support up to eight access points assigned the following names:

Wi-Fi module	Access point interfaces	Client	Supported protocols
Wi-Fi module 1	wifi-ap1, wifi-ap2, wifi-ap3, wifi-ap4	wifi-client1	bgn ac
Wi-Fi module 2	wifi-ap5, wifi-ap6, wifi-ap7, wifi-ap8	wifi-client2	ac

See Configure a Wi-Fi access point with no security and Configure a Wi-Fi access point with enterprise security

Client mode

If you configure a Wi-Fi module in client mode, you can configure one Wi-Fi client per module. The client for module 1 is Wi-Fi client 1; the client for module 2 is Wi-Fi client 2.

Wi-Fi module	Client
Wi-Fi module 1	Wi-Fi client 1
Wi-Fi module 2	Wi-Fi client 2

To use one of the modules as a WAN interface, configure the module as a client, configure the SSIDs for the Wi-Fi network(s) you would like the router to join, and then assign client to a WAN interface. See Configure a Wi-Fi client and add client networks.

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Configure the Wi-Fi module channel

By default, each Wi-Fi module is configured to automatically select the best channel to use with respect to other Wi-Fi networks. Optionally, you can configure a specific channel to use for a Wi-Fi module..

Supported channels

The following channels are supported:

- For the 2.4 GHz band, only channels 1 to 11 are supported for both Wi-Fi access points and Wi-Fi clients. Channels 12, 13, and 14 are not supported.
- For the 5.0 GHz band:
  - Access points:
    - WR54 and WR64 models: Channels 36,40, 44, and 48 are supported.
    - LR54 model: Channels 36 through 140 are supported.
  - Wi-Fi clients:
    - WR54 and WR64 models: Channels 36 through 165 are supported. The Wi-Fi client sends probe requests on non-DFS channels, but only passively scans (listens for beacons) on DFS channels.
    - LR54 model: Not supported.

 Web

1. On the menu, click **Network > Interfaces > Wi-Fi**.
2. Select a Wi-Fi module to configure, and set the **Mode** to **Access Point**.
3. In the **Edit Selected** box, select the channel you want to configure. Only channels appropriate for the band are displayed.
4. Click **Apply**.

 Command line

To configure the channel used by a Wi-Fi module, use the wifi-module.

```
digi.router> wifi-module 1 mode access-point
digi.router> wifi-module 1 channel 8
digi.router> save config
```


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Configure the Wi-Fi module band and protocol

For Wi-Fi modules that support both 2.4 GHz and 5 GHz modes, you can configure the band.

- On Digi WR models with only one Wi-Fi module, the default protocol and band for the one module is 5 GHz ac.
- On Digi WR models with two Wi-Fi modules, one module defaults to use 5 GHz ac and the other defaults to 2.4 GHz bgn.

Web

1. On the menu, click **Network > Interfaces > Wi-Fi**.
2. Select the Wi-Fi module you want to configure, and set the **Mode** to **Access Point**.
3. Click **Apply**.
4. In the **Edit Selected** box, select the band for the Wi-Fi module.
5. Click **Apply**.

Command line

To configure the band and/or protocol used by a Wi-Fi module, use the wifi-module command.

```
digi.router> wifi-module 1 mode access-point
digi.router> wifi-module 1 protocol ac
digi.router> wifi-module 1 band 5g
digi.router> save config
```

Configure a Wi-Fi access point with no security

Required configuration items

- Wi-Fi module mode
  Configure the Wi-Fi module **Mode** as **Access point**.
- Wi-Fi access point(s)
  Configure up to four access points on each Wi-Fi module. For models with two Wi-Fi modules, access points 1-4 belong to module 1; access points 5-9 belong to module 2. For each access point:
  - **SSID:**
    You can configure the SSID to use the device's serial number by including **%s** in the SSID. For example, an SSID parameter value of **%s-1** on a WR64 would resolve to an SSID similar to **WR64-123456-1**.

    Note Multiple access points can have the same SSID.
  - **Security**
    Configure security for the access points(s) to **None**.

- LAN assignment
  Once you configure a Wi-Fi access point, you must assign the Wi-Fi access point to a LAN interface. For more information, see About Local Area Networks (LANs).

Additional configuration items

See Access point options for a complete list of configuration options.

Web

1. On the menu, click **Network > Interfaces > Wi-Fi**.
2. Select a Wi-Fi interface to configure and set the **Mode** to **Access point**.
3. Click **New Access Point** to create a new access point interface on the module.
4. Configure options for the access point. Specifically, select **None** for **Security**. See Access point options for details.
5. Click **Apply**.
6. Assign the new Wi-Fi access point to a WAN interface. See About Local Area Networks (LANs).

Command line

- To configure a Wi-Fi module, use the wifi-module command.
- To configure Wi-Fi access points, use the wifi-ap command.

1. Configure the Wi-Fi module for access point mode.

```
digi.router> wifi-module 1 mode access-point
```

2. Enter the SSID for the Wi-Fi access point.

```
digi.router> wifi-ap 1 ssid WR64-AP1
```

3. Enter **none** for the security for the Wi-Fi access point.

```
digi.router> wifi-ap 1 security none
```

4. Optional: Enter a description for the Wi-Fi access point.

```
digi.router> wifi-ap 1 description “Office AP”
```

5. Optional: Disable broadcasting the SSID in beacon packets.

```
digi.router> wifi-ap 1 broadcast-ssid off
```

6. Optional: Disable Wi-Fi client isolation mode.

```
digi.router> wifi-ap 1 isolate-clients off
```

7. Optional: Disable Wi-Fi access point isolation mode.

```
digi.router> wifi-ap 1 isolate-ap off
```


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8. Save the configuration.

```
digi.router> save config
```

Configure a Wi-Fi access point with personal security

Required configuration items

- Wi-Fi module mode
  Configure the Wi-Fi module **Mode** as **Access point**.
- Wi-Fi access point(s)
  Configure up to four access points on each Wi-Fi module. For models with two Wi-Fi modules, access points 1-4 belong to module 1; access points 5-9 belong to module 2. For each access point:
  - **SSID:**
    You can configure the SSID to use the device's serial number by including **%s** in the SSID. For example, an SSID parameter value of **%s-1** on a WR64 would resolve to an SSID similar to **WR64-123456-1**.

    Note Multiple access points can have the same SSID.
  - **Security**
    Configure security for the access points(s) to **WPA2 Personal** or **WPA/WPA2 Mixed Mode Personal**.
  - The shared password to be used for authenticating connections to the access point(s). The password must be between 8 and 63 ASCII characters, or 64 hexadecimal characters.
- LAN assignment
  Once you configure a Wi-Fi access point, you must assign the Wi-Fi access point to a LAN interface. For more information, see About Local Area Networks (LANs).

Additional configuration options

See Access point options for a complete list of options.

Web

1. On the menu, click **Network > Interfaces > Wi-Fi**.
2. Select a Wi-Fi interface to configure and set the **Mode** to **Access point**.
3. Click **New Access Point** to create a new access point interface on the module.
4. Configure the access point as needed. Specifically, configure WPA2 Personal security and provide and verify the password. See Access point options for details.
5. Click **Apply**.
6. Assign the new Wi-Fi access point to a LAN interface. See About Local Area Networks (LANs).

Command line

- To configure a Wi-Fi module, use the wifi-module command.
- To configure Wi-Fi access points, use the wifi-ap command.
- To assign an access point to a LAN, use the lan comand.

1. Configure the Wi-Fi module for access point mode.

```
digi.router> wifi-module 1 mode access-point
```

2. Enter the SSID for the Wi-Fi access point.

```
digi.router> wifi-ap 1 ssid WR64-AP1
```

3. Enter the type of security that will be used by the access point.

```
digi.router> wifi-ap 1 security wpa2-personal
```

4. Enter the password for the access point.

```
digi.router> wifie-ap 1 password wifi-ap_password
```

5. Optional: Enter a description for the Wi-Fi access point.

```
digi.router> wifi-ap 1 description “Office AP”
```

6. Optional: Disable broadcasting the SSID in beacon packets.

```
digi.router> wifi-ap 1 broadcast-ssid off
```

7. Optional: Disable Wi-Fi client isolation mode.

```
digi.router> wifi-ap 1 isolate-clients off
```

8. Optional: Disable Wi-Fi access point isolation mode.

```
digi.router> wifi-ap 1 isolate-ap off
```

9. Assign the access point to a configured LAN.

```
digi.router> lan 1 interface wifi-ap1
```

10. Save the configuration.

```
digi.router> save config
```


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Configure a Wi-Fi access point with enterprise security

The WPA2-Enterprise and WPA-WPA2-Enterprise security modes allow a Wi-Fi access point to authenticate connecting Wi-Fi clients using a RADIUS server.

When the Wi-Fi access point receives a connection request from a Wi-Fi client, it authenticates the client with the RADIUS server before allowing the client to connect.

Using enterprise security modes allows each Wi-Fi client to have different usernames and passwords configured in the RADIUS server rather than in the Digi WR device.

Required configuration items

- Wi-Fi module mode
  Configure the Wi-Fi module **Mode** as **Access point**.
- Wi-Fi access point(s)
  Configure up to four access points on each Wi-Fi module. For models with two Wi-Fi modules, access points 1-4 belong to module 1; access points 5-9 belong to module 2. For each access point:
  - **SSID:**
    You can configure the SSID to use the device's serial number by including **%s** in the SSID. For example, an SSID parameter value of **%s-1** on a WR64 would resolve to an SSID similar to **WR64-123456-1**.

    Note Multiple access points can have the same SSID.
  - **Security**
    Configure security for the access points(s) to **WPA2 Enterprise** or **WPA/WPA2 Mixed Mode Enterprise**.
  - IP address of the RADIUS server to be used for authenticating connections to the access point(s).
  - The shared secret for the RADIUS server.
- LAN assignment
  Once you configure a Wi-Fi access point, you must assign the Wi-Fi access point to a LAN interface. For more information, see About Local Area Networks (LANs).

Additional configuration items

See Access point options for a complete list of options.

Web

1. On the menu, click **Network > Interfaces > Wi-Fi**.
2. Click on the Wi-Fi module you want to configure, and set the Wi-Fi **Mode** to **Access point**.
3. Click **New Access Point** or click on an existing access point.
4. Configure the access point as needed. Specifically, configure WPA2 Enterprise security and provide the RADIUS server and shared secret information. See Access point options for details.
5. Click **Apply**.
6. Assign each Wi-Fi access point to a LAN. See About Local Area Networks (LANs).

Command line

- To configure a Wi-Fi module, use the wifi-module command.
- To create Wi-Fi access points, use the wifi-ap command.
- To add the Wi-Fi client to a LAN, use the lan command.

1. Configure the Wi-Fi module mode to access point:

```
digi.router> wifi-module 1 mode access-point
```

2. Enter the SSID for the Wi-Fi access point.

```
digi.router> wifi-ap 1 ssid WR64-AP1
```

3. Enter the type of security that will be used by the access point.

```
digi.router> wifi-ap 1 security wpa2-enterprise
```

4. Enter the IP address of the RADIUS server.

```
digi.router> wifi-ap 1 radius-server 192.168.2.1
```

5. Enter the RADIUS shared secret.

```
digi.router> wifi-ap 1 radius-password your-radius-password
```

6. Optional: Enter the RADIUS server port.

```
digi.router> wifi-ap 1 radius-port 3001
```

7. Optional: Enter a description for the Wi-Fi access point.

```
digi.router> wifi-ap 1 description “Office AP”
```

8. Optional: Disable broadcasting the SSID in beacon packets.

```
digi.router> wifi-ap 1 broadcast-ssid off
```

9. Optional: Disable Wi-Fi client isolation mode.

```
digi.router> wifi-ap 1 isolate-clients off
```

10. Optional: Disable Wi-Fi access point isolation mode.

```
digi.router> wifi-ap 1 isolate-ap off
```

11. Add the access point to a configured LAN:

```
digi.router> lan 1 interface wifi-ap1
```

12. Save the configuration.

```
digi.router> save config
```

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.

Web

- On the menu, click **Dashboard**. The Interface section of the dashboard shows the status of all interfaces. Click on the interface names to get detailed status and statistics.

Command line

Show summary of Wi-Fi access points

To show the status and statistics for Wi-Fi access points, use the show wifi-ap command.

```
digi.router> show wifi-ap

Interface  Module  Status  SSID                                Security
-------------------------------------------------------------------------
wifi-ap1   1       Up      WR64-000073-1                       WPA2-Personal
wifi-ap2   1       Down                                        WPA2-Personal
wifi-ap3   1       Down                                        WPA2-Personal
wifi-ap4   1       Down                                        WPA2-Personal
wifi-ap5   2       Up      WR64-000073-5                       WPA2-Personal
wifi-ap6   2       Down                                        WPA2-Personal
wifi-ap7   2       Down                                        WPA2-Personal
wifi-ap8   2       Down                                        WPA2-Personal
digi.router>
```

Show detailed status and statistics of a Wi-Fi access point

To show a detailed status and statistics of a Wi-Fi access point, enter show wifi-ap command.

```
digi.router> show wifi-ap 1

wifi-ap 1 Status and Statistics
-------------------------------
Description       :
Admin Status      : Up
Oper Status       : Down
Channel           : 1
Module            : 1
SSID              : WR64-000073-1
Security          : WPA2-Personal

Received                                      Sent
------------------------------------------------
Rx Packets           : 8501                   Tx Packets           : 7178
Rx Bytes             : 1512218                Tx Bytes             : 1454265
Rx Compressed        : 0                      Tx Compressed        : 0
Rx Multicasts        : 0                      Tx Collisions        : 0
Rx Errors            : 0                      Tx Errors            : 0
Rx Dropped           : 0                      Tx Dropped           : 0
Rx FIFO Errors       : 0                      Tx FIFO Errors       : 0
Rx CRC Errors        : 0                      Tx Aborted Errors    : 0
Rx Frame Errors      : 0                      Tx Carrier Errors    : 0
```


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```
Rx Length Errors     : 0                    Tx Heartbeat Errors  : 0
Rx Missed Errors     : 0                    Tx Window Errors     : 0
Rx Over Errors       : 0

Connected Clients
-----------------
MAC Address        Connection Time  RSSI           Rate
-------------------------------------------------------
64:80:99:eb:72:d3  0h 2m 38s        -75 dBm        81.0 Mbps
ec:9b:f3:bf:91:d2  0h 0m 20s        -66 dBm        24.0 Mbps

digi.router>
```

Configure a Wi-Fi client and add client networks

Required configuration items

- Wi-Fi module mode
  Configure the Wi-Fi module Mode as Client.
- Wi-Fi client networks
  Add up to 16 client networks per router. For each client network:
  SSID: Provide the SSID of the access point to which you want to connect.
  Security: Provide the security type for the SSID. For personal security modes, you need to enter only a password; for enterprise modes, you need to enter both the username and password.
- WAN assignment
  Once you configure a Wi-Fi client, you must assign the Wi-Fi client to a WAN. See Wide Area Networks (WANs).

Additional configuration items

- Wi-Fi client: Using the command line only, you can configure custom values for RSSI thresholds and other options. See wifi-client command.
- Wi-Fi client networks: Some access points hide (do not broadcast) their SSID. In this case, enable the Hidden SSID option and the client will send out probes for the SSID when scanning. In general, for both security and performance issues, Digi recommends you do not enable the Hidden option.

See Interfaces—Wi-Fi page for a complete list of Wi-Fi interface configuration options.

Web

1. On the menu, click **Network > Interfaces > Wi-Fi**.
2. Click on the Wi-Fi module you want to configure:
   Set the **Mode** to **Client**.
   Optional: Enter a description for the Wi-Fi module.
3. Click **Apply**.
4. Add or edit Wi-Fi client networks. For each:
   SSID: Enter the SSID for the client network.
   Optional: If needed, provide the SSID security type and then provide credentials for the SSID.

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Optional: If you want to scan for a hidden SSID, enable the **Hiden SSID** under the **Advanced** options.
See Client mode options for detailed option descriptions.

5. When you have finished adding Wi-Fi networks for the client, click **Apply**.
6. Assign the new Wi-Fi client to a WAN interface. See Wide Area Networks (WANs).

Command line

- To configure a Wi-Fi module, use the wifi-module command.
- To customize options for a Wi-Fi client, use the wifi-client command.
- To configure Wi-Fi client networks for a Wi-Fi client, use the wifi-client-network command.
- To add the Wi-Fi client to a WAN, use the wan command.

1. Configure the Wi-Fi module for client mode. For example, to set Wi-Fi module 1 to client mode:

```
digi.router> wifi-module 1 mode client
```

2. Optional: Customize options for the Wi-Fi client. For Wi-Fi module 1, the client is Wi-Fi client 1; for Wi-Fi module 2, the client is Wi-Fi client 2.

```
digi.router> wifi-client <1 - 2> <parameter> <value>
```

3. Add Wi-Fi client networks to the Wi-Fi client. For example:

```
digi.router> wifi-client-network 1 wifi-client 1
digi.router> wifi-client-network 1 ssid <ssid>
digi.router> wifi-client-network 1 security wpa-wpa2-personal
digi.router> wifi-client-network 1 password <password>
digi.router> wifi-client-network 1 hidden-network on

digi.router> wifi-client-network 2 wifi-client 1
digi.router> wifi-client-network 2 ssid <ssid>
digi.router> wifi-client-network 2 security wpa-wpa2-enterprise
digi.router> wifi-client-network 2 enterprise-username <enterprise_
username>
digi.router> wifi-client-network 2 enterprise-password <enterprise-
password>
```

4. Add the Wi-Fi client to a configured WAN:

```
digi.router> wan 1 interface wifi-client1
```

5. Save the configuration.

```
digi.router> save config
```


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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.

Web

- On the menu, click **Dashboard**. The Interface section of the dashboard shows the status of all interfaces. Click on the interface names to get detailed status and statistics.

Command line

Show summary of Wi-Fi access points

To show the status and statistics for Wi-Fi clients, use the show wifi-client command.

```
digi.router> show wifi-client
```

Show detailed status and statistics of a Wi-Fi client

To show a detailed status and statistics of a Wi-Fi client, enter show wifi-client command along with the interface you want to show.

```
digi.router> show wifi-client 1
```


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Serial interface

Digi WR devices have a single serial port that provides access to the command-line interface.

Additionally, the devices support the use of USB to serial adapters that have Prolific or FTDI chipsets. USB to serial adapters can be accessed via the Python PySerial module at the follow ports:

- WR54:
  - /dev/ttyUSBSerial1
- WR64:
  - Lower rear USB port: /dev/ttyUSBSerial1
  - Upper rear USB port: /dev/ttyUSBSerial2

  The front USB port of the WR64 is not supported with USB to serial adapters.

Configure the serial interface

By default, the serial interface is **enabled**. To change serial configuration settings, use the serial command.

Command line

Disable the serial interface

```
digi.router> serial state off
digi.router> save config
```

Enable CLI access for the serial interface

```
digi.router> serial state cli
digi.router> save config
```

Enable PySerial access for the serial interface

```
digi.router> serial state python
digi.router> save config
```

Enter a description for the serial interface

```
digi.router> serial description “Command line access”
digi.router> save config
```

Set the baud rate

For example, to set the baud rate to **9600**, enter:

```
digi.router> serial baud 9600
digi.router> save config
```

Set the data bits

For example, to set the data bits to **7**, enter:

```
digi.router> serial databits 7
digi.router> save config
```


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Set the stop bits

For example, to set the stop bits to **2**, enter:

```
digi.router> serial stopbits 2
digi.router> save config
```

Set the parity

For example, to set the parity to **odd**, enter:

```
digi.router> serial parity odd
digi.router> save config
```

Set the flow control

For example, to set the flow control to **hardware**, enter:

```
digi.router> serial flowcontrol hardware
digi.router> save config
```

Show serial status and statistics

To show the status and statistics for the serial interface, use the show serial command.

For example:

```
digi.router> show serial

 Serial 1 Status
 ---------------
 Description  :
 Admin Status : CLI
 Oper Status  : up
 Uptime       : 0:07:05
 Tx Bytes     : 4038
 Rx Bytes     : 81
 Overflows    : 0
 Overruns     : 0
 Line status  : RTS|CTS|DTR|DSR|CD0

digi.router>
```


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Local Area Networks (LANs)

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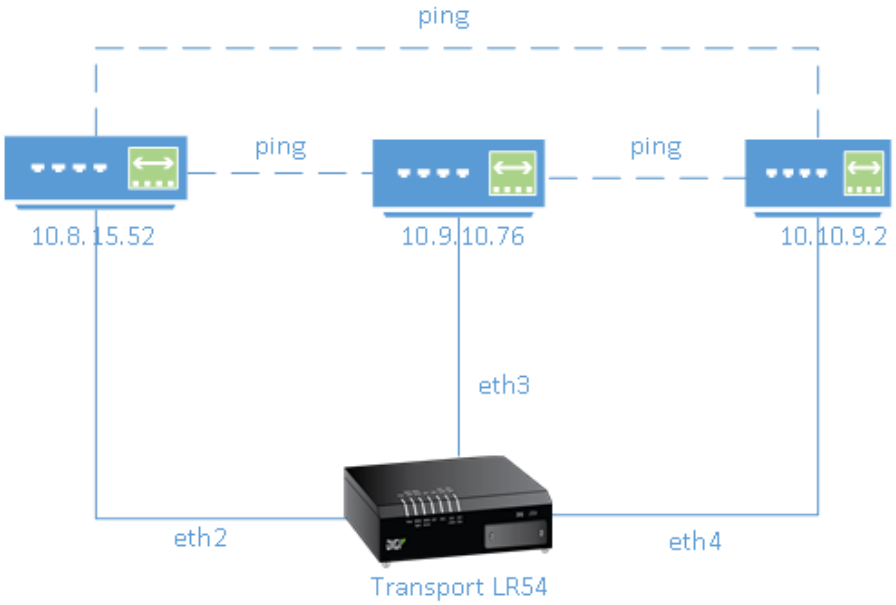
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About Local Area Networks (LANs)

A Local Area Network (LAN) connects network interfaces together, such as Ethernet or Wi-Fi, in a logical Layer-2 network. You can configure up to **10** LANs.

The diagram shows a LAN connecting the **eth2**, **eth3**, and **eth4** interfaces for a LR54 unit. 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.



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Configure a LAN

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

Required configuration items

- Identifying which interfaces are in the LAN.
- Enabling the LAN. LANs are disabled by default.
- Setting an 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, LAN 1 is set to an IP address of 192.168.1.1 and uses the IP subnet of 192.168.1.0/24. If the WAN 1 Ethernet interface is being used by LAN 1 and uses the same IP subnet, you should change the IP address and subnet of LAN1.

- If you want to use IPv6 addressing for the LAN, you need to enable the LAN interface instance for IPv6 and configure several other settings. See Configure a LAN for IPv6.

Additional configuration items

- Enable Spanning Tree Protocol (STP).
- Setting a descriptive name for the LAN.
- Setting the Maximum Transmission Unit (MTU), or packet size, for packets sent over the LAN. For IPv6, the minimum MTU must be 1280.

Web

To create a new LAN:

1. On the menu, click **Network > Networks > LANs**. The LANs page appears.
2. Click **New Network**. See Local Networks page for field descriptions.
3. In the **IPv4** group, set the IP address and netmask:

   IP address: Enter the IPv4 address for the LAN.

   Netmask: Enter the subnet mask for the LAN.
4. For **Enable DHCP Server**, select one of the following:
   - **Off** — Disables all DCHP server functionality.
   - **Server** — Enables the device's DHCP server. For **IP Start** and **IP End**, enter the range of IP addresses for the IP addresses pool that the DHCP server will use. Also optionally enter the amount of time in minutes that the DCHP lease will expire. See DHCP servers for more information about DHCP server support.
   - **Relay** — Disables the device's DHCP server and enables DHCP relay. For **Primary** and **Secondary Relay Server**, enter the IP addresses of the primary and secondary DHCP relay servers. See DHCP relay for more information.
5. In the **IPv6** group, configure **IPv6**. See Configure a LAN for IPv6.

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6. In the **Advanced** group, enter the Maximum Transmission Unit (MTU), or packet size, for packets sent over the LAN.
7. Click **Apply**. The new LAN is added to the **LAN** page.

Command line

1. Set the interfaces in the LAN. For example, to include **eth2**, **eth3**, and **eth4** interfaces in **lan1**, enter:

```
digi.router> lan 1 interfaces eth2,eth3,eth4
```

2. Enable the LAN. For example, to enable **lan1**:

```
digi.router> lan 1 state on
```

3. Optional: Set an IPv4 address for the LAN.

```
digi.router> lan 1 ip-address 192.10.8.8
```

4. Optional: Set a subnet mask for the LAN.

```
digi.router> lan 1 mask 255.255.255.0
```

5. Optional: Enable Spanning Tree Protocol (STP) for the LAN. STP is used when multiple LANs are configured on the same device, to prevent bridge loops and other routing conflicts.

```
digi.router> lan 1 stp on
```

6. Optional: Give a descriptive name to the LAN.

```
digi.router> lan 1 description ethlan
```

7. Optional: Set the MTU for the LAN.

```
digi.router> lan 1 mtu 1500
```

8. Save the configuration.

```
digi.router> save config
```

Show LAN status and statistics

You can view status and statistics for all LANs from either the Dashboard of the web interface, or from the command line:

Web

1. From the menu, click **Dashboard**. The **Network Activity** panel LAN section shows the total bytes received and sent over all LANs, and the **LAN** panel shows the configured LANs and their states.
2. Click a LAN to display additional status information, or to configure a LAN.

Command line

To show the status and statistics for a LAN, use the show lan command. For example, here is show lan output for a LAN on which IPv6 is enabled:

```
digi.router> show lan 1

 LAN 1 Status and Statistics
 ---------------------------
 Admin Status     : Up
 Oper Status      : Up

 Description      : Ethernet and Wi-Fi LAN network

 Interfaces       : eth3
 MTU              : 1500

 IP Address       : 192.168.1.1
 Mask             : 255.255.255.0

 IPv6 Address(es) : fe80::47/64 (Link local)
                    2001::1234:23:47:1/64 (Global)

               Received            Sent
               --------            ----
 Packets              0             137
 Bytes                0           15026

digi.router>
```

If IPv6 were disabled on this LAN, the **show lan** output looks like this:

```
digi.router> show lan 1

 LAN 1 Status and Statistics
 ---------------------------
 Admin Status  : Up
 Oper Status   : Up

 Description   : Ethernet and Wi-Fi LAN network

 Interfaces    : eth3
 MTU           : 1500

 IP Address    : 192.168.1.1
 Mask          : 255.255.255.0

 IPv6 is disabled on this interface

                Received            Sent
                --------            ----
 Packets              0             209
 Bytes                0           22946

digi.router>
```


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Delete a LAN

Deleting a LAN involves removing the physical interface associations from the LAN, thereby disabling the LAN. The definition for the LAN still exists in the device configuration, but it has no active physical interface.

Web

1. On the menu, click **Network > Networks > LANs**. The LANs page appears.
2. On the **LANs** page, select the LAN to delete.
3. Click **Delete**.

Command line

Use the lan command and specify **!** for the **interfaces** parameter value to set it to **none**:

```
lan <lan-number> interfaces !
```

DHCP servers

You can enable DHCP on a Digi WR 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.

  You can configure up to 10 DHCP servers, one for each local network.
- 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

To configure a DHCP server, you need to configure the following:

Required configuration items

- Enable the DHCP server.
- DHCP method:
  - If the device is being configured to use its local DHCP server:
    - The IP address pool: the range of IP addresses issued by the DHCP server to clients.

      Note If you set DHCP server values and find that they are not being served to your DHCP clients, review the LAN configuration in the Local Networks page to make sure that the specified **IP Start** and **IP End** values match the corresponding **IPv4** and **Netmask** settings for the interface.
  - If the device is being configured to use a DHCP relay server, see DHCP relay.

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- The IP network mask given to clients.
- The IP gateway address given to clients.
- The IP addresses of the preferred and alternate Domain Name Server (DNS) given to clients.

Additional configuration items

- Lease time: The length, in minutes, of the leases issued by the DHCP server.

Web

In the web interface, the DHCP server is configured as part of configuring a LAN on the **Local Networks** page. See Configure a LAN.

Command line

Note This 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 DHCP relay.

1. Enable the DHCP server. By default, the DHCP server is disabled.

```
digi.router> dhcp-server 1 state server
```

2. Enter the starting address of the IP address pool:

```
digi.router> dhcp-server 1 ip-address-start 10.30.1.150
```

3. Enter the ending address of the IP address pool:

```
digi.router> dhcp-server 1 ip-address-end 10.30.1.195
```

4. Enter the network mask:

```
digi.router> dhcp-server 1 mask 255.255.225.0
```

5. Enter the IP gateway address given to clients:

```
digi.router> dhcp-server 1 gateway 10.30.1.1
```

6. Enter the preferred DNS server address given to clients:

```
digi.router> dhcp-server 1 dns1 10.30.1.1
```

7. Enter the alternate DNS server address given to clients:

```
digi.router> dhcp-server 1 dns2 209.183.48.11
```

8. Enter the lease time:

```
digi.router> dhcp-server 1 lease-time 60
```

9. Save the configuration.

```
digi.router> save config
```


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Map static IP addresses to hosts

Using the dhcp-host command, you can configure the DHCP server to assign static IP addresses to specific hosts. Up to 32 static IP addresses can be assigned.

Required configuration items

- IP address that will be mapped to the device.
- MAC address of the device.

Command line

Static IP address mapping is available at the command line only.

1. Assign the MAC address of the host. For example:

```
digi.router> dhcp-host 1 mac-address 00:50:18:21:E2:82
```

2. Assign an IP address to the host. For example:

```
digi.router> dhcp-host 1 ip-address 192.168.1.2
```

3. Repeat for each additional host, using a unique number for the dhcp-host entry. Up to 32 hosts can be configured. For example:

```
digi.router> dhcp-host 2 mac-address 00:50:18:21:E2:83
digi.router> dhcp-host 2 ip-address 192.168.1.3
```

4. Save the configuration:

```
digi.router> save config
```

View current static IP mapping

To view your current static IP mapping, type the dhcp-host command with no parameters:

```
digi.router> dhcp-host

dhcp-host 1:
ip-address                  192.168.1.2
mac-address                 00:50:18:21:E2:82

dhcp-host 2:
ip-address                  192.168.1.3
mac-address                 00:50:18:21:E2:83

dhcp-host 3:
ip-address
mac-address

dhcp-host 4:
ip-address
mac-address

--More--
```


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Delete static IP mapping entries

To delete a static IP entry, type the following:

```
digi.router> dhcp-host 1 ip-address !
digi.router> save config
```

Configure DHCP options

You can configure DHCP servers running on your Digi WR 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 user class to specify the DHCP clients for the option.
- The LAN interface, which limits the DHCP option to the DHCP server running on the specified LAN interface.
- Force the option to be sent to the DHCP clients.

Command line

DHCP option configuration is available at the command line only.

1. Set the DHCP option and value. For example, to create a static route for the client, use option 32:

   ```
   digi.router> dhcp-option 1 option 32
   ```

2. Set the value for the DHCP option:

   ```
   digi.router> dhcp-option 1 value 192.168.1.100,192.168.1.1
   ```

3. (Optional) Define the LAN to which this option applies. The default is "all."

   ```
   digi.router> dhcp-option 1 lan lan1
   ```

4. (Optional) Set the user class to which this option applies:

   ```
   digi.router> dhcp-option 1 user-class Engineering
   ```

5. (Optional) Force the option to be sent to the DHCP clients.

   ```
   digi.router> dhcp-option 1 force on
   ```

6. Save the configuration:

   ```
   digi.router> save config
   ```


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View current DHCP option configuration

To view your current DHCP option configuration, type the dhcp-option command with no parameters:

```
digi.router> dhcp-option

dhcp-option 1:
force                       on
lan                         lan1
option                      33
user-class                  Engineering
value                       192.168.1.100,192.168.1.1

dhcp-option 2:
force                       off
lan                         all
option                      0
user-class
value

dhcp-option 3:
force                       off
lan                         all
option                      0
user-class
value

--More--
```


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Show DHCP server settings

View DHCP status to monitor which network devices have been given IP configuration by the Digi WR device, and to diagnose DHCP issues.

Web

1. On the menu, click **Network > Networks > LANs**. The LANs page appears.
2. Select a LAN.
3. Expand the **DHCP Server** group to view the current DHCP configuration. The **Enable DHCP Server** option indicates whether the DHCP server is **Off**, **Server**, or **Relay**.

Command line

To show the status of the DHCP server, use the show dhcp command. For example:

```
digi.router> show dhcp

DHCP Status
-----------
IP address       Hostname           MAC Address        Lease Expires At
-------------------------------------------------------------------------
192.168.123.123  IKY-CMS-JPINKN1    38:ea:a7:fd:de:cd  16:32:16, 14 Sep 2016
192.168.123.124  IKY-CMS-BOB        38:ea:a7:fd:a3:22  18:21:06, 14 Sep 2016

digi.router>
```

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 Digi WR devices, 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.

Up to two DHCP relay servers can be provided for each LAN: a primary and secondary relay server. If two relay servers are provided, DHCP requests are forwarded to both servers without waiting for a response. Clients will typically use the IP address from the first DHCP response received.

Configure DHCP relay

Configuring DHCP relay involves the following items:

Required configuration items

- 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 a secondary DHCP relay server.

Define DHCP relay servers

Web

1. On the menu, click **Network** > **Networks** > **LANs**.
   The **Local Networks (LAN)**page appears.
2. Click **New Network** or click an existing network to define DHCP relay servers for the network.
3. Expand the **DHCP Server** group.
4. For **Enable DHCP Server**, select **Relay**.
5. In **Primary Relay Server**, type the IP address of the DHCP server that will serve as the primary DHCP relay server.
6. (Optional) In **Secondary Relay Server**, type the IP address of the secondary DHCP relay server.
7. Click **Apply**

Command line

To define DHCP relay servers, use the dhcp-server command. For example:

1. Configure the LAN that DHCP clients will connect to, if it is not already configured:

   ```
   digi.router> lan 1 ip-address 10.251.99.1
   digi.router> lan 1 state on
   ```

   For more information, see Configure a LAN.
2. Enable DHCP relay server:

   ```
   digi.router> dhcp-server 1 state relay
   ```

   By enabling DHCP relay, you are disabling the device's local DHCP server, and any IP range that is configured will be ignored.
3. Define the IP address of the DHCP server that will serve as the primary DHCP relay server:

   ```
   digi.router> dhcp-server 1 relay-server1 192.168.1.1
   ```

4. (Optional) Define the IP address of the DHCP server that will serve as the primary DHCP relay server:

   ```
   digi.router> dhcp-server 1 relay-server2 192.168.1.2
   ```

5. Save the configuration:

   ```
   digi.router> save config
   ```


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DHCP relay server failure

When a DHCP relay server is being used and connecting devices are unable to obtain an IP address because the IP address is not accessible or there is a subnet conflict, a message will appear in the **system log** similar to the following:

```
daemon.warning dnsmasq-dhcp[5446]: no address range available for DHCP request
via lan1
```

If the device successfully forwards a DHCP request but does not receive a reply from the DHCP server, a static route may be required on the DHCP server's host to route the reply back to the device.

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Wide Area Networks (WANs)

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

- A physical interface, such as Ethernet or cellular
- Several networking parameters for the WAN, such as IP address, mask, and gateway
- Several parameters controlling failover

Using Ethernet interfaces in a WAN

Digi WR devices support four Ethernet interfaces, named **WAN/ETH1**, **ETH2**, **ETH3**, and **ETH4**. You can use Ethernet interfaces as a WAN when connecting to the Internet, through a device such as a cable modem:



By default, the **WAN/ETH1** interface is configured as a WAN with both DHCP and NAT enabled. This means you should be able to connect to the Internet by connecting the **WAN/ETH1** interface to a device that already has an internet connection.

The **ETH2**, **ETH3**, and **ETH4** interfaces are by default configured as a Local Area Network (LAN). If necessary, you can assign these Ethernet interfaces to a WAN. For more information on Ethernet interfaces and their configuration, see Ethernet interfaces.

Using cellular interfaces in a WAN

Depending on the model, Digi WR devices can support one or two cellular modules, and each module supports two SIMs. This means that a device can have either two or four cellular interfaces:

- cellular1-sim1
- cellular1-sim2
- cellular2-sim1 (only on models with two cellular modules)
- cellular2-sim2 (only on models with two cellular modules)

To use a cellular interface as a WAN, the cellular interface must be configured to connect to the cellular network. See Cellular interfaces for more information.

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WAN priority and default route metrics

You can configure up to **10** WANs, named **wan1**, **wan2**, **wan3**, and so on. The WAN number determines the priority: **wan1** is the highest priority, **wan2** is the second highest priority, and so on.

When a WAN comes up, the device automatically adds a default IP route for the WAN. The metric of the default route is based on the priority of the WAN. For example, because **wan1** is the highest priority WAN, the default route for **wan1** has a metric of **1**, and the default route for **wan2** has a metric of **2**, and so on.

WAN failover

If a connection to a WAN interface is lost for any reason, the Digi WR device will immediately fail over to the next WAN interface. Two parameters govern the behavior that occurs during the failover operation:

- The WAN interface's **Timeout** parameter determines how long the device will attempt to connect to the WAN interface before it assumes the interface is unavailable and fails over to the next WAN interface. Note that once the device has successfully connected to the WAN and then the connection is lost, it will immediately fail over to the next WAN, regardless of the **Timeout** parameter.
- The WAN interface's **Retry After** parameter determines how long the device will wait before attempting to connect to the interface again.

For example, if you configure the WAN1 interface to have a **Timeout** of 300 seconds and a **Retry After** of 1500 seconds:

1. When the device is restarted, it will attempt to connect to WAN1. If the device fails to connect to WAN1 after 300 seconds (the value of WAN1's **Timeout** parameter), it will stop attempting to connect to WAN1 and attempt to connect to WAN2. The device will then wait for 1500 seconds (the value of WAN1's **Retry After** parameter) before attempting to connect to WAN1 again.

   Note that if the device is already connected to WAN1 and the connection fails, the device will immediately attempt to connect to WAN2.
2. If the connection to WAN2 is not immediately successful, the device will continue to attempt to connect to WAN2 based for the number of seconds defined for WAN2's **Timeout** parameter.
3. If the connection to WAN2 also fails, the device will fail over to WAN3. In this case, the device will continue attempting to connect to WAN1 based on WAN1's **Retry After** parameter. It will also continue attempting to connect to WAN2 based on WAN2's **Retry After** parameter, unless and until the connection to WAN1 is successful.

The **Timeout** and **Retry After** parameters are configured in the Web UI by selecting **Network > Networks > WANs** on the menu and expanding the **Probing** group. See Configure a Wide Area Network (WAN) for information. The parameters are configured at the command line using the **wan <n> timeout** and **wan <n> retry-after** commands. See the wan command for information.

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Active vs. passive failure detection

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

- Active detection involves sending out IP probe packets (ICMP echo requests) to a particular host and waiting for a response. The WAN is considered to be down if there are no responses for a configured amount of time. See Using IP probing to detect WAN failures.
- Passive detection involves detecting the WAN going down by monitoring its link status by some means other than sending IP probe packets. For example, if an Ethernet cable is disconnected or the state of a cellular interface changes from **on** to **off**, the WAN is down.

Using IP probing to detect WAN failures

Problems can occur beyond the immediate WAN connection that prevent some IP traffic from reaching its destination. Normally this kind of problem does not cause the WAN to fail, as the connection continues to work while the core problem exists somewhere else in the network.

You can use IP probing to detect problems in an IP network. IP probing involves configuring the Digi WR device to send out regular IP probe packets (ICMP echo requests) to a particular destination. If there are no responses to the probe packets, the device will bring down the WAN and switch to using another WAN until the problem is resolved.

IP probing includes the following options:

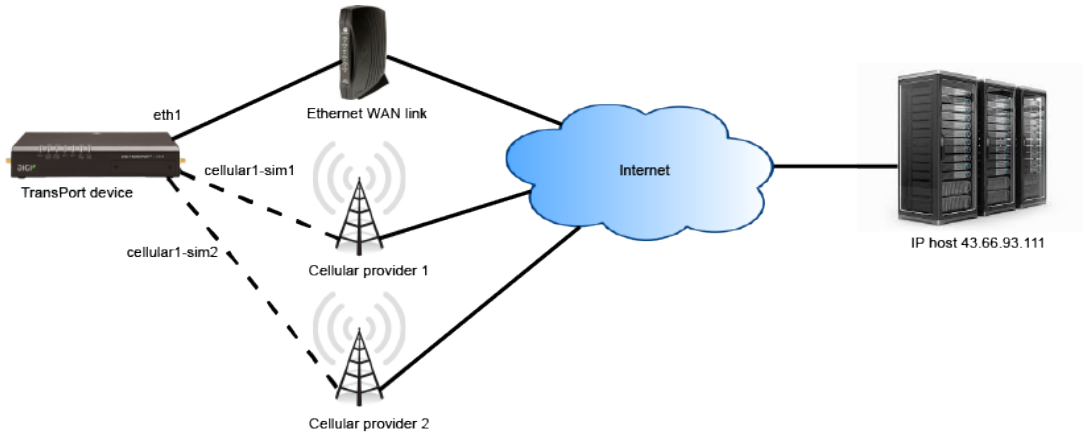
- **Probe host**: The IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device.
- **Probe interval**: The number of seconds to wait between sending probe packets. This value must be more than the probe timeout value.
- **Probe size**: The size in bytes of probe packets sent to detect WAN failures. Allowed values are between 64 and 1500.
- **Probe timeout**: The time, in seconds, to wait for a response to a probe before the device will consider the probe to have failed. This value must be less than the probe interval and timeout values.
- **Activate after**: The time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted.
- **Retry after**: The time, in seconds, to wait before retrying this interface after failover. Use a large retry timeout when both interfaces are cellular interfaces.
- **Timeout** : The number of seconds to wait after the first failed probe before failing over to the next lower priority WAN. Note that once the device has successfully connected and then the connection is lost, it will immediately fail over to the next WAN, regardless of the timeout setting.

Example: WAN failover from Ethernet to cellular

In this example WAN, the **eth1** interface associated with **wan1** serves as the primary WAN, while **cellular1-sim1** and **cellular1-sim2** are associated with **wan2** and **wan3**, respectively, and serve as backups.

Note The WR64 and some variants of the WR54 have a second modem with two additional sim slots. On these devices, up to four cellular interfaces can be associated with WANs.

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To detect failover:

- The **eth1** interface uses IP probing to detect interface failure.
- The backup WANs, **wan2** and **wan3**, use passive techniques to detect interface failure.

Using the IP probing configured over the **eth1** interface, the Digi WR device sends a probe packet of size **256** bytes to the IP host **43.66.93.111** every **10** seconds. If no responses are received for **60** seconds, the device brings the **eth1** interface down and starts using the **wan2** (**cellular1**) interface.

If the device cannot get a connection on the **wan2** (**cellular1-sim1**) interface, it attempts to use the **wan3** (**cellular1-sim2**) interface. It attempts to switch back to the **wan2** (**cellular1-sim1**) interface after **30** minutes (**1800** seconds).

The device continues to send probes out of the **eth1** interface. If it receives probe responses for **120** seconds, it reactivates the **wan1** interface and starts using it again as the primary WAN.

To achieve this WAN failover from the **eth1** to **cellular1-sim1** and **cellular1-sim2** interfaces, the WAN failover configuration commands are:

```
digi.router> wan 1 interface eth1
digi.router> wan 1 timeout 60
digi.router> wan 1 probe-host 43.66.93.111
digi.router> wan 1 probe-interval 10
digi.router> wan 1 probe-size 256
digi.router> wan 1 activate-after 120
digi.router> wan 1 state on
digi.router> wan 2 interface cellular1-sim1
digi.router> wan 2 retry-after 1800
digi.router> wan 2 state on
digi.router> wan 3 interface cellular1-sim2
digi.router> wan 3 retry-after 1800
digi.router> wan 3 state on
digi.router> save config
```


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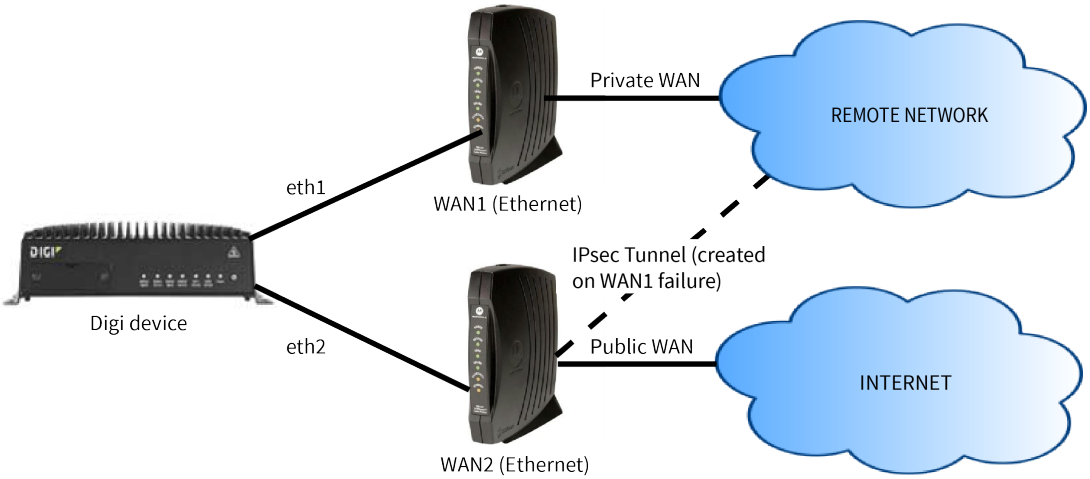
SureLink probe options for cellular WANs with only one SIM

For WANs configured to use a cellular interface with only one SIM, you can configure additional probe options to reset the cellular module and/or the router when a failure is detected:

- **Reboot cellular module:** If probing fails after a specified amount of time, the Digi WR device reboots the cellular module. See the wan command **probe-fail-reset-module** option.
- **Reboot router:** If probing fails after a specified amount of time, the Digi WR device is rebooted. See the wan command **probe-fail-reset-router** option.

WAN failover to IPsec

You can also configure a WAN to fail over to an IPsec tunnel. This is useful in cases where you are using a private WAN for sensitive data. In a failover scenario involving the private WAN, you can configure the device to route the sensitive data over a public WAN, while protecting the data by using an IPsec tunnel.



See Configure an IPsec tunnel for WAN failover for information about configuring a WAN to fail over to an IPsec tunnel.

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Configure a Wide Area Network (WAN)

You can configure up to **10** Wide Area Network (WANs). Configuring a WAN consists of the following:

- Associating a physical interface, such as Ethernet or cellular with the WAN.
- Optionally configuring networking parameters for the WAN, such as IP address, mask, and gateway.
- Optionally configuring several parameters controlling failover.
- Optionally configuring the WAN for IPv6 support.

Assigning priority to WANs

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 Ethernet to be your primary WAN with a cellular interface as backup, assign an Ethernet interface to **wan1** and assign a cellular interface to **wan2**.

WANs have priorities associated with them, which is based on a metric parameter set for each WAN. The Digi WR device automatically adds a default IP route for the WAN when it comes up. The metric of the route is based on the priority of the interface. For example, as **wan1** is the highest priority, the default route for **wan1** has a metric of **1**, and the default route for **wan2** has a metric of **2**.

Configuring a WAN for IPv6

You can enable IPv6 on a per-WAN-interface basis. See Configure a WAN for IPv6.

Required configuration items

- Assign an interface to the WAN. By default, WANs are assigned the following physical interfaces:
  - **wan1**: **eth1**
  - **wan2**: **cellular1**
  - **wan3**: **cellular2**
- Assign an interface to the WAN. By default, WANs are assigned the following physical interfaces:
  - wan1: eth1
  - wan2: cellular1-sim1
  - wan3: cellular2-sim1
  - wan4: cellular1-sim2
  - wan5: cellular2-sim2
- If you want to use IPv6 addressing for the WAN, enable the WAN for IPv6 and configure prefix delegation. See Configure a WAN for IPv6.

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Additional configuration items

These additional configuration settings are not typically configured, but you can set them as needed.

- For **Ethernet** interfaces:
  - The IP configuration. WANs typically get their IP address configuration from the network to which they connect (for example, cellular). However, you can manually set the IP configuration as needed. The following manual configuration settings are available:
    - IP address and mask.
    - Gateway: Required for Ethernet WANs if setting IP address manually, to create a default route over the WAN. If setting the IP address via DHCP, this setting is obtained automatically and does not need to be set.
    - Preferred and alternate DNS server.
  - Disable the DHCP client. Ethernet interfaces use DHCP client to get an IP address from a DHCP server (for example, from a cable modem). If you are manually configuring the IP address for the Ethernet interface, disable the DHCP client.
  - Network Address Translation (NAT). NAT translates IP addresses from a private LAN to a public IP address. By default, NAT is enabled. Unless your LAN has a publicly-addressable IP address range, do not disable NAT.
  - The IP probe settings. These settings control elements of the WAN failover feature, including sending of probe packets over the WAN interface to a specified device to determine whether the WAN is still up, timeouts, and switching between primary and backup interfaces. See Using IP probing to detect WAN failures for more information on these settings.

  Note A WAN configured for static IP takes precedence over a configuration derived via DHCP. This allows you to configure alternative DNS servers from those given to you by your network provider.

- For **Cellular** interfaces:
  - The IP probe settings. These settings control elements of the WAN failover feature, including sending of probe packets over the WAN interface to a specified device to determine whether the WAN is still up, timeouts, and switching between primary and backup interfaces. For more information on these settings, see the discussion of IP probing in Using IP probing to detect WAN failures and SureLink probe options for cellular WANs with only one SIM.

Web

Create a new WAN

1. On the menu, click **Network > Networks > WANs**. The WANs page appears.
2. Click **New WAN Connection** and enter the following:

   Select WAN: Assign an index number to the WAN. This number sets the WAN priority for the WAN.

   Select interface: Select an interface to assign to the WAN.

   Enable: Enable or disable the new WAN.

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3. In the **IPv4** group, configure IP address settings for IPv4 if you want to manually configure an IP address for the WAN.
4. In the **IPv6** group, enable and configure IPv6 if required for the WAN.
5. In the **Security** group, configure optional security settings for the WAN.
6. In the **Probing** group, configure optional probe host settings for the WAN.
7. Click **Apply**.

Command line

Configure basic WAN settings

1. Assign an interface to the WAN interface.

```
digi.router> wan 1 interface eth1
```

2. If using IPv6 addressing for the WAN, see Configure a WAN for IPv6.
3. Optional: Disable DHCP client mode.

```
digi.router> wan 1 dhcp off
```

4. Optional: Configure the IP address, mask, gateway, and DNS servers.

```
digi.router> wan 1 ip-address 10.1.2.2
digi.router> wan 1 mask 255.255.255.252
digi.router> wan 1 gateway 10.1.2.1
digi.router> wan 1 dns1 10.1.2.1
digi.router> wan 1 dns2 8.8.8.8
```

5. Optional: Set the speed.

```
digi.router> eth 1 speed {auto | 1000 | 100 | 10}
```

6. Save the configuration.

```
digi.router> save config
```

Configure IP probe settings

1. Optional: Configure the time, in seconds, to wait for this interface to connect and to receive a probe response before failing over to a lower priority interface.

```
digi.router> wan 1 timeout 60
```

2. Configure the IP host to probe.

```
digi.router> wan 1 probe-host 192.168.47.1
```

3. Optional: Configure the time, in seconds, to wait for a response to a probe. This value must be smaller than the probe-interval and timeout parameter values. If not, the configuration is considered invalid, and an error message is written to the system log.

```
digi.router> wan 1 probe-timeout 5
```


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4. Optional: Configure the interval, in seconds, between sending probe packets. This value must be larger than the probe-timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log.

```
digi.router> wan 1 probe-interval 20
```

5. Optional: Configure the size of the IP probe packet.

```
digi.router> wan 1 probe-size 120
```

6. Optional: Configure the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from **0** to **3600**. The default value is **0**.

```
digi.router> wan 1 activate-after 30
```

7. Optional: Configure the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from **10** to **3600**. The default value is **180**.

```
digi.router> wan 1 retry-after 1200
```

8. Save the configuration.

```
digi.router> save config
```

Show WAN status and statistics

You can view status and statistics for all WANs from either Web UI or the command line.

Web

1. On the menu, click **Network > Networks > WANs**. The WANs page appears.
2. Select a WAN.

   The WAN page shows configuration parameters, as well as status and statistics for the interface assigned to the WAN.

Command line

Show WAN summary statistics

To show the status and statistics for a WAN, use the show wan command. For example:

```
digi.router> show wan

 # WAN Interface  Status  IP Address
 -----------------------------------
 1 eth1           Up      192.168.0.25
 2 cellular1      Up      172.20.1.7

digi.router>
```


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Show status and statistics for the WAN physical interface

To view status and statistics for the physical interface for the WAN, enter the **show** command for that physical interface; for example, show eth or show cellular.

Show detailed WAN status

To show detailed status for a WAN, enter the show wan command, specifying the WAN instance number. For example, for a WAN on which IPv6 is enabled:

```
digi.router> show wan 1

 WAN 1 Status and Statistics

 ---------------------------
 WAN Interface      : eth1
 Admin Status       : Up
 Oper Status        : Up

 IP Address         : 47.0.0.101
 Mask               : 255.255.255.0
 Gateway            : 47.0.0.1
 DNS Server(s)      : 47.0.0.1, 8.8.8.8

 IPv6 Address(es)   : 2001:abcd:1234::1234:22:3/64 (Global)
                      fe80::20c:29ff:fef4:77fc/64 (Link local)
 IPv6 DNS Server(s) : 2001:abcd:1200:11:e4ff:fe09:3de3, 2001:4860:4860::8888

 Probes are not being used

               Received            Sent
               --------            ----
 Packets              4               4
 Bytes              836             796
```

When IP probing is enabled, the show wan output provides additional details, including how long it has been since the device received a probe response from the probe host:

```
digi.router> show wan 1

 WAN 1 Status and Statistics
 ---------------------------
 WAN Interface : eth1
 Admin Status  : Up
 Oper Status   : Up

 IP Address    : 10.52.18.120
 Mask          : 255.255.255.0
 Gateway       : 10.52.18.1
 DNS Server(s) : 8.8.8.8

 Probing                      : 10.52.18.1
 Last Probe Response received : 5 seconds ago

               Received            Sent
               --------            ----
 Packets           8356             640
 Bytes           673351           64841

digi.router>
```


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If IP probing is disabled because the configuration is invalid, the output is similar to the following:

```
digi.router> show wan 1

 WAN 1 Status and Statistics
 ---------------------------
 WAN Interface : eth1
 Admin Status  : Up
 Oper Status   : Up

 IP Address    : 10.52.18.120
 Mask          : 255.255.255.0
 Gateway       : 10.52.18.1
 DNS Server(s) : 8.8.8.8

 Probes are not being used

           Received            Sent
           --------            ----
 Packets       8356             640
 Bytes       673351           64841

digi.router>
```

If IP probing is on, but the device has not yet received any replies, the output is similar to the following:

```
digi.router> show wan 1

 WAN 1 Status and Statistics
 ---------------------------
 WAN Interface : eth1
 Admin Status  : Up
 Oper Status   : Up

 IP Address    : 10.52.18.120
 Mask          : 255.255.255.0
 Gateway       : 10.52.18.1
 DNS Server(s) : 8.8.8.8

 Probing                     : 10.52.18.1
 Waiting for first response

               Received            Sent
               --------            ----
 Packets           8356             640
 Bytes           673351           64841

digi.router>
```


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Delete a WAN

Web

1. On the menu, click **Network > Networks > WANs**. The WANs page appears.
2. On the **WAN** page, select the WAN to delete.
3. Click **Delete**.

Command line

You cannot delete a WAN using the command line. Instead, disable the WAN using the **wan n state off** command, for example:

```
wan 1 state off
```

IPv6

IPv6 is an updated version of the Internet Protocol (IP). Until recently, the Internet has used a previous version, IPv4.

One of the reasons for IPv6 is the shortage of IPv4 addresses. Although Network Address Translation (NAT), which allows users to use one public IPv4 address for a whole private network, has mitigated this shortage to some extent, with more and more devices being connected to the internet, there are not many IPv4 addresses left.

IPv4 addresses are 32 bits long. Over 4 billion addresses are available through IPv4, though not all the addresses are usable. IPv6 addresses are 128 bits long. Taking into account the structure of the IPv6 address, there are $4.6x10^{18}$ globally routable addresses available. This equates to approximately 650 million IP addresses for each person in the world.

Since every device can have a globally routable IPv6 address, there is no NAT with IPv6. This means it is very important to properly configure IP filters and firewall rules to prevent direct attacks on hosts on the LAN networks. By default, a Digi WR device blocks any incoming IPv6 traffic not associated with a connection established by a host on the LAN network.

IPv4 and IPv6 can co-exist on the same device. Each application can select the IP version to use. Some services, such as web server or Simple Network Management Protocol (SNMP) can accept connections on both IPv4 and IPv6.

Digi WR devices support both IPv4 and IPv6 on WAN and LAN interfaces. Using IPv6 on WAN interfaces requires an ISP that supports IPv6.

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Common IPv6 address types

There are several common IPv6 address types, distinguished by their beginning characters:

Address type	Beginning characters	Description
Global routable addresses	Either **2** or **3**	Each device using IPv6 on the Internet has a globally unique routable IPv6 address.
Link local addresses	**fe80**	Each device auto-generates a link-local address on every interface using IPv6. The interfaces use these addresses to communicate with other devices connected on the link.
Multicast addresses	**ff**	Addresses for sending packets to a group of devices. There are a number of well-known defined addresses, such as those for **All nodes** and **All routers**.
Unique local addresses (ULA)	**fc** or **fd**	Addresses for creating a site-specific network. While these addresses are globally unique, you cannot use them for routing on the Internet.

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Auto address assignment

There are three modes in which a device can auto-configure itself with an IPv6 address and other network configuration. The mode the device uses is controlled by the Router Advertisement messages a router periodically sends out, or in response to a Router Solicitation message that a host sends.

Auto-configuration mode	Description
Stateless auto-configuration (SLAAC)	The device uses the prefix sent in the Router Advertisement message to generate a unique IPv6 usually by appending the interface's MAC address with EUI-64 encoding. The device can also learn gateway and DNS server information from the Router Advertisement message. The device uses Duplicate Address Detection (DAD) to ensure the auto-generated IPv6 address is unique.
DHCPv6	The device uses DHCPv6 to get an IPv6 address and other network configuration.
SLAAC + DHCPv6	The device uses a combination of SLAAC and DHCPv6. It uses SLAAC to auto-configures itself with an IPv6 address, and DHCPv6 to get other network configuration, such as DNS server information. This configuration mode is available because earlier versions of the Router Advertisement did not include any DNS server information. Therefore the device had to use DHCPv6 to get this information.

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Prefix delegation

Prefix delegation is how a router asks for a prefix from the ISP that it can subnet and distribute through its LAN interfaces. Prefix delegation is an extension of the DHCPv6 protocol.

Normally, a router gets a **/64**-bit prefix using Router Advertisements, which cannot normally be subnetted. Therefore, a router uses prefix delegation to request a globally routable prefix it can distribute.

When the Digi WR device receives a delegated prefix, it appends a subnet ID and assigns it to the LAN interfaces with IPv6 enabled. The subnet ID differs for each LAN. By default, the subnet ID is the LAN instance.

For example, if the delegated prefix is **2001:1234:5678:9ab0::/60**, the prefixes for LANs **1** to **4** are:

- LAN 1: **2001:1234:5678:9ab1/64**
- LAN 2: **2001:1234:5678:9ab2/64**
- LAN 3: **2001:1234:5678:9ab3/64**
- LAN 4: **2001:1234:5678:9ab4/64**

The router's LAN interfaces then advertise these prefixes using Router Advertisements and DHCPv6.

More information on IPv6

For more information, including key differences between IPv4 and IPv6, see this Digi white paper on IPv6.

Configure a LAN for IPv6

Currently, the only mode for auto-configuration of devices connected on the LAN is **DHCPv6**. Configuring a LAN for IPv6 involves Enable IPv6 on a LAN.

Enable IPv6 on a LAN

You can enable IPv6 on a per-LAN interface basis.

Enabling IPv6 on a LAN does not affect IPv4 operation. When IPv6 is enabled for a LAN, you can have IPv4 addresses on the LAN and hosts on the LAN can use IPv4 and IPv6 as required.

Web

1. On the menu, click **Network > Networks > LANs**. The LANs page appears.
2. Select the LAN on which you want to enable IPv6.
3. Open the **IPv6** group, and enable IPv6.

Command line

To enable IPv6 on a LAN, use the lan command **ipv6-state** parameter. For example:

```
digi.router> lan 1 ipv6-state on
digi.router> save config
```


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Show LAN IPv6 status

You can view IPv6 status and statistics for LANs from either Web UI or the command line.

Web

1. On the menu, click **Network > Networks > LANs**. All configured LANs appear.
2. Select a LAN. The LAN display expands to show the configuration parameters and the status and statistics for the interface assigned to the LAN. If IPv6 is enabled for the LAN and IPv6 addresses are assigned to it, the addresses display in the **IPv6 Address** field.

Command line

To show the IPv6 status on a LAN, use the show lan command. For example:

```
digi.router> show lan 1

 LAN 1 Status and Statistics
 ---------------------------
 Admin Status      : Up
 Oper Status       : Up

 Description       : Ethernet LAN network
 Interfaces        : eth2
 MTU               : 1500

 DHCP client       : Off
 IP Address        : 192.168.1.1
 Mask              : 255.255.255.0
 DNS Server(s)     : 8.8.8.8

IPv6 Address(es)   : fe80::8473:dff:fe69:ab41/64    (Link Local)
                     2600:1000:b03e:7ae9:1000::1/68 (Global)

                        Received          Sent
                       ---------          ----
 Packets                  167018         56253
 Bytes                  13487578       4608476
```

Configure a WAN for IPv6

Configuring a WAN for IPv6 involves these tasks:

- Enable IPv6 on a WAN
- Configure prefix delegation on a WAN

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Enable IPv6 on a WAN

You can enable IPv6 on a per-WAN basis.

For IPv6 to work on a WAN interface, the ISP to which the WAN interface is connected must support IPv6.

Web

1. From the menu, click **Network > Networks > WANs**. The WANs page appears.
2. Select the WAN on which you want to enable IPv6.
3. Open the **IPv6** group, and enable IPv6.

Command line

To enable IPv6 on a WAN interface, use the wan command **ipv6-state** parameter. For example:

```
digi.router> wan 1 ipv6-state on
digi.router> save config
```

Configure prefix delegation on a WAN

When the WAN interface gets an IPv6 address, the Digi WR device automatically sends a prefix delegation request to the ISP. By default, the device requests a **/60** prefix, which allows the device to support up to **15** LANs. The number of LANs that can be supported is equal to **2** raised to the power of ((64 - prefix-length) - 1). You can request a different prefix length from this default.

Note The Digi WR device is not guaranteed to receive a prefix of the requested length. For example, the device may request a **/60** prefix, but receive a **/62** prefix. This means you might have more LANs with IPv6 enabled than can be supported by the received prefix. In this case, the device sets the prefix on the first LAN interfaces as defined by the number of available LANs.

Web

1. From the menu, click **Network > Networks > WANs**. The WANs page appears.
2. Select the WAN on which you want to configure prefix delegation.
3. Enter the length of the requested prefix in the **Requested Prefix Length** field.

Command line

To change the length of the requested prefix, use the wan ipv6-prefix-length command. For example:

```
digi.router> wan 1 ipv6-prefix-length 56
digi.router> save config
```


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Show WAN IPv6 status

You can view IPv6 status WANs from either the Web UI or the command line.

Web

1. On the menu, click **Network > Networks > WANs**. All configured WANs appear.
2. Select a WAN. The WAN display expands to show the configuration parameters and the status and statistics for the interface assigned to the WAN. If IPv6 is enabled for the WAN and IPv6 addresses assigned to the WAN, the addresses display in the **IPv6 Address** field.

Command line

To show the IPv6 status on a WAN, use the show wan command. For example:

```
digi.router> show wan 2

 WAN 2 Status and Statistics
 ---------------------------
 WAN Interface      : cellular1
 Admin Status       : Up
 Oper Status        : Up

 IP Address         : 100.67.98.174
 Mask               : 255.255.255.252
 Gateway            :
 DNS Server(s)      : 198.224.186.135, 198.224.187.135

 IPv6 Address(es)   : 2600:1000:b03e:7ae9:3038:63ff:fe47:4158/64 (Global)
                      fe80::3038:63ff:fe47:4158/64 (Link Local)
 IPv6 DNS Server(s) : 2001:4888:12:ff00:106:d::, 2001:4888:13:ff00:123:d::

 Probes are not being used

              Received            Sent
              --------            ----
 Packets           503             939
 Bytes           104697          130536
```


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Local users

To access a Digi WR device by using the command-line interface or web interface, users must log in as a configured user of the device. This topic details the Digi WR user model, as well as how to create, modify, and delete users.

Maximum number of users

Digi WR devices allow you to configure up to **10** local users per device, **user 1** through **user 10**. Each user has a unique username, password, and access level.

Default user

As manufactured, each Digi WR device comes with a default **user 1** configured as follows:

Username: **admin**

Password: The default password is displayed on the label on the bottom of the device. For example:



Access: **super**

> **Note** The default password is a unique password for the device, and is the most critical security feature for the device. Anytime you reset the device to factory defaults, you should immediately change the password from the default to a custom password. Before deploying or mounting the device, take a photo of or otherwise 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.

You can change the default **user 1** configuration to match your site requirements.

User access levels

Digi WR devices support three access levels: **super**, **read-write**, and **read-only**. These access levels determine the level of control users have over device features and settings.

Access level	Permissions allowed
super	The user can manage all features on the device. Devices can have multiple users with **super** access level. At least one user on each device must have a **super** access level to allow editing user access levels. If you or any other user deletes the only user with **super** access level, you must restore the default user configuration by resetting the device to factory defaults.
read-write	The user can manage all device features except security-related features, such as configuring user access, configuring firewalls, clearing logs, and so on.
read-only	The user can view device configuration and status, but cannot change the configuration or status.

Configure a user

To add, modify, or delete a user, you must be assigned the **super** access level. See User access levels for descriptions of user access levels.

To configure a user, you need to configure the following:

Required configuration items

- A username, up to **32** characters long.
- A password, from **1-128** characters long. For security reasons, passwords are stored in hash form. There is no way to get or display passwords in clear-text form.

Additional configuration items

- User access level. The default access level for users is **super**. To restrict access for a user, assign either **read-write** or **read-only**. See User access levels for descriptions of user access levels.

Web

1. Click **Security > Authentication > Local Users**. The User Management page appears.
2. Click **New User**.

   Note When you add a new user using the web interface, the device creates a new user with the next available index number. When you create a new user using the command line, you cannot set or change the user index number assigned to a user.

3. Enter user account information:
   - **Username**: The username for the user. Usernames can be up to **32** characters long and are case-insensitive. They:

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- Must start with a letter (lowercase or uppercase) or underscore.
- Can contain letters (lowercase and uppercase), digits, underscore (_), or hyphen (-).
- Can end with a dollar sign ($).
- No other characters are allowed.

Examples of valid usernames: **_Username1234$** and **userName-1234**.

Examples of invalid usernames: **-Username**, **user/name**, **userName$1234**

- **Access**: The user access permission for the user: **super**, **read-write**, or **read-only**. For descriptions of these access permissions, see User access levels.
- **Password/Confirm Password**: Password for the user.

4. Click **Apply**.

Command line

The user command configures users.

1. Configure the username. Usernames can be up to **32** characters long and are case-insensitive. They:
   - Must start with a letter (lowercase or uppercase) or underscore.
   - Can contain letters (lowercase and uppercase), digits, underscore (_), or hyphen (-).
   - Can end with a dollar sign ($).
   - No other characters are allowed.

   Examples of valid usernames: **_Username1234$** and **userName-1234**.

   Examples of invalid usernames: **-Username**, **user/name**, **userName$1234**

   For example:

```
digi.router> user 1 name joeuser
```

2. Configure the password. For example:

```
digi.router> user 1 password omnivers1031
```

3. Optional: Configure the access level. For example:

```
digi.router> user 1 access read-write
```

4. Save the configuration.

```
digi.router> save config
```


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Delete a user

You can delete user definitions when they are no longer needed.

To add, modify, or delete a user, you must be assigned the **super** access level. See User access levels for descriptions of user access levels.

Web

1. Click **Security > Authentication > Local Users**. The User Management page appears.
2. Select the user to delete.
3. Click **Delete** and respond to the confirmation prompt.

Command line

Enter the following command:

```
digi.router> user n name !
```

For example, to delete the user **joeuser** that was previously assigned to **user 1**, enter:

```
digi.router> user 1 name !
digi.router> save config
```

Change a user's password

To add, modify, or delete a user, you must be assigned the **super** access level. See User access levels for descriptions of user access levels.

Web

1. Click **Security > Authentication > Local Users**. The User Management page appears.
2. Select the user.
3. Enter the new password.
4. Confirm the new password.
5. Click **Apply**.

Command line

1. Enter the user command, specifying the new password value:

```
digi.router> user <user number> password <password-value>
```

   For example:

```
digi.router> user 6 password tester
```

2. Save the configuration.

```
digi.router> save config
```

Firewall management with IP filters

Digi WR devices secure your network by controlling network traffic using a variety of mechanisms, such as port forwarding (see Port forwarding) and **allow-https-access**/**allow-ssh-access** (see Wide Area Networks (WANs)).

IP filter rules allow you to further control network traffic by allowing and restricting access based on filter criteria.

For example, you can use an IP filter rule to:

- Allow additional traffic into the device
- Restrict access by rejecting traffic from a LAN to a WAN
- Restrict access to an open service
- Restrict access to a router service from LAN devices
- Restrict LAN-to-LAN for all but one service

IP filter source and destination options

Network traffic managed by IP filter rules can be categorized into three groups:

- **Incoming traffic:** Traffic destined to a service or application on the router.
- **Forwarded traffic:** Traffic flowing through the router from one network host to another.
- **Outgoing traffic:** Traffic originating from a service or application on the router.

If you want to create an IP filter rule that applies only to incoming traffic received using the source LAN or WAN, specify only the source option. In this case, incoming network traffic refers only to inbound traffic that is destined for a service on the router, not all traffic flowing through the router destined for another host.

If you want to create an IP filter rule that applies only to traffic flowing through the router received using a source LAN or WAN, specify both the source and destination options. The source and destination values must be different from each other or the rule is not applied.

Infrequently, you may need to create an IP filter rule that applies only to outgoing network traffic sent using the destination LAN or WAN. To do so, specify only the destination option. In this case, outgoing network traffic refers only to outbound traffic sent from a service on the router, not all traffic flowing through the router from another host.

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Note Invalid IP filter rules are not applied. To be valid, a rule must include the **Source**, **Destination**, or both the **Source** and **Destination** options. The **Source** and **Destination** options must be different from each other.

Example: Incoming traffic rule

The following rule applies only to incoming traffic received from any configured WAN, regardless of other specified parameters.

Note The destination **None** value is the default and need not be specified.

```
ip-filter 1 src any-wan
ip-filter 1 dst none
```

IP filter criteria options

An IP filter rule applies only to network traffic (packets) matching the following set of filter criteria options:

- Protocol
- Source IP address
- Source IP port
- Destination IP address
- Destination IP port

After determining if the network traffic is incoming, outgoing, or forwarded traffic, the filter criteria are used to examine the network packet. If the packet matches the criteria, the rule action is applied and the packet is accepted, dropped, or rejected.

Example: SSH criteria

The following rule applies only to packets coming from a host with a 10.20.x.y IP address that are for the SSH server. SSH typically uses TCP protocol on port 22. The default values for source IP port and destination IP address are not used because they are not relevant for this filter criteria.

```
ip-filter 1 protocol tcp
ip-filter 1 src-ip-address 10.20.0.0/16
ip-filter 1 dst-ip-port 22
```

IP filter rule priority

IP filter rules are higher priority than port forward rules, the WAN command allowing HTTPS or SSH access, or rules that allow LAN access by default. Therefore, use IP filter rules to further filter traffic by port, IP address, or protocol.

IP filter rules are applied in order from 1 to the maximum number of rules. Use multiple rules to build a more secure environment where some services are allowed, while others are rejected. See IP filter examples.

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Add an IP filter rule

Web

To add one or more IP filter rules:

1. On the menu, click **Security > Firewall**:
   - Select **Input IP Filters** to add an input IP filter.
   - Select **Routing IP Filters** to add a routing IP filter.
2. Within the set of rules you want to add, click ✚ (Add Filter) to create a new filter. See Firewall page for field descriptions.
3. When you have finished adding rules, click **Apply**.

Command line

To add an IP filter rule, use the ip-filter command.

For example, to create IP filter rule 3:

```
digi.router> ip-filter 3 description Allow WAN SNMP only from 10.20 network
digi.router> ip-filter 3 action accept
digi.router> ip-filter 3 src any-wan
digi.router> ip-filter 3 protocol tcp,udp
digi.router> ip-filter 3 src-ip-address 10.20.0.0/16
digi.router> ip-filter 3 dst-ip-port 161,162
digi.router> ip-filter 3 state on
digi.router> save config
```

Delete an IP filter rule

Web

To delete one or more IP filter rules:

1. On the menu, click **Security > Firewall**:
   - Select **Input IP Filters** to delete an input IP filter.
   - Select **Routing IP Filters** to delete a routing IP filter.
2. Select the rule you want to remove, and click 🗑.
3. Click **Apply**.

Command line

You cannot delete an IP filter rule using the command line, but you can disable a rule using the ip-filter command.

For example:

```
digi.router> ip-filter 4 state off
digi.router> save config
```


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Edit an IP filter rule

Web

To edit an IP filter rule:

1. On the menu, click **Security > Firewall**:
   - Select **Input IP Filters** to edit an input IP filter.
   - Select **Routing IP Filters** to edit a routing IP filter.
2. Select the rule you want to edit and click **Edit Rule**.
3. When you have finished editing the rule, click **Apply**.

Command line

To edit an IP filter rule, use the ip-filter command.

For example, to edit the description for IP filter rule 3:

```
ip-filter 3 description Allow WAN SNMP only from 10.20 network
save config
```

Enable or disable an IP filter rule

Web

To enable or disable an IP filter rule:

1. On the menu, click **Security > Firewall**:
   - Select **Input IP Filters** to edit an input IP filter.
   - Select **Routing IP Filters** to edit a routing IP filter.
2. Select the rule you want to change, and enable or disable the rule.
3. When you have finished, click **Apply**.

Command line

To enable or disable an IP filter rule, use the ip-filter command **state** option.

For example, to enable IP filter 1:

```
digi.router> ip-filter 1 state on
digi.router> save config
```

To disable IP filter 1:

```
digi.router> ip-filter 1 state off
digi.router> save config
```


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Show IP filter rules

Web

To show IP filter rules:

1. On the menu, click **Security > Firewall**. The **Firewall** page appears, displaying all configured IP filter rules.
2. Select **Input IP Filters** to view input IP filters and select **Routing IP Filters** to view routing IP filters.

Command line

To show IP filter rules, use the show ip-filter or ip-filter commands.

For example, to show a specific IP filter:

```
digi.router> show ip-filter 1

 IP Filter 1
 -----------
 Description             : Allow WAN SSH only from 10.20 network
 Action                  : Accept
 State                   : On

 Source                  : any-wan
 Destination             : none

 Filter Criteria
 ---------------
 Protocol                : tcp udp
 Source IP Address       : 10.20.0.0/16
 Source IP Port          : 0
 Destination IP Address  :
 Destination IP Port     : 22
```

```
digi.router> ip-filter 1

  action                    accept
  description               Allow WAN SSH only from 10.20 network
  dst                       none
  dst-ip-address
  dst-ip-port               22
  protocol                  tcp,udp
  src                       any-wan
  src-ip-address            10.20.0.0/16
  src-ip-port               0
  state                     on
```

To show all IP filters:

```
digi.router> show ip-filter

 #   State   Action    Source     Destination   Protocol      Description
 ------------------------------------------------------------------------------
 1   On      Accept    any-wan    none          tcp udp       Allow WAN SSH only from 10.20 network
 2   On      Drop      any-lan    none          tcp udp       Restrict LAN from HTTP,HTTPS,SSH,SNMP
```


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```
3   On      Accept    any-wan    none          tcp udp       Allow WAN SNMP only from 10.20 network
4   On      Reject    any-lan    any-wan       tcp udp       Restrict LAN to WAN for various email services
5   On      Accept    lan1       any-lan       tcp           Allow LAN1 SSH to Other LANs
6   On      Reject    lan1       any-lan       any           Restrict LAN1 from Accessing Other LANs
```

IP filter examples

The following examples show typical ways to use IP filters to control network traffic:

- IP filter example: Allow additional traffic into the device
- IP filter example: Restrict access by rejecting traffic from a LAN to a WAN
- IP filter example: Restrict access to an open service
- IP filter example: Restrict access to a router service from LAN devices
- IP filter example: Restrict LAN-to-LAN for all but one service

IP filter example: Allow additional traffic into the device

The following example shows how to allow SNMP access from a particular subnet on the WAN. Note that by default WAN access does not allow SNMP access.



WARNING! The commands in the following example open up SNMP access to your device. SNMP can be used to configure your device. Before allowing SNMP access, make sure you first secure your SNMP configuration using the snmp, snmp-user and snmp-community commands.

The example demonstrates that IP filter rules can override the default behavior for the firewall. By default, WAN traffic into the device is dropped if no other configuration or rules explicitly allow traffic in. That is, the default policy for the input chain in the firewall is to **DROP** traffic.

- Adds an IP filter **Accept** rule (the default) to allow incoming traffic on any WAN network additional access.
- Restricts the accepted network traffic so that only traffic from hosts on the 10.20 network to SNMP (ports 161 and 162) is allowed.
- Allows access to multiple protocols (the default). It allows both TCP and UDP access for the SNMP service.

```
digi.router> ip-filter 3 description Allow WAN SNMP only from 10.20 network
digi.router> ip-filter 3 action accept
digi.router> ip-filter 3 src any-wan
digi.router> ip-filter 3 protocol tcp,udp
digi.router> ip-filter 3 src-ip-address 10.20.0.0/16
digi.router> ip-filter 3 dst-ip-port 161,162
digi.router> ip-filter 3 state on
digi.router> save config
```


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IP filter example: Restrict access by rejecting traffic from a LAN to a WAN

The following example shows how to restrict LAN devices from accessing services on the WAN (possibly the internet).



WARNING! The commands in the following example could remove your access to the Internet. If you or your users are connected through the LAN to the WAN, using email, the example rule prevents access.

The example demonstrates blocking access from a LAN device to a WAN network. By default, LAN devices are allowed access via the WAN and traffic is forwarded through the router. The example blocks direct mail access to servers on the WAN from LAN devices. Examples like this might be used to prevent access to common services that use a lot of bandwidth or are security risks to the LAN:

- Adds an IP filter **Reject** rule to reject traffic forwarded from any LAN host to any WAN host. The reject rule immediately fails the connection.
- Restricts the rejected traffic to a set of commonly used mail ports.
- Rejects access using multiple protocols (the default). It rejects both TCP and UDP access.

```
digi.router> ip-filter 4 description Restrict LAN to WAN for various email
services
digi.router> ip-filter 4 action reject
digi.router> ip-filter 4 src any-lan
digi.router> ip-filter 4 dst any-wan
digi.router> ip-filter 4 protocol tcp,udp
digi.router> ip-filter 4 dst-ip-port 25,2525,265,587,110,995,143,993
digi.router> ip-filter 4 state on
digi.router> save config
```

IP filter example: Restrict access to an open service

The following example shows how to turn on SSH access for a WAN and restrict SSH access to only a particular subnet of authorized hosts.



WARNING! The commands in the following example could prevent access to your device if connected from the WAN. To safely modify and test ip filter rules, use a scheduled reboot strategy.

The example demonstrates the following:

- Uses the reboot command to schedule a reboot of the device in case of accidental lockout. A scheduled reboot discards any changes that have not been saved and restores access.
- Adds an ip filter **Accept** rule (the default) to allow incoming traffic on any WAN network additional access.
- Restricts the accepted network traffic so that only traffic from hosts on the 10.20 network to SSH (port 22) is allowed.
- Turns off the **allow-ssh-access** option for the two currently configured WAN networks. The **allow-ssh-access** allows SSH access unrestricted by host or network.

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```
# Schedule a reboot in 10 minutes in case we lock ourselves out of the
device
reboot in 10

# Add the ip filter rule. Be sure to include src-ip-address of at least your
current session (if connected with ssh)
ip-filter 1 description Allow WAN SSH only from 10.20 network
ip-filter 1 action accept
ip-filter 1 src any-wan
ip-filter 1 src-ip-address 10.20.0.0/16
ip-filter 1 dst-ip-port 22
ip-filter 1 state on

# Now turn off allow all ssh access on any WAN where it was turned on
previously
wan 1 allow-ssh-access off
wan 2 allow-ssh-access off

# Test the configuration. If all is good, save the configuration and cancel
the reboot before 10 minutes
save config
reboot cancel
```

IP filter example: Restrict access to a router service from LAN devices

The following example shows how to remove HTTP, HTTPS, SSH, SNMP access from a LAN. Note that by default, LAN traffic is allowed.



WARNING! The commands in the following example could prevent access to your device if connected from the LAN. To safely modify and test ip filter rules, use a scheduled reboot strategy.

The example demonstrates the following:

- IP filter rules have a higher precedence (priority) than many system firewall rules. By default for LANs, traffic is allowed into the device by built-in system firewall rules. This example changes the default allowed access, restricting LAN devices from access.
- Uses the reboot command to schedule a reboot of the device in case of accidental lockout. A scheduled reboot discards any changes that have not been saved and restores access.
- Adds an IP filter **Drop** rule to drop incoming traffic on any LAN network, thereby restricting additional access. A drop rule silently drops traffic, giving no indication to the connecting host.
- Restricts access to multiple protocols (the default) and multiple services (ports) to simplify creation of rules. It blocks both TCP and UDP access for all services even though only the SNMP service (ports 161 or 162) uses UDP.

```
# Schedule a reboot in 10 minutes in case we lock ourselves out of the
device
reboot in 10

# Add the ip filter rule. If you are connected from the LAN using SSH this
will remove your access.
ip-filter 2 description Restrict LAN from HTTP,HTTPS,SSH,SNMP
ip-filter 2 action drop
ip-filter 2 src any-lan
```


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```
ip-filter 2 protocol tcp,udp
ip-filter 2 dst-ip-port 80,443,22,161,162
ip-filter 2 state on

# Test the configuration. If all is good, save the configuration and cancel
the reboot before 10 minutes
save config
reboot cancel
```

IP filter example: Restrict LAN-to-LAN for all but one service

The following example shows how to restrict devices on LAN 1 (perhaps a public LAN) from communicating with devices on any other LAN (perhaps internal LANs) except for certain services. By default, LAN devices can communicate with other LANs.

On a Wi-Fi LAN, you can also configure client and access point isolation. These rules might typically be used when partial isolation is desirable.



WARNING! The commands in the following example could remove access to services for LAN devices. If you or your users are connected through the LAN, this example may prevent access.

The example demonstrates that multiple IP filter rules have an order precedence. Use multiple IP filter rules to build more complex access control than a single rule could provide:

- Creates two IP filter rules, one at index 5, the other at index 6.
- Rule 5 is an **Accept** rule that allows LAN 1 to access any LAN for the SSH service (port 22). It is executed before rule 6.
- Rule 6 is a **Reject** rule that restricts LAN 1 from accessing any protocol and any port on other LANs. It is executed after rule 5.

```
digi.router> ip-filter 5 description Allow LAN1 SSH to Other LANs
digi.router> ip-filter 5 action accept
digi.router> ip-filter 5 src lan1
digi.router> ip-filter 5 dst any-lan
digi.router> ip-filter 5 protocol tcp
digi.router> ip-filter 5 dst-ip-port 22
digi.router> ip-filter 5 state on

digi.router> ip-filter 6 description Restrict LAN1 from Accessing Other LANs
digi.router> ip-filter 6 action Reject
digi.router> ip-filter 6 src lan1
digi.router> ip-filter 6 dst any-lan
digi.router> ip-filter 6 protocol any
digi.router> ip-filter 6 state on
digi.router> save config
```


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Certificate and key management

This section covers concepts and tasks for managing certificates and private keys.

- Create a private key file
- Create a Diffie Hellman key file
- List private key files
- Create a certificate signing request
- Use an externally-generated private key file
- Delete a private key file

Create a private key file

Command line

To create a private key file, use the pki command. The private key file name must be a maximum of 255 characters. Allowed characters are **0**-**9**, **A**-**Z**, **a**-**z**, underscore (_), and period (**.**).

For example:

```
digi.router> pki privkey testpriv.key 204
```

You can optionally encrypt the file using either the aes128 or aes256 options. If you choose to encrypt the file, you must provide a password that must be at least four characters in length. For example:

```
digi.router> pki privkey testpriv.key 2048 aes128 hello
```

Create a Diffie Hellman key file

Command line

To create a Diffie Hellman key file, use the pki command. For example:

```
digi.router> pki dh-file openvpndh.pem 2048

Creating Diffie Hellman file openvpndh.pem, 2048 bits
```

Note Generating a Diffie Hellman file can take up to 40 minutes. Make sure the default for command line timeout allows enough time to generate the file or the command will terminate. See the system **timeout** parameter for details on changing the command line timeout default.

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List private key files

Command line

To list private key files, use the pki command. For example:

```
digi.router> pki list

Private key files
------------------------
tespriv.key
anotherpriv.key
```

Use an externally-generated private key file

Command line

To use an externally-generated private key file:

1. Upload the key file to the device by using the Web UI, or using a utility such as Secure Copy (SCP) or SSH File Transfer Protocol (SFTP). See Upload and download files for instructions.
2. Use the pki addkey command to add the key to the device. For example:

```
digi.router> pki addkey mykeyfile.key
```

Delete a private key file

Command line

To delete a private key file, use the pki and del commands. For example:

```
digi.router> pki list


Private key files
------------------------
testpriv.key
anotherpriv.key

digi.router> del testpriv.key
```


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Create a certificate signing request

Command line

To create a certificate signing request (CSR):

1. At the CLI, enter the pki csr command. For example:

```
digi.router> pki csr country GB state "North Yorkshire" locality Richmond
organization Digi organizational-unit "Digi Engineering" common-name www.example.com
testpriv.key testpriv.csr sha256


Country Name (letter code): GB
State or Province Name: North Yorkshire
Locality Name: Richmond

Organization Name: Digi
Organization Unit Name: Digi Engineering
Common Name: www.example.com
Email address:


testpriv.csr has been created
```

Note To show all **pki csr** command option settings within the page margin, the example shows the settings on multiple lines. However, Digi WR devices do not allow you to continue a command line—the example is for display only.

2. To obtain a signed certificate, download the CSR. This can be done from within the WebUI, or using a utility such as Secure Copy (SCP) or SSH File Transfer Protocol (SFTP). To download from within the WebUI:
   a. Click **System** >**File System**.
      The **File System** page appears.
   b. Select the CSR and click the Download icon (⬇).
3. After downloading the CSR, obtain a signed certificate from the certificate signing authority.

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Simple Certificate Enrollment Protocol

Simple Certificate Enrollment Protocol (SCEP) is a mechanism that allows for large-scale X.509 certificate deployment. You can configure the Digi WR54 and WR64 models to function as SCEP clients 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 URL 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 that will be used to store the certificate.
- The RSA private key to be used for the SCEP request.
- The name of the CA certificate.
- The file name of the CRL from the CA.

Additional configuration

- The number of days that the certificate enrollment can be renewed, prior to the request expiring.

This procedure is available only from the command line.

Command line

1. Enable the SCEP client:

```
digi.router> scep-client 1 state on
```

2. Set the URL of the SCEP server:

```
digi.router> scep-client 1 server url
```

3. Set the challenge password:

```
digi.router> scep-client 1 password pwd
```

4. Set the distinguished name to be used for the certificate request. The distinguished name is a comma-separated list of attribute-value pairs. No spaces allowed between attribute values.

```
digi.router> scep-client 1 distinguished-name attribute=value
[,attribute=value,...]
```

Allowed values are **DC**, **C**, **ST**, **L**, **O**, **OU**, and **CN**, where:

- **DC** is the domain component.
- **C** is the country name.
- **ST** is the state or province name.

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- **L** is the locality name.
- **O** is the organization name.
- **OU** is the organizational unit name.
- **CN** is the common name.

5. Set the file name that will be used to store the certificate:

```
digi.router> scep-client 1 certificate-name name
```

6. Set the name of the CA certificate. If it does not exist, one will be retrieved from the server and saved in a file.

```
digi.router> scep-client 1 ca-name name
```

7. Set the file name of the CRL from the CA:

```
digi.router> scep-client 1 crl-name name
```

8. Set the file name of the RSA private key to be used for the SCEP request. If the key does not exist, it will be automatically generated and saved in a key file using the specified name.

9.
```
digi.router> scep-client 1 private-key keyfile
```

where *keyfile* is a maximum of 255 characters. Allowed characters are **0**-**9**, **A**-**Z**, **a**-**z**, underscore (_), and period (**.**).

10. (Optional) 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 Digi WR device to determine when to start attempting to auto-renew an existing certificate. The default is **7**.

```
digi.router> scep-client 1 renewable-time number
```


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Web server with secure authentication connections

By default, the Digi WR device automatically generates a private key and self-signed certificate for HTTPS connections to the device's web server. This provides an encrypted link between the device and a web browser. However, because the device's certificate is self-signed, the browser is not able to authenticate the certificate and will report that the connection is not secure.

For an authenticated secure connection, the device must use a certificate signed by a trusted signatory. When a certificate is signed by a trusted signatory, the browser uses the signatory's CA certificate (usually pre-installed on the browser or the host) to authenticate the certificate.

A private key and Certificate Signing Request (CSR) can be created on the device or can be created externally. The CSR can then be used to create a certificate signed by a trusted signatory.

- See Create a private key and Certificate Signing Request on the Digi WR device for information about creating a private key and a Certificate Signing Request (CSR) on the device.
- See Upload and install an externally-created private key and signed certificate for information about uploading a private key and signed certificate to the device when the private key was created externally from the device.

After a private key has been created and a signed certificate has been obtained, see Configure the web server to use a private key and signed certificate for information about configuring the web server to use the private key and signed certificate.

Create a private key and Certificate Signing Request on the Digi WR device

There is no WebUI support for creating a private key and Certificate Signing Request (CSR).

Command line

1. Create the private key using the pki privkey command. For example, to create a private key file called webserver.key that uses an RSA 4096-bit key:

```
digi.router> pki privkey webserver.key 4096
```

2. Create the CSR using the pki csr command. For example, to create a CSR named webserver.csr:

```
digi.router> pki csr country US state Minnesota locality Minneapolis
organization Example common-name www.example.com webserver.key
webserver.csr sha256
```

3. To obtain a signed certificate, download the CSR. This can be done from within the WebUI, or using a utility such as Secure Copy (SCP) or SSH File Transfer Protocol (SFTP). To download from within the WebUI:
   a. Click **System** >**File System**.
      The **File System** page appears.
   b. Select the CSR and click the Download icon ( ).

   After downloading the CSR, obtain a signed certificate from the certificate signing authority. The signed certificate will be used for web server configuration. See Configure the web server

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to use a private key and signed certificate for information about configuring the web server to use the private key and signed certificate.

Upload and install an externally-created private key and signed certificate

If a private key has been created externally from the Digi WR device:

1. Upload the private key file and signed certificate onto the device. This can be done from within the WebUI, or using a utility such as Secure Copy (SCP) or SSH File Transfer Protocol (SFTP). To upload from within the WebUI:
   a. Click **System** > **File System**.
      The **File System** page appears.
   b. Click the Upload icon (⬆).
   c. Select the file and click **Open**.
   d. Repeat for all applicable files.
2. Use the pki addkey command to install the private key file. This will move the private key file from the user file system to a protected area. For example, to install a private key file named webserver.key:

```
digi.router> pki addkey webserver.key
```

The signed certificate will be used for web server configuration. See Configure the web server to use a private key and signed certificate for information about configuring the web server to use the private key and signed certificate.

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Configure the web server to use a private key and signed certificate

Command line

There is no Web UI support for configuring custom Web key and certificates.

Note A signed certificate must be obtained and uploaded to the Digi WR device prior to configuring the web server for an authenticated secure connection. To upload the certificate, use the WebUI, or use a utility such as Secure Copy (SCP) or SSH File Transfer Protocol (SFTP). To upload from within the WebUI:

1. Click **System** > **File System**.
   The **File System** page appears.
2. Click the Upload icon ( ).
3. Select the certificate and click **Open**.

To configure the web server to use a private key and signed certificate:

1. Configure the web server to use a private key file. For example, to configure the web server to use a private key file named webserver.key:

```
digi.router> web-server 1 key-file webserver.key
```

2. Configure the web server to use the certificate file. For example, to configure the web server to use a certificate file called webserver.crt:

```
digi.router> web-server 1 cert-file webserver.crt
```

3. Save the configuration:

```
digi.router> save config
```


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Remote Authentication Dial-In User Service (RADIUS)

Your Digi WR 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 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.

Note RADIUS user names must be different than any user names defined locally on the Digi WR device. RADIUS users with the same user name as a local user cannot log into the Digi WR device, even if local authentication is disabled.

This section contains the following topics:

Setting up a RADIUS server 104
RADIUS user configuration 104
RADIUS server failover 105
Using local authentication when RADIUS servers are unavailable 105
Configure a Digi WR device to use a RADIUS server 106

Setting up a RADIUS server

To use RADIUS authentication, you must set up a RADIUS server that is accessible by the Digi WR 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, and a quick-start guide for setting up a FreeRADIUS server is here: http://wiki.freeradius.org/guide/Getting Started.

RADIUS user configuration

After setting up the RADIUS server, you will need to configure one or more users on the server. When configured with RADIUS support, the Digi WR device uses the RADIUS server for authentication (password verification) and authorization (assigning the access level of the user). RADIUS provides the authorization information to the device in a Vender Specific Attribute (VSA) that contains a number representing a Group ID (GID). The specific process varies between RADIUS servers, but you will need to configure the following information for each user:

- User name and password. The user name must be different than any of the user names defined locally on the Digi WR device. RADIUS users with the same user name as a local user cannot log into the Digi WR device, even if local authentication is disabled.
- Group ID. The GID should be specified as a VSA (Unix-FTP-GID), with the following allowed values:
  - 2000 (read-write access level).
  - 2001 (read-only access level).
  - 2002 (super user access level).
  - Any other value (or omitting this attribute) will result in the user having read-only access.
- User ID (optional). The UID should be specified as a VSA (Unix-FTP-UID), with a value of 3000 or higher. If the UID is not specified, a UID will be automatically assigned by the device when the user first logs into the device, and will persist until the device is rebooted. In this case, because UIDs do not persist after the device has been rebooted, the same UID may be assigned to a different user. This may result in file ownership being incorrectly assigned.

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 nano /etc/freeradius/3.0/users
```

2. Add users to the file using the following format. This example will create three users, one with each access level.

```
# A read-only user (2001) with a UID of 3000
   "user1" Cleartext-Password := "password1"
   Unix-FTP-UID := 3000,
   Unix-FTP-GID := 2001

# A read-write user (2000) with a UID of 3001
   "user2" Cleartext-Password := "password2"
   Unix-FTP-UID := 3001,
   Unix-FTP-GID := 2000
```


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```
# A super user (2002) with a UID of 3002
   "user3" Cleartext-Password := "password3"
   Unix-FTP-UID := 3002,
   Unix-FTP-GID := 2002
```

Note Change the passwords for these users before putting the server into production.

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

In addition to the primary RADIUS server, you can also configure a backup RADIUS server on your Digi WR device. The backup RADIUS server is used for authentication requests when the primary RADIUS server is unavailable.

Falling back to local authentication

You can configure local authentication to be used as a fallback mechanism if both the primary and backup RADIUS servers are unavailable. If the RADIUS servers are unavailable and the Digi WR 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. See Using local authentication when RADIUS servers are unavailable for more information about local authentication fallback configuration.

Using local authentication when RADIUS servers are unavailable

The local authentication fallback configuration option determines how the Digi WR device behaves when all configured RADIUS servers are unavailable. In most situations, you should use local authentication for fallback login, to allow local users to log into the device and configure other available servers when the RADIUS servers are unavailable. If the RADIUS servers are unavailable and local authentication disabled, no users can log in to the device.

Local authentication fallback is configured in the WebUI by using the **Local Auth Fallback** option, and from the command line by using the **local-auth** parameter for the radius command. See Configure a Digi WR device to use a RADIUS server for details.

Note RADIUS users with the same user name as a local user cannot log into the Digi WR device, even if local authentication is disabled.

The table below shows how the primary RADIUS server, the backup RADIUS server, and local authentication work together.

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Primary server available	Backup server available	Local authentication	Who can log in?
YES	YES	N/A	Primary RADIUS server is used for authentication. Only RADIUS users can log in.
Yes	No	N/A	Primary RADIUS server is used for authentication. Only RADIUS users can log in.
No	Yes	N/A	Backup RADIUS server is used for authentication. Only RADIUS users can log in.
No	No	Enabled	Only local users can log in. RADIUS users cannot log in until the RADIUS servers are brought back online.
No	No	Disabled	No users can log in.

Configure a Digi WR device to use a RADIUS server

This section describes how to configure a Digi WR device to use a RADIUS server for authentication and authorization.

Required configuration items

- Enable RADIUS based authentication on then device. It is disabled by default.
- Define the primary RADIUS server IP address or domain name.
- Define the primary RADIUS server port. It is configured to 1812 by default.
- Define the primary server shared secret.
- Determine whether local authentication is used if a RADIUS server is unavailable. It is enabled by default.

Additional configuration items

- The server NAS ID. If left blank, the default value of **sshd** is sent out.
- Time in seconds before the request to the server times out. The default is 3 seconds and the maximum possible value is 10 seconds.
- Enable debug logging. It is disabled by default.
- Add a backup server in case the primary RADIUS server is unavailable. Configuration items similar to the primary RADIUS server are also available for the backup RADIUS server.

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Web

1. On the menu, click **Security > RADIUS**. The RADIUS page appears.
2. Under the **Settings** section, enable the RADIUS-based authentication feature and configure the basic settings:
   a. Click **Enable** to turn RADIUS based authentication on.
   b. In the **NAS ID** field, enter a NAS ID for the Digi WR device. This attribute contains a string identifying the NAS originating the request to the RADIUS server. If the field is left blank, the default value of **sshd** is sent out.
   c. Click **Local Auth Fallback** to enable authentication of local users when the primary and backup RADIUS servers are unavailable.
   d. (Optional) Click **Debug** to log RADIUS debug messages to the device's log.
3. Under the **Primary Server Settings** section, configure the primary RADIUS server. See RADIUS page for detailed information.
4. If using a backup server, under the **Backup Server Settings** section, configure the backup RADIUS server. Configuring a backup server is optional. See RADIUS page for detailed information.
5. Click **Apply** to save the changes.

Command line

1. Set the RADIUS server IP address or FQDN:

```
digi.router> radius server 192.168.10.1
```

2. Set the RADIUS server port:

```
digi.router> radius server-port 1812
```

3. Set the RADIUS server secret:

```
digi.router> radius server-secret thisisasecret
```

4. (Optional) Set the RADIUS server nas-id:

```
digi.router> radius nas-id 123
```

5. (Optional) Establish whether using the local authentication fallback feature is desired:

```
digi.router> radius local-auth on
```

6. (Optional) Set the RADIUS server timeout:

```
digi.router> radius server-timeout 10
```

7. (Optional) Turn on debug logging:

```
digi.router> radius debug on
```


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8. (Optional) Set a backup server IP address or domain name:

```
digi.router> radius backup-server radius.ny.domain
```

9. (Optional) Set a backup server port:

```
digi.router> radius backup-server-port 1812
```

10. (Optional) Set a backup server secret:

```
digi.router> radius backup-server-secret thisisthebackupsecret
```

11. (Optional) Set a backup server timeout:

```
digi.router> radius backup-server-timeout 10
```

12. Turn on the RADIUS server authentication:

```
digi.router> radius state on
```

13. Save the configuration:

```
digi.router> save config
```


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Hotspot

Your Digi WR 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 device, as well as applying bandwidth limits, authenticating users, and other features. The 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 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 Digi WR device are located in the **hotspot** directory on the device's filesystem. The **hotspot** directory is created when you enable hotspot for the first time, and cannot be accessed prior to that.

This chapter contains the following information:

Hotspot authentication modes 110
Selecting a LAN to be used by the hotspot 111
Hotspot DHCP server 111
Hotspot security 111
Hotspot configuration 112
Show hotspot status and statistics 144
Show current hotspot configuration 145
Customize the hotspot login page 146
Hotspot RADIUS attributes 150

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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 local HTML page that the device uses by default for click-through authentication is **/hotspot/terms.html**.

  See Configure the hotspot with click-through authentication 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 Digi WR device, and the password is the same for all users. The local HTML page that the device uses by default for local shared password authentication is **/hotspot/password.html**.

  See Configure the hotspot with a local shared password 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 **Allowed Domains** or **Allowed Subnets** for the hotspot, which allows unauthenticated hotspot clients to access the server for authentication. The local HTML page that the device uses by default for RADIUS shared password authentication is **/hotspot/password.html**.

  See Configure the hotspot with a RADIUS shared password 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 **Allowed Domains** or **Allowed Subnets** for the hotspot, which allows unauthenticated hotspot clients to access the server for authentication. The local HTML page that the device uses by default for RADIUS shared password authentication is **/hotspot/login.html**.

  See Configure the hotspot with 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 authenticatiuon, payment options, and social media login should be "white listed" by including them in the **Allowed Domains** or **Allowed Subnets** 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 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 **Allowed Domains** and **Allowed Subnets** 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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Selecting a LAN to be used by the hotspot

By default, the hotspot is configured to use LAN2. You can select any LAN on your device to serve as the hotspot LAN; however, once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Therefore, you must make sure that you do not enable hotspot on a LAN that you are otherwise using to access the device for other purposes, such as configuring and monitoring the device, or providing clients with non-hotspot access to your network.

If you lose access to the router by configuring hotspot to use an incorrect LAN, try the following methods to recover access:

- If you have configured multiple LANs, use one of the other LANs to connect to the device.
- If you have enabled HTTPS or SSH access on the WAN interface, use the WAN to connect to the device.
- If you were using the command line and the configuration has not been saved, reboot the router and the hotspot will be not be enabled when the unit boots up again.
- If you have access to Remote Manager, you can disable the Hotspot feature.

If the above methods fail, you may need to reset the router back to factory defaults.

Hotspot DHCP server

When the hotspot is enabled on the Digi WR device, it automatically enables a DHCP server. During hotspot configuration, you assign an IPv4 IP 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 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 default firewall rules prevent hotspot clients from accessing any of the other interfaces on the router (such as the LAN and VPN interfaces). Additionally, the default firewall rules prevent hotspot clients from accessing the router itself (for example, via the web interface or SSH).

Hotspot configuration

This section provides hotspot configuration procedures based on the type of authentication mode you select for your hotspot. See Hotspot authentication modes for information about available authentication modes.

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Enable the hotspot using the default configuration

The Digi WR device's hotspot is configured by default for **click-through** authentication using **LAN2** as the hotspot's LAN, with the hotspot's IP address set to **10.1.0.1** with a subnet mast of **255.255.255.0**. You can use the default click-through authentication by simply enabling the hotspot, adding interfaces to the LAN, and configuring the hotspot's Wi-Fi interface.

Once you have selected a LAN for a hotspot, you have limited configuration capabilities for that LAN. Most of its configuration (for example, its IP address and DHCP server) is set automatically by the hotspot, and the LAN is dedicated for use only by the hotspot. For this reason, you should select a LAN for the hotspot that has not already been configured for use outside of hotspot functionality. If LAN2 is already being used by your device, you should configure the hotspot to use a different LAN by using one of the other hotspot configuration procedures in subsequent sections.



WARNING! Once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Do not enable hotspot for the LAN that you are using to access the device for other purposes. See Selecting a LAN to be used by the hotspot for more information.

After enabling the default hotspot configuration, you will want to modify the sample local HTML page that the device uses by default for click-through authentication. See Edit sample hotspot html pages for instructions about how to modify the sample local HTML page.

Enable hotspot using the default configuration from the Web UI

1. Enable the hotspot with the default configuration:
   a. On the menu, click **Network** > **Services** > **Hotspot**.
   b. Click **Enable** to enable the hotspot.
   c. Click **Apply**.
2. Configure the hotspot LAN:
   a. On the menu, click **Network** > **Networks** > **LANs**.
      - LAN2 already exists, select LAN2.
      - LAN2 does not exist:
        i. Click **New Network**.
        ii. For **Select Network**, select LAN2.

      Most settings for the LAN's configuration are performed automatically when the hotspot is created and cannot be changed here. You can view the configuration settings in read-only mode. Only the interfaces and optional description field can be changed.
   b. For **Interfaces**, select the appropriate Ethernet and/or Wi-Fi interfaces for the hotspot.
   c. Click **Apply**.
3. Configure the hotspot's Wi-Fi interface:

   Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

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a. On the menu, click **Network** > **Interfaces**> **Wi-Fi**.
   - If the access point selected as the Wi-FI interface for the hotspot's LAN already exists, select that access point.
   - If the access point selected as the Wi-FI interface for the for the hotspot's LAN does not exist
     i. Click **New Access Point**.
     ii. For **Select Access Point**, select the access point of the Wi-FI interface that was selected for the LAN.

b. For **SSID**, type the SSID that will be used for this hotspot.

c. For **Security**, select **None**.

d. Enable **Broadcast SSID**.

e. Click **Apply**.

Enable hotspot using the default configuration from the Command Line

View the default configuration

To view the default configuration prior to enabling the hotspot, type the hotspot command at the command line with no parameters:

```
digi.router> hotspot

 hotspot 1:
   allowed-domains
    allowed-subnets
    auth-mode                  click-through
    auth-port                  3990
    bandwidth-max-down         10000
    bandwidth-max-up           10000
    dhcp-lease                 600
    ip-address                 10.1.0.1
    lan                        lan2
    local-page
    local-shared-password
    login                      local-page
    mask                       255.255.255.0
    radius-nas-id              hotspot
    radius-secret
    radius-server-port         1812
    radius-server1
    radius-server2
    remote-url
    server-port                4990
    state                      on
    swapoctets                 off
    uamsecret
    use-uamsecret              off

digi.router>
```


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Edit and enable the hotspot

1. Enable the hotspot:

```
digi.router> hotspot state on
```

2. Enable and add interfaces to the hotspot's default LAN (**LAN2**):
   a. Enable the LAN:

```
digi.router> lan 2 state on
```

   b. Add interfaces to the LAN:

```
digi.router> lan 2 interfaces wifi-ap2
```

3. Configure the Wi-Fi interface:

   Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. Set the SSID for the Wi-Fi interface:

```
digi.router> wifi-ap 2 ssid ssid
```

   b. Disable the Wi-Fi interface's security:

```
digi.router> wifi-ap 2 security none
```

4. Save the configuration:

```
digi.router> save config
```


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Configure the hotspot with click-through authentication

Click-through authentication requires each user to accept terms and conditions prior to accessing the internet via the hotspot. It does not require any further authentication.

By default, the router redirects unauthenticated users to the HTML authentication page located on the router at **/hotspot/terms.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

- Enable the hotspot with click-through authentication.
- The LAN to serve as the hotspot LAN. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
- IP Address and subnet mask for the hotspot.
- Interfaces for the hotspot LAN (Wi-Fi and/or Ethernet).

Additional configuration items

- DHCP server lease timeout.
- Bandwidth limits.
- Modify the local HTML authentication page, **/hotspot/terms.html**, 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.

Hotspot LAN configuration

Once you have selected a LAN for a hotspot, you have limited configuration capabilities for that LAN. Most of its configuration (for example, its IP address and DHCP server) is set automatically by the hotspot, and the LAN is dedicated for use only by the hotspot. For this reason, you should select a LAN for the hotspot that has not already been configured for use outside of hotspot functionality.

WARNING! Once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Do not enable hotspot for the LAN that you are using to access the device for other purposes. See Selecting a LAN to be used by the hotspot for more information.

Configure hotspot for click-through authentication from the Web UI

1. Enable and configure the hotspot for click-through authentication:
   a. On the menu, click **Network** > **Services** > **Hotspot**.
   b. Click **Enable** to enable the hotspot.
   c. For **LAN**, select a LAN for the hotspot. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   d. For **Login**, select the login type:

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- **Local Page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
- **Remote URL**—Uses an HTML page for authentication that is served by a remote web server.

e. **Local Page**/**Remote URL**:
   - If **Local Page** is selected for the **Login** type, the **Local Page** field is displayed. Normally, this field should be left blank, and the device will use the default authentication HTML page (for click-through authentication, the default authentication page is **terms.html**). If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.
   - If **Remote URL** is selected for the **Login** type, enter the URL in the **Remote URL** field. The URL must begin with **http://** or **https://**. The server listed here must also be included in the **Allowed Domains** or **Allowed Subnets**.

f. For **IP Address**, enter the IP address for the hotspot's LAN. The default is **10.1.0.1**.

   This IP address also defines the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.

g. For **Subnet Mask**, enter the subnet mask for the hotspot's LAN. The default is **255.255.255.0**.

h. For **Auth Mode**, select **Click-Through**.

i. Click **Advanced**.

   Many of the advanced hotspot settings are optional or contain default values that normally do not need to be changed.

j. For **Server Port**, enter the port number for the hotspot server. The default is **4990**.

k. For **Auth Port**, enter the port number for the hotspot authentication server. The default is **3990**.

l. For **Max Download** and **Max Upload**, define the throughput limits that will be applied to clients that connect to the hotspot. Enter the number and select either **Kbps** or **Mbps**. The default for both is **10 Mbps**.

m. For **DHCP Lease Length**, enter the duration of the DHCP server lease in seconds. The default is **600** seconds.

n. The **Allowed Domains** and **Allowed Subnets** fields define the "white list" of domains and subnets that unauthenticated clients are able to access. If **Remote URL** has been selected for the **Login** type, 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.

o. Click **Apply**.

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2. Configure the hotspot LAN:
   a. On the menu, click **Network** > **Networks** > **LANs**.
      - If the LAN selected for the hotspot already exists, select that LAN.
      - If the LAN selected for the hotspot does not exist:
        i. Click **New Network**.
        ii. For **Select Network**, select the LAN.

      Most settings for the LAN's configuration are performed automatically when the hotspot is created and cannot be changed here. You can view the configuration settings in read-only mode. Only the interfaces and optional description field can be changed.
   b. For **Interfaces**, select the appropriate Ethernet and/or Wi-Fi interfaces for the hotspot.
   c. Click **Apply**.
3. Configure the hotspot's Wi-Fi interface:

   Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. On the menu, click **Network** > **Interfaces** > **Wi-Fi**.
      - If the access point selected as the Wi-FI interface for the hotspot's LAN already exists, select that access point.
      - If the access point selected as the Wi-FI interface for the for the hotspot's LAN does not exist:
        i. Click **New Access Point**.
        ii. For **Select Access Point**, select the access point of the Wi-FI interface that was selected for the LAN.
   b. For **SSID**, type the SSID that will be used for this hotspot.
   c. For **Security**, select **None**.
   d. Enable **Broadcast SSID**.
   e. Click **Apply**.

Configure hotspot for click-through authentication from the Command line

1. Enable and configure the hotspot for click-through authentication:
   a. Assign the appropriate LAN to the hotspot:

   ```
   digi.router> hotspot lan lan3
   ```

   See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   b. Set the authentication mode to **click-through**:

   ```
   digi.router> hotspot auth-mode click-through
   ```


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c. Set the login type:
   - **local-page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
     i. Set **login** to **local-page**:

     ```
     digi.router> hotspot login local-page
     ```

     ii. (Optional) Set the local page. Normally, local page should not be set, and the device will use the default authentication HTML page, **/hotspot/terms.html**. If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.

     ```
     digi.router> hotspot local-page filename
     ```

   - **remote-url**—Uses an HTML page for authentication that is served by a remote web server.
     i. Set **login** to **remote-url**:

     ```
     digi.router> hotspot login remote-url
     ```

     ii. Set the URL of the remote server that hosts the remote HTML authentication page. The URL must begin with **http://** or **https://**.

     ```
     digi.router> hotspot remote-url url
     ```

     iii. Add the remote server to either the **allowed-domains** or **allowed-subnets**:

     ```
     digi.router> hotspot allowed-domains domain-name
     ```

     Additional servers can be added to the **allowed-domains** or **allowed-subnets** using a comma-separated list. Up to 999 characters are allowed.

d. Configure the default IP address and subnet mask for the hotspot. The IP address and subnet mask define the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.

```
digi.router> hotspot ip-address ip-address
digi.router> hotspot mask subnet-mask
```

e. (Optional) Change the hotspot server port. Default is **4990**.

```
digi.router> hotspot server-port port
```

f. (Optional) Change the port that the hotspot uses for authentication. Default is **3990**.

```
digi.router> hotspot auth-port port
```

g. (Optional) Change the upload and download throughput limits, in kbps, that will be applied to clients that connect to the hotspot. The default for both is **10000 kbps**.

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```
digi.router> hotspot bandwidth-max-up max_in_kbps
digi.router> hotspot bandwidth-max-down max_in_kbps
```

h. (Optional) Change the duration of the DHCP server lease in seconds. The default is **600** seconds.

```
digi.router> hotspot dhcp-lease length_in_seconds
```

i. Enable the hotspot.

```
digi.router> hotspot state on
```

2. Enable and add interfaces to the hotspot's LAN:
   a. Enable the LAN:

```
digi.router> lan 3 state on
```

   b. Add interfaces to the LAN:

```
digi.router> lan 3 interfaces wifi-ap2
```

3. Configure the Wi-Fi interface:

Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. Set the SSID for the Wi-Fi interface:

```
digi.router> wifi-ap 2 ssid ssid
```

   b. Disable the Wi-Fi interface's security:

```
digi.router> wifi-ap 2 security none
```

4. Save the configuration:

```
digi.router> save config
```


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Configure the hotspot with a local shared password

Local shared password authentication requires each user to enter a password. This password is validated locally on the Digi WR 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 **/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.

Required configuration items

- Enable the hotspot with local shared password authentication.
- The local password that will be used for authentication.
- The LAN to serve as the hotspot LAN. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
- IP Address and subnet mask for the hotspot.
- Interfaces for the hotspot LAN (Wi-Fi and/or Ethernet).

Additional configuration items

- DHCP server lease timeout.
- Bandwidth limits.
- Modify the local HTML authentication page, **/hotspot/password.html**, 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.

Hotspot LAN configuration

Once you have selected a LAN for a hotspot, you have limited configuration capabilities for that LAN. Most of its configuration (for example, its IP address and DHCP server) is set automatically by the hotspot, and the LAN is dedicated for use only by the hotspot. For this reason, you should select a LAN for the hotspot that has not already been configured for use outside of hotspot functionality.

WARNING! Once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Do not enable hotspot for the LAN that you are using to access the device for other purposes. See Selecting a LAN to be used by the hotspot for more information.

Configure hotspot for local shared password authentication from the Web UI

1. Enable and configure the hotspot for local shared password authentication:
   a. On the menu, click **Network** > **Services** > **Hotspot**.
   b. Click **Enable** to enable the hotspot.
   c. For **LAN**, select a LAN for the hotspot. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.

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d. For **Login**, select the login type:
   - **Local Page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
   - **Remote URL**—Uses an HTML page for authentication that is served by a remote web server.

e. **Local Page**/**Remote URL**:
   - If **Local Page** is selected for the **Login** type, the **Local Page** field is displayed. Normally, this field should be left blank, and the device will use the default authentication HTML page (for local shared password authentication, the default authentication page is **password.html**). If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.
   - If **Remote URL** is selected for the **Login** type, enter the URL in the **Remote URL** field. The URL must begin with **http://** or **https://**. The server listed here must also be included in the **Allowed Domains** or **Allowed Subnets**.

f. For **IP Address**, enter the IP address for the hotspot's LAN. The default is **10.1.0.1**.

   This IP address also defines the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.

g. For **Subnet Mask**, enter the subnet mask for the hotspot's LAN. The default is **255.255.255.0**.

h. For **Auth Mode**, select **Local Shared Password**.

i. Click **Advanced**.

   Many of the advanced hotspot settings are optional or contain default values that normally do not need to be changed.

j. For **Server Port**, enter the port number for the hotspot server. The default is **4990**.

k. For **Auth Port**, enter the port number for the hotspot authentication server. The default is **3990**.

l. For **Max Download** and **Max Upload**, define the throughput limits that will be applied to clients that connect to the hotspot. Enter the number and select either **Kbps** or **Mbps**. The default for both is **10 Mbps**.

m. For **DHCP Lease Length**, enter the duration of the DHCP server lease in seconds. The default is **600** seconds.

n. The **Allowed Domains** and **Allowed Subnets** fields define the "white list" of domains and subnets that unauthenticated clients are able to access. If **Remote URL** has been selected for the **Login** type, 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.

o. Click **Apply**.

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2. Configure the hotspot LAN:
   a. On the menu, click **Network** > **Networks** > **LANs**.
      - If the LAN selected for the hotspot already exists, select that LAN.
      - If the LAN selected for the hotspot does not exist:
        i. Click **New Network**.
        ii. For **Select Network**, select the LAN.

      Most settings for the LAN's configuration are performed automatically when the hotspot is created and cannot be changed here. You can view the configuration settings in read-only mode. Only the interfaces and optional description field can be changed.
   b. For **Interfaces**, select the appropriate Ethernet and/or Wi-Fi interfaces for the hotspot.
   c. Click **Apply**.
3. Configure the hotspot's Wi-Fi interface:

   Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. On the menu, click **Network** > **Interfaces** > **Wi-Fi**.
      - If the access point selected as the Wi-FI interface for the hotspot's LAN already exists, select that access point.
      - If the access point selected as the Wi-FI interface for the for the hotspot's LAN does not exist:
        i. Click **New Access Point**.
        ii. For **Select Access Point**, select the access point of the Wi-FI interface that was selected for the LAN.
   b. For **SSID**, type the SSID that will be used for this hotspot.
   c. For **Security**, select **None**.
   d. Enable **Broadcast SSID**.
   e. Click **Apply**.

Configure hotspot for local shared password authentication from the Command line

1. Enable and configure the hotspot for local shared password authentication:
   a. Assign the appropriate LAN to the hotspot:

   ```
   digi.router> hotspot lan lan3
   ```

   See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   b. Set the authentication mode to **local-shared-password**:

   ```
   digi.router> hotspot auth-mode local-shared-password
   ```


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c. Set the login type:
   - **local-page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
     i. Set **login** to **local-page**:

     ```
     digi.router> hotspot login local-page
     ```

     ii. (Optional) Set the local page. Normally, local page should not be set, and the device will use the default authentication HTML page, **/hotspot/password.html**. If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.

     ```
     digi.router> hotspot local-page filename
     ```

   - **remote-url**—Uses an HTML page for authentication that is served by a remote web server.
     i. Set **login** to **remote-url**:

     ```
     digi.router> hotspot login remote-url
     ```

     ii. Set the URL of the remote server that hosts the remote HTML authentication page. The URL must begin with **http://** or **https://**.

     ```
     digi.router> hotspot remote-url url
     ```

     iii. Add the remote server to either the **allowed-domains** or **allowed-subnets**:

     ```
     digi.router> hotspot allowed-domains domain-name
     ```

     Additional servers can be added to the **allowed-domains** or **allowed-subnets** using a comma-separated list. Up to 999 characters are allowed.

d. Configure the default IP address and subnet mask for the hotspot. The IP address and subnet mask define the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.

```
digi.router> hotspot ip-address ip-address
digi.router> hotspot mask subnet-mask
```

e. (Optional) Change the hotspot server port. Default is **4990**.

```
digi.router> hotspot server-port port
```

f. (Optional) Change the port that the hotspot uses for authentication. Default is **3990**.

```
digi.router> hotspot auth-port port
```

g. (Optional) Change the upload and download throughput limits, in kbps, that will be applied to clients that connect to the hotspot. The default for both is **10000 kbps**.

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```
digi.router> hotspot bandwidth-max-up max_in_kbps
digi.router> hotspot bandwidth-max-down max_in_kbps
```

h. (Optional) Change the duration of the DHCP server lease in seconds. The default is **600** seconds.

```
digi.router> hotspot dhcp-lease length_in_seconds
```

i. Enable the hotspot.

```
digi.router> hotspot state on
```

2. Enable and add interfaces to the hotspot's LAN:
   a. Enable the LAN:

```
digi.router> lan 3 state on
```

   b. Add interfaces to the LAN:

```
digi.router> lan 3 interfaces wifi-ap2
```

3. Configure the Wi-Fi interface:

Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. Set the SSID for the Wi-Fi interface:

```
digi.router> wifi-ap 2 ssid ssid
```

   b. Disable the Wi-Fi interface's security:

```
digi.router> wifi-ap 2 security none
```

4. Save the configuration:

```
digi.router> save config
```


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Configure the hotspot with a RADIUS shared password

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 **/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.

Required configuration items

- Enable the hotspot with RADIUS shared password authentication.
- IP address or fully qualified domain name of the 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.
- The LAN to serve as the hotspot LAN. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
- IP Address and subnet mask for the hotspot.
- Interfaces for the hotspot LAN (Wi-Fi and/or Ethernet).

Additional configuration items

- DHCP server lease timeout.
- Bandwidth limits.
- IP address or fully qualified domain name of the backup RADIUS server to be used if the primary RADIUS server is unreachable.
- Modify the local HTML authentication page, **/hotspot/password.html**, 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.

Hotspot LAN configuration

Once you have selected a LAN for a hotspot, you have limited configuration capabilities for that LAN. Most of its configuration (for example, its IP address and DHCP server) is set automatically by the hotspot, and the LAN is dedicated for use only by the hotspot. For this reason, you should select a LAN for the hotspot that has not already been configured for use outside of hotspot functionality.

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WARNING! Once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Do not enable hotspot for the LAN that you are using to access the device for other purposes. See Selecting a LAN to be used by the hotspot for more information.

Configure hotspot for RADIUS shared password authentication from the Web UI

1. Enable and configure the hotspot for RADIUS shared password authentication:
   a. On the menu, click **Network** > **Services** > **Hotspot**.
   b. Click **Enable** to enable the hotspot.
   c. For **LAN**, select a LAN for the hotspot. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   d. For **Login**, select the login type:
      - **Local Page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
      - **Remote URL**—Uses an HTML page for authentication that is served by a remote web server.
   e. **Local Page**/**Remote URL**:
      - If **Local Page** is selected for the **Login** type, the **Local Page** field is displayed. Normally, this field should be left blank, and the device will use the default authentication HTML page (for RADIUS shared password authentication, the default authentication page is **password.html**). If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.
      - If **Remote URL** is selected for the **Login** type, enter the URL in the **Remote URL** field. The URL must begin with **http://** or **https://**. The server listed here must also be included in the **Allowed Domains** or **Allowed Subnets**.
   f. For **IP Address**, enter the IP address for the hotspot's LAN. The default is **10.1.0.1**.

      This IP address also defines the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.
   g. For **Subnet Mask**, enter the subnet mask for the hotspot's LAN. The default is **255.255.255.0**.
   h. For **Auth Mode**, select **RADIUS Shared Password**.
   i. For **Primary RADIUS Server**, enter the IP address or fully-qualified domain name of the RADIUS server to use to authenticate hotspot users.
   j. For **RADIUS Server Secret**, enter the shared secret for the RADIUS server. This is configured on the RADIUS server.
   k. For **RADIUS NAS ID**, enter the NAS ID. The default is **hotspot**.

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l. Click **Advanced**.

Many of the advanced hotspot settings are optional or contain default values that normally do not need to be changed.

m. For **Server Port**, enter the port number for the hotspot server. The default is **4990**.

n. For **Auth Port**, enter the port number for the hotspot authentication server. The default is **3990**.

o. For **Max Download** and **Max Upload**, define the throughput limits that will be applied to clients that connect to the hotspot. Enter the number and select either **Kbps** or **Mbps**. The default for both is **10 Mbps**.

p. For **DHCP Lease Length**, enter the duration of the DHCP server lease in seconds. The default is **600** seconds.

q. The **Allowed Domains** and **Allowed Subnets** fields 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. If **Remote URL** has been selected for the **Login** type, 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.

r. (Optional) For **Secondary RADIUS Server**, enter the IP address or fully qualified domain name of a secondary RADIUS server to be used if the primary RADIUS server is not reachable.

s. For **RADIUS Server Port**, enter the UDP port number for the RADIUS server. The default is **1812**.

t. (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**.

u. (Optional) Enable **Use UAM Secret** if required for integration with a cloud hotspot provider.

v. For UAM Secret, if **Use UAM Secret** is enabled, enter the UAM secret.

w. Click **Apply**.

2. Configure the hotspot LAN:

a. On the menu, click **Network** > **Networks** > **LANs**.

- If the LAN selected for the hotspot already exists, select that LAN.
- If the LAN selected for the hotspot does not exist:

i. Click **New Network**.

ii. For **Select Network**, select the LAN.

Most settings for the LAN's configuration are performed automatically when the hotspot is created and cannot be changed here. You can view the configuration settings in read-only mode. Only the interfaces and optional description field can be changed.

b. For **Interfaces**, select the appropriate Ethernet and/or Wi-Fi interfaces for the hotspot.

c. Click **Apply**.

3. Configure the hotspot's Wi-Fi interface:

Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

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a. On the menu, click **Network** > **Interfaces** > **Wi-Fi**.
   - If the access point selected as the Wi-FI interface for the hotspot's LAN already exists, select that access point.
   - If the access point selected as the Wi-FI interface for the for the hotspot's LAN does not exist:
     i. Click **New Access Point**.
     ii. For **Select Access Point**, select the access point of the Wi-FI interface that was selected for the LAN.

b. For **SSID**, type the SSID that will be used for this hotspot.

c. For **Security**, select **None**.

d. Enable **Broadcast SSID**.

e. Click **Apply**.



Configure hotspot for RADIUS shared password authentication from the Command line

1. Enable and configure the hotspot for RADIUS shared password authentication:
   a. Assign the appropriate LAN to the hotspot:

   ```
   digi.router> hotspot lan lan3
   ```

   See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.

   b. Set the authentication mode to **radius-shared-password**:

   ```
   digi.router> hotspot auth-mode radius-shared-password
   ```


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c. Set the login type:
   - **local-page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
     i. Set **login** to **local-page**:

```
digi.router> hotspot login local-page
```

     ii. (Optional) Set the local page. Normally, local page should not be set, and the device will use the default authentication HTML page, **/hotspot/password.html**. If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.

```
digi.router> hotspot local-page filename
```

   - **remote-url**—Uses an HTML page for authentication that is served by a remote web server.
     i. Set **login** to **remote-url**:

```
digi.router> hotspot login remote-url
```

     ii. Set the URL of the remote server that hosts the remote HTML authentication page. The URL must begin with **http://** or **https://**.

```
digi.router> hotspot remote-url url
```

     iii. Add the remote server to either the **allowed-domains** or **allowed-subnets**:

```
digi.router> hotspot allowed-domains domain-name
```

     Additional servers can be added to the **allowed-domains** or **allowed-subnets** using a comma-separated list. Up to 999 characters are allowed. Include the domain or subnet of the RADIUS server(s) that are being used for authentication.

d. Configure the default IP address and subnet mask for the hotspot. The IP address and subnet mask define the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.

```
digi.router> hotspot ip-address ip-address
digi.router> hotspot mask subnet-mask
```

e. Set the fully qualified domain name or IP address of the primary RADIUS server:

```
digi.router> hotspot radius-server1 server
```

f. (Optional) Set the fully qualified domain name or IP address of the secondary RADIUS server, used if the primary RADIUS server is unreachable:

```
digi.router> hotspot radius-server2 server
```


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g. Set the shared secret for the RADIUS server. This is configured on the RADIUS server.

```
digi.router> hotspot radius-secret secret
```

h. Set the RADIUS server NAS ID. The default is hotspot.

```
digi.router> hotspot radius-nas-id nas-id
```

i. (Optional) change the UDP port number for the RADIUS server. The default is **1812**.

```
digi.router> hotspot radius-server-port port
```

j. (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**.

```
digi.router> hotspot swapoctets on
```

k. (Optional) Enable the use of a UAM secret if required for integration with a cloud hotspot provider.

```
digi.router> hotspot use-uamsecret on
```

l. For UAM Secret, if the use of a UAM secret is enabled, enter the UAM secret.

```
digi.router> hotspot uamsecret secret
```

m. (Optional) Change the hotspot server port. Default is **4990**.

```
digi.router> hotspot server-port port
```

n. (Optional) Change the port that the hotspot uses for authentication. Default is **3990**.

```
digi.router> hotspot auth-port port
```

o. (Optional) Change the upload and download throughput limits, in kbps, that will be applied to clients that connect to the hotspot. The default for both is **10000 kbps**.

```
digi.router> hotspot bandwidth-max-up max_in_kbps
digi.router> hotspot bandwidth-max-down max_in_kbps
```

p. (Optional) Change the duration of the DHCP server lease in seconds. The default is **600** seconds.

```
digi.router> hotspot dhcp-lease length_in_seconds
```

q. Enable the hotspot.

```
digi.router> hotspot state on
```

2. Enable and add interfaces to the hotspot's LAN:
   a. Enable the LAN:

```
digi.router> lan 3 state on
```


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b. Add interfaces to the LAN:

```
digi.router> lan 3 interfaces wifi-ap2
```

3. Configure the Wi-Fi interface:

Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

a. Set the SSID for the Wi-Fi interface:

```
digi.router> wifi-ap 2 ssid ssid
```

b. Disable the Wi-Fi interface's security:

```
digi.router> wifi-ap 2 security none
```

4. Save the configuration:

```
digi.router> save config
```


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Configure the hotspot with 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 **/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

- Enable the hotspot with RADIUS users authentication.
- IP address or fully qualified domain name of the 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.
- The LAN to serve as the hotspot LAN. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
- IP Address and subnet mask for the hotspot.
- Interfaces for the hotspot LAN (Wi-Fi and/or Ethernet).

Additional configuration items

- DHCP server lease timeout.
- Bandwidth limits.
- IP address or fully qualified domain name of the backup RADIUS server to be used if the primary RADIUS server is unreachable.
- Modify the local HTML authentication page, **/hotspot/login.html**, 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.

Hotspot LAN configuration

Once you have selected a LAN for a hotspot, you have limited configuration capabilities for that LAN. Most of its configuration (for example, its IP address and DHCP server) is set automatically by the hotspot, and the LAN is dedicated for use only by the hotspot. For this reason, you should select a LAN for the hotspot that has not already been configured for use outside of hotspot functionality.



WARNING! Once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Do not enable hotspot for the LAN that you are using to access the device for other purposes. See Selecting a LAN to be used by the hotspot for more information.

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Configure hotspot for RADIUS users authentication from the Web UI

1. Enable and configure the hotspot for RADIUS users authentication:
   a. On the menu, click **Network** > **Services** > **Hotspot**.
   b. Click **Enable** to enable the hotspot.
   c. For **LAN**, select a LAN for the hotspot. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   d. For **Login**, select the login type:
      - **Local Page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
      - **Remote URL**—Uses an HTML page for authentication that is served by a remote web server.
   e. **Local Page**/**Remote URL**:
      - If **Local Page** is selected for the **Login** type, the **Local Page** field is displayed. Normally, this field should be left blank, and the device will use the default authentication HTML page (for RADIUS users authentication, the default authentication page is **login.html**). If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.
      - If **Remote URL** is selected for the **Login** type, enter the URL in the **Remote URL** field. The URL must begin with **http://** or **https://**. The server listed here must also be included in the **Allowed Domains** or **Allowed Subnets**.
   f. For **IP Address**, enter the IP address for the hotspot's LAN. The default is **10.1.0.1**.

      This IP address also defines the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.
   g. For **Subnet Mask**, enter the subnet mask for the hotspot's LAN. The default is **255.255.255.0**.
   h. For **Auth Mode**, select **RADIUS Users**.
   i. For **Primary RADIUS Server**, enter the IP address or fully-qualified domain name of the RADIUS server to use to authenticate hotspot users.
   j. For **RADIUS Server Secret**, enter the shared secret for the RADIUS server. This is configured on the RADIUS server.
   k. For **RADIUS NAS ID**, enter the NAS ID. The default is **hotspot**.
   l. Click **Advanced**.

      Many of the advanced hotspot settings are optional or contain default values that normally do not need to be changed.
   m. For **Server Port**, enter the port number for the hotspot server. The default is **4990**.
   n. For **Auth Port**, enter the port number for the hotspot authentication server. The default is **3990**.
   o. For **Max Download** and **Max Upload**, define the throughput limits that will be applied to clients that connect to the hotspot. Enter the number and select either **Kbps** or **Mbps**. The default for both is **10 Mbps**.

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p. For **DHCP Lease Length**, enter the duration of the DHCP server lease in seconds. The default is **600** seconds.

q. The **Allowed Domains** and **Allowed Subnets** fields 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. If **Remote URL** has been selected for the **Login** type, 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.

r. (Optional) For **Secondary RADIUS Server**, enter the IP address or fully qualified domain name of a secondary RADIUS server to be used if the primary RADIUS server is not reachable.

s. For **RADIUS Server Port**, enter the UDP port number for the RADIUS server. The default is **1812**.

t. (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**.

u. (Optional) Enable **Use UAM Secret** if required for integration with a cloud hotspot provider.

v. For UAM Secret, if **Use UAM Secret** is enabled, enter the UAM secret.

w. Click **Apply**.

2. Configure the hotspot LAN:

   a. On the menu, click **Network** > **Networks** > **LANs**.

      - If the LAN selected for the hotspot already exists, select that LAN.
      - If the LAN selected for the hotspot does not exist:
        i. Click **New Network**.
        ii. For **Select Network**, select the LAN.

      Most settings for the LAN's configuration are performed automatically when the hotspot is created and cannot be changed here. You can view the configuration settings in read-only mode. Only the interfaces and optional description field can be changed.

   b. For **Interfaces**, select the appropriate Ethernet and/or Wi-Fi interfaces for the hotspot.

   c. Click **Apply**.

3. Configure the hotspot's Wi-Fi interface:

   Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. On the menu, click **Network** > **Interfaces** > **Wi-Fi**.

      - If the access point selected as the Wi-FI interface for the hotspot's LAN already exists, select that access point.
      - If the access point selected as the Wi-FI interface for the for the hotspot's LAN does not exist:
        i. Click **New Access Point**.
        ii. For **Select Access Point**, select the access point of the Wi-FI interface that was selected for the LAN.

   b. For **SSID**, type the SSID that will be used for this hotspot.

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c. For **Security**, select **None**.
d. Enable **Broadcast SSID**.
e. Click **Apply**.

Configure hotspot for RADIUS users authentication from the Command line

1. Enable and configure the hotspot for RADIUS users authentication:
   a. Assign the appropriate LAN to the hotspot:

```
digi.router> hotspot lan lan3
```

   See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   b. Set the authentication mode to **radius-users**:

```
digi.router> hotspot auth-mode radius-users
```


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c. Set the login type:
   - **local-page**—Uses an HTML page for authentication that is stored locally on the Digi WR device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time.
     i. Set **login** to **local-page**:

     ```
     digi.router> hotspot login local-page
     ```

     ii. (Optional) Set the local page. Normally, local page should not be set, and the device will use the default authentication HTML page, **/hotspot/login.html**. If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. See Upload custom hotspot HTML pages for more information about creating and uploading custom HTML files.

     ```
     digi.router> hotspot local-page filename
     ```

   - **remote-url**—Uses an HTML page for authentication that is served by a remote web server.
     i. Set **login** to **remote-url**:

     ```
     digi.router> hotspot login remote-url
     ```

     ii. Set the URL of the remote server that hosts the remote HTML authentication page. The URL must begin with **http://** or **https://**.

     ```
     digi.router> hotspot remote-url url
     ```

     iii. Add the remote server to either the **allowed-domains** or **allowed-subnets**:

     ```
     digi.router> hotspot allowed-domains domain-name
     ```

     Additional servers can be added to the **allowed-domains** or **allowed-subnets** using a comma-separated list. Up to 999 characters are allowed. Include the domain or subnet of the RADIUS server(s) that are being used for authentication.

d. Configure the default IP address and subnet mask for the hotspot. The IP address and subnet mask define the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.

```
digi.router> hotspot ip-address ip-address
digi.router> hotspot mask subnet-mask
```

e. Set the fully qualified domain name or IP address of the primary RADIUS server:

```
digi.router> hotspot radius-server1 server
```

f. (Optional) Set the fully qualified domain name or IP address of the secondary RADIUS server, used if the primary RADIUS server is unreachable:

```
digi.router> hotspot radius-server2 server
```


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g. Set the shared secret for the RADIUS server. This is configured on the RADIUS server.

```
digi.router> hotspot radius-secret secret
```

h. Set the RADIUS server NAS ID. The default is hotspot.

```
digi.router> hotspot radius-nas-id nas-id
```

i. (Optional) change the UDP port number for the RADIUS server. The default is **1812**.

```
digi.router> hotspot radius-server-port port
```

j. (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**.

```
digi.router> hotspot swapoctets on
```

k. (Optional) Enable the use of a UAM secret if required for integration with a cloud hotspot provider.

```
digi.router> hotspot use-uamsecret on
```

l. For UAM Secret, if the use of a UAM secret is enabled, enter the UAM secret.

```
digi.router> hotspot uamsecret secret
```

m. (Optional) Change the hotspot server port. Default is **4990**.

```
digi.router> hotspot server-port port
```

n. (Optional) Change the port that the hotspot uses for authentication. Default is **3990**.

```
digi.router> hotspot auth-port port
```

o. (Optional) Change the upload and download throughput limits, in kbps, that will be applied to clients that connect to the hotspot. The default for both is **10000 kbps**.

```
digi.router> hotspot bandwidth-max-up max_in_kbps
digi.router> hotspot bandwidth-max-down max_in_kbps
```

p. (Optional) Change the duration of the DHCP server lease in seconds. The default is **600** seconds.

```
digi.router> hotspot dhcp-lease length_in_seconds
```

q. Enable the hotspot.

```
digi.router> hotspot state on
```

2. Enable and add interfaces to the hotspot's LAN:
   a. Enable the LAN:

```
digi.router> lan 3 state on
```


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b. Add interfaces to the LAN:

```
digi.router> lan 3 interfaces wifi-ap2
```

3. Configure the Wi-Fi interface:

Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

a. Set the SSID for the Wi-Fi interface:

```
digi.router> wifi-ap 2 ssid ssid
```

b. Disable the Wi-Fi interface's security:

```
digi.router> wifi-ap 2 security none
```

4. Save the configuration:

```
digi.router> save config
```


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Configure the hotspot to use HotspotSystem

You can configure your Digi WR device's 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 **/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

- Enable the hotspot with HotspotSystem authentication.
- Create and configure a HotspotSystem account.
- NAS ID for use with the HotspotSystem.
- The LAN to serve as the hotspot LAN. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
- IP Address and subnet mask for the hotspot.
- Interfaces for the hotspot LAN (Wi-Fi and/or Ethernet).

Additional configuration items

- DHCP server lease timeout.
- Bandwidth limits.
- Modify the local HTML authentication page, **/hotspot/login.html**, 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.

Hotspot LAN configuration

Once you have selected a LAN for a hotspot, you have limited configuration capabilities for that LAN. Most of its configuration (for example, its IP address and DHCP server) is set automatically by the hotspot, and the LAN is dedicated for use only by the hotspot. For this reason, you should select a LAN for the hotspot that has not already been configured for use outside of hotspot functionality.



WARNING! Once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Do not enable hotspot for the LAN that you are using to access the device for other purposes. See Selecting a LAN to be used by the hotspot for more information.

Configure a HotspotSystem account

1. Sign up for an operator account. Go to HotspotSystem signup.
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**.

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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 NAS ID

When you configure the router, you need to set the NAS ID properly so that the router is linked to the HotspotSystem location that you created. HotspotSystem requires the NAS ID to be a combination of your HotspotSystem username and the Location ID number in the following format:

```
username_#
```

If needed, additional routers can be deployed to expand coverage in an existing location. This is done by appending a WDS number to the NAS ID as follows:

```
username_#_wds_#
```

For example, this is the NAS ID for 3rd router (**wds_2**) deployed at Location ID **7** for the username **digidotcom**:

```
digidotcom_7_wds_2
```

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 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 Web UI

1. Enable and configure the hotspot for HotspotSystem authentication:
   a. On the menu, click **Network** > **Services** > **Hotspot**.
   b. Click **Enable** to enable the hotspot.
   c. For **LAN**, select a LAN for the hotspot. See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   d. For **IP Address**, enter the IP address for the hotspot's LAN. The default is **10.1.0.1**.
      This IP address also defines the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.
   e. For **Subnet Mask**, enter the subnet mask for the hotspot's LAN. The default is **255.255.255.0**.
   f. For **Auth Mode**, select **HotspotSystem**.

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g. For **RADIUS NAS ID**, enter the NAS ID. The default is **hotspot**.
h. Click **Advanced**.

   Many of the advanced hotspot settings are optional or contain default values that normally do not need to be changed.

i. For **Server Port**, enter the port number for the hotspot server. The default is **4990**.
j. For **Auth Port**, enter the port number for the hotspot authentication server. The default is **3990**.
k. For **Max Download** and **Max Upload**, define the throughput limits that will be applied to clients that connect to the hotspot. Enter the number and select either **Kbps** or **Mbps**. The default for both is **10 Mbps**.
l. For **DHCP Lease Length**, enter the duration of the DHCP server lease in seconds. The default is **600** seconds.
m. The **Allowed Domains** and **Allowed Subnets** fields 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). If **Remote URL** has been selected for the **Login** type, 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.
n. Click **Apply**.

2. Configure the hotspot LAN:
   a. On the menu, click **Network** > **Networks** > **LANs**.
      - If the LAN selected for the hotspot already exists, select that LAN.
      - If the LAN selected for the hotspot does not exist:
        i. Click **New Network**.
        ii. For **Select Network**, select the LAN.

      Most settings for the LAN's configuration are performed automatically when the hotspot is created and cannot be changed here. You can view the configuration settings in read-only mode. Only the interfaces and optional description field can be changed.
   b. For **Interfaces**, select the appropriate Ethernet and/or Wi-Fi interfaces for the hotspot.
   c. Click **Apply**.
3. Configure the hotspot's Wi-Fi interface:

   Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. On the menu, click **Network** > **Interfaces** > **Wi-Fi**.
      - If the access point selected as the Wi-FI interface for the hotspot's LAN already exists, select that access point.
      - If the access point selected as the Wi-FI interface for the for the hotspot's LAN does not exist:
        i. Click **New Access Point**.
        ii. For **Select Access Point**, select the access point of the Wi-FI interface that was selected for the LAN.

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b. For **SSID**, type the SSID that will be used for this hotspot.
c. For **Security**, select **None**.
d. Enable **Broadcast SSID**.
e. Click **Apply**.

Configure hotspot for HotspotSystem authentication from the Command line

1. Enable and configure the hotspot for HotspotSystem authentication:
   a. Assign the appropriate LAN to the hotspot:

```
digi.router> hotspot lan lan3
```

   See Hotspot LAN configuration for important information about selecting a LAN for the hotspot.
   b. Set the authentication mode to **hotspotsystem**:

```
digi.router> hotspot auth-mode hotspotsystem
```

   c. Configure the default IP address and subnet mask for the hotspot. The IP address and subnet mask define the subnet that will be used by the hotspot's DHCP server. See Hotspot DHCP server for more information.

```
digi.router> hotspot ip-address ip-address
digi.router> hotspot mask subnet-mask
```

   d. Set the RADIUS server NAS ID. The default is hotspot.

```
digi.router> hotspot radius-nas-id nas-id
```

   e. (Optional) Change the hotspot server port. Default is **4990**.

```
digi.router> hotspot server-port port
```

   f. (Optional) Change the port that the hotspot uses for authentication. Default is **3990**.

```
digi.router> hotspot auth-port port
```

   g. (Optional) Change the upload and download throughput limits, in kbps, that will be applied to clients that connect to the hotspot. The default for both is **10000 kbps**.

```
digi.router> hotspot bandwidth-max-up max_in_kbps
digi.router> hotspot bandwidth-max-down max_in_kbps
```

   h. (Optional) Change the duration of the DHCP server lease in seconds. The default is **600** seconds.

```
digi.router> hotspot dhcp-lease length_in_seconds
```

   i. Enable the hotspot.

```
digi.router> hotspot state on
```


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2. Enable and add interfaces to the hotspot's LAN:
   a. Enable the LAN:

```
digi.router> lan 3 state on
```

   b. Add interfaces to the LAN:

```
digi.router> lan 3 interfaces wifi-ap2
```

3. Configure the Wi-Fi interface:

Note If an Ethernet interface was added to the LAN, no configuration of the Ethernet interface is required.

   a. Set the SSID for the Wi-Fi interface:

```
digi.router> wifi-ap 2 ssid ssid
```

   b. Disable the Wi-Fi interface's security:

```
digi.router> wifi-ap 2 security none
```

4. Save the configuration:

```
digi.router> save config
```

Show hotspot status and statistics

View status and statistics about the hotspot at the command line using the show hotspot command:

```
digi.router> show hotspot

 Hotspot
 -------
 Admin Status            : Up
 Operating Status        : Up
 LAN                     : lan5
 Authenticated clients   : 1
 Unauthenticated clients : 0

 MAC               IP       Auth? Username Duration/max sec Idle/max sec %/max up bps %/max down bps
 ------------------------------------------------------------------------------------------------------
 98-01-A7-8F-A5-93 10.1.0.3 Yes   usertest 13/0             0/0          0%/10000000  0%/10000000

digi.router>
```

Show current hotspot configuration

You can view the current hotspot configuration from either the Web UI or the command line.

Web

On the menu, click **Network** > **Services** > **Hotspot**. The current configuration is displayed.

Command line

View the current hotspot configuration using the show hotspot command with no parameters:

```
digi.router> hotspot

 hotspot 1:
   allowed-domains
   allowed-subnets
   auth-mode                  click-through
   auth-port                  3990
   bandwidth-max-down         10000
   bandwidth-max-up           10000
   dhcp-lease                 600
   ip-address                 10.1.0.1
   lan                        lan2
   local-page
   local-shared-password
   login                      local-page
   mask                       255.255.255.0
   radius-nas-id              hotspot
   radius-secret
   radius-server-port         1812
   radius-server1
   radius-server2
   remote-url
   server-port                4990
   state                      on
   swapoctets                 off
   uamsecret
   use-uamsecret              off

digi.router>
```


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Customize the hotspot login page

The Digi WR device provides several sample HTML webpages for use with the hotspot feature. When hotspot is enabled for the first time, the sample webpages are installed to the **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 page, so that hotspot users will be redirected to your custom HTML page when they log into the hotspot. You can also host the HTML pages on an external web server, rather than on the device.

This section contains the following information:

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Edit sample hotspot html pages

To edit the sample HTML pages, download and edit the files on your local machine. After they have been edited, upload the edited files to the 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, .swf, .json, and .dat.

Web

1. Download the sample HTML file:
   a. On the menu, click **System > Administration > File System**. The **File System** page appears.
   b. Expand the **/hotspot** directory.

      Note The **/hotspot** directory is only available after hotspot has been enabled for the first time.

   c. Select the HTML file you want to edit and click (download).
2. On your local machine, edit the file as needed.
3. Upload the edited file:
   a. On the menu, click **System > Administration > File System**. The **File System** page appears.
   b. Expand the **/hotspot** directory.
   c. Click (upload).
   d. 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

You can download and upload the sample HTML files using utilities such as Secure Copy (SCP), SSH File Transfer Protocol (SFTP), or an SFTP application, such as FileZilla.

For example, to edit the sample files by using SCP:

1. Download the file to your local machine. For example:

```
scp username@device_ip_address:hotspot/login.html login.html
```

2. On your local machine, edit the file as needed.
3. Upload the edited file from your local machine to the device. For example:

```
scp login.html username@device_ip_address:hotspot/login.html
```


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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 **ChilliLibrary.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 Digi WR device to use your custom HTML page using either the Web UI or the command line:

Web

1. Upload your custom HTML file to the device's filesystem:
   a. On the menu, click **System > Administration > File System**. The **File System** page appears.
   b. Expand the **/hotspot** directory.

      Note The **/hotspot** directory is only available after hotspot has been enabled for the first time.

   c. Click (upload).
   d. 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.
2. Configure the hotspot to use your custom HTML file:
   a. On the menu, click **Network** > **Services** > **Hotspot**.
   b. Ensure that **Login** is set to **Local Page**.
   c. For **Local Page**, select your custom HTML file.
   d. Click **Apply**.

Command line

1. Upload your custom HTML file to the device's filesystem.

   You can upload your custom HTML file using utilities such as Secure Copy (SCP), SSH File Transfer Protocol (SFTP), or an SFTP application, such as FileZilla. For example, to upload your custom html file by using SCP:

   ```
   scp custom.html username@device_ip_address:hotspot/custom.html
   ```

2. Configure the hotspot to use your custom HTML file:
   a. Set **login** to **local-page**:

      ```
      digi.router> hotspot login local-page
      ```

   b. Set **local-page** to your custom HTML file:

      ```
      digi.router> hotspot local-page custom.html
      ```


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c. Save the configuration:

```
digi.router> save config
```

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** folder and files are loaded when the hotspot is enabled, and you can restore the default pages by doing the following:

1. On the menu, click **System > File System**.
2. Select the **/hotspot** folder.
3. Click (**Rename**) in the toolbar.
4. Enter **hotspot_modified** and press **OK**.
5. On the menu, click **Network > Services > Hotspot**.
6. Disable the hotspot by clicking on the **Enable** toggle switch.
7. Click **Apply**.
8. Enable the hotspot by clicking on the **Enable** toggle switch.
9. Click **Apply**. The **/hotspot** folder and sample files are loaded into the file system.

Use a remote web server

You can use an external web server for authentication instead of hosting the login web page on the router. To use an external web server, set **Login** to **Remote URL** and set **Remote URL** to the URL of the login page. The URL should start with **http://** or **https://**. The server hosting the login page, as well as any supporting servers (for instance, servers used for assets, payment, or social media login), should be "white listed" by adding them to the **Allowed Domains** or **Allowed Subnets** for the hotspot.

Alternately, you can use the command line to make this change. For example, if the login page was located at **http://example.com/login.html**, you could use the following commands:

```
digi.router> hotspot login remote-url
digi.router> hotspot remote-url http://example.com/login.html
digi.router> hotspot allowed-domains example.com
digi.router> save config
```

The login page on the external server should include **ChilliLibrary.js** and call the same JavaScript functions that the sample HTML pages do. While integrating an external server, you can download the sample HTML pages from the hotspot folder on the router and then upload the sample pages to the external server for debugging purposes. To make this work, modify the following javascript variables in the sample HTML page:

Javascript variable	Description
hostname	Hotspot IP address (for example, 10.1.0.1).
port	Hotspot UI server port (for example, 4990).
host	Hotspot IP address and UI server port number (for example, 10.1.0.1:4990).

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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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Location information

The WR54 and WR64 models contain a Global Navigation Satellite System (GNSS) module that provides information about the current location of the device. Additionally, the device can be configured to:

- Accept location messages from other location-enabled devices. See Configure the device to accept location messages from external sources for further information.
- Forward location messages, either from the device or from external sources, to a remote host. See Forward location information to a remote host for further information. You can also configure a vehicle ID for the device that will be included in location messages. See Configure the Vehicle ID for further information.

Enable the GNSS module

The GNSS module on the WR54 and WR64 devices can be enabled or disabled from the WebUI or the command line.

Web

1. On the menu, click **System** > **Configuration** > **Location** > **Settings**.
2. Set the **GNSS State** toggle switch to **GNSS** to enable the GNSS module, or **Off** to disable it.
3. Click **Apply**.

Command line

To enable the GNSS module:

1. Enable the module:

```
digi.router> location state gnss
```

2. Save the configuration:

```
digi.router> save config
```

Configure the device to accept location messages from external sources

You can configure the WR54 or WR64 device to accept NMEA or TAIP messages from external sources. For example, location-enabled devices connected to the device can forward their location information to the device, and then the 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 a WR54 or WR64 device to forward location messages.

This procedure configures a UDP port on the WR54 or WR64 device that will be used to listen for incoming messages. An IP filter rule should also be also created on the device to allow this port to accept UDP communications.

Note When the device is configured as a location server, it will not read location data from its GNSS module.

Required configuration items

- Enable the location server.
- UDP port that the Digi WR device will listen to for incoming location messages. If set to 0, the location feature is disabled.
- An IP filter rule that allows incoming messages from external sources to the specified port.

Additional configuration items

- Refresh interval, in seconds. Determines how often the device will poll the specified UPD port for incoming location messages.

Configure the listening port

Web

1. On the menu, click **System** > **Configuration** > **Location** > **Settings**.
2. Set the **GNSS State** toggle switch to **Server**.
3. For **Server Port**, set the port that will receive incoming location messages.
4. (Optional) For **Interval**, set the refresh interval. Accepted value is any integer from 1 to 3600; the default is 10.
5. Click **Apply**.

Command line

To enable the GNSS module:

To configure the WR54 or WR64 device to accept incoming location messages:

1. Enable the location server:

```
digi.router> location state server
```

2. Set the port that will receive incoming location messages:

```
digi.router> location server-port 8000
```

3. (Optional) Set the refresh interval. Accepted value is any integer from 1 to 3600; the default is 10.

```
digi.router> location interval 5
```

4. Save the configuration:

```
digi.router> save config
```


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Create IP filter rule

An IP filter rule must be created for the port that will receive incoming location messages. This procedure can be performed from either the WebUI or the command line.

Web

1. On the menu, click **Security** > **Firewall** > **Input IP Filters**.
2. Click ✚ (Add Filter) to create a new filter.
3. Toggle **Enabled** to On.
4. (Optional) For **Description**, type a description for this IP filter, for example:
   IP filter rule for incoming location messages.
5. For **Action**, select **Accept**.
6. For **Source**, select the appropriate source for the incoming messages.
7. (Optional) For **Address**, enter the IP address or subnet of the host or hosts that will be forwarding location data to this device.
8. For **Port**, enter the port defined in Configure the listening port .
9. For **Protocol**, select **UDP**.
10. Click **OK**.
11. Click **Apply**.

Command line

Note This example uses IP filter rule **3**. This number should be replaced with an unused instance to avoid overwriting an existing IP filter rule.

1. (Optional) Set a description for this ip-filter rule:

```
digi.router> ip-filter 3 description IP filter rule for incoming location
messages
```

2. Set the action to **accept**:

```
digi.router> ip-filter 3 action accept
```

3. Set the appropriate source for the incoming messages:

```
digi.router> ip-filter 3 src lan1
```

4. (Optional) Set a source IP address or subnet of the host that will be forwarding location data to this device:

```
digi.router> ip-filter 3 src-ip-address 10.20.1.1/32
```

5. Set the port to the port defined in Configure the listening port :

```
digi.router> ip-filter 3 dst-ip-port 8000
```

6. Set the protocol to UDP:

```
digi.router> ip-filter 3 protocol udp
```


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7. Enable the filter:

```
digi.router> ip-filter state on
```

8. Save the configuration:

```
digi.router> save config
```

Forward location information to a remote host

You can configure location clients on a WR54 or WR64 device to forward location messages in either NMEA or TAIP format to a remote host. You can configure up to ten location clients on the device, to forward location information to up to ten different remote hosts.

Depending on how the device's location feature is enabled, you can either forward the device's location information based on its GNSS module, or you location information from external sources:

- If the location feature is set to **off**, no information is forwarded.
- If the location feature is set to **gnss**, the device's location information based on its GNSS module is forwarded.
- If the location feature is set to **server**, location information from external sources is forwarded. See Configure the device to accept location messages from external sources for more information.
- You can also configure a vehicle ID for the Digi WR device to be included in the forwarded messages. See Configure the Vehicle ID for more information.

Required configuration items

- Enable the location feature.
- IP address of the remote host to which the location messages will be forwarded.
- 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. The default is TAIP.

Additional configuration items

- 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. See Configure the Vehicle ID.

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Configure the WR54 or WR64 device to forward location information

This procedure can be performed from the Web UI or the command line.

Web

1. Enable the location feature. On the menu, click **System** > **Configuration** > **Location** > **Settings**.
   - To forward the device's location information based on its GNSS module, set **State** to **GNSS**.
   - To forward location information from external sources, set **State** to **Server**.
2. On the menu, click **System** > **Configuration** > **Location** > **Client**.
3. Click **New Location Client**.
4. (Optional) In **Description**, enter a description of the location client.
5. For **Server**, enter the IP address of the remote host to which location messages will be sent.
6. For **Server Port**, enter the UDP port on the remote host to which location messages will be sent.
7. For **Type**, select the protocol type for the messages, either **TAIP** or **NMEA**.
8. (Optional) Select the types of messages that will be forwarded. Allowed values depend on the protocol type selected for **Type**:
   - 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.
     - **PV** — Position/velocity: reports the latitude, longitude, and heading.

     The default is to report all message types.
   - 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.

     The default is to report all message types.

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9. (Optional) For **Prepend**, enter text to prepend to the forwarded message. Two variables can be included in the prepended text:
   - **%s** — Includes the device's serial number in the prepended text.
   - **%v** — Includes the vehicle ID in the prepended text. See Configure the Vehicle ID for information about configuring the vehicle ID.

   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|__
   ```

10. Click **Apply**.

Command line

1. Enable the location feature:
   - To forward the device's location information based on its GNSS module:

     ```
     digi.router> location state gnss
     ```

   - To forward location information from external sources:

     ```
     digi.router> location state server
     ```

2. Set the IP address of the remote host to which location messages will be sent:

   ```
   digi.router> location-client 1 server 192.168.2.3
   ```

3. (Optional) Provide a description of the remote host:

   ```
   digi.router> location-client 1 description Remote host 1
   ```

4. Set the UDP port on the remote host to which location messages will be sent:

   ```
   digi.router> location-client 1 server-port 8000
   ```

5. Set the protocol type for the messages. Allowed values are **taip** or **nmea**; the default is **taip**:

   ```
   digi.router> location-client 1 type nmea
   ```

6. (Optional) Specify a comma-separated list of the types of messages that will be forwarded. Allowed values depend on the value of the protocol type configured in the **type** parameter:
   - 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.
     - **pv** — Position/velocity: reports the latitude, longitude, and heading.

     The default is to report all message types.

     ```
     digi.router> location-client 1 filter-taip al,cp,id
     ```


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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.

  The default is to report all message types.

```
digi.router> location-client 1 filter-nmea gga,gll,gsa
```

7. (Optional) Set the text to prepend to the forwarded message. Two variables can be included in the prepended text:
   - **%s** — Includes the device's serial number in the prepended text.
   - **%v** — Includes the vehicle ID in the prepended text. See Configure the Vehicle ID for information about configuring the vehicle ID.

```
digi.router> location-client 1 prepend __|%s|__|%v|__
```

8. Save the configuration:

```
digi.router> save config
```


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Configure the Vehicle ID

You can configure the WR54 or WR64 device to include a vehicle ID with location messages.

Required configuration items

- A four-digit alphanumeric string for the vehicle ID. The default is **0000**.

To set the vehicle ID:

Web

1. On the menu, click **System** > **Configuration** > **Location** > **Settings**.
2. For **Vehicle ID**, enter the vehicle ID.
3. Click **Apply**.

Command line

1. Set the ID. Allowed value is a four digit alphanumerical string (for example, 01A3 or 1234). If no vehicle ID is configured, this setting defaults to 0000.

```
digi.router> location vehicle-id 1234
```

2. Save the configuration:

```
digi.router> save config
```


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Show location information

You can view status, configuration, and statistics about location information from either the WebUI or the command line.

Web

1. On the menu, click **System** > **Configuration** > **Location** > **Settings**.

Command line

Show basic configuration information

To show detailed location information and statistics, use the show location command:

```
digi.router> show location

Location Status
---------------
GNSS State        : on
Source            : 192.168.2.3
Latitude          : 40* 49' 20.000" N (40.822245)
Longitude         : 73* 12' 32.000" E (-73.209048)
Altitude          : 15 meters
Velocity          : 0 meters per second
Direction         : None
Quality           : Standard GNSS (2D/3D)
UTC Date and Time : 03 October 2018, 16:47:53
No. of Satellites : 7

digi.router>
```


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Auto-run commands

Auto-run commands are commands that are automatically run at boot-up. You can use auto-run commands for such tasks as:

- Starting a Python program
- Switching between configuration files
- Scheduling a reboot

The Digi WR device supports up to **10** auto-run commands. See autorun for details.

Required configuration items

Configure the command that is to be automatically run at bootup. See Use multiple configuration files to test configurations on remote devices for an example of using autorun commands to safely test configurations on a remote device.

Example: Update the configuration from file config.da0

1. Type the following command:

```
digi.router> autorun 1 command “update config config.da0”
```

2. Save the configuration.

```
digi.router> save config
```

Example: Run a timed reboot

1. Type the following command:

```
digi.router> autorun 2 command “reboot in 5”
```

2. Save the configuration.

```
digi.router> save config
```


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Python

Digi WR devices support Python 3.5, providing the ability to run Python applications on the device, either from a file or interactively.

You can also configure devices to automatically run Python applications when the device restarts.



WARNING! If your Python application repeatedly writes to files or logs, it can cause excessive wear on the flash memory. Therefore, you should design your Python scripts to keep frequently-modified data in memory and write to files only when required.

Run a Python application at the command line

Command line

Python applications can be run from a file at the command line. 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** or use the python stop command from another CLI session.

1. Upload the Python application script to the device using the Web UI **File System** page or applications such Filezilla, SFTP or SCP. See Upload and download files for information about uploading files.
2. Use the python command to run the Python application. In the following example, the Python application, **health.py**, takes 3 parameters: **120**, **ports** and **storage**:

```
digi.router> python health.py 120 ports storage
```

Show running Python applications

Command line

Use the show python command to list Python applications currently running on your device.

For example:

```
digi.router> show python

 ID       File Name                          Arguments

 ------------------------------------------------------------------
 4990     health.py                          120 ports storage

 4993     scripts/python/traffic.py          300 --quiet

 6322     (interactive)
```


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Stop a Python application

Command line

Use the python stop command to stop a running Python application.

To stop a Python application:

1. Determine the Python application ID using the show python command. For example:

```
digi.router > show python
ID              File Name                       Arguments
-------------------------------------------------------------------------
4990            health.py                       120 ports storage
4993            scripts/python/traffic.py       300 --quiet

digi.router >
```

2. Enter the python stop command with the Python application ID:

```
digi.router > python stop 4990

Stopped: 4990 'health.py'

digi.router >
```

Run an interactive Python session

Command line

You can use the python command to run an interactive Python session from within the current CLI command session. This allows you to test Python commands on the device while developing a Python application.

1. Use the python command with no parameters to enter an interactive Python session:

```
digi.router> python

Python 3.5.5
>>>
```

2. Use **Ctrl-D** to exit the Python session. You can also exit the session using exit() or quit(), or by terminating the session from another shell instance by using python stop. See Stop a Python application for information about using python stop.

Configure a Python application to run automatically at startup

You can configure your Digi WR device to automatically run a Python application when the device restarts. Up to four Python scripts can be configured to run automatically at startup.

Upload Python application scripts to the device using the Web UI **File System** page or applications such Filezilla, SFTP or SCP; see Upload and download files for information about uploading files. Python applications can stored in a different directory as required; for example, you can create a **scripts** directory using the mkdir command, and store your uploaded Python applications in this directory.

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Required configuration items

- Upload the Python script to be run.
- Enable the Python script.

Additional configuration items

- The arguments for the Python script.
- The action to take if the Python script finishes. The actions that can be taken are
  - None.
  - Restart the script.
  - Reboot the device.

Web

1. On the menu, click **System** > **Configuration** > **Python Autostart**.
2. Click ✚ (Add Rule) .
   - **Enabled**: Enables or disables the autostart rule.
   - **Filepath**: Type or select the path and filename of the Python script to be included in the autostart rule.
   - **Args**: (Optional) Include arguments for the selected Python script.
   - **On exit**: Select the action to be taken when the script finishes. Allowed values are: none, restart or reboot.
3. Click **Apply**.

Command line

Use the python-autostart command to configure Python applications to be automatically run at startup.

1. Configure the Python application to be run automatically at startup.

```
digi.router> python-autostart 1 filepath “scripts/traffic.py”
```

2. (Optional) Configure arguments for the Python script.

```
digi.router> python-autostart 1 args “300 -quiet”
```

3. (Optional) Configure the action to be taken when the script finishes. Allowed values are: none, restart or reboot.

```
digi.router> python-autostart 1 restart
```

4. Enable the Python script.

```
digi.router> python-autostart 1 state on
```

5. Save the configuration.

```
digi.router> save config
```

Digidevice module

The Python **digidevice** module provides platform-specific extensions that allow you to interact with the device's configuration and interfaces.

The digidevice cli submodule

Use the **cli** submodule to issue CLI commands from Python to change the configuration of the device, and 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 CLI command with the **digidevice cli** submodule:

1. Use the python command with no parameters to enter an interactive Python session:

```
digi.router> python

Python 3.5.5
>>>
```

2. Import the **cli** submodule:

```
>>> from digidevice import cli
```

3. Print the system status and statistics to stdout using the show system command:

```
>>> response = cli.execute("show system")
>>>
>>> print (response)

Model              : LR54W-FIPS
Part Number        : LR54-AW403
Serial Number      : LR000130

Hardware Version   : 50001899-03 A
Using Bank         : 1
Firmware Version   : 4.3.0.52 06/28/2018 14:54:33
Bootloader Version: 1.1.3 (Jun 20 2018 - 20:48:44)
Using Config File : config.da0

Uptime             : 3 Days, 11 Hours, 12 Minutes, 20 Seconds
System Time        : 16 July 2018, 06:24:28

CPU                : 0% (min 0%, max 99%, avg 2%)
Temperature        : 30.50 C

Description        :
Location           :
Contact            :
>>>
```

4. Use **Ctrl-D** to exit the Python session. You can also exit the session using exit() or quit(), or by terminating the session from another shell instance by using python stop. See Stop a Python application for information about using python stop.

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Output the cli show command in JSON format

Many of the **cli show** commands can output the response in JSON format, using the **-fjson** option. This makes it easier for Python applications to read the data.

```
digi.router> python

Python 3.5.3
>>> from digidevice import cli
>>> import json
>>>
>>> response = cli.execute(“show system -fjson”)
>>> resp = json.loads(response)
>>> resp
{'cpu-max': '99', 'firmware-version': '4.3.0.52 06/28/2018 14:54:33', 'contact':
'', 'part-number': 'LR54-AW403',
'bootloader-version': '1.1.3 (Jun 20 2018 - 20:48:44)', 'temperature': '30.75 C',
'serial-number': 'LR000130',
'model': 'LR54W-FIPS', 'config-file': 'config.da0', 'cpu-usage': '3', 'hardware-
version': '50001899-03 1P',
'system-time': '16 July 2018, 06:28:59', 'cpu-avg': '1', 'bank': '1',
'description': "", 'location': '',
'cpu-min': '0', 'uptime': '3 Days, 11 Hours, 16 Minutes, 50 Seconds'}
>>>
>>> print (resp[“model”])
LR54W-FIPS
>>>
```

The digidevice datapoint submodule

Use the **datapoint** submodule to upload custom datapoints to Digi Remote Manager (DRM).

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)
- 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:

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1. Use the python command with no parameters to enter an interactive Python session:

```
digi.router> python

Python 3.5.5
>>>
```

2. Import the **datapoint** submodule and other necessary modules:

```
>>> from digidevice import datapoint
>>> import time
```

3. Upload the datapoints to DRM:

```
>>> datapoint.upload("Velocity", 69, units="mph", data_type="integer")
>>> datapoint.upload("Temperature", 24, geo_location=(54.409469, -1.718836,
129)
>>> datapoint.upload("Emergency Door", "closed", timestamp=time.time())
```

4. Use **Ctrl-D** to exit the Python session. You can also exit the session using exit() or quit(), or by terminating the session from another shell instance by using python stop. See Stop a Python application for information about using python stop.

Once the datapoints have been uploaded to DRM, they can be viewed via DRM or accessed using Web Services calls. For more information on web services and datapoints, see the Digi Remote Manager Programmers Guide.

The digidevice device_request submodule

The **device_request** submodule allows you to interact with Digi Remote Manager (DRM) by using DRM's Server Command Interface (SCI), a web service that allows users to access information and perform commands that relate to their devices.

Use DRM's SCI interface to create SCI requests that are sent to your Digi WR device, and use the **device_request** submodule to send responses to those requests to DRM.

See the Digi Remote Manager Programmers Guide for more information on SCI.

Task one: Use the device_request submodule on your device to create a response

1. Use the python command with no parameters to enter an interactive Python session:

```
digi.router> python

Python 3.5.5
>>>
```

2. Import the **device_request** submodule:

```
>>> from digidevice import device_request
>>>
```

3. Create a function to handle the request from DRM:

```
>>> def handler(target, request):
...     print ("received request %s for target %s" % (request, target))
```


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```
...     return "OK"
...
>>>
```

4. Register a callbackup function that will be called when the device receives a SCI request from DRM:

```
>>> device_request.register("myTarget", handler)
>>>
```

Note Leave the interactive Python session active while completing task two, below. Once you have completed task two, close the interactive Python session by using **Ctrl-D** to exit the session. You can also exit the session using exit() or quit(), or by terminating the session from another shell instance by using python stop. See Stop a Python application for information about using python stop.

Task two: Create and send an SCI request from Digi Remote Manager

The second step in using the **device_request** submodule is to create a SCI request that DRM will forward to the device. For example, you can create in SCI request in the DRM API explorer:

1. In DRM, 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**.
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="00000000-00000000-0000FFFF-A83CF6A3"/>
    </targets>
    <requests>
      <device_request target_name="myTarget">
        my payload string
      </device_request>
    </requests>
  </data_service>
</sci_request>
```

   For the **device_request** element, the **target_name** parameter must correspond to the **target** parameter of the **device_request.register** function in the Python script running on the WR routers device.
4. Click **Send**.

   Once that the request has been sent to the device, the handler on the device is executed.

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- On the device, you will receive the following output:

```
>>> received request
        my payload string
       for target myTarget
```

- In DRM, you will receive a response similar to the following:

```
<sci_reply version="1.0">
  <data_service>
    <device id="00000000-00000000-0000FFFF-A83CF6A3"/>
      <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 DRM.

1. Create a Python application, called showsystem.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 DRM:

```
from digidevice import device_request
from digidevice import cli
import time


def handler(target, request):
    return cli.execute("show system")

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 multiple devices using the Web UI **File System** page or applications such Filezilla, SFTP or SCP. In this example, we will upload it to two devices, and use the same request in DRM to query both devices.

   See Upload and download files for information about uploading files.

3. Configure the showsystem.py application to run automatically.

   See Configure a Python application to run automatically at startup for information about configuring Python applications to start automatically.

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4. In DRM, click **Documentation** > **API Explorer**.
5. Select the devices to use as the SCI targest:
   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="00000000-00000000-0000FFFF-A83CF6A3"/>
      <device id="00000000-00000000-0000FFFF-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="00000000-00000000-0000FFFF-A83CF6A3"/>
      <requests>
        <device_request target_name="showSystem" status="0">Model
         : Digi WR54
          Part Number              : WR54-A146
          Serial Number            : WR54-000068

          Hardware Version         : 50001987-01 A
          Firmware Version         : 4.8.6.2
          Bootloader Version       : 1 1.3 (Dec 20 2018 - 00:34:45)

          Uptime                   : 12 Day, 4 Hours, 24 Minutes, 33
Seconds
          System Time              : 17 July 2019, 22:53:39
```


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```
          CPU                       : 24% (min 8%, max 100%, avg 37%)
          Temperature               : 33.00 C

          Description               : Corporate Headquarters WR54
          Location                  : Hopkins, MN
          Contact                   : Jane Smith</device_request>
      </requests>
    </device>
    <device id="00000000-00000000-0040FFFF-485740BC"/>
      <requests>
        <device_request target_name="showSystem" status="0">Model
         : Digi WR54
          Part Number               : WR54-A146
          Serial Number             : WR54-000068

          Hardware Version          : 50001987-01 A
          Firmware Version          : 4.8.6.2
          Bootloader Version        : 1 1.3 (Dec 20 2018 - 00:34:45)

          Uptime                    : 1 Day, 0 Hours, 48 Minutes, 38 Seconds
          System Time               : 17 July 2019, 22:53:39

          CPU                       : 24% (min 8%, max 100%, avg 37%)
          Temperature               : 32.00 C

          Description               : Satellite office WR54
          Location                  : Boston, MA
          Contact                   : Omar Ahmad</device_request>
      </requests>
    </device>
  </data_service>
</sci_request>
```


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The digidevice led submodule

Use the **led** submodule to redefine the purpose of any front-panel LED on the device. With this submodule, you can:

- Gain control of the LED with the led.acquire() method.
- Define the state of the LED with the led.set() method.
- Optionally release control of the LED with the led.release() method.

See Use Python to set the state of LEDs for instructions on using these methods.

Available LEDs

LED	Available colors	Attribute name	Notes
Power	Blue	Led.POWER	
GNSS	Green	Led.GNSS	Not supported on the LR54.
SIM1	Green	Led.SIM1	Supported on the LR54 only.
SIM2	Green	Led.SIM2	Supported on the LR54 only.
WIFI1	Green	Led.WIFI1	
WIFI2	Green	Led.WIFI2	Not supported on single Wi-Fi models of the WR54.
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	Not supported on the LR54. Not supported on single cellular models of the WR54.
WWAN2 Service	Green Yellow	Led.WWAN2_SERVICE_GREEN Led.WWAN2_SERVICE_YELLOW	Not supported on the LR54. Not supported on single cellular models of the WR54.

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Available LED states

State	Atttribute name
Solid on	State.ON
Off	State.OFF
Slow flash	State.FLASH_SLOW
Medium flash	State.FLASH_MEDIUM
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 GNSS LED to a slow flash.

Note See The digidevice led submodule for a list of available LEDs and states.

1. Use the python command with no parameters to enter an interactive Python session:

```
digi.router> python

Python 3.5.5
>>>
```

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 GNSS LED:

```
>>> led.acquire(Led.GNSS)
```

5. Use led.set() to set the state of the LED:

```
>>> led.set(Led.GNSS, State.FLASH_SLOW)
```

6. (Optional) Use led.release() to release the LED to system control:

```
>>> led.release(Led.GNSS)
```

7. Use **Ctrl-D** to exit the Python session. You can also exit the session using exit() or quit(), or by terminating the session from another shell instance by using python stop. See Stop a Python application for information about using python stop.

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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.

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 a Python application to run automatically at startup 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.

The digidevice name submodule

The **name** submodule can be used to upload a custom name for your device to Digi Remote Manager (DRM).

When you use the **name** submodule to upload a custom device name to DRM, the following issues apply:

- If the name is being used by to another device in your DRM account, the name will be removed from the previous device and added to the new device.
- If DRM is configured to apply a profile to a device based on the device name, changing the name of the device may cause DRM 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 DRM 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 DRM.

Enable support on Digi Remote Manager for uploading custom device names

1. In Digi 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 by using the name submodule

1. Use the python command with no parameters to enter an interactive Python session:

```
digi.router> python

Python 3.5.5
>>>
```

2. Import the **name** submodule:

```
>>> from digidevice import name
>>>
```

3. Upload the name to DRM:

```
>>> name.upload("my_name")
>>>
```

4. Use **Ctrl-D** to exit the Python session. You can also exit the session using exit() or quit(), or by terminating the session from another shell instance by using python stop. See Stop a Python application for information about using python stop.

Log messages for Python applications

To write log messages for Python applications to the device's event log:

1. Use the standard Python **syslog** module to write messages from Python applications to the event log. For example:

```
digi.router> python

Python 3.5.3
>>> import syslog
>>>
>>> syslog.syslog(syslog.LOG_ERR, “Error message from Python”)
>>> syslog.syslog(syslog.LOG_INFO, “Informational message from Python”)
```

2. Print the event log:

```
digi.router> show log

2018-07-16 07:36:29.103272 user.err python3_sb: Error message from Python
2018-07-16 07:36:30.447212 user.info python3_sb: Informational message from
Python
```


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Port forwarding

Most computers connected to a router 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. Each port forwarding rule automatically maps and forwards an external request for a port on a WAN to an IP address and port on an internal LAN.

For a port forwarding rule to be applied, you must configure **From Port** and **To IP Address**, and set the rule to **Enabled**. Incomplete and incorrect port forwarding rules are not applied. You can configure a maximum of 30 port forwarding rules.

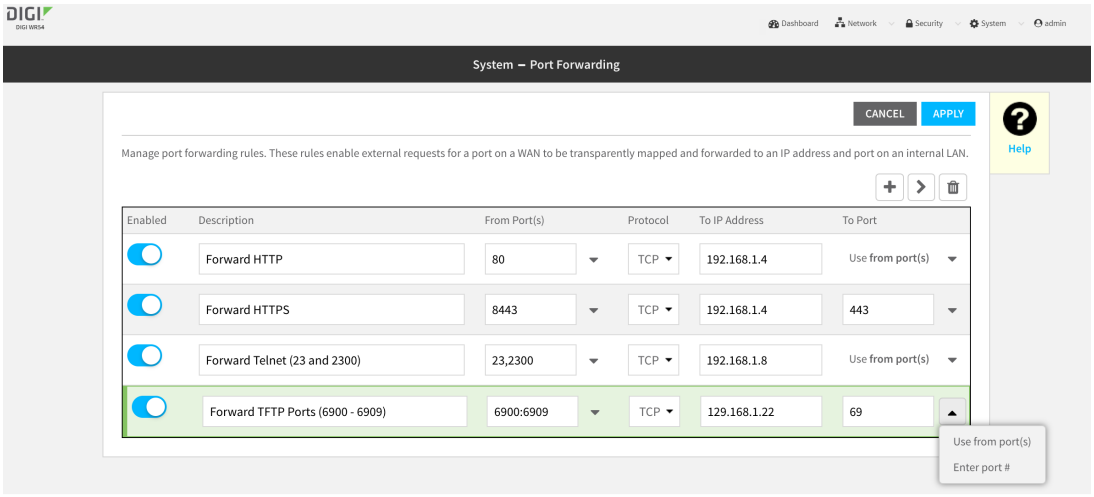
Add a port forwarding rule

Web

To add one or more port forwarding rules:

1. On the menu, click **Network > Services > Port Forwarding**. The **Port Forwarding** page appears.
2. Click ✚ (Add Rule) to create a new rule. See Port forwarding page for field descriptions. For a port forwarding rule to be applied, you must configure **From Port** and **To IP Address**, and set the rule to **Enabled**. Incomplete and incorrect port forwarding rules are not applied.
3. When you have finished adding rules, click **Apply**.

Here's a sample of port forwarding rules:



Command line

To add a port forwarding rule, use the port-forward command.

For a port forwarding rule to be applied, you must configure **port** and **to-ip-address**, and set the **state** of the rule to **on** (the default state). Incomplete and incorrect port forwarding rules are not applied.

For example:

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```
digi.router> port-forward 4 port 80
digi.router> port-forward 4 to-ip-address 192.168.47.1
digi.router> port-forward 4 state on
digi.router> save config
```

Delete a port forwarding rule

Web

To delete one or more port forwarding rules:

1. On the menu, click **Network > Services > Port Forwarding**. The **Port Forwarding** page appears.
2. Select the rule you want to remove, and click 🗑.
3. Click **Apply**.

Command line

You cannot delete a port forwarding rule using the command line, but you can disable a port forwarding rule using the port-forward command.

For example:

```
digi.router> port-forward 4 state off
digi.router> save config
```

Enable or disable a port forwarding rule

Web

To enable or disable a port forwarding rule:

1. On the menu, click **Network > Services > Port Forwarding**. The **Port Forwarding** page appears.
2. For each rule, use the slider on the **Enabled** field to enable or disable the rule as needed.
3. Click **Apply**.

Command line

To enable or disable a port forwarding rule, use the port-forward state command.

For example, to enable port forwarding rule 4:

```
digi.router> port-forward 4 state on
digi.router> save config
```

To disable port forwarding rule 4:

```
digi.router> port-forward 4 state off
digi.router> save config
```


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Show port forwarding rules

Web

On the menu, click **Network > Services > Port Forwarding**. The **Port Forwarding** page appears. See Port forwarding page for field descriptions.

Command line

To show port forwarding rules, use the show port-forward command.

For example:

```
digi.router> show port-forward
```

Using an SSH server

Digi WR devices have a Secure Shell (SSH) server for managing the device through the command-line interface over a SSH connection. Only the SSHv2 protocol is supported; earlier versions of SSH protocol are no longer considered secure.

Configure a Secure Shell (SSH) server

Command line

1. Enable the SSH server.

   ```
   digi.router> ssh state on
   ```

2. Optional: Configure the port number for the SSH server.

   ```
   digi.router> ssh port 50684
   ```

3. Save the configuration.

   ```
   digi.router> save config
   ```

Use SSH to connect to the command-line interface

You can make SSH connections using utilities such as PuTTY, TeraTerm, or the Linux **ssh** command.

Command line

The following example shows how to use the Linux **ssh** command to connect to IP address **192.168.1.1** for the first time using the **admin** user account.

```
$ ssh admin@192.168.1.1
The authenticity of host '192.168.1.1 (192.168.1.1)' can't be established.
RSA key fingerprint is 2c:db:01:65:2f:bb:a3:4f:c0:5e:dd:2d:e7:9f:7d:01.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.1.1' (RSA) to the list of known hosts.
Password: **********
```


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```
Welcome admin
Access Level: super
Timeout     : 180 seconds
digi.router>
```

Terminate an SSH connection

Command line

To terminate an SSH connection:

- Exit the command-line interface using the exit command.

Using 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 a more sophisticated lock. A public key configured on the 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 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 (Rivest–Shamir–Adleman) 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
- SSH key type

Optional configuration items

- If you want to use the configured user via the serial or web UI interfaces, you must configure a password for the user.
- If you want to access the device using SSH over a WAN interface, you must allow SSH access for each WAN interface.

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Command line

1. Configure a user. For example:

```
digi.router> user 2 name joeuser
```

2. Configure the SSH public key for the user. Because the SSH public key is a long character string, cut and paste the key to avoid input errors. For example:

```
digi.router> user 2 ssh-key AAAAB3NzaC1y... T3rbBVb
```

3. Configure the SSH key type for the user. For example:

```
digi.router> ssh 1 ssh-key-type ssh-rsa
```

4. (Optional) Configure a password for the user. For example:

```
digi.router> user 2 password omnivers1031
```

5. (Optional) Allow SSH access over the WAN interfaces. For example:

```
digi.router> wan 1 allow-ssh-access on
```

6. Save the configuration.

```
digi.router> save config
```

Using SSH with certificate authentication

Rather than using passwords or SSH keys, you can use SSH certificates to authenticate users connecting via SSH, SFTP, or SCP.

SSH certificates provide security and scalability:

- **Security:** In addition to the innate security of using signed certificates for authentication, certificates allows you to restrict access to designated time period as needed.
- **Scalability:** Multiple user keys can be signed by one Certificate Authority (CA) so multiple users can log into the device without any additional configuration.

SSH supports both user and host keys. For this feature, Digi WR devices use SSH user keys.

A Certificate Authority (CA) public key is configured on the device. The CA private key is used to sign individual user public SSH keys which are then used to authenticate the user with the device.

Required configuration items

- Name of the user
- SSH CA key
- SSH CA key type

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Optional configuration items

- If you want the configured user to access the device via the serial or web interfaces, you must configure a password for the user.
- If you want to allow access to the device using SSH over a WAN interface, you must configure SSH access for each WAN interface.

Command line

1. Configure a user. For example:

```
digi.router> user 2 name joeuser
```

2. (Optional) Configure a password for the user. For example:

```
digi.router> user 2 password omnivers1031
```

3. (Optional) Allow SSH access over WAN interfaces. For example:

```
digi.router> wan 1 allow-ssh-access on
```

4. Configure the SSH certificate authority (CA) public key. The CA public key is very long and should be cut and pasted to avoid an input error. For example:

```
digi.router> ssh 1 ca-key AAAAB3NzaC1y...yjpY4HJ
```

5. Configure the SSH CA key type. For example:

```
digi.router> ssh 1 ca-key-type ssh-rsa
```

6. Save the configuration.

```
digi.router> save config
```


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Example: Use an SSL certificate authentication

This example gives the steps to set up a user called John Smith to use SSL certificate authentication to log in to a Digi WR device from a Linux host. His Linux username is **jsmith** and the username on the device will be **john**.

This example uses **ssh-keygen** to create and sign keys and certificates and was created on an Ubuntu Linux host using OpenSSH 6.6.1p1.

Note This example creates a CA private and public RSA key pair. If you already have an SSH CA admin that can sign SSH keys, you do not need to generate your own CA key pair.

On the Linux host

1. Create a CA private and public RSA key pair in the **.ssh** directory. You will be prompted for a passphrase. To prevent unauthorized use of the CA key, Digi recommends you configure a passphrase for the key.

```
jsmith@ubuntu:~$ ssh-keygen -t rsa -f ~/.ssh/ca_user_key
Generating public/private rsa key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in .ssh/ca_user_key.
Your public key has been saved in .ssh/ca_user_key.pub.
The key fingerprint is:
2048 47:f0:5f:62:0f:c2:3f:d3:89:a7:65:8d:f3:58:74:49  jsmith@ubuntu (RSA)
The key's randomart image is:
+--[ RSA 2048]----+
|         .      E |
|          +    . .|
|           = + ..o|
|          . = B =.|
|         S . * X o|
|          .   B = |
|             . . .|
|                  |
|                  |
+------------------+
jsmith@ubuntu:~$
```

Note If you already have an SSH CA admin that can sign SSH keys, then you do not need to generate your own CA key pair. Instead, the SSH user keys should be signed by the SSH CA administrator.

2. Using the CA private key, sign John's public user key, **id_rsa.pub**, which is usually auto-generated in the **.ssh** directory. This generates a certificate file called **id_rsa-cert.pub**. You must pass the device username to the **ssh-keygen** tool using the **–n <principals>** option.

```
jsmith@ubuntu:~$ ssh-keygen -s ca_user_key -I jsmith -n john -V +52w .ssh/id_rsa.pub
Enter passphrase:
Signed user key .ssh/id_rsa-cert.pub: id "jsmith" serial 0 for john valid from 2018-03-19T14:41:00 to
2019-03-18T14:42:20
jsmith@ubuntu:~$
```

Note If necessary, a user private and public key pair can be generated using the following

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command:

```
ssh-keygen -t rsa -f ~/.ssh/id_rsa
```

3. Display the CA public key.

```
jsmith@ubuntu:~$ ls .ssh/
ca_user_key  ca_user_key.pub  id_rsa  id_rsa-cert.pub  id_rsa.pub
jsmith@ubuntu:~$
jsmith@ubuntu:~$ cat .ssh/ca_user_key.pub
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQC1f9czThv8PbVimiNHkv9xTFCC2As3h1/RYSh68J3dGg274mLr6VR6FhauAQhWEa4VmLJDo2Htq
AnTLnzTkMYKupKNCLxacmzLL6BwZS9nVBs5QO49TfLQXRdqfeGDaXxwat2qlt+YNen+eRVuNnT48YbMO+0FPdHZI3fTcZOoXHAH9zLhmW
H1kXUEZoFE8PVFKy/oA7yo9Fu7GsdrAhzr1YFuQthC5SyTDn2GV5B+Kj7vTtP8deT37JBIC1LK9psIpxJ8I1Ed9BQtqQ7+jeIvnzHW35W
5NxC8eBpCechM3F/+HCzXBYSuPxL2sjxC5ou71lJ4iip2Gl7zPyjpY4HJ jsmith@ubuntu
jsmith@ubuntu:~$
```

On the WR routers device

- Configure the device with the user and CA key information.

```
digi.router> user 2 name john
digi.router> ssh 1 ca-key AAAAB3NzaC1y...yjpY4HJ
digi.router> ssh 1 ca-key-type ssh-rsa
digi.router> save config
```

Log in with SSH from the Linux host

- Log into the device using the ssh command.

```
jsmith@ubuntu:~$ ssh john@192.168.1.1

Welcome john
Access Level: super
Timeout     : 300 seconds
digi.router>
```


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Example: Use an SSL certificate authentication with shared account

This example gives the steps to set up two users to use SSH certificates to log in to a shared admin account on the Digi WR device.

The example sets up two users: **Alice** and **Bob**. Both users will log in to the device using the shared **it-admin** account. The example assumes there is an SSH CA admin available that controls the SSH CA private key and can sign the public keys.

The method demonstrated in this example can be extended to support any number of users. The CA admin can also sign the individual user public keys with different validity periods. For example, one user can be given access for 2 weeks and another user can be given access for a year.

1. Alice gives the SSH CA admin her public SSH key (usually **~/.ssh/id_rsa.pub**).
2. The SSH CA admin signs Alice's SSH public key using the CA private key, using the name **it-admin** as the principal (ssh-keygen -n option) in the key signing.
3. The SSH CA admin gives the signed public key file (for example, **id_rsa-cert.pub**).
4. Alice stores the signed public key file on her host (usually in the **.ssh directory**).
5. Repeat steps 1—4 for Bob's SSH public key.
6. The SSH CA public key is obtained from the SSH CA admin.
7. On the device, configure the following:

```
digi.router> user 2 name it-admin
digi.router> ssh 1 ca-key AAAAB3NzaC1y...yjpY4HJ
digi.router> ssh 1 ca-key-type ssh-rsa
digi.router> save config
```

8. Alice and Bob should now be able to log in to the device using the **it-admin** account and SSH certificate authentication.
9. As Alice and Bob are using a shared account, the event log only logs the fact the user **it-admin** has logged in. However, the system log does display the ID of the user's public key so it is possible to identify who logged in.

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Iperf3 server

Your Digi 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 Digi WR implementation of Iperf3 supports testing with both TCP and UDP.

Required configuration items

- Enable the Iperf3 server on the Digi device.
- An Iperf3 client installed on a remote host. Iperf3 software can be downloaded at https://iperf.fr/iperf-download.php.

Additional configuration Items

- The port that the Digi device's Iperf3 server will use to listen for incoming connections. The default port is 5102.

Enable the Iperf3 server

This functionality is not available from the Web UI.

Command line

1. Enable the Iperf3 server:

```
digi-router> perf-server state on
digi-router>
```

When the Iperf3 server is enabled, the Digi device will automatically configure its firewall rules to allow incoming connections on the configured listening port.

2. (Optional) Set the listening port that the Iperf3 server will use for incoming connections. The default port is 5102.

```
digi-router> perf-server port port-number
digi-router>
```


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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 Digi device. For example:

```
$ iperf3 -c 192.168.1.1
Connecting to host 192.168.1.1, 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  26.7 MBytes   224 Mbits/sec    8   2.68 MBytes
[  4]   1.00-2.00   sec  28.4 MBytes   238 Mbits/sec   29   1.39 MBytes
[  4]   2.00-3.00   sec  29.8 MBytes   250 Mbits/sec    0   1.46 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   1.60 MBytes
[  4]   7.00-8.00   sec  33.7 MBytes   282 Mbits/sec    0   1.60 MBytes
[  4]   8.00-9.00   sec  33.5 MBytes   281 Mbits/sec    0   1.60 MBytes
[  4]   9.00-10.00  sec  33.2 MBytes   279 Mbits/sec    0   1.60 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.
$
```


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Enable the Wi-Fi scanning service

The Wi-Fi scanning service 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.

The Wi-Fi scanning service is supported on Digi WR54 and WR64 models.

Required configuration

- Enable the Wi-Fi scanning service.
- A remote host to view the output of the service.

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.

This functionality is not available from the Web UI.

Command line

1. Enable the Wi-Fi scanning service:
   - To enable a single Wi-Fi scanning service instance:

     ```
     digi.router> wifi-scanner 1 state on
     digi.router>
     ```

   - For dual-Wi-Fi versions of Digi WR devices, there are two instances of service, one for each Wi-Fi module:

     ```
     digi.router> wifi-scanner 1 state on
     digi.router> wifi-scanner 2 state on
     digi.router>
     ```

2. (Optional) Set the port that will be used by this instance of the service. The default is **3101**.

   ```
   digi.router> wifi-scanner 1 port number
   digi.router>
   ```

3. (Optional) Set the Wi-Fi channels that will be scanned by this instance of the service. The allowed value is a comma-separated list of channel numbers, or **all** to scan all channels. The default is **all**.

   ```
   digi.router> wifi-scanner 1 channels list
   digi.router>
   ```

4. (Optional) Set the frequency, in milliseconds, that the Wi-Fi scanning service will hop from one channel to the next during scanning. The default is **150**.

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```
digi.router> wifi-scanner 1 hop-frequency number
digi.router>
```

5. (Optional) Set the number of seconds that the service waits before updating its output. The default is 5 seconds.

```
digi.router> wifi-scanner 1 update-interval number
digi.router>
```

6. (Optional) To configure the Wi-Fi module to use only its primary antenna, and not the secondary antenna:

```
digi.router> wifi-scanner 1 secondary-antenna off
```

Note This functionality is supported on the WR54 model only. Normally you should not turn off support for the secondary antenna.

7. Connect a remote host to the device by using the scanner's port. For example, to view the output of the scanner, use SSH from a remote host to connect to the device:

```
$ ssh user@device-ip -p 3101
Password:
```

After logging into your device, it will display the output from the Wi-Fi scanning service in your shell. For example:

```
WR54|Hopkins, MN|1561754337|D0-81-C0-D5-E3-B0|D0-81-C0-D5-E3-B0|48|<hidden-
ssid>| -1
WR54|Hopkins, MN|1561754369|27-96-16-79-C9-0C|27-96-16-79-C9-0C|48|WR54-
000488-1|-76
WR54|Hopkins, MN|1561754304|DA-3C-0E-CA-6F-78||48||-78
WR54|Hopkins, MN|1561754292|85-94-36-14-CF-34||48||-84
```

The output from the Wi-Fi scanning service 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 scanning service. 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.

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Field	Description
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).

Enable the Bluetooth scanning service

The Bluetooth scanning service allows you to configure your device to detect BLE-enabled devices that are nearby, and then opens an SSH port that remote hosts can access to read basic information about those devices.

The Bluetooth scanning service is supported on Digi WR54 and WR64 models.

Required configuration

- Enable the Bluetooth scanning service.
- A remote host to view the output of the service.

Additional configuration

- The SSH port used by the Bluetooth scanner for reporting information to the remote host.
- The number of seconds between scans for Bluetooth enabled devices.

This functionality is not available from the Web UI.

Command line

1. Enable the Bluetooth scanning service.

```
digi.router> bluetooth-scanner state on
digi.router>
```

2. (Optional) Set the port that the Bluetooth scanning service will use. The default is **3102**.

```
digi.router> bluetooth-scanner port number
digi.router>
```

3. (Optional) Set the number of seconds between scans. The default is **15** seconds.

```
digi.router> bluetooth-scanner scan-rate number
digi.router>
```

4. Connect a remote host to the device by using the scanner's port. For example, to view the output of the scanner, use SSH from a remote host to connect to the device:

```
$ ssh user@device-ip -p 3102
Password:
```


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After logging into your device, it will display the output from the Bluetooth scanning service in your shell. For example:

```
WR54|Hopkins, MN|2019-06-28 17:08:57|38-97-31-8C-EF-7C|Unknown
Manufacturer|VOID|VOID|-62
WR54|Hopkins, MN|2019-06-28 17:08:58|26-20-A5-7B-0F-61|Apple,
Inc.|VOID|VOID|-80
WR54|Hopkins, MN|2019-06-28 17:08:59|EF-C8-3E-D3-65-04|Digi International
Inc (R)|VOID|VOID|-55
WR54|Hopkins, MN|2019-06-28 17:08:59|B6-21-0B-23-AE-FC|Apple,
Inc.|VOID|VOID|-75
```

The output from the Bluetooth scanning service 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).

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Remote Manager

Digi Remote Manager is a hosted remote configuration and management system that allows you to remotely manage a large number of devices. Digi Remote Manager has a web-based interface from which you can perform device operations, such as viewing and changing device configurations and updating the firmware.

Digi Remote Manager also provide a data storage facility.

Using Digi Remote Manager requires setting up a Digi Remote Manager account. To set up a Digi Remote Manager account and learn more about Digi Remote Manager, go to www.digi.com/products/cloud/digi-remote-manager.

To learn more about Digi Remote Manager features and functions, see the Digi Remote Manager User Guide.

Configure Digi Remote Manager

Digi Remote Manager is enabled by default. Once the device has a WAN connection, it automatically connects to Digi Remote Manager.

Additional configuration options

These additional configuration settings are not typically configured, but you can set them as needed:

- You can disable the Digi Remote Manager connection if it is not required.
- You can change the reconnection timer. By default, the device attempts to connect to Digi Remote Manager every **30** seconds.
- The non-cellular keepalive timeout. By default, the device will send a keepalive message to Digi Remote Manager and expect a keepalive message every **60** seconds when using a non-cellular WAN interface. You can change the non-cellular keepalive timeout value depending on your WAN characteristics.
- The cellular keepalive timeout. By default, the device will send a keepalive message to Digi Remote Manager and expect a keepalive message every **290** seconds when using a cellular WAN interface. You can change the cellular keepalive timeout length depending on your cellular interface characteristics.
- The keepalive count before the Remote Manager connection is dropped. By default, the device disconnects and attempts to reconnect to Remote Manager after **3** missed keepalive messages.

Web

Register device in Digi Remote Manager

- **If you have already registered your device**:
  If you have registered your device with Digi Remote Manager when you went through the Getting Started Wizard:
  1. Enter your credentials to log in to your Remote Manager account and click **Log In**.
  2. A message appears showing the group into which your device has been registered in the **Remote Manager Status** section of the Digi Remote Manager page.

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- **If you have not already registered the device**:
  1. On the menu, click **System > Administration > Remote Manager**. The **Digi Remote Manager** page appears.
  2. Enter your credentials to log in to your Digi Remote Manager account and click **Log In**.
  3. Select a group for you device in your Digi Remote Manager account, then click **Register Device**.
  4. If the registration succeeds, a message appears indicating that your device has been registered in your Digi Remote Manager account; for example:

```
This device is registered in your Digi Remote Manager account
Group location: Group C
```

Optional: Modify Digi Remote Manager settings

1. On the menu, click **System > Administration > Remote Manager**.
2. Enter the settings.
   - Enable or disable the connection to Digi Remote Manager.
   - **Ethernet Keepalive**: The interval between sending keepalives to Digi Remote Manager over Ethernet interfaces.
   - **Cellular Keepalive**: The interval between sending keepalives to Digi Remote Manager over cellular interfaces.
   - **Reconnect Delay**: The reconnection timer for reconnecting to Digi Remote Manager after a disconnect. By default, the device attempts to connect to Digi Remote Manager every **30** seconds.
3. Click **Apply**.

Command line

- Disable the Digi Remote Manager connection.

```
digi.router> cloud state off
digi.router> save config
```

- Set the reconnect timer. For example, to set it to **60** seconds:

```
digi.router> cloud reconnect 60
digi.router> save config
```

- Set the non-cellular keepalive time. For example , to set it to **180** seconds:

```
digi.router> cloud keepalive 180
digi.router> save config
```

- Set the cellular keepalive time. For example, to set it to **600** seconds:

```
digi.router> cloud keepalive-cellular 600
digi.router> save config
```


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- Set the keepalive count. For example, to set it to **5**:

```
digi.router> cloud keepalive-count 5
digi.router> save config
```

Show Digi Remote Manager connection status

Web

On the menu, click **System > Administration > Remote Manager**.

The **Digi Remote Manager** page shows whether your device is connected to Digi Remote Manager, as well as device connection statistics.

Command line

To show the status of the Digi Remote Manager connection, use the show cloud command.

In the show cloud command output, the device ID is the unique identifier for the device on the Digi Remote Manager.

For example:

```
digi.router> show cloud

 Device Cloud Status
 -------------------

 Status    : Connected
 Server    : my.devicecloud.com
 Device ID : 00000000-00000000-0040FFFF-FF0F4594

 Uptime    : 1 Minute, 9 Seconds

            Received                    Sent
            --------                    ----
 Packets          13                      14
 Bytes            37                     218

digi.router>
```


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Enable health reporting and set sample interval

You can enable the gathering of health metrics information for your device. Before enabling health reporting, make sure you first register your device with Digi Remote Manager. See Configure Digi Remote Manager for instructions about registering your device with Digi Remote Manager.

Note To avoid a situation where several devices are uploading health metrics information to Digi Remote Manager at the same time, Digi WR devices include a two minute randomization for uploading metrics. For example, if **Health Sample Interval** is set to five minutes, the metrics will be uploaded to Digi Remote Manager at a random time between five and seven minutes.

Web

1. From the menu, click **System > Remote Manager**.
2. Click **Open Remote Manager**.
3. Go to **Configuration > Remote Manager** page.
4. For the **Enable Health Reporting** option, select **On**.
5. For the **Health Sample Interval**, select the interval, in minutes, for sampling health data.

   See The health sample interval and health metrics reported by Digi Remote Manager for further information about the **Health Sample Interval**.
6. For **Health Rollup Period**, select the amount of time, in minutes, that health metrics information is aggregated before being reported to Digi Remote Manager. Generally, the **Health Sample Interval** and **Health Rollup Period** should be set to the same value.
7. Click **Save** to save the configuration.

Command line

1. Turn on health reporting for Digi Remote Manager:

   ```
   digi.router> cloud health on
   ```
2. Set the interval in minutes for sampling health data. Allowed values are 1, 5, 15, 30, or 60 minutes, and the default is **60**.

   ```
   digi.router> cloud health-sample-interval 30
   ```

   See The health sample interval and health metrics reported by Digi Remote Manager for further information about the **health sample interval**.
3. Set amount of time, in minutes, that health metrics information is aggregated before being reported to Digi Remote Manager. Generally, the health-sample-interval and health-rollup-period should be set to the same value.

   ```
   digi.router> cloud health-rollup-period 30
   ```
4. Save the configuration.

   ```
   digi.router> save config
   ```


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The health sample interval and health metrics reported by Digi Remote Manager

The **health sample interval** sets a regular sample period that the device uses to report health metrics to the Digi Remote Manager. This allows you to create thresholds that fire alarms based on the sample period.

For example, with the **uptime** health metric, you can configure the Digi Remote Manager to issue errors and warnings based on the amount of time during the sample interval period that the device has been offline. By default, the **health sample interval** is set to 60 minutes on the device, and the Digi Remote Manager's **uptime** metric is configured to:

- Trigger an warning alarm if the device is down for 100 seconds during the 60 minute sample period.
- Trigger an error alarm if the device is down for ten minutes during the 60 minute sample period.

You can edit the **uptime** metric in the Digi Remote Manager to change these values, so that, for example, a Digi Remote Manager warning is fired if the device is down for as little as one second during the sample interval period.

One result of this behavior is that the device uptime, as reported in the Digi Remote Manager, will never exceed the **health sample interval**, and is therefore not a mechanism to determine the total device uptime. Instead, do one of the following to determine the total device uptime:

- Open the device's WebUI, either from within the Digi Remote Manager or locally on the device.
  - The device uptime is listed on the device's dashboard in the WebUI in the **Device** pane.
  - Alternatively, you can select **System** > **Device Preferences**, and the device uptime is listed in the **Device Overview** section.
- Use the show system command at device's command line:

```
digi.router> show system

 Model              : WR54
 Part Number        : WR54-A146
 Serial Number      : WR54-001116

 Hardware Version   : 50001987-01 A
 Using Bank         : 1
 Firmware Version   : 4.6.0.40 03/19/2019 18:47:59
 Bootloader Version: 1.1.3 (Dec 20 2018 - 00:34:45)
 Using Config File : config.da0

 Uptime             : 19 Days, 22 Hours, 43 Minutes, 34 Seconds
...

digi router>
```


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Using 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.

Supported SNMP versions

Digi WR devices support the SNMP versions **SNMPv1**, **SNMPv2c**, and **SNMPv3**.

The device supports up to **10** SNMPv1/SNMPv2c communities. Each community can have read-only or read-write access.

The device supports up to **10** SNMPv3 users. You can configure each user's access level as read-only or read-write, and configure security settings on an individual-user basis.

Supported Management Information Bases (MIBs)

Digi WR devices support the following SNMP MIBs for managing the entities in a communication network:

- Standard SNMP MIBs
- An enterprise-specific MIB for the LR54, named **transport-lr54.mib**. This MIB is available for download from Digi Support.

Note You cannot use SNMPv1 with the Enterprise MIB because of the **COUNTER64** types used in the Enterprise MIB.

SNMP Security

By default, Digi WR devices automatically block SNMP packets from being received over WAN and LAN interfaces. As a result, if you want a device to receive SNMP packets, you must create an IP filter that will allow the device to receive the packets. When creating the IP filter, you should configure a source IP address by using the **ip-filter src-ip-address** command, which restricts incoming SNMP requests to that particular host.

With SNMPv3, SNMP packets are authenticated and encrypted. Therefore, when using SNMP over a WAN interface, you should use SNMPv3.

Configure SNMPv1 and SNMPv2

Command line

1. All SNMP versions are disabled by default. To enable support for SNMPv1 or SNMPv2c, enter:

```
digi.router> snmp v1 on
```

OR

```
digi.router> snmp v2c on
```


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2. If using SNMPv1/v2c communities, configure a name for each community. For example:

```
digi.router> snmp-community 1 community public
```

3. The community access level defaults to **read-only**. To set the access level to **read-write**, enter:

```
digi.router> snmp-community 1 access read-write
```

4. Configure an IP filter that allows SNMP traffic to be received by the device. For example, to allow SNMP packets from IP host 192.168.1.200 over LAN 1, the commands are as follows:

```
digi.router> ip-filter 1 description "Allow SNMP from 192.168.1.200"
digi.router> ip-filter 1 dst-ip-port 161
digi.router> ip-filter 1 src lan1
digi.router> ip-filter 1 src-ip-address 192.168.1.200
digi.router> ip-filter 1 state on
```

5. Save the configuration.

```
digi.router> save configuration
```

Configure SNMPv3

Command line

1. All SNMP versions are disabled by default. To enable support for SNMPv3, enter:

```
digi.router> snmp v3 on
```

2. For each SNMPv3 user, give the user a name of up to **32** characters:

```
digi.router> snmp-user 1 user joe
```

3. Set the authentication type for the SNMPv3 user (**none**, **md5**, or **sha1**). To use privacy (DES or AES), the authentication type be either **md5** or **sha1**.

```
digi.router> snmp-user 1 authentication sha1
```

4. Set the authentication password for the SNMPv3 user. The password length can be between **8** and **64** characters.

```
digi.router> snmp-user 1 authentication-password authpassword
```

5. Set the privacy type for the SNMPv3 user (**none**, **aes**, or **des**):

```
digi.router> snmp-user 1 privacy des
```

6. Set the privacy password for the SNMPv3 user. The password length can be between **8** and **64** characters.

```
digi.router> snmp-user 1 privacy-password privpassword
```


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7. Configure the access level for the SNMPv3 user.

```
digi.router> snmp-user 1 access read-write
```

8. Configure an IP filter that allows SNMP traffic to be received device. For example, to allow SNMP packets from IP host 192.168.1.200 over any WAN interface, the commands are as follows:

```
digi.router> ip-filter 1 description "Allow SNMP from 192.168.1.200"
digi.router> ip-filter 1 dst-ip-port 161
digi.router> ip-filter 1 src lan1
digi.router> ip-filter 1 src-ip-address 192.168.1.200
digi.router> ip-filter 1 state on
```

9. Save the configuration.

```
digi.router> save configuration
```


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Routing

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IP routing

The Digi WR 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.

Configure general IP settings

Configuring general IP settings is one of the building blocks of setting up IP routing.

Optional configuration items

- The IP hostname. This hostname identifies the Digi WR device on IP networks. It is an unqualified hostname. The default setting for the device is **<model>-%s** which expands to serial number for the device.
- The administrative distance settings for connected and static routes. Administrative distance settings rank the type of routes, from the most to least preferred. When there are two or more routes to the same destination and mask, the route with the lowest metric is used. By default, routes to connected networks are preferred, with static routes being next. The administrative distance for each route type is added to the route's metric when it is added to the routing table. Configuring the administrative distance of a particular route type can alter the order of use for the routes. The two administrative distance settings are:
  - Administrative distance for connected network routes. The default value is **0**.
  - Administrative distance for static routes. The default value is **1**.

Web

In the web interface, general IP settings are configured as part of configuring a LAN or WAN. See Configure a LAN and Configure a Wide Area Network (WAN).

Command line

1. Set the hostname.

```
digi.router> ip hostname WR64-NewYork
```

2. Set the administrative distance for connected routes.

```
digi.router> ip admin-conn 3
```


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3. Set the administrative distance for static routes.

```
digi.router> ip admin-static 5
```

4. Save the configuration.

```
digi.router> save config
```

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. Digi WR devices support up to **32** static routes.

Required configuration items

- The destination network and mask.
- The gateway IP address for routes using LAN and WAN Ethernet interfaces. The gateway IP address should be on the same subnet as the IP address of the LAN or WAN Ethernet interface in use.
- The interface name for routes using cellular interfaces.

Optional configuration items

- The metric for the route. The metric defines the order in which routes should be used if there are two routes to the same destination. In such a case, the smaller metric is used.

Command line

Use the route command to configure IP routes.

Example 1

To configure a static route to the **192.168.47.0/24** network using the **lan1** interface, which has an IP address of **192.168.1.1** and a gateway at IP address of **192.168.1.254**:

1. Set the destination network and mask.

```
digi.router> route 1 destination 192.168.47.0
digi.router> route 1 mask 255.255.255.0
```

2. Set the gateway IP address.

```
digi.router> route 1 gateway 192.168.1.254
```

3. Save the configuration.

```
digi.router> save config
```


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Example 2

To configure a static route to the **44.1.0.0/16** network using the **cellular1** interface:

1. Set the destination network and mask.

```
digi.router> route 4 destination 44.1.0.0
digi.router> route 4 mask 255.255.0.0
```

2. Set the interface.

```
digi.router> route 4 interface cellular1
```

3. Optional: Set the metric.

```
digi.router> route 4 metric 5
```

4. Save the configuration.

```
digi.router> save config
```

Once the static route is configured, it should appear in the IPv4 routing table, which you can display using the show route command.

Show the IPv4 routing table

Command line

To display the IPv4 routing table, use the show route command.

```
digi.router> show route

 Destination         Gateway         Metric    Protocol       Idx       Interface Status
 ------------------------------------------------------------------------------------------
 10.1.2.0/24         192.168.1.254   1         Static         1         lan1      UP
 192.168.1.0/24      0.0.0.0         0         Connected                lan1      UP
 default             0.0.0.0         1         Connected                eth1      UP
 default             0.0.0.0         2         Connected                cellular1 UP

digi.router>
```

Delete a static route

Command line

To remove a static route from the routing table, clear the destination network configuration.

To revert the settings for the route destination, enter the route command, specifying the interface number, the destination parameter, and the exclamation mark (**!**) character. For example:

```
digi.router> route 1 destination !
digi.router> save config
```


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Routing rules

Routing rules allows you to control which WAN interface is used for specific traffic from a LAN or Hotspot interface.

For example, you can configure the device so that one LAN's traffic is routed out of one WAN interface, and another LAN is routed out of another WAN interface. Or, you can route all traffic for a particular protocol through a specific WAN interface.

The order of the routing rules is important. Routing rules are processed sequentially; as a result, if a packet matches an earlier rule, it will be routed out of that rule's WAN interface. It will not be processed by any subsequent rules.

Configure a routing rule

Required configuration items

- Enable the routing rule. Routing rules are disabled by default.
- The packet matching parameters. It can be any combination of the following:
  - Source LAN or Hotspot interface.
  - Source IP address. This can be a single IPv4/IPv6 address or an IPv4/IPv6 network.
  - Source port. This is only used if the protocol is set to **any**, **tcp** or **udp**.
  - Destination IP address. This can be a single IPv4/IPv6 address or an IPv4/IPv6 network.
  - Destination port. This is only used if protocol is set to **any**, **tcp** or **udp**.
  - Protocol. This can be **any**, **tcp**, **udp** or **icmp**.
- The WAN interface on which the matching traffic will be sent.

Additional configuration items

- A description for the routing rule.

Example: Route LAN1 traffic over WAN1, and LAN2 traffic over WAN2

This example uses the routing-rule command to route all traffic from LAN1 out of WAN1, and all traffic from LAN2 out of WAN1.

This procedure is supported on the command line only.

Command line

1. Configure the routing rule for LAN1:
   a. Set the source to LAN1:

```
digi.router> routing-rule 1 src lan1
```

   b. Set the wan to WAN1:

```
digi.router> routing-rule 1 wan 1
```

   c. Enable the routing rule:

```
digi.router> routing-rule 1 state on
```


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2. Configure the routing rule for LAN2:
   a. Set the source to LAN2:

```
digi.router> routing-rule 2 src lan2
```

   b. Set the wan to WAN2:

```
digi.router> routing-rule 2 wan 2
```

   c. Enable the routing rule:

```
digi.router> routing-rule 2 state on
```

3. Save the configuration:

```
digi.router> save config
```

Example: Route all traffic to a specific network through a specific WAN

This example uses the routing-rule to route all traffic to the 202.98.2.0/24 through WAN3.

Web

Currently not supported.

Command line

1. Configure the destination network:

```
digi.router> routing-rule 1 dst-ip-address 202.98.2.0/24
```

2. Set wan to WAN3:

```
digi.router> routing-rule 1 wan 3
```

3. Enable the routing rule:

```
digi.router> routing-rule 2 state on
```

4. Save the configuration:

```
digi.router> save config
```


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Show routing rules

Web

Currently not supported.

Command line

The show routing-rule command displays the current routing rules configuration:

```
digi.router> show routing rule

 #   Oper Status   WAN   Description
 ------------------------------------
 1   Up            1     LAN 1 > WAN 1
 2   Up            2     LAN 2 > WAN 2

digi.router>
```

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 device with the hostname, service, and credentials obtained from a dynamic DNS provider, the device can automatically update the remote nameserver whenever your WAN or public IP address changes.

Digi WR devices support the following Dynamic DNS providers:

- DynDNS https://dyn.com/
- No-IP https://www.noip.com/
- DNS-O-Matic https://www.dnsomatic.com/
- ChangeIP https://www.changeip.com/

Configure dynamic DNS

This section describes how to cofigure dynamic DNS on a Digi WR device. For details on dynamic DNS, see Dynamic DNS

Required configuration items

- Enable Dynamic DNS
- Service: Provide the name of a Dynamic DNS provider (for example, dyndns, dnsomatic, noip, changeip).
- Username: Provide username to be used to authenticate with your Dynamic DNS provider.
- Password: Provide the password corresponding to the username provided above.
- Hostname: Provide the URL for your Dynamic DNS provider, which will be linked to your IP address.

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Additional configuration items

- IP monitoring, to determine which IP address to monitor for changes. If you set the **ip-monitoring** option to **wan**, the device monitors the IP address of WAN interfaces. If you set it to **public**, the device monitors the public-facing IP address, regardless of the IP address of the WAN interface.

Command line

1. Set the dynamic DNS service:

```
digi.router> dynamic-dns service dyndns
```

2. Set the username and password for the dynamic DNS service:

```
digi.router> dynamic-dns username yourusername
digi.router> dynamic-dns password yourpassword
```

3. Set the hostname to update when your IP address changes:

```
digi.router> dynamic-dns hostname your.dynamicdns.hostname
```

4. Optional: Set ip-monitoring type for dynamic DNS:

```
digi.router> dynamic-dns ip-monitoring public
```

5. Enable Dynamic DNS:

```
digi.router> dynamic-dns state on
```

6. Save the configuration.

```
digi.router> save config
```

Web filtering (OpenDNS)

Web filtering allows you to control access to services that can be accessed through the device.

It does this 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 routers 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.

Digi WR devices support Cisco Umbrella (formally known as OpenDNS). For more information, see https://umbrella.cisco.com.

Configure web filtering using Cisco Umbrella

This section describes how to configure the web filter on a Digi WR device using the Cisco Umbrella service.

To use Cisco Umbrella with your device, you must obtain an API token. For instructions on how to do this, see Cisco-Umbrella-Network-Device-Integrations.

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CAUTION! Due to recent changes in Cisco Umbrella, if you have a legacy token generated prior to December 7, 2017, you cannot use the token with a device. Regenerate a token from your Umbrella console.

Once you have completed your Cisco Umbrella configuration, you can verify that your setup is working by following the steps outlined in How-to-test-for-successful-OpenDNS-configuration.

Required configuration items

- Set web filter customer-specific token.
- Enable web filter.

 Command line

1. Set the web filter token:

```
digi.router> web-filter token your_client_token
```

2. Enable the web filter:

```
digi.router> web-filter state on
```

3. Save the configuration.

```
digi.router> save config
```

Clear device ID

If the device ID on your Digi WR device appears to be invalid, you can clear the device ID by using the clear **web-filter-id** command.

 Command line

Clear the web filter ID:

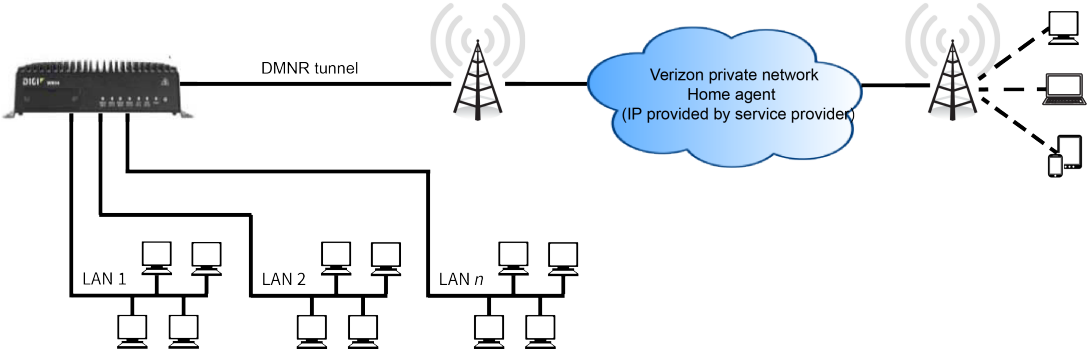
```
digi.router> clear web-filter-id
```


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Dynamic Mobile Network Routing (DMNR)

Dynamic Mobile Network Routing (DMNR) is a mobile networking technology available on Verizon Wireless Private Networks that provides access to one or more Local Area Networks (LANs) on your device. DMNR creates a tunnel between the home agent on the Verizon private network and the Digi WR device, isolating the connection from internet traffic and advertising the IP subnets of the LANs for remote access and device management.

DMNR support requires the use of Verizon SIM cards that have DMNR enabled.



This section contains the following information:

- Configure DMNR
- Show DMNR status

Configure DMNR

Web

1. On the menu bar:
   a. Click **Network**.
   b. In the **Services** section of the **Network** menu, select **DMNR**.

   The **DMNR** page is displayed.
2. Select **Enabled** to enable DMNR.
3. For **Home Agent**, type the IP address of the home agent that has been supplied to you by your service provider.
4. For **Networks to Route**, select the LAN or LANs that the Verizon private network will advertise.
5. (Optional) Expanded **Advanced** to change advanced options from their default settings.
   a. **Authorization Key**: Enter the key provided by your service provider. The default is **VzWNeMo**, which is the key for Verizon.
   b. **SPI**: The Security Parameter Index, which is used in the authentication extension when registering. Normally left at the default setting of **256** unless your service provider indicates a different value.

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c. **Home Network (Tunnel)**: This represents a non-routable ("dummy") IP address for the device. Normally left at the default setting of **1.2.3.4**.
d. **Lifetime**: Specifies the number of seconds until the authorization key expires. The default is **600**.
e. **MTU**: Specifies the Maximum Transmission Unit, in bytes. The default is **1476**.

   The default MTU size for LANs on the Digi WR device is 1500. The MTU size of the DMNR tunnel will be smaller, to take into account the required headers.
f. **Reconnect Time**: The number of seconds to wait before attempting an automatic reconnect.

6. Click **Apply**.

Command line

To configure DMNR, use the dmnr command. For example:

1. Set the IP address of the home agent. The home agent IP address is supplied to you by your service provider.

```
digi.router> dmnr home-agent 4.3.2.1
```

2. Set the LANs configured on the device that the Verizon private network will advertise.

```
digi.router> dmnr local-networks lan1, lan2
```

   Additional LANs can be included, separated with a comma.
3. Enable DMNR.

```
digi.router> dmnr state on
```

4. (Optional) The following settings can be changed, but are normally left at their default settings:
   a. Set the home network IP addres. This represents a non-routable ("dummy") IP address for the device. Normally left at the default setting of 1.2.3.4

```
digi.router> dmnr home-network ip-addr
```

   b. Set the authorization key. Normally left at the default of VzWNeMo.

```
digi.router> dmnr key value
```

   c. Set the number of seconds until the authorization key expires. The default is 600.

```
digi.router> dmnr lifetime value
```

   d. Set the MTU. The default MTU size for LANs on the device is 1500. The MTU size of the DMNR tunnel will be smaller, to take into account the required headers. Defaults to 1476.

```
digi.router> dmnr mtu value
```

   e. Set the number of seconds to wait before attempting an automatic reconnect. Default is 30.

```
digi.router> dmnr reconnect value
```


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f. Set the Security Parameter Index (SPI). Normally left at the default setting of **256**.

```
digi.router> dmnr spi value
```

5. Save the configuration.

```
digi.router> save config
```

Show DMNR status

Web

1. On the menu bar, click **Network**.
2. In the **Services** section of the **Network** menu, select **DMNR**.

The **DMNR** page appears. DMNR status appears in the **DMNR Status** pane.

Option	Description
Admin status	Shows the current administrative status: **Up** or **Down**.
Operational status	Shows the current operational status: **Up** or **Down**.
Registration status	Shows the current registration status: **Registered** or **Unregistered**.
Home agent	Shows the IP address for the Verizon home agent.
Care of address	Shows the current point of attachment IP address for DMNR.
Interface	Shows the interface for DMNR.
Lifetime (actual)	Shows the actual lifetime in seconds for the current DMNR authorization.
Networks	Shows the networks currently being advertised by DMNR.

Command line

To show DMNR status, use the show dmnr command. For example:

```
digi.router> show dmnr

DMNR Status
-----------

Admin Status          : Up
Operational Status    : Up
Registration Status   : Registered
Home Agent            : 4.3.2.1
Care of Address       : 10.251.193.245
Interface             : cellular1-sim1
Lifetime (actual)     : 570

       Local Network      Subnet              Status
       -------------      ------              -------
```


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```
       lan1              10.251.80.140/30     Registered
       lan2              10.251.80.128/30     Registered

digi.router>
```

Quality of Service (QoS)

Quality of Service (QoS) queues and filters allow you to identify and prioritize traffic, as well as restrict bandwidth for a given queue.

You can categorize and prioritize traffic using QoS queues. Traffic associated with lower-numbered queues is given higher priority than traffic associated with higher-numbered queues, although there are exceptions depending on how you have configured bandwidth restrictions for the queues.

Each queue has one or more QoS filters used to identify traffic associated with the queue. As traffic flows through the router destined for a QoS-enabled WAN, it is associated with a queue based on QoS filter criteria. Once traffic is associated with a queue, it is prioritized and delivered according to the configured queue parameters.

This section describes how to enable QoS on one or more configured WANs and configure QoS queues and filters.

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Configure QoS

Configuring QoS consists of the following:

- Enabling a configured WAN for QoS.
- Configuring from one to eight QoS queues using the eight tabs in the Queues panel. Queue 1 has the highest priority; queue 2 has second-highest priority, queue 3 has third-highest priority, and so on up to queue 8 which has the lowest priority.
- Configuring filters for each configured queue to force traffic to the queue. You can configure up to 32 filters.

Web

1. On the menu, click **Network > Services > QoS**. The **QoS** page appears.
2. Enable QoS on a configured WAN:
   a. In the WANs configuration panel, enable or disable one or more configured WANs. See Quality of Service (QoS) WANs page for field descriptions.
   b. Click **Apply**.
3. Create QoS queues:
   a. In the **Queues configuration** panel, configure from one to eight QoS queues. See Quality of Service (QoS) queues page for field descriptions.
   b. When you have finished configuring queues, click **Apply**.
4. Create filters for each configured queue:
   a. In the **Queues configuration** panel, scroll to the **Filters** section. See Quality of Service (QoS) queues page for field descriptions.
   b. Add one or more filters for each configured queue. You can configure a total of 32 filters for all queues.
   c. When you have finished configuring filters, click **Apply**.

Command line

- To enable QoS on a configured WAN, use the wan command. For example, to enable QoS on WAN 3 and set the bandwidth upstream to 8000 kbps:

```
digi.router> wan 3 qos on
digi.router> wan 3 bandwidth-upstream 8000
digi.router> save config
```

- To configure one or more QoS queues, use the qos-queue command. For example:

```
digi.router> qos-queue 1 description myhighqosqueue
digi.router> qos-queue 1 borrow-upstream on
digi.router> qos-queue 1 dscp-class be
digi.router> qos-queue 1 state on
```


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```
digi.router> save config
digi.router> qos-queue 2 description mymediumqosqueue
digi.router> qos-queue 2 borrow-upstream off
digi.router> qos-queue 2 state on
digi.router> save config
digi.router> qos-queue 3 description mylowqosqueue
digi.router> qos-queue 3 borrow-upstream off
digi.router> qos-queue 3 state on
digi.router> save config
```

- To configure filters for a configured QoS queue, use the qos-filter command. For example:

```
digi.router> qos-filter 1 queue 1
qos-queue 1:
digi.router> qos-queue

 qos-queue 1:
   bandwidth-upstream          2000
   borrow-upstream             on
   description                 VoIP Queue
   dscp-class                  do-not-set
   state                       on

 qos-queue 2:
   bandwidth-upstream          500
   borrow-upstream             on
   description                 Video Streaming
   dscp-class                  be
   state                       on

digi.router> qos-filter

 qos-filter 1:
   description                 VoIP traffic
   dscp                        ef
   dst-ip-address
   dst-ip-port                 0
   protocol                    any
   queue                       1
   src                         any-lan
   src-ip-address
   src-ip-port                 0
```


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```
  state                     on

qos-filter 2:
  description               YouTube traffic
  dscp                      cs0
  dst-ip-address
  dst-ip-port               0
  protocol                  any
  queue                     2
  src                       lan1
  src-ip-address
  src-ip-port               0
  state                     on

qos-filter 3:
  description               Netflix traffic
  dscp                      cs0,cs1,cs2,cs3,cs4
  dst-ip-address
  dst-ip-port               0
  protocol                  tcp,udp
  queue                     2
  src                       lan2
  src-ip-address            192.168.2.1
  src-ip-port               9000
  state                     on
```

Show QoS configuration and status

Web

On the menu, click **Network > Services > QoS**. The **QoS** page appears.

Command line

To show the current QoS configuration use the qos-queue command and the qos-filter command with no parameters. For example:

```
digi.router> qos-queue

digi.router> qos-filter
```


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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 devices can be configured as VRRP devices and assigned a priority. 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.

VRRP+

VRRP+ is is an extension to the VRRP standard that uses network probing to monitor connections through VRRP-enabled devices and can dynamically change the priority of the devices, including changing devices from master to backup, and from backup to master, even if the device has not failed. For example, if a host becomes unreachable on the far end of a network link, then the physical default gateway can be changed by adjusting the VRRP priority of the device connected to the failing link. This provides failover capabilities based on the status of connections behind the router, in addition to the basic VRRP device failover. For Digi WR devices, VRRP+ can be configured to probe a specified IP address by either sending an ICMP echo request (ping) or attempting to open a TCP socket to the IP address.

Configure VRRP

This section describes how to configure VRRP and VRRP+ on a Digi WR device.

Required configuration items

- Enable VRRP.
- The interface used by VRRP. By default, VRRP is configured to use LAN1.
- 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. Allowed values are from 1 and 255, and it is configured to 1 by default.
- The interval in seconds between 1 and 60 at which this router will broadcast advertisement packets to other routers in the same group. It is set to 1 by default.
- The initial VRRP state (either master or backup) for this router. The default is backup.
- The shared IP address for the VRRP virtual router that devices connected to the LAN will use as their default gateway.
- The VRRP priority of this device. It is configured to 100 by default.

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Additional configuration items

For VRRP+ probing:

- The IPv4 IP address of the host to probe.
- The IPv4 IP address of the gateway to probe through, if this device is intended to serve primarily in a backup state. The gateway should be set to the physical VRRP LAN IP address of the device intended to serve as the master.
- The type of probe, either an ICMP echo (ping) or an attempt to open a TCP socket.
- If the probe type is a TCP socket, the destination port for the probe.
- The number of consecutive failed probes that are allowed before the VRRP priority is modified.
- The number of consecutive successful probes that are required, after VRRP+ probing is considered to have failed, before returning to the original priority settings.
- The amount that the VRRP priority will be modified for this device, if VRRP+ probing is considered to have failed.
- The number of seconds to wait between probes when the device is in master state.
- The number of seconds to wait between probes when the device is in backup state.

Web

1. On the menu bar:
   a. Click **Network**.
   b. In the **Services** section of the **Network** menu, select **VRRP**.

   The **VRRP** page is displayed.
2. Click the **State** toggle switch to "on" to turn on the VRRP instance.
3. From the **Interface** drop down, select the LAN interface on which VRRP should run.
4. In the **Router ID** field, enter 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 **1** by default.
5. In the **Interval** field, enter the broadcast interval.
6. In the **Initial State** drop down, select the initial state at which the VRRP will start on this router.
7. In the **IP Address** field, enter the virtual IP address that is used by clients to connect to this router.
8. In the **Priority** field, enter the priority for this route in the group. Note that a router with higher priority gets preference when transitioning to the master router.

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9. Expand **Probing** to configure VRRP+ settings.
   a. **Host**: Type the fully-qualified doman name or IPv4 IP address of the host to be probed.
   b. **Gateway**: If this device is intended to serve primarily in a backup state, type the IPv4 IP address of the gateway that the probe will be sent through. The gateway should be set to the physical VRRP LAN IP address of the device intended to serve as the master.
   c. **Priority Modifier**: Type the amount that the VRRP priority will be modified for this device, if probing is considered to have failed. The behavior of this setting varies depending on whether **Gateway** has been set:
      - If **Gateway** has not been set, the device is considered to be intended to be serving as the master. When probing is considered to have failed, the device's priority setting will be reduced by the amount entered in **Priority Modifier**.
      - If **Gateway** has been set, the device is considered to be intended to be serving as a backup device. When probing is considered to have failed, the device's priority setting will be increased by the amount entered in **Priority Modifier**.
   d. **Type**: Select the type of probe to be sent. Select either:
      - **ICMP**: Sends a ping to the **Host** IP address.
      - **TCP**: Attempts to open a TCP socket to the **Host**.
   e. **Port**: Type the probe destination port on the **Host**. Only used if **Type** is set to **TCP**.
   f. **Failure Threshold**: Type the number of consecutive failed probes that are allowed before the VRRP priority is modified. Allowed values are **1** through **60**.
   g. **Success Threshold**: Type the number of consecutive successful probes that are required, after VRRP+ probing is considered to have failed, before returning to the original priority settings. Allowed values are **1** through **60**.
   h. **Response Timeout**: Type the number of seconds to wait for a response from a probe attempt. Allowed values are **5** through **15**.
   i. **Probing Intervals**: Type the number of seconds to wait between probes:
      - **Master** : The number of seconds to wait between probes when the device is in master state. Allowed values are **15** through **60**.
      - **Backup**: The number of seconds to wait between probes when the device is in backup state. Allowed values are **15** through **60**.
10. Click **Apply** to save the changes.

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Command line

1. Set the VRRP interface:

```
digi.router> vrrp 1 interface lan2
```

2. Set the virtual router instance. The virtual router instance 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 1 by default:

```
digi.router> vrrp 1 router-id 157
```

3. Set the interval at which this router will send out broadcast packets:

```
digi.router> vrrp 1 interval 25
```

4. Set the initial state at which VRRP will start on this router:

```
digi.router> vrrp 1 initial-state master
```

5. Set the virtual IP address that clients on the LAN will use to connect to this router:

```
digi.router> vrrp 1 ip-address 172.16.32.101
```

6. (Optional) Set parameters for VRRP+ support:
   a. Set the fully-qualified doman name or IPv4 IP address of the host to be probed:

```
digi router> vrrp 1 probe-host 192.168.1.100
```

   b. If this device is intended to serve primarily in a backup state, set the IPv4 IP address of the gateway that the probe will be sent through. The gateway should be set to the physical VRRP LAN IP address of the device intended to serve as the master:

```
digi.router> vrrp 1 probe-gateway 192.168.1.1
```

   c. Set the amount that the VRRP priority will be modified for this device, if probing is considered to have failed. The behavior of this setting varies depending on whether probe-gateway has been set:
      - If probe-gateway has not been set, the device is considered to be intended to be serving as the master. When probing is considered to have failed, the device's priority setting will be reduced by the amount entered in probe-priority-modifier.
      - If probe-gateway has been set, the device is considered to be intended to be serving as a backup device. When probing is considered to have failed, the device's priority setting will be increased by the amount entered in probe-priority-modifier.

      The default is **10**.

```
digi router> vrrp 1 probe-priority-modifier 20
```

   d. Set the type of probe to be sent. Allowed values are:
      - **icmp**: Sends a ping to the probe-host IP address.
      - **tcp**: Attempts to open a TCP socket to the probe-host .

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```
digi router> vrrp 1 probe-type tcp
```

e. If probe-type is set to tcp, set the probe destination port on probe-host:

```
digi router> vrrp 1 probe-port 85
```

f. Set the number of consecutive failed probes that are allowed before the VRRP priority is modified. Allowed values are **1** through **60**; default is **5**.

```
digi router> vrrp 1 probe-failure-threshold 10
```

g. Set the number of consecutive successful probes that are required, after VRRP+ probing is considered to have failed, before returning to the original priority settings. Allowed values are **1** through **60**; default is **5**.

```
digi router> vrrp 1 probe-success-threshold 10
```

h. Set the number of seconds to wait between probes when the device is in master state. Allowed values are **15** through **60**.

```
digi router> vrrp 1 probe-interval-master 20
```

i. Set the number of seconds to wait between probes when the device is in backup state. Allowed values are **15** through **60**.

```
digi router> vrrp 1 probe-interval-backup 20
```

7. Enable VRRP:

```
digi.router> vrrp 1 state on
```

8. Save the configuration:

```
digi.router> save config
```

Show VRRP status and statistics

This section describes how to display VRRP status and statistics.

Web

On the menu bar:

1. Click **Network**.
2. In the **Services** section of the **Network** menu, select **VRRP**.

The **VRRP** page is displayed.

Status and statistics are shown in the right-hand pane of the page.

Option	Description
State	Specifies whether the VRRP daemon is configured to be running.

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Option	Description
Interface	Displays the current interface being used by the VRRP daemon.
Current VRRP State	The state of the VRRP daemon on this router.
Current VRRP Priority	The current VRRP priority of this router.
Last Transition	The most recent date this router transitioned between VRRP states.
Became Master	The total number of times this router has transitioned into the VRRP master state.
Released Master	The total number of times this router has transitioned out of the VRRP master state.
Adverts Sent	The total number of VRRP advertisements sent by this router.
Adverts Received	The total number of VRRP advertisements received by this router.
Priority Zero Sent	The total number of VRRP packets with a priority of '0' sent by this router.
Priority Zero Received	The total number of VRRP packets with a priority of '0' received by this router.

Command line

Enter the following command:

```
digi.router> show vrrp

 VRRP Status and Statistics
 --------------------------
 State                  : Enabled
 Interface              : lan1

 Current State          : Unknown
 Current Priority       : 0

 Last Transition        : Not Available

 Became Master          : 0
 Released Master        : 0
 Adverts Sent           : 0
 Adverts Received       : 0
 Priority Zero Sent     : 0
 Priority Zero Received : 0

 Probe Host             : 192.168.1.100
 Probe Gateway          : 192.168.1.1
 Probe Last Received    : 8 seconds ago
```

Option	Description
State	Specifies whether the VRRP daemon is configured to be running.

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Option	Description
Interface	Displays the current interface being used by the VRRP daemon.
Current VRRP State	The state of the VRRP daemon on this router.
Current VRRP Priority	The current VRRP priority of this router.
Last Transition	The most recent date this router transitioned between VRRP states.
Became Master	The total number of times this router has transitioned into the VRRP master state.
Released Master	The total number of times this router has transitioned out of the VRRP master state.
Adverts Sent	The total number of VRRP advertisements sent by this router.
Adverts Received	The total number of VRRP advertisements received by this router.
Priority Zero Sent	The total number of VRRP packets with a priority of '0' sent by this router.
Priority Zero Received	The total number of VRRP packets with a priority of '0' received by this router.
Probe Host	The IP address of the host being probed.
Probe Gateway	The IP address of the gateway that the probe is sent through.
Probe Last Received	The number of seconds since a probe response was last received from the host. If the is waiting for an initial response, this will be indicated instead.

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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.

IPsec 224
OpenVPN 247
Generic Routing Encapsulation (GRE) 268

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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.

Digi WR devices support to up **32** IPsec tunnels.

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**.

Currently, Digi WR devices support tunnel mode only.

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.

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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. Aggressive mode is usually used when one or both of the devices have a dynamic external IP address.

Phase 2

In phase 2, 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.

XAuth (eXtended Authentication)

XAuth pre-shared key authentication mode provides additional security using client authentication credentials in addition to the standard pre-shared key. Digi WR devices can act as either a XAuth client or server. See IPsec XAuth authentication for more information.

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 Digi WR 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). See IPsec certificate support for more information.

Configure an IPsec tunnel

Configuring an IPsec tunnel with a remote device involves configuring the following items:

Required configuration items

- **IPsec tunnel configuration items:**
  - Enabling the IPsec tunnel. The IPsec tunnels are disabled by default. You can also set the IPsec tunnel state to **off** or **on**.
  - The IP address or name of the remote device, also known as the **peer**, at the other end of the IPsec tunnel.
  - The local and remote IDs at either end of the IPsec tunnel. The setting for the local ID must match the setting for the remote ID on the remote device, and the setting for the remote ID must match the setting for the local ID on the remote device. If **X.509 Certificate**

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authentication is selected for the authentication mode, the local and remote IDs should not be set.

- The local and remote IP networks at either end of the IPsec tunnel.
- The authentication mode:
  - **Preshared key authentication**
  - **XAuth and Preshared key authorization**

    See IPsec XAuth authentication for more information on using XAuth with IPsec tunnels.
  - **X.509 Certificate authentication**

    See IPsec certificate support for more information on using certificates with IPsec tunnels.
- The shared key the device and the remote device use to authenticate each other.
- The Encapsulating Security Payload (ESP) encryption protocol to use. This has to match the encryption protocol configured on the remote device.
- The ESP authentication protocol to use. This setting must match the authentication protocol configured on the remote device.
- The ESP Diffie-Hellman group for the IPsec tunnel. This setting must match the Diffie-Hellman group configured on the remote device.

  The larger the number of bits, the more secure the IPsec tunnel. However, a larger bit length requires more computing power, which can slow down the tunnel negotiation and performance.

■ **IKE configuration items**

- The IKE authentication protocols to use for the IPsec tunnel negotiation.

  You can select more than one authentication protocol. IKE negotiates with the remote device to determine which authentication protocol to use. This setting does not need to match the IKE authentication protocols configured on the remote device, but at least one of the authentication protocols must be configured on the remote device.
- The IKE encryption protocols to use for the IPsec tunnel negotiation.

  You can select more than one encryption protocol. IKE negotiates with the remote device to determine which encryption protocol to use. This setting does not need to match the IKE encryption protocols configured on the remote device, but at least one of the encryption protocols must be configured on the remote device.
- The IKE Diffie-Hellman groups to use for the IPsec tunnel negotiation.

  You can select more than one Diffie-Hellman group. IKE negotiates with the remote device to determine which group to use. This setting does not need to match the IKE Diffie-Hellman groups configured on the remote device, but at least of the Diffie-Hellman groups must be configured on the remote device.

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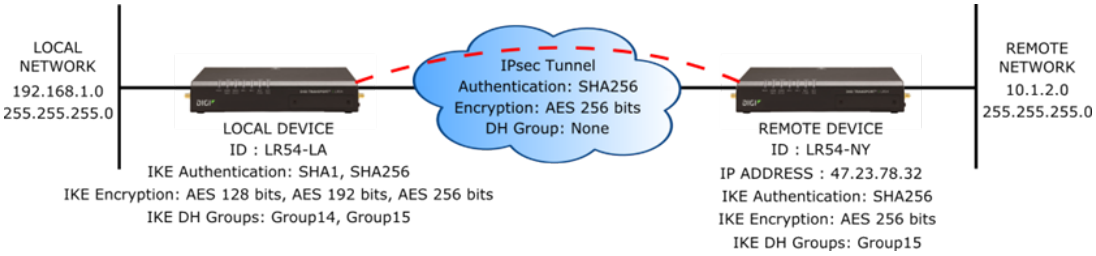
Additional configuration items

The following additional configuration settings are not typically configured to get an IPsec tunnel working, but can be configured as needed:

- **Tunnel and key renegotiating**
  - The lifetime of the IPsec tunnel before it is renegotiated. This defaults to **1 hour** (**3600** seconds), and does not need to match the setting on the remote device.
  - The number of bytes, also known as lifebytes, sent on the IPsec tunnel before it is renegotiated. By default, this setting is disabled, but can be configured up to **4 GB**. This setting does not need to match the setting on the remote device.
  - The IKE lifetime before the keys are renegotiated. This defaults to **4800** seconds and does not need to match the IKE lifetime configured on the remote device.
  - The amount of time prior to expiration of the IPsec lifetime that renegotiation should start. This defaults to **540** seconds and does not need to match the setting on the remote device.
  - The number of bytes before the IPsec lifebytes limit is reached before the key is renegotiated. By default, this is set to **0** and does not need to match the setting on the remote device.
  - A randomizing factor for the number of seconds or bytes margin before the IPsec tunnel is renegotiated. This defaults to **100%** and does not need to match the setting on the remote device. This setting would be used if the device has a number of IPsec tunnels configured to ensure that the IPsec tunnels are not renegotiated at the same time which could put excessive load on the device.
- Other configuration items
  - A description for the IPsec tunnel.
  - Determine whether the device should use UDP encapsulation even when it does not detect that NAT is being used.
  - The number of tries IKE will attempt to negotiate the IPsec tunnel with the remote device before giving up.
  - The preferred WAN for the IPsec tunnel, and WAN failover priority.
  - The metric for the IPsec route. The metric defines the order in which the device uses routes if there are two routes to the same destination. In such a case, the device uses the route with the smaller metric. The default is 10 but you can configure the metric differently to increase or decrease the route's priority.
  - Probing settings to determine if the IPsec tunnel is alive. See Using IP probing to detect IPsec failures for further information.

Example IPsec tunnel

Suppose you are configuring the following IPsec tunnel:



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Web

Configure a new IPsec tunnel

1. **Prerequisite**: A configured LAN must be available for use in the IPsec tunnel. See Configure a LAN.
2. On the menu, click **Network** > **Networks** > **IPsec** > **Tunnels**.

   The **IPsec Tunnels** page appears.
3. Click **New IPsec Tunnel**.

   The **IPsec** page displays the settings for a new IPsec tunnel. The settings are displayed in five groups: **Network**, **Authentication**, **Encryption**, **Negotiation**, and **Lifetime**. Most of these settings groups have defaults which you can review and use or modify as needed. The Network settings involve settings you must supply.
4. In the **Select IPsec** setting, select a number to assign to the IPsec tunnel.
5. Enter the **Network** settings:
   - **Description**: (Optional) Description of this IPsec tunnel.
   - **Enable**: Enables or disables the IPsec tunnel when configuration is completed.
   - **Enable UDP Encapsulation**: Enable or disable UDP Encapsulation. The device automatically uses UDP encapsulation when it detects that NAT is being used. When enabled, this option forces the device to use UDP Encapsulation even if it does not detect that NAT is being used.
   - **Use If WAN Down**: Select a WAN that, on failure, will trigger this IPsec tunnel to start. This is useful in cases where you are using a private WAN for sensitive data. In a failover scenario involving the private WAN, you can configure the device to route the sensitive data over a public WAN, while protecting the data by using an IPsec tunnel.
   - **WAN Interfaces**: Specify the preferred WAN for the IPsec tunnel, and the failover behavior of the IPsec tunnel during WAN failure. By default, the IPsec tunnel will operate on the first available WAN and will fail over to the next available WAN, based on the WAN priority. You can select and prioritize multiple WANs for the IPsec tunnel: the first WAN will be the initial WAN that the IPsec tunnel uses; each additional WAN will be the next priority for failover during WAN failure. See IPsec preferred WAN and WAN failover for more information. The default is **all**, which means that the default failover behavior will be used.
   - **Local IP Network**: The network used for the IPsec tunnel on the local side of the tunnel. Select a LAN from the list.
   - **Local Identifier**: Enter the local identifier for the IPsec tunnel. The value for the **Local Identifier** must match the value for the **Remote Identifier** on the remote device at the other end of the tunnel. If **X.509 Certificate authentication** is selected for the authentication mode, the local ID should not be set.
   - **Remote Peer IP Address or Name**: Enter the IP address or name of the remote device, also known as the **peer**, at the other end of the IPsec tunnel.
   - **Remote IP Subnets**: Enter the IP address and subnet mask of the network used for the IPsec tunnel on the remote side of the tunnel.
   - **Remote Identifier**: Enter the remote identifier for the IPsec tunnel. The value for the Remote Identifier must match the value for the Local Identifier on the remote device at

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the other end of the tunnel. If **X.509 Certificate authentication** is selected for the authentication mode, the remote ID should not be set.

6. Enter the **Authentication** settings:
   a. **Authentication Mode**. Select one of the following:
      - **Preshared key authentication**
      - **XAuth and Preshared key authorization**

        See IPsec XAuth authentication for more information on using XAuth with IPsec tunnels.
      - **X.509 Certificate authentication**

        See IPsec certificate support for more information on using certificates with IPsec tunnels.

   b. If **Preshared key authentication** or **XAuth and Preshared key authorization** are selected for the authentication mode, enter the **IPSec Pre-Shared Key** that the local device and the remote device use to authenticate each other.
   c. If **XAuth and Preshared key authorization** is selected for the authentication mode, the **XAuth Identity**, **Password**, and **Role** options appear. See IPsec tunnel with XAuth authentication configuration for more information on using XAuth with IPsec tunnels.
   d. If **X.509 Certificate authentication** is selected for the authentication mode, the **Certificate**, **Private Key**, **Private Key Password**, **CA Certificate**, and **Certificate Relocation List** options appear. See Configure an IPsec tunnel with certificate-based authentication for more information on using certificates with IPsec tunnels.
7. Review the **Encryption** settings and modify as needed. These settings configure the encryption protocols to use for the IPsec tunnel negotiation.
8. Review the **Negotiation** settings and modify as needed. These settings configure detailed negotiation protocols and other options to use for the IPsec tunnel negotiation.
9. Review the **Lifetime** settings and modify as needed. These settings configure the duration of the IPsec tunnel before it is renegotiated, and the lifetime of the Internet Key Exchange (IKE) before the keys are renegotiated.
10. Click **Apply**.

Modify an existing IPsec tunnel

1. On the menu, click **Network > Networks > IPsec** > **Tunnels**.

   The **IPsec Tunnels** page appears.
2. Select an IPsec tunnel and click **Edit**.
3. Modify the **Network**, **Encryption**, **Negotiation**, and **Lifetime** settings as needed.
4. Click **Apply**.

Command line

Note If XAuth will be used for authentication, see IPsec tunnel with XAuth authentication configuration for instructions.

If certificates will be used for authentication, see Configure an IPsec tunnel with certificate-based authentication for instructions.

1. Enable the IPsec tunnel.

```
digi.router> ipsec 1 state on
```

2. Enter the IP address or name of the remote device.

```
digi.router> ipsec 1 peer 47.23.78.32
```

3. Enter the local and remote IDs. If **X.509 Certificate authentication** is selected for the authentication mode, the local ID should not be set. See IPsec certificate support for more information on using certificates with IPsec tunnels.

```
digi.router> ipsec 1 local-id LR54-LA
digi.router> ipsec 1 remote-id LR54-NY
```

4. Enter the local and remote IP subnets.

```
digi.router> ipsec 1 local-subnet 192.168.1.0/24
digi.router> ipsec 1 remote-subnet 10.1.2.0/24
```

5. Enter the pre-shared key.

```
digi.router> ipsec 1 psk “secret-psk”
```

6. Enter the IPsec authentication, encryption, and Diffie-Hellman settings.

```
digi.router> ipsec 1 esp-authentication sha256
digi.router> ipsec 1 esp-encryption aes256
digi.router> ipsec 1 esp-diffie-hellman none
```

7. Enter the IKE authentication, encryption, and Diffie-Hellman settings.

```
digi.router> ipsec 1 ike-authentication sha1,sha256
digi.router> ipsec 1 ike-encryption aes128,aes192,aes256
digi.router> ipsec 1 ike-diffie-hellman group14,group15
```

8. (Optional) Set the preferred WAN and WAN failover priority. See IPsec preferred WAN and WAN failover for more information.

```
digi.router> ipsec 1 wan-interfaces wan1,wan3,wan2
```

9. (Optional) Enable UDP encapsulation.

```
digi.router> ipsec 1 udp-encap on
```

The device automatically uses UDP encapsulation when it detects that NAT is being used. When enabled, this option forces the device to use UDP Encapsulation even if it does not detect that NAT is being used.

10. Save the configuration.

```
digi.router> save config
```

Example: IPsec tunnel between an LR54 and a WR44 device

The following example describes configuration settings to create an IPsec tunnel between an LR54 and a WR44 device. This example assumes:

LR54 configuration

1. Configure the LAN 1 network:

```
digi.router> lan 1
digi.router> lan 1 state on
digi.router> lan 1 interfaces eth2,eth3,eth4
digi.router> lan 1 ip-address 192.168.10.1
```

2. Configure the DHCP server:

```
digi.router> dhcp-server 1 state on
digi.router> dhcp-server 1 mask 255.255.255.0
digi.router> dhcp-server 1 dns1 192.168.10.1
digi.router> dhcp-server 1 gateway 192.168.10.1
digi.router> dhcp-server 1 ip-address-end 192.168.10.199
digi.router> dhcp-server 1 ip-address-start 192.168.10.100
```

3. Configure the IPsec parameters:
   a. Set the remote peer of the IPsec tunnel to the WAN IP of the WR44:

```
ipsec 1 peer 10.52.18.130
```

   b. Set the encryption of the IPsec tunnel:

```
ipsec 1 ike-encryption aes256
ipsec 1 ike-mode main
ipsec 1 esp-encryption aes256
ipsec 1 psk mysecretipseckey
```

   c. Set the local ID to the WAN IP of the LR54:

```
digirouter> ipsec 1 local-id 10.52.18.109
```

   d. Set the remote ID to the WAN IP of the WR44:

```
digirouter> ipsec 1 remote-id 10.52.18.130
```

   e. Set additional parameters for the IP sec tunnel and enable the tunnel:

```
digirouter> ipsec 1 remote-subnet 192.168.8.0/24
digirouter> ipsec 1 local-subnet 192.168.10.1/24
digirouter> ipsec 1 dpd on
digirouter> ipsec 1 state on
```


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4. Enable the firewall for receiving IPsec esp traffic.

```
digirouter> firewall -A INPUT -p esp -j ACCEPT
digirouter> firewall -t nat -I POSTROUTING -s 192.168.10.0/24 -d
192.168.8.0/24 -j ACCEPT
```

Note In an actual deployment, the firewall may require further restrictions.

5. Save the configuration:

```
digirouter> save config
```

WR44 configuration

1. If the WR44 is not in port isolation mode, type the following:

```
> ethvlan
> config 0 save
> reboot
```

2. Enable ipsec on eth0. This should be the wan port.

```
> eth 0 ipsec 1
```

3. Configure eth1 as a LAN port:

```
> eth 1 IPaddr 192.168.8.1
> eth 1 ethanon ON
```

4. Configure the DHCP server:

```
> dhcp 1 IPmin 192.168.8.100
> dhcp 1 IPrange 100
> dhcp 1 mask 255.255.255.0
> dhcp 1 gateway 192.168.8.1
```

5. Configure a route for ipsec traffic:

```
route 0 IPaddr 192.168.10.0
route 0 mask 255.255.255.0
route 0 ll_ent ETH
```

6. Setup the IPsec parameters
   a. Set the peer IP to the WAN IP of the LR54:

```
> eroute 0 peerip "10.52.18.109"
```

   b. Set the peer ID to the WAN IP of the LR54:

```
> eroute 0 peerid "10.52.18.109"
```


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c. Set the ourid parameter to the WAN IP of the WR44:

```
> eroute 0 ourid "10.52.18.130"
```

d. Set additional IPsec parameters:

```
> eroute 0 ouridtype 3
> eroute 0 locip "192.168.8.0"
> eroute 0 locmsk "255.255.255.0"
> eroute 0 remip "192.168.10.0"
> eroute 0 remmsk "255.255.255.0"
> eroute 0 ESPauth "SHA1"
> eroute 0 ESPenc "AES"
> eroute 0 authmeth "PRESHARED"
> eroute 0 autosa 2
> eroute 0 dhgroup 14
> eroute 0 enckeybits 256
> ike 0 encalg "AES"
> ike 0 keybits 256
> ike 0 authalg "SHA1"
> ike 0 aggressive ON
> ike 0 ikegroup 14
```

2. Set the user 9 name to the WAN IP of the LR54:

```
> user 9 name "10.52.18.109"
```

3. Set other user 9 parameters:

```
> user 9 access 4
> user 9 password mysecretipseckey
```

7. Save the configuration:

```
> config 0 save
```

View the status of the IPsec Tunnel on the LR54

```
digi.router> show ipsec 1
   IPsec 1 Status and Statistics
   -----------------------------
   Description        :
   Admin Status       : Up
   Oper Status        : Up
   Local Network      : 192.168.10.0/24
   Remote Network     : 192.168.8.0/24
   Uptime             : 85 seconds

   Local Peer IP      : 10.52.18.130
   Remote Peer IP     : 192.168.32.22
   Outgoing Interface :

   IKE Information
   ---------------
```


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```
   Key Negotiation  : IKEv1, aes256, sha1, modp2048
   SPIs             : d43ad84cde2479a8_i* fe153a7f1dc87756_r

   Tunnel Information
   ------------------
   Rekeying In      : 67 minutes
   AH Cipher Suite  : Not Used
   ESP Cipher Suite : aes256, sha1, modp2048
   Renegotiating In : 23 minutes
   Outbound ESP SAs : 4bedb691
   Inbound ESP SAs  : c1e2a1f9

   Dead Peer Detection is on

   Bytes In         : 212832
   Bytes Out        : 212916

digi.router>
```

View the status of the IPsec Tunnel on the WR44

```
> sastat
IPsec SAs (total:1). Eroute 0 -> 4
Outbound V1 SAs
  SPI Eroute     Peer IP        Rem. subnet       Loc. subnet       TTL    KBytes
Left   VIP
   c1e2a1f9   0   10.52.18.109   192.168.10.0/24   192.168.8.0/24    2180   0
       N/A
Inbound V1 SAs
  SPI Eroute     Peer IP        Rem. subnet       Loc. subnet       TTL    KBytes
Left   VIP
   4bedb691   0   10.52.18.109   192.168.10.0/24   192.168.8.0/24    2180   0
       N/A
Outbound V2 SAs
   List Empty
Inbound V2 SAs
   List Empty
OK

>
```


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IPsec preferred WAN and WAN failover

The default behavior of the Digi WR device is to use the first available WAN for IPsec tunnels, and when that WAN becomes unavailable, to fail over to the next available WAN based on the default WAN priority (see WAN priority and default route metrics).

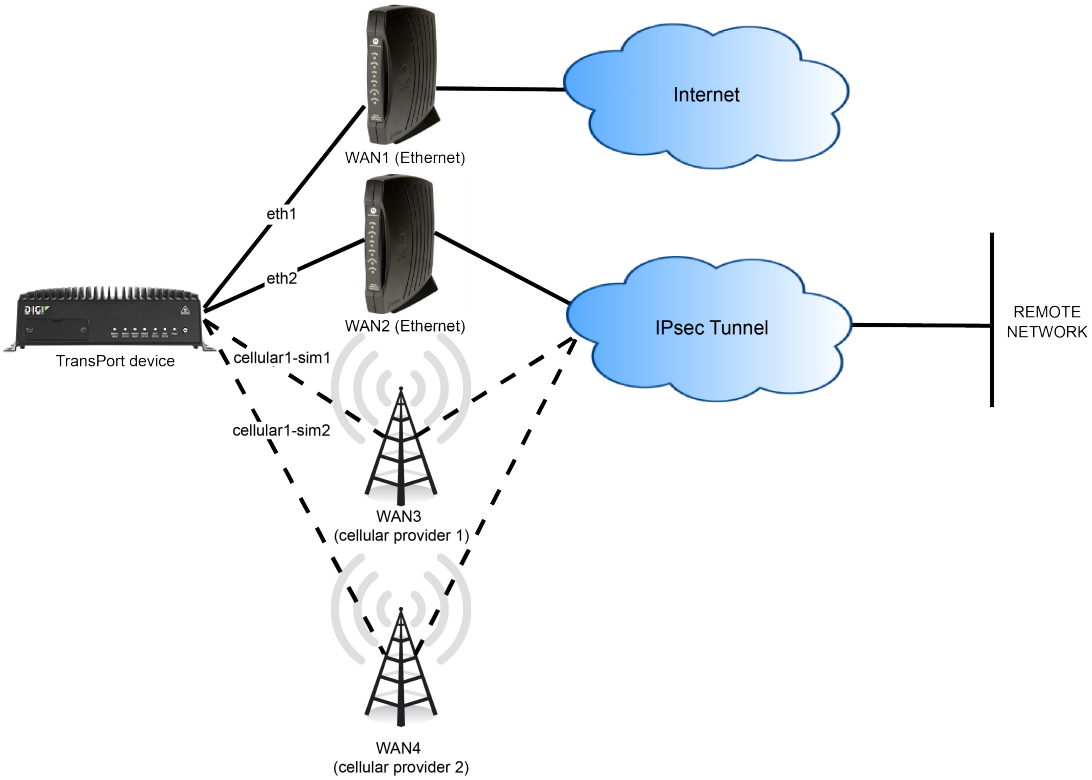
You can customize the behavior of each IPsec tunnel on your device to override the device's default behavior by selecting:

- The preferred WAN for the IPsec tunnel to use.
- Additional WANs for failover.
- WAN failover priority.
- Probing parameters to determine when the tunnel has failed.

After a failover event, the device will automatically fall back using the same prioritization when previously unavailable WANs become available.

Example IPsec preferred WAN and failover configuration

In the following example, the Digi WR device is configured with Ethernet connections on WAN1 and WAN2, and cellular connections on WAN3 and WAN4. The IPsec tunnel is configured with WAN2 as its preferred WAN, and WAN3 and WAN4 for failover. To achieve this failover configuration, select WAN2, WAN3, and WAN4, in that order, for the **WAN interfaces** option during IPsec configuration. See Configure an IPsec tunnel's preferred WAN and WAN failover priority for details.



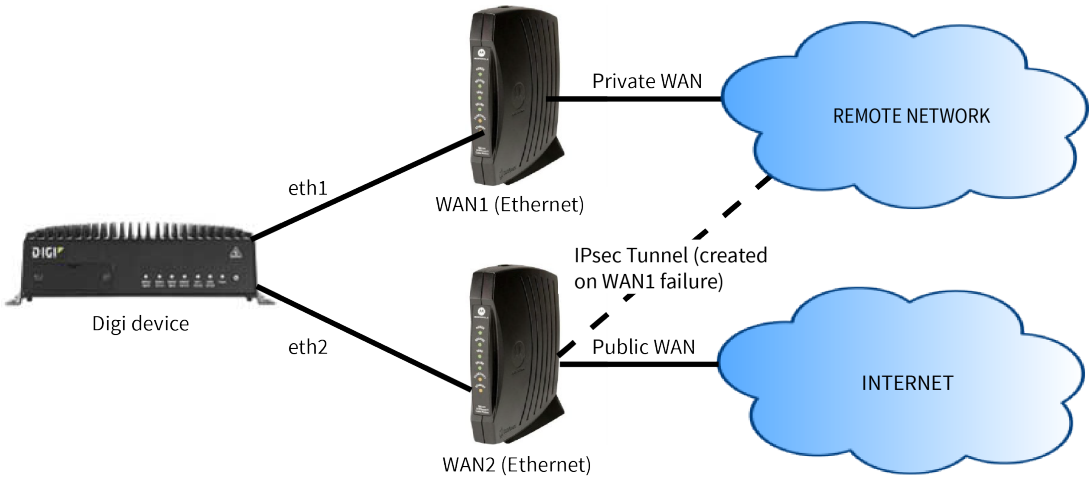
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WAN failover to IPsec

You can also configure a WAN to fail over to an IPsec tunnel. This is useful in cases where you are using a private WAN for sensitive data. In a failover scenario involving the private WAN, you can configure the device to route the sensitive data over a public WAN, while protecting the data by using an IPsec tunnel.



See Configure an IPsec tunnel for WAN failover for information about configuring a WAN to fail over to an IPsec tunnel.

Configure an IPsec tunnel's preferred WAN and WAN failover priority

The default configuration of IPsec tunnels is to use the first available WAN, and to fail over to the next available WAN based on the WAN priority. You can customize the failover behavior of each IPsec tunnel on your device to override the default behavior.

Required Configuration items

- Valid IPsec configuration. See Configure an IPsec tunnel.
- Multiple configured WANs. See Configure a Wide Area Network (WAN).

Web

1. Create a new IPsec tunnel or modify an existing one, as described in Configure an IPsec tunnel.
2. In the **Network** settings section, click **Interfaces**. Select the preferred WAN for the IPsec tunnel, and select additional WANs to be used for failover. Select the WANs in the order of priority that the failover should occur.
   - The first selected WAN will be the preferred WAN for the IPsec tunnel. For example, if you select WAN2 as the first (or only) WAN, the IPsec tunnel will use WAN2 as its preferred WAN.
   - Subsequent WANs included in this option will be used for failover. For example, if you select WAN2 as the first WAN, then WAN3, then WAN1, the IPsec tunnel will operate on WAN2 when it is available and will fail over to WAN3 if WAN2 is unavailable, and will

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failover to WAN1 if both WAN2 and WAN3 are unavailable. Fallback will occur automatically based on the same priority as unavailable WANs become available.

- The default setting of **All** means that the IPsec tunnel will use the first available WAN, and failover will occur based on the default WAN priority.

Any WANs that are not included in **Interfaces** will not be used by the tunnel.

3. Click **Apply** when IPsec configuration is complete.

Command line

1. Set the preferred WAN for the IPsec tunnel, and set additional WANs to be used for failover. The WANs should be comma-separated and listed in the order of priority that the failover should occur.

```
digi.router> ipsec 1 interfaces wan2,wan3,wan1
```

- The first WAN will be the preferred WAN for the IPsec tunnel. For example, if you set WAN2 as the first (or only) WAN, the IPsec tunnel will use WAN2 as its preferred WAN.
- Subsequent WANs included in this parameter will be used for failover. For example, if you set WAN2 as the first WAN, then WAN3, then WAN1, the IPsec tunnel will operate on WAN2 when it is available and will fail over to WAN3 if WAN2 is unavailable, and will failover to WAN1 if both WAN2 and WAN3 are unavailable. Fallback will occur automatically based on the same priority as unavailable WANs become available.
- The default setting of **all** means that the IPsec tunnel will use the first available WAN, and failover will occur based on the default WAN priority.

Any WANs that are not included in the **interfaces** parameter will not be used by the tunnel.

2. Save the configuration:

```
digi.router> save config
```

Using IP probing to detect IPsec failures

You can use IP probing to detect problems in an IP network. IP probing involves configuring the Digi WR device to send out regular IP probe packets (ICMP echo requests) over the IPsec tunnel to a particular destination. If there are no responses to the probe packets, the device will bring down and restart the IPsec tunnel.

IP probing includes the following options:

- **Probe hosts**: A comma-separated list of endpoints that will be probed.
- **Probe interval**: The number of seconds to wait between sending probe packets. This value must be more than the probe **response** timeout value.
- **Probe size**: The size in bytes of probe packets sent to detect IPsec tunnel failures. Allowed values are between 64 and 1500.
- **Probe response timeout**: The time, in seconds, to wait for a response to a probe before the device will consider the probe to have failed. This value must be less than the probe interval and probe timeout values.
- **Probe timeout** : The number of seconds to wait after the first failed probe before restarting the IPsec tunnel. Note that once the device has successfully connected and then the connection is lost, it will immediately fail over to the next IPsec tunnel, regardless of the probe timeout setting.

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Configure IPsec probing

Required configuration items

- One or more endpoints of the IPsec tunnel, to which probe packets will be sent.

Additional configuration items

- The number of seconds to wait between probe packets.
- The number of seconds to wait for a response to the probe.
- The size of the probe packets.
- The number of seconds to wait after the first failed probe before the IPsec tunnel is reset.

Web

1. Create a new IPsec tunnel or modify an existing one, as described in Configure an IPsec tunnel.
2. In the **Probing** settings section:
   a. For **Probe Hosts**, type the endpoints of the IPsec tunnel to which the probe packets will be set. These should in the format IPv4 address, network mask, and optional traffic selector. If multiple hosts are listed, separate them with commas.
   b. (Optional) For **Probe Interval**, type the number of seconds to wait for a probe response. The default is **5** seconds.
   c. (Optional) For **Probe Timeout**, type the number of seconds to wait after the first failed probe before restarting the IPsec tunnel. The default is **60** seconds.
   d. (Optional) For **Probe Response Timeout**, type the number of seconds to wait for a probe response. The default is **5** seconds.
   e. (Optional) For **Probe Size**, type the size, in bytes, of the probe packets. Allowed values are between 64 and 1500. The default is **64** bytes.
3. Click **Apply** when IPsec configuration is complete.

Command line

1. Set the endpoints of the IPsec tunnel to which the probe packets will be set. These should in the format IPv4 address, network mask, and optional traffic selector. If multiple hosts are listed, separate them with commas.

```
digi.router> ipsec 1 probe-hosts 192.168.2.2,192.168.2.3
```

2. (Optional) Set the number of seconds to wait between probe packets. The default is **15** seconds.

```
digi.router> ipsec 1 probe-interval 20
```

3. (Optional) Set the number of seconds to wait for a probe response. The default is **5** seconds.

```
digi.router> ipsec 1 probe-response-timeout 10
```

4. (Optional) Set the size, in bytes, of the probe packets. Allowed values are between 64 and 1500. The default is **64** bytes.

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```
digi.router> ipsec 1 probe-size 128
```

5. (Optional) Set the number of seconds to wait after the first failed probe before restarting the IPsec tunnel. The default is **60** seconds.

```
digi.router> ipsec 1 probe-timeout 120
```

6. Save the configuration:

```
digi.router> save config
```

Configure an IPsec tunnel for WAN failover

To configure an IPsec tunnel to be used for WAN failover:

Required Configuration items

- Valid IPsec configuration. See Configure an IPsec tunnel.

Web

1. Create a new IPsec tunnel or modify an existing one, as described in Configure an IPsec tunnel.
2. In the **Network** settings section, click the **Use if WAN Down** dropdown. Select the WAN that, on failure, will trigger this IPsec tunnel to start.
3. Click **Apply** when IPsec configuration is complete.

Command line

1. Set the WAN that, on failure, will trigger this IPsec tunnel to start:

```
digi.router> ipsec 1 use-if-wan-down wan2
```

2. Save the configuration:

```
digi.router> save config
```

Debug an IPsec configuration

If you experience issues with an IPsec tunnel not being successfully negotiated with the remote end of the tunnel, you can enable IPsec debug messages to be written to a file. Once enabled, the debug messages are written to a file named **ipsec.debug** in the root directory of the device.

To enable IPsec debugging, use the system command **ipsec-debug** parameter. This parameter accepts the following values to set the debug level:

- **-1** — (Default) No debug information is written. This is the equivalent of turning off debug messages for IPsec.
- **0** — Basic auditing logs, (for example, SA up/SA down).
- **1** — Generic control flow with errors. Select this for basic debugging information.
- **2** — More detailed debugging control flow.
- **3** — Includes RAW data dumps in hexadecimal format.
- **4** — Also includes sensitive material in dumps (for example, encryption keys).

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Command line

```
digi.router> system ipsec-debug <debug_level>
```

IPsec XAuth authentication

XAuth (eXtended Authentication) pre-shared key authentication mode provides additional security using client authentication credentials in addition to the standard pre-shared key. Digi WR devices can act as either a XAuth client or server.

IPsec tunnel with XAuth authentication configuration

Configuring an IPsec tunnel with XAuth involves the following items:

Required configuration items

- A valid IPsec configuration.

  See Configure an IPsec tunnel for more information.
- The IPsec authentication mode must be set to **XAuth and Preshared Key authentication**.
- The XAuth role, either client or server.

  The default role is client.

If XAuth role is client

- The username and password to use for XAuth authentication.

If XAuth role is server

- XAuth clients.

  XAuth clients are configured on the IPsec XAuth Users page (**Network** > **Networks** > **IPsec** > **XAuth Users**). Up to 10 XAuth clients can be configured.

Configure an IPsec tunnel with XAuth authentication

Client configuration

To configure a device as an XAuth client:

Web

1. On the menu, click **Network** > **Networks** > **IPsec** > **Tunnels**.

   The **IPsec Tunnels** page appears.
2. Click **New IPsec Tunnel** or click an existing IPsec tunnel.

   Compete the IPsec tunnel configuration as described in Configure an IPsec tunnel.
3. At **Authentication**, for **Authentication Mode**, select **XAuth and Preshared Key authentication**.
4. For **XAuth Role**, select **Client Role**.
5. For **XAuth Identity** and **XAuth Password**, type your XAuth credentials.
6. Click **Apply**

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Command line

Note These instructions assume an IPsec tunnel has already been created. For more information, see Configure an IPsec tunnel.

1. Set the authentication mode to xauth-psk:

```
digi.router> ipsec 1 auth-by xauth-psk
```

2. Set the XAuth role to client:

```
digi.router> ipsec 1 xauth-role client
```

3. Set the username that the device will use for authentication:

```
digi.router> ipsec 1 xauth-username <user>
```

4. Set the password that the device will use for authentication:

```
digi.router> ipsec 1 xauth-password <password>
```

5. Save the configuration:

```
digi.router> save config
```

Server configuration

To configure a device as an XAuth server:

Web

1. On the menu, click **Network** > **Networks** > **IPSec Tunnels**.
   The **IPsec Tunnels** page appears.
2. Click **New IPsec Tunnel** or click an existing network to change the authentication to XAuth.
   Compete the IPsec tunnel configuration as described in Configure an IPsec tunnel.
3. At **Authentication**, for **Authentication Mode**, select **XAuth and Preshared Key authentication**.
4. For **XAuth Role**, select **Server Role**.
5. Click **Apply**

Additionally, configure XAuth users for XAuth clients that will connect to the XAuth server. Up to ten XAuth clients can be configured:

1. On the menu, click **Network** > **Networks** > **IPSec** > **XAuth Users**.
   The **IPsec XAuth Users** page appears.
2. Click **New XAuth User** .
3. For **Username** and **Password** type the credentials that the XAuth client will use to authenticate to the device's XAuth server.
4. For **Confirm Password**, retype the password.
5. Click **Apply**

Up to ten XAuth clients can be configured.

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Command line

Note These instructions assume an IPsec tunnel has already been created. For more information, see Configure an IPsec tunnel.

1. Set the authentication mode to xauth-psk:

```
digi.router> ipsec 1 auth-by xauth-psk
```

2. Set the XAuth role to server:

```
digi.router> ipsec 1 xauth-role server
```

3. Configure the credentials that the XAuth client will use to authenticate to the device's XAuth server:

```
digi.router> xauth-user 1 username <user>
digi.router> xauth-user 1 password <password>
```

   Up to ten XAuth clients can be configured.

4. Save the configuration:

```
digi.router> save config
```

IPsec certificate support

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 CA also has a certificate file, and may provide a Certificate Revocation List (CRL) of certificates that are no longer valid.

The Digi WR implementation of IPsec supports authentication with X.509 certificates by using the private keys, certificates, CA certificates, and CRLs. Private keys must be securely added using the pki command at the device's CLI before they can be used with IPsec.

Configure an IPsec tunnel with certificate-based authentication

Configuring an IPsec tunnel with X.509 certificate-based authentication involves the following items:

Required configuration items

- A valid IPsec configuration. For certificate-based authentication, the local and remote IDs are determined from the certificate and should not be set.
- A valid private key for the device that has been created by using the pki command at the CLI, or has been added to the device by using the pki addkey command. The private key must be visible with the pki list command.

  See Certificate and key management for information about using the pki, pki addkey, and pki list commands.
- A valid certificate issued by a Certificate Authority (CA) and signed with the private key.

  See Create a certificate signing request for information about requesting a certificate from a CA for your device's private key.
- A valid root CA certificate from the CA.

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Additional Configuration options

- A password for the private key, if the private key is encrypted.
- A Certificate Revocation List (CRL) from the CA, which provides a list of certificates that are no longer valid.

Web

Note These instructions assume an IPsec tunnel has already been created. For more information, see Configure an IPsec tunnel.

1. Upload all required certificates to the device's file system. This can be done from within the Web UI, or using a utility such as Secure Copy (SCP) or SSH File Transfer Protocol (SFTP). To upload from within the Web UI:
   a. Click **System** >**File System**.
      The **File System** page appears.
   b. (Optional) Create or select a directory for the certificates. See Create a directory for information about creating a new directory.
   c. Click (upload).
   d. Browse to the location of the certificates on the host file system, select the certificates, and click **Open** to upload.
2. On the menu, click **Network** > **Networks** > **IPsec** > **Tunnels**.
   The **IPsec Tunnels** page appears.
3. Click **New IPsec Tunnel** or click an existing IPsec tunnel.
   Compete the IPsec tunnel configuration as described in Configure an IPsec tunnel.
4. At **Authentication**, for **Authentication Mode**, select **X.509 Certificate authentication**.
5. For **Certificate**, type the path and file name of the certificate file issued by a Certificate Authority (CA) and signed with the device's private key. For example, **cert_directory/my_certificate.pem**.
6. For **Private Key**, type file name of the private key file, as show by the pki list command.
7. (Optional) For **Private Key Password**, type the password that was used to encrypt the private key file when the private key was created.
8. For **CA Certificate**, type the path and file name of the Certificate Authority's root CA certificate file.
9. (Optional). For **Certificate Revocation List**, type the path and file name of CRL from the Certificate Authority.
10. Click **Apply**

Command line

Note These instructions assume an IPsec tunnel has already been created. For more information, see Configure an IPsec tunnel.

1. Upload all required certificates to the device's file system. You can upload the certificates by using utilities such as Secure Copy (SCP), SSH File Transfer Protocol (SFTP), or an SFTP application, such as FileZilla. For example:
   a. (Optional) Create a directory for the certificates, if one does not exist already. See Create a directory for information about creating a new directory.
   b. Upload the certificates by using SCP:

   ```
   scp my_certificate.pem username@device_ip_address:cert_directory/my_certificate.pem
   ```

2. Set the authentication mode to X.509 certificate-based authentication:

   ```
   digi.router> ipsec 1 auth-by cert
   ```

3. Enter the private key file, as seen with the pki list command:

   ```
   digi.router> ipsec 1 private-key privkey_file
   ```

4. (Optional) Enter the password that was used to encrypt the private key file when the private key was created:

   ```
   digi.router> ipsec 1 private-key-password ******
   ```

5. Enter the path and file name of the certificate file issued by a Certificate Authority (CA) and signed with the device's private key:

   ```
   digi.router> ipsec 1 cert cert_directory/my_certificate.pem
   ```

6. Enter the path and file name of the Certificate Authority's root CA certificate file:

   ```
   digi.router> ipsec 1 ca cert_directory/root_ca_certificate.pem
   ```

7. (Optional) Enter the path and file name of the Certificate Revocation List from the Certificate Authority:

   ```
   digi.router> ipsec 1 crl cert_directory/root_ca_revocation.crl
   ```

8. Save the configuration:

   ```
   digi.router> save config
   ```


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Show IPsec status and statistics

Web

- On the menu, click **Network > Networks > IPsec**. The **IPsec** page appears.

Command line

The show ipsec displays the status of the IPsec tunnels and statistics regarding their use.

Display summary status for IPsec tunnels

To display summary status and statistics of all configured IPsec tunnels, enter the show ipsec command without parameters.

```
digi.router> show ipsec

 #   Status  Peer             Local              Remote             Uptime
 ------------------------------------------------------------------------------
 1   Up      192.170.1.100    192.168.0.0/16     192.169.1.0/24     3 minutes

digi.router>
```

Display detailed status and statistics for an IPsec tunnel

To display detailed status and statistics of all configured IPsec tunnels, enter the show ipsec command, specifying the tunnel number.

```
digi.router> show ipsec 1

 IPsec 1 Status and Statistics
 -----------------------------
 Description        :
 Admin Status       : Up
 Oper Status        : Up
 Local Network      : 192.168.0.0/16
 Remote Network     : 192.169.1.0/24
 Uptime             : 2 minutes
 Local Peer IP      : 192.170.1.100
 Remote Peer IP     : 192.169.1.100
 Outgoing Interface : lan1

 IKE Information
 ---------------
 Key Negotiation    : IKEv1, aes128, sha1, modp2048
 SPIs               : 5078e20a02eb1e9c_i* 6b2cfcdf33b4125c_r

 Tunnel Information
 ------------------
 Rekeying In        : 35 minutes
 AH Cipher Suite    : Not Used
 ESP Cipher Suite   : aes128, sha1
 Renegotiating In   : 42 minutes
 Outbound ESP SAs   : d2fad10b, 9bcc91db
 Inbound ESP SAs    : 2af8bb94, 3be64703
 Bytes In           : 1435
 Bytes Out          : 32412

 Dead Peer Detection is on

 Probing is enabled.


digi.router>
```


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IPsec rekeying

Digi WR devices provide inline rekeying of IKE SAs, which means that new keys can be established without interrupting existing IKE and IPsec Security Associations (SAs).

Rekeying takes place randomly based on a formula that includes:

- *lifetime*—The amount of time to wait before the IPsec tunnel is renegotiated.

  For Digi WR devices, the default setting for *lifetime* is one hour and can be configured in the Web UI by using the **Lifetime** > **Time Threshold Max** option, or at the CLI by using the *lifetime* parameter with the ipsec command.
- *margintime*—The amount of time before the SA expires that rekeying should start.

  For Digi WR devices, *margintime* defaults to 9 minutes and can be configured at the CLI by using the *margintime* parameter with the ipsec command.
- *rekeyfuzz*—A percentage by which *margintime* is randomly increased.

  For Digi WR devices, *rekeyfuzz* is 100% and cannot be changed.

Based on the default configuration, the Digi WR device will attempt to rekey at a random time between 9 minutes (*margintime*) and 18 minutes (*margintime* multipled by the *rekeyfuzz* percentage of 100%) prior to the *lifetime* setting. This results in the Digi WR device by default attempting to rekey the SA from between 42 and 51 minutes prior to SA expiration.

This random rekey time may result in the **Rekeying In** parameter displayed by the show ipsec command randomly changing.

Note Because of the way that *lifetime* and *margintime* interact, if you reduce the *lifetime* setting, you should also reduce the *margintime* setting.

- If *lifetime* and *margintime* are set to the same amount of time, this can result in a rekey time of 0, which disables rekeying.
- If *margintime* is greater than *lifetime*, this results in unexpected and unpredictable rekey times.

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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.

Digi WR devices support **OpenVPN 2.4** in both client and server mode with the **net30**, **p2p**, and **subnet** OpenVPN topologies. The devices support **1** OpenVPN server and up to **10** OpenVPN clients.

The OpenVPN server supports the use of either an internal user list or an external RADIUS server for authentication using a username and password.

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.

Digi WR devices are compatible with OpenVPN running on Windows, Linux, and Mac OS X.

For more information on OpenVPN, see www.openvpn.net.

OpenVPN network interfaces

Digi WR devices support several named interfaces for OpenVPN. The interface for OpenVPN server is named **ovpns**. For OpenVPN clients, there are multiple interfaces named **ovpn*x***, where ***x*** is the index number for a particular OpenVPN client.

Routing (TUN) mode

There are two modes for running OpenVPN: routing mode, also known as TUN, and bridging mode, also known as TAP.

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:

OpenVPN Topology	Subnet definition method
net30	Each OpenVPN client is assigned a **/30** subnet within the IP subnet specified in the OpenVPN server configuration.
p2p	Each OpenVPN client uses a point to point link. This is not available for Windows clients.
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 more information on OpenVPN topologies, see OpenVPN topology.

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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 other OpenVPN devices.

Additional OpenVPN information

For more information on OpenVPN, see these resources:

Bridging vs. routing

OpenVPN/Routing

Configure an OpenVPN server for routing mode and certificate authentication

Required configuration items

- Enable the OpenVPN server. The OpenVPN server is disabled by default.
- The IP network of the OpenVPN server (only needed when using routing mode).
- The server certificate and private key parameters should be loaded onto the Digi WR device prior to using them. For more information on how to create private key files and certificates, see Certificate and key management. The process for loading this information onto the device varies by certificate and key type:
  - **Certificate authority (CA) certificate**: Copy the CA certificate and the CRL onto the device from the CA prior to using it.
  - **Private key and certificate**: There are two options to install a private key and certificate on the device:
    - Use the pki commands **pki privkey** and **pki csr** to generate the private key and certificate, copy the CRS to an external system to get it signed, then copy the signed certificate back onto the device.
    - Generate the private key and certificate, fully signed, on an external system and copy them onto the device. Use **pki addkey** command to import the private key into the private key store.
  - **If using a Diffie-Hellman (DH) file**: There are two options to install a DH file on the device:
    - Generate the DH file using the **pki dh-file** command on the device.
    - Generate a DH file on an external system and copy it onto the device.

Additional configuration items

A description of the OpenVPN server.

- The OpenVPN topology. By default, **net30** is used.
- A subnet mask for the network when in routing mode.
- A primary and secondary DNS server.

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- The ciphers and digest used by the OpenVPN server. For more information, see Configure ciphers and digests for use on the OpenVPN tunnel.
- The IP protocol (TCP or UDP) to use. By default, the Digi WR device uses **UDP**. This must match the IP protocol configured on the OpenVPN client.
- The TCP/UDP Port to use. By default, the device uses port **1194**.
- You can enable compression on the OpenVPN tunnel. The compression options are **LZO** and **LZ4**.

Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Server**. The **OpenVPN Server** page appears.
2. Click **Edit**. The **OpenVPN server** page displays the settings for the OpenVPN server.
3. Enter the **Connection** settings:
   - **Enable**: Enables or disables the OpenVPN server when configuration is completed.
   - **Logging Level**: The detail level of output that the OpenVPN server records in the system log. See Debug an OpenVPN tunnel for more information on logging levels.
4. Enter the **Network** settings:
   - **Network**: Enter the IP network to be used with the OpenVPN clients.
   - **Mask**: Enter the subnet mask for the IP subnet.
5. Review the **Encryption** settings and modify as needed. These settings configure the encryption protocols used with the OpenVPN tunnel.
   - **Digest**: Enter the digest to be used with the OpenVPN tunnel.
6. Enter the **Authentication** settings:
   - **Certificate authority (CA) certificate**: Enter the name of the Certificate Authority certificate to authenticate OpenVPN client certificates.
   - **Diffie-Hellman file**: Enter the name of the Diffie-Hellman file.
   - **Certificate**: Enter the name of the certificate to be used by the OpenVPN server.
   - **Private Key File**: Enter the private key file to be used by the OpenVPN server.
7. Review the **Lifetime** settings and modify as needed. These settings configure the OpenVPN tunnel keepalive and renegotiation.
8. Click **Apply**.

Command line

1. Enable the OpenVPN server.

```
digi.router> openvpn-server state on
```

2. Configure the IP network of the OpenVPN server.

```
digi.router> openvpn-server network 192.168.54.0
```


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3. (Optional) Configure the IP subnet mask of the OpenVPN server.

```
digi.router> openvpn-server mask 255.255.255.128
```

4. (Optional) Configure a primary and secondary DNS server to be used with this OpenVPN tunnel. The DNS server configuration will be pushed to the OpenVPN client. The OpenVPN client can decide how to use these values. A Digi WR OpenVPN client will ignore them.

```
digi.router> openvpn-server dns1 192.168.10.1
digi.router> openvpn-server dns2 192.168.10.2
```

5. Configure the CA certificate.

```
digi.router> openvpn-server ca cacert.pem
```

6. Configure the server certificate.

```
digi.router> openvpn-server cert ovpns.pem
```

7. Configure the server key.

```
digi.router> openvpn-server key ovpns.key
```

8. Configure the Diffie Hellman file.

```
digi.router> openvpn-server dh ovpns-dh.pem
```

9. (Optional) Configure the OpenVPN topology

```
digi.router> openvpn-server topology subnet
```

10. (Optional) Configure the IP protocol.

```
digi.router> openvpn-server protocol tcp
```

11. (Optional) Configure the TCP/UDP port.

```
digi.router> openvpn-server port 8894
```

12. (Optional) Enable compression.

```
digi.router> openvpn-server compression lzo
```

13. (Optional) Configure a description.

```
digi.router> openvpn-server description “LA OpenVPN server”
```

14. Save the configuration.

```
digi.router> save config
```


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Configure an OpenVPN server to use username and password authentication

The OpenVPN server is able to authenticate clients using username and passwords. You can configure up to **10** usernames and passwords. If you need more than **10** usernames and passwords, use RADIUS authentication instead. See Configure an OpenVPN server to use RADIUS authentication for more information.

Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Server**. The **OpenVPN Server** page appears.
2. Click **Edit**. The **OpenVPN server** page displays the settings for the OpenVPN Server.
3. Enter the **Authentication** settings:
   - **Certificate:** Enter the name of the certificate to be used by the OpenVPN server.
   - **Private Key File**: Enter the name of the private key file to be used by the OpenVPN server.
   - **Authenticate By**: Select **User name and password**.
4. Click **Apply**.
5. On the menu, click **VPN** and select **OpenVPN User Management**.
6. Click **New OpenVPN User**.
7. Enter user information:
   - **Username**: The name of the OpenVPN client.
     - Usernames can be up to **32** characters long and are case-sensitive.
     - Usernames cannot start with a number.
   - **Password/Confirm Password**: Password for the user.
8. Click **Apply**.

Command line

1. Configure the authentication mode to use username and password authentication.

```
digi.router> openvpn-server auth-by user-pass
```

2. Configure a user name and password. For example, to configure a username ny-office and password abcdefgh, the commands would be.

```
digi.router> openvpn-user 1 username ny-office
digi.router> openvpn-user 1 password abcdefgh
```

3. Save the configuration.

```
digi.router> save config
```


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Configure an OpenVPN server to use RADIUS authentication

The OpenVPN server can authenticate clients using RADIUS instead of configuring usernames and passwords on the device.

To use RADIUS, set the OpenVPN authentication mode to username and password, and configure and enable the RADIUS server and secret.

Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Server**. The **OpenVPN Server** page appears.
2. Click **Edit**. The **OpenVPN server** page displays the settings for the OpenVPN server.
3. Enter the **Authentication** settings:
   - **Auth-By**: Select **Username and password**.
   - **Radius Server State**: Enable the RADIUS server.
   - **Radius Server**: Configure the IP address or domain name of the RADIUS server.
   - **Radius Server Secret**: Configure the secret of the RADIUS server.
4. Click **Apply**.

Command line

1. Configure the authentication mode to use username and password authentication.

```
digi.router> openvpn-server auth-by user-pass
```

2. Configure OpenVPN to use RADIUS to authenticate users.

```
digi.router> openvpn-server radius-server-state on
```

3. Configure the RADIUS server address.

```
digi.router> openvpn-server radius-server 10.12.33.200
```

4. Configure the RADIUS server secret.

```
digi.router> openvpn-server radius-server-secret mysecret
```

5. (Optional) Configure the RADIUS server port. For example, to change the port to **8812**, the command is:

```
digi.router> openvpn-server radius-server-port 8812
```

6. Save the configuration.

```
digi.router> save config
```


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Configure an OpenVPN client for routing mode and certificate authentication

OpenVPN is designed to allow the OpenVPN server to push much of the OpenVPN configuration to the OpenVPN client. Therefore, client configuration is simplified.

Required configuration items

- Enable the OpenVPN client. The OpenVPN client is disabled by default.
- The IP address or domain name of the OpenVPN server.
- The client certificate and private key parameters. For more information on how to create private key files and certificates, see Certificate and key management. The server certificate and private key parameters should be loaded onto the Digi WR device prior to using them. For more information on how to create private key files and certificates, see Certificate and key management. The process for loading this information onto the device varies by certificate and key type:
  - **Certificate authority (CA) certificate**: Copy the CA certificate and the CRL onto the device from the CA prior to using it.
  - **Private key and certificate**: There are two options to install a private key and certificate on the Digi WR device:
    - Use the pki commands **pki privkey** and **pki csr** to generate the private key and certificate, copy the CRS to an external system to get it signed, then copy the signed certificate back onto the device.
    - Generate the private key and certificate, fully signed, on an external system and copy them onto the device. Use **pki addkey** command to import the private key into the private key store.

Additional configuration items

- A description of the OpenVPN client.
- The ciphers and digest used by the OpenVPN client. For more information, see Configuring ciphers and digests to be used on the OpenVPN tunnel.
- The IP protocol (TCP or UDP) to use. The default is to use **UDP**. This value must match the IP protocol configured on the OpenVPN server.
- The TCP/UDP Port to use. By default, port **1194** is used. This must match the TCP/UDP port configured on the OpenVPN server.
- The connection retry attempt period. By default, the OpenVPN client waits **5** seconds before retrying to connect to the OpenVPN server. After **5** unsuccessful attempts, the period doubles to a maximum of **300** seconds.

Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Client**. The **OpenVPN Client** page appears.
2. Click **New OpenVPN Client**. The **OpenVPN client** page displays the settings for a new OpenVPN tunnel.

3. In the **Select OpenVPN Client** setting, select a number to assign to the OpenVPN client.
4. Enter **Connection** settings:
   - **Enable**: Enables or disables the OpenVPN client when configuration is completed.
   - **Compression**: Select the compression algorithm this OpenVPN client uses to compress data channel packets. Setting the value to **any** allows the client to accept the value provided by the server.
5. Enter **Network** settings:
   - **Server**: Configure the IP address or domain name of the OpenVPN server.
6. Review **Encryption** settings and modify as needed. These settings configure the encryption protocols used with the OpenVPN tunnel.
   - **Digest**: Enter the digest to be used with the OpenVPN tunnel.
7. Enter **Authentication** settings:
   - **Certificate authority (CA) certificate**: Enter the name of the Certificate Authority certificate to authenticate OpenVPN server certificate.
   - **Certificate**: Enter the name of the certificate to be used by the OpenVPN client.
   - **Private Key File**: Enter the name of the private key file to be used by the OpenVPN client.
8. Click **Apply**.

Command line

1. Enable the OpenVPN client.

```
digi.router> openvpn-client 1 state on
```

2. Configure the IP address or the domain name of the OpenVPN server.

```
digi.router> openvpn-client 1 server 209.98.33.1
```

3. Configure the CA certificate.

```
digi.router> openvpn-client 1 ca cacert.pem
```

4. Configure the server certificate.

```
digi.router> openvpn-client 1 cert ovpnc1.pem
```

5. Configure the server key.

```
digi.router> openvpn-client 1 key ovpnc1.key
```

6. (Optional) Configure the IP protocol.

```
digi.router> openvpn-client 1 protocol tcp
```

7. (Optional) Configure the TCP/UDP port.

```
digi.router> openvpn-client 1 port 8894
```


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8. (Optional) Configure the compression algorithm this OpenVPN client uses to compress data channel packets.

```
digi.router> openvpn-client 1 compression lzo
```

9. (Optional) Configure the connection retry interval.

```
digi.router> openvpn-client 1 connect-retry 10
```

10. (Optional) Configure a description.

```
digi.router> openvpn-server description “OpenVPN to LA office”
```

11. Save the configuration.

```
digi.router> save config
```

Configure an OpenVPN client to use username and password authentication

The configuration for an OpenVPN client to username and password is similar to that of the certificate authentication but instead of configuring a certificate and key, a username and password is configured.

Note that a CA certificate is still required to validate the OpenVPN server's certificate to prevent an attacker from replacing or spoofing the server.

Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Client**. The **OpenVPN Client** page appears.
2. Click **New OpenVPN Client**. The **OpenVPN client** page displays the settings for a new OpenVPN tunnel.
3. In the **Select OpenVPN Client** setting, select a number to assign to the OpenVPN client.
4. Enter the **Connection** settings:
   - **State**: Enables or disables the OpenVPN client when configuration is completed.
5. Enter the **Network** settings:
   - **Server**: Configure the IP address or domain name of the OpenVPN server.
6. Review the **Encryption** settings and modify as needed. These settings configure the encryption protocols used with the OpenVPN tunnel.
   - **Digest**: Enter the digest to be used with the OpenVPN tunnel.
7. Enter the **Authentication** settings:
   - **Certificate authority (CA) certificate**: Enter the name of the Certificate Authority certificate to authenticate OpenVPN server certificate.
   - **Username**: Enter the username of the OpenVPN client. This must match the username configured on the OpenVPN server.
   - **Password**: Password of the OpenVPN client.
8. Click **Apply**.

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Command line

- Configure the username and password. For example, to configure the username **ny-office** and password **abcdefgh**, the commands are:

```
digi.router> openvpn-client 1 username ny_office
digi.router> openvpn-client 1 password abcdefgh
```

Configure OpenVPN TLS authentication

Transport Layer Security (TLS) authentication adds additional security to OpenVPN through the use of a pre-shared key (PSK) that is shared between the Digi WR device and an OpenVPN server or OpenVPN clients. The PSK must be generated in advance and configured on both the OpenVPN client and server. If it is changed, then it must be changed on all peers.

Key direction

OpenVPN TLS authentication configuration includes a key direction parameter, which must be the opposite between peers. For Digi WR devices, the key direction parameter is hard-coded as follows:

- **OpenVPN server**: When operating in server mode, the device has the key direction parameter set to 0. Therefore, clients connecting to the device's OpenVPN implementation must be configured with a key direction parameter of 1.
- **OpenVPN client**: When operating in client mode, the device has the direction parameter set to 1. Therefore, the OpenVPN server to which the device connects must be configured with a key direction parameter of 0.

Required configuration items

- A PSK key. See Generate the PSK.

Generate the PSK

Note You cannot generate the PSK on the Digi WR device. You will need to generate it on a PC that has OpenVPN installed, and then copy the key file to the device by using Secure Copy (SCP), SSH File Transfer Protocol (SFTP), or an SFTP application, such as FileZilla.

To generate the PSK:

1. Type the following command on a PC that has OpenVPN installed:

```
openvpn --genkey --secret ta.key
```

   This command will generate an OpenVPN static key and write it to the key file ta.key.
2. Copy the key file to the Digi WR device by using SFTP or SCP.

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Configure the device to use TLS authentication in server mode

Web

1. Copy the key file created in Generate the PSK to the device.
2. On the menu, click **Network > Networks > OpenVPN** and select **Server**.
   The **OpenVPN Server** page appears.
3. Click **Edit**.
   The **OpenVPN server** page displays the settings for the OpenVPN server.
4. Click **Authentication**.
   The **Authentication** panel appears.
5. For **TLS Authentication Key File**, enter the name of the key file.
6. Click **Apply**.

Command line

1. Copy the key file created in Generate the PSK to the device.
2. Type the following at the device's command prompt:

   ```
   digi.router> openvpn-server n tls-auth keyfile
   ```

   For example:

   ```
   digi.router> openvpn-server 1 tls-auth ta.key
   ```

3. Save the configuration:

   ```
   digi.router> save config
   ```

Configure the Digi WR device to use TLS authentication in client mode

Web

1. Copy the key file created in Generate the PSK to the Digi WR device.
2. On the menu, click **Network > Networks > OpenVPN** and select **Client**.
   The **OpenVPN Client** page appears.
3. Click **New OpenVPN Client** or select an existing OpenVPN client and click **Edit**.
   The **OpenVPN client** page displays the settings for the OpenVPN client.
4. Click **Authentication**.
   The Authentication panel appears.
5. For **TLS Authentication Key File**, enter the name of the key file.
6. Click **Apply**.

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Command line

1. Copy the key file created in Generate the PSK to the Digi WR device.
2. Type the following at the device's command prompt:

```
digi.router> openvpn-client n tls-auth keyfile
```

For example:

```
digi.router> openvpn-client 1 tls-auth ta.key
```

3. Save the configuration:

```
digi.router> save config
```

Configure ciphers and digests for use on the OpenVPN tunnel

By default, the OpenVPN server negotiates with the OpenVPN client the cipher that will be used to encrypt data being sent over the OpenVPN tunnel. The ciphers that will be used for the negotiation can be configured as a list. In order for the negotiation to be successful, the OpenVPN client's cipher list must include the first cipher in the OpenVPN server's cipher list. OpenVPN clients that do not support cipher negotiation can use any cipher in the OpenVPN server's cipher list to connect.

To force the OpenVPN client or server to use a specific cipher, only the desired cipher should be configured in the list.

By default, the OpenVPN client and server support the following ciphers for negotiation:

- AES 128 CBC
- AES 192 CBC
- AES 256 CBC
- AES 128 GCM
- AES 192 GCM
- AES 256 GCM

When using CBC encryption algorithms, the OpenVPN client and server will also use a digest to authenticate the data sent over the OpenVPN tunnel. The digest configured on the OpenVPN client must match the digest configured on the OpenVPN server.

By default, the OpenVPN client and server will use **SHA1** for authentication.

The digest is not used when a **GCM** encryption algorithm is in use, since GCM encryption includes built-in digest functionality.

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Web

For OpenVPN Server

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Server**. The **OpenVPN Server** page appears.
2. Click **Edit**. The **OpenVPN server** page displays the settings for the OpenVPN Server.
3. Enter the **Encryption** settings:
   - **Cipher**: Select the desired ciphers that the OpenVPN can use for an OpenVPN tunnel.

   Note The order of the ciphers is important for cipher negotiation. The first cipher in the list will be used if both the OpenVPN client and server support cipher negotiation.
4. Click **Apply**.

For OpenVPN Clients

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Client**. The **OpenVPN Client** page appears.
2. Select the required OpenVPN client.
3. Click **Edit**. The **OpenVPN client** page displays the settings for the OpenVPN client.
4. Enter the **Encryption** settings:
   - **Cipher**: Select the desired ciphers that the OpenVPN can use for an OpenVPN tunnel.
5. Click **Apply**.

Command line

For OpenVPN Server and Clients

1. For the OpenVPN server, the command to configure the list of ciphers is **openvpn-server cipher**. For example, to configure the OpenVPN server to use either **AES 128 GCM** for cipher negotiation or allow **AES 256 GCM** cipher for OpenVPN clients that don't support cipher negotiation, the command is:

```
digi.router> openvpn-server cipher aes-128-gcm,aes-256-gcm
```

2. For the OpenVPN server, the command to configure the digest is **openvpn-server digest**. For example, the command to configure the OpenVPN server to use **SHA256**, the command would be:

```
digi.router> openvpn-server digest sha256
```

3. For the OpenVPN client, the command to configure the list of ciphers is **openvpn-client *x* cipher**. For example, to configure the OpenVPN client 1 to use AES 256 GCM cipher only, the command would be:

```
digi.router> openvpn-client 1 cipher aes-256-gcm
```

4. For the OpenVPN client, the command to configure the digest is **openvpn-client *x* digest**. For example, the command to configure the OpenVPN client **1** to use **SHA256**, the command would be:

```
digi.router> openvpn-client 1 digest sha256
```


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5. Save the configuration on the OpenVPN client and/or server.

```
digi.router> save config
```

Configure keepalive messages on the OpenVPN tunnels

You can configure keepalive message to be sent periodically to detect whether the OpenVPN tunnel is operational.

If there are no keepalive messages received for a configurable amount of time, the OpenVPN tunnel is brought down and then renegotiated.

The keepalive interval and timeout is only configured on the OpenVPN server and is pushed up to the OpenVPN client during the tunnel negotiation. The OpenVPN server automatically doubles the configured keepalive timeout to ensure that the OpenVPN client times out first.

By default, a keepalive message will be sent by the OpenVPN client every **30** seconds and by the OpenVPN server every **60** seconds. The OpenVPN client will drop and renegotiate the tunnel if it does not receive a keepalive message for **150** seconds. The OpenVPN server will drop and renegotiate after **300** seconds.

 Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Server**. The **OpenVPN Server** page appears.
2. Click **Edit**. The **OpenVPN server** page displays the settings for the OpenVPN server.
3. Enter the **Lifetime** configuration:
   - **Keepalive Interval (Seconds)**: The interval at which keepalive messages are sent by the OpenVPN client. Keepalive messages are sent by the OpenVPN server at twice the interval.
   - **Keepalive Timeout (Seconds)**: The OpenVPN tunnel will be brought down and renegotiated if no messages have been received for the configured timeout.
4. Click **Apply**.

 Command line

1. Configure the keepalive interval.

```
digi.router> openvpn-server keepalive-interval 10
```

2. Configure the keepalive timeout.

```
digi.router> openvpn-server keepalive-timeout 60
```

3. Save the configuration.

```
digi.router> save config
```


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Configure renegotiation on the OpenVPN tunnels

The OpenVPN server can be configured to automatically renegotiate the OpenVPN tunnel after a specific amount of time or after a specific amount of data has been sent over the OpenVPN tunnel. The purpose of this renegotiation is to reduce the risk of the negotiated keys from becoming compromised from overuse.

Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Server**. The **OpenVPN Server** page appears.
2. Click **Edit**. The **OpenVPN server** page displays the settings for the OpenVPN server.
3. Enter the **Lifetime** configuration:
   - **Time Until Tunnel Renegotiation (Seconds)**: OpenVPN tunnels are renegotiated after the tunnel has been up for the configured amount of time.
   - **Bytes Until Tunnel Renegotiation**: OpenVPN tunnels are renegotiated after the tunnel has had the configured amount of traffic sent over it.
4. Click **Apply**.

Command line

1. To configure the amount of data to be sent before renegotiating, the command is **openvpn-server reneg-bytes**. For example, the renegotiate the OpenVPN tunnel after **32 MB** of data has been sent, the command is:

```
digi.router> openvpn-server reneg-bytes 33554432
```

2. To configure the amount of time before renegotiating, the command is **openvpn-server reneg-sec**. For example, to renegotiate the OpenVPN tunnel after **2** hours have passed, the command is:

```
digi.router> openvpn-server reneg-sec 7200
```

3. Save the configuration.

```
digi.router> save config
```


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Configure pushing routes to OpenVPN clients

The OpenVPN server can push route information to the OpenVPN client so that the client automatically learns routes to networks on the OpenVPN server LAN interfaces.

Configuring the routes on the OpenVPN server involves configuring the destination network and mask for each route.

Web

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Route Management**. The **OpenVNP Route Management** page appears.
2. Click ✚ (Add Rule) to create a new route.
3. Enter the route **Destination** and **Mask**.
4. Click **Apply**.

Command line

1. OpenVPN routes are configured using the **openvpn-route** command. For example to configure routes for **10.123.1.0/24** and **10.222.33.0/24** networks, the commands are:

```
digi.router> openvpn-route 1 destination 10.123.1.0
digi.router> openvpn-route 1 mask 255.255.255.0
digi.router> openvpn-route 2 destination 10.222.33.0
digi.router> openvpn-route 2 mask 255.255.255.0
```

2. Save the configuration.

```
digi.router> save config
```

Configure an OpenVPN client and server for bridge mode

The configuration for the bridge mode is the same as with routing mode except for the following differences:

- The OpenVPN server is not configured with an IP network or mask.
- A LAN interface is assigned to the OpenVPN server.
- A LAN interface is assigned to the OpenVPN client.

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Web

For OpenVPN server

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Server**. The **OpenVPN Server** page appears.
2. Click **Edit**. The **OpenVPN server** page displays the settings for the OpenVPN server.
3. Enter the **Network** settings:
   - **Bridge Mode**: Select the LAN interface to be bridged with the OpenVPN clients.
4. Click **Apply**.

For OpenVPN clients

1. On the menu, click **Network > Networks > OpenVPN** and select **OpenVPN Client**. The **OpenVPN Client** page appears.
2. Select the required OpenVPN client.
3. Click **Edit**. The **OpenVPN client** page displays the settings for the OpenVPN client.
4. Enter the **Network** settings:
   - **Bridge Mode**: Select the LAN interface to be bridged with the OpenVPN server.
5. Click **Apply**.

Command line

1. Configure the LAN interface to be assigned with the OpenVPN server.

```
digi.router> openvpn-server bridge-mode lan1
```

2. Configure the LAN interface to be assigned with the OpenVPN client.

```
digi.router> openvpn-client 1 bridge-mode lan1
```

3. Save the configuration on the OpenVPN client and/or server.

```
digi.router> save config
```


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Show OpenVPN server status and statistics

You can view status and statistics for OpenVPN servers from either the web interface or the command line:

Web

- On the menu, click **Network > Networks > OpenVPN** > **Server**.

Command line

Enter the show openvpn-server command. For example:

```
digi.router> show openvpn-server

 OpenVPN Server Status
 ---------------------
 Description      : VPN server for remote employees
 Admin Status     : Up
 Oper Status      : Up
 Interface        : ovpns
 IP Address       : 10.8.0.1
 Mask             : 255.255.255.0
 MTU              : 1500

                          Received                Sent
                          --------                ----
 Interface Packets  :            4                   4
 Interface Bytes    :          288                 288

 Connected Client          Real Address   Virtual Address      Bytes Received       Bytes Sent  Connected Since
 ------------------------------------------------------------------------------------------------------------
 client                    203.0.113.3    10.8.0.2            23550                4189  Thu Aug  3 17:12:21 2017

digi.router>
```

Show OpenVPN client status and statistics

You can view status and statistics for OpenVPN clients from either web interface or the command line:

Web

1. On the menu, click **Network** > **Networks** > **OpenVPN** > **Client**.
2. Select the appropriate OpenVPN client.

Command line

Display all enabled OpenVPN clients

The **show openvpn-client** command displays a summary of the OpenVPN clients configured on the device.

```
digi.router> show openvpn-client

 #  Status  Remote Server    IP Address      Mask             Description
 ------------------------------------------------------------------------
 1  Up      203.0.113.3      10.8.0.2        255.255.255.0    VPN to main office

digi.router>
```


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Display detailed status information for an OpenVPN client

Enter the show openvpn-client ***x*** command, where ***x*** is the index number of the client, from the first column of summary show openvpn-client command output. For example:

```
digi.router> show openvpn-client 1

 OpenVPN Client Status
 ---------------------
 Description      : VPN connection to main office
 Admin Status     : Up
 Oper Status      : Up
 Remote Server    : 203.0.113.3
 Interface        : ovpn1
 IP Address       : 10.8.0.2
 Mask             : 255.255.255.0
 MTU              : 1500

                                 Received                 Sent
                                 --------                 ----
 Interface Packets  :                  13                    9
 Interface Bytes    :                 940                  684
 Socket Bytes       :                5201                 4908

digi.router>
```

Debug an OpenVPN tunnel

You can enable debugging on an OpenVPN server or on a specific OpenVPN client. When enabled, debugging messages display in the system log.

Enabling debugging is done by changing the logging level for messages on the OpenVPN server and the OpenVPN client. There are four logging levels, from **0** to **4**. Set this parameter to **0** to record only errors and warnings, and set it to **4** to record fairly complete log activity to help debug an OpenVPN tunnel.

Web

1. On the menu, click **Network** > **Networks** > **OpenVPN** > **Server**.
   The **OpenVPN Server** page appears.
2. Click **Edit**.
3. Set the **Logging Level** to **3**.
4. Click **Apply**.
5. On the menu, click **Network** > **Networks** > **OpenVPN** > **Client**.
   The **OpenVPN Client** page appears.
6. Select the OpenVPN client to configure.
7. Set the Logging Level to **3**.
8. Click **Apply**.

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Command line

Enable display and logging of debugging messages on an OpenVPN server

To enable display and logging of debugging messages on an OpenVPN server, the command is **openvpn-server verb *n***, where ***n*** is the verbosity level for debugging messages. This value can range from **0**, which disables debugging messages, to **4**, the most detail. For example to set the verbosity level to 3:

```
openvpn-server verb 3
```

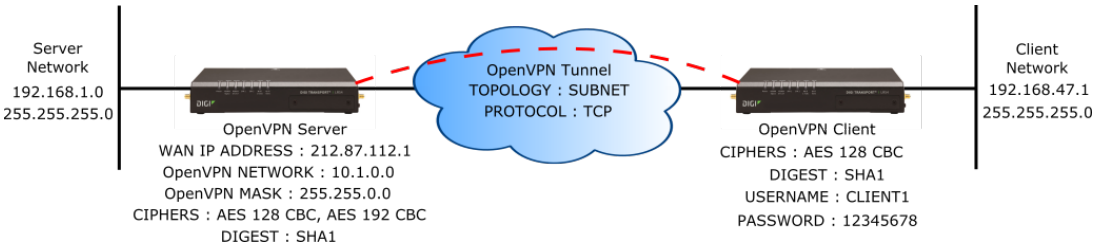
Enable display and logging of debugging messages on an OpenVPN client

To enable display and logging of debugging messages on an OpenVPN client, the command is **openvpn-client x verb *n***, where **n** is the verbosity level for debugging messages, again ranging from **0** to **4**. For example:

```
openvpn-client 1 verb 3
```

Example: OpenVPN tunnel in routing mode with username and password authentication

The following figure shows a sample OpenVPN tunnel in routing mode with username and password authentication:



The configuration settings for the OpenVPN client and server are as follows:

OpenVPN server configuration

```
openvpn-server state on
openvpn-server topology subnet
openvpn-server protocol tcp
openvpn-server network 10.1.0.0
openvpn-server mask 255.255.0.0
openvpn-server cipher aes-128-cbc,aes-192-cbc
openvpn-server digest sha1
openvpn-server auth-by user-pass
openvpn-server cert ovpns.crt
openvpn-server key ovpns.key

# Client's username and password
openvpn-user 1 username client1
openvpn-user 1 password 12345678

# Route to server's LAN to be pushed to client
openvpn-route 1 destination 192.168.1.0
openvpn-route 1 mask 255.255.255.0
```

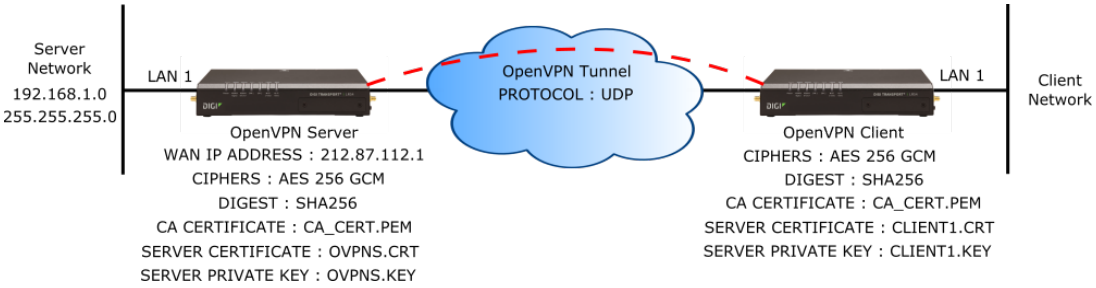

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OpenVPN client configuration

```
openvpn-client 1 state on
openvpn-client 1 server 212.87.112.1
openvpn-client 1 protocol tcp
openvpn-client 1 cipher aes-128-cbc
openvpn-client 1 digest sha1
openvpn-client 1 ca ca.crt
openvpn-client 1 username client1
openvpn-client 1 password 12345678
```

Example: OpenVPN tunnel in bridging mode using certificate authentication

The following figure shows a sample OpenVPN tunnel in bridging mode using certificate authentication:



The configuration settings for the OpenVPN client and server are as follows:

OpenVPN server configuration

```
openvpn-server state on
openvpn-server bridge-mode lan1
openvpn-server protocol udp
openvpn-server cipher aes-256-gcm
openvpn-server auth-by certificate
openvpn-server ca ca_cert.pem
openvpn-server cert ovpns.crt
openvpn-server key ovpns.key
openvpn-server dh ovpns-dh.pem
```

OpenVPN client configuration

```
openvpn-client 1 state on
openvpn-client 1 server 212.87.112.1
openvpn-client 1 bridge-mode lan1
openvpn-client 1 protocol udp
openvpn-client 1 cipher aes-256-gcm
openvpn-client 1 ca ca.crt
openvpn-client 1 cert client1.crt
openvpn-client 1 key client1.key
```


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Generic Routing Encapsulation (GRE)

Generic Routing Encapsulation (GRE) is an IP packet encapsulation protocol. 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

- GRE tunnel configuration:
  - Enable the GRE tunnel.

    The GRE tunnels are disabled by default.
  - The IP address or domain name of the remote device/peer.
  - The GRE network IP address and mask.
- IP routes and filters:

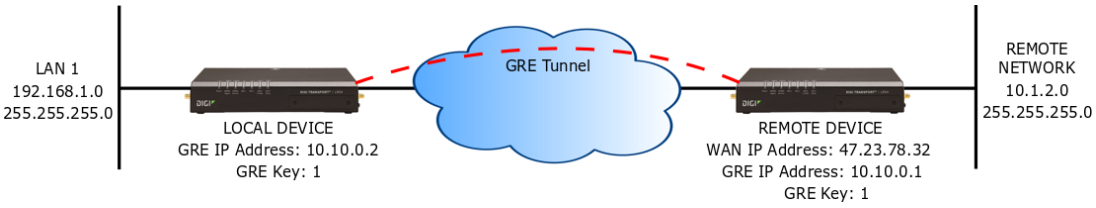
  IP routes and filters are not set up automatically, because the specific local and remote networks need to be configured.
  - A route for each remote network to be accessed via the GRE tunnel.
  - An IP forwarding filter for each local LAN network.

Additional configuration items

- A description for the GRE tunnel.
- A GRE key.

Example GRE tunnel

In the following example, a GRE tunnel is created between a local device with the GRE IP address of 10.10.0.2 and a remote device with a WAN IP address of 47.23.78.32 and a GRE address of 10.10.0.1:



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Web

Configure a new GRE tunnel

1. On the menu, click **Network > Services > GRE**.
   The **GRE** page appears.
2. Click **New GRE tunnel**.
3. Configure the GRE tunnel:
   a. **Select Tunnel**: Select the number for the GRE tunnel.
   b. **Enable**: Enables or disables the GRE tunnel.
   c. **Description**: (Optional) Enter a description for the GRE tunnel.
   d. **IP Address**: Enter the IP address of the GRE tunnel.
   e. **Subnet Mask**: Enter the IP network mask of the GRE tunnel.
   f. **Peer**: Enter the IP address or domain name of the remote device.
   g. **Key**: Enter the key for the GRE tunnel.
   See New GRE tunnel page for further information about these fields.
4. Click **Apply**
5. Add a route for the remote network.
   IP routes are configured via the Web using the appropriate CLI commands from the **Device Console**:
   a. On the menu, click **System** > **Administration** > **Device Console**.
   b. At the command prompt in the **Device Console**, type the IP route settings commands. For example:

```
digi.router> route 1 destination 10.1.2.0
digi.router> route 1 mask 255.255.255.0
digi.router> route 1 interface gre1
```

   For more information, see the route command.
6. Add an IP filter to allow packets to be forwarded to the local network:
   a. On the menu, click **Security** > **Firewall** > **Routing IP Filters**.
   b. Within the **Routing IP Filters** section, click ✚ (Add Filter) to create a new filter.
      i. **Enable**: Enables or disables the IP filter.
      ii. **Description**: (Optional) Enter a description for the GRE tunnel.
      iii. **Action**: ACCEPT.
      iv. **Source**: Select the appropriate GRE tunnel, for example, **GRE tunnel 1**.
      v. **Protocol**: Any.
      vi. Click **OK**.

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Modify an existing GRE tunnel

1. On the menu, click **Network > Services > GRE**.
   The **GRE** page appears.
2. Click to expand an existing GRE tunnel.
3. Modify the GRE tunnel settings as needed.
4. Click **Apply**

Command line

To create a GRE tunnel, use the gre command. For example:

1. Configure the GRE tunnel peer IP address or domain name:

```
digi.router> gre 1 peer 47.23.78.32
```

2. Configure the GRE tunnel IP address and mask:

```
digi.router> gre 1 ip-address 10.10.0.2
digi.router> gre 1 mask 255.255.255.252
```

3. (Optional) Configure the GRE key:

```
digi.router> gre 1 key 1
```

4. Enable the GRE tunnel by setting the state to on:

```
digi.router> gre 1 state on
```

5. Add a route for the remote network:

```
digi.router> route 1 destination 10.1.2.0
digi.router> route 1 mask 255.255.255.0
digi.router> route 1 interface gre1
```

   For more information, see the route command.

6. Add an IP filter to allow packets to be forwarded to the local network:

```
digi.router> ip-filter 1 description “Forward rule for GRE 1”
digi.router> ip-filter 1 src gre1
digi.router> ip-filter 1 dst lan1
digi.router> ip-filter 1 protocol any
digi.router> ip-filter 1 state on
```

   For more information, see the ip-filter command.

7. Save the configuration:

```
digi.router> save config
```


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Show GRE tunnels

To view information about currently configured GRE tunnels:

Web

1. On the menu, click **Network > Services > GRE**.
   The **GRE** page appears.
2. To view configuration details about a GRE tunnel, click to expand the GRE tunnel.

Command line

The show gre command displays the status and statistics of the GRE tunnels. To display detailed status and information for all configured GRE tunnels, type **show gre** without parameters:

```
digi.router> show gre

#   Status   IP Address        Mask              Description
------------------------------------------------------------
1   Up       10.10.0.2         255.255.255.252
digi.router>
```

To display detailed status and statistics for a particular GRE tunnel, specify the tunnel number with the **show gre** command:

```
digi.router> show gre 1

GRE 1 Status and Statistics
---------------------------
Admin Status : Up
Oper Status  : Up

IPv4 Address : 10.10.0.2
Mask         : 255.255.255.252
Peer         : 37.85.231.45
Key          : 1

Received            Sent
--------            ----
Packets             55              54
Bytes             4620            3456

digi.router>
```


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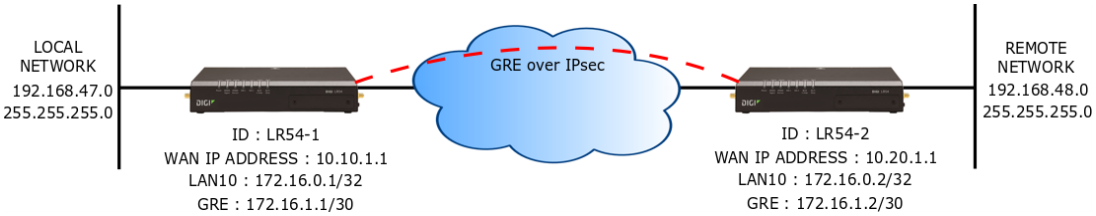
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Example: GRE tunnel over an IPSec tunnel

In order to support GRE over an IPsec tunnel, a LAN interface needs to be configured on each device. The LAN interface will have an IP address and no interfaces. These LAN interfaces are then configured as the IPsec local and remote networks, and as the GRE peers.

In the following example, LAN 10 is being used.



Web

Example configuration steps for the first device:

1. Configure the LAN 10 interface:
   a. On the menu, click **Network** > **Networks** > **LANs**.
   b. Click **New Network**.
   c. For **Select Network**, select 10.
   d. In the **IPv4** group, set the IP address and netmask, for example:
      - **IP Address**: 172.168.0.1
      - **Netmask**: 255.255.255.255
   e. Expand the **DHCP Server** group and disable the DHCP server.
   f. Click **Apply**.
2. Configure the IPsec tunnel:
   a. On the menu, click **Network**> **Networks** > **IPsec**.
   b. Click **New IPsec Tunnel**.
   c. Complete the following fields:
      - **IPsec Pre-Shared Key**: key
      - **Local IP Network**: LAN 10
      - **Local Identifier**: lr54-1
      - **Remote Peer IP Address or Name:** 10.20.1.1
      - **Remote IP Network**: 172.168.0.2
      - **Remote IP Network Mask**: 255.255.255.255
      - **Remote Identifier**: lr54-2
   d. Click **Apply**.
3. Configure the GRE tunnel:
   a. On the menu, click **Network** > **Services** > **GRE**.
   b. Click **New GRE Tunnel**.

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c. Complete the following fields:
   - **Select Tunnel**: 1
   - **Enable**: On
   - **IP Address**: 172.168.1.1
   - **Subnet Mask**: 255.255.255.252
   - **Peer:** 172.168.0.2

d. Click **Apply**.

4. Add a route for the remote LAN 1 network:
   a. On the menu, click **System** > **Administration** > **Device Console**.
   b. At the command prompt in the **Device Console**, type the following:

```
digi.router> route 1 destination 192.168.48.0
digi.router> route 1 mask 255.255.255.0
digi.router> route 1 interface gre1
```

5. Add a filter to allow data from the remote network to be forwarded to LAN 1:
   a. On the menu, click **Security** > **Firewall** > **Routing IP Filters**.
   b. Within the **Routing IP Filters** section, click ✚ (Add Filter) to create a new filter and complete the following:
      - **Enable**: On.
      - **Action**: ACCEPT.
      - **Source**: GRE tunnel 1.
      - **Protocol**: Any.
      - Click **OK**.

Example configuration steps for the second device:

1. Configure the LAN 10 interface:
   a. On the menu, click **Network** > **Networks** > **LANs**.
   b. Click **New Network**.
   c. For **Select Network**, select 10.
   d. In the **IPv4** group, set the IP address and netmask, for example:
      - **IP Address**: 172.168.0.2
      - **Netmask**: 255.255.255.255
   e. Expand the **DHCP Server** group and disable the DHCP server.
   f. Click **Apply**.
2. Configure the IPsec tunnel:

   Note This example uses the default authentication and encryption options.

   a. On the menu, click **Network**> **Networks** > **IPsec**.
   b. Click **New IPsec Tunnel**.
   c. Complete the following fields:

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- **IPsec Pre-Shared Key**: key
- **Local IP Network**: LAN 10
- **Local Identifier**: lr54-2
- **Remote Peer IP Address or Name:** 10.10.1.1
- **Remote IP Network**: 172.168.0.1
- **Remote IP Network Mask**: 255.255.255.255
- **Remote Identifier**: lr54-1

d. Click **Apply**.

3. Configure the GRE tunnel:
   a. On the menu, click **Network** > **Services** > **GRE**.
   b. Click **New GRE Tunnel**.
   c. Complete the following fields:
      - **Select Tunnel**: 1
      - **Enable**: On
      - **IP Address**: 172.168.1.2
      - **Subnet Mask**: 255.255.255.252
      - **Peer:** 172.168.0.1

   d. Click **Apply**.
4. Add a route for the remote LAN 1 network:
   a. On the menu, click **System** > **Administration** > **Device Console**.
   b. At the command prompt in the **Device Console**, type the following:

```
digi.router> route 1 destination 192.168.47.0
digi.router> route 1 mask 255.255.255.0
digi.router> route 1 interface gre1
```

5. Add a filter to allow data from the remote network to be forwarded to LAN 1:
   a. On the menu, click **Security** > **Firewall** > **Routing IP Filters**.
   b. Within the **Routing IP Filters** section, click ✚ (Add Filter) to create a new filter and complete the following:
      - **Enable**: On.
      - **Action**: ACCEPT.
      - **Source**: GRE tunnel 1.
      - **Protocol**: Any.
      - Click **OK**.

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Command line

Example configuration steps for the first device:

1. Configure the LAN 10 interface:

```
digi.router> lan 10 ip-address 172.168.0.1
digi.router> lan 10 mask 255.255.255.255
digi.router> lan 10 state on
```

2. Configure the IPsec tunnel:

```
digi.router> ipsec 1 peer 10.20.1.1
digi.router> ipsec 1 local-id lr54-1
digi.router> ipsec 1 local-network 172.168.0.1
digi.router> ipsec 1 local-mask 255.255.255.255
digi.router> ipsec 1 remote-id lr54-2
digi.router> ipsec 1 remote-network 172.168.0.2
digi.router> ipsec 1 remote-mask 255.255.255.255
digi.router> ipsec 1 psk key
digi.router> ipsec 1 state on
```

3. Configure the GRE tunnel:

```
digi.router> gre 1 ip-address 172.168.1.1
digi.router> gre 1 mask 255.255.255.252
digi.router> gre 1 peer 172.168.0.2
digi.router> gre 1 state on
```

4. Add a route for the remote LAN 1 network:

```
digi.router> route 1 destination 192.168.48.0
digi.router> route 1 mask 255.255.255.0
digi.router> route 1 interface gre1
```

5. Add a filter to allow data from the remote network to be forwarded to LAN 1:

```
digi.router> ip-filter 1 src gre1
digi.router> ip-filter 1 dst lan1
digi.router> ip-filter 1 protocol any
digi.router> ip-filter 1 state on
```

6. Save the configuration:

```
digi.router> save config
```

Example configuration steps for the second device:

1. Configure the LAN 10 interface:

```
digi.router> lan 10 ip-address 172.168.0.2
digi.router> lan 10 mask 255.255.255.255
digi.router> lan 10 state on
```

2. Configure the IPsec tunnel:

Note This example uses the default authentication and encryption options.

```
digi.router> ipsec 1 peer 10.10.1.1
digi.router> ipsec 1 local-id lr54-2
digi.router> ipsec 1 local-network 172.168.0.2
digi.router> ipsec 1 local-mask 255.255.255.255
digi.router> ipsec 1 remote-id lr54-1
digi.router> ipsec 1 remote-network 172.168.0.1
digi.router> ipsec 1 remote-mask 255.255.255.255
digi.router> ipsec 1 psk key
digi.router> ipsec 1 state on
```

3. Configure the GRE tunnel:

```
digi.router> gre 1 ip-address 172.168.1.2
digi.router> gre 1 mask 255.255.255.252
digi.router> gre 1 peer 172.168.0.1
digi.router> gre 1 state on
```

4. Add a route for the remote LAN 1 network:

```
digi.router> route 1 destination 192.168.47.0
digi.router> route 1 mask 255.255.255.0
digi.router> route 1 interface gre1
```

5. Add a filter to allow data from the remote network to be forwarded to LAN 1:

```
digi.router> ip-filter 1 src gre1
digi.router> ip-filter 1 dst lan1
digi.router> ip-filter 1 protocol any
digi.router> ip-filter 1 state on
```

6. Save the configuration:

```
digi.router> save config
```


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System settings

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Configure system settings

The Digi WR device has several system settings that control the general behavior of the device and information displayed about the device.

Web

On the menu, click **System > Administration**. System options include the following:

- **Remote Manager**: Configures the connection to Digi Remote Manager. See Remote Manager.
- **File System**: Displays the local file system for the device and allows you to perform file management operations. See File system.
- **Device Console**: Opens the Device Console, from which you can execute commands. See Execute a command from the web interface.
- **Logs**: Displays the event and system logs. See Logs.
- **Firmware Update**: Updates operating system firmware and other device firmware. See Update system firmware.
- **Reboot**: Reboots the device. See Reboot the device.

Command line

Use the system command to configure the following system options:

- **System prompt for CLI:** The default system prompt is **digi.router>**. You can configure the system prompt to be any value of up to **16** characters. To use the device's serial number in the system prompt, include **%s** in the **prompt** parameter value. For example, a **prompt** parameter value of **LR54_%s** resolves to **LR54_LR123456**.
- **CLI timeout:** This is the time, in seconds, after which the command-line interface times out if there is no activity. The default is **180** seconds. You can specify any value between **60** and **3600** seconds.
- **Minimum event level to log:** The minimum event level that is logged in the event log. The default value is **info**, but you can also set the event level to the following levels: **emergency**, **alert**, **critical**, **error**, **warning**, **notice**, or **debug**. For more information on the event log, see Logs, Event log levels, and Configure options for event and system logs.
- **Name:** The name of this device.
- **Location:** The location of this device.
- **Contact:** Contact information for this device.
- **Default page size:** The page size for command-line interface output; that is, the number of lines of output displayed. The default value is **40**. You can set the page size to any value between **0** and **100**.
- **Device-specific passwords:** Encrypted passwords can be device-specific or not. When encrypted passwords are device-specific, they are more secure, but cannot be copied onto another device. By default, device-specific passwords are disabled, but you can enable them if required.
- **Description:** A description of this device.

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- **TCP passthrough port:** By default, passthrough mode is disabled, but you can enable it by setting a TCP port of any value but **0**. A reboot is required for changes to this setting to take effect.
- **Getting Started Wizard:** By default, the Getting Started Wizard is enabled to start up at system startup, to perform initial device configuration. You can disable the wizard so it is skipped at system startup.
- **IPsec debugging messages:** These messages help diagnose issues with IPsec configuration and interoperability. The default setting for IPsec debugging messages is off, but you can enable them as needed. For more information on IPsec debugging, see Debug an IPsec configuration.

Command-line examples

- Change the system prompt.

```
digi.router> system prompt "LR54_%s"
digi.router> save config
```

- Set the command-line interface timeout. For example, to set the timeout to 60 seconds, enter:

```
digi.router> system timeout 60
digi.router> save config
```

- Configure the event log level. For example, to set the event log level to **warning**, enter:

```
digi.router> system log-level warning
digi.router> save config
```

- Set the page size for command-line interface output. For example, to set the output to **30** lines:

```
digi.router> system page 30
digi.router> save config
```

- Disable the Getting Started Wizard.

```
digi.router> system wizard off
digi.router> save config
```


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Show system information

You can view the system information from either the Dashboard of the Web interface, or from the command line:

Web

1. On the menu, click **Dashboard**.
2. In the **Device** section of the dashboard, view the system information. For descriptions of these fields, see the show system command description.

Command line

To show system information, use the show system command. For example:

```
digi.router> show system

 Model              : LR54W
 Part Number        : LR54-AW401
 Serial Number      : LR000130

 Hardware Version   : 50001899-03 A
 Using Bank         : 0
 Firmware Version   : 1.0.0.3-90c4383 06/19/16 20:31:29
 Bootloader Version: v1.0.0.2
 Using Config File : config.da0

 Uptime             : 4 Hours, 59 Minutes, 4 Seconds
 System Time        : 20 June 2016, 13:01:04

 CPU                : 3% (min 1%, max 60%, avg 2%)
 Temperature        : 33C

 Description        :
 Location           :
 Contact            :

digi.router>
```


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System date and time

Configuring your device to use an accurate date and time is important for various functions that the device performs, such as validating certificates, and using accurate timestamps on events in the event log. The device has three different mechanisms for configuring and maintaining accurate system time:

- NTP server: In this configuration, the device acts as an NTP server for hosts that are attached to the device's Local Area Networks. The attached hosts can synchronize their system date and time to the device's NTP server, while the device itself synchronizes its system date and time using one of two mechanisms:
  - GNSS.
  - One or more upstream NTP servers.

  See Network Time Protocol for further information.
- SNTP client: In this configuration, the device synchronizes its system date and time to an NTP server.

  See Network Time Protocol for further information.
- Manual configuration of the device's system date and time. See Set the date and time manually.

Additionally, you can optionally configure the system's time zone and Daylight Savings Time settings. See Set the time zone and Daylight Saving Time .

To show the system date and time, see Show system date and time.

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. Synchronizing your device to an NTP server is important for various functions, such as validating certificates and timestamps on events in the event log. The Digi WR device supports two implementations of Network Time Protocol (NTP):

- NTP server — The device functions as an NTP server, allowing hosts that are attached to the device's Local Area Networks to synchronize with the device. See Configure the device as an NTP server for information about configuring your device as an NTP server.
- SNTP client — The device is synchronized with an NTP server, but does not function as an NTP server itself. See Configure the device as an SNTP client for information about configuring your device as an NTP server.

Configure the device as an NTP server

Required Configuration Items

- The synchronization source, either GNSS, or at least one upstream NTP server.

Additional Configuration Options

- If the synchronization source is NTP servers, additional NTP servers for synchronization (up to a total of four servers).
- One or more configured LAN interfaces to accept NTP requests from.

This functionality is not available from the Web UI.

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Command line

1. Configure the synchronization source:

```
digi router> ntp 1 source value
digi router>
```

where *value* is either:

- **gnss** — Uses the device's GNSS module to as the synchronization source.
- **servers** — Uses upstream NTP servers.

2. If the synchronization source is set to **servers**, configure the external NTP server that the Digi WR device will use for system date and time synchronization.

```
digi.router> ntp 1 server1 0.time.devicecloud.com
digi router>
```

This can be repeated for up to four servers. For example:

```
digi.router> ntp 1 server2 1.time.devicecloud.com
digi router>
```

3. Select the LAN interfaces from which the device will accept incoming NTP synchronization requests. This is a comma-separated list:

```
digi.router> ntp 1 interfaces lan1,lan2
digi router>
```

4. Enable the NTP server:

```
digi.router> ntp 1 state on
digi router>
```

5. Save the configuration:

```
digi.router> save config
digi router>
```


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Show NTP server status and statistics

Command line

Display basic information about the NTP server configuration:

```
digi.router> ntp

ntp 1:
interfaces                lan1,lan2
server1                   0.time.devicecloud.com
server2                   1.time.devicecloud.com
server3
server4
source                    servers
state                     on

digi router>
```

Display detailed status and statistics for the NTP server configuration:

```
digi.router> show ntp


NTP Server
----------
Admin Status        : Up
Sync Status         : Up
Interfaces          : lan1,lan2

Remote           Refid        St T  When Poll  Reach   Delay  Offset
Jitter
------------------------------------------------------------------------------
--
*0.time.digi.com  129.6.15.32   2 u     1   64      1  31.456   9.651
0.061
+ec2-35-164-164-  132.163.96.5  1 u    62   64     17  24.576   1.171
9.514

digi.router>
```

Where:

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- **Admin Status** — Indicates whether the NTP server is sufficiently configured to be functional.
- **Sync Status** — Indicates whether the NTP server has successfully synced with an upstream peer.
- **Interfaces** — Lists the LAN interfaces that the NTP server is serving.
- **Remote**
  - If the synchronization source is GNSS, lists the shared memory (SHM) device being used.
  - If the synchronization source is NTP servers, lists the URL of the NTP peer from reverse DNS lookup. The URL is preceded by a special character, called the "tally code," which represents the current state of the NTP peer:
    - **space** character — The server is not being used (the server may be unreachable, forms a synchronization loop with the device, or there is too much distance for accurate synchronization).
    - **x** — The NTP server is not being used (falseticker).
    - **.** — The NTP server is not being used (sync distance).
    - **-** — The NTP server is not being used (outlier).
    - **+** — The NTP server is a candidate for the combining algorithm.
    - **#** — The NTP server could be used.
    - ***** — The NTP server is NTP system peer.
    - **o** — The NTP server is NTP system peer (pulse-per-second (PPS) signal).
- **Refid**
  - If the synchronization source is GNSS, displays **.GNSS.**.
  - If the synchronization source is GNSS, lists the reference ID for the NTP peer's time source.
- **St** — Stratum or steps from reference clock.
- **T** — Type of addressing used:
  - **l** — local
  - **u** — unicast
  - **m** — multicast
  - **b** — broadcast
  - **-** — netaddr
- **When** — Number of seconds since last response.
- **Poll** — Polling interval in seconds for source.
- **Reach** — Success or failure to reach source over the last eight transactions.
- **Delay** — Round-trip time to receive a reply in milliseconds.
- **Offset** — Time difference between server and source.
- **Jitter** — Difference between two samples in milliseconds.

Configure the device as an SNTP client

Required Configuration Items

- The SNTP server. By default, SNTP is configured to use the Digi SNTP server **time.devicecloud.com**.

Additional Configuration Options

- The SNTP update interval. This is the interval at which Digi WR device checks the SNTP server for date and time. By default, SNTP is checked **once a day**. At bootup, the device attempts to send an update message to the configured SNTP server every **15** seconds until it receives a response. Once it receives a response, it reverts to the configured update interval.

This functionality is not available from the Web UI.

Command line

To set the date and time using SNTP, use the sntp command.

1. Optional: Set the SNTP server. For example, to set the server to **time.devicecloud.com**:

```
digi.router> sntp server time.devicecloud.com
```

2. (Optional) Set the SNTP update interval:

```
digi.router> sntp update-interval 10
```

3. Save the configuration:

```
digi.router> save config
```

Show NTP client status

Command line

- To display information about the NTP client configuration:

```
digi.router> sntp

sntp 1:
server                    time.devicecloud.com
state                     on
update-interval           10

digi.router>
```


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Set the date and time manually

This functionality is not available from the Web UI.

Command line

To set the date and time manually, use the date command. The date command specifies the time in **HH:MM:SS** format, where seconds are optional, followed by the date, in **DD:MM:YYYY** format.

For example, to manually set the time and date to **14:55:00** on **May 3, 2016**, enter:

```
digi.router> date 14:55:00 03:05:2016
```

Set the time zone and Daylight Saving Time

When the date and time is set using SNTP, the system time is set to Universal Coordinated Time (UTC) and not to your local time. In addition, the date and time, whether it is set manually or using SNTP, does not automatically change to reflect Daylight Saving Time (DST). By setting the time zone, the device displays the local time for that time zone and automatically adjusts for daylight saving time.

You can set the time zone to any of the following values:

canada-atlantic, **canada-central**, **canada-eastern**, **canada-mountain**, **canada-newfoundland**, **canada-pacific**, **europe-central**, **europe-eastern**, **europe-western**, **none**, **uk-ireland**, **us-alaska**, **us-arizona**, **us-central**, **us-eastern**, **us-hawaii**, **us-indiana**, **us-mountain**, **us-pacific**. The default is **none**.

Command line

To set the time zone to, for example, US Central:

```
digi.router> system timezone us-central

digi.router>
```

Show time zone configuration

Command line

- To display information about the time zone configuration:

```
digi.router> system timezone

 us-central
```


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Show system date and time

You can view the system data and time from either the Dashboard of the Web interface, or from the command line:

Web

- On the menu, click **Dashboard**. The **System Time** field in the **Device** panel displays the system time.

Command line

To display the current system date and time, use the date command.

```
digi.router> date

system time: 14:55:06, 03 May 2016

digi.router>
```

Configure Power button power down behavior

The Digi router's front panel includes a **Power** button.

- If the device is off, press the **Power** button to turn on the device.
- If the device is on, the **Power** button includes short-press and long-press options. By default, both short-press and long-press **Power** button actions power down the device.

You can configure how the **Power** button powers down the device using the power command. For example, to prevent accidentally powering down the device when the **Power** button is accidentally pressed, you can disable the **Power** button short-press power down. Or, you can completely disable the **Power** button for power down—both short- and long-presses.

To prevent short-press **Power** button power down:

```
digi.router> power button disable-power-down
digi.router> save config
```

To completely prevent power down using the **Power** button:

```
digi.router> power button disable-all-power-down
digi.router> save config
```

Pressing the **Power** button when the device is off always powers on the device, regardless of how you configure **Power** button power down options.

Configure power delays for power ignition sensor

The Digi WR device automatically powers on and powers off when it detects power on the ignition sensor. By default, 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 using the power command.

To set a delay time of five minutes (300 seconds) for power off when the ignition power sensor goes off:

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```
digi.router> power ignition-off-delay 60
digi.router> save config
```

To set a delay time of two minutes (120 seconds) for power on when the ignition power sensor goes on:

```
digi.router> power ignition-on-delay 120
digi.router> save config
```

Note If the device does not automatically power on within the configured ignition-on delay time, you can manually power on the device using the **Power** button.

Configure automatic reboot behavior for temporary power drop

Note This functionality is available for the WR64 only.

The WR64 device can be configured to automatically reboot if the ignition sense line is high and the device experiences a temporary power drop. By default, the device will not automatically reboot in this situation.

To configure the WR64 device to automatically reboot if the ignition sense line is high and the device experiences a temporary power drop, use the power auto-reset command:

```
digi.router> power auto-reset on
digi.router> save config
```


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Update system firmware

The Digi WR device operating system firmware images consist of a single file with the following naming convention:

***<platform>-<version>*.bin**

For example, **wr64-4.8.6.2.bin**.

To update the system firmware, use one of the following procedures:

Web

Digi maintains a repository of available firmware versions. You can update system firmware to one of these versions, or upload a previously downloaded firmware file.

Update firmware from available versions in the Digi repository

1. On the menu, click **System > Administration > Firmware Update**.
2. Select a version from the **Available Versions** list. The system firmware file downloads.
3. Click **Update Firmware**.

Download and upload firmware

1. Download the operating system firmware from the Digi Support FTP site.
2. Select **Upload firmware** from the **Available Versions** list.
3. Click **Choose File**.
4. Browse to the system firmware file location and select the file.
5. Click **Update Firmware**.

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Command line

1. Download the operating system firmware from the Digi Support FTP site.
2. Load the firmware image onto the device. To do so, use a Windows SFTP client, such as FileZilla, or use the Linux applications **scp** and **sftp**. For example, to use **scp**:

```
$ scp wr64-4.8.6.2.bin admin@192.168.1.1:

Password:
wr64-4.8.6.2.bin
                100%   52MB   1.0MB/s   00:22
$
```

3. Check that the firmware file has been successfully uploaded to the device.

```
digi.router> dir

  File                        Size   Last Modified
  ------------------------------------------------------------
  ssh_host_rsa_key.pub         382   Fri May  6 11:05:02
  ssh_host_dsa_key.pub         590   Fri May  6 11:05:05
  config.da0                  1541   Mon May 23 12:32:22
  config.fac                  1760   Fri May  6 11:44:26
  wr64-4.8.6.2.bin       52000149   Mon sept 5 22:17:59

  Remaining User Space: 5,143,183,360 bytes

digi.router>
```

4. Update the firmware by entering the update command, specifying the **firmware** keyword and the firmware file name.

```
digi.router> update firmware wr64-4.8.6.2.bin

Validating firmware image
Updating firmware from version "4.7.1.1" to version "4.8.6.2"
Firmware update completed. Please reboot the device.
digi.router>
```

5. Reboot the device to run the new firmware image using the reboot command.

```
digi.router> reboot
```

6. Once the device has rebooted, verify the running firmware version by entering the show system command.

```
digi.router> show system

Model              : WR64
Part Number        : WR64-AW401
Serial Number      : WR000038
```


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```
Hardware Version  : Not available
Using Bank        : 1
Firmware Version  : 4.8.6.2 09/05/2018 22:19:52
...

digi.router>
```

Certificate management for firmware images

The system firmware files are signed to ensure that only Digi-approved firmware load onto the device. The device validates the system firmware image as part of the update process and only successfully updates if the system firmware image can be authenticated.

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 ensures 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.

Failover and recovery during system update

Digi WR devices are capable of storing two firmware images in flash memory. Additionally, the device stores a "boot bit" in flash memory, which the bootloader uses to determine which firmware image to load when the system restarts. The following workflows describe the process involved in downloading a new firmware image, validating the image, installing the image, and changing the boot bit to indicate that the new image should be use at startup:

- **Firmware update process using the Web UI:**
  1. The selected firmware image is downloaded from the Digi Repository or the user's PC.
  2. The firmware image is validated by checking the signature of the firmware image.
     - If the firmware is invalid either through a corrupted firmware download, or an invalid signature, the firmware update process is aborted and the device will continue to run the existing firmware.
     - If the firmware is valid, the firmware image is unpacked and the firmware image is stored in the unused firmware banks.
  3. The boot bit is toggled, so that the new firmware image is loaded when the device next reboots.
- **Firmware update process using the command line:**
  1. The user downloads the firmware from the Digi support site.
  2. The user copies the firmware image onto the device using SFTP or SCP.
  3. The user initiates the firmware update, using the update firmware command.
  4. The firmware image is validated by checking the signature of the firmware image.
     - If the firmware is invalid either through a corrupted firmware download, or an invalid signature, the firmware update process is aborted and the device will continue to run the existing firmware.

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- If the firmware is valid, the firmware image is unpacked and the firmware image is stored in the unused firmware banks.

5. The boot bit is toggled, so that the new firmware image is loaded when the device next reboots.

Firmware update failure scenarios

The following are examples of situations where the firmware update process might fail, and how the device recovers from that failure:

- Loss of internet connectivity while downloading firmware.

  The firmware update process will timeout and the device will continue to run the existing firmware image without rebooting. If the device is subsequently rebooted, it will continue to use the existing firmware image.

- Loss of internet connectivity while upgrading device.

  This has no impact on the firmware update, because once the firmware image has been downloaded, internet access is no longer required. The firmware update process will continue. During the update process, the boot bit is toggled, and the new firmware image is loaded when the device reboots.

- Unable to update firmware after download of new firmware.

  If the new firmware image cannot be used to update the image (for example, if there is an invalid signature due to a corrupted download), the update process will abort and the device will continue to run the existing firmware image without rebooting. If the device is subsequently rebooted, it will continue to use the existing firmware image.

- The device reboots or shuts down during the firmware update process.

  The outcome of this varies, depending on the state of the update process when the power loss or reboot occurred. There are two stages involved in writing the firmware image to flash storage during the update process:

  - Write the firmware image to flash storage.
  - Toggle the boot bit to reflect which firmware bank to use when the device reboots.

  If the device loses power or reboots when the firmware image is being written to flash, then the boot bit has not yet been toggled. Therefore, the device will continue to use the existing firmware image.

  It is extremely unlikely that the device will lose power or reboot when updating the boot bit, because it is single bit being changed. If the boot bit has not changed, then the device will reboot using the existing image. If the boot bit has been changed, then the device will reboot with the new firmware image.

How to recover a WR54, LR54, or LR54-FIPS that will not boot

This section describes the process for recovering a WR54, LR54, or LR54-FIPS device that cannot boot because both firmware images stored in flash memory have become corrupted.

When a WR54/LR54/LR54-FIPS device is in this state, the device will continually reboot as it attempts to boot one of the firmware images that are stored on the device. The LED state will be as follows:

Dual-cellular WR54 LEDs	Single-cellular WR54 LEDs	LR54/LR54-FIPS LEDs	State
Power	Power	Power	Periodic blink as the device reboots
WWAN1 Signal	WWAN Signal	WWAN Signal	Off or Yellow or Green
WWAN1 Service	WWAN Service	WWAN Service	Off or Green
WWAN2 Signal	N/A	SIM1	Off or Green
WWAN2 Service	N/A	SIM2	Off or Green

To recover the WR54/LR54/LR54-FIPS, you will need a TFTP server that has an IP address of **192.168.1.100**. The WR54/LR54/LR54-FIPS will use an IP address of **192.168.1.1**.

The recovery image is a fully functional release of the firmware; however, a newer firmware release may be available. Once the device is recovered, you should update to the latest firmware release.

Any configuration on the WR54/LR54/LR54-FIPS will not be modified as part of the recovery process.

Recovery process for WR54/LR54/LR54-FIPS firmware

1. Download the WR54/LR54/LR54-FIPS recovery image:
   - WR54: http://ftp1.digi.com/support/firmware/transport/WR54/latest/
   - LR54/LR54-FIPS: http://ftp1.digi.com/support/firmware/transport/LR54/latest/

   The recovery image file is named:
   - WR54: **wr54_recovery.img**
   - LR54: **lr54_recovery.img**
   - LR54-FIPS: **lr54_fips_recovery.img**
2. Copy the recovery image into your TFTP server directory.
3. Connect the WR54/LR54/LR54-FIPS to the TFTP server using the ETH2 interface.

   Note To recover the WR54/LR54/LR54-FIPS, you will need a TFTP server that has an IP address of **192.168.1.100**. The WR54/LR54/LR54-FIPS will use an IP address of **192.168.1.1**.
4. Hold in the reset button on the WR54/LR54/LR54-FIPS and power on the device. The WWAN1/WWAN Signal and WWAN1/WWAN Service LEDs should start flashing yellow.
5. Continue holding the reset button until the WWAN1/WWAN Signal and WWAN1/WWAN Service LEDs stay on. The device is now in the recovery mode.
6. Release the reset button.

   The following will now occur:
   a. The device downloads the firmware image from the TFTP server. Once the firmware image is downloaded, the WWAN2 Signal/SIM 1 LED is lit.
   b. The device verifies the firmware image. Once verified, the WWAN2 Service/SIM 2 LED is lit.
   c. The device programs the firmware image into flash memory. This will take a few seconds.
   d. The device reboots, loading and running the recovery image.
7. Once the device has rebooted, update to the latest firmware release using the Web UI or the CLI. See Update system firmware for instructions.

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Dual boot behavior

This section applies to WR54 and WR64 models only.

By default, the Digi WR device stores two copies of firmware in two flash memory banks:

- The current firmware version that is used to boot the device.
- A copy of the firmware that was in use prior to your most recent firmware update.

When the device reboots, it will attempt to use the current firmware version. If the current firmware version fails to load after three consecutive attempts, it is marked as invalid and the device will use the previous firmware version stored in the alternate memory bank.

If the device consistently looses power during the boot process, this may result in the current firmware being marked as invalid and the device downgrading to a previous version of the firmware. As a result of this behavior, you can use the following procedure to guarantee that the same firmware is stored in both memory banks:

Command line

1. After performing a firmware update, verify that the device has booted successfully.
2. Use the update firmware copy-bank command to copy the updated firmware from the current bank to the alternate bank:

```
digi.router> update firmware copy-bank

Copying from active partition 1 to alternate partition 0.
Firmware update was successful. Please reboot the router.
digi.router>
```

3. Reboot the device.

After rebooting the device, the show system command will display the same firmware version for both memory banks:

```
digi.router> show system
Model                              : WR54
Part Number                        : WR54-A246
Serial Number                      : WR54-001126

Hardware Version                   : 50001988-01 A
Using Bank                         : 1
Next Boot Bank                     : 1
Firmware Version                   : 4.8.6.2
Alternate Bank Firmware Version    : 4.8.6.2
...
digi.router>
```


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Update cellular module firmware

Digi provides the cellular module files for all certified cellular carriers for Digi WR devices on the Digi repository of cellular module firmware files.

Update the cellular module automatically from the Digi repository

You can use the update module command to update the cellular module firmware automatically from the Digi repository by specifying the module number and your carrier name: **att**, **verizon**, **generic**, or **all**.

For example:

```
digi.router> update module 1 verizon
```

Update the cellular module by using a local file

You can use the update module command to update the cellular module firmware from the device's local fileystem.

1. Download the cellular module firmware file from the Digi repository to a host computer:
   a. Using an FTP utility, connect to the Digi repository at ftp://ftp1.digi.com/support/firmware/transport.
   b. Locate the firmware for your cellular module:
      - For Telit modems, the firmware is named **all.bin**.
      - For Sierra modems, the firmware is a combination of a carrier-specific ***.nvu** file and a ***.cwe** file. A text file in the module firmware directory will provide details about which ***.nvu** and ***.cwe** file should be downloaded.
2. Upload the cellular module firmware file from the host computer to a directory on the Digi WR device. See Upload and download files for information about transferring files onto the Digi WR device.
3. Use the update module command to update the cellular module firmware by specifying the module number and the directory on the Digi WR device where the firmware was uploaded. For example, if the firmware was uploaded to a directory on the Digi WR device called **verizon_fw**, using the following command:

   ```
   digi.router> update module 1 verizon_fw
   ```

Note You cannot use this command to update firmware for multiple carriers. If you are updating firmware for multiple carriers, upload the firmware for each carrier to a separate directory.

Example: Use local files to update Verizon and AT&T firmware for an MC7455 cellular module

To update the firmware for an MC7455 cellular module for both Verizon and AT&T:

1. On a host computer, use an FTP utility to connect to the Digi repository at ftp://ftp1.digi.com/support/firmware/transport.
2. Change to the **MC7455_carrier_firmware** directory on the Digi repository.

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3. Open the **car_7455.txt** file to determine the required firmware files.
   This file contains the following information:

```
...
att "AT&T" image2
generic "Generic" image2
verizon "Verizon" image1
...
```

   This information correlates to the following:
   - For AT&T firmware, the required firmware files are **att.nvu** and **image2.cwe**.
   - For Verizon firmware, the required firmware files are **verizon.nvu** and **image1.cwe**.
4. Download the required firmware files to your host computer.
5. On the Digi WR device, create two directories, **att_fw** and **verizon_fw**. See Create a directory for instructions.
6. Upload the firmware files to the appropriate directory:
   - For AT&T firmware, upload the **att.nvu** and **image2.cwe** files to the **att_fw** directory
   - For Verizon firmware, upload the **verizon.nvu** and **image1.cwe** to the **verizon_fw** directory.

   See Upload and download files for instructions.
7. Update the firmware for AT&T:

```
digi.router> update module 1 att_fw
```

8. After the AT&T firmware has successfully updated, update the firmware for Verizon:

```
digi.router> update module 1 verizon_fw
```


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Reboot the device

You can reboot the Digi WR device immediately or schedule a reboot after a period of time or at a specific time. You can cancel a scheduled reboot, if required.

Note Any unsaved configuration is lost during the reboot. You may want to save your configuration settings to a file before rebooting. See Save configuration settings to a file.

Web

- Click **System > Administration > Reboot**.

A message displays the maximum time expected for the reboot operation. When the reboot completes, the device reconnects and the **Device Login** page displays.

Command line

Reboot the device immediately

To reboot the device immediately, enter:

```
digi.router> reboot
```

Reboot the device after a period of time

To reboot the device after a period of time, enter the following command, where **MM** represents the number of minutes to wait before rebooting.

```
digi.router> reboot in MM
```

For example, to reboot in 5 minutes:

```
digi.router> reboot in 5
```

Reboot the device at a specific time

To reboot the device at a specific time, enter the following command, where **HH:MM** is the time at which to reboot. The time is in 24-hour format.

```
digi.router> reboot at HH:MM
```

For example, to reboot at 6:30 PM (18:30 hours):

```
digi.router> reboot at 18:30
```

Cancel a scheduled reboot

To cancel a scheduled reboot, enter:

```
digi.router> reboot cancel
```


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Reset the device to factory defaults

Resetting the device to factory defaults performs the following actions:

- Clears all configuration settings. When the device boots up again, it uses the configuration in file **config.fac**. If the **config.fac** file has been deleted, the device regenerates the file with the default Digi configuration.
- Deletes all user files including Python scripts.
- Regenerates SSH keys.
- Clears event and system log files.
- Creates a new event in the event log indicating a factory reset.

To reset the device to factory defaults:

1. Locate the reset button on your device. For the Digi WR routers, the **Reset** button is located beneath the SIM card slot cover on the front panel, to the right of SIM slot 2. Remove the SIM cover to access the **Reset** button.



2. Press and hold the **Reset** button for **5** seconds. The device reboots automatically.
The device reset to factory defaults. Follow the instructions in the *Digi LR54 Quick Start Guide* to reconfigure the device.

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Default configuration files

As released, the Digi WR device firmware provides the following configuration files.

Configuration	Name	Description
Default configuration	**config.da0**	The default configuration file is named **config.da0**. If needed, you can change the default configuration file. See Switch configuration files.
Factory default configuration	**config.fac**	The configuration file named **config.fac** contains the factory default configuration. When you reset a device back to factory defaults, the **config.fac** is applied when the device boots up. You can customize the **config.fac** file if you want to create a custom factory-default configuration.

Configuration file sections

There are several sections of note in the configuration file.

Configuration file section	Description

Timestamp	Identifies the date and time the configuration file was saved and the user who updated the file.
	`digi.router> more config.da0`
	`# Last updated by admin on Mon May 23 12:32:22 2016`

Main	Contains the commands and parameters required to configure features.
	■ Passwords in the file are stored in encrypted form. You cannot display passwords in clear-text form.
	■ Comment lines in the file begin with a pound sign **#** character.
	`lan 1 description "Ethernet and Wi-Fi LAN network"`
	`lan 1 state "on"`
	`lan 1 interfaces "eth2,eth3,eth4,wifi1,wifi5g"`
	`lan 1 ip-address "192.168.1.1"`
	`lan 2 description "Guest Wi-Fi network"`
	`lan 2 interfaces "wifi2,wifi5g2"`
	`lan 2 ip-address "192.168.2.1"`
	`wifi 1 state on`
	`.`
	`.`
	`.`

Firewall	Contains rules for controlling which packets are allowed into and out of the device. For more information, see Using firewall and firewall6 commands.
	`[FIREWALL]`
	`*nat`
	`-A POSTROUTING -o eth1 -j MASQUERADE`
	`COMMIT`
	`[FIREWALL_END]`
	`digi.router>`

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Shared configuration files and device-specific passwords

User passwords for the Digi WR device are stored in the configuration file in an encrypted form and the passwords are not device-specific. Another Digi WR device can read the configuration file and decipher the encrypted form of the password. Because passwords are encrypted and cannot be displayed in clear text, you can safely share configuration files across multiple devices.

However, if you do not intend to share configuration files, you can enable the **device-specific passwords** option. When the **device-specific passwords** option is enabled, only the device on which the password was configured can decipher the password. See the system command **device-specific-passwords** parameter for details.

Note The **device-specific-passwords** option does not apply to passwords set using the user or openvpn-user commands.

Save configuration settings to a file

When you make a change to the Digi WR configuration, the changes are not automatically saved to the configuration file. You must explicitly save configuration changes to a configuration file. If you do not save configuration changes, the system discards the changes when the device next boots up.

Web

- On configuration pages, click **Apply** to save changes to the configuration file immediately.

Command line

Enter the **save config** command.

```
digi.router> save config
```

Switch configuration files

You can store multiple configuration files on a device, but the device uses only one configuration file when it reboots. The default configuration file is named **config.da0**. See Default configuration files.

To switch to another configuration file:

1. If needed, identify the current configuration file using the show system command.
2. Change the current configuration file using the update command.
3. If needed, create the configuration file you specified in the **update** command using the save command.

Step 1: Identify the current configuration file

To identify the current configuration file, use the show system command. For example:

```
digi.router> show system

Model              : LR54W
Part Number        : LR54-AW401
Serial Number      : LR000038
```


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```
Hardware Version  : Not available
Using Bank        : 1
Firmware Version  : 1.1.0.6 06/17/16 13:37:58
Bootloader Version: 201602051801
Using Config File : config.da0

Uptime            : 14 Minutes, 29 Seconds
System Time       : 23 July 2016, 13:08:09

CPU               : 3% (min 1%, max 70%, avg 3%)
Temperature       : Not available

Description       :
Location          :
Contact           :

digi.router>
```

Step 2: Change the configuration file name

To change the name of the current configuration file, use the update command. For example:

```
digi.router> update config <filename>
```

The file you specified is used the next time the device reboots.

Step 3: Save the current configuration to the configuration file

If the configuration file name you specified on the update command does not exist, use the save command **config** parameter to create the new configuration file by saving the current configuration.

To save the current configuration, use the save command **config** parameter. For example:

```
digi.router> save config
```

Use multiple configuration files to test configurations on remote devices

You can use multiple configuration files and the autorun command to safely test a new configuration on a remote device that might result in the remote device going offline, in which case the device cannot be remotely accessed.

To test the configuration on a remote device, create a new configuration file with the configuration you want to test. In addition to the configuration, include two autorun commands:

- The first autorun command automatically reverts the device to use the original configuration file.
- The second autorun command schedules a reboot after a period of time.

Example: Test configuration file

For example, suppose you creates a test configuration file named **test.cfg**.

The **test.cfg** file changes the **cellular 1 apn** parameter and executes two autorun commands to automatically revert the device back to use the **config.da0** configuration file and to reboot in **5** minutes. It then saves the configuration to **test.cfg** and reboots the device.

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```
update config test.cfg
cellular 1 apn new-apn-to-test
autorun 1 command “update config config.da0”
autorun 2 command “reboot in 5”
save config
reboot
```

If the device does not come back online, it automatically reverts to the old (working) configuration file, **config.da0**, and reboots after **5** minutes.

If the device comes back online after being rebooted with the configuration—that is, the device connected with the new cellular Access Point Name (APN)— you can cancel the scheduled reboot using the **reboot cancel** command.

```
digi.router> reboot cancel
```

Using the copy and update commands, you can copy the configuration file to the final configuration file, and change the configuration file name.

```
digi.router> copy test.cfg config.da0
digi.router> update config config.da0
```


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File system

The Digi WR device's local file system has approximately **100 MB** of space available for storing files, such as Python programs, alternative configuration files and firmware versions, and release files, such as cellular module images.

See Configuration files for information on managing configuration files.

Create a directory

Web

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Navigate to the file system location where you want to create a directory and click ⊞. The **New Directory** dialog appears.
3. Enter a name for the directory and click **Create**.

   To create a nested directory, navigate to the subdirectory by double-clicking the parent directory. Click ⊞ for the New Directory dialog. Alternately, you can create a nested directory by including the parent directory with the slash delimiter **/** in the directory name field.

Command line

To make a new directory, use the mkdir command, specifying the name of the directory.

For example:

```
digi.router> mkdir test
digi.router> dir

 File                          Size   Last Modified
 ------------------------------------------------------
 test                                 Directory
 config.da0                     763   Sun Mar  5 12:36:20
 config.fac                     186   Mon Feb 21 03:00:17

 Remaining User Space: 102,457,344 bytes

digi.router>
```


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Display directory contents

Web

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Double-click the directory row to navigate to a sub-directory and display contents.

Command line

To display directory contents, use the dir command. For example:

```
digi.router> dir

 File                          Size   Last Modified
 ------------------------------------------------------------
 test                                 Directory
 config.da0                    763    Sun Mar  5 12:36:20
 config.fac                    186    Mon Feb 21 03:00:17

 Remaining User Space: 102,457,344 bytes


digi.router>
```

Change the current directory

Web

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Navigate to the desired directory or subdirectory.
3. To return to the home directory, click .

Command line

To change the current directory, use the cd command, specifying the directory name.

For example:

```
digi.router> dir

 File                          Size   Last Modified
 ------------------------------------------------------------
 test                                 Directory
 config.da0                    763    Sun Mar  5 12:36:20
 config.fac                    186    Mon Feb 21 03:00:17

Remaining User Space: 102,457,344 bytes
digi.router>
digi.router> cd test

digi.router> dir
```


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```
 File                         Size   Last Modified
-------------------------------------------------------

Remaining User Space: 102,457,344 bytes


digi.router>
```

Delete a directory

Web

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Select the directory to delete.
3. Click 🗑. A warning dialog displays.
4. Click **OK**.

Note This operation deletes any files in the directory along with the directory.

Command line

1. Make sure the directory is empty.
2. Use the rmdir command, specifying the name of the directory to remove. For example:

```
digi.router> dir

 File                         Size   Last Modified
 -------------------------------------------------------
 test                               Directory
 config.da0                   763   Sun Mar  5 12:36:20
 config.fac                   186   Mon Feb 21 03:00:17

Remaining User Space: 102,457,344 bytes
digi.router>
digi.router> rmdir test
Directory test is not empty
ERROR
digi.router>
digi.router> dir test

 File                         Size   Last Modified
 -------------------------------------------------------
 config.tst                   186   Wed Apr  5 07:10:41

Remaining User Space: 102,457,344 bytes

digi.router>
digi.router> del test/config.tst
digi.router>
digi.router> rmdir test
digi.router>
```


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```
digi.router> dir

 File                         Size   Last Modified
 ------------------------------------------------------------
 config.da0                    763   Sun Mar  5 12:36:20
 config.fac                    186   Mon Feb 21 03:00:17

Remaining User Space: 102,457,344 bytes

digi.router>
```

Display file contents

Web

There is no direct way to display file contents from the **System - File Management** page. Instead you must download the file and then view the downloaded file from a file editor.

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Select the file.
3. Click .
4. When the file is downloaded, open it with an editor.

Command line

To display the contents of a file, use the more command, specifying the name of the file. For example:

```
digi.router> more config.da0

# Last updated by username on Thu Nov 19 14:26:02 2015

eth 1 ip-address "192.168.1.1"
cellular 1 apn "mobile.o2.co.uk"
cellular 1 state "on"
user 1 name "username"
user 1 password "$1$4WdqUHrv$K.aB78KILuxVpesZtyveG/"

digi.router>
```

Copy a file

To copy a file, use the copy command, specifying the existing file name, followed by the name of the new copy.

For example, to copy file **config.da0** to a file in the main directory named **backup.da0**, and then to a file named **test.cfg** in the **test** directory, enter the following:

Command line

```
digi.router> dir

 File                         Size   Last Modified
------------------------------------------------------------
```


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```
 test                                Directory
 config.da0                   763    Sun Mar  5 12:36:20
 config.fac                   186    Mon Feb 21 03:00:17

Remaining User Space: 102,457,344 bytes
digi.router>
digi.router>
digi.router> copy config.da0 backup.da0
digi.router>
digi.router> dir

 File                          Size   Last Modified
------------------------------------------------------------
 test                                Directory
 config.da0                    763   Sun Mar  5 12:36:20
 config.fac                    186   Mon Feb 21 03:00:17
 backup.da0                    763   Wed Apr  5 07:22:29

Remaining User Space: 102,457,344 bytes
digi.router>
digi.router> copy config.da0 test/test.cfg

digi.router>
digi.router> dir test

 File                          Size   Last Modified
 ------------------------------------------------------------
 test.cfg                      763   Wed Apr  5 07:24:45

Remaining User Space: 102,457,344 bytes


digi.router>
```

Rename a file

Web

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Select the file to rename. Navigate to the file's directory location, if necessary.
3. Click ✎. Enter the new file name.
4. Click **OK**.

Command line

To rename a file, use the rename command, specifying the existing name and the new name.

For example:

```
digi.router> dir

 File                          Size   Last Modified
------------------------------------------------------------
 test                                Directory
 config.da0                    763   Sun Mar  5 12:36:20
 config.fac                    186   Mon Feb 21 03:00:17
```


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```
 backup.da0                    763   Wed Apr  5 07:22:29

Remaining User Space: 102,457,344 bytes
digi.router>
digi.router> rename backup.da0 test.da0
digi.router>
digi.router> dir

 File                          Size   Last Modified
-------------------------------------------------------------
 test                                 Directory
 test.da0                      763   Wed Apr  5 07:22:29
 config.da0                    763   Sun Mar  5 12:36:20
 config.fac                    186   Mon Feb 21 03:00:17

Remaining User Space: 102,453,248 bytes

digi.router>
```

Delete a file

Web

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Select or navigate to the file to delete.
3. Click 🗑. A confirm delete dialog displays.
4. Click **OK**.

Note To delete all files in a directory, see Delete a directory.

Command line

To delete a file, use the del command, specifying the filename to delete.
For example, to delete a file named **test.cfg** in the **test** directory, enter the following:

```
digi.router>
digi.router> dir

 File                          Size   Last Modified
-------------------------------------------------------------
 test                                 Directory
 test.da0                      763   Wed Apr  5 07:22:29
 config.da0                    763   Sun Mar  5 12:36:20
 config.fac                    186   Mon Feb 21 03:00:17

 Remaining User Space: 102,453,248 bytes

digi.router>
digi.router> del test.da0
digi.router>
digi.router> dir test

 File                          Size   Last Modified
-------------------------------------------------------------
```


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```
 test.cfg                     763   Wed Apr  5 07:24:45

 Remaining User Space: 102,453,248 bytes


digi.router>
digi.router> del test/test.cfg
digi.router> dir test

 File                         Size   Last Modified
 ------------------------------------------------------------
 Remaining User Space: 102,449,152 bytes

digi.router>
```

Upload and download files

Web

Upload files

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Click .
3. Use the local file system to browse to the location of the file to upload. Select the file and click **Open** to start the upload.
4. A progress dialog appears. When the upload operation is complete, the file is displayed in the file list.

Download files

1. On the menu, click **System > Administration > File System**. The **File System** page appears.
2. Navigate to the file you want to download and click the file to select it.
   To download the event log, select file **event.log**. To download the system log, select file **system.log**.
3. Click . The file downloads to your system using your browser's download settings.

Command line

You can download and upload files using utilities such as Secure Copy (SCP), SSH File Transfer Protocol (SFTP), or an SFTP application, such as FileZilla.

Upload files using SCP

To upload a file to a device using SCP, use this syntax:

```
scp filename username@ip_address:filename
```

For example, to upload a file named **script.py** to a device at IP address **192.168.1.1**:

```
$ scp script.py john@192.168.1.1:script.py
Password:
script.py
    100%  3728    0.3KB/s   00:00
```

Download files using SCP

To download a file from a device using SCP, use this syntax:

```
scp username@ip_address:filename filename
```

For example, to download a file named **config.da0** to the local directory from a device at IP address **192.168.1.1** using the username **john**:

```
$ scp john@192.168.1.1:config.da0 config.da0
Password:
config.da0
    100%  254     0.3KB/s   00:00
```

Upload files using SFTP

This example uploads a file named **wr64-4.8.6.2.bin** to a device with an IP address of **192.168.1.1**, using the username **john**:

```
$ sftp john@192.168.1.1
Password:
Connected to 192.168.1.1
sftp> put wr64-4.8.6.2.bin
Uploading wr64-4.8.6.2.bin to wr64-4.8.6.2.bin
wr64-4.8.6.2.bin
    100%  24M  830.4KB/s   00:00
sftp> exit
$
```

Download files using SFTP

This example downloads a file named **config.da0** from a device with an IP address of **192.168.1.1** to the local directory, using the username **john**:

```
$ sftp john@192.168.1.1
Password:
Connected to 192.168.1.1
sftp> get config.da0
Fetching config.da0 to config.da0
config.da0
     100%  254    0.3KB/s   00:00
sftp> exit
$
```


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Logs

The **event log** contains events related to the functionality of the Digi WR device. These events include information about configuration changes, interface state changes, user access, and so on.

The **system log** contains events related to the low-level system. While these events are typically not useful to end users, they are useful to Digi support and engineering when diagnosing device issues.

You can view logs from either the web interface or the command line.

Log entry format

Event and system log entries have the following format:

```
<timestamp> <level> <application> <event message>
```

For example, here is an event log entry showing a configuration change by the user **admin** to the **system timeout** parameter which has been logged by the command-line interface (CLI) application at the **info** log level:

```
2016-05-03 12:05:29.653107 user.info CLI[admin]: system timeout 3600
```

In the web interface Log viewer page, here is an event log entry showing the login to the command line interface by the user **admin**:

Date	Level	Source ▲	Message
2017-01-26 01:27:18.332389	user.notice	CLI[admin@web]:	Login by admin.

Configure options for event and system logs

You can configure options for event and system logs.

- For event logs, you can set the level of events you want to log, enable logging to a file, and enable logging to a syslog server.
- For system logs, you can enable logging to a file and enable logging to a syslog server.

Web

1. On the menu, click **System > Administration > Logs**.
2. Click **Log Configuration**.
3. Under **Event Log**:

   Log level: Select the log level. See Event log levels.

   Log to file: Enable or disable logging to a file.

   Log to syslog: If you want to log to a syslog server, select a syslog server for the event log.

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4. Under **System Log**:

   Log to file: Enable or disable logging to a file.

   Log to syslog: If you want to log to a syslog server, select a syslog server for the system log.

5. Click **Apply**.

Command line

Enter the system log-level command, specifying the event log level.

```
system log-level <level>
```

For example:

```
system log-level warning
```

Configure syslog servers

You can configure up to two syslog servers for storing event and system logs.

Web

1. On the menu, click **System > Administration > Logs**.
2. Click **Syslog Server Configuration**.
3. For each syslog you want to configure, provide the following:

   Server: Specify the IPv4 IP address for the server.

   Port: Specify the listening port for the server. The default is port **514**.

   Mode: Specify the mode for syslog traffic: UDP or TCP. The default is **UDP**.

4. Click **Apply**.

Command line

To configure syslog server 1:

```
syslog 1 server my_syslog1.company.com
syslog 1 server-port 516
syslog 1 mode udp
```

To configure syslog server 2:

```
syslog 2 server my_syslog2.company.com
syslog 2 server-port 517
syslog 2 mode udp
```


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Display logs

Web

1. On the menu, click **System > Administration > Logs**.
2. Click **Log viewer**. See Log viewer page for details on all page fields.
3. To stream the event log, click ▶ under **Event Log.** To stream the system log, click ▶ under **System Log.** For more information on the controls in the Log Viewer, see Log viewer page.

Command line

To display the event log, use the show log command.

Note If the logs are stored in flash, the show log command displays the logs stored in flash.

For example:

```
digi.router> show log

2016-06-03 16:54:50.643501 user.notice CLI[admin]: Login by admin.
2016-06-03 16:54:47.245107 user.notice CLI[]: Login failure by .
2016-06-03 16:54:39.831107 user.info cellular_monitor[1245]: module support =
HE910 4G support = 0
2016-06-03 16:54:39.653107 user.info cellular_monitor[1245]: Model = HE910
```

To display the system log, use the **show log system** command variant. For example:

```
digi.router> show log system

2017-01-26 00:22:36.157657 kern.warning kernel:ESW: Link Status Changed - Port2
Link Down
2017-01-26 00:22:36.157263 kern.info kernel:device wifi5g1 entered promiscuous
mode
2017-01-26 00:22:36.157263 kern.info kernel:device wifi1 entered promiscuous mode
2017-01-26 00:22:36.042680 kern.info kernel:lan1: port 3(eth4) entering
forwarding state
2017-01-26 00:22:36.042576 kern.info kernel:lan1: port 3(eth4) entering
forwarding state
2017-01-26 00:22:36.042255 kern.info kernel:device eth4 entered promiscuous mode
2017-01-26 00:22:33.312014 kern.info kernel:lan1: port 2(eth3) entering
forwarding state
2017-01-26 00:22:33.311843 kern.info kernel:lan1: port 2(eth3) entering
forwarding state
2017-01-26 00:22:33.297835 kern.info kernel:device eth3 entered promiscuous mode

digi.router>
```


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Find and filter log file entries

You can find and filter log file entries based on search criteria entered in the Log Viewer Search bar. The find operation searches every field of a log file entry, including the date.

Web

1. On the menu, click **System > Administration > Logs**.
2. Click **Log viewer**.
3. In the **Find** field, enter the text to search for in messages.
4. To clear the filter, delete the text in the **Find** field.

Save logs to a file

By default, the event and system logs are stored in RAM. This means the event and system logs are lost when the device is rebooted. You can configure the device to store the event and system logs in a file to help diagnose issues if the device is being rebooted. When enabled, the event log is stored in the file **event.log** and the system log is stored in the file **system.log**.

The maximum size of a log file is **2 MB**. When the event and system log files reach this size, they are backed up to **event.log.0** and **system.log.0** respectively, and the log file is cleared out.

WARNING! Saving event and system logs to files and keeping them resident for some time is not recommended for normal operations, as this practice can lead to additional wear to the flash memory.

Web

1. On the menu, click **System > Administration > Logs**.
2. Click **Log Configuration**.
3. - To write event log entries to a file: Under **Event Log** in the **Log to File** setting, click **On**.
   - To write system log entries to a file: Under **System Log**, in the **Log to File** setting, click **On**.
4. Click **Apply**.

Command line

To log events to the file **event.log** and **system.log**, use the system command, specifying the **log-to-file** parameter:

```
system log-to-file on
```

To log system events to the file **system.log**, use the system command, specifying the **log-system-to-file** parameter:

```
system log-system-to-file on
```


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Download log files

The download operation downloads the entire event or system log, not just those entries currently displayed in the Log Viewer. For the event log, file **event.log** is downloaded. For the system log, file **system.log** is downloaded.

When your device is configured to save logs to a file, only the active log file can be downloaded through this procedure. If you need to download a backup log file (for example, **event.log.0**), you can download that backup log file using the **File System** download function. See Upload and download files.

Web

1. On the menu, click **System > Administration > Logs**.
2. Click **Log viewer**. See Log viewer page for details on all page fields.
3. Under **Event Log** or **System Log**, click the button. The file download proceeds according to download procedures of the browser you are using, and stores the file in your browser's default download directory.

Clear logs

As needed, you can clear the event or system log. This results a single new entry in the event or system log after the previous events are cleared. This clear function is useful when you want to start all logs fresh from a certain point in time.

This operation is available from the command line only.

Command line

To clear the event log, use the **clear log** command. For example:

```
digi.router> clear log
```

To clear the system log, use the **clear log system** command. For example:

```
digi.router> clear log system
```

Event log levels

Events can be logged at various levels of severity. The log levels, from highest to lowest level of severity, are as follows:

Log level	Conditions indicated
Emergency	Device is unusable.
Alert	Events that should be resolved immediately.
Critical	A feature may not be working correctly.
Error	An error has occurred with a particular feature.
Warning	An error will occur if no action is taken.
Notification	Events that are unusual, but are not error conditions.

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Log level	Conditions indicated
Informational	Normal operational messages that require no action.
Debugging	Useful information for Digi Technical Support and Engineering to use in debugging the device.

The default level at which events are logged is **info**, which means that any event of a level **info** or higher is logged. To change the event logging level, see Configure options for event and system logs.

Analyze traffic

The traffic analyzer captures data traffic on any of the WAN and LAN interfaces and decodes the captured data traffic for diagnosis.

You can capture data traffic on multiple interfaces at the same time, and define capture filters to reduce the amount of data traffic captured.

You can capture up to **10** MB of data traffic, in two **5** MB files.

To perform more detailed analysis, you can upload the captured data traffic from the device and view it using a third-party application, such as Wireshark (www.wireshark.org).



WARNING! Enabling data traffic capture significantly affects device performance.

Capture data traffic

You can capture up to **10** MB of data traffic, in **2** files of up to **5** MB each.



WARNING! Enabling data traffic capture significantly affects device performance.

To capture data traffic, use the analyzer command.

The analyzer command has the following parameters:

state
Enables or disables the capturing of data traffic. As this configuration can be saved, it means that the device can be configured to start capturing data as soon as it boots up.

interfaces
Defines the interfaces on which data is captured.

filter
Defines the capture filter to reduce the amount of data traffic being captured. The filters use the BPF syntax for defining filters, described at http://www.tcpdump.org/manpages/pcap-filter.7.html. See Example filters for capturing data traffic for examples of using the syntax to define filters.

Note Captured data traffic is captured into RAM and is lost when the device reboots, unless you save the traffic to a file. See Save captured data traffic to a file.

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To capture data on the **eth1** and **cellular1** interfaces:

```
digi.router> analyzer state on
digi.router> analyzer interfaces eth1,cellular1
digi.router>
```

Example filters for capturing data traffic

To filter captured data, use the **analyzer** command filter parameter. For example:

```
digi.router> analyzer filter ip host 192.168.1.1
```

For more information on filtering, see http://www.tcpdump.org/manpages/pcap-filter.7.html.

The following are examples of filters on data traffic capturing for several types of network data.

Example IPv4 capture filters

Capture traffic to and from IP host **192.168.1.1**:

```
digi.router> analyzer filter ip host 192.168.1.1
```

Capture traffic from IP host **192.168.1.1**:

```
digi.router> analyzer filter ip src host 192.168.1.1
```

Capture traffic to IP host **192.168.1.1**:

```
digi.router> analyzer filter ip dst host 192.168.1.1
```

Capture traffic for a particular IP protocol:

```
digi.router> analyzer filter ip proto <protocol>
```

Replace **<protocol>** with 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**.

Note When you specify **\icmp**, **\tcp**, or **\udp** as a protocol, you must precede the name with the backslash character.

Capture traffic to and from a TCP port **80**:

```
digi.router> analyzer filter ip proto \tcp and port 80
```

Capture traffic to UDP port **53**:

```
digi.router> analyzer filter ip proto \udp and dst port 53
```

Capture traffic from UDP port **53**:

```
digi.router> analyzer filter ip proto \udp and src port 53
```


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Capture to and from IP host **10.0.0.1** but filter out ports **22** and **80**:

```
digi.router> analyzer filter ip host 10.0.0.1 and not (port 22 or port
80)
```

Example Ethernet capture filters

Capture Ethernet packets to and from host **00:40:FF:0F:45:94**:

```
digi.router> analyzer filter ether host 00:40:FF:0F:45:94
```

Capture Ethernet packets from host **00:40:FF:0F:45:94**:

```
digi.router> analyzer filter ether src 00:40:FF:0F:45:94:
```

Capture Ethernet packets to host **00:40:FF:0F:45:94**:

```
digi.router> analyzer filter ether dst 00:40:FF:0F:45:94
```

Show captured data traffic

To view the captured data traffic, use the show analyzer command. The command output shows 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

The output uses indents received packets as a visual cue for sent and received packets.

The output is paged. Press the spacebar to view the next page of data. Enter **Q** to navigate to the command prompt.

For example:

```
digi.router> show analyzer

Packet 1 : Nov-09-2016 09:26:06.256857, Length 74 bytes (Captured Length 74 bytes)

Sent on interface eth1

  00 04 2d f4 f8 aa 00 40  ff 0f 45 94 08 00 45 00   ..-....@ ..E...E.
  00 3c 19 73 00 00 7f 01  e2 da 2f 00 00 64 08 08   .<.s.... ../..d..
  08 08 08 00 08 e1 00 01  44 7a 61 62 63 64 65 66   ........ Dzabcdef
  67 68 69 6a 6b 6c 6d 6e  6f 70 71 72 73 74 75 76   ghijklmn opqrstuv
  77 61 62 63 64 65 66 67  68 69                     wabcdefg hi

 Ethernet Header
   Destination MAC Addr : 00:04:2d:f4:f8:aa
   Source MAC Addr      : 00:40:ff:0f:45:94
   Ethernet Type        : IP (0x0800)
 IP Header
   IP Version           : 4
   Header Length        : 20 bytes
   ToS                  : 0x00
   Total Length         : 60 bytes
   ID                   : 6515 (0x1973)
   Flags                :
   Fragment Offset      : 0 (0x0000)
```


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```
   TTL                 : 127 (0x7f)
   Protocol            : ICMP (1)
   Checksum            : 0xe2da
   Source IP Address   : 47.0.0.100
   Dest. IP Address    : 8.8.8.8
 ICMP Header
   Type                : Echo Request (8)
   Code                : 0
   Checksum            : 0x08e1
 ICMP Data
   61 62 63 64 65 66 67 68  69 6a 6b 6c 6d 6e 6f 70   abcdefgh ijklmnop
   71 72 73 74 75 76 77 61  62 63 64 65 66 67 68 69   qrstuvwa bcdefghi


 Packet 2 : Nov-09-2016 09:26:06.284248, Length 74 bytes (Captured Length 74 bytes)

 Received on interface eth1

          00 40 ff 0f 45 94 00 04  2d f4 f8 aa 08 00 45 00   .@..E... -.....E.
          00 3c e7 97 00 00 36 01  5d b6 08 08 08 08 2f 00   .<....6. ]......./.
          00 64 00 00 10 e1 00 01  44 7a 61 62 63 64 65 66   .d...... Dzabcdef
          67 68 69 6a 6b 6c 6d 6e  6f 70 71 72 73 74 75 76   ghijklmn opqrstuv
          77 61 62 63 64 65 66 67  68 69                     wabcdefg hi

        Ethernet Header
          Destination MAC Addr : 00:40:ff:0f:45:94
          Source MAC Addr      : 00:04:2d:f4:f8:aa
          Ethernet Type        : IP (0x0800)
        IP Header
          IP Version           : 4
          Header Length        : 20 bytes
          ToS                  : 0x00
          Total Length         : 60 bytes
          ID                   : 59287 (0xe797)
          Flags                :
          Fragment Offset      : 0 (0x0000)
          TTL                  : 54 (0x36)
          Protocol             : ICMP (1)
          Checksum             : 0x5db6
          Source IP Address    : 8.8.8.8
          Dest. IP Address     : 47.0.0.100
       ICMP Header
          Type                 : Echo Reply (0)
          Code                 : 0
          Checksum             : 0x10e1
       ICMP Data
          61 62 63 64 65 66 67 68  69 6a 6b 6c 6d 6e 6f 70   abcdefgh ijklmnop
          71 72 73 74 75 76 77 61  62 63 64 65 66 67 68 69   qrstuvwa bcdefghi

digi.router>
```

Clear captured data traffic

To clear the captured data traffic, use the clear command, specifying **clear analyzer**.

```
digi.router> clear analyzer
digi.router>
```

Save captured data traffic to a file

Data traffic is captured to RAM and not saved when the device reboots. To upload the file to a PC, you must first save the captured data to a file.

Command line

Use the **save** command. For example:

```
digi.router> save analyzer lan1.pcapng
digi.router>
```


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Use the "ping" command to troubleshoot network connections

Use the ping command troubleshoot connectivity problems. See the ping command description for command syntax and examples.

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**.

Ping to check internet connection

To check your internet connection, enter:

```
ping 8.8.8.8
```

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, but they are generally not used or required:

- **hops**: The maximum number of hops to allow.
- **host**: The IP address of the destination host.
- **interface**: The interface for sending the route trace.
- **size**: The size, in bytes, of the message to send.
- **src-ip**: Use this source IP address for outgoing packets.
- **timeout**: The maximum number of seconds to wait for a response from a hop.

Example

This example shows using **traceroute** to verify that the 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:

```
digi.router> show route

Destination Gateway Metric Protocol Idx Interface Status
-------------------------------------------------------------------------------------
10.101.1.0/24 0.0.0.0 0 Connected lan1 UP
192.168.1.0/24 0.0.0.0 0 Connected lan3 UP
10.101.12.0/24 0.0.0.0 0 Connected lan4 UP
10.101.8.0/24 0.0.0.0 0 Connected lan2 UP
192.168.8.0/24 0.0.0.0 0 Connected eth1 UP
default 192.168.8.1 1 Static eth1 UP
digi.router>
digi.router> traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
1 192.168.8.1 (192.168.8.1) 0.613 ms 0.384 ms 0.452 ms
2 10.240.192.1 (10.240.192.1) 19.039 ms 19.070 ms 18.985 ms
3 96.34.84.22 (96.34.84.22) 19.279 ms 25.487 ms 27.848 ms
4 96.34.80.240 (96.34.80.240) 32.560 ms 96.34.80.238 (96.34.80.238) 32.593 ms 96.34.80.230 (96.34.80.230) 32.688
ms
5 96.34.2.12 (96.34.2.12) 32.494 ms 42.865 ms 96.34.81.23 (96.34.81.23) 32.418 ms
6 96.34.81.190 (96.34.81.190) 32.590 ms 31.993 ms 31.993 ms
```


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```
7 96.34.2.12 (96.34.2.12) 42.367 ms 24.334 ms 29.216 ms
8 96.34.0.51 (96.34.0.51) 34.155 ms 33.648 ms 27.910 ms
9 96.34.148.2 (96.34.148.2) 34.194 ms 96.34.0.137 (96.34.0.137) 25.195 ms 37.465 ms
10 216.239.46.248 (216.239.46.248) 31.285 ms 31.068 ms 216.58.215.44 (216.58.215.44) 37.434 ms
11 96.34.148.2 (96.34.148.2) 40.958 ms 209.85.143.112 (209.85.143.112) 31.281 ms 96.34.148.2 (96.34.148.2) 40.600
ms
12 216.239.46.248 (216.239.46.248) 21.515 ms 209.85.250.70 (209.85.250.70) 63.989 ms 216.58.215.44 (216.58.215.44)
30.455 ms
13 209.85.251.163 (209.85.251.163) 26.121 ms 216.239.48.235 (216.239.48.235) 27.429 ms 209.85.251.161
(209.85.251.161) 26.867 ms
14 216.239.48.160 (216.239.48.160) 33.652 ms 64.233.174.11 (64.233.174.11) 45.731 ms 209.85.250.70 (209.85.250.70)
29.792 ms
15 216.239.48.235 (216.239.48.235) 30.280 ms 72.14.234.55 (72.14.234.55) 34.517 ms 209.85.251.243 (209.85.251.243)
38.733 ms
16 * 8.8.8.8 (8.8.8.8) 40.967 ms 44.762 ms
digi.router>
```

By entering a **whois** command on another Unix device, the output shows that the route is as follows:

1. **192/8**: The local network of the Digi WR 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**.

Use the "show tech-support" command

The show tech-support command displays information useful for Digi Technical Support when handling issues with your device.

You can execute this command from the command-line interface or from the Device Console in the web interface.

The syntax for show tech-support is as follows:

```
show tech-support [filename]
```

The **filename** parameter is optional. If specified, the information is saved to the given filename.

The **show tech-support** command executes the following commands:

- **show system**
- **show config more**
- **config.da0** (or whichever configuration file is in use)
- **show route**
- **show lan**
- **show lan x**, for whichever LAN interface's **admin** status is **up**
- **show dhcp**
- **show wan**
- **show wan x**, for whichever WAN interface's **admin** status is **up**
- **show cellular**
- **show ipsec**
- **show ipsec x**, for whichever IPsec tunnel is configured (**state**=**on**)
- **show log**

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- **show log system**
- **show firewall**
- **show firewall6**
- **show tech-support**

In the output, each executed command output is prefixed with the command name; for example:

```
show system
===========
```


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Troubleshooting

There are several tools and resources available within your device and on the Digi website for dealing with configuration or other device issues.

- Logs
- Analyze traffic
- Use the "ping" command to troubleshoot network connections
- Use the "traceroute" command to diagnose IP routing problems
- Use the "show tech-support" command
- Reboot the device
- Digi support site: www.digi.com/support.
- Digi knowledge base: knowledge.digi.com/.

Ethernet LED does not illuminate

Problem

Ethernet LED does not illuminate on the **WAN/ETH1**, **ETH2**, **ETH3**, or **ETH4** ports.

Probable Cause

The most likely cause is a bad connection or a bad Ethernet cable.

Solution

1. Replace the Ethernet cable and verify that both ends are plugged in. if the Ethernet LED is now illuminated on the Ethernet port, skip the rest of these steps .
2. Open the command line interface. Enter the command **eth n**, where **n** is replaced with the Ethernet port number. In the **eth** command output, verify that the state of the Ethernet port is set to **on**. For example, if you are diagnosing port **WAN/ETH1**, enter:

```
digi.router> eth 1
   description
   duplex                       auto
   mtu                          1500
   speed                        auto
   state                        on

digi.router>
```

3. If the state is set to **off**, enter another eth command to change the state to be **on** and see if that fixes the problem. For example, to change the state of port **WAN/ETH1**, enter:

```
digi.router> eth 1 on
```

4. Enter **show eth n** (where n is replaced with the Ethernet port number). Verify that the **Operational Status** is **Up** and that the **Link** status does not say **No connection**. For example, on Ethernet port **WAN/ETH1**, enter:

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```
digi.router> show eth 1
 Eth Status and Statistics Port 1
 --------------------------------
 Description     :
 Admin Status    : Up
 Oper Status     : Down
 Up Time         : 48 Minutes, 23 Seconds

 MAC Address     : 00:40:FF:0F:48:1C
 Link            : No connection

 Received                              Sent
 --------                              ----
 Rx Unicast Packet    : 21512          Tx Unicast Packet    : 16147
 Rx Broadcast Packet  : 917            Tx Broadcast Packet  : 8
 Rx Multicast Packet  : 5638           Tx Multicast Packet  : 7
 Rx CRC Error         : 0              Tx CRC Error         : 0
 Rx Drop Packet       : 0              Tx Drop Packet       : 0
 Rx Pause Packet      : 0              Tx Pause Packet      : 0
 Rx Filtering Packet  : 13631488       Tx Collision Event   : 0
 Rx Alignment Error   : 0
 Rx Undersize Error   : 0
 Rx Fragment Error    : 0
 Rx Oversize Error    : 0
 Rx Jabber Error      : 0
```

5. If the **Link** status shows there is **No connection**, try plugging the Ethernet cable into a different Ethernet port.
6. If the new Ethernet port shows the same **No connection** status, either the cable is bad, or there is a problem at the other end. If the new port shows a valid connection, something may be wrong with the device hardware. Contact Digi Technical Support.

Device cannot communicate on WAN/ETH1 port

Problem

The device cannot communicate on its **WAN/ETH1** port.

Probable Cause

The most likely cause is that the WAN port is not correctly configured.

Solution

The following steps assume you are using **WAN/ETH1** as a WAN port, which is the default configuration. If you are using **WAN/ETH1** as a LAN port, see the steps in Device cannot communicate on ETH2, ETH3, or ETH4 ports.

1. Check the Ethernet LED for the **WAN/ETH1** port. If the LED is not lit, verify the physical connection following the steps in Ethernet LED does not illuminate.
2. Open the command line interface. Enter **show wan n**, where n is the number of the WAN. In the command output, verify that the IP Address, mask, and gateway are set. For example, if **WAN/ETH1** is configured for **WAN1**, which is the default configuration, enter:

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```
digi.router> show wan 1

 WAN 1 Status and Statistics
 ---------------------------
 WAN Interface : eth1
 Admin Status  : Up
 Oper Status   : Down

 IP Address    :
 Mask          :
 Gateway       :
 DNS Server(s) :

Probes are not being used

              Received            Sent
              --------            ----
Packets          28225           16256
Bytes         19551951         3199259
```

3. If the IP configuration is not set, as shown above, the most likely problem is that the port has not been configured correctly. To view the current configuration, enter the command **wan n**, where **n** is the number of the WAN. In the command output, verify that the interface for the WAN is set to the Ethernet port. Set the correct interface if necessary. For example:

```
digi.router> wan 1

   activate-after              0
   allow-https-access          off
   allow-ssh-access            off
   dhcp                        on
   dns1
   dns2
   gateway
   interface                   eth1
   ip-address
   mask                        255.255.255.0
   nat                         on
   probe-host
   probe-interval              60
   probe-size                  64
   probe-timeout               5
   retry-after                 300
   timeout                     300
```

4. If the interface is correct, but the port still does not get an IP configuration, enter another **wan n** command for that port to verify that the DHCP setting is correct. If the network to which the WAN is connected uses DHCP to assign IP addresses, make sure DHCP is on for the WAN port.

```
digi.router> wan 1
```


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```
activate-after              0
allow-https-access          off
allow-ssh-access            off
dhcp                        on
dns1
dns2
gateway
interface                   eth1
ip-address
mask                        255.255.255.0
nat                         on
probe-host
probe-interval              60
probe-size                  64
probe-timeout               5
retry-after                 300
timeout                     300
```

5. If the network does not use DHCP to assign IP addresses, you need to disable DHCP on the WAN port, and configure a static IP address. For example, if your network uses static IP addresses and the device has been assigned the address **10.10.10.10** with subnet mask **255.255.255.0** and a gateway of **10.10.10.1**, you would enter the following commands:

```
digi.router> wan 1 dhcp off
digi.router> wan 1 ip-address 10.10.10.10
digi.router> wan 1 mask 255.255.255.0
digi.router> wan 1 gateway 10.10.10.1
```

6. If these steps do not resolve your problem, contact Digi Technical Support.

Device cannot communicate on ETH2, ETH3, or ETH4 ports

Problem

The device is not able to communicate on its **ETH2**, **ETH3**, or **ETH4** port.

Probable Cause

Ports **ETH2**, **ETH3**, and **ETH4** are usually bridged together to form a LAN. The most likely problem is that the LAN is not correctly configured.

Solution

1. Check the Ethernet LED for the Ethernet port. If the LED is not lit, verify the physical connection, following the steps in Ethernet LED does not illuminate.
2. Open the command line interface. Enter the command **lan n**, where **n** is the number of the LAN with which the Ethernet port is associated. In the command output, verify that the Ethernet port really is assigned to the LAN. For example, if the port is supposed to be associated with **LAN 1**, enter:

```
digi.router> lan 1
```


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```
description                 Ethernet and Wi-Fi LAN network
dhcp-client                 off
dns1
dns2
interfaces                  eth2,eth3,eth4,wifi1,wifi5g1
ip-address                  192.168.1.1
mask                        255.255.255.0
mtu                         1500
state                       on
```

3. If the Ethernet port is not listed as one of the LAN's interfaces, add it using the command **lan n interfaces**, where **n** is the Ethernet port number.
4. Verify that the LAN is enabled. If needed, enter the command **lan n state on** to enable the LAN.

```
digi.router> lan 1

   description              Ethernet and Wi-Fi LAN network
   dhcp-client              off
   dns1
   dns2
   interfaces               eth2,eth3,eth4,wifi1,wifi5g1
   ip-address               192.168.1.1
   mask                     255.255.255.0
   mtu                      1500
   state                    on
```

5. Verify that the LAN is configured with an IP address. Use the **lan n ip-address**command to set the IP address if necessary.

```
digi.router> lan 1

   description              Ethernet and Wi-Fi LAN network
   dhcp-client              off
   dns1
   dns2
   interfaces               eth2,eth3,eth4,wifi1,wifi5g1
   ip-address               192.168.1.1
   mask                     255.255.255.0
   mtu                      1500
   state                    on
```

6. Use the **dhcp-server** command to verify the LAN's DHCP server is set up correctly. The gateway field should be set to the LAN's IP address, and the ip-address-start and ip-address-end fields should be within the subnet configured for the LAN port. For example, suppose the LAN is configured with the IP address **192.168.1.1** and subnet **255.255.255.0**. If DHCP server **1** was used to service the LAN, its configuration should look something like this:

```
digi.router> dhcp-server 1

   dns1                     192.168.1.1
```


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```
  dns2
  gateway                   192.168.1.1
  ip-address-end            192.168.1.199
  ip-address-start          192.168.1.100
  lease-time                1440
  mask                      255.255.255.0
  state                     on
```

7. Verify that the PC or device plugged into that port has been configured to use DHCP to get an IP address.
8. If the PC still cannot communicate with the Ethernet port, try plugging a different PC into the port and see if that can communicate over the port. If it can, the problem is with the first PC or device.
9. Enter the **show dhcp** command to verify that there are some available DHCP leases left. For example, the DHCP server configuration creates a range of **100** DHCP leases, and the DHCP status below shows that only one is in use. If your status showed that all available DHCP leases were in use, you would have to either update the DHCP server configuration to add more leases, or remove some devices from the LAN.

```
digi.router> show dhcp

DHCP Status
 -----------
 IP address      Hostname            MAC Address        Lease Expires At
 ------------------------------------------------------------------------
 192.168.1.100   WAL-CMS-PJACO1      6c:19:8f:b1:68:99  17:23:05, 04 Apr
2017

digi.router>
```

10. If you still have communications issues with the LAN port, contact Digi Technical Support.

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Verify cellular connectivity

Test SIM slot

1. With the router powered off, insert a SIM card into the **SIM 1** (LR models) or **1-1** (WR models) slot of the device.
2. Power on the device.
3. Access the device's command line interface. See Access the command line interface.
4. Enter the show cellular command to confirm that the device acknowledges the SIM card:

```
digi.router> show cellular 1
```

The cellular status and statistics should be displayed. Look for the SIM status and whether the **ICCID** can be read:

```
Cellular Status and Statistics
------------------------------
Oper status             : Up
SIM status              : Using SIM1 (Ready)
...
ICCID                   : 89014104278007194782
```

If the **ICCID** does not appear in the cellular status and statistics, repeat this procedure with a different SIM card. If the **ICCID** still does not display, request an RMA with the reason SIM SLOT 1 (or 1-1) DETECTION FAIL.

Test cellular connectivity with SIM 1

Note Make sure that both antennas are connected and the router is located in an area with good signal strength.

1. With the router powered off, insert a SIM card into the **SIM 1** (LR models) or **1-1** (WR models) slot of the device.
2. Power on the device.
3. Open the command line interface. See Access the command line interface.
4. Configure an APN for SIM 1. Issue the following commands:

```
digi.router> cellular 1 sim1-apn my_apn
```

5. If the APN requires a username and password, add the following:

```
digi.router> cellular 1 sim1-password my_apn_password
digi.router> cellular 1 sim1-username my_apn_username
```

6. Enter the show cellular command and locate the IP address:

```
digi.router> show cellular 1

Cellular Status and Statistics
```


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```
------------------------------
…
IP address              : 10.123.456.90
Mask                    : 255.255.255.248
Gateway                 : 255.255.255.0
DNS servers             : 192.168.1.1, 192.168.1.2
```

If a valid IP address is not found, issue the show tech-support command from the device and email the command output to Digi Technical Support for assistance. To extract the show tech-support output from the device, see the following application note:

http://ftp1.digi.com/support/documentation/TLR_QN04_show_tech_support.PDF

Test SIM slot 2

1. With the router powered off, insert a SIM card into the **SIM 2** (LR models) or **1-2** (WR models) slot of the device.
2. Power on the device.
3. Access the Digi WR command line interface. See Access the command line interface.
4. Enter the show cellular command to confirm that the device acknowledges that the SIM card is installed in SIM slot 2:

```
digi.router> show cellular 1
```

The cellular status and statistics table appears. Locate the **SIM status** and determine if the **ICCID** can be read.

```
Cellular Status and Statistics
------------------------------
…
SIM status              : Using SIM2
ICCID                   : 89333603603003003000
```

If the **ICCID** does not appear, try with a different SIM card. If the **ICCID** still does not appear, contact Digi Technical Support, with the following subject line and problem description: **SIM slot 2 detection fail**.

Test cellular connectivity with SIM 2

1. Make sure that both antennas are connected and the router is located in an area with good signal strength.
2. With the router powered off, insert a SIM card into the **SIM 2** (LR models) or **1-2** (WR models) slot of the device.
3. Power on the device.
4. Open the command line interface. See Access the command line interface.
5. Configure an APN for SIM 2. Issue the following commands:

```
digi.router> cellular 1 sim2-apn my_apn
```

If the APN requires a username and password, add the following:

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```
digi.router> cellular 1 sim2-password my_apn_password
digi.router> cellular 1 sim2-username my_apn_username
```

6. Enter the show cellular command and locate the IP address:

```
digi.router> show cellular 1

Cellular Status and Statistics
------------------------------
…
IP address              : 10.123.456.90
Mask                    : 255.255.255.248
Gateway                 : 255.255.255.0
DNS servers             : 192.168.1.1, 192.168.1.2
```

If a valid IP address is not found, issue the show tech-support command from the device and email the command output to Digi Technical Support for assistance.

Models with two modems

If your has two modems, repeat the above procedures using SIM slots **2-1** and **2-2** and using cellular 2 in place of cellular 1 at the command line to verify SIM connectivity for the second modem. For example:

```
digi.router> show cellular 2

Cellular Status and Statistics
------------------------------
Oper status             : Up
SIM status              : Using SIM1 (Ready)
...
ICCID                   : 89014104278007194834
```


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Check cellular signal strength

1. While the internet link is still connected from following steps in Verify cellular connectivity, access the command line interface. See Access the command line interface.
2. Enter the show cellular command. In the output, view the values displayed for the **Signal strength** and **Signal quality** fields:

```
digi.router> show cellular

SIM  Status  APN           Signal Quality        PIN Status
-----------------------------------------------------------
1-1  Up      broadband     Good (-93dBm)         No PIN needed
1-2  Down                                        Unknown
2-1  Up      vzwinternet   Good (-102dBm)        No PIN needed
2-2  Down                                        Unknown
```

3. Check that the signal quality is roughly what you normally get with the same antenna in the test location, which should be **+/- 10 dBm**. If the signal strength is much worse than normal:
   - Swap the antennas with another set.
   - Insert a SIM card from a different carrier.
4. Ideally, repeat the test on a known working Digi WR device that contains the same type of radio module in the same location. Make sure this known working device is connected using the same antenna and the same provider. If it does, and the signal strength is much better (**+ 10 dBm**) than the suspected bad router, contact Digi Technical Support, with the following subject line and problem description: **Cellular signal strength low**.

Verify serial connectivity

Problem

When using the command line interface, command output displays unusual or garbled characters.

Probable causes

- Serial cable is bad.
- Wrong type of serial cable is being used for the serial connection.
- Wrong pinout being used for the serial connection.
- The baud rate setting for serial communication is set to different rates on either end of the connection.

Solution

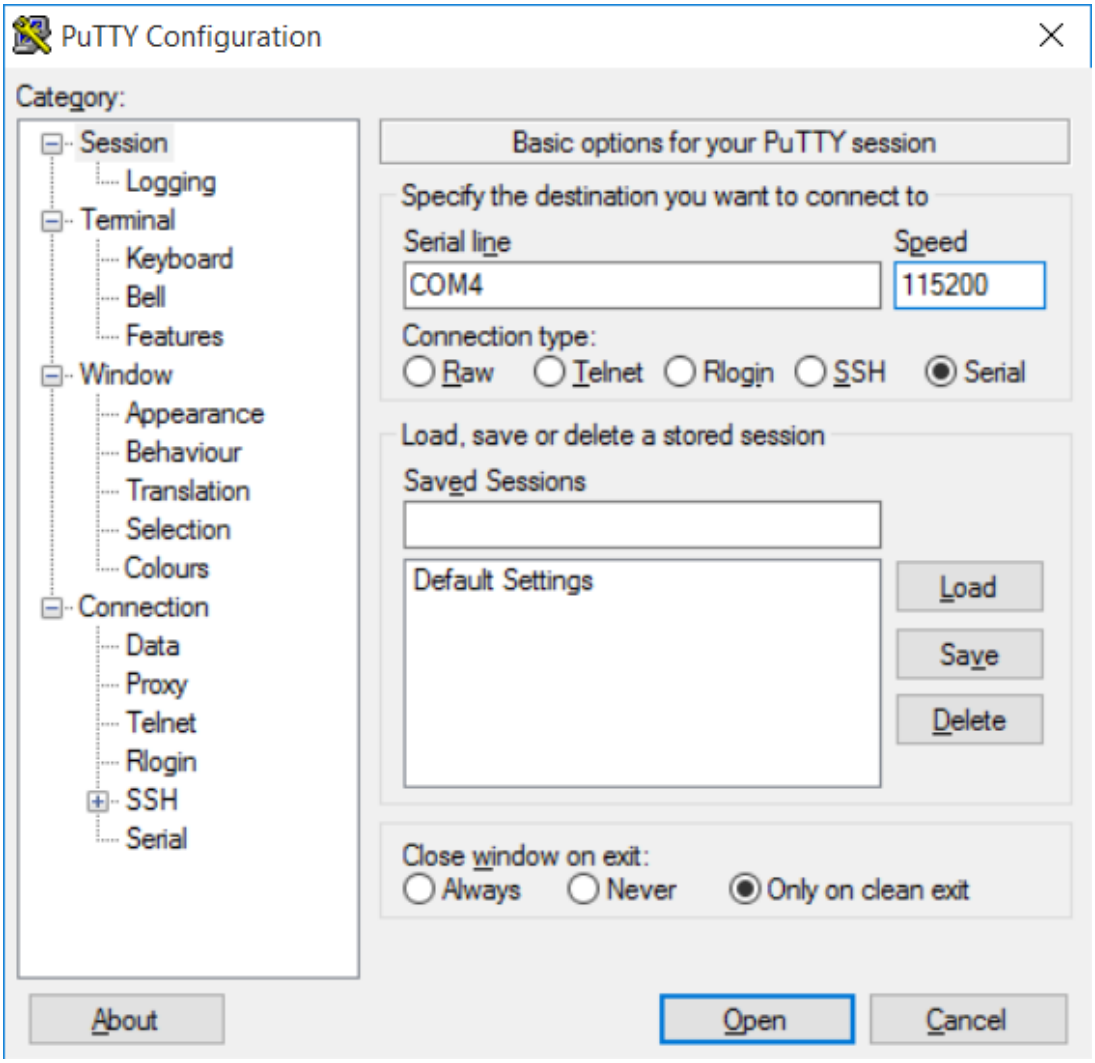
Test the serial connection.

1. Using a straight-through serial cable, connect a PC serial port to the device. For pinout details, see the hardware reference guide for your model.
2. Open a terminal application such as PuTTy, with the following serial port configuration:

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- Serial Port: **COM X**, where **X** is the serial port number of the computer, usually **1**.
- Speed: **115200**
- Connection type: depending on the application, make sure **Serial** is selected for the connection type.

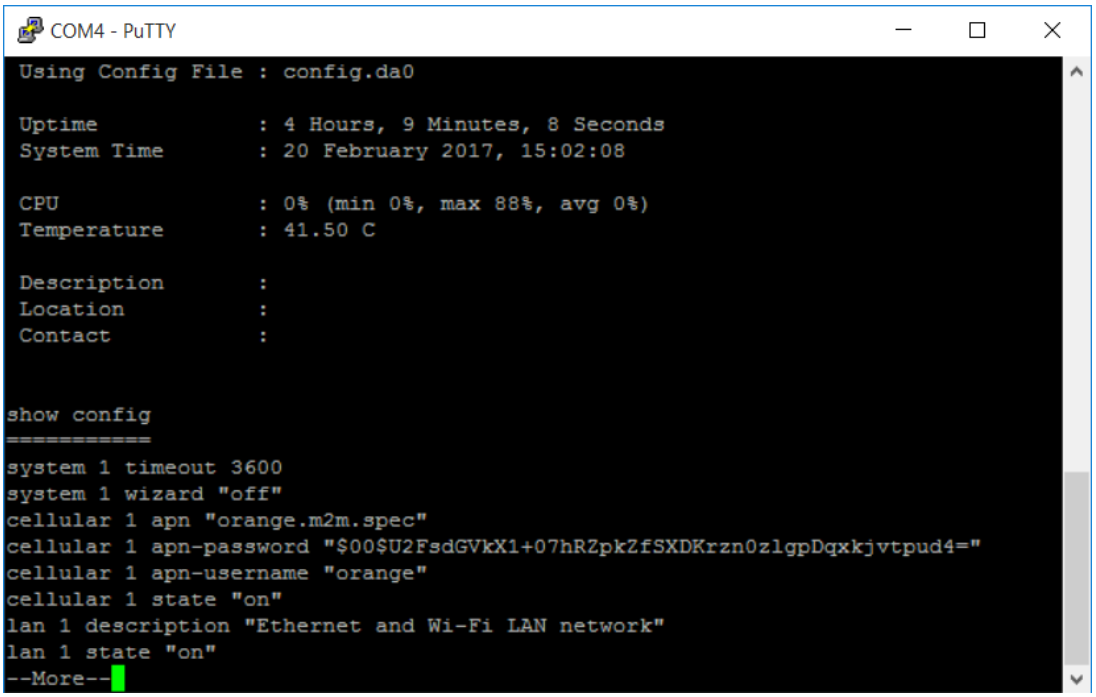


3. Click **Open**. A terminal window appears.
4. When prompted, enter your current username and password.
5. Check that you can send and receive command line interface commands, for example, enter show tech-support:

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6. If the command output does not contain any garbled or unusual output, the serial connection is up and working appropriately.
   If the command output has garbled output or unusual characters, continue to the next step.
7. Connect to the device Web UI over the network. See Log in to the web interface if you need help accessing the Web UI.
8. On the web interface, click **System** and select **Device Console**. The Device Console displays.



9. In the Device Console, enter the command **serial 1**. The serial settings display.
10. Verify that the serial port is configured for **115200** baud, **8** databits, **1** stopbit, **no** flow control, and **no** parity. Verify that the **state** setting of the serial interface is **on**. For example:

```
digi router > serial 1

baud 115200
databits 8
description
flowcontrol none
parity none
state cli
stopbits 1
```


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11. If the serial configuration is incorrect, follow the instructions in Configure the serial interface to set the correct configuration.
12. If you have verified that the serial ports on both the PC and the device are correctly configured, and you still cannot access the command-line interface over the console, try replacing the serial cable.
13. If serial issues persist after following these steps, contact Digi Technical Support, with the subject line **Serial connectivity issues**.

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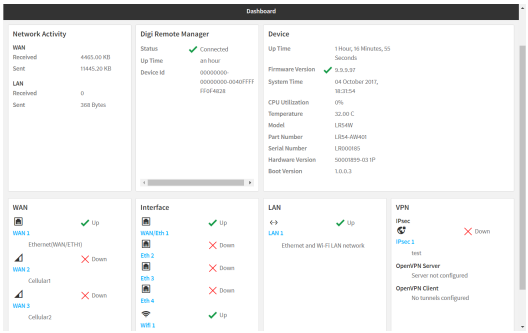
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Dashboard

The dashboard shows the current state of the device.



Dashboard display areas

Dashboard area	Description
Network activity	Summarizes network statistics: the total number of bytes sent and received over all Wide Area Networks (WANs) and Local Area Networks (LANs), including all WANs/LANs configured and active, disabled, and/or disabled.
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 Remote Manager.
Device	Displays device status, statistics, and identifying information. See the show system command for details. For **Firmware Version**, a green checkmark ✔ indicates the firmware is up to date and a red X indicates a firmware update is available. See Update system firmware for instructions.
WAN	Displays all configured Wide Area Networks (WANs), the physical interface assigned to the WAN, and the current state of the WAN. Click a WAN to display detailed configuration and status information. See Wide Area Networks (WANs) for details.
Interface	Displays all configured and available physical interfaces for the device and their current states. See Interfaces for details.
LAN	Displays all configured Local Area Networks (LANs), the physical interface(s) assigned to the LAN, and the current state of the LAN. Click a LAN to display detailed configuration and status information. See About Local Area Networks (LANs) for details.
VPN	Displays all configured Virtual Private Network (VPN) tunnels. See Virtual Private Networks (VPN) for details.

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DMNR page

Use the DMNR page to configure and view Verizon Dynamic Mobile Network Routing (DMNR).

Configuration options

Option	Description
Enable	Enables or disables DMNR. Specifies the current state of DMNR. The default is **disabled**.
Home agent	Specifies the IPv4 address for home agent.
Networks to route	Specifies the IPv4 addresses for the LANs to advertise. Select one or more available configured LANs or **None**. The default is **None**.
Advanced	
Authorization key	Specifies the character string for accessing the mobile network. The default is **VzWNeMo**.
SPI	Specifies the security parameter index. Enter an integer from 0 to 4294967295. The default is **256**.
Home network (tunnel)	Specifies an IP address for the mobile network; that is, the tunnel address that represents the mobile network. The default is **1.2.3.4**.
Lifetime	Specifies the number of seconds until the authorization key expires. Enter an integer from 120 to 65535. The default is **600**.
MTU	Specifies the maximum transmission unit in bytes for the tunnel. Enter an integer from 68 to 1476. The default value is **1476**.

Status display

Option	Description
Admin status	Shows the current administrative status: **Up** or **Down**.
Operational status	Shows the current operational status: **Up** or **Down**.
Registration status	Shows the current registration status: **Registered** or **Unregistered**.
Home agent	Shows the IP address for the Verizon home agent.
Care of address	Shows the current point of attachment IP address for DMNR.
Interface	Shows the interface for DMNR.
Lifetime (actual)	Shows the actual lifetime in seconds for the current DMNR authorization.
Networks	Shows the networks currently being advertised by DMNR.

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File system page

Use the **File system** page to display and manage the files and directories in the local file system of your device.

Navigation options

Field/Button	Description
	Navigates to the home or **/** directory of the file system. As you navigate through the file system, the path is displayed in breadcrumbs to the right of ; for example:  > app > dist To return to the home directory, click .
	Uploads directory or file to the device's file system.
	Creates a directory. You can create nested directories by specifying the path, separated by **/**.
	Displayed when a file is selected. Downloads the selected file from the device's file system. The file is downloaded to the default download directory for your browser.
	Displayed when a directory or file is selected. Renames the selected directory or file.
	Displayed when a directory or file is selected. Deletes the selected directory or file.
File list	The rest of the page lists the directories and files in the file system. Initially, all directories and files listed alphabetically, starting with directories first. All columns are sortable.
Name	The directory or file name.
Size	File size.
Last modified	Date the directory or file was last modified.

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Firewall page

Use the **Firewall** page to create and manage IP filter rules.

- **Input IP filter:** Manage your input filters in this section of the Firewall page.
- **Routing IP filter:** Manage your routing and output filters in this section of the Firewall page.

Depending on the address you provide for a filter, rules for either IPv4 or IPv6 are created.

Note Because output filters are rarely needed, all output filter rules you create display with a warning to notify you that you may not need to use an output filter rule.

See IP filter source and destination options and IP filter criteria options for information on configuring IP filter rules.

Input IP filter options

Option	Description
Enabled	Enables or disables the IP filter rule. The default is **enabled**.
Description	Description for the rule. Specify a string value up to **255** characters long.
Action	Specifies what to do with received packets: **Accept**, **Drop**, or **Reject** packets. The default is **Accept**.
Src	Specifies the interface for the incoming packets. Can be: ■ **ANY LAN** or a specific LAN ■ **ANY WAN** or a specific WAN ■ **Hotspot** ■ **ANY GRE Tunnel** or a specific GRE Tunnel. ■ **DMNR Tunnel** The default is **NONE (unrestricted)**.
Address	Specifies the source IP address for incoming packets. If you do not specify an address, the filter is applied to all addresses. Specify the address in IPv4 or IPv6 format. The format for the source IP address and the destination IP address must match. To force either IPv4 or IPv6 version, enter a default address: ■ For IPv4 0.0.0.0/0 ■ For IPv6 ::/0
Port	Specifies the destination port on the router for incoming packets. You can enter a port number, a range of ports, or a list of ports. If you do not specify a port, the filter is applied to all ports.
Protocol	Specifies the protocol for incoming packets: **tcp**, **udp**, and **icmp**. If you do not specify a protocol, the filter is applied to all protocols.

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Web reference *Firewall page*

Routing IP filter options

Option	Description
Enabled	Enables or disables the IP filter rule. The default is **enabled**.
Description	Description for the rule. Specify a string value up to **255** characters long.
Action	Specifies what to do with received packets: **Accept**, **Drop**, or **Reject** packets. The default is **Accept**.
Src	Specifies the interface for the incoming packets: **ANY-LAN**, **ANY-WAN**, or a specific LAN or WAN. The default is **NONE**.
Address	Specifies the source IP address for incoming packets. If you do not specify an address, the filter is applied to all addresses. Specify the IP address in IPv4 or IPv6 format. The format for the source IP address and the destination IP address must match. To force either IPv4 or IPv6 version, enter a default address: ■ For IPv4 0.0.0.0/0 ■ For IPv6 ::/0
Port	Specifies the source port number. You can enter a port number, a range of ports, or a list of ports. If you do not specify a port, the filter is applied to all ports.
Dest	Specifies the destination interface for forwarded packets: **ANY-LAN**, **ANY-WAN**, or a specific LAN or WAN.
Address	Specifies the destination IP address for incoming packets. If you do not specify an address, the filter is applied to all addresses. Specify the address in IPv4 or IPv6 format. The format for the source IP address and the destination IP address must match. To force either IPv4 or IPv6 version, enter a default address: ■ For IPv4 0.0.0.0/0 ■ For IPv6 ::/0
Port	Specifies the destination port number. You can enter a port number, a range of ports, or a list of ports. If you do not specify a port, the filter is applied to all ports.
Protocol	Specifies the protocol for incoming packets: **tcp**, **udp**, and **icmp**. If you do not specify a protocol, the filter is applied to all protocols.

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GRE page

Use the GRE tunnel page to create or modify a GRE tunnel. You can configure up to 10 GRE tunnels.

Configuration options

Option	Description
Enable	Enables or disables the GRE tunnel. The default is **disabled**.
Description	Description for the GRE tunnel. Specify a string value up to 255 characters long.
IP Address	Specifies the IPv4 address for the GRE tunnel.
Subnet Mask	Specifies the subnet mask for the GRE IP address in IPv4 format.
Peer	Specifies the remote peer address for the GRE tunnel in IPv4 format.
Key	Specifies the key to use for the GRE tunnel, a 4-byte unsigned integer. Specify an integer from 0 to 4294967295. The default is no key.

Status display

Option	Description
Admin Status	Shows the current administrative status: **Up** or **Down**.
Oper Status	Shows the current operational status: **Up** or **Down**.
IP Address	Shows the IP address for the GRE tunnel.
Subnet Mask	Shows the subnet mask for the GRE IP address.
Peer	Shows the IP address for the GRE peer.
Key	Shows the key for the GRE tunnel.
Packets	Shows the number of received and sent packets for the GRE tunnel.
Bytes	Shows the number of received and sent bytes for the GRE tunnel.

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Cellular locked pin page

A SIM card can be locked if any 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 device cannot make a cellular connection.

The show cellular command indicates whether a SIM card is set to a locked state. In the show cellular output, look for the fields **SIM1 PIN status**, **SIM2 PIN status**, and **SIM status**. For example:

```
digi.router> show cellular

 Cellular Status and Statistics
 ------------------------------

 Admin status           : Up
 Oper status            : Down
 Module                 : Sierra Wireless, Incorporated MC7455
 Firmware version       : SWI9X30C_02.08.02.00
 Hardware version       : 1.0
 IMEI                   : 359072060053937
 Temperature            : 33C

 SIM1 PIN status        : New PIN is untested
 SIM2 PIN status        : Never connected
 SIM status             : Using SIM1 (SIM is locked)
 ICCID                  :
 ⋮
```

Command line

Unlocking a SIM card can be performed from the command line interface only.

1. To unlock the SIM card, use the unlock command to set a new PIN for the SIM card using the following command syntax:

   ```
   unlock <sim1 | sim2> <puk code> <new sim pin>
   ```

   Where:

   <sim1 | sim2> indicates whether the SIM card to unlock is in the SIM1 or SIM2 SIM card slot.

   <puk code> is the code to unlock the SIM card. The PUK code can be between 8 and 10 digits long.

   <new sim pin> is the new PIN for the SIM card. This PIN can be between 4 and 8 digits long. Using this parameter changes the PIN for the SIM card to a new value.

   For example:

   To unlock a SIM card in SIM slot SIM **1** with PUK code **12345678**, and set the new SIM PIN to **1234**:

   ```
   digi.router> unlock sim1 12345678 1234
   ```

   When the command operations are complete, the unlock command displays one of the following messages to indicate the state of the SIM:

   ```
   SIM x is permanently locked and must be replaced.
   ```


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Web reference *Cellular locked pin page*

```
The PUK code is invalid. You have x retries left before the SIM is
permanently locked.
```

```
The new PIN has been set.
Please use the "save config" command to save the new PIN to the
configuration.
```

2. If the SIM remains in a locked state after using the unlock command, contact your cellular carrier.
3. Save the configuration.

```
digi.router> save config
```


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Device preferences page

Use the Device preferences page to configure system settings.

Configuration options

Option	Description
Name	The name of this device. Accepted value is any string up to 255 characters.
Description	A description of this device. Accepted value is any string up to 255 characters.
Contact	Contact information for this device. Accepted value is any string up to 255 characters.
Location	The location of this device. Accepted value is any string up to 255 characters.
Timezone	Sets the system timezone. By setting the time zone, the device displays the local time for that time zone and automatically adjusts for daylight saving time.
Session timeout	The time, in seconds, after which a web or command-line interface session times out if there is no activity. Accepted value is any integer from 60 to 3600. The default value is **300**.

Status display

Option	Description
Up time	Displays the amount of time the device has been up without interruption.
Firmware version	Shows the firmware version running on the device.
System time	Shows the system time and date.
CPU utilization	Shows the current percentage of CPU utilization.
Temperature	Shows the current device temperature in celsius.
Model	Shows the device model.
Part number	Shows the device part number.
Serial number	Shows the device serial number.
Hardware version	Shows the device hardware version.
Boot version	Shows the device boot version.

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Hotspot page

Use the Hotspot page to configure a hotspot for a LAN.

See Hotspot for more information about configuring a hotspot.

General options

Option	Description
Enable	Enables or disables the hotspot. The default is **disabled**.
LAN	Specifies which LAN to run the hotspot on. You can select any LAN on your device to serve as the hotspot LAN; however, once you configure a LAN for use as the hotspot LAN, you can no longer access the device's web interface or SSH server via that LAN. Therefore, you must make sure that you do not enable hotspot for the LAN that you are using to access the device for other purposes, such as configuring and monitoring the device, or providing clients with non-hotspot access to your network. The default is **lan2**.
Login	Specifies whether the login page is a **Local page** or a **Remote URL**. ■ **Local Page**—Uses an HTML page for authentication that is stored locally on the device's filesystem, in the **hotspot** directory. Note that the **hotspot** directory is not visible until hotspot has been enabled for the first time. ■ **Remote URL**—Uses an HTML page for authentication that is stored remotely. Default is **Local page**.
Local page/Remote URL	If **Login** is set to: ■ **Local Page**—Specifies the local page. Normally, this field should be left blank, and the device will use the default authentication HTML page based on the selected **Auth Mode**. If you upload a custom HTML file that uses a filename other than the default filename, you should select the custom filename here. ■ **Remote URL**—Enter the URL of the server that hosts the HTML authentication page. The URL must begin with **http://** or **https://**. The server listed here must also be included in the **Allowed Domains** or **Allowed Subnets**.
IP address	Specifies the IPv4 address on which the hotspot runs, as well as the IP addresses assigned to clients. This IPv4 address must not exist within a current subnet. Specify the IPv4 address. The default is **10.1.0.1**.
Subnet mask	Specifies IPv4 subnet mask for the hotspot to assign addresses within. Specify the subnet mask. The default is **255.255.255.0**.

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Web reference *Hotspot page*

Option	Description
Auth Mode	Specifies the authentication mode for hotspot users: **Click-through**: Presents terms of use that must be accepted before user can continue. **Local shared password**: Hotspot users must enter a shared local password. **RADIUS shared password**: Hotspot users must enter a shared RADIUS password. **RADIUS Users**: Hotspot user must enter an assigned RADIUS username and password. **HotspotSystem**: Hotspot is controlled by HotspotSystem. See Hotspot authentication modes for further information about authentication modes. The default is **Click-through**.
Local shared password	Specifies the password when **Auth mode** is set to **Local shared password**.
Primary RADIUS server	Specifies the IP address or fully-qualified domain name of the RADIUS server to use to authenticate hotspot users when **Auth mode** is set to **RADIUS shared password** or **RADIUS Users**. Specify an IP address or fully qualified domain name.
RADIUS server secret	Specifies the shared secret for the RADIUS server when **Auth mode** is set to **RADIUS shared password** or **RADIUS Users**. Specify a string up to 64 characters.
RADIUS NAS ID	Specifies a unique identifier for this network access server (NAS) when **Auth mode** is set to **RADIUS shared password**, **RADIUS Users**, or **HotspotSystem**. The fully-qualified domain name of the NAS is often used, but any arbitrary string cay be used. String cannot contain spaces, an open bracket ([), or close bracket (]). Specify a string from 1 and 64 characters. The default is **hotspot**.

Advanced options

Option	Description
Server Port	Specifies the port to run the hotspot server on. Specify an integer from from 1 to 65535. The default is **4990**.
Auth Port	Specifies the port to run hotspot authentication server on. Specify an integer from 1 to 65535. The default is **3990**.
Max Download	Specifies the maximum download speed allowed for each client. Enter an integer from 0 to 100000 and select **Kbps** or **Mbps**. The default is **10 Mbps**.
Max Upload	Specifies the maximum upload speed allowed for each client. Enter an integer from 0 to 100000 and select **Kbps** or **Mbps**. The default is **10 Mbps**.
Swap Octets	Specifies whether to swap the meaning of the input octets/packets and output octets/packets RADIUS attributes when **Auth mode** is set to **RADIUS shared password** or **RADIUS Users**. This can fix issues if the data limits and/or accounting reports appear to be reversed on the RADIUS server. The default is **disabled**.

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Option	Description
Use UAM Secret	Enables or disables the use of the UAM secret when **Auth mode** is set to **RADIUS shared password** or **RADIUS Users**. This does not typically need to be set unless integrating with a cloud hotspot provider. The default is **disabled**.
UAM Secret	Specifies the secret shared between the UAM server and the hotspot when **Auth mode** is set to **RADIUS shared password** or **RADIUS Users**. This does not typically need to be set unless integrating with a cloud hotspot provider. Specify a string up to 64 characters.
DHCP lease length	Specifies the number of seconds until a DHCP lease expires. Specify an integer from 60 to 1000000. The default value is **600**.
Secondary RADIUS Server	Specifies the IP address or fully-qualified domain name of the backup RADIUS server to use to authenticate hotspot users when **Auth mode** is set to **RADIUS shared password** or **RADIUS Users**. Specify a fully qualified domain name.
RADIUS Server Port	Specifies the UDP port number for the RADIUS server when **Auth mode** is set to **RADIUS shared password** or **RADIUS Users**. Specify an integer from 1 to 65535. The default is **1812**.
Allowed Domains	Specifies the domains to which hotspot users have access before hotspot authentication. Enter a string that is a comma-separated list of domains up to 999 characters.
Allowed Subnets	Specifies the subnets to which hotspot users have access before hotspot authentication. Enter a string that is a comma-separated list of domains up to 999 characters.

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Interfaces—cellular page

Use the Cellular interface page to create and manage cellular interfaces.

Option	Description
Cellular1 or Cellular 2	
Description	Description for the interface. Specify a string value up to **255** characters long.
SIM(s)	
APN	Specifies the Access Point Name (APN) for the cellular interface. Enter a string up to 63 characters long.
Username	Specifies the username for the APN. Enter a string up to 63 characters long.
Password	Specifies the password for the APN. Enter a string up to 128 characters long.
Preferred mode	Specifies the preferred mode for the cellular interface: Auto, 4G, 3G, or 2G. The default is **Auto**.
Connection attempts	Specifies the number of attempts to establish a cellular connection. After this number of attempts, the cellular module is power cycled, and the device attempts to make a cellular connection again. Enter an integer from 10 to 500. The default is **20**.

Cellular status and statistics

Option	Description
WAN	For SIMs, displays the WAN to which the cellular interface is assigned.
Oper status	Displays the operational status for the cellular interface: Up or Down.
SIM status	Displays the SIM (SIM1 or SIM2) in use for this cellular module.
Signal quality	Displays an indicator of the quality of the received cellular signal measured in dB.
Signal strength	Displays a measure of the signal level of the cellular network measured in dB.
IP address	Displays the IP address for the cellular interface.
Mask	Displays the address mask for the cellular interface.
Gateway	Displays the IP address of the remote end of the cellular connection.
DNS servers	Displays the DNS server(s) associated with the cellular interface.
TX bytes	Displays the number of bytes transmitted by the cellular interface.
RX bytes	Displays the number of bytes received by the cellular interface.

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Web reference *Interfaces—cellular page*

Option	Description
APN in use	Displays the current Packet Data Protocol (PDP) connection context. A PDP context contains routing information for packet transfer between a mobile station (MS) and a gateway GPRS support node (GGSN) to have access to an external packet-switching network. The PDP context identified by an exclusive MS PDP address (the mobile station's IP address). This means that the mobile station will have as many PDP addresses as activated PDP contexts.
Registration status	Displays the registration status for the cellular interface.
Attachment status	Displays the attachment status for the cellular interface: attached or detached.
Phone number	Displays the phone number for the cellular interface.
Network provider	Displays the network provider for the cellular interface.
PLMN	Displays the PLMN, identified by the Mobile Country Code (MCC) and the Mobile Network Code (MNC).
Location	Displays the LAC—Location Area Code and CellID (CID).
Roaming status	Displays the roaming status: Roaming or Home (not roaming).
Connection type	Displays the cellular connection type.
Radio technology	Displays the radio technology the modem is using.
Band	Displays the radio band on which the cellular module is operating.
Channel	Displays the radio channel on which the cellular module is operating.
Module	Displays the manufacturer model number for the cellular module.
Firmware version	Displays the manufacturer version number for the software running on the cellular module.
Hardware version	Displays the manufacturer version number for the cellular module hardware.
Temperature	Displays the current temperature of the cellular module, as read and reported by the temperature sensor on the cellular module.
IMEI	Displays the International Mobile Station Equipment Identity (IMEI) number for the cellular module, a unique number assigned to every mobile device.
IMSI	Displays the International Mobile Subscriber identity (IMSI).
ICCID	Displays the Integrated Circuit Card Identifier (ICCID). This identifier is unique to each SIM card.

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Interfaces—Ethernet page

Use the Ethernet interface page to manage Ethernet interfaces.

Option	Description
Enable	Enables or disables the interface. The default is **enabled**.
Description	Description for the interface. Specify a string up to **255** characters long.
Speed	Specifies the speed in Mbps for the Ethernet interface: Automatic, 10Mbps, 100Mbps, or 1000Mbps. The default is **Automatic**.
Duplex	Specifies the duplex mode for the Ethernet interface: Automatic, Full, or Half. The default is **Automatic**.

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Interfaces—Wi-Fi page

Use the Wi-Fi interface page to manage Wi-Fi interfaces. Depending on the device, you can configure one or two Wi-Fi modules.

General options

Option	Description
Module 1 or Module 2	
Description	Description for the interface. Specify a string value up to **255** characters long.
Mode	Selects the mode for the Wi-Fi module: Access point options and Access point status and statistics or Client mode options and Client status and statistics The default value is **Access point**.

Access point options

Option	Description
Module 1 or Module 2	
Band	Specifies the band for the Wi-Fi module: 2.4 GHz or 5 GHz.
Channel	Specifies a channel for the Wi-Fi module or **auto** to automatically select the best channel for the module. Specify a channel (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 36, 40, 44 or 48) or auto. The default value is **auto**.
Advanced	
Protocol	Specifies the protocol for the Wi-Fi module: ■ For 2.4 GHz, the default and only protocol is **bgn**. ■ For 5 GHz, select a, an, or an/ac. The default is **an/ac**.
TX power	Specifies theTX power to use for Wi-Fi module by percentage. Specify an integer from 1 to 100. The default is **100**.
For each access point	
SSID	Specifies the Service Set Identifier (SSID) for the Wi-Fi interface. You can configure the SSID to use the device's serial number by including **%s** in the SSID. For example, an SSID parameter value of **%s-1** on a WR64 would resolve to an SSID similar to **WR64-123456-1**. **Note** Multiple access points can have the same SSID.

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Web reference *Interfaces—Wi-Fi page*

Option	Description	
Description	Description for the interface. Specify a string value up to **255** characters long.	
Security	Specifies the security type for the Wi-Fi interface: **None**, **WPA2 Personal**, **WPA/WPA2 Mixed Mode Personal**, **WPA2 Enterprise**, or **WPA/WPA2 Mixed Mode Enterprise**. The default is **WPA2 Personal**.	
	If WPA2 Personal or WPA/WPA2 Mixed Mode Personal are selected for Security	
	Password	Specifies the password for the Wi-Fi interface. The password must be 8-63 ASCII or 64 hexadecimal characters. Enter a string up to 64 characters long.
	Verify password	Re-enter the password for the Wi-Fi interface. The text you enter must match the text you entered for **Password**.
	If WPA2 Enterprise or WPA/WPA2 Mixed Mode Enterprise are selected for Security	
	Radius Server	The IP address of the RADIUS server that will be used to authorize access to the access point.
	Radius Port	The port of the RADIUS server.
	Radius Port	The RADIUS server shared secret.
Broadcast SSID	Enables or disables broadcasting the SSID in beacon packets. Disabling the SSID prevents clients from easily detecting the presence of this access point. The default value is **Enabled**.	
Isolation—Client	Enables or disables Wi-Fi client isolation, which prevents clients connected to the Wi-Fi access point from communicating with each other. The default value is **Enabled**.	
Isolation—Access point	Enables or disables clients on a Wi-Fi access point from communicating with clients on other Access Points. The default value is **Enabled**.	

Client mode options

Option	Description
SSID	Specifies the Service Set Identifier (SSID) for the Wi-Fi interface. You can configure the SSID to use the device serial number by including the percent (%) symbol in the SSID. For example, an SSID value **WR64_%s** resolves to **WR64_LR123456**. Enter a string up to 32 characters long.
Security	Specifies the security type for the Wi-Fi interface: none, WPA2 personal, WPA/WPA2 personal, WPA2 enterprise, or WPA/WPA2 enterprise. The default is **WPA2-personal**.
Username	For WPA2 enterprise and WPA/WPA2 mixed mode. Specifies the username for the Wi-Fi network. Enter a string up to 64 characters long.

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Option	Description
Password	Specifies the password for the Wi-Fi interface. The password must be 8-63 ASCII or 64 hexadecimal characters. Enter a string up to 64 characters long.
Hidden SSID	Enables or disables whether to scan for hidden SSID. The default is **off**. In general, for both security and performance issues, Digi recommends you do not enable the Hidden option.

Access point status and statistics

Option	Description
Network	Shows the network to which the Wi-Fi interface is assigned.
Admin status	Shows whether the Wi-Fi access point is sufficiently configured to be brought up.
Oper status	Shows whether the Wi-Fi access point is up or down.
Channel	Shows the radio channel on which the Wi-Fi Access Point is operating.
Module	Shows the Wi-Fi module on which the Wi-Fi access point is operating.
MAC address	Shows the MAC address for the Wi-Fi access point.
SSID	Shows the SSID for the Wi-Fi access point.
Network traffic details	
Bytes	Shows bytes received and sent on the Wi-Fi access point.
Packets	Shows packets received and sent on the Wi-Fi access point.
Multicasts	Shows the number of multicasts received and sent on the Wi-Fi access point.
Collisions	Shows the number of transmit collusions received and sent by the Wi-Fi access point.
Errors	Shows the number errors received and sent by the Wi-Fi access point.
Dropped	Shows the number of received and sent packets dropped by the Wi-Fi access point.
FIFO errors	Shows the number of received and sent FIFO errors by the Wi-Fi access point.
CRC errors	Shows the number of CRC errors for received and sent packets on the Wi-Fi access point.
Aborted errors	Shows the number of received and sent aborted errors on the Wi-Fi access point.
Frame errors	Shows the number of received and sent frame errors on the Wi-Fi access point.
Carrier errors	Shows the number of received and sent carrier errors on the Wi-Fi access point.
Length errors	Shows the number of received and sent length errors on the Wi-Fi access point.
Heartbeat errors	Shows the number of received and sent hearbeat errors on the Wi-Fi access point.

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Option	Description
Missed errors	Shows the number of received and sent missed errors on the Wi-Fi access point.
Window errors	Shows the number of received and sent window errors on the Wi-Fi access point.
Over errors	Shows the number of received and sent over errors on the Wi-Fi access point.

Client status and statistics

Option	Description
WAN	Shows whether the WAN is available.
Admin status	Shows whether the Wi-Fi client is sufficiently configured to be brought up.
Oper status	Shows whether the Wi-Fi client is up or down.
SSID	Shows the SSID for the Wi-Fi client.
MAC address	Shows the MAC address for the Wi-Fi client.
BSSID	Shows the BSSID for the Wi-Fi client.
Security	Shows the security mode for the Wi-Fi client.
RSSI	Shows the signal strength in dBm for the Wi-Fi client.
Connection time	Shows the connection time in seconds for the Wi-Fi client.
Connection rate	Shows the connection rate in Mbps for the Wi-Fi client.
Network traffic details	
Bytes	Shows bytes received and sent by the Wi-Fi client.
Packets	Shows packets received and sent by the Wi-Fi client.
Multicasts	Shows the number of multicasts received and sent by the Wi-Fi client.
Collisions	Shows the number of received and sent collisions on the Wi-Fi client.
Errors	Shows the number of received and sent errors on the Wi-Fi client.
Dropped	Shows the number of received and sent dropped packets on the Wi-Fi client.
FIFO errors	Shows the number of received and sent FIFO errors on the Wi-Fi client.
CRC errors	Shows the number of received and sent CRC errors on the Wi-Fi client.
Aborted errors	Shows the number of received and sent aborted errors on the Wi-Fi client.
Frame errors	Shows the number of received and sent frame errors on the Wi-Fi client.
Carrier errors	Shows the number of received and sent carrier errors on the Wi-Fi client.
Length errors	Shows the number of received and sent length errors on the Wi-Fi client.
Heartbeat errors	Shows the number of received and sent heartbeat errors on the Wi-Fi client.

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Web reference *Interfaces—Wi-Fi page*

Option	Description
Missed errors	Shows the number of received and sent missed errors on the Wi-Fi client.
Window errors	Shows the number of received and sent window errors on the Wi-Fi client.
Over errors	Shows the number of received and sent over errors on the Wi-Fi client.

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IPsec Tunnels page

Use the IPsec Tunnels page to configure IPsec tunnels. You can configure up to 32 tunnels.

Network options

Option	Description
Description	Description for the IPsec tunnel. Specify a string value up to **255** characters long.
Enable	Enables or disables the IPsec tunnel. The default is **enabled**.
Enable UDP Encapsulation	Enables or disables UDP Encapsulation. The device automatically uses UDP encapsulation when it detects that NAT is being used. When enabled, this option forces the device to use UDP Encapsulation even if it does not detect that NAT is being used. The default is **disabled**.
Use If WAN Down	Specifies a WAN that, on failure, will trigger this IPsec tunnel to start. This is useful in cases where you are using a private WAN for sensitive data. In a failover scenario involving the private WAN, you can configure the device to route the sensitive data over a public WAN, while protecting the data by using an IPsec tunnel. The default is **None**.
Interfaces	Specifies the preferred WAN for the IPsec tunnel, and the failover behavior of the IPsec tunnel during WAN failure. By default, the IPsec tunnel will operate on the first available WAN and will fail over to the next available WAN, based on the WAN priority. You can select and prioritize multiple WANs for the IPsec tunnel: the first WAN will be the initial WAN that the IPsec tunnel uses; each additional WAN will be the next priority for failover during WAN failure. See IPsec preferred WAN and WAN failover for more information. The default is **all**, which means that the default failover behavior will be used.
Local IP Subnet	Specifies the local subnet(s) for this IPsec tunnel. Enter an IPv4 address.
Local Identifier	Specifies the local ID used for this IPsec tunnel. Enter a string up to 31 characters long.
Remote Peer IP Address or Name	Specifies the remote peer for this IPsec tunnel. Enter a fully qualified domain name.
Remote IP Subnets	Specifies the remote subnet(s) for this IPsec tunnel. Enter an IPv4 address.
Remote Identifier	Specifies the remote ID used for this IPsec tunnel. Enter a string up to 31 characters long.

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Authentication

Option	Description
Authentication Mode	The type of authentication to be used for the IPsec tunnel. Available options are **Pre-shared Key Authentication** or **XAuth and Pre-shared Key Authentication**.
IPsec pre-shared key	Specifies the preshared key for the IPsec tunnel. Enter a string up to 128 characters long.
XAuth Role	Determines whether the device will function as an XAuth client or server. Values are: ■ **Client Role** — Device will function as an XAuth client. ■ **Server Role** — Device will function as an XAuth server. If this is selected, you need to create XAuth users at the IPsec XAuth Users page (**Network** > **Networks** > **IPsec** > **Users**). This option is only displayed if **Authentication Mode** is set to **XAuth and Pre-shared Key Authentication**.
XAuth Identity	If **Client Role** is selected for **XAuth Role**, specifies the username to use for XAuth authentication.
XAuth Password	If **Client Role** is selected for **XAuth Role**, specifies the password to use for XAuth authentication.

Encryption options

Option	Description
ESP encryption	Selects the ESP encryption type for IPsec tunnel. Select multiple values of aes128, aes192 and aes256. The default is **aes128**.
ESP authentication	Selects the Encapsulating Security Payload (ESP) authentication type used for the IPsec tunnel. Select multiple values of sha1 and sha256. The default value **sha1**.
ESP Diffie Hellman group	Selects the Encapsulating Security Payload (ESP) Diffie-Hellman group used for the IPsec tunnel. Select multiple values of none, group5, group14, group15 and group16. The default is **group14**.

Negotiation options

Option	Description
Internet Key Exchange (IKE)	Selects the Internet Key Exchange (IKE) version to use for this IPsec tunnel. The default is **1**.

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Web reference *IPsec Tunnels page*

Option	Description
IKE negotiation mode	Selects the IKEv1 mode to use for this IPsec tunnel: main or aggressive. The default is **main**.
IKE encryption	Selects the IKE encryption type for this IPsec tunnel. Select multiple values of aes128, aes192 and aes256. The default is **aes128**.
IKE authentication	Selects the IKE authentication type for this IPsec tunnel: sha1 or sha256. The default is **sha1**.
IKE Diffie Hellman group	Selects the IKE Diffie-Hellman group for this IPsec tunnel. Diffie-Hellman is a public-key cryptography protocol for establishing a shared secret over an insecure communications channel. Diffie-Hellman is used with Internet Key Exchange (IKE) to establish the session keys that create a secure channel. Select multiple values of group5, group14, group15 and group16. The default is **group14**.

Lifetime options

Option	Description
IPsec tunnel lifetime before renegotiation	
Time threshold max (seconds)	Specifies the timeout, in seconds, for dead peer detection. Enter an integer from 1 to 3600. The default value is **3600**.
Data threshold max (bytes)	Specifies the dead peer detection transmit delay. Enter an integer from 1 to 3600. The default value is **0**.
IKE Lifetime before key renegotiation	
Time threshold max (seconds)	Specifies the lifetime for the IKE key, in seconds. Enter an integer from 180 to 4294967295. The default is **4800**.

Probing

Option	Description
Probe hosts	Specifies a comma-separated list of endpoints that will be probed.
Probe interval	Specifies the number of seconds to wait between sending probe packets. This value must be more than the probe timeout value.
Probe timeout	Specifies the number of seconds to wait after the first failed probe before restarting the IPsec tunnel. Note that once the device has successfully connected and then the connection is lost, it will immediately fail over to the next probe-type, regardless of the probe timeout setting.
Probe response timeout	Specifies the time, in seconds, to wait for a response to a probe before the device will consider the probe to have failed. This value must be less than the **Probe interval** and **Probe timeout** values.

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Web reference *IPsec Tunnels page*

Option	Description
Probe size	Specifies the size, in bytes, of probe packets sent to detect IPsec failures. Allowed values are between 64 and 1500.

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IPsec XAuth Users page

Use the IPsec Users page to configure IPsec XAuth users, when the **XAuth Role** is set to **Server Role** on the IPsec Tunnels page (**Network** > **Networks** > **IPsec** > **Tunnels**).

Option	Description
Username	The username that an XAuth client will use for XAuth authentication.
Password	The password that an XAuth client will use for XAuth authentication.
Confirm Password	Retype the password to confirm.

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Local Networks page

Use the Local Networks page to configure and manage local networks. For each local network, you can configure the following options.

Configuration options

Option	Description
Enable	Enables or disables the network. The default is **disabled**.
Interfaces	Specifies one or more physical interfaces for the LAN. The default is **none**.
Description	Specifies a description for the network. Enter a string up to 63 characters long.
IPv4	
IP address	Specifies the IPv4 address for the network.
Netmask	Specifies the netmask for IP address in IPv4 format. The default value is **255.255.255.0**.
DHCP server	
DHCP server	Enables or disables a DHCP server, or enables DHCP relay. Values are: ■ **Off** — Disables all DCHP server functionality. ■ **Server** — Enables the device's DHCP server. ■ **Relay** — Disables the device's DHCP server and enables DHCP relay. The default is **Server**.
IP start	If **Server** is selected for **DHCP Server**, specifies the start IP address for the range of IP addresses the DHCP server issues to clients.
IP end	If **Server** is selected for **DHCP Server**, specifies the end IP address for the range of IP addresses the DHCP server issues to clients.
Lease expires	If **Server** is selected for **DHCP Server**, specifies the lease length, in minutes, issued by the DHCP server.
Primary Relay Server	If **Relay** is selected for **DHCP Server**, specifies the IP address of the primary relay server.
Secondary Relay Server	(Optional) If **Relay** is selected for **DHCP Server**, specifies the IP address of the secondary relay server.
IPv6	
Enable IPv6	Enables or disables IPv6 addressing. The default is **disabled**.

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Web reference *Local Networks page*

Option	Description
IP address mode	Specifed the address mode for IPv6: ■ **Use SLAAC to provision clients** ■ **Use DHCPv6 to provision clients** ■ **Use SLAAC and DHCPv6** The default is **Use SLAAC and DHCPv6**.
Advanced	
MTU	Specifies the maximum Transmission Unit (MTU), or packet size, for packets sent over the LAN. Enter an integer from 128 to 1500. The default value is **1500**. For IPv6 addresses, the minimum MTU value must be **1280**.

Status display

Option	Description
Interfaces	Shows the interfaces for the LAN.
Admin status	Shows the administrative status for the LAN: Up or Down.
Oper status	Shows the operational status for the LAN: Up or Down.
IPv4 address	Shows the IPv4 address for the LAN.
Netmask	Shows the IPv4 netmask for the LAN.
DHCP client	Shows the status of the DHCP client: On or Off.
IPv6	Shows whether IPv6 is enabled or disabled.
Packets	Shows packets received and sent on the LAN.
Bytes	Shows bytes received and sent on the LAN.

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Location page

Use the Location page to enable or disable the Global Navigation Satellite System (GNSS) module. You can also view location details from this page when the module is enabled.

Configuration options

Option	Description
State	Enables location support for either the local GNSS module or for the location server, or disables location support.
Server Port	Available only if **State** is set to **Server**: Defines the IP UDP port to listen for location messages. If set to **0**, this feature is disabled. Accepted value is any integer from **0** to **65535**. The default value is **0**.
Interval	Sets the refresh interval in seconds for reading and sending location data. Accepted value is any integer from **1** to **3600**. The default value is **10**.
Vehicle ID	Sets the vehicle ID to include location messages. Accepted value is any string of 4 characters.

Status display

Option	Description
GNSS State	The state of the GNSS module.
Latitude	The current latitude of the device.
Longitude	The current longitude of the device.
Altitude	The current altitude of the device.
Horizontal Velocity	The current horizontal velocity of the device.
Vertical Velocity	The current vertical velocity of the device.
Direction	The current direction that the device is moving.
Quality	The quality of the GNSS signal.
Date Time	A date and time stamp for this information.
Number of Satellites	The number of satellites involved in determining the device's location.

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Location Client page

Use the Location Client page to configure location clients on the device that forward location messages in either NMEA or TAIP format to a remote host. You can configure up to ten location clients on the device to forward location information to up to ten different remote hosts.

Configuration options

Option	Description
Description	(Optional) Enter a description of the location client.
Server	The IP address of the remote host to which location messages will be sent.
Server Port	The UDP port on the remote host to which location messages will be sent.
Type	The protocol type for the messages, either **TAIP** or **NMEA**.
TAIP/NMEA Filter	The types of messages that will be forwarded. Allowed values depend on the protocol type selected for **Type**: ■ 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. • **PV** — Position/velocity: reports the latitude, longitude, and heading. The default is to report all message types. ■ 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. The default is to report all message types.
Prepend	(Optional) Text to prepend to the forwarded message. Two variables can be included in the prepended text: ■ **%s** — Includes the device's serial number in the prepended text. ■ **%v** — Includes the vehicle ID in the prepended text. See Configure the Vehicle ID for information about configuring the vehicle ID.

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Log configuration page

Use the **Log configuration** page to configure options for event and system logs.

Event log options

Option	Description
Log level	Specifies the level for logs. The default is **Informational**. For a list of log levels, see Event log levels.
Log to file	Enable or disable saving the event log to a file on the device. The default is Disabled. Digi recommends that you do not download logs to your device unless instructed to do so by support services.
Log to Syslog	Specifies a syslog server on which to store event logs. By default, the event log is not saved on a syslog server.

System log options

Option	Description
Log to file	Enable or disable saving the system log to a file on the device. The default is Disabled. Digi recommends that you do not download logs to your device unless instructed to do so by support services.
Log to Syslog	Specifies a syslog server on which to store system logs. By default, the system log is not saved on a syslog server.



WARNING! Digi recommends that you do not download log files to your device. Keeping log files on your device during normal operations can cause unnecessary wear on the device flash memory.

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Log viewer page

Use the **Log viewer** page to stream and download event and system logs.

Log viewer controls

Field/Button	Description
⏵	Stream entries from the event log, system log, or both.
⏸	Pause the stream of incoming log messages.
📥	Download the event or system log files.
>>	Expand the event and system logs control panel to configure the number of recent messages to show. The default is 10 messages.
<<	Collapse the expanded log viewer controls panel.

Message display

Field/Button	Description
⛔	Indicates the message is from the event log.
⏻	Indicates the message is from the system log.
Date	Timestamp for the log message.
Level	Log level for the message.
Source	Source device application that generated the message.
Message	Message text.
Find	Search or filter log messages. All fields in the message display are included in the search, such as the **Date**, **Level**, and so on. See Find and filter log file entries.

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New GRE tunnel page

Use the **New GRE tunnel** page to configure a new GRE tunnel.

Configuration options

Option	Description
Select Tunnel	Specifies the number for the tunnel, an integer from 1 to 10. By default, tunnel numbers are assigned from 1 to 10 and the next available tunnel number is used.
Enable	Enables or disables the GRE tunnel. The default is **enabled**.
Description	Description for the GRE tunnel. Specify a string value up to 255 characters long.
IP Address	Specifies the IPv4 address for the GRE tunnel.
Subnet Mask	Specifies the subnet mask for the GRE IP address in IPv4 format.
Peer	Specifies the remote peer address for the GRE tunnel in IPv4 format.
Key	Specifies the key to use for the GRE tunnel, a 4-byte unsigned integer. Specify an integer from 0 to 4294967295. The default is no key.

Status display

Option	Description
Admin Status	Shows the current administrative status: **Up** or **Down**.
Oper Status	Shows the current operational status: **Up** or **Down**.
IP Address	Shows the IP address for the GRE tunnel.
Subnet Mask	Shows the subnet mask for the GRE IP address.
Peer	Shows the IP address for the GRE peer.
Key	Shows the key for the GRE tunnel.
Packets	Shows the number of received and sent packets for the GRE tunnel.
Bytes	Shows the number of received and sent bytes for the GRE tunnel.

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New Wide Area Network (WAN) page

Use the New Wide Area Networks (WAN) page to configure a new WAN.

New WAN connection

Option	Description
Select WAN	Select an available index number for the new WAN.
Select interface	Select an available interface for the WAN.
Enable	Enable or disable the network. The default is **Enabled**.

Configuration options—cellular

Option	Description
Select WAN	Select an available index number for the new WAN.
Select interface	Select an available interface for the WAN.
Enable	Enable or disable the network. The default is **Enabled**.
IPv6	
Enable IPv6	Enable or disable IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.
Security	
Allow HTTPS	Enable or disable HTTPS access for the WAN. The default is **Disabled**.
All SSH	Enable or disable SSH access for the WAN. The default is **Disabled.**
Probing	
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.

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Web reference *New Wide Area Network (WAN) page*

Option	Description
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

Configuration options—Ethernet

Option	Description
Enable	Enable or disable the network. The default is **Enabled**.
IPv4	
Configure using	Specifies configuration method: Manually or DHCP. The default is **DHCP**.
IP address	For manually configured WAN only. Specifies the IPv4 address for the WAN.
Netmask	For manually configured WAN only. Specifies the IPv4 netmask for the WAN.
Gateway	For manually configured WAN only. Specifies the IPv4 gateway address for the WAN.
DNS1	For manually configured WAN only. Specifies the IPv4 address for the primary DNS server.
DNS2	For manually configured WAN only. Specifies the IPv4 address for the secondary DNS server.
IPv6	
Enable IPv6	Enable or disable IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.

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Web reference *New Wide Area Network (WAN) page*

Option	Description
Security	
Allow HTTPS	Enable or disable HTTPS access for the WAN. The default is **Disabled**.
Allow SSH	Enable or disable SSH access for the WAN. The default is **Disabled.**
Probing	
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

Status display

Option	Description
Interface	Shows the interface for the WAN.
Admin status	Shows the administrative status for the WAN: Up or Down.
Oper status	Shows the operational status for the WAN: Up or Down.
IP address	Shows the IP address for the WAN.
Netmask	Shows the Netmask for the WAN.
Gateway	Shows the Gateway for the WAN.

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Web reference *New Wide Area Network (WAN) page*

Option	Description
DNS servers	Shows the DNS servers for the WAN.
IPv6	Shows whether IPv6 is enabled or disabled for the WAN.
Packets	Shows the number of received and sent packets for the WAN.
Bytes	Shows the number of received and sent bytes for the WAN.

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OpenVPN client page

Use the OpenVPN client page to set up OpenVPN clients.

Connection options

Option	Description
Enable	Enables or disables the OpenVPN client connection. The default is **disabled**.
Description	Description for the OpenVPN client. Specify a string value up to **255** characters long.
Port	Port number to which this OpenVPN client attempts to connect. Enter an integer from **1** to **65535**. The default is **1194**.
Protocol	Protocol that this OpenVPN client uses to connect: **UDP** or **TCP**. The default is **UDP**.
Compression	Compression algorithm this OpenVPN client uses to compress data channel packets: **Off**, **lzo**, **lz4**, or **any**. Setting the value to **any** allows the client to accept the value provided by the server. The default is **Off**.
Logging Level	Specifies the level of output this OpenVPN client records in the system log. Specify an integer from **0** to **4**. The default is **0**.

Network options

Option	Description
Server	IP address or fully-qualified domain name of the OpenVPN server to which this OpenVPN client attempts to connect. This option is required.
Pull Routes	Enables or disables the OpenVPN client to accept routes that are pushed from the OpenVPN server. The default is **enabled**.
NAT	Enables or disables Network Address Translation (NAT) for outgoing packets on the OpenVPN client network interface. Note that the OpenVPN client uses NAT only if the Bridge mode is disabled. The default is **enabled**.
Bridge Mode	Specify a LAN as an Ethernet bridge (TAP) for this OpenVPN client or disable Bridge mode. **Note** Although using Bridge mode eliminates the need for routing between networks (required by TUN mode), Bridge mode can cause scalability issues since all broadcast traffic flows over the OpenVPN tunnel. The default is **Off**.

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Encryption options

Option	Description
Cipher	Encryption algorithm or list of algorithms the OpenVPN client can use to encrypt and decrypt data channel packets. The OpenVPN client accepts the cipher pushed by the server if it is in this list. If the OpenVPN server supports cipher negotiation, the OpenVPN client can accept additional ciphers that are not in this list. Select one or more ciphers: **aes-128-cbc**, **aes-192-cbc**, **aes-256-cbc**, **aes-128-gcm**, **aes-192-gcm**, and **aes-256-gcm**. The default is **aes-256-gcm,aes-256-cbc,aes-192-gcm,aes-192-cbc,aes-128-gcm,aes-128-cbc**.
Digest	Digest algorithm the OpenVPN client uses to sign and authenticate data channel packets. Select one of the following: **sha1**, **sha224**, **sha256**, **sha384**, or **sha512**. The default is **sha1**.

Authentication options

Option	Description
Certificate Authority (CA) certificate	CA certificate file this OpenVPN client uses to validate the certificate presented by the server. See Certificate and key management.
Certificate Revocation List (CRL) file	CRL file this OpenVPN client uses to prevent connection to a server that presents a revoked certificate.
CA/CRL directory path (capath)	CA and CRL directory path for this OpenVPN client. You provide multiple CA and CRL files. Use the c_rehash tool to create CA certificates with a **.0** filename extension and CRLs with a **.r0** filename extension.
Certificate	Public certificate file for this OpenVPN client. The file is in PEM format.
Private Key File	Private key file for this OpenVPN client. The file is in PEM format.
TLS Authentication Key File	The filename of the TLS authentication key file.
Username	Username the OpenVPN client uses to authenticate with the OpenVPN server. A username is a string up to **32** characters long.
Password	Password the OpenVPN client uses to authenticate with the OpenVPN server. A password is a string up to **128** characters long.
Confirm Password	A string of up to 128 characters long that should exactly match the value used for the **password** parameter.

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Lifetime options

Option	Description
Connect Retry	Number of seconds to wait between connection attempts. After five **5** unsuccessful attempts, the wait time is doubled for each subsequent connection attempt, up to a maximum wait time of **300** seconds. Accepted value is any integer from **1** to **60**. The default value is **5**.

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OpenVPN route management page

User the OpenVPN route management page to manage routes for OpenVPN servers.

Route options

Option	Description
Description	Description for the OpenVPN route. Users cannot modify this description. It will always be **Route1**, **Route2**, etc.
Destination	IP address in IPv4 format for the destination.
Mask	Mask for the destination address in IPv4 format. The default is **255.255.255.0**.

OpenVPN server page

Use the OpenVPN server page to configure and display an OpenVPN server.

Connection options

Option	Description
Enable	Enables or disables the OpenVPN server. The default is **disabled**.
Description	Description for the OpenVPN server. Specify a string value up to **255** characters long.
Port	Port number to which this OpenVPN server attempts to connect. Enter an integer from **1** to **65535**. The default is **1194**.
Protocol	Protocol that this OpenVPN server uses to connect: **UDP** or **TCP**. T Ihe default is **UDP**.
Compression	Compression algorithm this OpenVPN server uses to compress data channel packets: off, lzo, or lz4. The default is **off**.
Logging level	Specifies the level of output this OpenVPN server records in the system log. Specify an integer from 0 to 4. The default is **0**.

Network options

Option	Description
Network	If Bridge mode is disabled, specifies the IP address in IPv4 format of the local network for this OpenVPN tunnel. The value typically ends with **.0** to match the subnet mask.
Mask	If Bridge mode is disabled, specifies the local subnet for this OpenVPN tunnel in IPv4 format. The default is **255.255.255.0**.
Bridge Mode	Specify a LAN as an Ethernet bridge (TAP) for this OpenVPN server or disable bridge mode. **Note** Although using bridge mode eliminates the need for routing between networks (required by TUN mode), bridge mode can cause scalability issues since all broadcast traffic flows over the OpenVPN tunnel. The default is **Off**.
Topology	Network topology this OpenVPN server uses to assign IP addresses to OpenVPN clients. This value is used only if Bridge mode is disabled. Select one of the following values: **net30**, **p2p**, or **subnet**. The default is **net30**.
Primary DNS	IP address in IPv4 format of the primary DNS server. This value is pushed to OpenVPN clients if Bridge mode is disabled.
Secondary DNS	IP address in IPv4 format of the secondary DNS server. This value is pushed to OpenVPN clients if Bridge mode is off.

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Encryption options

Option	Description
Cipher	Encryption algorithm or list of algorithms the OpenVPN server can use to encrypt and decrypt data channel packets. The OpenVPN server pushes the first cipher in the list to OpenVPN clients that support cipher negotiation. OpenVPN clients that do not support cipher negotiation can connect using any cipher in this list. Select one or more ciphers: **aes-128-cbc**, **aes-192-cbc**, **aes-256-cbc**, **aes-128-gcm**, **aes-192-gcm**, and **aes-256-gcm**. The default is **aes-256-gcm,aes-256-cbc,aes-192-gcm,aes-192-cbc,aes-128-gcm,aes-128-cbc**.
Digest	Digest algorithm the OpenVPN server uses to sign and authenticate data channel packets. Select one of the following: **sha1**, **sha224**, **sha256**, **sha384**, or **sha512**. The default is **sha1**.

Authentication options

Option	Description
Certificate Authority (CA) certificate	Certificate file this OpenVPN server uses to validate the certificate presented by the clients. See Certificate and key management.
Certificate Revocation List (CRL) file	CRL file this OpenVPN server uses to prevent connection to a client that presents a revoked certificate.
CA/CRL directory path (capath)	CA and CRL directory path for this OpenVPN server. You can provide multiple CA and CRL files. Use the c_rehash tool to create CA certificates with a **.0** filename extension and CRLs with a **.r0** filename extension. See rehash for details.
Diffie-Hellman file	Diffie-Hellman parameters this OpenVPN server uses for shared secret generation. This file is in PEM format.
Certificate	Public certificate file for this OpenVPN server. The file is in PEM format.
Private Key File	Private key file for this OpenVPN server. The file is in PEM format.
Authenticate By	Configures authentication to use **username and password**, **certificates**, or **both**. The default is **certificates**.
TLS Authentication Key File	The filename of the TLS authentication key file.
Radius Server State	Enables or disables the Radius server. The default is **disabled**.
Radius Server	IP address in IPv4 format for the RADIUS server for OpenVPN.
Radius Server Port	Port for the RADIUS server. Specify an integer from **1** to **65535**. The default is **1812**.

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Option	Description
Radius Server Secret	Secret for the RADIUS server. Specify a string up to **64** characters long.

Lifetime options

Option	Description
OpenVPN Keepalive	
Keepalive Interval (Seconds)	Specifies the interval at which to send a ping message if no other traffic is sent in either direction between the OpenVPN client and server. This value is also pushed to the client. To disable the ping-based keepalive mechanism, set this parameter to **0**. The default is **30**.
Keepalive Timeout (Seconds)	Specifies the amount of time at which to restart the OpenVPN tunnel if no traffic is detected. This value should be five to six times as large as the **Keepalive interval**. This value is doubled before it is set on the server. This value is also pushed to the client. To disable the ping-based keepalive mechanism, set this parameter to **0**. Specify an integer from **0** to **3600**. The default is **150**.
OpenVPN Renegotiation	
Time Until Tunnel Renegotiation (seconds)	Number of seconds before the data channel encryption key is renegotiated. Specify an integer from **60** to **86400**. The default is **3600**.
Bytes Until Tunnel Renegotiation	Number of bytes sent/received before the data channel encryption key is renegotiated. To disable data channel encryption key renegotiation, set this parameter to **0**. Specify an integer from **0** to **4000000000**. The default is **0**.

OpenVPN user management page

Use the OpenVPN user management page to add, edit, and delete VPN users.

Configuration options

Option	Description
Username	Username for OpenVPN user. Specify a string up to **32** characters long.
Password	Password for OpenVPN user. Specify a string up to **128** characters long.
Confirm password	Re-enter the password for the OpenVPN user.

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Port forwarding page

Use the Port forwarding page to configure and view port forwarding rules. Each port forwarding rule automatically maps and forwards an external request for a port on a WAN to an IP address and port on an internal LAN. In this way, users can access servers on a private network when they are not directly connected to the private network.

For a port forwarding rule to be applied, you must configure **From Port** and **To IP Address**, and set the rule to **Enabled**. You can configure a maximum of 30 port forwarding rules.

Configuration options

Each port forwarding rule shows the following fields:

Option	Description
Enabled	Enables or disables the port forwarding rule. The default is **enabled**. **Note** Invalid rules are not applied.
Description	Description for the rule. Specify a string value up to **255** characters long.
From Port	Port or ports to forward packets from. A port is an integer value from **0** to **65535**. The default is **0**. Specify a single port, a list of ports, or a range of ports: ■ To specify a list of ports, use a comma (**,**) to separate the ports in the list. For example: **443,22,31**. ■ To specify a range of ports, use a colon (**:**) to separate the low and high ports in the range. For example: **22:31**.
Source	Source WAN or LAN of incoming traffic to be forwarded. Select Any, Any-LAN, Any-WAN, or an available LAN or WAN. The default is **Any**.
Protocol	Protocol to which the rule applies: **UDP**, **TCP**, or **UDP and TCP**. The default is **TCP**.
To IP address	IP address in IPv4 format that packets are forwarded to.
To Port	Port to forward packets to. A port is an integer value from **0** to **65535**. Enter a port number or the **Use from port(s)** option to map the ports specified by **From Port** as the **To Port**. The default is **Use from port(s)**.

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Python autostart page

Use the Python autostart page to set up Python files to be executed when the device reboots.

Option	Description
Enable	Enables or disables Python file for autostart.The default is **disabled**.
Filepath	Specifies the Python file to run when the device reboots. Files are run in the order listed.
Args	Specifies arguments to pass to the Python script.
On exit	Specifies the action to take when the script completes. Select None, Restart, or Reboot. the default is **None**.

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Quality of Service (QoS) queues page

Use the Quality of Services (QoS) queues page to manage QoS queues.

Configuration options

Configure from one to eight QoS queues using the eight tabs in the Queues panel. Queue 1 has the highest priority; queue 2 has second-highest priority, queue 3 has third-highest priority, and so on up to queue 8 which has the lowest priority.

Field/Button	Description
Enabled	Enables or disables the QoS queue. The default is **disabled**.
Description	Specifies a description for the QoS queue that displays as the tab label for the queue. Specify a string value up to **255** characters long.
Bandwidth upstream	Specifies the amount of bandwidth this queue can use in Kbps or Mbps. For Kbps, enter an integer from 0 to 1000000; for Mbps, enter an integer from 1 to 1000. The default is **0**.
Borrow upstream	Enables (allows) or disables (prohibits) additional bandwidth for this queue if any unused bandwidth is available. The default is **enabled**.
Tag packet (DSCP)	Tags packets with a specified Differentiated Services Code Point (DSCP). Select a value from the drop-down list. The default is **do not set**; that is, do not tag packets.

QoS filters

Field/Button	Description
Enabled	Enables or disables the QoS filter. For a new filter, the default is **enabled**.
Description	Specifies a description for the QoS filter. Specify a string value up to **255** characters long.
Queue	Specifies the queue number to associate with the QoS filter. Specify an integer from 1 to 8, corresponding to queue 1, queue 2, queue 3, and so on. The default is **0** or the current queue being edited.
Protocol	Specifies the protocols for incoming packets. Select one or more specific protocols from the drop-down or select **any** to include all protocols. The default is **any**.
Src	Specifies the source LAN or LANs of incoming packets. Select a specific LAN from the drop-down list or specify **any** to include all LANs. The default is **any**.
Src IP	Specifies the IPv4 or IPv6 source address of incoming packets. Use a simple IPv4 or IPv6 address or use CIDR notation. For example, 192.168.100.0/24, fe80::/10.

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Web reference *Quality of Service (QoS) queues page*

Field/Button	Description
Src port	Specifies the port or ports for incoming packets. A port is an integer value from **0** to **65535**. Specify a single port, a list of ports, or a range of ports: ■ To specify a list of ports, use a comma (**,**) to separate the ports in the list. For example: **443,22,31**. ■ To specify a range of ports, use a colon (**:**) to separate the low and high ports in the range. For example: **22:31**. The default is **0**.
Dst IP	Specifies the IPv4 or IPv6 destination address of outgoing packets. Use a simple IPv4 or IPv6 address or use CIDR notation. For example, 192.168.100.0/24, fe80::/10.
Dst port	Specifies the port or ports for outgoing packets. A port is an integer value from **0** to **65535**. Specify a single port, a list of ports, or a range of ports: ■ To specify a list of ports, use a comma (**,**) to separate the ports in the list. For example: **443,22,31**. ■ To specify a range of ports, use a colon (**:**) to separate the low and high ports in the range. For example: **22:31**. The default is **0**.
DSCP	Specifies one or more DSCP tags to filter incoming packets. Select one or more DSCP categories or any. The default is **any**.

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Quality of Service (QoS) WANs page

Use the Quality of Services (QoS) WANs page to enable QoS for a configured WAN.

Configuration options

Field/Button	Description
Interface	Displays the interface for the configured WAN.
Enable QoS	Enables or disables Quality of Service (QoS) on this WAN interface. The default is **disabled**.
Bandwidth upstream	Sets the upstream bandwidth of the WAN interface in Kbps or Mbps. For Kbps, enter an integer from 1 to 1000000; for Mbps, enter an integer from 1 to 1000. The default is **1000 Mbps**.

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RADIUS page

Use the RADIUS server page to create or modify RADIUS servers.

Settings options

Option	Description
Enable	Enable or disable RADIUS authentication for system administrators. The value is either **on** or **off**. The default is **off**.
NAS ID	A unique identifier for this network access server (NAS). You can use the fully-qualified domain name of the NAS or any arbitrary string. The accepted value is any string up to **64** characters. If left blank, the default value of **sshd** is sent out.
Local Auth Fallback	Determines whether to use local authentication if the RADIUS server does not respond before the timeout expires. The value is either **on** or **off**. The default value is **on**.
Debug	Enable or disable additional debug messages from the RADIUS client. These messages are added to the system log. The value is either **on** or **off**. The default value is **off**.

Primary Server Settings

Option	Description
Primary Server	The IP address or fully-qualified domain name of the RADIUS server to use to authenticate system administrators. The value should be a fully qualified domain name.
Primary Server Port	The UDP port number for the RADIUS server. The accepted value is any integer from **1** to **65535**. The default value is **1812**.
Primary Server Secret	The shared secret for the RADIUS server. The secret cannot contain spaces. The accepted value is any string up to **64** characters.
Primary Server Timeout	The amount of time in seconds to wait for the RADIUS server to respond. The accepted value is any integer from **1** to **10**. The default value is **3**.

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Backup Server Settings

Option	Description
Backup Server	The IP address or fully-qualified domain name of the backup RADIUS server to use to authenticate system administrators when the main RADIUS server is not available. The value should be a fully qualified domain name.
Backup Server Port	The UDP port number for the backup RADIUS server. The accepted value is any integer from **1** to **65535**. The default value is **1812**.
Backup Server Secret	The shared secret for the backup RADIUS server. The secret cannot contain spaces. The accepted value is any string up to **64** characters.
Backup Server Timeout	The amount of time in seconds to wait for the backup RADIUS server to respond. The accepted value is any integer from **1** to **10**. The default value is **3**.

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Digi Remote Manager page

Use the Digi Remote Manager page to configure the device's connection to Digi Remote Manager. For information on Digi Remote Manager, see Digi Remote Manager.

Administration options

Option	Description
Enable	Enables or disables connection to Digi Remote Manager for this device. The default is **disabled**.
Ethernet keepalive	Specifies the Ethernet keepalive timeout in seconds. Enter an integer from 10 to 7200. The default is **60**.
Cellular keepalive	Specifies the cellular keepalive timeout in seconds. Enter an integer from 10 to 7200. The default is **290**.
Keepalive count	Specifies the number of times a keepalive message is missed before the Remote Manager connection is dropped. Enter an integer from 2 to 10. The default is **3**.
Reconnect delay	Specifies the the time, in seconds, between the device's attempts to connect to Digi Remote Manager. Enter an integer from 10 to 3600. The default is **30**.
Enable health reporting	Enables or disables Digi Remote Manager health reporting for this device. The default is **enabled**.
Health sample interval	The sample interval in minutes. Allowed values are 1, 5, 15, 30, or 60; the default is **60**.
Health rollup period	The amount of time, in minutes, that health metrics information is aggregated before being reported to Digi Remote Manager. Generally, the **Health sample interval** and **Health rollup period** should be set to the same value. Allowed values are 1, 5, 15, 30, or 60; the default is **60**.

Register device

Option	Description
Username	Specifies the Digi Remote Manager username.
Password	Specifies the password for the Digi Remote Manager user.

Status display

Option	Description
Status	Shows the current Digi Remote Manager status: Connected or Disconnected.

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Web reference *Digi Remote Manager page*

Option	Description
Up time	Shows the amount of time the device has been connected to Digi Remote Manager.
Device ID	Shows the Digi Remote Manager ID for the device.

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Syslog server configuration page

Use the **Syslog server configuration** page to configure syslogs for storing event and system logs. You can configure up to two syslog servers.

Configuration options

Option	Description
Server	Specify the IP address for the server.
Port	Specify the listening port for the server. The default is port **514**.
Mode	Specify the mode for syslog traffic: UDP or TCP. The default is **UDP**.

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User Management page

Use the User management page to create and edit device users.

Note You cannot edit the current active user.

Option	Description
Username	Specifies the username for the user. Usernames are case-insensitive strings that must start with a letter or underscore (_), but can contain letters, digits, underscores (_), and hyphens (-). In addition, a username can end with a dollar sign ($). No other characters are allowed. Enter a string up to 32 characters long.
Access	Specifies the user access control for the user: Read-only, Read-write, or Super. The default is **Super**.
Password	Specifies the password for the user. A password can be any string up to 128 characters long.
Confirm password	Re-enter the password for the user. The value you enter for **Confirm password** must match the **Password** value.

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VRRP page

Use the VRRP page to create or modify the VRRP protocol.

Configuration parameters

Option	Description
State	Enable or disable Virtual Router Redundancy Protocol (VRRP). The value is either **on** or **off**. The default value is **off**.
Interface	The LAN interface on which to run VRRP. The default value is **LAN1**.
Router ID	The ID of the VRRP virtual router. The accepted value is any integer from **1** to **255**. The default value is **1**.
Interval	The time in seconds between VRRP advertisement packets. All of the routers in the VRRP group should use the same interval. The accepted value is any integer from **1** to **60**. The default value is **1**.
Initial State	The initial VRRP state of this router when it is enabled. The accepted value is either **backup** or **master**. The default value is **backup**.
IP Address	The virtual IP address assigned to the VRRP virtual router. Each client on the LAN should use this address as the default gateway. Typically, the DHCP server distributes this address to each client. The value should be an IPv4 address.
Priority	The VRRP priority of this router. The accepted value is any integer from **1** to **255**. The default value is **100**.
Probing	
Host	The fully-qualified doman name or IPv4 IP address of the host to be probed.
Gateway	The IPv4 IP address of the gateway that the probe will be sent through. Used if this device is intended to serve primarily in a backup state. The gateway should be set to the physical VRRP LAN IP address of the device intended to serve as the master.
Priority Modifier	The amount that the VRRP priority will be modified for this device, if probing is considered to have failed. The behavior of this setting varies depending on whether **Gateway** has been set: ■ If **Gateway** has not been set, the device is considered to be intended to be serving as the master. When probing is considered to have failed, the device's priority setting will be reduced by the amount entered in **Priority Modifier**. ■ If **Gateway** has been set, the device is considered to be intended to be serving as a backup device. When probing is considered to have failed, the device's priority setting will be increased by the amount entered in **Priority Modifier**.

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Web reference *VRRP page*

Option	Description
Type	The type of probe to be sent. Select either: ■ **ICMP**: Sends a ping to the **Host** IP address. ■ **TCP**: Attempts to open a TCP socket to the **Host**.
Port	The probe destination port on the **Host**. Only used if **Type** is set to **TCP**.
Failure Threshold	The number of consecutive failed probes that are allowed before the VRRP priority is modified. Allowed values are **1** through **60**.
Success Threshold	The number of consecutive successful probes that are required, after VRRP+ probing is considered to have failed, before returning to the original priority settings. Allowed values are **1** through **60**.
Response Timeout	The number of seconds to wait for a response from a probe attempt. Allowed values are **5** through **15**.
Probing Intervals	The number of seconds to wait between probes: ■ **Master** : The number of seconds to wait between probes when the device is in master state. Allowed values are **15** through **60**. ■ **Backup**: The number of seconds to wait between probes when the device is in backup state. Allowed values are **15** through **60**.

Status

Option	Description
State	Specifies whether the VRRP daemon is configured to be running.
Interface	Displays the current interface being used by the VRRP daemon.
Current VRRP State	The state of the VRRP daemon on this router.
Current VRRP Priority	The current VRRP priority of this router.
Last Transition	The most recent date this router transitioned between VRRP states.
Became Master	The total number of times this router has transitioned into the VRRP master state.
Released Master	The total number of times this router has transitioned out of the VRRP master state.
Adverts Sent	The total number of VRRP advertisements sent by this router.
Adverts Received	The total number of VRRP advertisements received by this router.
Priority Zero Sent	The total number of VRRP packets with a priority of '0' sent by this router.
Priority Zero Received	The total number of VRRP packets with a priority of '0' received by this router.

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Wide Area Network (WAN) page—Cellular

Use the Wide Area Networks (WAN) page to configure and manage WANs.

Configuration options—Cellular

Option	Description
Enable	Enables or disables the network. The default is **Enabled**.
IPv6	
Enable IPv6	Enables or disables IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.
Security	
Allow HTTPS	Enables or disables HTTPS access for the WAN. The default is **Disabled**.
All SSH	Enables or disables SSH access for the WAN. The default is **Disabled.**
Probing	
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.

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Option	Description
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

Status display

Option	Description
Interface	Shows the interface for the WAN.
Admin status	Shows the administrative status for the WAN: Up or Down.
Oper status	Shows the operational status for the WAN: Up or Down.
IP address	Shows the IP address for the WAN.
Netmask	Shows the Netmask for the WAN.
Gateway	Shows the Gateway for the WAN.
DNS servers	Shows the DNS servers for the WAN.
IPv6	Shows whether IPv6 is enabled or disabled for the WAN.
Packets	Shows the number of received and sent packets for the WAN.
Bytes	Shows the number of received and sent bytes for the WAN.

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Wide Area Network (WAN) page—Ethernet

Use the Wide Area Networks (WAN) page to configure and manage WANs.

Configuration options—Ethernet

Option	Description
Enable	Enables or disables the network. The default is **Enabled**.
IPv4	
Configure using	Specifies configuration method: Manually or DHCP. The default is **DHCP**.
IP address	For manually configured WAN only. Specifies the IPv4 address for the WAN.
Netmask	For manually configured WAN only. Specifies the IPv4 netmask for the WAN.
Gateway	For manually configured WAN only. Specifies the IPv4 gateway address for the WAN.
DNS1	For manually configured WAN only. Specifies the IPv4 address for the primary DNS server.
DNS2	For manually configured WAN only. Specifies the IPv4 address for the secondary DNS server.
IPv6	
Enable IPv6	Enables or disables IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.
Security	
Allow HTTPS	Enables or disables HTTPS access for the WAN. The default is **Disabled**.
All SSH	Enables or disables SSH access for the WAN. The default is **Disabled.**
Probing	
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.

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Option	Description
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

Status display

Option	Description
Interface	Shows the interface for the WAN.
Admin status	Shows the administrative status for the WAN: Up or Down.
Oper status	Shows the operational status for the WAN: Up or Down.
IP address	Shows the IP address for the WAN.
Netmask	Shows the Netmask for the WAN.
Gateway	Shows the Gateway for the WAN.
DNS servers	Shows the DNS servers for the WAN.
IPv6	Shows whether IPv6 is enabled or disabled for the WAN.
Packets	Shows the number of received and sent packets for the WAN.
Bytes	Shows the number of received and sent bytes for the WAN.

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Wide Area Network (WAN) page

Use the Wide Area Networks (WAN) page to configure and manage WANs.

Option	Description
Select WAN	Select an available index number for the new WAN.
Select interface	Select an available interface for the WAN.
Enable	Enable or disable the network. The default is **Enabled**.

Configuration options—Cellular

Option	Description
Enable	Enables or disables the network. The default is **Enabled**.
IPv6	
Enable IPv6	Enables or disables IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.
Security	
Allow HTTPS	Enables or disables HTTPS access for the WAN. The default is **Disabled**.
All SSH	Enables or disables SSH access for the WAN. The default is **Disabled.**
Probing	
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.

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Option	Description
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

Configuration options—Ethernet

Option	Description
Enable	Enables or disables the network. The default is **Enabled**.
IPv4	
Configure using	Specifies configuration method: Manually or DHCP. The default is **DHCP**.
IP address	For manually configured WAN only. Specifies the IPv4 address for the WAN.
Netmask	For manually configured WAN only. Specifies the IPv4 netmask for the WAN.
Gateway	For manually configured WAN only. Specifies the IPv4 gateway address for the WAN.
DNS1	For manually configured WAN only. Specifies the IPv4 address for the primary DNS server.
DNS2	For manually configured WAN only. Specifies the IPv4 address for the secondary DNS server.
IPv6	
Enable IPv6	Enables or disables IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.
Security	
Allow HTTPS	Enables or disables HTTPS access for the WAN. The default is **Disabled**.
All SSH	Enables or disables SSH access for the WAN. The default is **Disabled.**
Probing	

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Web reference *Wide Area Network (WAN) page*

Option	Description
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

Configuration options—Wi-Fi

Option	Description
Enable	Enables or disables the network. The default is **Enabled**.
IPv4	
Configure using	Specifies configuration method: Manually or DHCP. The default is **DHCP**.
IP address	For manually configured WAN only. Specifies the IPv4 address for the WAN.
Netmask	For manually configured WAN only. Specifies the IPv4 netmask for the WAN.
Gateway	For manually configured WAN only. Specifies the IPv4 gateway address for the WAN.
DNS1	For manually configured WAN only. Specifies the IPv4 address for the primary DNS server.
DNS2	For manually configured WAN only. Specifies the IPv4 address for the secondary DNS server.

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Web reference *Wide Area Network (WAN) page*

Option	Description
IPv6	
Enable IPv6	Enables or disables IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.
Security	
Allow HTTPS	Enables or disables HTTPS access for the WAN. The default is **Disabled**.
All SSH	Enables or disables SSH access for the WAN. The default is **Disabled.**
Probing	
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

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Web reference *Wide Area Network (WAN) page*

Status display

Option	Description
Interface	Shows the interface for the WAN.
Admin status	Shows the administrative status for the WAN: Up or Down.
Oper status	Shows the operational status for the WAN: Up or Down.
IP address	Shows the IP address for the WAN.
Netmask	Shows the Netmask for the WAN.
Gateway	Shows the Gateway for the WAN.
DNS servers	Shows the DNS servers for the WAN.
IPv6	Shows whether IPv6 is enabled or disabled for the WAN.
Packets	Shows the number of received and sent packets for the WAN.
Bytes	Shows the number of received and sent bytes for the WAN.

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Wide Area Network (WAN) page—Wi-Fi

Use the Wide Area Networks (WAN) page to configure and manage WANs.

Configuration options—Wi-Fi

Option	Description
Enable	Enables or disables the network. The default is **Enabled**.
IPv4	
Configure using	Specifies configuration method: Manually or DHCP. The default is **DHCP**.
IP address	For manually configured WAN only. Specifies the IPv4 address for the WAN.
Netmask	For manually configured WAN only. Specifies the IPv4 netmask for the WAN.
Gateway	For manually configured WAN only. Specifies the IPv4 gateway address for the WAN.
DNS1	For manually configured WAN only. Specifies the IPv4 address for the primary DNS server.
DNS2	For manually configured WAN only. Specifies the IPv4 address for the secondary DNS server.
IPv6	
Enable IPv6	Enables or disables IPv6 addressing. The default is **disabled**.
Requested prefix length	Specifies the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs. Enter an integer from 48 to 64. The default value is **60**.
Security	
Allow HTTPS	Enables or disables HTTPS access for the WAN. The default is **Disabled**.
All SSH	Enables or disables SSH access for the WAN. The default is **Disabled.**
Probing	
Probe host	Specifies the IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device. Value should be a fully qualified domain name.
Probe interval	Specifies the interval, in seconds, between sending probe packets. The value for must be larger than the Probe timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 2 to 3600. The default value is **60**.

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Option	Description
Probe size	Specifies the size of probe packets sent to detect WAN failures. Accepted value is any integer from 64 to 1500. The default value is **64**.
Probe timeout	Specifies the timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the Probe interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log. Accepted value is any integer from 1 to 60. The default value is **5**.
Activate after	Specifies the time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted. Accepted value is any integer from 0 to 3600. The default value is **0**.
Retry after	Specifies the time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces. Accepted value is any integer from 10 to 3600. The default value is **180**.
Timeout	Specifies the time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface. Accepted value is any integer from 10 to 3600. The default value is **180**.

Status display

Option	Description
Interface	Shows the interface for the WAN.
Admin status	Shows the administrative status for the WAN: Up or Down.
Oper status	Shows the operational status for the WAN: Up or Down.
IP address	Shows the IP address for the WAN.
Netmask	Shows the Netmask for the WAN.
Gateway	Shows the Gateway for the WAN.
DNS servers	Shows the DNS servers for the WAN.
IPv6	Shows whether IPv6 is enabled or disabled for the WAN.
Packets	Shows the number of received and sent packets for the WAN.
Bytes	Shows the number of received and sent bytes for the WAN.

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? (Display command help)

Displays help text for all commands, individual commands, and command parameters.

To display help on parameters, enter the command name, the interface number as needed, and parameter name, followed by the **?** character.

To use the **?** character in a parameter value, enclose it within **"** characters. For example, to display the help text for the **system** command's **description** parameter:

```
system 1 description ?
```

To set the **system** command **description** parameter to **?**:

```
system 1 description "?"
```


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! (Revert command settings)

Reverts an individual command element to its default.

For example, to revert the default setting of interfaces on the **lan** command, enter:

```
digi.router> lan 1 interfaces !
```

To use the **!** character in a parameter value, enclose it within **"** characters. For example, to reset the Wi-Fi SSID to the default (blank):

```
wifi 1 ssid !
```

To set the Wi-Fi SSID to **!abc**:

```
wifi 1 ssid "!abc"
```


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analyzer

Configures the network packet capture feature. Enabling data traffic capture significantly affects device performance.

Syntax

```
analyzer <parameter> <value>
```

Parameters

state

Enables or disables packet capture.

Accepted values can be one of off or on. The default value is off.

interfaces

The member interfaces for the packet capture operation. List the interfaces, separated by commas.

Accepted values can be multiple values of none, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9, lan10, eth1, eth2, eth3, eth4, wifi-ap1, wifi-ap2, wifi-ap3, wifi-ap4, wifi-ap5, wifi-ap6, wifi-ap7, wifi-ap8, cellular1-sim1, cellular1-sim2, cellular2-sim1, cellular2-sim2, wifi-client1, wifi-client2 and lo. The default value is none.

filter

The filter for capturing data packets, in BPF format. If you do not specify a filter, the capture operation captures all incoming and outgoing packets.

Accepted value is any string up to 255 characters.

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atcommand

Sends AT command

This command is available to super users only.

Syntax

```
atcommand [module] command
```

Parameters

module

Which module to send the AT command to cellular module.

command

AT command

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autorun

Configures commands to be automatically run at boot-up. You can use auto-run commands for tasks such as switching configuration files, or scheduling a reboot. You can configure up to 10 auto-run commands. Use the python-autostart command to schedule python programs.

This command is available to super users only.

Syntax

```
autorun <1 - 10> <parameter> <value>
```

Parameters

command

Command to run.

Accepted value is any string up to 100 characters.

Examples

- ```
  autorun 1 command "copy config.da0 config.backup"
  ```

  Automatically copy a file.
  ```

bluetooth-scanner

Configures Bluetooth Scanning

Syntax

```
bluetooth-scanner <parameter> <value>
```

Parameters

state

Enables and disables the Bluetooth scanner.
Value is either on or off. The default value is off.

scan-rate

Rate in seconds in which individual devices are scanned and reported.
Accepted value is any integer from 1 to 3600. The default value is 15.

port

SSH port to read data on.
Accepted value is any integer from 1 to 65535. The default value is 3102.

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cd

Changes the current directory.

Syntax

```
cd [dir]
```

Parameters

dir

When a directory name is specified, 'cd' changes the current directory to it.

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cellular

Configures a cellular interface.

Syntax

```
cellular <1 - 2> <parameter> <value>
```

Parameters

description

A description of the cellular interface.

Accepted value is any string up to 63 characters.

sim1-apn

The Access Point Name (APN) for the cellular interface.

Accepted value is any string up to 63 characters.

sim1-username

The username for the APN.

Accepted value is any string up to 63 characters.

sim1-password

The password for the APN.

Accepted value is any string up to 255 characters.

sim1-pin

The PIN for SIM1. The PIN is a number between 4 to 8 digits long. If no value is specified for this parameter, no PIN is needed to activate the SIM1.

Accepted value is any string up to 64 characters.

sim1-preferred-mode

The preferred cellular mode for the cellular interface.

Accepted values can be one of auto, 4g, 3g or 4g3g. The default value is auto.

sim1-connection-attempts

The number of attempts to establish a cellular connection. After this number of attempts, the cellular module is power cycled, and the device attempts to make a cellular connection again.

Accepted value is any integer from 10 to 500. The default value is 20.

sim1-registration-timeout

Number of seconds to wait for registration before rebooting the module.

Accepted value is any integer from 60 to 10000. The default value is 180.

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sim2-apn

The Access Point Name (APN) for the cellular interface.

Accepted value is any string up to 63 characters.

sim2-username

The username for the APN.

Accepted value is any string up to 63 characters.

sim2-password

The password for the APN.

Accepted value is any string up to 255 characters.

sim2-pin

The PIN for SIM2. The PIN is a number between 4 to 8 digits long. If no value is specified for this parameter, no PIN is needed to activate the SIM2.

Accepted value is any string up to 64 characters.

sim2-preferred-mode

The preferred cellular mode for the cellular interface.

Accepted values can be one of auto, 4g, 3g or 4g3g. The default value is auto.

sim2-connection-attempts

The number of attempts to establish a cellular connection. After this number of attempts, the cellular module is power cycled, and the device attempts to make a cellular connection again.

Accepted value is any integer from 10 to 500. The default value is 20.

sim2-registration-timeout

Number of seconds to wait for registration before rebooting the module.

Accepted value is any integer from 60 to 10000. The default value is 180.

sim1-oos-timeout

The number of seconds to wait to reconnect after cellular service disconnects before failing over to the next highest priority WAN interface.

Accepted value is any integer from 10 to 60. The default value is 30.

sim2-oos-timeout

The number of seconds to wait to reconnect after cellular service disconnects before failing over to the next highest priority WAN interface.

Accepted value is any integer from 10 to 60. The default value is 30.

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Examples

- `cellular 1 sim1-apn broadband`

  Set the SIM slot 1 APN to 'broadband.'

- `cellular 1 sim1-username my-username`

  Set the SIM slot 1 username to 'my-username.'

- `cellular 1 sim1-password my-password`

  Set the SIM slot 1 password to 'my-password.'

- `cellular 1 sim2-username my-username`

  Set the SIM slot 2 username to 'my-username.'

- `cellular 2 sim2-password my-password`

  Set the SIM slot 2 password to 'my-password.'

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clear

Clears system status and statistics, such as the event log, firewall counters, traffic analyzer log, etc. This command is available to super users only.

Syntax

```
clear analyzer
clear arp [IP address]
clear dhcp-server
clear firewall
clear firewall6
clear log
clear log system
clear log all
clear web-filter-id
```

Parameters

analyzer

Clears the traffic analyzer log.

arp

Clears entries in the ARP table.

dhcp-server

Clears the DHCP server leases.

firewall

Clears firewall counters.

firewall6

Clears firewall IPv6 counters.

log

Clears event log.

web-filter-id

Clears the device ID provided by the Cisco Umbrella service. The router automatically acquires a device ID whenever web filtering is enabled.

Examples

- ```
  clear analyzer
  ```

  Clear the traffic analyzer log.

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  ```

- `clear arp`

  Clear the ARP table.

- `clear dhcp-server`

  Clear the DHCP server leases.

- `clear firewall`

  Clear the packet and byte counters in all firewall rules.

- `clear firewall6`

  Clear the packet and byte counters in all IPv6 firewall rules.

- `clear log`

  Clear the event log and leaves an entry in the log after clearing.

- `clear log system`

  Clear the system/kernel event log and leaves an entry in the log after clearing.

- `clear web-filter-id`

  Clear the Cisco Umbrella device ID.

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cloud

Configures Digi Remote Manager settings.

Syntax

```
cloud <parameter> <value>
```

Parameters

state

Enable or disable Digi Remote Manager.

Value is either on or off. The default value is on.

server

The name of the Digi Remote Manager server.

Value should be a fully qualified domain name. The default value is my.devicecloud.com.

reconnect

The time, in seconds, between the device's attempts to connect to Digi Remote Manager.

Accepted value is any integer from 10 to 3600. The default value is 30.

keepalive

The interval, in seconds, used to contact the server to validate connectivity over a non-cellular interface.

Accepted value is any integer from 10 to 7200. The default value is 60.

keepalive-cellular

The interval, in seconds, used to contact the server to validate connectivity over a cellular interface.

Accepted value is any integer from 10 to 7200. The default value is 290.

keepalive-count

Number of keepalives missed before the device disconnects from Remote Manager.

Accepted value is any integer from 2 to 10. The default value is 3.

health

Enable or disable health metric reporting to Digi Remote Manager.

Value is either on or off. The default value is on.

health-sample-interval

The time, in minutes, between health metric samples.

Accepted values can be one of 1, 5, 15, 30 or 60. The default value is 60.

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watchdog

Enable or disable the Digi Remote Manager watchdog feature.

Value is either on or off. The default value is on.

health-rollup-period

The period, in minutes, over which metric samples are aggregated before being reported.

Accepted values can be one of 1, 5, 15, 30 or 60. The default value is 60.

metrics

Metrics.

Accepted values can be multiple values of all, system, eth, cellular, wifi-ap, wifi-client, location, ipsec and power. The default value is all.

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copy

Copies a file.
This command is available to all users.

Syntax

```
copy source dest
```

Parameters

source

The source file to be copied to the location specified by 'dest.'

dest

The destination file, or file to which the source file is copied.

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date

Manually sets and displays the system date and time.

Syntax

```
date [HH:MM:SS [DD:MM:YYYY]]
```

Parameters

time

System time, specified in the 24-hour format HH:MM:SS.

date

System date, specified in the format DD:MM:YYYY.

Examples

- ```
  date 14:55:00 03:05:2016
  ```

  Set the system date and time to 14:55:00 on May 3, 2016.

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  ```

del

Deletes a file.
This command is available to all users.

Syntax

```
del file
```

Parameters

file
The file to be deleted.

dhcp-host

Configures a DHCP host static IP address

Syntax

```
dhcp-host <1 - 32> <parameter> <value>
```

Parameters

mac-address
The MAC address of the host
Value should be a MAC address.

ip-address
The IP address to be assigned to the host
Value should be an IPv4 address.

dhcp-option

Configures a DHCP server option

Syntax

```
dhcp-option <1 - 32> <parameter> <value>
```


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Parameters

option

The DHCP server option

Accepted value is any integer from 0 to 255. The default value is 0.

value

The value of the DHCP server option

Accepted value is any string up to 255 characters.

user-class

The User Class for the DHCP option

Accepted value is any string up to 255 characters.

lan

The LAN interfaces the DHCP option is valid on

Accepted values can be one of all, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9 or lan10. The default value is all.

force

Forces the DHCP option to be sent even if not requested

Value is either on or off. The default value is off.

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dhcp-server

Configures Dynamic Host Configuration Protocol (DHCP) server settings.

Syntax

```
dhcp-server <1 - 10> <parameter> <value>
```

Parameters

state

Enables or disables this DHCP server, or enables the use of DHCP relay.

Accepted values can be one of off, server or relay. The default value is off.

ip-address-start

The first IP address in the pool of addresses to assign.

Value should be an IPv4 address.

ip-address-end

The last IP address in the pool of addresses to assign.

Value should be an IPv4 address.

mask

The IP network mask given to clients.

Value should be an IPv4 address. The default value is 255.255.255.0.

gateway

Override the IP gateway address given to clients. By default, the gateway address given to clients is the IP address of the LAN with the same index as this DHCP server. If VRRP is enabled for this LAN, the VRRP virtual IP address is given to clients instead. However, if a gateway address is explicitly specified here, that address is given to clients instead of the LAN or VRRP IP address.

Value should be an IPv4 address.

dns1

Override the preferred DNS server address given to clients. By default, the DNS server address given to clients is the IP address of the LAN with the same index as this DHCP server. If VRRP is enabled for this LAN, the VRRP virtual IP address is given to clients instead. However, if a DNS server address is explicitly specified here, that address is given to clients instead of the LAN or VRRP IP address.

Value should be an IPv4 address.

dns2

Alternate DNS server address given to clients.

Value should be an IPv4 address.

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lease-time

The length, in minutes, of the leases issued by this DHCP server.
Accepted value is any integer from 2 to 10080. The default value is 1440.

relay-server1

The Primary DHCP Relay Server
Value should be an IPv4 address.

relay-server2

The Secondary DHCP Relay Server
Value should be an IPv4 address.

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dir

Displays the contents of the current directory.

Syntax

```
dir [dir]
```

Parameters

dir

Lists information about the directory (by default, the current directory).

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dmnr

Configures dynamic mobile network routing

Syntax

```
dmnr <parameter> <value>
```

Parameters

state

Enables or disables DMNR.

Value is either on or off. The default value is off.

home-agent

The IP address of the home agent.

Value should be an IPv4 address.

home-network

The IPv4 address of the home network. Use a simple IP address, or use CIDR notation (example: 192.168.100.0/24).

Accepted value is any string up to 18 characters. The default value is 1.2.3.4.

key

Authorization key for the home agent.

Accepted value is any string up to 255 characters. The default value is VzWNeMo.

spi

Security parameter index used to identify the security association.

Accepted value is any integer from 0 to 4294967295. The default value is 256.

lifetime

The lifetime of the registration to the home agent.

Accepted value is any integer from 120 to 65535. The default value is 600.

mtu

The maximum transmission unit (MTU) of the underlying tunnel.

Accepted value is any integer from 68 to 1476. The default value is 1476.

local-networks

Allows you to select the lans to advertise.

Accepted values can be multiple values of none, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9 and lan10. The default value is none.

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reconnect

Time in seconds to reconnect to the home agent

Accepted value is any integer from 1 to 300. The default value is 30.

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dsl

UNUSED

Syntax

```
dsl <parameter> <value>
```

Parameters

unused

UNUSED

Accepted value is any string up to 63 characters.

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dynamic-dns

Configures the dynamic DNS client on this device. This client notifies a dynamic DNS service of the IP address of this device. This allows external users to access this device using a fixed domain name, even when the public IP address of the device changes due to WAN failover or DHCP lease expiration.

Syntax

```
dynamic-dns <parameter> <value>
```

Parameters

state

Enables or disables the dynamic DNS client.

Value is either on or off. The default value is off.

service

Specifies the dynamic DNS service to which this dynamic DNS client will push updates.

Accepted values can be one of dyndns, noip, changeip or dnsomatic. The default value is dyndns.

hostname

The domain name that refers to this device. This domain name is provided when registering with the dynamic DNS service.

Value should be a fully qualified domain name.

username

The username used to authenticate with the dynamic DNS service.

Accepted value is any string up to 255 characters.

password

The password used to authenticate with the dynamic DNS service.

Accepted value is any string up to 255 characters.

ip-monitoring

Specify wheather dynamic DNS client monitors the IP address of this device or monitors a web service that returns a public IP address.

Accepted values can be one of wan or public. The default value is public.

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eth

Configures an Ethernet interface.

Syntax

```
eth <1 - 4> <parameter> <value>
```

Parameters

state

Enables or disables the Ethernet interface.

Accepted values can be one of off or on. The default value is on.

description

A description of the Ethernet interface.

Accepted value is any string up to 63 characters.

duplex

The duplex mode the device uses to communicate on the Ethernet network. The keyword 'auto' causes the device to sense the mode used on the network and adjust automatically.

Accepted values can be one of auto, full or half. The default value is auto.

speed

Transmission speed, in Mbps, the device uses on the Ethernet network. The keyword 'auto' causes the device to sense the Ethernet speed of the network and adjust automatically.

Accepted values can be one of auto, 10, 100 or 1000. The default value is auto.

mtu

The Maximum Transmission Unit (MTU) transmitted over the Ethernet interface.

Accepted value is any integer from 64 to 1500. The default value is 1500.

Examples

- ```
  eth 3 mask 255.255.255.0
  ```

  Set network mask of Ethernet interface 3 to 255.255.255.0.

- ```
  eth 3 state on
  ```

  Enable Ethernet interface 3.

- ```
  eth 3 state off
  ```

  Disable Ethernet interface 3.

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  ```

exit

Exits the command-line interface.

Syntax

```
exit
```


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firewall

Configures the firewall. The firewall controls which packets are allowed into and out of the device. Firewalls can filter packets based on the IP address, protocol, TCP ports, and UDP ports. You can also use the firewall to do port forwarding. The firewall is based on the open-source firewall named iptables. It uses the same syntax as the iptables firewall, except that the rules start with firewall instead of iptables. The firewall syntax is case-sensitive. For more information on configuring the firewall, see the Firewall section of the User Guide and these external sources: http://www.netfilter.org/documentation and https://help.ubuntu.com/community/IptablesHowTo

This command is available to super users only.

Syntax

```
firewall rule
```

Parameters

rule

Firewall rule.

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firewall6

Configures the IPv6 firewall. The firewall controls which packets are allowed into and out of the device. Firewalls can filter packets based on the IP address, protocol, TCP ports, and UDP ports. You can also use the firewall to do port forwarding. The firewall is based on the open-source firewall named iptables. It uses the same syntax as the iptables firewall, except that the rules start with firewall instead of iptables. The firewall syntax is case-sensitive. For more information on configuring the firewall, see the Firewall section of the User Guide and these external sources: http://www.netfilter.org/documentation and https://help.ubuntu.com/community/IptablesHowTo

This command is available to super users only.

Syntax

```
firewall6 rule
```

Parameters

rule

Firewall rule.

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gpio-analog

Configures the Analog IO ports

Syntax

```
gpio-analog <parameter> <value>
```

Parameters

mode

Configures the analog IO mode.

Accepted values can be one of voltage or current. The default value is voltage.

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gpio-digital

Configures the digital IO ports

Syntax

```
gpio-digital <parameter> <value>
```

Parameters

mode

Configures the digital IO mode.
Accepted values can be one of input or output. The default value is input.

pullup

Enables or disables the pullup resistor.
Accepted values can be one of off or on. The default value is on.

output-state

Enables or disables the output state.
Accepted values can be one of off or on. The default value is off.

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gpio-calibrate

Calibrates the analog input port

This command is available to super users only.

Syntax

```
gpio-calibrate
```

Parameters

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gre

Configures a GRE tunnel.

Syntax

```
gre <1 - 10> <parameter> <value>
```

Parameters

state

Enables or disables this GRE tunnel.
Value is either on or off. The default value is off.

description

A description of this GRE tunnel.
Accepted value is any string up to 255 characters.

ip-address

IPv4 address for this GRE interface.
Value should be an IPv4 address.

mask

IPv4 subnet mask for this GRE interface.
Value should be an IPv4 address.

peer

Remote peer for this GRE interface.
Value should be an IPv4 address.

key

The key to use for this GRE tunnel.
Accepted value is any string up to 10 characters.

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hotspot

Configures the hotspot feature on this device. This feature forces all clients connecting over the specified LAN to authenticate before they can access the WAN interface.

Syntax

```
hotspot <parameter> <value>
```

Parameters

state

Enables or disables the hotspot.

Value is either on or off. The default value is off.

auth-mode

The method used to authenticate hotspot clients.

Accepted values can be one of click-through, local-shared-password, radius-shared-password, radius-users or hotspotsystem. The default value is click-through.

local-shared-password

Password used when 'auth-mode' is set to 'local-shared-password'.

Accepted value is any string up to 255 characters.

lan

Specifies which LAN to run the hotspot on. When a user attempts to make a connection to any of the network interfaces that are part of this LAN they will be redirected to the login page for authentication before they can access the WAN resources.

Accepted values can be one of lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9 or lan10. The default value is lan2.

radius-server1

The IP address or fully-qualified domain name of the RADIUS server to use to authenticate hotspot users.

Value should be a fully qualified domain name.

radius-server2

The IP address or fully-qualified domain name of the backup RADIUS server to use to authenticate hotspot users.

Value should be a fully qualified domain name.

radius-server-port

The UDP authentication port number for the RADIUS server.

Accepted value is any integer from 1 to 65535. The default value is 1812.

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radius-secret

The shared secret for the RADIUS server.

Accepted value is any string up to 255 characters.

radius-nas-id

A unique identifier for this network access server (NAS). The fully-qualified domain name of the NAS is often used, but any arbitrary string may be used. String may not contain spaces, an open bracket ([), or close bracket (]).

Accepted value is any string between 1 and 64 characters. The default value is hotspot.

local-page

The filename of the login page displayed to unauthenticated users if 'login' is set to 'local-page'. The router will create some example implementations in the 'hotspot' folder that can be customized as needed.

Accepted value is any string up to 256 characters.

remote-url

The URL of the login page displayed to unauthenticated users if 'login' is set to 'remote-url'. The external server hosting this page also needs to be added to 'allowed-domains'.

Accepted value is any string up to 256 characters.

server-port

The port to run hotspot server on.

Accepted value is any integer from 1 to 65535. The default value is 4990.

auth-port

The port to run hotspot authentication server on.

Accepted value is any integer from 1 to 65535. The default value is 3990.

login

Specifies whether the hotspot redirects unauthenticated users to a login page hosted by the router or a login page located on an external server.

Accepted values can be one of local-page or remote-url. The default value is local-page.

bandwidth-max-down

The maximum download speed allowed for each client in kbps.

Accepted value is any integer from 0 to 100000. The default value is 10000.

bandwidth-max-up

The maximum upload speed allowed for each client in kbps.

Accepted value is any integer from 0 to 100000. The default value is 10000.

allowed-domains

A comma-separated list of domains that are accessible to users that are not currently authenticated. This list might include the remote server hosting the login page, payment handlers, social media sites

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used for authentication, and any other sites that should be available inside the walled garden. Subdomains underneath any of the domains listed here are also allowed.

Accepted value is any string up to 999 characters.

ip-address

The specified IPV4 address determines which IP the hotspot runs on as well as what IP addresses are assigned to clients. This IPV4 address must not exist within a current subnet.

Value should be an IPv4 address. The default value is 10.1.0.1.

mask

IPV4 subnet mask for the hotspot to assign addresses within.

Value should be an IPv4 address. The default value is 255.255.255.0.

swapoctets

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.

Value is either on or off. The default value is off.

uamsecret

Secret shared between the UAM server and the hotspot. This does not typically need to be set unless integrating with a cloud hotspot provider.

Accepted value is any string up to 255 characters.

use-uamsecret

Allows the UAM secret to be used. This does not typically need to be set unless integrating with a cloud hotspot provider.

Value is either on or off. The default value is off.

dhcp-lease

The number of seconds until a DHCP lease expires.

Accepted value is any integer from 60 to 1000000. The default value is 600.

allowed-subnets

A comma-separated list of subnets that are accessible to users that are not currently authenticated. This list might include one or more remote servers that should be available inside the walled garden. Subnets are specified in CIDR notation (an IP address followed by a slash and a decimal number indicating the size of the subnet mask). Individual IP addresses can also be specified in this list. If a domain name is specified in this list, the hotspot performs a DNS lookup to convert it to an IP address.

Accepted value is any string up to 999 characters.

radius-server-acct-port

The UDP accounting port number for the RADIUS server.

Accepted value is any integer from 1 to 65535. The default value is 1813.

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ip

Configures Internet Protocol (IP) settings.

Syntax

```
ip <parameter> <value>
```

Parameters

admin-conn

Administrative distance value for connected routes. Administrative distance values rank route types from most to least preferred. If there are two routes to the same destination that have the same mask, the device uses a route's 'metric' parameter value to determine which route to use. In such a case, the administrative distances for the routes determine the preferred type of route to use. The administrative distance is added to the route's metric to calculate the metric the routing engine uses. Usually, connected interfaces are most preferred, because the device is directly connected to the networks on such interfaces, followed by static routes.

Accepted value is any integer from 0 to 255. The default value is 0.

admin-static

Administrative distance value for static routes. See 'admin-conn' for how routers use administrative distance.

Accepted value is any integer from 0 to 255. The default value is 1.

hostname

IP hostname for this device.

Accepted value is any string up to 63 characters.

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ip-filter

Configures IP filter rules.

Syntax

```
ip-filter <1 - 32> <parameter> <value>
```

Parameters

description

The description of this rule.

Accepted value is any string up to 255 characters.

state

Enables or disables an IP filter rule.

Value is either on or off. The default value is off.

action

Accepts, drops, or rejects IP packets.

Accepted values can be one of accept, drop or reject. The default value is accept.

src-ip-address

The IPv4 or IPv6 source address of the incoming packet. Use a simple IPv4 or IPv6 address, or use CIDR notation (example: 192.168.100.0/24, fe80::/10)

Accepted value is any string up to 43 characters.

src-ip-port

The source port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Source port is ignored when protocol does not explicitly include tcp or udp.

Accepted value is any string up to 255 characters. The default value is 0.

dst-ip-address

The IPv4 or IPv6 destination address of the incoming packet. Use a simple IPv4 or IPv6 address, or use CIDR notation (example: 192.168.100.0/24, fe80::/10)

Accepted value is any string up to 43 characters.

dst-ip-port

The destination port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Dest port is ignored when protocol does not explicitly include tcp or udp.

Accepted value is any string up to 255 characters. The default value is 0.

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src

The WAN or LAN that is the source of incoming traffic. Required if 'dst' is not specified. Must be different than 'dst'.

Accepted values can be one of none, any-lan, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9, lan10, any-wan, wan1, wan2, wan3, wan4, wan5, wan6, wan7, wan8, wan9, wan10, hotspot, any-gre, gre1, gre2, gre3, gre4, gre5, gre6, gre7, gre8, gre9, gre10 or dmnr-tunnel. The default value is none.

dst

The WAN or LAN that is the destination of outgoing traffic. Required if 'src' is not specified. Must be different than 'src'.

Accepted values can be one of none, any-lan, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9, lan10, any-wan, wan1, wan2, wan3, wan4, wan5, wan6, wan7, wan8, wan9, wan10, hotspot, any-gre, gre1, gre2, gre3, gre4, gre5, gre6, gre7, gre8, gre9, gre10 or dmnr-tunnel. The default value is none.

protocol

The protocol of the incoming packet. Use a single protocol, a list (tcp,udp,icmp), or exclusive value (any). When set to 'any', src-ip-port and dst-ip-port values are ignored.

Accepted values can be multiple values of tcp, udp, icmp and any. The default value is tcp,udp.

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ipsec

Configures an IPsec tunnel. Up to 32 IPsec tunnels can be configured.

Syntax

```
ipsec <1 - 32> <parameter> <value>
```

Parameters

state

Enables or disables the IPsec tunnel.

Accepted values can be one of off or on. The default value is off.

description

A description of this IPsec tunnel.

Accepted value is any string up to 255 characters.

peer

The remote peer for this IPsec tunnel.

Value should be a fully qualified domain name.

esp-authentication

The Encapsulating Security Payload (ESP) authentication type used for the IPsec tunnel.

Accepted values can be multiple values of sha1, sha256 and sha384. The default value is sha1.

esp-encryption

ESP encryption type for IPsec tunnel

Accepted values can be multiple values of aes128, aes192, aes256, aes128gcm64, aes192gcm64, aes256gcm64, aes128gcm96, aes192gcm96, aes256gcm96, aes128gcm128, aes192gcm128 and aes256gcm128. The default value is aes128.

esp-diffie-hellman

The Encapsulating Security Payload (ESP) Diffie-Hellman group used for the IPsec tunnel.

Accepted values can be multiple values of none, group5, group14, group15, group16 and group20. The default value is group14.

auth-by

The authentication type for the IPsec tunnel

Accepted values can be one of psk, xauth-psk or cert. The default value is psk.

psk

The preshared key for the IPsec tunnel.

Accepted value is any string up to 255 characters.

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local-id

The local ID used for this IPsec tunnel.

Accepted value is any string up to 31 characters.

remote-id

The remote ID used for this IPsec tunnel.

Accepted value is any string up to 31 characters.

lifetime

Number of seconds before this IPsec tunnel is renegotiated.

Accepted value is any integer from 60 to 86400. The default value is 3600.

lifebytes

Number of bytes sent before this IPsec tunnel is renegotiated. A value of 0 means the IPsec tunnel will not be renegotiated based on the amount of data sent.

Accepted value is any integer from 0 to 4000000000. The default value is 0.

margintime

The number of seconds before the 'lifetime' limit to attempt to renegotiate the security association (SA).

Accepted value is any integer from 1 to 3600. The default value is 540.

marginbytes

The number of bytes before the 'lifebytes' limit to attempt to renegotiate the security association (SA).

Accepted value is any integer from 0 to 1000000000. The default value is 0.

random

The percentage of the total renegotiation limits that should be randomized.

Accepted value is any integer from 0 to 200. The default value is 100.

ike

The Internet Key Exchange (IKE) version to use for this IPsec tunnel.

Accepted value is any integer from 1 to 2. The default value is 1.

ike-mode

The IKEv1 mode to use for this IPsec tunnel.

Accepted values can be one of main or aggressive. The default value is main.

ike-encryption

The IKE encryption type for this IPsec tunnel.

Accepted values can be multiple values of aes128, aes192, aes256, aes128gcm64, aes192gcm64, aes256gcm64, aes128gcm96, aes192gcm96, aes256gcm96, aes128gcm128, aes192gcm128 and aes256gcm128. The default value is aes128.

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ike-authentication

The IKE authentication type for this IPsec tunnel.

Accepted values can be multiple values of sha1, sha256 and sha384. The default value is sha1.

ike-diffie-hellman

The IKE Diffie-Hellman group for this IPsec tunnel. Diffie-Hellman is a public-key cryptography protocol for establishing a shared secret over an insecure communications channel. Diffie-Hellman is used with Internet Key Exchange (IKE) to establish the session keys that create a secure channel.

Accepted values can be multiple values of group5, group14, group15, group16 and group20. The default value is group14.

ike-lifetime

The lifetime for the IKE key, in seconds.

Accepted value is any integer from 180 to 4294967295. The default value is 4800.

ike-tries

The number of attempts to negotiate this IPsec tunnel before failing.

Accepted value is any integer from 0 to 100. The default value is 3.

dpddelay

Dead peer detection transmit delay.

Accepted value is any integer from 1 to 3600. The default value is 30.

dpdtimeout

Timeout, in seconds, for dead peer detection.

Accepted value is any integer from 1 to 3600. The default value is 150.

dpd

Enables or disables dead peer detection. Dead Peer Detection (DPD) is a method of detecting a dead Internet Key Exchange (IKE) peer. The method uses IPsec traffic patterns to minimize the number of messages required to confirm the availability of a peer.

Value is either on or off. The default value is off.

metric

The metric for the IPsec route. The metric defines the order in which the device uses routes if there are two routes to the same destination. In such a case, the device uses the IPsec route with the smaller metric.

Accepted value is any integer from 0 to 255. The default value is 10.

xauth-username

XAuth identity used to reply to XAuth requests

Accepted value is any string up to 128 characters.

xauth-password

XAuth password used to reply to XAuth requests

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Accepted value is any string up to 255 characters.

xauth-role

Client or Server role for XAuth authentication

Accepted values can be one of client or server. The default value is client.

local-subnet

The local IP subnet(s) for this IPsec tunnel.

Accepted value is any string up to 255 characters.

remote-subnet

The remote IP subnet(s) for this IPsec tunnel.

Accepted value is any string up to 255 characters.

interfaces

Interfaces that can be used by this IPsec tunnel.

Accepted values can be multiple values of all, wan1, wan2, wan3, wan4, wan5, wan6, wan7, wan8, wan9 and wan10. The default value is all.

use-if-wan-down

Only start this tunnel if the specified WAN is down

Accepted values can be one of none, wan1, wan2, wan3, wan4, wan5, wan6, wan7, wan8, wan9 or wan10. The default value is none.

udp-encap

Force UDP encapsulation on IPsec tunnel.

Accepted values can be one of off or on. The default value is off.

probe-hosts

A comma-separated list of IPv4 addresses to probe on the remote end of the tunnel

Accepted value is any string up to 255 characters.

probe-interval

Number of seconds between probes sent over the tunnel

Accepted value is any integer from 15 to 3600. The default value is 15.

probe-size

Size of probe sent over the tunnel, in bytes

Accepted value is any integer from 64 to 1500. The default value is 64.

probe-response-timeout

Number of seconds to wait for a probe response from any probe host.

Accepted value is any integer from 5 to 60. The default value is 5.

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probe-timeout

Number of seconds to wait before attempting to recover the tunnel

Accepted value is any integer from 60 to 3600. The default value is 60.

cert

The local certificate used by this IPsec tunnel.

Accepted value is any string up to 255 characters.

private-key

The filename of the private key file. This file should be one of the ones shown by the 'pki list' command.

Accepted value is any string up to 255 characters.

private-key-password

The password for the private key file

Accepted value is any string up to 255 characters.

ca

The path to the certificate of the Certificate Authority that issued the remote peer's certificate.

Accepted value is any string up to 255 characters.

crl

A comma-separated list of paths to certificate revocation lists for the Certificate Authority that issued the remote peer's certificate.

Accepted value is any string up to 255 characters.

use-if-ipsec-down

Only start this IPsec tunnel if the specified IPsec tunnel is down.

Accepted values can be one of none, ipsec1, ipsec2, ipsec3, ipsec4, ipsec5, ipsec6, ipsec7, ipsec8, ipsec9, ipsec10, ipsec11, ipsec12, ipsec13, ipsec14, ipsec15, ipsec16, ipsec17, ipsec18, ipsec19, ipsec20, ipsec21, ipsec22, ipsec23, ipsec24, ipsec25, ipsec26, ipsec27, ipsec28, ipsec29, ipsec30, ipsec31 or ipsec32. The default value is none.

reboot-timeout

The number of minutes to wait for a tunnel to be established before rebooting the device. If set to the default of 0, reboot behavior is disabled.

Accepted value is any integer from 0 to 3600. The default value is 0.

Examples

- ```
  ipsec 3 state on
  ```

  Enable IPsec tunnel 3.

- ```
  ipsec 3 state off
  ```


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Disable IPsec tunnel 3.

- `ipsec 3 esp-authentication sha256`

  Set ESP authentication for IPsec tunnel 3 to SHA256.

- `ipsec 3 esp-encryption aes256`

  Set ESP encryption for IPsec tunnel 3 to AES 256 bit keys.

- `ipsec 3 esp-diffie-hellman group15`

  Set IPsec tunnel 3 to use ESP Diffie-Hellman group 15 for negotiation.

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lan

Configures a Local Area Network (LAN). A LAN is a group of Ethernet and Wi-Fi interfaces.

Syntax

```
lan <1 - 10> <parameter> <value>
```

Parameters

state

Enables or disables a LAN.

Value is either on or off. The default value is off.

description

A descriptive name for the LAN.

Accepted value is any string up to 63 characters.

mtu

Maximum Transmission Unit (MTU) for the LAN.

Accepted value is any integer from 128 to 1500. The default value is 1500.

interfaces

The physical interfaces for the LAN.

Accepted values can be multiple values of none, eth1, eth2, eth3, eth4, wifi-ap1, wifi-ap2, wifi-ap3, wifi-ap4, wifi-ap5, wifi-ap6, wifi-ap7 and wifi-ap8. The default value is none.

ip-address

IPv4 address for the LAN. While it is not strictly necessary for a LAN to have an IP address, an IP address must be configured to send traffic from and to the LAN.

Value should be an IPv4 address.

mask

IPv4 subnet mask for the LAN.

Value should be an IPv4 address. The default value is 255.255.255.0.

dns1

Preferred DNS server.

Value should be an IPv4 address.

dns2

Alternate DNS server.

Value should be an IPv4 address.

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dhcp-client

Enables or disable the DHCP client for this LAN.
Value is either on or off. The default value is off.

ipv6-state

Enables or disables IPv6 support on this LAN.
Value is either on or off. The default value is off.

ipv6-mode

Selects configuration method to provision clients on this LAN. Currently only DHCPv6 is supported.
Accepted values can be one of dhcpv6. The default value is dhcpv6.

stp

Enables or disables Spanning Tree Protocol (STP) on this LAN.
Value is either on or off. The default value is off.

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location

Configures location settings.

Syntax

```
location <parameter> <value>
```

Parameters

interval

Set the refresh interval in seconds for reading and sending location data.
Accepted value is any integer from 1 to 3600. The default value is 10.

vehicle-id

Set the vehicle ID to include in TAIP messages.
Accepted value is any string between 4 and 4 characters. The default value is 0000.

server-port

IP UDP port to listen for location messages. If 0, this feature is disabled.
Accepted value is any integer from 0 to 65535. The default value is 0.

state

Enable or disable location information.
Accepted values can be one of off, gnss or server. The default value is gnss.

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location-client

Configures location data that will be forwarded to a remote host, and identifies the remote host.

Syntax

```
location-client <1 - 10> <parameter> <value>
```

Parameters

description

Description for remote host that will receive location data.

Accepted value is any string up to 255 characters.

server

Server address for the remote host.

Value should be a fully qualified domain name.

server-port

Server port for the remote host.

Accepted value is any integer from 0 to 65535. The default value is 0.

type

Protocol type for location data being forwarded.

Accepted values can be one of taip or nmea. The default value is taip.

filter-nmea

Specifies which NMEA messages to send.

Accepted values can be multiple values of gga, gll, gsa, gsv, rmc and vtg. The default value is gga,gll,gsa,gsv,rmc,vtg.

filter-taip

Specifies which TAIP messages to send.

Accepted values can be multiple values of al, cp, id, ln and pv. The default value is al,cp,id,ln,pv.

prepend

Text to prepend to outgoing messages. '%s' translates to this device's serial number. '%v' translates to the configured vehicle ID.

Accepted value is any string up to 32 characters. The default value is .

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mkdir

Creates a directory.
This command is available to all users.

Syntax

```
mkdir dir
```

Parameters

dir

The directory to be created.

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more

Displays the contents of a file.

Syntax

```
more [file]
```

Parameters

file

File to be displayed.

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openvpn-client

Configures an OpenVPN client.

Syntax

```
openvpn-client <1 - 10> <parameter> <value>
```

Parameters

state

Enables or disables this OpenVPN client.

Value is either on or off. The default value is off.

description

A description of this OpenVPN client.

Accepted value is any string up to 255 characters.

server

The IP address or fully-qualified domain name of the OpenVPN server to which this OpenVPN client attempts to connect.

Value should be a fully qualified domain name.

port

The port number to which this OpenVPN client attempts to connect.

Accepted value is any integer from 1 to 65535. The default value is 1194.

protocol

The protocol (TCP or UDP) that this OpenVPN client uses to connect.

Accepted values can be one of udp or tcp. The default value is udp.

connect-retry

The number of seconds to wait between connection attempts. After 5 unsuccessful attempts, the wait time is doubled for each subsequent connection attempt, up to a maximum wait time of 300 seconds.

Accepted value is any integer from 1 to 60. The default value is 5.

bridge-mode

Enables Ethernet bridge (TAP) mode for this OpenVPN client. This eliminates the need for routing between networks as required by TUN mode, but may have scalability issues, since all broadcast traffic will flow over the OpenVPN tunnel.

Accepted values can be one of off, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9 or lan10. The default value is off.

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cipher

The encryption algorithm or list of algorithms the OpenVPN client can use to encrypt and decrypt data channel packets. The OpenVPN client will accept the cipher pushed by the server if it is in this list. If the OpenVPN server supports cipher negotiation, the OpenVPN client may accept additional ciphers that are not in this list.

Accepted values can be multiple values of aes-128-cbc, aes-192-cbc, aes-256-cbc, aes-128-gcm, aes-192-gcm and aes-256-gcm. The default value is aes-256-gcm,aes-256-cbc,aes-128-gcm,aes-128-cbc.

digest

The digest algorithm the OpenVPN client uses to sign and authenticate data channel packets.

Accepted values can be one of sha1, sha224, sha256, sha384 or sha512. The default value is sha1.

ca

The CA certificate this OpenVPN client uses to validate the certificate presented by the server. This file is in PEM format and is often named 'ca.crt' or similar.

Accepted value is any string up to 63 characters.

crl

The CRL this OpenVPN client uses to prevent connection to a server that presents a revoked certificate. This file is in PEM format and is often named 'crl.pem' or similar.

Accepted value is any string up to 63 characters.

capath

The CA and CRL directory path for this OpenVPN client. This allows you to provide multiple CA and CRL files. You should use the c_rehash tool to create CA certificates with a '.0' filename extension and CRLs with a '.r0' filename extension.

Accepted value is any string up to 63 characters.

cert

The public certificate for this OpenVPN client. This file is in PEM format and is often named 'client.crt' or similar.

Accepted value is any string up to 63 characters.

key

The private key for this OpenVPN client. This file is in PEM format and is often named 'client.key' or similar.

Accepted value is any string up to 63 characters.

username

The username the OpenVPN client uses to authenticate with the OpenVPN server.

Accepted value is any string up to 32 characters.

password

The password the OpenVPN client uses to authenticate with the OpenVPN server.

Accepted value is any string up to 255 characters.

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pull-routes

Allows the OpenVPN client to accept or reject routes that are pushed from the OpenVPN server.

Value is either on or off. The default value is on.

verb

Adjusts the amount of output that this OpenVPN client records in the system log. Set this parameter to 0 to record only errors and warnings. Set this parameter to 3 to record a fairly complete activity log.

Accepted value is any integer from 0 to 4. The default value is 0.

nat

Enables Network Address Translation (NAT) for outgoing packets on the OpenVPN client network interface. NAT allows a computer on a local network to send a request to a computer behind the OpenVPN server without adding additional routes on the OpenVPN server. NAT changes the source IP address of the outgoing packet to the IP address of the OpenVPN client, hiding the local network from the OpenVPN server. Since the request appears to come from the OpenVPN client, the response packet is destined for the OpenVPN client, and the OpenVPN server properly routes it to the correct OpenVPN client. The OpenVPN client only uses NAT if the 'bridge-mode' parameter is set to 'off'.

Value is either on or off. The default value is on.

compression

The compression algorithm this OpenVPN client uses to compress data channel packets.

Accepted values can be one of off, lzo, lz4 or any. The default value is off.

tls-auth

The key file this OpenVPN client uses for TLS authentication.

Accepted value is any string up to 63 characters.

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openvpn-route

Specifies the routes the OpenVPN server pushes to OpenVPN clients so they can access resources located behind the OpenVPN server. These resources would be otherwise unavailable since they are on different subnets than the OpenVPN tunnel itself. Typically, these routes would only be needed for non-bridged (TUN) configurations.

Syntax

```
openvpn-route <1 - 10> <parameter> <value>
```

Parameters

destination

Destination network for the route. This value typically ends with '.0' to match the subnet mask.

Value should be an IPv4 address.

mask

Subnet mask for the route.

Value should be an IPv4 address. The default value is 255.255.255.0.

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openvpn-server

Configures an OpenVPN server.

Syntax

```
openvpn-server <parameter> <value>
```

Parameters

state

Enables or disables the OpenVPN server.

Value is either on or off. The default value is off.

description

A description of this OpenVPN server.

Accepted value is any string up to 255 characters.

network

The local network for this OpenVPN tunnel if 'bridge-mode' is set to off. This value typically ends with '.0' to match the subnet mask.

Value should be an IPv4 address.

mask

The local subnet for this OpenVPN tunnel if 'bridge-mode' is set to off.

Value should be an IPv4 address. The default value is 255.255.255.0.

dns1

The IPv4 address of the primary DNS server. This value is pushed to OpenVPN clients if 'bridge-mode' is set to off.

Value should be an IPv4 address.

dns2

The IPv4 address of the secondary DNS server. This value is pushed to OpenVPN clients if 'bridge-mode' is set to off.

Value should be an IPv4 address.

port

The port this OpenVPN server uses to listen for incoming connections from OpenVPN clients.

Accepted value is any integer from 1 to 65535. The default value is 1194.

topology

The network topology this OpenVPN server uses to assign IP addresses to OpenVPN clients. This value is only used if 'bridge-mode' is set to off.

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Accepted values can be one of net30, p2p or subnet. The default value is net30.

protocol

The protocol (TCP or UDP) this OpenVPN server uses to listen for incoming connections from OpenVPN clients.

Accepted values can be one of udp or tcp. The default value is udp.

bridge-mode

Enables Ethernet bridge (TAP) mode for this OpenVPN server. This eliminates the need for routing between networks as required by TUN mode, but may have scalability issues, since all broadcast traffic will flow over the OpenVPN tunnel.

Accepted values can be one of off, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9 or lan10. The default value is off.

cipher

The encryption algorithm or list of algorithms the OpenVPN server can use to encrypt and decrypt data channel packets. The OpenVPN server will always push the first cipher in the list to OpenVPN clients that support cipher negotiation. OpenVPN clients that do not support cipher negotiation can connect using any cipher in this list.

Accepted values can be multiple values of aes-128-cbc, aes-192-cbc, aes-256-cbc, aes-128-gcm, aes-192-gcm and aes-256-gcm. The default value is aes-256-gcm,aes-256-cbc,aes-128-gcm,aes-128-cbc.

digest

The digest algorithm the OpenVPN server uses to sign and authenticate data channel packets.

Accepted values can be one of sha1, sha224, sha256, sha384 or sha512. The default value is sha1.

auth-by

Configures authentication to use certs, username/password, or both.

Accepted values can be one of certs, user-pass or both. The default value is certs.

ca

The CA certificate this OpenVPN server uses to validate all certificates presented by clients. This file is in PEM format and is often named 'ca.crt' or similar.

Accepted value is any string up to 63 characters.

crl

The CRL this OpenVPN server uses to deny access to any client that presents a revoked certificate. This file is in PEM format and is often named 'crl.pem' or similar.

Accepted value is any string up to 63 characters.

capath

The CA and CRL directory path for this OpenVPN server. This allows you to provide multiple CA and CRL files. You should use the c_rehash tool to create CA certificates with a '.0' filename extension and CRLs with a '.r0' filename extension.

Accepted value is any string up to 63 characters.

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dh

The Diffie-Hellman parameters this OpenVPN server uses for shared secret generation. This file is in PEM format and is often named 'dh2048.pem' or similar. Leave blank to use Elliptic Curve Diffie-Hellman key exchange.

Accepted value is any string up to 63 characters.

cert

The public certificate for this OpenVPN server. This file is in PEM format and is often named 'server.crt' or similar.

Accepted value is any string up to 63 characters.

key

The private key for this OpenVPN server. This file is in PEM format and is often named 'server.key' or similar.

Accepted value is any string up to 63 characters.

radius-server

The IP address for the RADIUS server for OpenVPN.

Value should be an IPv4 address.

radius-server-port

The port for the RADIUS server.

Accepted value is any integer from 1 to 65535. The default value is 1812.

radius-server-secret

The secret for the RADIUS server.

Accepted value is any string up to 255 characters.

radius-server-state

Enables or disables RADIUS authentication.

Value is either on or off. The default value is off.

compression

The compression algorithm this OpenVPN server uses to compress data channel packets.

Accepted values can be one of off, lzo or lz4. The default value is off.

verb

Adjusts the amount of output that this OpenVPN server records in the system log. Set this parameter to 0 to record only errors and warnings. Set this parameter to 3 to record a fairly complete activity log.

Accepted value is any integer from 0 to 4. The default value is 0.

keepalive-interval

Sends a ping message if no other traffic is sent in either direction between the OpenVPN client and server. This value is also pushed to the client. To disable the ping-based keepalive mechanism, set this

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parameter to 0.

Accepted value is any integer from 0 to 3600. The default value is 30.

keepalive-timeout

Restarts the OpenVPN tunnel if no traffic is detected for this many seconds. This value should typically be 5-6 times as large as the 'keepalive-interval' value. This value is doubled before it is set on the server. This value is also pushed to the client. To disable the ping-based keepalive mechanism, set this parameter to 0.

Accepted value is any integer from 0 to 3600. The default value is 150.

reneg-bytes

Number of bytes sent/received before data channel encryption key is renegotiated. To disable data channel encryption key renegotiation, set this parameter to 0.

Accepted value is any integer from 0 to 4000000000. The default value is 0.

reneg-sec

Number of seconds before the data channel encryption key is renegotiated.

Accepted value is any integer from 60 to 86400. The default value is 3600.

tls-auth

The key file this OpenVPN server uses for TLS authentication.

Accepted value is any string up to 63 characters.

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openvpn-user

Configures an OpenVPN server user.

Syntax

```
openvpn-user <1 - 10> <parameter> <value>
```

Parameters

username

Username for OpenVPN user.
Accepted value is any string up to 32 characters.

password

Password for OpenVPN user.
Accepted value is any string up to 128 characters.

perf-server

Configures performance server

Syntax

```
perf-server <parameter> <value>
```

Parameters

state

Enables or disables throughput performance server.
Value is either on or off. The default value is off.

port

The port on which the Performance server listens.
Accepted value is any integer from 0 to 65535. The default value is 5201.

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ping

Sends ICMP echo (ping) packets to the specified destination address.

Syntax

```
ping [ipv6] [count n] [interface ifname] [size bytes] [dont-fragment] [broadcast]
destination
```

Parameters

ipv6

Specifies whether the destination address to ping is an IPv6 address.

count

Number of pings to send.

interface

The interface or IP address from which pings are sent.

size

The number of data bytes to send.

dont-fragment

Prevents packet fragmentation.

broadcast

Sends a broadcast ping.

destination

The name of the IP host to ping.

Examples

- `ping ipv6 ipv6.google.com`

  Ping the ipv6 host 'ipv6.google.com'

- `ping 8.8.8.8`

  Ping IP address 8.8.8.8 with packets of default size 56 bytes

- `ping count 10 size 8 8.8.8.8`

  Ping IP address 8.8.8.8 for 10 times

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ping

- `ping interface eth2 count 5 8.8.8.8`

  Ping IP address 8.8.8.8 for 5 times via Ethernet interface 2

- `ping size 8192 dont-fragment 8.8.8.8`

  Ping IP address 8.8.8.8 with packs of size 8192 and prevent fragmentation

- `ping broadcast 192.168.1.255`

  Ping IP broadcast address 192.168.1.255

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pki

The public key infrastructure is used to manage private key and certificate files to secure network activities.

This command is available to super users only.

Syntax

```
pki privkey <privkeyfile> <size> [aes128|aes256 <passphrase>]
pki list
pki del <privkeyfile>
pki addkey <privkeyfile>
pki csr [country c] [state st] [locality l] [organization o] [organizational-unit
ou] [common-name cn] [email e] [passphrase pw] <privkeyfile> <csr-file> <digest>
pki dh-file <parameter-file> <size>
```

Parameters

csr

Create a Certificate Signing Request.

privkey

Generate a private key file.

list

Show the private key files.

del

Remove a private key file.

addkey

Add an externally-generated private key file to the list of private key files. Key file can be in PEM or PKCS #12 format

dh-file

Generate a Diffie Hellman parameter file using the PEM format.

Examples

- ```
  privkey mykeyfile.key 2048
  ```

  Generates an unencrypted mykeyfile.key with 2048 bits rsa

- ```
  privkey mykeyfile.key 4096 aes256 "my secret phrase"
  ```

  Generates an encrypted mykeyfile.key with 4096 bits rsa

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pki

- `dh-file mydhfile.pem 1024`

  Generates a Diffie Hellman 1024 bit parameter file

- `list`

  Lists the existing key files

- `del mykeyfile.key`

  Deletes mykeyfile.key from the list of key files

- `addkey mykeyfile.key`

  Moves the externally-generated file mykeyfile.key from the upload folder into the list of private key files

- `csr common-name www.example.com mykeyfile.key my.csr sha256`

  Create a Certificate Signing Request with a common name

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port-forward

Configures port forwarding rules.

Syntax

```
port-forward <1 - 30> <parameter> <value>
```

Parameters

port

The TCP or UDP port or ports from which incoming packets are forwarded.
Accepted value is any string up to 255 characters.

to-port

The TCP or UDP port that packets are forwarded to after being received on the incoming port(s).
Accepted value is any integer from 0 to 65535. The default value is 0.

to-ip-address

The IPv4 address that packets are forwarded to after being received on the incoming interface.
Value should be an IPv4 address.

description

The description of this rule.
Accepted value is any string up to 255 characters.

state

Enables or disables a port forward rule. Invalid rules are not enabled.
Value is either on or off. The default value is off.

protocol

The protocol or protocols of the packets to forward.
Accepted values can be one of tcp, udp or tcp-and-udp. The default value is tcp-and-udp.

src

The WAN or LAN that is the source of incoming traffic to be forwarded.
Accepted values can be one of any, any-lan, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9, lan10, any-wan, wan1, wan2, wan3, wan4, wan5, wan6, wan7, wan8, wan9, wan10, any-ovpn, ovpn1, ovpn2, ovpn3, ovpn4, ovpn5, ovpn6, ovpn7, ovpn8, ovpn9, ovpn10, any-gre, gre1, gre2, gre3, gre4, gre5, gre6, gre7, gre8, gre9 or gre10. The default value is any.

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port-forward

Examples

- `port-forward 4 port 80`

  Forward port 80 to the to-port and to-ip-address

- `port-forward 4 port 1000:2000`

  Forward all ports in the range 1000-2000

- `port-forward 4 port 23,24,25`

  Forward ports in the list 23,24,25

- `port-forward 4 src any-wan`

  Forwards traffic from WANs only

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power

Configures device power settings.

Syntax

```
power <parameter> <value>
```

Parameters

ignition-on-delay

Power on delay in seconds after ignition sense goes up.

Accepted value is any integer from 0 to 64800. The default value is 0.

ignition-off-delay

Power off delay in seconds after ignition sense goes down.

Accepted value is any integer from 0 to 64800. The default value is 0.

button

Controls powering down via power button. Use Disable Power Down to disable short press (a normal shutdown) but allow a forced shutdown via a long press of the power button. Use Disable All to disable the power button completely. In any case, powering up the device using the power button is allowed.

Accepted values can be one of enable-power-down, disable-power-down or disable-all-power-down. The default value is enable-power-down.

auto-reboot

Enables or disables auto reboot if the device experiences a temporary power drop.

Value is either on or off. The default value is off.

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pwd

Displays the current directory name.

Syntax

```
pwd
```

Parameters

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python

Starts Python

This command is available to super users only.

Syntax

```
python
python <filepath> [args]
python stop <id>
python version
```

Parameters

filepath

The path to the python file.

args

Arguments to send to the python file.

id

The id of the python file to be stopped.

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python-autostart

Configures Python applications to be run at startup
This command is available to super users only.

Syntax

```
python-autostart <1 - 4> <parameter> <value>
```

Parameters

filepath

Path to the file to be run.
Accepted value is any string up to 255 characters.

on-exit

Action taken when the application exits.
Accepted values can be one of none, restart or reboot. The default value is none.

args

Arguments sent to the application.
Accepted value is any string up to 255 characters.

state

Enables or disable application startup.
Accepted values can be one of on or off. The default value is on.

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qos-filter

Configures QoS filters.

Syntax

```
qos-filter <1 - 32> <parameter> <value>
```

Parameters

description

The description of this filter.

Accepted value is any string up to 255 characters.

state

Enables or disables a QoS filter.

Value is either on or off. The default value is off.

queue

All traffic matching this filter is sent to this queue.

Accepted value is any integer from 0 to 8. The default value is 0.

src-ip-address

The IPv4 or IPv6 source address of the incoming packet. Use a simple IPv4 or IPv6 address, or use CIDR notation (example: 192.168.100.0/24, fe80::/10)

Accepted value is any string up to 43 characters.

src-ip-port

The source port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Source port is ignored when protocol does not explicitly include tcp or udp.

Accepted value is any string up to 255 characters. The default value is 0.

dst-ip-address

The IPv4 or IPv6 destination address of the incoming packet. Use a simple IPv4 or IPv6 address, or use CIDR notation (example: 192.168.100.0/24, fe80::/10)

Accepted value is any string up to 43 characters.

dst-ip-port

The destination port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Dest port is ignored when protocol does not explicitly include tcp or udp.

Accepted value is any string up to 255 characters. The default value is 0.

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src

The interface that is the source of incoming traffic.

Accepted values can be one of any, any-lan, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9, lan10 or hotspot. The default value is any.

protocol

The protocol of the incoming packet. Use a single protocol, a list (tcp,udp,icmp), or exclusive value (any). When set to 'any', src-ip-port and dst-ip-port values are ignored.

Accepted values can be multiple values of tcp, udp, icmp and any. The default value is tcp,udp.

dscp

The Differentiated Services Field values to match. Use a single value, a list (ef,af11,af21), or exclusive value (any).

Accepted values can be multiple values of any, be, af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, ef, cs0, cs1, cs2, cs3, cs4, cs5, cs6 and cs7. The default value is any.

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qos-queue

Configures a QoS queue

Syntax

```
qos-queue <1 - 8> <parameter> <value>
```

Parameters

state

Enables or disables this QoS queue.

Value is either on or off. The default value is off.

description

A description of this QoS queue.

Accepted value is any string up to 255 characters.

bandwidth-upstream

Amount of bandwidth that is guaranteed to this queue in kbps. The sum of the guaranteed bandwidth for all queues should not exceed the bandwidth of the slowest WAN with QoS enabled.

Accepted value is any integer from 0 to 1000000. The default value is 0.

borrow-upstream

Allow the queue to use additional bandwidth if there is any unused.

Value is either on or off. The default value is on.

dscp-class

Set the DSCP class of outbound packets using this queue.

Accepted values can be one of do-not-set, be, af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, ef, cs0, cs1, cs2, cs3, cs4, cs5, cs6 or cs7. The default value is do-not-set.

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radius

Configures RADIUS authentication for system administrators, restricting access to the web and command line interfaces.

This command is available to super users only.

Syntax

```
radius <parameter> <value>
```

Parameters

state

Enable or disable RADIUS authentication for system administrators.

Value is either on or off. The default value is off.

server

The IP address or fully-qualified domain name of the RADIUS server to use to authenticate system administrators.

Value should be a fully qualified domain name.

server-port

The UDP port number for the RADIUS server.

Accepted value is any integer from 1 to 65535. The default value is 1812.

server-secret

The shared secret for the RADIUS server. Secret can not contain spaces, an open bracket ([), or a close bracket (]).

Accepted value is any string up to 255 characters.

nas-id

A unique identifier for this network access server (NAS). The fully-qualified domain name of the NAS is often used, but any arbitrary string may be used. String may not contain spaces, an open bracket ([), or close bracket (]).

Accepted value is any string up to 64 characters.

server-timeout

The amount of time in seconds to wait for the RADIUS server to respond.

Accepted value is any integer from 3 to 10. The default value is 3.

local-auth

Whether to use local authentication if the RADIUS server does not respond before the timeout expires.

Value is either on or off. The default value is on.

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debug

Enable or disable additional debug messages from the RADIUS client. These messages are added to the system log.

Value is either on or off. The default value is off.

backup-server

The IP address or fully-qualified domain name of the backup RADIUS server to use to authenticate system administrators when the main RADIUS server is not available.

Value should be a fully qualified domain name.

backup-server-port

The UDP port number for the backup RADIUS server.

Accepted value is any integer from 1 to 65535. The default value is 1812.

backup-server-secret

The shared secret for the backup RADIUS server. Secret can not contain spaces, an open bracket ([), or a close bracket (]).

Accepted value is any string up to 255 characters.

backup-server-timeout

The amount of time in seconds to wait for the backup RADIUS server to respond.

Accepted value is any integer from 3 to 10. The default value is 3.

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reboot

Reboots the device immediately or at a scheduled time. Performing a reboot will not automatically save any configuration changes since the configuration was last saved.

This command is available to all users.

Syntax

```
reboot [[in M][at HH:MM][cancel]]
```

Parameters

in

For a scheduled reboot, the minutes before the device is rebooted.

at

For a scheduled reboot, the time to reboot the device, specified in the format HH:MM.

cancel

Cancels a scheduled reboot.

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rename

Renames a file.

This command is available to all users.

Syntax

```
rename oldName newName
```

Parameters

oldName

Old file name.

newName

New file name.

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rmdir

Deletes a directory.
This command is available to all users.

Syntax

```
rmdir dir
```

Parameters

dir

The directory to be removed.

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route

Configures a static route, a manually-configured entry in the routing table.

Syntax

```
route <1 - 32> <parameter> <value>
```

Parameters

destination

The destination IP network for the static route.

Value should be an IPv4 address.

mask

The destination IP netmask for the static route.

Value should be an IPv4 address.

gateway

The gateway to use for the static route.

Value should be an IPv4 address.

metric

The metric for the static route. The metric defines the order in which the device uses routes if there are two routes to the same destination. In such a case, the device uses the route with the smaller metric.

Accepted value is any integer from 0 to 255. The default value is 0.

interface

The name of the interface to which packets are routed.

Accepted values can be one of none, eth1, eth2, eth3, eth4, wifi-client1, wifi-client2, cellular1-sim1, cellular1-sim2, cellular2-sim1, cellular2-sim2, ovpn1, ovpn2, ovpn3, ovpn4, ovpn5, ovpn6, ovpn7, ovpn8, ovpn9, ovpn10, gre1, gre2, gre3, gre4, gre5, gre6, gre7, gre8, gre9 or gre10. The default value is none.

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routing-rule

Configures IP filter rules.

Syntax

```
routing-rule <1 - 16> <parameter> <value>
```

Parameters

description

The description of this rule.

Accepted value is any string up to 255 characters.

state

Enables or disables a routing rule.

Value is either on or off. The default value is off.

src-ip-address

The IPv4 or IPv6 source address of the incoming packet. Use a simple IPv4 or IPv6 address, or use CIDR notation (example: 192.168.100.0/24, fe80::/10)

Accepted value is any string up to 43 characters.

src-ip-port

The source port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Source port is ignored when protocol does not explicitly include tcp or udp.

Accepted value is any string up to 255 characters. The default value is 0.

dst-ip-address

The IPv4 or IPv6 destination address of the incoming packet. Use a simple IPv4 or IPv6 address, or use CIDR notation (example: 192.168.100.0/24, fe80::/10)

Accepted value is any string up to 43 characters.

dst-ip-port

The destination port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Dest port is ignored when protocol does not explicitly include tcp or udp.

Accepted value is any string up to 255 characters. The default value is 0.

src

The source interface of the incoming traffic.

Accepted values can be one of any, any-lan, lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9, lan10 or hotspot. The default value is any.

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protocol

The protocol of the incoming packet. Use a single protocol, a list (tcp,udp,icmp), or exclusive value (any). When set to 'any', src-ip-port and dst-ip-port values are ignored.

Accepted values can be multiple values of tcp, udp, icmp and any. The default value is any.

wan

The WAN packets that match this rule should be routed to.

Accepted value is any integer from 1 to 10. The default value is 1.

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save

Saves the configuration to flash memory. Unless you issue this command, all configuration changes since the configuration was last saved are discarded after a reboot.

This command is available to all users.

Syntax

```
save config
save analyzer
```

Parameters

config

Saves all configuration to flash memory.

analyzer

Saves the current captured traffic to a file.

Examples

- `save config`

  Save the current configuration to flash memory.

- `save analyzer packets.pcapng`

  Saves the current captured traffic to packets.pcapng.

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scep-client

Client for the SCEP protocol

Syntax

```
scep-client <1 - 2> <parameter> <value>
```

Parameters

server

Full HTTP URL of the SCEP server to be used for cert request

Accepted value is any string up to 255 characters.

password

challenge password for SCEP request

Accepted value is any string up to 255 characters.

certificate-name

After a successful certificate request, the enrolled certificate is stored in this filename

Accepted value is any string up to 255 characters.

renewable-time

The number of days that the certificate enrollment can be renewed, prior to the request expiring.

Accepted value is any integer from 1 to 365. The default value is 7.

distinguished-name

Valid DN attributes are DC, C, ST, L, O, OU, CN. No spaces allowed between attribute values

Accepted value is any string up to 255 characters.

private-key

RSA key to be used for the request. If it doesn't exist, one will be generated and saved in a file

Accepted value is any string up to 255 characters.

ca-name

The CA certificate to be used for the request. If it doesn't exist, one will be retrieved from the server and saved in a file

Accepted value is any string up to 255 characters.

crl-name

The file name of the Certificate Revocation List that will be retrieved from the server

Accepted value is any string up to 255 characters.

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state

Enable or disable SCEP client

Value is either on or off. The default value is off.

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serial

Configures a serial interface.

Syntax

```
serial <1 - 4> <parameter> <value>
```

Parameters

state

Configure the mode of the serial interface to be either off, cli, or python

Accepted values can be one of off, cli or python. The default value is cli.

description

A description of the serial interface.

Accepted value is any string up to 63 characters.

baud

The data rate in bits per second (baud) for serial transmission.

Accepted values can be one of 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800 or 921600. The default value is 115200.

databits

Number of data bits in each transmitted character.

Accepted values can be one of 8 or 7. The default value is 8.

parity

Sets the parity bit. The parity bit is a method of detecting errors in transmission. It is an extra data bit sent with each data character, arranged so that the number of 1 bits in each character, including the parity bit, is always odd or always even.

Accepted values can be one of none, odd or even. The default value is none.

stopbits

The number of stop bits sent at the end of every character.

Accepted values can be one of 1 or 2. The default value is 1.

flowcontrol

The type of flow control signals to pause and resume data transmission. Available options are software flow control using XON/XOFF characters, hardware flow control using the RS232 RTS and CTS signals, or no flow control signals.

Accepted values can be one of none, software or hardware. The default value is none.

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show analyzer

Displays the traffic analyzer log.

Parameters

description

Displays the traffic analyzer log.

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show cellular

Displays cellular interface status and statistics.

Parameters

oper-status

Whether the Cellular interface is up or down.

module

Manufacturer's model number for the cellular module.

firmware-version

Manufacturer's version number for the software running on the cellular module.

hardware-version

Manufacturer's version number for the cellular module hardware.

imei

International Mobile Station Equipment Identity (IMEI) number for the cellular module, a unique number assigned to every mobile device.

sim-used

Which SIM slot is currently in use by the device.

sim-status

SIM card status

signal-strength

A measure of the signal level of the cellular network, measured in dB.

signal-quality

An indicator of the quality of the received cellular signal, measured in dB.

registration-status

The status of the cellular module's connection to a cellular network.

network-provider

Network provider for the cellular network.

temperature

Current temperature of the cellular module, as read and reported by the temperature sensor on the cellular module.

connection-type
Cellular connection type.

radio-band
The radio band on which the cellular module is operating.

radio-technology
Radio technology the modem is using.

channel
The radio channel on which the cellular module is operating.

apn-in-use
The current Packet Data Protocol (PDP) connection context. A PDP context contains routing information for packet transfer between a mobile station (MS) and a gateway GPRS support node (GGSN) to have access to an external packet-switching network. The PDP context identified by an exclusive MS PDP address (the mobile station's IP address). This means that the mobile station will have as many PDP addresses as activated PDP contexts.

ip-address
IP address for the cellular interface.

mask
Address mask for the cellular interface.

gateway
IP address of the remote end of the cellular connection.

dns-servers
IP addresses of the DNS servers in use for the cellular interface.

rx-packets
Number of packets received by the cellular module during the current data session.

tx-packets
Number of packets transmitted by the cellular module during the current data session.

rx-bytes
Number of bytes received by the cellular module during the current data session.

tx-bytes
Number of bytes transmitted by the cellular module during the current data session.

attachment-status
The status of the cellular module's attachment to a cellular network.

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show cellular

iccid
Integrated Circuit Card Identifier (ICCID). This identifier is unique to each SIM card.

sim1-pin-status
SIM1 PIN Status.

sim1-pin-retries
Number of retries PIN left on SIM1

sim2-pin-status
SIM2 PIN Status.

sim2-pin-retries
Number of PIN retries left on SIM2

firmware-carrier
Current carrier firmware

esn
Equipment Serial Number (ESN)

imsi
International Mobile Subscriber identity (IMSI)

phone-number
Phone number

tac
The Type Allocation Code (TAC)

power
Transmit power

plmn
A PLMN is identified by the Mobile Country Code (MCC) and the Mobile Network Code (MNC).

roaming-status
Roaming or Home (not roaming)

location
LAC - Location Area Code and CellID (CID)

preferred-technology
Radio technology the modem is using.

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show cloud

Displays Digi Remote Manager connection status and statistics.

Parameters

status

Status of the device connection to the Digi Remote Manager.

server

The URL of the connected Digi Remote Manager.

deviceid

Device ID for Digi Remote Manager connection.

uptime

Amount of time, in seconds, that the Digi Remote Manager connection has been established.

rx-bytes

Number of bytes received from Digi Remote Manager.

rx-packets

Number of packets received from Digi Remote Manager.

tx-bytes

Number of bytes transmitted to Digi Remote Manager.

tx-packets

Number of packets transmitted to Digi Remote Manager.

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show config

Displays the current device configuration.

Parameters

config

The current configuration running on the device.

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show dhcp

Displays information about DHCP connected clients.

Parameters

dhcp

Displays the DHCP status.

show dmnr

Displays local networks and their DMNR details.

Parameters

admin-status

Whether DMNR is sufficiently configured to be brought up.

oper-status

Whether the DMNR tunnel is up or down.

registration-status

Displays the DMNR registration state as it negotiates with the Home Agent.

home-agent

Displays the IP address of DMNR Home Agent.

care-of-address

Displays the IP address of DMNR Care of Address.

interface

Displays the interface used by the DMNR tunnel.

lifetime

Displays the actual lifetime status.

local-networks

Displays the local networks and their DMNR status.

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show eth

Displays Ethernet interfaces status and statistics.

Parameters

description

A description of the Ethernet interface.

admin-status

Whether the Ethernet interface is sufficiently configured to be brought up.

oper-status

Whether the Ethernet interface is up or down.

uptime

Amount of time the Ethernet interface has been up.

mac-address

The MAC address, or physical address, of the Ethernet interface.

link-status

The current speed and duplex mode of the Ethernet interface.

link-speed

The current speed of the Ethernet interface.

link-duplex

The current duplex mode of the Ethernet interface.

rx-unicast-packets

The number of unicast packets transmitted on the Ethernet interface.

tx-unicast-packets

The number of unicast packets transmitted on the Ethernet interface.

rx-broadcast-packets

The number of broadcast packets received on the Ethernet interface.

tx-broadcast-packets

The number of broadcast packets transmitted on the Ethernet interface.

rx-multicast-packets

The number of multicast packets received on the Ethernet interface.

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tx-multicast-packets

The number of multicast packets transmitted on the Ethernet interface.

rx-crc-errors

The number of received packets that do not contain the proper cyclic redundancy check (CRC), or checksum value.

tx-crc-errors

The number of transmitted packets that do not contain the proper cyclic redundancy check (CRC), or checksum value.

rx-drop-packets

The number of received packets that have been dropped on the Ethernet interface.

tx-drop-packets

The number of transmitted packets that have been dropped on the Ethernet interface.

rx-pause-packets

The number of pause packets received on the Ethernet interface. An overwhelmed network node can send a packet, which halts the transmission of the sender for a specified period of time.

tx-pause-packets

The number of pause packets transmitted on the Ethernet interface.

rx-filtering-packets

The number of received packets that were blocked or dropped through packet filtering.

tx-collisions

The number of collision events detected in transmitted data. Collisions occur when two devices attempt to place a packet on the network at the same time. Collisions are detected when the signal on the cable is equal to or exceeds the signal produced by two or more transceivers that are transmitting simultaneously.

rx-alignment-error

The number of received packets that do not end on an 8-bit boundary, known as an alignment error.

rx-undersize-error

The number of received packets that do not end on an 8-bit boundary, known as an alignment error.

rx-fragment-error

The number of received packets that contain fewer than the required minimum of 64 bytes, and have a bad CRC. Fragments are generally caused by collisions.

rx-oversize-error

The number of received packets that are larger than the maximum 1518 bytes and have a good CRC.

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rx-jabber-error

The number of packets that are greater than 1518 bytes and have a bad CRC. If a transceiver does not halt transmission after 1518 bytes, it is considered to be a jabbering transceiver.

rx-packets

The number of packets received on the Ethernet interface.

tx-packets

The number of packets transmitted on the Ethernet interface.

rx-bytes

The number of bytes received on the Ethernet interface.

tx-bytes

The number of bytes transmitted on the Ethernet interface.

rx-errors

The total number of received packets that are marked as errors.

tx-errors

The total number of transmitted packets that are marked as errors.

tx-carrier-error

The number of transmission failures due to improper signaling, as with a duplex mismatch.

rx-fifo-error

The number of events in which the Ethernet driver detects an inability to service the receive packet queue, as with processor congestion.

tx-fifo-error

The number of events in which the Ethernet driver detects an inability to service the transmit packet queue, as with processor or network congestion.

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show firewall

Displays the firewall status and statistics. By default, all firewall tables are displayed. To display individual tables, specify the table name on the show firewall command. In the command output, the policy for each chain is also displayed in brackets after the chain name. The firewall keeps a counter for each rule which counts the number of packets and bytes that have been matched against the rule. This is a useful tool to determine if a rule is correctly detecting packets. To clear the counters, use the 'clear firewall' command.

Parameters

filter

The currently defined filter table for IPv4.

mangle

The currently defined mangle table for IPv4.

raw

The currently defined raw table for IPv4.

nat

The currently defined nat table for IPv4.

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show firewall6

Displays the firewall status and statistics. By default, all firewall tables are displayed. To display individual tables, specify the table name on the show firewall6 command. In the command output, the policy for each chain is also displayed in brackets after the chain name. The firewall keeps a counter for each rule which counts the number of packets and bytes that have been matched against the rule. This is a useful tool to determine if a rule is correctly detecting packets. To clear the counters, use the 'clear firewall6' command.

Parameters

filter

The currently defined filter table for IPv6.

mangle

The currently defined mangle table for IPv6.

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show gre

Displays Generic Routing Encapsulation (GRE) tunnel status and statistics.

Parameters

admin-status

Whether the GRE tunnel is sufficiently configured to be brought up.

oper-status

Whether the GRE tunnel is up or down.

description

Description of the GRE tunnel.

ip-address

IP address for the GRE tunnel.

mask

Subnet mask for the GRE tunnel.

peer

Remote peer for this GRE tunnel.

key

Key being used by this GRE tunnel.

rx-bytes

Number of bytes received by the GRE tunnel.

rx-packets

Number of packets received by the GRE tunnel.

tx-bytes

Number of bytes transmitted by the GRE tunnel.

tx-packets

Number of packets transmitted by the GRE tunnel.

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show hotspot

Displays hotspot status and statistics, as well as a list of clients.

Parameters

admin-status

Whether the hotspot is configured to be running.

oper-status

Whether the hotspot is running or not.

lan

The LAN that the hotspot is running on.

auth-clients

The number of clients that are currently authenticated to the hotspot.

unauth-clients

The number of clients that are connected to the hotspot but have not successfully authenticated. These clients may be authenticating and/or accessing sites available within the walled garden.

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show ip-filter

Displays IP filter rules status.

Parameters

description

The description of this rule.

state

Whether the IP filter rule is enabled or disabled.

action

The action taken when the rule matches.

src-ip-address

The IPv4 source address of the incoming packet. Use a simple IP address, or use CIDR notation (example: 192.168.100.0/24)

src-ip-port

The source port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Source port is ignored when protocol does not explicitly include tcp or udp.

dst-ip-address

The IPv4 destination address of the incoming packet. Use a simple IP address, or use CIDR notation (example: 192.168.100.0/24)

dst-ip-port

The destination port(s) of the incoming packet. Use a simple port, a range (lowport:highport) or a list (port1,port2...,portn). Default '0' implies 'Any'. Dest port is ignored when protocol does not explicitly include tcp or udp.

src

The WAN or LAN that is the source of incoming traffic.

dst

The WAN or LAN that is the destination of outgoing traffic.

protocol

The protocol of the incoming packet. Use a single protocol, a list (tcp,udp,icmp), or exclusive value (any). When set to 'any', src-ip-port and dst-ip-port values are ignored.

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show ipsec

Displays IPsec tunnel status and statistics.

Parameters

description

A description for this IPsec tunnel.

admin-status

Whether this IPsec tunnel is sufficiently configured to be brought up.

oper-status

Whether this IPsec tunnel is up or down.

uptime

Amount of time, in seconds, this IPsec tunnel has been up.

peer-ip

Peer IP address for this IPsec tunnel.

local-network

Local network for this IPsec tunnel.

local-mask

Local network mask for this IPsec tunnel.

remote-network

Remote network for this IPsec tunnel.

remote-mask

Remote network mask for this IPsec tunnel.

key-negotiation

Key negotiation used for this IPsec tunnel.

rekeying-in

Amount of time before the keys are renegotiated.

ah-ciphers

Authentication Header (AH) Ciphers.

esp-ciphers

Encapsulating Security Payload (ESP) Ciphers.

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renegotiating-in
Renegotiating in.

outbound-esp-sas
Outbound ESP Security Associations (SA).

inbound-esp-sas
Inbound ESP Security Associations (SA).

rx-bytes
Number of bytes received over the IPsec tunnel.

tx-bytes
Number of bytes transmitted over the IPsec tunnel.

ike-spis
IKE Security Parameter Indexes.

local-peer
The IP address of the WAN interface used by this IPsec tunnel.

outgoing-interface
The name of the outgoing interface (for example, WAN1) used by this IPsec tunnel.

probe-host
The IPv4 address or fully qualified domain name (FQDN) of the last device probe responses were received from.

probe-resp-seconds
Number of seconds since the device received the last probe response. A value of -10 indicates that probes are disabled. A value of -20 indicates the device has not received any probe responses yet.

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show ipstats

Displays system-level Internet Protocol (IP) status and statistics.

Parameters

rx-bytes
Number of bytes received.

rx-packets
Number of packets received.

rx-multicast-packets
Number of multicast packets received.

rx-multicast-bytes
Number of multicast bytes received.

rx-broadcast-packets
Number of broadcast packets received.

rx-forward-datagrams
Number of forwarded packets received.

rx-delivers
Number of received packets delivered.

rx-reasm-requireds
Number of received packets that required reassembly.

rx-reasm-oks
Number of received packets that were reassembled without errors.

rx-reasm-fails
Number of received packets for which reassembly failed.

rx-discards
Number of received IP packets that have been discarded.

rx-no-routes
Number of received packets that have no routing information associated with them.

rx-address-errors
Number of received packets containing IP address errors.

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rx-unknown-protos
Number of received packets where the protocol is unknown.

rx-truncated-packets
Number of received packets where the data was truncated.

tx-bytes
Number of bytes transmitted.

tx-packets
Number of packets transmitted.

tx-multicast-packets
Number of multicast packets transmitted.

tx-multicast-bytes
Number of multicast bytes transmitted.

tx-broadcast-packets
Number of broadcast packets transmitted.

tx-forward-datagrams
Number of forwarded packets transmitted.

tx-frag-requireds
Total number of transmitted IP packets that required fragmenting.

tx-frag-oks
Number of transmitted IP packets that were fragmented without errors.

tx-frag-fails
Number of transmitted IP packets for which fragmentation failed.

tx-frag-creates
Number of IP fragments created.

tx-discards
Number of transmitted IP packets that were discarded.

tx-no-routes
Number of transmitted IP packets that had no routing information associated with them.

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show lan

Displays Local Area Network (LAN) status and statistics.

Parameters

admin-status

Whether the LAN is sufficiently configured to be brought up.

oper-status

Whether the LAN is up or down.

description

Description of the LAN.

interfaces

The physical interfaces for the LAN.

mtu

Maximum Transmission Unit for the LAN.

ip-address

IP address for the LAN.

dhcp-client

Enables or disable the DHCP client for this LAN.

mask

Subnet mask for the LAN.

dns1

Preferred DNS server.

dns2

Alternate DNS server.

rx-bytes

Number of bytes received by the LAN.

rx-packets

Number of packets received by the LAN.

tx-bytes

Number of bytes transmitted by the LAN.

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tx-packets

Number of packets transmitted by the LAN.

ipv6-address

The IPv6 address or addresses assigned to the LAN.

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show location

Displays location information

Parameters

gnss-state

Whether GNSS receiver turned on and running.

source

Current source of GPS location data

latitude

Current latitude in degrees, minutes, seconds and in decimal degrees.

longitude

Current longitude in degrees, minutes, seconds and in decimal degrees.

altitude

Current altitude in meters.

quality

GPS quality indicator for position fix.

utc-date-time

Current UTC date and time in 24-hour format.

num-of-satellites

Current number of visible satellites.

horizontal-velocity

Current horizontal velocity in meters per second.

vertical-velocity

Current vertical velocity in meters per second.

direction

Current direction of heading in degrees.

recv-state

Current state of location data receival

show log

Displays log (event or system/kernel).

Parameters

system

Displays the system/kernel log.

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show openvpn-client

Displays status and statistics about this OpenVPN client.

Parameters

description

A description of this OpenVPN client.

admin-status

Whether this OpenVPN client is configured to be running.

oper-status

Whether this OpenVPN client is actually running.

server

The IP address or fully-qualified domain name of the OpenVPN server to which this OpenVPN client attempts to connect.

interface

The name of the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

ip-address

The IP address assigned to the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

mask

The subnet mask assigned to the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

mtu

The Maximum Transmission Unit (MTU) size configured for the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

interface-rx-bytes

The number of bytes received on the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

interface-tx-bytes

The number of bytes transmitted on the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

interface-rx-packets

The number of packets received on the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

interface-tx-packets

The number of packets transmitted on the local virtual network interface (TUN/TAP adapter) that this OpenVPN client uses.

socket-rx-bytes

The number of bytes received on the local UDP/TCP socket that this OpenVPN client uses.

socket-tx-bytes

The number of bytes transmitted on the local UDP/TCP socket that this OpenVPN client uses.

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show openvpn-server

Displays status and statistics about this OpenVPN server.

Parameters

description

A description of this OpenVPN server.

admin-status

Whether this OpenVPN server is configured to be running.

oper-status

Whether this OpenVPN server is actually running.

interface

The name of the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

ip-address

The IP address assigned to the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

mask

The subnet mask assigned to the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

mtu

The Maximum Transmission Unit (MTU) size configured for the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

interface-rx-bytes

The number of bytes received on the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

interface-tx-bytes

The number of bytes transmitted on the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

interface-rx-packets

The number of packets received on the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

interface-tx-packets

The number of packets transmitted on the local virtual network interface (TUN/TAP adapter) that this OpenVPN server uses.

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show port-forward

Displays port forwarding rules.

Parameters

port

The TCP or UDP port or ports from which incoming packets are forwarded.

to-port

The TCP or UDP port that packets are forwarded to after being received on the incoming port(s).

to-ip-address

The IPv4 address that packets are forwarded to after being received on the incoming interface.

description

The description of this rule.

state

Enables or disables a port forward rule. Invalid rules are not enabled.

protocol

The protocol or protocols of the packets to forward.

src

The WAN or LAN that is the source of incoming traffic to be forwarded.

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show power

Displays information about the device power status.

Parameters

ignition-sense

Whether the ignition is on or off.

voltage

The supply voltage in DC volts

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show python

Displays running Python applications

Parameters

applications

Displays running Python applications

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show route

Displays all IP routes in the IPv4 routing table.

Parameters

destination

Destination of the route.

gateway

The gateway for the route.

metric

The metric assigned to the route.

protocol

The protocol for the route.

idx

The index number for the route.

interface

The interface for the route.

status

Status of the route.

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show routing-rule

Displays routing rule status

Parameters

oper-status

Whether the routing rule is up or down.

description

The description of this routing rule.

wan

The WAN of the routing rule.

show serial

Displays serial interface status and statistics.

Parameters

description

A description of the serial interface.

admin-status

Whether the serial interface is sufficiently configured to be brought up.

oper-status

Whether the serial interface is up or down.

uptime

Amount of time the serial interface has been up.

tx-bytes

Number of bytes transmitted over the serial interface.

rx-bytes

Number of bytes received over the serial interface.

overrun

Number of times the next data character arrived before the hardware could move the previous character.

overflow

Number of times the received buffer was full when additional data was received.

line-status

The current signal detected on the serial line.

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show system

Displays system status and statistics.

Parameters

model

The model name for the device.

part-number

The part number for the device.

serial-number

The serial number for the device.

hardware-version

The hardware version for the device.

bank

The current firmware flash memory bank in use.

firmware-version

The current firmware version running on the device.

bootloader-version

The current bootloader version running on the device.

config-file

The current configuration file loaded on the device.

uptime

The time the device has been up.

system-time

The current time on the device.

cpu-usage

Current CPU usage.

cpu-min

Minimum CPU usage.

cpu-max

Maximum CPU usage.

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cpu-avg
Average CPU usage.

description
Description for this device.

location
Location details for this device.

contact
Contact information for this device.

temperature
The current temperature of the device.

core-temperature
The current temperature of the CPU core.

boot-bank
The firmware flash memory bank which the device will boot from after the reboot.

other-bank-firmware-version
The firmware version of the non running bank.

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show tech-support

Displays information needed by Digi Technical Support when diagnosing device issues.

Parameters

output-file

The name of the file to which the command output is written. Optional.

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show usb

Displays Vendor ID, Product ID, Manufacturer, Product Name, and USB Port of USB devices.

Parameters

vendor-id

Vendor ID of the USB Device

product-id

Product ID of the USB Device

manufacturer

Manufacturer of USB Device

product

Product Name of USB Device

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show vrrp

Displays VRRP tunnel status and statistics.

Parameters

state

Whether the VRRP daemon is configured to be running.

interface

Displays current interface being used by the VRRP daemon.

current-state

The state of the VRRP daemon on this router.

current-master

Displays IP address and priority of the router that is currently the VRRP master.

current-priority

The current VRRP priority of this router.

last-transition

The most recent date that this router transitioned between VRRP states.

became-master

The total number of times that this router has transitioned into the VRRP master state.

released-master

The total number of times that this router has transitioned out of the VRRP master state.

adverts-sent

The total number of VRRP advertisements sent by this router.

adverts-received

The total number of VRRP advertisements received by this router.

priority-sent

The total number of VRRP packets with a priority of '0' sent by this router.

priority-received

The total number of VRRP packets with a priority of '0' received by this router.

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show wan

Displays Wide Area Network (WAN) status and statistics.

Parameters

admin-status

Whether the WAN is sufficiently configured to be brought up.

oper-status

Whether the WAN is up or down.

interface

The physical interface assigned to the WAN.

ip-address

IP address for the WAN.

dns1

Preferred DNS server.

dns2

Alternate DNS server.

gateway

The gateway to use for the static route.

mask

Subnet mask for the WAN.

rx-bytes

Number of bytes received by the WAN.

rx-packets

Number of packets received by the WAN.

tx-bytes

Number of bytes transmitted by the WAN.

tx-packets

Number of packets transmitted by the WAN.

probe-host

The IPv4 address or fully qualified domain name (FQDN) of the device to send probes to.

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probe-resp-seconds

Number of seconds since the device received the last probe response. A value of -1 indicates that probes are disabled. A value of -2 indicates the device has not received any probe responses yet.

ipv6-address

The IPv6 address or addresses assigned to the WAN.

ipv6-dns1

Preferred IPv6 DNS server.

ipv6-dns2

Alternate IPv6 DNS server.

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show web-filter

Displays status for the web filtering service used for all WAN traffic

Parameters

state

Whether web filtering is enabled.

device-id

Device ID from the Cisco Umbrella Network Device Registration API.

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show wifi-ap

Displays status and statistics for a Wi-Fi Access Point interface.

Parameters

interface

The name of the Wi-Fi Access Point interface.

description

A descriptive name for the Wi-Fi Access Point interface.

admin-status

Whether the Wi-Fi Access Point interface is sufficiently configured to be brought up.

oper-status

Whether the Wi-Fi Access Point interface is up or down.

channel

The radio channel on which the Wi-Fi Access Point interface is operating.

module

The Wi-Fi module on which the Wi-Fi Access Point interface is operating.

ssid

Service Set Identifier (SSID) for the Wi-Fi Access Point interface.

bssid

BSSID/MAC Address of the Wi-Fi Access Point interface.

security

Security for the Wi-Fi Access Point interface.

rx-bytes

The number of bytes received by the Wi-Fi Access Point interface.

tx-bytes

The number of bytes transmitted by the Wi-Fi Access Point interface.

rx-packets

The number of packets transmitted by the Wi-Fi Access Point interface.

tx-packets

The number of packets transmitted by the Wi-Fi Access Point interface.

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rx-multicasts
The number of receive multicasts by the Wi-Fi Access Point interface.

tx-collisions
The number of transmit collisions by the Wi-Fi Access Point interface.

rx-errors
The number of receive errors by the Wi-Fi Access Point interface.

tx-errors
The number of transmit errors by the Wi-Fi Access Point interface.

rx-dropped
The number of receive packets dropped by the Wi-Fi Access Point interface.

tx-dropped
The number of transmit packets dropped by the Wi-Fi Access Point interface.

rx-fifo-errors
The number of receive FIFO errors by the Wi-Fi Access Point interface.

tx-fifo-errors
The number of transmit FIFO errors by the Wi-Fi Access Point interface.

rx-crc-errors
The number of received packets by the Wi-Fi Access Point interface that do not contain the proper cyclic redundancy check (CRC), or checksum value.

tx-aborted-errors
The number of transmit aborted errors by the Wi-Fi Access Point interface.

rx-frame-errors
The number of receive frame errors by the Wi-Fi Access Point interface.

tx-carrier-errors
The number of transmit carrier errors by the Wi-Fi Access Point interface.

rx-length-errors
The number of receive length errors by the Wi-Fi Access Point interface.

tx-heartbeat-errors
The number of transmit heartbeat errors by the Wi-Fi Access Point interface.

rx-missed-errors
The number of receive missed errors by the Wi-Fi Access Point interface.

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tx-window-errors

The number of transmit window errors by the Wi-Fi Access Point interface.

rx-over-errors

The number of receive over errors by the Wi-Fi Access Point interface.

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show wifi-client

Displays status and statistics for a Wi-Fi Client interface.

Parameters

interface

The name of the Wi-Fi Client interface.

admin-status

Whether the Wi-Fi Client module is configured for client mode.

oper-status

Whether the Wi-Fi Client link is connected or not connected.

ssid

Service Set Identifier (SSID) for the connected Wi-Fi network.

mac-address

MAC address of the Wi-Fi Client interface.

security

Wi-Fi network security mode of the Wi-Fi Access Point.

bssid

BSSID/MAC address of the connected Wi-Fi Access Point.

rssi

Wi-Fi Client signal strength in dBm.

connection-time

Amount of time, in seconds, that the Wi-Fi Client connection has been established.

connection-rate

Wi-Fi Client Connection rate in Mbps.

rx-bytes

The number of bytes received by the Wi-Fi Client interface.

tx-bytes

The number of bytes transmitted by the Wi-Fi Client interface.

rx-packets

The number of packets transmitted by the Wi-Fi Client interface.

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tx-packets
The number of packets transmitted by the Wi-Fi Client interface.

rx-multicasts
The number of receive multicasts by the Wi-Fi Client interface.

tx-collisions
The number of transmit collisions by the Wi-Fi Client interface.

rx-errors
The number of receive errors by the Wi-Fi Client interface.

tx-errors
The number of transmit errors by the Wi-Fi Client interface.

rx-dropped
The number of receive packets dropped by the Wi-Fi Client interface.

tx-dropped
The number of transmit packets dropped by the Wi-Fi Client interface.

rx-fifo-errors
The number of receive FIFO errors by the Wi-Fi Client interface.

tx-fifo-errors
The number of transmit FIFO errors by the Wi-Fi Client interface.

rx-crc-errors
The number of received packets by the Wi-Fi Client interface that do not contain the proper cyclic redundancy check (CRC), or checksum value.

tx-aborted-errors
The number of transmit aborted errors by the Wi-Fi Client interface.

rx-frame-errors
The number of receive frame errors by the Wi-Fi Client interface.

tx-carrier-errors
The number of transmit carrier errors by the Wi-Fi Client interface.

rx-length-errors
The number of receive length errors by the Wi-Fi Client interface.

tx-heartbeat-errors
The number of transmit heartbeat errors by the Wi-Fi Client interface.

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rx-missed-errors

The number of receive missed errors by the Wi-Fi Client interface.

tx-window-errors

The number of transmit window errors by the Wi-Fi Client interface.

rx-over-errors

The number of receive over errors by the Wi-Fi Client interface.

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snmp

Configures Simple Network Management Protocol (SNMP) management for this device.

Syntax

```
snmp <parameter> <value>
```

Parameters

v1

Enables or disables SNMPv1 support.
Value is either on or off. The default value is off.

v2c

Enables or disables SNMPv2c support.
Value is either on or off. The default value is off.

v3

Enables or disables SNMPv3 support.
Value is either on or off. The default value is off.

port

The port on which the device listens for SNMP packets.
Accepted value is any integer from 0 to 65535. The default value is 161.

authentication-traps

Enables or disables SNMP authentication traps.
Value is either on or off. The default value is off.

Examples

- ```
  snmp v1 on
  ```

  Enable SNMPv1 support.

- ```
  snmp v2c on
  ```

  Enable SNMPv2c support.

- ```
  snmp port 161
  ```

  Set the SNMP listening port to 161.

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  ```

snmp-community

Configures SNMPv1 and SNMPv2c communities.
This command is available to super users only.

Syntax

```
snmp-community <1 - 10> <parameter> <value>
```

Parameters

community

SNMPv1 or SNMPv2c community name.
Accepted value is any string up to 255 characters.

access

SNMPv1 or SNMPv2c community access level.
Accepted values can be one of read-only or read-write. The default value is read-only.

Examples

- ```
  snmp-community 1 community public
  ```

  Set the first SNMPv1 or SNMPv2c community name to 'public.'

- ```
  snmp-community 1 access read-write
  ```

  Set the first SNMPv1 or SNMPv2c community access level to 'read-write.'

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snmp-user

Configures SNMPv3 users.

This command is available to super users only.

Syntax

```
snmp-user <1 - 10> <parameter> <value>
```

Parameters

user

SNMPv3 user name.

Accepted value is any string up to 32 characters.

authentication

SNMPv3 authentication type.

Accepted values can be one of none, md5 or sha1. The default value is none.

privacy

SNMPv3 privacy type. To use SNMPv3 privacy (that is, Data Encryption Standard (DES) or Advanced Encryption Standard (AES)) for the SNMP user, the SNMPv3 authentication type must be set to MD5 or SHA1.

Accepted values can be one of none, aes or des. The default value is none.

access

SNMPv3 user access level.

Accepted values can be one of read-only or read-write. The default value is read-only.

authentication-password

SNMPv3 authentication password. The password is stored in encrypted form.

Accepted value is any string up to 255 characters.

privacy-password

SNMPv3 privacy password. The password is stored in encrypted form.

Accepted value is any string up to 255 characters.

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sntp

Configures system date and time using Simple Network Time Protocol (SNTP). SNTP continually polls an external NTP time server on either a private company network or the internet at a configured interval rate.

Syntax

```
sntp <parameter> <value>
```

Parameters

state

Enables or disables SNTP to set the system date and time.

Accepted values can be one of off or on. The default value is on.

server

The SNTP server to use for setting system date and time.

Value should be a fully qualified domain name. The default value is time.devicecloud.com.

update-interval

The interval, in minutes, at which the device checks the SNTP server for date and time.

Accepted value is any integer from 1 to 10080. The default value is 1440.

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ssh

Configures Secure Shell (SSH) server settings.

Syntax

```
ssh <parameter> <value>
```

Parameters

server

Enables or disables the SSH server.

Value is either on or off. The default value is on.

port

The port number for the SSH Server.

Accepted value is any integer from 1 to 65535. The default value is 22.

ca-key

The base64 encoded public key for the certificate authority trusted to sign SSH certificates for user authentication.

This element is available to super users only.

Accepted value is any string up to 716 characters.

ca-key-type

The key type of the CA public key

This element is available to super users only.

Accepted values can be one of none, ecdsa-sha2-nistp256, ecdsa-sha2-nistp384, ecdsa-sha2-nistp521, ssh-ed25519 or ssh-rsa. The default value is none.

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syslog

Configures remote syslog servers

Syntax

```
syslog <1 - 2> <parameter> <value>
```

Parameters

server

Set the syslog server ip address. You can configure the syslog to log remotely to this ip address. Value should be a fully qualified domain name.

server-port

This is the port that syslog server uses to report events.
Accepted value is any integer from 0 to 65535. The default value is 514.

mode

This allows you to send syslog messages with either TCP or UDP.
Accepted values can be one of udp or tcp. The default value is udp.

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system

Configures system settings.

Syntax

```
system <parameter> <value>
```

Parameters

prompt

The prompt displayed in the command-line interface. You can configure the system prompt to use the device's serial number by including '%s' in prompt value. For example, a 'prompt' parameter value of 'WR64_%s' resolves to 'WR64_WR123456.'

Accepted value is any string up to 16 characters. The default value is digi.router>.

timeout

The time, in seconds, after which a web or command-line interface session times out if there is no activity.

Accepted value is any integer from 60 to 3600. The default value is 300.

loglevel

The minimum event level that is logged in the event log.

Accepted values can be one of emergency, alert, critical, error, warning, notice, info or debug. The default value is info.

name

The name of this device.

Accepted value is any string up to 255 characters.

location

The location of this device.

Accepted value is any string up to 255 characters.

contact

Contact information for this device.

Accepted value is any string up to 255 characters.

page

Sets the page size for command-line interface output.

Accepted value is any integer from 0 to 100. The default value is 40.

device-specific-passwords

Enables or disables device-specific passwords. Encrypted passwords can be device-specific or not. When encrypted passwords are device-specific, they are more secure, but cannot be copied onto

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another device.

Value is either on or off. The default value is off.

description

A description of this device.

Accepted value is any string up to 255 characters.

wizard

Enables or disables the Getting Started Wizard. To skip the wizard, disable this option.

Value is either on or off. The default value is on.

ipsec-debug

Sets the IPsec debugging level in the ipsec.debug file. These messages can help diagnose issues with IPsec configuration and interoperability.

Accepted value is any integer from -1 to 4. The default value is -1.

log-to-file

Enables or disables logging events to a file. If disabled, the log is created in RAM, and is lost when the device is rebooted. If enabled, the log is created to flash and is saved on reboot. Saving event logs to files and keeping them resident for some time is not recommended for normal operations, as this practice can lead to additional wear to the device's flash memory.

Value is either on or off. The default value is off.

log-system-to-file

If enabled, log system/kernel events to system.log (on flash, will be saved on reboot). This is not recommended for normal operations, as this practice can lead to additional wear to the device's flash memory.

Value is either on or off. The default value is off.

timezone

Sets the system timezone. When the date and time is set using SNTP, the system time is set to Universal Coordinated Time (UTC) and not to your local time. In addition, the date and time, whether it is set manually or using SNTP, does not automatically change to reflect Daylight Saving Time (DST). By setting the time zone, the device displays the local time for that time zone and automatically adjusts for daylight saving time.

Accepted values can be one of none, canada-atlantic, canada-central, canada-eastern, canada-mountain, canada-newfoundland, canada-pacific, europe-central, europe-eastern, europe-western, uk-ireland, us-alaska, us-arizona, us-central, us-eastern, us-hawaii, us-mountain or us-pacific. The default value is none.

log-to-syslog

Enables logging events to a syslog server

Accepted values can be multiple values of syslog1, syslog2 and off. The default value is off.

log-system-to-syslog

Enables logging system events to a syslog server

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system

Accepted values can be multiple values of syslog1, syslog2 and off. The default value is off.

hw-crypto

Enables or disables the HW crypto accelerator for the IPsec connections.
Value is either on or off. The default value is on.

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traceroute

Traces the network route to a remote IP host.

Syntax

```
traceroute [src-ip <ip-address>] [interface <interface>] [hops <n>] [timeout
<secs>] [size <bytes>] host
```

Parameters

src-ip

Use this source IP address for outgoing packets.

interface

The interface from which traceroute messages are sent.

hops

The maximum number of hops to allow.

timeout

The maximum number of seconds to wait for a response from a hop.

size

The size, in bytes, of the message to send.

host

The IP address of the destination host.

Examples

- ```
  traceroute 8.8.8.8
  ```

  Finds the network route to IP address 8.8.8.8

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  ```

unlock

Unlock a SIM card and set a new SIM card PIN code.

This command is available to super users only.

Syntax

```
unlock <cellular1-sim1 | cellular1-sim2 | ...> <puk code> <new sim pin>
```

Parameters

sim

The SIM slot number in which the SIM card is inserted. Enter cellular1-sim1 if the SIM card is inserted in slot SIM1 of cellular1, or cellular1-sim2 if the SIM card is inserted in slot SIM2.

puk-code

The PUK code for the SIM card. This code can be between 8 and 10 digits long.

new-sim-pin

The new SIM card PIN. This PIN can be between 4 and 8 digits long.

Examples

- ```
  unlock cellular1-sim2 12345678 1234
  ```

  Unlock the SIM card in cellular1 SIM2 with PUK code 12345678 and set the new SIM PIN to 1234.

- ```
  unlock cellular2-sim1 12345678 1234
  ```

  Unlock the SIM card in cellular2 SIM1 with PUK code 12345678 and set the new SIM PIN to 1234.

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update

Performs system updates, such as firmware updates, and setting the configuration file used at bootup and when saving configuration. Firmware update options include specifying the device system firmware or the cellular module firmware to load onto the device.

This command is available to super users only.

Syntax

```
update firmware <firmware-file>
update firmware copy-bank
update firmware switch <0|1>
update module <module number> <firmware-images-path | carrier-name | show>
[force]
update config <configuration-file>
```

Parameters

firmware

Updates the device system firmware.

module

Updates the cellular module firmware.

config

Sets the configuration filename.

Examples

- `update config config.da1`

  Set the configuration file to 'config.da1.'

- `update firmware filename`

  Initiate the device system firmware update process.

- `update firmware copy-bank`

  Copy the current partition into the alternate partition and then switch to the alternate partition.

- `update module 1`

  Initiate the cellular module firmware update process. This process retrieves image files from Digi International site and downloads the images to the module.

- `update module 1 ./module_fw`

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update

Initiate the cellular module firmware update process. This process uploads firmware files from the directory ./module_fw to the cellular module.

- `update module 1 verizon`

Initiate the cellular module firmware update process. This process retrieves firmware files from the Digi repository of cellular module firmware files and uploads the images to the module.

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user

Configures users and user access privileges.

Syntax

```
user <1 - 10> <parameter> <value>
```

Parameters

name

User names are case-insensitive strings, which must start with a letter or underscore (_), but otherwise can contain letters, digits, underscores (_), or hyphens (-). In addition, they can end with a dollar sign ($). No other characters are allowed.

Accepted value is any string up to 32 characters.

password

The password for the user.

Accepted value is any string up to 128 characters.

access

The user access level for the user. User access levels determine the level of control users have over device features and their settings. The 'super' access permission allows the most control over features and settings, and 'read-only' the lowest control over features and settings.

Accepted values can be one of read-only, read-write or super. The default value is super.

ssh-key

The base64 encoded SSH public key to use for authentication of this user

Accepted value is any string up to 716 characters.

ssh-key-type

The key type of the SSH public key

Accepted values can be one of none, ecdsa-sha2-nistp256, ecdsa-sha2-nistp384, ecdsa-sha2-nistp521, ssh-ed25519 or ssh-rsa. The default value is none.

Examples

- ```
  user 1 username _Username1234$
  ```

  Valid user 1 username starting with _ and ending with $.

- ```
  user 3 username userName-1234
  ```

  Valid user 3 username containing a dash.

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vrrp

Configures Virtual Router Redundancy Protocol (VRRP). This allows multiple routers to work together to provide a LAN with high-reliability routing to the Internet or another network.

Syntax

```
vrrp <parameter> <value>
```

Parameters

state

Enable or disable Virtual Router Redundancy Protocol (VRRP).

Value is either on or off. The default value is off.

initial-state

The initial VRRP state of this router when it is enabled.

Accepted values can be one of backup or master. The default value is backup.

interface

The LAN interface on which to run VRRP.

Accepted values can be one of lan1, lan2, lan3, lan4, lan5, lan6, lan7, lan8, lan9 or lan10. The default value is lan1.

ip-address

The virtual IP address assigned to the VRRP virtual router. Each client on the LAN should use this address as the default gateway. Typically, the DHCP server distributes this address to the each client.

Value should be an IPv4 address.

router-id

The ID of the VRRP virtual router.

Accepted value is any integer from 1 to 255. The default value is 1.

priority

The VRRP priority of this router.

Accepted value is any integer from 1 to 255. The default value is 100.

interval

The time in seconds betweeen VRRP advertisement packets. All of the routers in the VRRP group should use the same interval.

Accepted value is any integer from 1 to 60. The default value is 1.

probe-gateway

The unique IPv4 address of the intended Master router's LAN interface used for VRRP (not the shared VRRP virtual IP address). If unspecified, probing uses this router's default route.

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Value should be an IPv4 address.

probe-host

An IPv4 address to probe to determine VRRP Priority.
Value should be a fully qualified domain name.

probe-type

The type of protocol (ICMP or TCP) to use when probing.
Accepted values can be one of icmp or tcp. The default value is icmp.

probe-port

Destination port to use when probing with TCP.
Accepted value is any integer from 1 to 65535. The default value is 80.

probe-interval-backup

The probing interval, in seconds, while in the Backup state.
Accepted value is any integer from 15 to 60. The default value is 15.

probe-interval-master

The probing interval, in seconds, while in the Master state.
Accepted value is any integer from 15 to 60. The default value is 15.

probe-response-timeout

Number of seconds to wait for a probe response.
Accepted value is any integer from 5 to 15. The default value is 5.

probe-priority-modifier

The value used to increment the VRRP priority when probes through the probe-gateway fails, or decrement when probes through our default route fail.
Accepted value is any integer from 1 to 100. The default value is 10.

probe-failure-threshold

Number of consecutive failed probes allowed before modifying priority
Accepted value is any integer from 1 to 60. The default value is 5.

probe-success-threshold

Number of consecutive successful probes allowed before returning to original priority
Accepted value is any integer from 1 to 60. The default value is 5.

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wan

Configures a Wide Area Network (WAN). The physical communications interface for the WAN can be an Ethernet or cellular interface that connects to a remote network, such as the internet.

Syntax

```
wan <1 - 10> <parameter> <value>
```

Parameters

interface

The physical interface to use for the WAN.

Accepted values can be one of none, eth1, eth2, eth3, eth4, cellular1-sim1, cellular1-sim2, cellular2-sim1, cellular2-sim2, wifi-client1 or wifi-client2. The default value is none.

nat

Enables Network Address Translation (NAT) for outgoing packets on the WAN. NAT is a mechanism that allows sending packets from a private network (for example, 10.x.x.x or 192.168.x.x) over a public network. The device changes the source IP address of the packet to be the address for the WAN interface, which is a public IP address. This allows the device on the public network to know how to send responses.

Value is either on or off. The default value is on.

timeout

The time, in seconds, to wait for the physical interface to connect and to receive a probe response before failing over to a lower priority interface.

Accepted value is any integer from 10 to 3600. The default value is 180.

probe-host

The IPv4 or fully qualified domain name (FQDN) of the address of the device itself. The WAN failover feature sends probe packets over the WAN to the IP address of this device.

Value should be a fully qualified domain name.

probe-timeout

Timeout, in seconds, to wait for a response to a probe. The value for this parameter must be smaller than the probe-interval and timeout parameter values or the configuration is considered invalid, and an error message is written to the system log.

Accepted value is any integer from 1 to 60. The default value is 5.

probe-interval

Interval, in seconds, between sending probe packets. The value for probe-interval must be larger than the probe-timeout value. If not, the WAN failover configuration is considered invalid, and an error message is written to the system log.

Accepted value is any integer from 2 to 3600. The default value is 60.

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probe-size

Size of probe packets sent to detect WAN failures.

Accepted value is any integer from 64 to 1500. The default value is 64.

activate-after

The time, in seconds, that the primary interface needs to be up before switching back to it as the active interface. If probing is active, no probes are permitted to be lost during this period. Otherwise, the timer is restarted.

Accepted value is any integer from 0 to 3600. The default value is 0.

retry-after

The time, in seconds, to wait before retrying this interface after failing over to a lower priority one. Use a large retry timeout when both interfaces are cellular interfaces.

Accepted value is any integer from 10 to 3600. The default value is 180.

dhcp

Enables or disables the DHCP client. The DHCP client is used to automatically get an IP address for the interface from a DHCP server.

Value is either on or off. The default value is on.

ip-address

The IPv4 address to be statically assigned to this WAN if DHCP is disabled.

Value should be an IPv4 address.

mask

The IPv4 mask to be statically assigned to this WAN if DHCP is disabled.

Value should be an IPv4 address. The default value is 255.255.255.0.

gateway

The gateway to use for the default route.

Value should be an IPv4 address.

dns1

The IPv4 address of the preferred DNS server. This value overrides the value assigned by DHCP.

Value should be an IPv4 address.

dns2

The IPv4 address of the alternate DNS server used if the device cannot communicate with the preferred server.

Value should be an IPv4 address.

allow-ssh-access

Allow SSH access on this WAN interface. Custom firewall rules may affect the behavior of this parameter.

Value is either on or off. The default value is off.

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wan

allow-https-access

Allow HTTPS access on this WAN interface. Custom firewall rules may affect the behavior of this parameter.

Value is either on or off. The default value is off.

state

Enables or disables a WAN interface

Value is either on or off. The default value is on.

ipv6-state

Enables or disables IPv6 support on this WAN interface

Value is either on or off. The default value is off.

ipv6-prefix-length

Set the length, in bits, of the IPv6 address prefix to request from the upstream router for this WAN. The size of the prefix determines how many LANs can support IPv6. Request a prefix length of 60 bits or less to support up to 16 LANs.

Accepted value is any integer from 48 to 64. The default value is 60.

qos

Enables or disables Quality of Service (QoS) on this WAN interface

Value is either on or off. The default value is off.

bandwidth-upstream

Sets the upstream bandwidth of the WAN interface in kbps.

Accepted value is any integer from 1 to 1000000. The default value is 1000000.

probe-fail-reset-module

The time in seconds to wait for a response to probes before resetting the cellular module. This is only done for cellular modules using a single SIM. Set to 0 to disable, minimum timeout is 300 seconds

Accepted value is any integer from 0 to 86400. The default value is 0.

probe-fail-reset-router

The time in seconds to wait for a response to probes before resetting the router. This is only done for cellular modules using a single SIM. Set to 0 to disable, minimum timeout is 300 seconds.

Accepted value is any integer from 0 to 86400. The default value is 0.

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web-filter

Configures the web filtering service to be used for all WAN traffic. Use of a web filtering service like Cisco Umbrella may provide content filtering, security, privacy, and monitoring features. If web filtering is enabled, all DNS requests passing through the router are redirected to the selected web filtering service, ensuring that computers on the LAN cannot bypass the web filter.

Syntax

```
web-filter <parameter> <value>
```

Parameters

state

Enables or disables the use of a web filtering service for all WAN traffic.

Value is either on or off. The default value is off.

service

Selects the web filtering service that the router uses for all WAN traffic.

Accepted values can be one of umbrella. The default value is umbrella.

token

The customer-specific API token for the Cisco Umbrella service. This token can be found on the Cisco Umbrella dashboard under the Network Devices area. The router uses this token to automatically obtain a device ID using the Network Device Registration API.

Accepted value is any string up to 255 characters.

dns1

Use the specified DNS server instead the default primary DNS server for the web filtering service. This value should only be set if the web filtering service changes the IP addresses of their DNS servers before Digi can release a software update that includes the new IP addresses.

Value should be an IPv4 address.

dns2

Use the specified DNS server instead the default secondary DNS server for the web filtering service. This value should only be set if the web filtering service changes the IP addresses of their DNS servers before Digi can release a software update that includes the new IP addresses.

Value should be an IPv4 address.

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wifi-ap

Configures a Wi-Fi Access Point interface.

Syntax

```
wifi-ap <1 - 8> <parameter> <value>
```

Parameters

description

A descriptive name for the Wi-Fi Access Point interface.

Accepted value is any string up to 255 characters.

ssid

Service Set Identifier (SSID) for the Wi-Fi Access Point interface. You can configure the SSID to use the device's serial number by including '%s' in the SSID. For example, an 'ssid' parameter value of 'WR64_%s' resolves to 'WR64_WR123456.'

Accepted value is any string up to 32 characters.

security

Security for the Wi-Fi Access Point interface.

Accepted values can be one of none, wpa2-personal, wpa-wpa2-personal, wpa2-enterprise or wpa-wpa2-enterprise. The default value is wpa2-personal.

password

Password for the Wi-Fi Access Point interface. The password must be 8-63 ASCII or 64 hexadecimal characters

Accepted value is any string up to 255 characters.

broadcast-ssid

Enables or disables broadcasting the SSID in beacon packets. Disabling the SSID prevents clients from easily detecting the presence of this access point.

Accepted values can be one of off or on. The default value is on.

isolate-clients

Enables or disables Wi-Fi client isolation, which prevents clients connected to the Wi-Fi access point from communicating with each other.

Accepted values can be one of off or on. The default value is on.

isolate-ap

Enables or disables clients on a Wi-Fi access point from communicating with clients on other Access Points.

Accepted values can be one of off or on. The default value is on.

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radius-server

The IP address for the RADIUS server for WPA/WPA2 Enterprise.
Value should be an IPv4 address.

radius-server-port

The port for the RADIUS server.
Accepted value is any integer from 1 to 65535. The default value is 1812.

radius-password

The password for the RADIUS server.
Accepted value is any string up to 255 characters.

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wifi-client

Configures Wi-Fi clients

Syntax

```
wifi-client <1 - 2> <parameter> <value>
```

Parameters

rssi-threshold

RSSI threshold. Setting this value to 0 will disable scanning while connected.

Accepted value is any integer from -100 to 0. The default value is -70.

below-rssi-interval

How often in seconds the client will scan for a better access point to connect to when below the RSSI threshold. Setting this value to 0 will disable scanning while connected.

Accepted value is any integer from 0 to 2147483647. The default value is 30.

above-rssi-interval

How often in seconds the client will scan for a better access point to connect to when above the RSSI threshold. Setting this value to 0 will disable scanning while connected.

Accepted value is any integer from 0 to 2147483647. The default value is 3600.

connect-interval

How often in seconds the client will scan for an access point to connect to when not connected.

Accepted value is any integer from 1 to 2147483647. The default value is 30.

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wifi-client-network

Configures a Wi-Fi network to join.

Syntax

```
wifi-client-network <1 - 16> <parameter> <value>
```

Parameters

ssid

Service Set Identifier (SSID) for the Wi-Fi network to join.

Accepted value is any string up to 32 characters.

security

Security for the Wi-Fi network.

Accepted values can be one of none, wpa2-personal, wpa-wpa2-personal, wpa2-enterprise or wpa-wpa2-enterprise. The default value is none.

password

Password for the Wi-Fi network. Used for authentication when using wpa-wpa2-personal or wpa2-personal security.

Accepted value is any string up to 255 characters.

enterprise-username

Username for the Wi-Fi network. Used for authentication when using wpa-wpa2-enterprise or wpa2-enterprise security.

Accepted value is any string up to 64 characters.

enterprise-password

Password for the Wi-Fi network. Used for authentication when using wpa-wpa2-enterprise or wpa2-enterprise security.

Accepted value is any string up to 255 characters.

wifi-client

Wi-Fi client that should join this network

Accepted values can be one of none, 1 or 2. The default value is none.

hidden-network

Wi-Fi network SSID is hidden (not broadcast). Enabling this will add latency to scanning.

Value is either on or off. The default value is off.

enterprise-mode

The type of enterprise authentication mode, either tls or peap-ttls

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Accepted values can be one of peap-ttls or tls. The default value is peap-ttls.

enterprise-cert

Client Certificate file name

Accepted value is any string up to 255 characters.

enterprise-ca

CA Certificate file name

Accepted value is any string up to 255 characters.

enterprise-key

The enterprise private key file. When a PKCS#12/PFX file is used, enterprise-ca should not be specified, because both the enterprise private key and enterprise certificate will be read from PKCS#12 file

Accepted value is any string up to 255 characters.

enterprise-key-password

Password for the enterprise private key file

Accepted value is any string up to 255 characters.

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wifi-module

Configures global settings for Wi-Fi modules.

Syntax

```
wifi-module <1 - 2> <parameter> <value>
```

Parameters

description

A descriptive name for the Wi-Fi module.

Accepted value is any string up to 255 characters.

mode

The operating mode of the Wi-Fi module.

Accepted values can be one of access-point or client. The default value is access-point.

band

Wi-Fi band in 2.4 GHz or 5 GHz.

Accepted values can be one of 2dot4g or 5g. The default value is 5g.

protocol

Wi-Fi protocol.

Accepted values can be one of bgn, a, an or anac. The default value is anac.

txpower

The TX power to use for Wi-Fi module by percentage.

Accepted value is any integer from 1 to 100. The default value is 100.

channel

The channel to use for Wi-Fi module.

Accepted values can be one of auto, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 132, 136 or 140. The default value is auto.

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wifi-scanner

Configures Wi-Fi Scanning

Syntax

```
wifi-scanner <1 - 2> <parameter> <value>
```

Parameters

channels

Comma-separated channel list to scan, or all.
Accepted value is any string up to 255 characters. The default value is all.

hop-frequency

Channel Hop Frequency in milliseconds.
Accepted value is any integer from 50 to 10000. The default value is 150.

update-interval

Interval in seconds to update output.
Accepted value is any integer from 1 to 3600. The default value is 5.

port

SSH port to read data on.
Accepted value is any integer from 1 to 65535. The default value is 3101.

state

Enables or disables Wi-Fi Scanner
Value is either on or off. The default value is off.

secondary-antenna

Use secondary antenna
Value is either on or off. The default value is on.

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xauth-user

Configures users for IPsec Xauth authentication in the Server role.

Syntax

```
xauth-user <1 - 10> <parameter> <value>
```

Parameters

username

Username for IPsec XAuth authentication
Accepted value is any string up to 128 characters.

password

Password for IPsec XAuth authentication
Accepted value is any string up to 255 characters.

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Using firewall and firewall6 commands

Using the firewall command

The Digi WR firewall is a full stateful firewall that controls which packets are allowed into and out of the device. Firewalls can filter packets based on the IP address, protocol, TCP ports, and UDP ports.

You can either:

- Allow Digi WR to automatically manage firewall rules using built-in features, such as port forwarding and IP filters.

  or

- Directly manage firewalls using the firewall and firewall6 commands.
- Directly manage firewalls using the firewall command.

This section describes how to manage firewalls using the firewall and firewall6 commands. Use the firewall command to manage IPv4 traffic, and use the firewall6 command to manage IPv6 traffic. Both firewall commands function in the same manner except the firewall6 command does not manage a **nat** table.

For details on how to manage firewalls using built-in Digi WR features, see Understanding system firewall rules.

Digi WR firewalls based on iptables firewall

The Digi WR firewall and firewall6 commands are based on the open-source firewall named **iptables**. Both commands use the same syntax as **iptables**, except the rules start with the keyword **firewall** or **firewall6** instead of **iptables**. The firewall syntax is case-sensitive.

For more information on configuring the firewall, see www.netfilter.org/documentation and IptablesHowTo.

Note Digi WR automatically manages some **iptables** rules, referred to as **system firewall rules**. Some system firewall rules are added when the device starts; other system firewall rules are added and removed when built-in features are configured. For example, when you use port forwarding, the Digi WR adds system firewall rules based on your port forwarding rules. Take care when directly modifying firewall rules using firewall and firewall6 commands. The system may reapply unmodified rules when you use certain commands, the system restarts, or other configuration changes are made. See Understanding system firewall rules for details.

Tables and chains in firewall rules

Depending on their function, firewall rules are organized into tables and chains. The tables define the function of the rule. The chains define when the rule is applied in relation to when a packet is being received, sent or forwarded.

Tables

Firewall tables are as follows:

filter
The filter table filters packets being sent, received, and forwarded by the device. This is the default table if one is not specified in the firewall rule. The filter table supports these chains: **INPUT**, **OUTPUT**, **FORWARD**.

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nat
The nat table modifies the source and destination IP addresses and TCP and UDP ports so that traffic can be sent between private IP networks such as a company network and public IP networks such as the Internet. The nat table supports these chains: **OUTPUT**, **PREROUTING**, **POSTROUTING**.

mangle
The mangle table modifies a packet being sent, received, or forwarded by the device. The mangle table supports these chains: **INPUT**, **OUTPUT**, **FORWARD**, **PREROUTING**, **POSTROUTING**.

raw
The raw table marks packets for special treatment. When a packet is received, the raw table is processed first. The raw table supports these chains: **INPUT**, **OUTPUT**, **FORWARD**, **PREROUTING**, **POSTROUTING**.

Chains

By default, there are multiple chains for directing packets:

INPUT
For packets destined for the device.

OUTPUT
For packets generated by the device.

FORWARD
For packets forwarded by the device.

PREROUTING
For packets before the device has decided to forward the packet, or if the packet has been defined for the device.

POSTROUTING
For packets that have been forwarded by the device, or if the packet has been generated by the device.

tlr_port_forward
Used by the nat table. Contains rules associated with port forwarding. Reserved for use by the Digi WR system only. Do not modify these rules.

tlr_wan_input
Used by the filter table. Contains rules associated with WAN configuration. Reserved for use by the Digi WR system only. Do not modify these rules.

tlr_ip_filter_input
Used by the filter table. Contains rules associated with ip-filter for data destined to the device. Reserved for use by the Digi WR system only. Do not modify these rules.

tlr_ip_filter_output
Used by the filter table. Contains rules associated with ip-filter for data originating from the device. Reserved for use by the Digi WR system only. Do not modify these rules.

tlr_ip_filter_forward
Used by the filter table. Contains rules associated with ip-filter for data routing through the device. Reserved for use by the Digi WR system only. Do not modify these rules.

tlr_ip_priority_output
Used by the filter table. Contains rules associated with services on the device that require outgoing access for correct operation. Reserved for use by the Digi WR system only. Do not modify these rules.

Policy rules

A policy rule defines the default action for a chain; for example **ACCEPT** or **DROP**.

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For example, the policy could be to drop all inbound packets that do not explicitly match any of the chain rules.

Using a policy rule is better than simply defining a normal rule that matches all packets. Policy rules are the last rule tested for a chain, while a normal rule could appear anywhere in the list of rules, depending how rules were added.

Default firewall configuration

To provide a secure device out-of-the-box, the router's firewall is configured for the following default behavior:

- Block all traffic received on the physical interfaces for WANs (**eth1**, **cellular1**, **cellular2**) except for traffic for established connections or related data.
- Allow all traffic from the physical interfaces for LANs to be forwarded by the device.
- Only allow ICMP, SSH, HTTP, HTTPS, DNS and DHCP traffic to be received on the physical interfaces for LANs.
- All other traffic is blocked.

The default settings allows devices connected on the physical interfaces for LANs to make connections over the physical interfaces for WANs, but remote devices cannot make a connection to the device or devices connected on the physical interfaces for LANs.

This means that by default it is not possible to make an HTTPS or SSH connection via a WAN. To allow HTTPS or SSH connections over a WAN, see Allow HTTPS access on a WAN and Allow SSH access on a WAN to change the default firewall behavior.

Example firewall rules

```
Filter Table
 ------------
 Chain INPUT (policy DROP xx packets, xxx bytes)
 num   pkts bytes target     prot opt in     out     source               destination
[....snip....]
 5        0     0 ACCEPT     icmp --  lan+   any     anywhere             anywhere             /* (autogenerated)
lan */
 6        0     0 ACCEPT     tcp  --  lan+   any     anywhere             anywhere             tcp dpt:22 /*
(autogenerated) lan */
 7        0     0 ACCEPT     tcp  --  lan+   any     anywhere             anywhere             tcp dpt:http /*
(autogenerated) lan */
 8        0     0 ACCEPT     tcp  --  lan+   any     anywhere             anywhere             tcp dpt:443 /*
(autogenerated) lan */
 9        0     0 ACCEPT     udp  --  lan+   any     anywhere             anywhere             udp dpt:67 /*
(autogenerated) lan */
 10       0     0 ACCEPT     udp  --  lan+   any     anywhere             anywhere             udp dpt:53 /*
(autogenerated) lan */
[....snip....]
```


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Allow SSH access on a WAN

To allow SSH access on a WAN interface:

1. Open the command-line interface, either from a command prompt or the web interface **System > Device Console** option.
2. Use the wan command **allow-ssh-access** option to toggle SSH access on a WAN. For example, to allow SSH access on WAN 1:

```
digi.router> wan 1 allow-ssh-access on
```

3. Save the configuration.

```
digi.router> save config
```

Allow SSH access for only a specific source IP address

To allow SSH access for only a specific IP address:

1. Open the command-line interface, either from a command prompt or the web interface **System > Device Console** option**.**
2. Use the ip-filter command to allow incoming connections from hosts on the 10.20 network to SSH (port 22). For example, assuming port **22** is the SSH port, enter commands similar to the following:

```
digi.router> ip-filter 1 description Allow WAN SSH only from 10.20 network
digi.router> ip-filter 1 action accept
digi.router> ip-filter 1 src any-wan
digi.router> ip-filter 1 src-ip-address 10.20.0.0/16
digi.router> ip-filter 1 dst-ip-port 22
digi.router> ip-filter 1 state on
```

3. Use the wan command **allow-ssh-access** option to prohibit SSH access on a WAN. For example, to turn off SSH access on WAN 1:



WARNING! Before turning off ssh access for a WAN, make sure your device can accept traffic other than ssh traffic. Otherwise, when you turn off ssh access, you may remove your ability to access the device.

```
digi.router> wan 1 allow-ssh-access off
```

4. Save the configuration.

```
digi.router> save config
```


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Allow HTTPS access on a WAN

To allow HTTPS access on a WAN interface:

1. Open the command-line interface, either from a command prompt or the web interface **System > Device Console** option.
2. Use the wan command **allow-https-access** option to toggle HTTPS access on a WAN. For example, to allow HTTPS access on **WAN 1**:

```
digi.router> wan 1 allow-https-access on
```

3. Save the configuration.

```
digi.router> save config
```

Allow HTTPS access on a WAN from only a specific source IP address

To allow HTTPS access on a WAN interface:

1. Open the command-line interface, either from a command prompt or the web interface **System > Device Console** option.
2. Use the ip-filter command to allow incoming connections from hosts on the 10.20 network to HTTPS (port 443). For example, assuming port **443** is the HTTPS port, enter commands similar to the following:

```
digi.router> ip-filter 1 description Allow WAN HTTPS only from 10.20
network
digi.router> ip-filter 1 action accept
digi.router> ip-filter 1 src any-wan
digi.router> ip-filter 1 src-ip-address 10.20.0.0/16
digi.router> ip-filter 1 dst-ip-port 443
digi.router> ip-filter 1 state on
```

3. Use the wan command **allow-https-access** option to prohibit HTTPS access on a WAN. For example:

```
digi.router> wan 1 allow-https-access off
```

4. Save the configuration.

```
digi.router> save config
```

Add a firewall rule

Note Take care when inserting or updating rules. The number of rules and the position of system rules may change when you configure some Digi WR components. See Understanding system firewall rules for details.

Add a rule to the bottom of the firewall

To add a rule to the bottom of the firewall, use the firewall or firewall6 command **–A** option, using the following syntax. The command syntax is case-sensitive.

```
firewall [-t table] -A <chain> <rule>
```


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If you do not specify a table (**-t**), the default table is the **filter** table.

For example, to append a rule to the bottom of the **filter** table:

```
digi.router> firewall -A INPUT -i lan1 -p icmp --icmp-type echo-request -j DROP
digi.router>
```

The show firewall output for the **filter** table created by the above command:

```
digi.router> show firewall filter

Filter Table
------------
Chain INPUT (policy DROP 4 packets, 256 bytes)
num   pkts bytes target     prot opt in     out     source               destination
1        3   152 DROP       tcp  --  any    any     anywhere             anywhere             tcp dpt:22
2        0     0 DROP       icmp --  lan1   any     anywhere             anywhere             icmp echo-request

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source               destination

Chain OUTPUT (policy ACCEPT 4 packets, 256 bytes)
num   pkts bytes target     prot opt in     out     source               destination

digi.router>
```

Insert a rule at any position of the firewall

To insert rules into the firewall at any position, the firewall or firewall6 command **–I** option, using the following syntax:

```
firewall [-t table] -I <chain> <position> <rule>
```

For example, to insert a rule before the second rule, specify a position of **2**.

```
digi.router>

digi.router> show firewall filter

Filter Table
------------
Chain INPUT (policy DROP 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source               destination
1        3   152 DROP       tcp  --  any    any     anywhere             anywhere             tcp dpt:22
2       74  4440 DROP       icmp --  lan1   any     anywhere             anywhere             icmp echo-request

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source               destination

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source               destination

digi.router>
digi.router> firewall -I INPUT 2 -i cellular1 -p udp --dport 7 -j ACCEPT
digi.router>
digi.router> show firewall filter

Filter Table
------------
Chain INPUT (policy DROP 4 packets, 256 bytes)
num   pkts bytes target     prot opt in     out     source               destination
1        3   152 DROP       tcp  --  any    any     anywhere             anywhere             tcp dpt:22
2        0     0 ACCEPT     udp  --  cellular1 any  anywhere             anywhere             udp dpt:7
3       74  4440 DROP       icmp --  lan1   any     anywhere             anywhere             icmp echo-request

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source               destination

Chain OUTPUT (policy ACCEPT 4 packets, 256 bytes)
num   pkts bytes target     prot opt in     out     source               destination

digi.router>
```

For more information on configuring the firewall, see www.netfilter.org/documentation and IptablesHowTo.

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Update a firewall rule

Note Take care when inserting or updating rules. The number of rules and the position of system rules may change when you configure some Digi WR components. See Understanding system firewall rules for details.

To update a firewall rule, use the firewall or firewall6 command **–R** option, using the following syntax:

```
firewall [-t table] -R <chain> <position> <rule>
```

For example, to update the second rule, specify a position of **2**.

```
digi.router> firewall -R INPUT 2 -i cellular1 -p udp --dport 123 -j ACCEPT
```

The show firewall output for the filter table created by the above command looks like this:

```
digi.router> show firewall filter

Filter Table
------------
Chain INPUT (policy DROP 2 packets, 130 bytes)
num   pkts bytes target     prot opt in     out     source               destination
1        3   152 DROP       tcp  --  any    any     anywhere             anywhere            tcp dpt:22
2        0     0 ACCEPT     udp  --  cellular1 any    anywhere             anywhere            udp dpt:123
3       74  4440 DROP       icmp --  lan1   any     anywhere             anywhere            icmp echo-request

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source               destination

Chain OUTPUT (policy ACCEPT 2 packets, 130 bytes)
num   pkts bytes target     prot opt in     out     source               destination

digi.router>
```

Delete a firewall rule

Note Take care when inserting or updating rules. The number of rules and the position of system rules may change when you configure some Digi WR components. See Understanding system firewall rules for details.

To delete a firewall rule, use the firewall or firewall6 command **–D** option. You can delete a single firewall rule or all firewall rules.

Delete a single firewall rule

For example, suppose the following firewall rule exists to block incoming SSH traffic over the **cellular1** interface. The firewall rule is displayed here through the output from a show config command:

```
[FIREWALL]
*filter
-A INPUT -i cellular1 -p tcp -m tcp --dport 22 -j DROP
COMMIT
[FIREWALL_END]
```

The command to delete this firewall rule is:

```
firewall -D INPUT -i cellular1 -p tcp -m tcp --dport 22 -j DROP
```


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Delete all firewall rules

To remove all firewall rules, use the firewall or firewall6 command **-F** option. If you do not specify a table, all the rules in the filter table are deleted.

```
firewall -F [-t <table>]
```



WARNING! Using **firewall -F -t nat** to clear entries in the NAT table removes entries that perform NAT operations on WAN interfaces. Clearing such entries could leave the device unreachable if you are remotely accessing it over a WAN interface.

Show firewall rules and counters

To display all firewall rules and counters, use the show firewall or show firewall6 command.

For example:

Display all firewall rules

```
digi.router> show firewall

 Filter Table
 ------------
 Chain INPUT (policy DROP 0 packets, 0 bytes)
 num   pkts bytes target     prot opt in     out     source          destination
 1        3   272 ACCEPT     all  --  eth+   any     anywhere        anywhere          state RELATED,ESTABLISHED
/* (autogenerated) wan */
 2        0     0 ACCEPT     all  --  cellular1 any     anywhere     anywhere          state RELATED,ESTABLISHED
/* (autogenerated) wan */
 3        0     0 ACCEPT     all  --  cellular2 any     anywhere     anywhere          state RELATED,ESTABLISHED
/* (autogenerated) wan */
 4       33  2412 tlr_wan_input  all  --  any    any     anywhere     anywhere          /* (autogenerated) wan */
 5        0     0 ACCEPT     icmp --  lan+   any     anywhere        anywhere          /* (autogenerated) lan */
 6        0     0 ACCEPT     tcp  --  lan+   any     anywhere        anywhere          tcp dpt:22 /*
(autogenerated) lan */
 7        0     0 ACCEPT     tcp  --  lan+   any     anywhere        anywhere          tcp dpt:http /*
(autogenerated) lan */
 8        0     0 ACCEPT     tcp  --  lan+   any     anywhere        anywhere          tcp dpt:443 /*
(autogenerated) lan */
 9        0     0 ACCEPT     udp  --  lan+   any     anywhere        anywhere          udp dpt:67 /*
(autogenerated) lan */
 10       0     0 ACCEPT     udp  --  lan+   any     anywhere        anywhere          udp dpt:53 /*
(autogenerated) lan */
 11      33  2412 ACCEPT     all  --  lo     any     anywhere        anywhere          /* (autogenerated) core */

 Chain FORWARD (policy DROP 0 packets, 0 bytes)
 num   pkts bytes target     prot opt in     out     source          destination
 1        0     0 REJECT     tcp  --  lan+   any     anywhere        anywhere  state INVALID /*
(autogenerated)core */ reject-with tcp-reset
 2        0     0 DROP       all  --  lan+   any     anywhere        anywhere          state INVALID /*
(autogenerated) core */
 3        0     0 TCPMSS     tcp  --  any    any     anywhere        anywhere          tcp flags:SYN,RST/SYN /*
(autogenerated) core */ TCPMSS clamp to PMTU
 4        0     0 ACCEPT     all  --  eth+   any     anywhere        anywhere          state RELATED,ESTABLISHED
/* (autogenerated) wan */
 5        0     0 ACCEPT     all  --  cellular1 any  anywhere        anywhere          state RELATED,ESTABLISHED
/* (autogenerated) wan */
 6        0     0 ACCEPT     all  --  cellular2 any  anywhere        anywhere          state RELATED,ESTABLISHED
/* (autogenerated) wan */
 7        0     0 ACCEPT     all  --  any    any     anywhere        anywhere          ctstate DNAT /*
(autogenerated) port-forward */
 8        0     0 ACCEPT     all  --  lan+   any     anywhere        anywhere          /* (autogenerated) lan */

 Chain OUTPUT (policy ACCEPT 8 packets, 576 bytes)
 num   pkts bytes target     prot opt in     out     source          destination

 Chain tlr_wan_input (1 references)
 num   pkts bytes target     prot opt in     out     source          destination


 Raw Table
 ---------
```


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```
Chain PREROUTING (policy ACCEPT 116 packets, 17802 bytes)
num   pkts bytes target     prot opt in     out     source          destination

Chain INPUT (policy ACCEPT 36 packets, 2684 bytes)
num   pkts bytes target     prot opt in     out     source          destination

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source          destination

Chain OUTPUT (policy ACCEPT 36 packets, 2620 bytes)
num   pkts bytes target     prot opt in     out     source          destination

Chain POSTROUTING (policy ACCEPT 36 packets, 2620 bytes)
num   pkts bytes target     prot opt in     out     source          destination


NAT Table
---------
Chain PREROUTING (policy ACCEPT 2 packets, 120 bytes)
num   pkts bytes target     prot opt in     out     source          destination
1       38 10641 tlr_port_forward  all  --  any    any     anywhere anywhere         /* (autogenerated) port-
forward */

Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source          destination

Chain OUTPUT (policy ACCEPT 1 packets, 72 bytes)
num   pkts bytes target     prot opt in     out     source          destination

Chain POSTROUTING (policy ACCEPT 1 packets, 72 bytes)
num   pkts bytes target     prot opt in     out         source      destination
1        3   208 MASQUERADE  all  --  any    eth1        anywhere    anywhere
2        0     0 MASQUERADE  all  --  any    cellular1   anywhere    anywhere
3        0     0 MASQUERADE  all  --  any    cellular2   anywhere    anywhere

Chain tlr_port_forward (1 references)
num   pkts bytes target     prot opt in     out     source          destination
```

Display a specific firewall table

To display individual firewall tables, specify the table name on the show firewall or show firewall6 command. In the command output, the policy for each chain is also displayed in brackets after the chain name. For example:

```
digi.router> show firewall filter

Filter Table
------------
Chain INPUT (policy ACCEPT 1732 packets, 117K bytes)
num   pkts bytes target     prot opt in     out     source          destination
1       16   960 DROP       tcp  --  cellular1 any  anywhere        anywhere            tcp dpt:22

Chain FORWARD (policy ACCEPT 788 packets, 82764 bytes)
num   pkts bytes target     prot opt in     out     source          destination

Chain OUTPUT (policy ACCEPT 1646 packets, 110K bytes)
num   pkts bytes target     prot opt in     out     source          destination

digi.router>
```

Display and clear firewall rule counters

The firewall keeps a counter for each rule that counts the number of packets and bytes that have been matched against the rule. This is a useful tool to determine if a rule is correctly detecting packets.

To clear the counters, use the **clear firewall** and **clear firewall6** commands.

```
digi.router> show firewall filter

Filter Table
------------
Chain INPUT (policy ACCEPT 1732 packets, 117K bytes)
num   pkts bytes target     prot opt in     out     source          destination
1        3   152 DROP       tcp  --  cellular1 any  anywhere        anywhere            tcp dpt:22
2       23  1380 DROP       icmp --  lan1   any     anywhere        anywhere            icmp echo-request
```


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```
Chain FORWARD (policy ACCEPT 788 packets, 82764 bytes)
num   pkts bytes target     prot opt in     out     source           destination

Chain OUTPUT (policy ACCEPT 1646 packets, 110K bytes)
num   pkts bytes target     prot opt in     out     source           destination

digi.router>
digi.router> clear firewall

Filter Table
------------
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source           destination
1        0     0 DROP       tcp  --  cellular1 any     anywhere       anywhere            tcp dpt:22
2        0     0 DROP       icmp --  lan1   any     anywhere         anywhere            icmp echo-request

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source           destination

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
num   pkts bytes target     prot opt in     out     source           destination

digi.router>
```


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Understanding system firewall rules

This section explains how Digi WR built-in components automatically create and apply system firewall rules transparently when you configure system components.

Who should read this section

Do this ...	If you
Skip this section	If you do not use the firewall or firewall6 commands or you use the commands only to create simple firewall rules that allow greater access to device features, skip this section.
Continue reading this section	If you use the firewall or firewall6 commands to create or manage firewall rules on your Digi WR device, read this section to understand how Digi WR components automatically create and manage system firewall rules and how all firewall rules—both system-generated and command-generated—are saved and applied.

What are system firewall rules?

System firewall rules are automatically created and managed when you configure various Digi WR components. For example, the WAN, LAN, and port-forward components create and manage system firewall rules when you configure the components, either from the web interface or the command line.

System firewall rules are applied when the Digi WR device starts and anytime you configure a Digi WR component that creates or modifies a system firewall rule.

Demonstration

For example, if you enter the following command to allow HTTPS access on WAN 1:

```
wan 1 allow-https-access on
```

Digi WR automatically creates a new system firewall rule in the **tlr_wan_input** section of the **iptables** chain. See Using firewall and firewall6 commands for more information about tables and chains.

The new rule might look like this:

```
Chain tlr_wan_input (1 references)
num   pkts bytes target   prot opt in     out   source     destination
1        0     0 ACCEPT   tcp  --  eth1   any   anywhere   anywhere     tcp dpt:443 /* (autogenerated) wan 1 */
```

The WAN firewall rule will be re-applied anytime the WAN configuration is changed from the web interface or the command line.

User priority chains



WARNING! Take extreme care when using user priority chain rules. If you implement user priority chain rules incorrectly, you can expose your device to security threats or disable remote access to the device.

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High priority user chains are named:

```
user_prio_<table>_<builtinchain>
```

For example:

```
user_prior_filter_input
```

Corresponds to high priority user rules for the built-in **filter** table, **INPUT** chain.

Each table in the firewall provides rule chains that can be used for critical, high priority rules. The rules in user priority chains take higher precedence than all built-in firewall rules or rules configured via normal system configuration and services.

Before you manually create firewall rules using custom user priority chains, Digi recommends you allow the system to automatically generate firewall rules using standard built-in chains and/or the ip-filter, port-forward and other CLI commands for firewall configuration.

Testing new firewall rules

When you create or modify firewall rules using the firewall or firewall6 commands, save the new rules using the **save config** command and then reboot the Digi WR device to test the new rules.

The **FIREWALL** section of the configuration file **config.da0** is saved based on **iptables** save support, and the **FIREWALL** section is executed after the system firewall rules.

Using the autorun command to force firewall rule precedence

If you have difficulty with the saved rule set or the order in which rules are executed, you can use the autorun command to work around these issues. Use an **autorun** command to apply a firewall rule after system startup and after all firewall rules have been applied.

For example, the following **autorun** command applies a DROP to all ICMP requests for the LAN after system startup and after all the firewall rules have been applied. Note the example rule is marked with the **donotsave** comment to prevent it from being saved to the **FIREWALL** section of the **config.da0** file.

```
autorun 1 command firewall -I INPUT 1 -i lan+ -p icmp -j DROP -m comment --comment (donotsave)
```

The result is that the autorun firewall rule is inserted before all of the user and system rules in the **INPUT** chain.

Demonstration

For example, enter the following command to configure the WAN to allow HTTPS connections:

```
wan 1 allow-https-access on
```

A user rule to drop HTTPS traffic on any Ethernet interface might look like this:

```
firewall -A INPUT -i eth+ -p tcp -m tcp --dport 443 -m comment --comment BLOCK-HTTPS-EXAMPLE -j DROP
```

And the result may not be as expected. HTTPS traffic to eth1 (on a device where eth1 is part of wan 1) will not be dropped. The reason can be demonstrated in the following snippet of lines from the show firewall command.

Input packets are processed by the **INPUT** chain in the filter table. When rule 4 is encountered, the system chain **tlr_wan_input** is processed, accepting packets destined for HTTPS (port 443). The appended rule 12 to drop HTTPS packages is never processed because the packet was already accepted due to the system rule created by **wan 1 allow-https-access on**.

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```
digi.router> show firewall

 Filter Table
 ------------
 Chain INPUT (policy DROP 8 packets, 2523 bytes)
 num  pkts bytes target        prot opt in    out  source    destination
...
 4     798 92581 tlr_wan_input all  --  any   any  anywhere  anywhere     /* (autogenerated) wan */
...
 12      0     0 DROP          tcp  --  eth+  any  anywhere  anywhere     tcp dpt:443 /* BLOCK-HTTPS-EXAMPLE */
...
 Chain tlr_wan_input (1 references)
 num  pkts bytes target        prot opt in    out  source    destination
 1       0     0 ACCEPT        tcp  --  eth1  any  anywhere  anywhere     tcp dpt:443 /* (autogenerated) wan 1 */
...
```

System chains

The system creates **iptables** chains named with the prefix **tlr_**.

- Do not modify rules in **tlr** chains using the firewall or firewall6 commands. Changes will be discarded.
- Do not modify rules jumping to or from **tlr** chains. Changes will be discarded or negatively affect the system configuration.

Migration of rules from older firmware

Prior to Digi WR **1.4.0.0** firmware, all firewall rules (both user and system) were saved in the **FIREWALL** section of the configuration file **config.da0**. The rules were restored as one unit during startup as part of system initialization.

With Digi WR firmware **1.4.0.0** and later, any firewall rules recognized as system firewall rules are migrated out of the configuration file and are now managed by the system. The system firewall rules run each time the device is started or when configuration changes result in new or modified system firewall rules.

Future releases

System firewall rules will continue to change and be restructured as subsequent versions of the Digi WR firmware are released. If you create or modify firewall rules using the firewall command, be aware of the relationship between system-managed rules and the rules you create.

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