ExtremeCloud IQ User Guide

Version 24.4.0

9038923-00 Rev AB
June 2024

Legal Notice

Extreme Networks, Inc. reserves the right to make changes in specifications and other information contained in this document and its website without prior notice. The reader should in all cases consult representatives of Extreme Networks to determine whether any such changes have been made.

The hardware, firmware, software or any specifications described or referred to in this document are subject to change without notice.

Trademarks

Extreme Networks and the Extreme Networks logo are trademarks or registered trademarks of Extreme Networks, Inc. in the United States and/or other countries.

All other names (including any product names) mentioned in this document are the property of their respective owners and may be trademarks or registered trademarks of their respective companies/owners.

For additional information on Extreme Networks trademarks, see: https://www.extremenetworks.com/about-extreme-networks/company/legal/trademarks

Open Source Declarations

Some software files have been licensed under certain open source or third-party licenses. End-user license agreements and open source declarations can be found at: https://www.extremenetworks.com/support/policies/open-source-declaration/

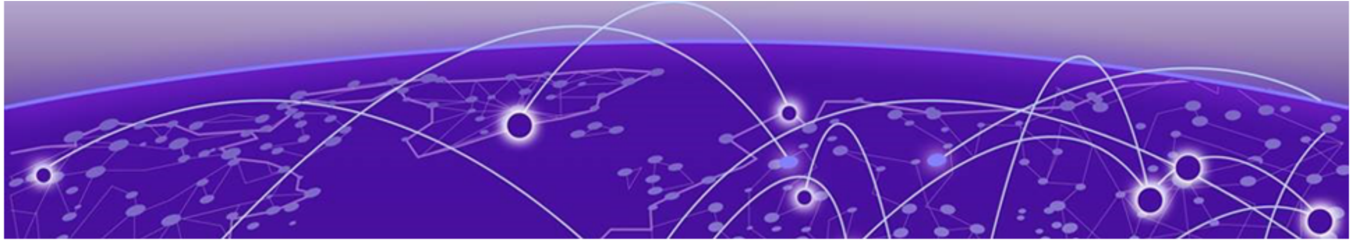
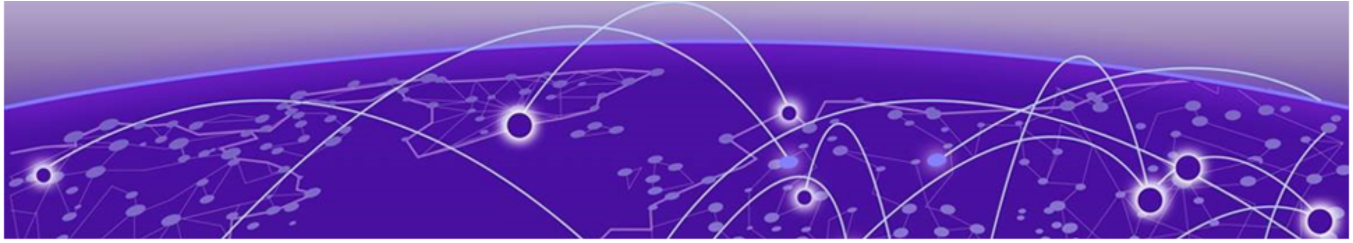


Table of Contents



Preface

Read the following topics to learn about:

- The meanings of text formats used in this document.
- Where you can find additional information and help.
- How to reach us with questions and comments.

Text Conventions

Unless otherwise noted, information in this document applies to all supported environments for the products in question. Exceptions, like command keywords associated with a specific software version, are identified in the text.

When a feature, function, or operation pertains to a specific hardware product, the product name is used. When features, functions, and operations are the same across an entire product family, such as Extreme Networks switches or SLX routers, the product is referred to as *the switch* or *the router*.

Table 1: Notes and warnings

Icon	Notice type	Alerts you to...
💡	Tip	Helpful tips and notices for using the product
📝	Note	Useful information or instructions
➡	Important	Important features or instructions
⚠	Caution	Risk of personal injury, system damage, or loss of data
⚠	Warning	Risk of severe personal injury

Table 2: Text

Convention	Description
`screen displays`	This typeface indicates command syntax, or represents information as it is displayed on the screen.
The words *enter* and *type*	When you see the word *enter* in this guide, you must type something, and then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says *type*.
Key names	Key names are written in boldface, for example **Ctrl** or **Esc**. If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: Press **Ctrl**+**Alt**+**Del**
Words in italicized type	Italics emphasize a point or denote new terms at the place where they are defined in the text. Italics are also used when referring to publication titles.
NEW!	New information. In a PDF, this is searchable text.

Table 3: Command syntax

Convention	Description
bold text	Bold text indicates command names, keywords, and command options.
italic text	Italic text indicates variable content.
[ ]	Syntax components displayed within square brackets are optional. Default responses to system prompts are enclosed in square brackets.
{ **x** | **y** | **z** }	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options.
x | **y**	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, such as passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, *member*[*member*...].
\	In command examples, the backslash indicates a “soft” line break. When a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Documentation and Training

Find Extreme Networks product information at the following locations:

Current Product Documentation
Release Notes
Hardware and Software Compatibility for Extreme Networks products
Extreme Optics Compatibility
Other Resources such as articles, white papers, and case studies

Open Source Declarations

Some software files have been licensed under certain open source licenses. Information is available on the Open Source Declaration page.

Training

Extreme Networks offers product training courses, both online and in person, as well as specialized certifications. For details, visit the Extreme Networks Training page.

Help and Support

If you require assistance, contact Extreme Networks using one of the following methods:

Extreme Portal

Search the GTAC (Global Technical Assistance Center) knowledge base; manage support cases and service contracts; download software; and obtain product licensing, training, and certifications.

The Hub

A forum for Extreme Networks customers to connect with one another, answer questions, and share ideas and feedback. This community is monitored by Extreme Networks employees, but is not intended to replace specific guidance from GTAC.

Call GTAC

For immediate support: (800) 998 2408 (toll-free in U.S. and Canada) or 1 (408) 579 2800. For the support phone number in your country, visit www.extremenetworks.com/support/contact.

Before contacting Extreme Networks for technical support, have the following information ready:

- Your Extreme Networks service contract number, or serial numbers for all involved Extreme Networks products
- A description of the failure
- A description of any actions already taken to resolve the problem
- A description of your network environment (such as layout, cable type, other relevant environmental information)
- Network load at the time of trouble (if known)
- The device history (for example, if you have returned the device before, or if this is a recurring problem)
- Any related RMA (Return Material Authorization) numbers

Subscribe to Product Announcements

You can subscribe to email notifications for product and software release announcements, Field Notices, and Vulnerability Notices.

1. Go to The Hub.
2. In the list of categories, expand the **Product Announcements** list.
3. Select a product for which you would like to receive notifications.
4. Select **Subscribe**.
5. To select additional products, return to the **Product Announcements** list and repeat steps 3 and 4.

You can modify your product selections or unsubscribe at any time.

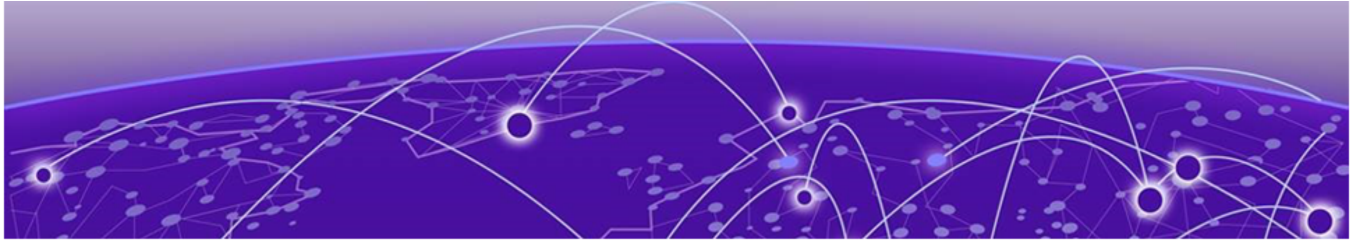
Send Feedback

The User Enablement team at Extreme Networks has made every effort to ensure that this document is accurate, complete, and easy to use. We strive to improve our documentation to help you in your work, so we want to hear from you. We welcome all feedback, but we especially want to know about:

- Content errors, or confusing or conflicting information.
- Improvements that would help you find relevant information.
- Broken links or usability issues.

To send feedback, email us at documentation@extremenetworks.com.

Provide as much detail as possible including the publication title, topic heading, and page number (if applicable), along with your comments and suggestions for improvement.



Release Notes

Consult the Release Notes for details about changes in the current release of ExtremeCloud IQ.

Welcome to ExtremeCloud IQ

ExtremeCloud IQ is an industry-leading approach to cloud-driven networking, designed to take full advantage of the Extreme Networks end-to-end networking solutions.

ExtremeCloud IQ offers the following:

- Unified, full-stack management of access points, switches, and SD-WAN
- Innovative ML technologies to analyze and interpret millions of network and user data points from the edge to the data center
- Network automation and intelligence to streamline operations.

For more information, consult the ExtremeCloud IQ documentation.

Related Topics

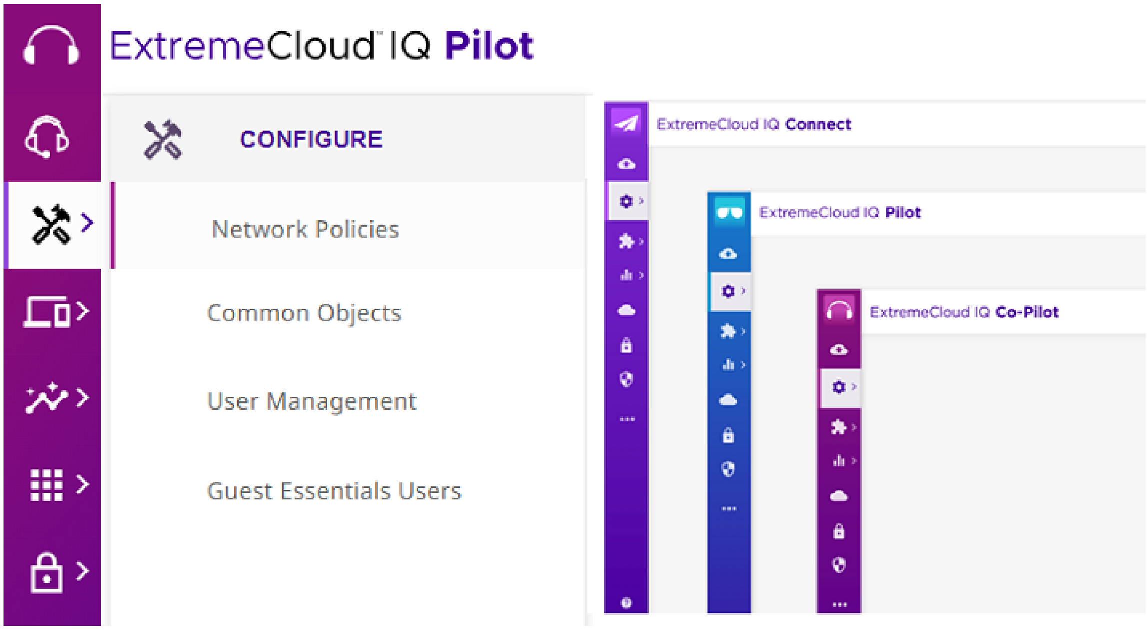
Onboarding on page 18

Navigate ExtremeCloud IQ

Log in to ExtremeCloud IQ.

After you log in, ExtremeCloud IQ displays the **Manage** > **Devices** page.

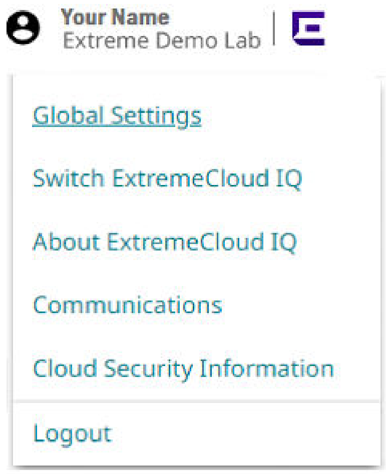
1. Use the left-hand navigation bar to select one of the tabs, and then make a selection from the navigation drawer.



Note

The color of the navigation bar changes color, depending on the license tier level.

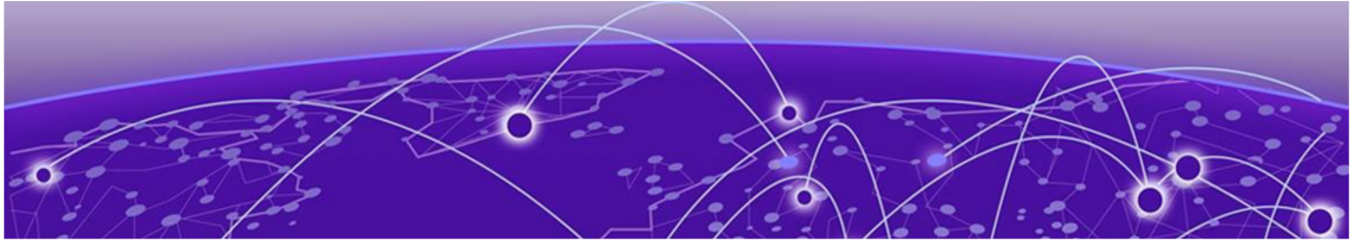
2. Mouse over 👤 to open the ExtremeCloud IQ menu and select a link.



To do this	Select
Configure Global Settings. For more information, see About Global Settings on page 32.	**Global Settings**
Change the ExtremeCloud IQ account that you are managing. This option is available only if you have access to multiple accounts.	**Switch ExtremeCloud IQ**
Learn about ExtremeCloud IQ.	**About ExtremeCloud IQ**
Check for communications about ExtremeCloud IQ.	**Communications**
Read about Cloud Security.	**Cloud Security Information**
Log out of ExtremeCloud IQ.	**Logout**

Related Topics

About Global Settings on page 32



Onboarding

Use Onboarding to set up a basic network structure for your interactions with ExtremeCloud IQ. Then use the following tabs in the left-hand navigation space to navigate ExtremeCloud IQ:

- **Administration**: Define Global Settings for ExtremeCloud IQ.
- **Configure**: Create advanced network structures when necessary. Configure users, network policies, and common objects.
- **Manage**: View user or device status, customize device configurations at the device level, and assign devices to existing locations.
- **ML Insights**: Monitor your network on a daily basis.

Add Devices Overview

There are two ways to onboard real or simulated devices:

- Quick Add Devices is a simplified way to add devices to your network. If you choose to manage your devices directly from the cloud, you can onboard real or simulated devices to your network. You must use an existing location. When you create simulated devices with this method, you can also create Digital Twin devices. Create simulated devices to help you prepare your network for real devices. You can create up to 20 Digital Twins, each with a lifespan of 4 hours. For more information about the Digital Twin feature, see About Digital Twin on page 26. If you choose to manage your devices locally, with an on-premise controller, you can select ExtremeWireless WiNG, ExtremeXOS/Switch Engine, or VOSS/Fabric Engine devices. All you need is the device serial number.
- Advanced Onboarding is a guided process to add manually managed real devices or cloud-managed real or simulated devices, assign locations, and either assign an existing network policy or create and assign a new network policy.

ExtremeCloud IQ supports many families of devices and each family is sufficiently distinct from others to make onboarding them together complicated. Multiple devices of the same family can always be onboarded together. The following items **cannot** be onboarded with devices from a different device family:

- Any AP device family with any switch or router family
- Switch Engine Switches
- Fabric Engine Switches
- Universal Hardware Switches
- ExtremeWireless WiNG Controller
- ExtremeCloud IQ Controller
- ExtremeCloud IQ Site Engine
- Universal Appliances
- Tunnel Concentrator instances

Related Topics

Quick Add Devices on page 19
Quick Add Tunnel Concentrators on page 21
Add Devices with Advanced Onboarding on page 24
Add Locally Managed Devices on page 22
About Digital Twin on page 26
Wireless AP Overview on page 26

Quick Add Devices

Note

- For information about adding a Tunnel Concentrator, see Quick Add Tunnel Concentrators on page 21.
- For information about onboarding access points, see Add Devices Overview on page 18.
- For information about adding switches, see the *ExtremeCloud IQ Universal Switch Deployment Guide*.

Use this task to quickly add devices to ExtremeCloud IQ from the **Manage** > **Device List** page.

1. Go to **Manage** > **Devices**.
2. Select +, then select **Quick Add Devices**.
3. Select **Manage your devices directly from the cloud**.

   If you intend to manage your devices locally through an on-premise controller, see Add Locally Managed Devices on page 22 for instructions before you proceed to the next step.

4. For **Device Type**, select **Real** or **Simulated**.
   - For **Real** devices: For **Entry Type**, either select **Manual** and enter device serial numbers in the field, or select **CSV** to import a **.csv** file with a list of device serial numbers or service tags. If you select **Manual**, ExtremeCloud IQ tries to detect your device automatically when you submit the serial numbers and displays the detected device make in a separate field. If it cannot detect the device make from the serial number, it prompts you to select a device make manually.

     Note
     To onboard a Universal Hardware Switch, for the **Device OS**, choose **Switch Engine** or **Fabric Engine**.

     Your CSV file must have at least one field containing serial numbers or service tags. Add a second field for the model numbers of the devices. For example:

     Serial Number :

     01234567890123

     01234567890124

     01234567890125

     Serial Number and Model Number:

     01234567890123, AP3000

     01234567890124, AP410

     01234567890125, AP5050

     Note
     Avoid using spread sheet applications such as Excel to create or modify a .csv file. Excel formats serial numbers that contain preceding zeros incorrectly. Many applications interpret the serial number as a numeric value, which can cause the preceding zeros to be lost and the value to be represented in scientific notation, requiring you to use special functions or convert the cell content type. Instead, use a text editor that does not format the contents.

   - For **Simulated** devices: In the **Device Model** drop-down list, choose a model, and enter the number of devices to add. Repeat this step to add different models.
   - For **Digital Twin** devices: Use to create a simulated Switch Engine Switch. Select **`Switch Engine`** from the **OS Persona**, then select the **Device Model** and **OS Version**. Proceed to Step 4.

     Note
     You can only add Digital Twin devices if you are also using ExtremeCloud IQ CoPilot.

5. For **Location**, select a location from the pick list.

   Note
   You cannot create a new location in the Quick Add process; you must select an existing location.

6. (Optional) From the **Policy** menu, select an existing network policy.
7. Select **Add Devices**, or **Launch Digital Twin**.

   Note
   To add a device that was previously onboarded using an earlier version of ExtremeCloud IQ or Extreme Management Center, you must first delete the device from the older version. In these instances, you will see an alert.

Related Topics

Add Devices Overview on page 18

Quick Add Tunnel Concentrators on page 21

Wireless AP Overview on page 26

Quick Add Tunnel Concentrators

Deploy the Tunnel Concentrators instances. For more information, see the documentation for *Extreme Tunnel Concentrator*.

Use this task to quickly add Tunnel Concentrator instances as devices and register the serial number for each instance.

1. Go to **Manage** > **Devices**.
2. Select +, then select **Quick Add Devices**.
3. Select **Manage your devices directly from the cloud**.
4. For **Device Type**, select **Real**.
5. For **Entry Type**, select **Manual**.
6. Type the **Serial Number** of the device.
7. From the **Device Make** menu, select **Tunnel Concentrator**.
8. (Optional) From the **Policy** menu, select an existing network policy.
   If you do not already have an existing policy configured for this purpose, skip this step and add the policy later.
9. Select **Add Devices**.

After you complete this procedure, you can open the Extreme Tunnel Concentrator application from ExtremeCloud IQ.

Select a Tunnel Concentrator from the **Devices** page to view the device details. To open the Tunnel Concentrator application, go to one of the following locations:

- **Device Details** > **Monitoring** > **Overview**
- **Device Details** > **Monitoring** > **System Information**

Related Topics

Configure Tunnel Concentrator Services on page 284

Quick Add Devices on page 19

Add Locally Managed Devices

> **Note**
> Onboard locally managed devices to monitor them from ExtremeCloud IQ. You cannot use ExtremeCloud IQ to adjust the device configuration for locally managed devices.

For information about supported switches, see *ExtremeCloud IQ Release Notes*.

Use this task to onboard supported switches that you intend to manage locally, with an on-premise controller. This option applies to WiNG, Switch Engine, or Fabric Engine devices.

1. Go to **Manage** > **Devices**.
2. Select +, then select **Quick Add Devices**.
3. Select **Manage your devices locally**.
4. To enter the devices manually, select **Manual** and enter the associated serial numbers.

   If you select **Manual**, ExtremeCloud IQ tries to detect your device automatically when you submit the serial numbers and displays the detected device make in a separate field. If it cannot detect the device make from the serial number, it prompts you to select a device make manually.

   > **Note**
   > Insert serial numbers that are part of the same platform family.

5. To enter devices via a CSV file, select **CSV**.
6. Select the device make from the drop-down list.

7. Drag or choose a **`.csv`** file with a list of device serial numbers or service tags, and a second field for the model numbers of the devices.

   For example:

   Serial Number :

   12345678901234

   12345678901235

   12345678901236

   Serial Number and Model Number:

   12345678901234, AP3000

   12345678901235, AP410

   12345678901236, AP5050

   Optionally, you can specify the IP addresses for local controllers by using the fields *Controller1* and *Controller2*. For more information, see Enhanced Discovery on page 23.

   Serial Number, Model Number, Controller1, and Controller2:

   12345678901234, AP350, 192.0.2.1, 192.0.2.2

   12345678901235, AP410, 192.0.2.3, 192.0.2.4

   12345678901236, AP630, 192.0.2.5, 192.0.2.6

   Note
   Avoid using spread sheet applications such as Excel to create or modify a CSV file. Excel formats serial numbers that contain preceding zeros incorrectly. Many applications interpret the serial number as a numeric value, which can cause the preceding zeros to be lost and the value to be represented in scientific notation, requiring you to use special functions or convert the cell content type. Instead, use a text editor that does not format the contents.

Related Topics

Enhanced Discovery on page 23
Add Devices Overview on page 18
Add Devices with Advanced Onboarding on page 24
Quick Add Devices on page 19

Enhanced Discovery

Enhanced Discovery can be used to enhance support of onboarding for Local Management (within ExtremeCloud IQ) providing an option to define the list of primary and secondary controllers running ExtremeCloud IQ Controller.

For deployments that do not have a local network configuration for discovery, we offer an enhanced AP onboarding experience that provides indication of the specific IP address or Fully-Qualified Domain Name (FQDN) of the controllers to which the AP connects.

With Enhanced Discovery, the user assigns a selection of APs to be managed by a specific controller (or high availability pair) as part of the conversion to local operating system. Once the AP boots into the local WiNG operating system, if the discovery override is defined, the AP automatically connects to the indicated controller, bypassing the traditional discovery methods.

Universal APs are configured for cloud management by default. To manage these APs locally, select **Local Management** when onboarding the APs in ExtremeCloud IQ.

In a remote deployment, you can configure the IP addresses or FQDNs of the primary and secondary controllers for local management. First, the AP uses a REST API call to connect to ExtremeCloud IQ. The API response includes the configured controller IP addresses. After the AP successfully adopts to ExtremeCloud IQ Controller, the access point reboots to the local management persona.

Enhanced Discovery is supported when manually onboarding devices or when importing devices with a .csv file.

Note
Enhanced Discovery is supported on AP3000 and ExtremeCloud IQ Controller.

Related Topics

Add Locally Managed Devices on page 22
Enhanced Discovery Action on page 351

Add Devices with Advanced Onboarding

Use this task to add devices to ExtremeCloud IQ from the **Manage** > **Device List** page. Use **Advanced Onboarding** when you want to create a new location or a new network policy for the device.

For more information about adding switches, see the ExtremeCloud IQ Switch Deployment Guide.

Use this task to add devices using Advanced Onboarding.

1. Go to **Manage** > **Devices**.
2. Select + and then select **Advanced Onboarding**.

3. On the **Onboard your devices** tab, select the **Device Type**: **Real** or **Simulated**.
    - For simulated devices: In the device model drop-down list, choose a model, and enter the number of devices to add. Repeat this step to add different models.
    - For real devices: Either manually enter the serial numbers in the first field, separated by commas, or import a CSV file by either dragging the file into the second field, or browse for a file by selecting **Choose**.

    Note
    To onboard a Universal Hardware Switch, for the **Device OS**, choose **Switch Engine** or **Fabric Engine**.

    Your .csv file must have at least one field containing serial numbers. Add a second field for the model numbers of the devices. For example:

    Serial Number :

    01221234567890

    01221234567891

    01221234567892

    Serial Number, and Model Number:

    01221234567894, AP3000

    01221234567895, AP410

    01221234567896, AP5050

    Note
    Avoid using spread sheet applications such as Excel to create or modify a .csv file. Excel formats serial numbers that contain preceding zeros incorrectly. Many applications interpret the serial number as a numeric value, which can cause the preceding zeros to be lost and the value to be represented in scientific notation, requiring you to use special functions or convert the cell content type. Instead, use a text editor that does not format the contents.

4. For **Assign a network policy** (optional): Select an existing network policy from the drop-down list or create a new network policy.
5. Select **Next**, and then **Finish**.

Related Topics

Add a Network Policy on page 69
Add Devices Overview on page 18
Add Locally Managed Devices on page 22
Quick Add Devices on page 19
Wireless AP Overview on page 26

About Digital Twin

Digital Twin allows you to create simulated devices to help you prepare your network for real devices. You can perform multiple actions to see how the devices will function in your networks in the same way as you would with actual devices.

You can have a maximum of 15 Digital Twins with every ExtremeCloud IQ CoPilot account, with a maximum of 5 of these 15 in an active or running state at the same time. Digital Twins have a maximum uptime of 24 hours, after which they are automatically shut down. To continue using a Digital Twin that has been shut down, you must manually re-launch it.

Digital Twin devices appear in the device list and are identified by an icon showing two masks—🎭. Select the **Hostname** to see more details and make modifications, just as you would for a real device. Many of the same monitor and configuration options that apply to real devices are available for twins.

Select the check box for a **Digital Twin** device in the **Device** list to activate the **Actions** drop-down list above the table.

Select the check box for a **Digital Twin** device to activate the **Update** option above the table. In the dialog box, you can select **Perform Update** to update the network policy and configuration.

NEW! Wireless AP Overview

ExtremeCloud IQ access points (APs) use 802.11 wireless standards (802.11a/b/g/n/ac/ax/be) for network communications, and bridge network traffic to an Ethernet LAN.

Extreme Networks offers Universal APs that can operate in either ExtremeCloud IQ or in an on-premise environment — one configured operating mode at a time. From the factory, Universal APs are configured for management by ExtremeCloud IQ and always engage with ExtremeCloud IQ for onboarding. You have the option to deploy your devices locally — on-premise from ExtremeCloud IQ Controller (or an ExtremeWireless WiNG controller) — or to deploy your devices from ExtremeCloud IQ. From an ExtremeCloud IQ account, onboard and register the Universal AP using either Local Management or Cloud Management. To manage these APs on-premise, you can specify Local Management.

ExtremeCloud IQ supports the following APs.

Table 4: ExtremeCloud IQ Supported APs

AP Class	Supported Access Points
Wi-Fi 7	• AP5020
Wi-Fi 6E Universal World-Wide APs ExtremeCloud IQ	• AP3000/X • AP4000 • AP4000-1 • AP5010 • AP5050U/AP5050D
Wi-Fi 6 Universal APs ExtremeCloud IQ	• AP302W • AP305C/CX • AP305C-1 • AP410C • AP410C-1 • AP460C/S6C/S12C • AP510C/CX

Related Topics

AP3000 Series Radios and 6 GHz Support on page 27
AP4000/AP4000-1 Radios and 6 GHz Support on page 29
AP5000 Series Radios and 6 GHz Support on page 30
Add Devices Overview on page 18
Quick Add Devices on page 19
Add Devices with Advanced Onboarding on page 24

NEW! AP3000 Series Radios and 6 GHz Support

The AP3000 series access points (APs) are Wi-Fi 6E tri-radio APs with support for multiple Extreme Networks operating systems. The AP3000 series APs include the following models:

- AP3000 — Indoor access point
- AP3000X — Indoor access point with optional external antenna.

The AP3000 series APs offer two radios in three modes:

Table 5: AP3000/X Operating Modes

Mode	Radio 1 (2x2)	Radio 2 (2x2)	Radio Definitions
1 (Default)	g/n/ax	a/n/ac/ax	2.4 GHz and 5 GHz
2	ax6	a/n/ac/ax	5 GHz and 6 GHz
3	Dedicated Sensor (2.4 GHz or 6GHz)	Dedicated Sensor (5 GHz)	

Radio 1:

- sensor
- b/g
- g/n
- b/g/n
- g/n/ax (Default)
- client-bridge
- ax6

Radio 2:

- sensor
- a/n/ac
- a/n/ac/ax (Default)
- client-bridge

Note

When configuring sensor mode, set both Radio 1 and Radio 2 to **sensor** at the same time.

Note

The World-Wide Universal Access Points 6 GHz radios support only the following Wi-Fi Alliance (WFA) 6E Compliant network authentication methods:

- OWE (Opportunistic Wireless Encryption) for Open Networks
- WPA3-Personal (SAE/H2E)
- WPA3-Enterprise

ExtremeCloud IQ requires that your 6 GHz radio network assignment be WFA 6E compliant. ExtremeCloud IQ rejects network configuration changes that result in 6 GHz radio network assignments that are not compliant. It might be necessary to redefine your networks when configuring the 6 GHz radio on the Universal Access Points.

For the AP3000/X, before changing the Radio 1 configuration from 2.4 GHz to 6 GHz, ensure that the AP is assigned a 6E WPA compliant network.

Note

For all Extreme NetworksAPs, use the Extreme Networks certified ACC-WIFI-MICRO-USB console cable. Other MICRO-USB console cables have not been certified by Extreme Networks.

Related Topics

Wireless AP Overview on page 26

NEW! AP4000/AP4000-1 Radios and 6 GHz Support

The AP4000/AP4000-1 access points (APs) offer three radios:

Table 6: AP4000/AP4000-1 Radio Modes

Radio	Radio Modes
Radio 1	• b/g • g/n • b/g/n • g/n/ax • client-bridge
Radio 2	• a/n/ac • a/n/ac/ax • client-bridge
Radio 3	• 2x2 WLAN Service 6.0 GHz, Or • 2x2 WLAN Tri-Band Sensor, 2.4 GHz, 5.0 GHz, 6.0 GHz

AP4000/AP4000-1 APs support the following:

- IEEE 802.11ax Orthogonal Frequency-Division Multiple Access (OFDMA) multi-user access.
- Out of Band discovery on the 6 GHz band. Access points that provide WLAN service on the 6 GHz band include Reduced Neighbor Report IE in all 2.4 GHz and 5 GHz beacons and probe responses. Out of Band discovery helps clients find 6 GHz SSIDs and channel information that comes from 2.4 GHz and 5 GHz beacons of co-located APs.
- Supports AirDefense Services Platform (ADSP) on 2.4 GHz, 5 GHz, and 6 GHz radios.
- 6E WFA Compliant network authentication methods.

  World-Wide Universal AP 6 GHz radios support only the following Wi-Fi Alliance (WFA) 6E Compliant network authentication methods:

  - OWE (Opportunistic Wireless Encryption) for Open Networks
  - WPA3-Personal
  - WPA3-Enterprise

  ExtremeCloud IQ requires that your 6 GHz radio network assignment be WFA 6E compliant. ExtremeCloud IQ rejects network configuration changes that result in 6 GHz radio network assignments that are not compliant. It might be necessary to redefine your networks when configuring the 6 GHz radio on Universal APs.

Note
AP4000-1 models do not support IoT.

Related Topics

Wireless AP Overview on page 26

NEW! AP5000 Series Radios and 6 GHz Support

The AP5000 series access points (APs) are Wi-Fi 6E tri-radio APs with support for multiple Extreme Networks operating systems. The AP5000 series APs include the following models:

- AP5010 — Indoor AP
- AP5020 — Indoor AP
- AP5050U — Indoor/Outdoor, underseat AP
- AP5050D — Indoor/Outdoor AP with selectable narrow and wide angle built in directional antennas.

The AP5050U/D has an Environment choice of **Indoor**, **Outdoor**, or **Outdoor — Under Seat**, depending on the installation location.

Support for 6 GHz (Wi-Fi 6E) radio (Indoor) operation depends on the compliance region.

The AP5020 is a universal **indoor** access point with a Wi-Fi 7 tri-radio. It is designed for high-density environments where a large number of people access your network such as schools, warehouses, healthcare facilities, and stadiums. You can operate the AP5020 across three bands - 2.4 GHz (4x4:4), 5 GHz (4x4:4), and 6 GHz (4x4:4).

ExtremeCloud IQ supports the following AP5020 operating modes:

- Mode 1: 2.4 GHz / 5 GHz (Full) / 6 GHz — Tri-Radio

- Mode 3: 5 GHz (Low) / 5 GHz (High) / 6 GHz — Dual 5GHz with 6GHz

Table 7: AP5000 Series Radio Modes

Radio	Radio Modes
Radio 1: • 4x4 WLAN Service 2.4 GHz, Or • 2x2 WLAN Tri-Band Sensor, 2.4 GHz, 5.0 GHz, 6.0 GHz	• sensor • b/g • g/n • b/g/n • g/n/ax • g/n/ax/be (AP5020 only) • client-bridge
Radio 2: • 4x4 WLAN Service 5.0 GHz	• a/n/ac • a/n/ac/ax • a/n/ac/ax/be (AP5020 only) • client-bridge
Radio 3: • 4x4 WLAN Service 6.0 GHz	• ax6 • ax6/be (AP5020 only) • client-bridge

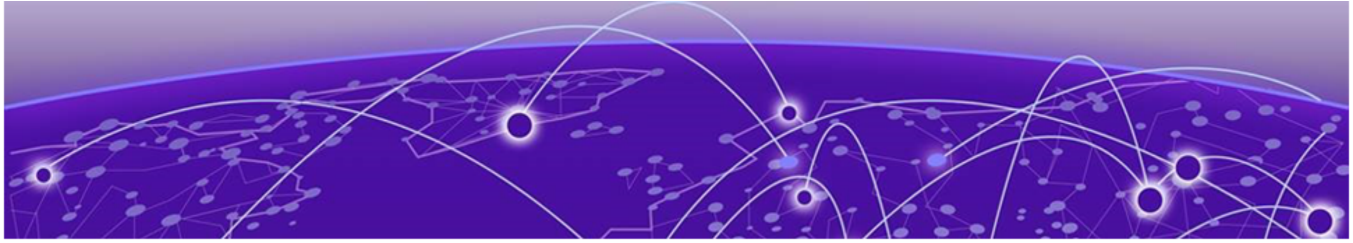
Note
The AP5020 does not support the following radio optimization settings:

- High Density Configuration
- Client Load Balancing
- Radio Load Balancing
- Weak Signal Probe Request Suppression
- Safety Net
- Client SLA

For more information, see Optimize Radio Usage on page 177.

Related Topics

Wireless AP Overview on page 26



Administration

Administration provides access to various ExtremeCloud IQ settings as follows:

- **Global Settings**: Define criteria that affects the entire system. For example, license management, device settings, email notifications, API settings, and viewing activity logs.
- **Switch ExtremeCloud IQ Accounts**: Switch between multiple ExtremeCloud IQ accounts.

About Global Settings

Global Settings affect the entire ExtremeCloud IQ management system as follows:

- **Account Details**: View personal and organizational information about the administrator that is currently logged in to this account. Manage Account Details on page 33
- **Account Management**: Add, delete, or edit accounts. Add an Administrator Account on page 36

- **Credential Distribution Groups**: Add, delete, or edit credential distribution groups. Add a Credential Distribution Group on page 35
- **License Management**: View and add license and entitlement objects. Manage Licenses on page 41
- **Device Management Settings** : View and modify the default device management password. Set a Device Default Password on page 41
- **VIQ Management**: Manage the Virtual ExtremeCloud IQ. Manage the Virtual IQ on page 42
- **Email Notifications**: View, add, and modify email notification rules for status changes. Set Email Notifications on page 44
- **API**: View, add, modify, and delete API data management objects, and enable and disable presence and location data feeds. Add an API Presence and Data Location Feed on page 47, Add a Third-Party API Token on page 47, Generate API Access Tokens on page 46
- **Logs**: View and sort logs. Download log entries for any or all admin accounts. Download Audit Logs on page 49
- **SSH**: Provide temporary remote access to your network for troubleshooting purposes. Enable SSH Availability on page 54

Manage Account Details

Use this task to edit your personal and company information.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Accounts** menu, select **Account Details**, and then configure the settings for your account.

Table 8: Account Details Settings

Setting	Description
Personal Information	
Name	The name of the account. Select ✎, type the new value, and then select ☑.
Role	Information only—you cannot edit the **Role**.
Email	The primary email address for your account. Select ✎, type the new value, and then select ☑.
Proactive license warning email messages	Select the toggle to change the setting. Set to **ON** to receive emails about upcoming license expiration dates.
Alternate Email	An alternate (optional) email address for your account. Select ✎, type the new value, and then select ☑.
Phone Number	The phone number for your account. Select ✎, type the new value, and then select ☑.
Job Title	Your job title. Select ✎, type the new value, and then select ☑.

Table 8: Account Details Settings (continued)

Setting	Description
Password	The password for your account. Select **CHANGE PASSWORD**, type the current password, and then type the new password twice: **New Password** and **Confirm New Password**. Select **SAVE**. **Note:** After you change your password, you can continue your current administrative session or navigate through the GUI. After you log out of your current session, you must enter your new password the next time you log in. To change your password at the log in prompt, select **Forgot Password** and follow the instructions.
Select Language	Select your preferred language from the menu, and then select **APPLY**. **Note:** You must log out for the change to take effect.
Organization Information	
Organization Name	The name of the organization. Select ✏, type the new value, and then select ☑.
Industry	Select an industry from the drop-down list and then select **Apply**. **Note:** The industry that you identify here indicates the group that submits data for CoPilot global analytics.
Address	Select ✏, type the new value, and then select ☑.

Related Topics

About Global Settings on page 32

Enable Two-Factor Authentication

Use these steps to configure ExtremeCloud IQ to require multi-factor authentication at log in. When this feature is enabled, to log in, enter your VIQ account admin name and password credentials, and then enter a six-digit key generated by the Google Authenticator app. (Google Authenticator generates time-based one-time keys and runs on iOS and Android devices.)

To enable two-factor authentication:

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Accounts** menu, select **Multi-Factor Authentication**.
3. Toggle the **Status** switch to **ON**.
4. Install the **Google Authenticator** app on your iOS or Android smart device.

5. Open **Google Authenticator**, select **Scan Barcode**, and scan the on-screen QR code.

   Alternately, you can open **Google Authenticator**, select **Manual Entry**, enter the email address you use as your admin name when logging into ExtremeCloud IQ, and enter the secret key that ExtremeCloud IQ displays. After you scan the QR code or enter a valid email address and secret key, **Google Authenticator** displays a six-digit code, which changes every 30 seconds.
6. Enter the six-digit code in the **Step 2** text box in the **Setup Multi-Factor Authentication** window.
7. Select **Confirm** to activate multi-factor authentication for yourself.

   > Note
   > For legibility, **Google Authenticator** includes a space between the first three digits and the second three digits in its display. Do not include this space when you enter the six-digit code.

When administrators log in, they enter their admin name and password, the **Google Authenticator** app code, and select **Submit**. If authorized sessions were active using earlier authentication, an informational message alerts the user of this state. Verify this message to terminate these sessions after successful enforcement of MFA authentication.

Related Topics

About Global Settings on page 32

Enable ExtremeCloud IQ Classic

Use this task to link your devices directly to the ExtremeCloud IQ Classic version:

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Accounts** menu, select **ExtremeCloud IQ Classic Account**.
3. Toggle the **Status** switch to **ON**.
4. Enter your user name.
5. Enter your password.
6. Select **Get Organization**.

Related Topics

About Global Settings on page 32

Add a Credential Distribution Group

Use this task to create Credential Distribution Groups for members of your organization who are permitted to distribute log in credentials to visitors.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Accounts** menu, select **Credential Distribution Groups**.
3. Select an existing group, and then select ✏, or select +.

4. Configure the settings.

Setting	Description
Group Name	(Required) Type a name for the group.
Admin Account	(Required) From the menu, choose **Active Directory User** or **Guest Management Role User**.
Member Of	**Active Directory User** only Enter the Active Directory user group for the account. If the account is a member of multiple groups, type the name of the first group, press **Enter**, and then enter the next group name.
Guest Management User	(Required) **Guest Management Role User** only Enter the access control role to assign to a group member.
Credential Restriction	Select **Restrict the number of credentials per employee to**, and then select the number of credentials that group members can distribute.
Registration Operation	Select **Email Approval**.
Enable User Groups	Add existing user groups to add to this credential distribution group either by selecting **Select All**, or by selecting the check boxes for individual user groups.

5. Select **SAVE**.

Related Topics

About Global Settings on page 32

Add an Administrator Account

Create the organization to which this administrator will be assigned.

Use this task to create a new administrator account and set parameters, such as read/write privileges, and device management restrictions based on deployment locations.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Accounts** menu, select **Account Management**.
3. Specify whether the new admin is internal to your organization, or external.
   - **Create a new admin account**: Select to create an account for an admin within your organization.
   - **Grant access to an external admin**: Select to grant access to administrators outside of your organization. These administrators include personnel from Extreme Networks resellers, distributors, technical support, and sales engineering.

> Note
> External administrators must have an ExtremeCloud IQ account before they can be added.

4. Enter the **Email Address** for the administrator.
5. Enter the **Name** for the administrator (internal admin only).
6. For **Idle Session Timeout**, enter the number of minutes before a session times out (internal admin only).
7. Assign a role to each admin.

    - An **Administrator** has full read-write access to ExtremeCloud IQ and your network. This is the only role that can create and manage administrators and ExtremeCloud IQ licenses.
    - An **Operator** has full write access, but cannot manage accounts and licensing. An operator can also update the network map (located on the **Manage** > **Planning** tab) to add a building or a floor to any location, unless they are restricted to a single location.

        Note
        Local operators cannot view alarms for locations they cannot access.

    - A **Monitor** has full read-write access to system **Tools** located at (**Manage** > **Devices** > **Utilities** > **Tools**) and restricted (read-only) access to the remaining tabs. With full access to the **Tools** tab, the monitor role can diagnose client issues, escalate issues, and mark issues as resolved.
    - The **Help Desk** role has full access to the **Tools** tab. They can diagnose client issues, escalate issues, and mark issues as resolved, and search by user name to see details for a user, or by MAC address to see details for a client.
    - The **Guest Management** role has access only to the guest management admin interface. This is mainly for employees who need to create user accounts for guests, contractors, and employee personal devices to enable access to the wireless network.
    - An **Observer** has read-only access to most of the ExtremeCloud IQ interface. This role does not have access to the account and license management functions. The difference between Observer and Monitor is the Monitor role has write access to the **Tools** tab and read access to the rest of the network. The Observer has read-only access.
    - The **Installer** role is designed to work with the mobile app, and so has limited privileges based on the in-build limitations of the app. If you log into ExtremeCloud IQ as an admin with Installer privileges using the standard web interface, then the **Management**, **Insights**, and **Configuration** tools are read only with the following exceptions:
        - Onboard, update, reboot, and delete devices
        - Assign network policies
        - Assign locations
        - CLI access
        - Flash LEDs
    - An **Application Operator** can view status information about client devices and supported APs and change roles for a client device. this role cannot see other menus, or make configuration changes to the network.

8. Assign the locations to which the admin has access.

   Access restrictions by location are based on how you have defined your network map.
9. Select **SAVE & CLOSE**.

Related Topics

About Global Settings on page 32

Manage Licenses Overview

The first time that you log into ExtremeCloud IQ you are redirected to the Extreme Portal and prompted for your credentials. If you do not have an Extreme Portal account, you must register for one before you can continue.

Note

If you are partner, distributor, or reseller, and are setting up an account for a customer, you can create the account and then instruct the customer to log into their new ExtremeCloud IQ instance and proceed through the licensing prompts.

After you enter your credentials, ExtremeCloud IQ retrieves the license information from your Extreme Portal account and applies it to your ExtremeCloud IQ account. See Manage Licenses on page 41.

Note

The terms *Licenses* and *Entitlements* appear throughout the ExtremeCloud IQ interface. These terms are interchangeable. For clarity, this document uses license, licenses, and licensing in all cases, unless the term *Entitlement* is part of a product name or label in the user interface.

Entitlements

The **Entitlements** table displays the following information about your current licenses:

Type

Licenses can be subscription or permanent.

Total

The total number of licenses of that type. **Available** + **Activated** = **Total**

License Name

The name of the license. Some licenses add device management capabilities, while other licenses enable specific features. Examples:

- XIQ-PIL-S-C—ExtremeCloud IQ Pilot
- XIQ-NAV-S—ExtremeCloud IQ Navigator
- XIQ-COPILOT-S-C—ExtremeCloud IQ CoPilot

Available

The number of licenses that are available for use.

Activated

The number of used licenses.

Start Date

The date the license became valid. This column can be sorted. The date is in the UTC time zone.

End Date

The date the license expired. This column can be sorted. The date is in the UTC time zone.

Description

A description of the license, if one was entered.

Note

ExtremeCloud IQ sends aggregated information for each license type to ExtremeCloud IQ Site Engine.

ExtremeCloud IQ Site Engine displays a table listing the licenses purchased: XIQ-PIL-S-C, XIQ-NAV-S-C, and XIQ-NAC-S licenses. A single line displays the **Contract Start Date**, **Contract End Date**, and **Feature**. The **Quantity** is the total number of licenses purchased of that type, similar to what ExtremeCloud IQ displays.

NAC Entitlements

Network Access Control (NAC) uses a set of protocols to secure devices when they first try to access the network. The 802.1X standard is a basic form of NAC.

Universal NAC licenses are available for ExtremeCloud A3 and ExtremeControl.

NAC controls access using pre-admission endpoint security checks and post-admission controls over access levels and permissions that devices exercise in the network.

The total number of NAC entitlements available appears above the **NAC Entitlements** table, and is based on the number of NAC subscriptions you have purchased.

Note

An MSP operator can define **Total NAC Entitlements** for the VIQ. If defined, the system uses the defined value rather than the number of NAC subscriptions that you see in the license pool.

The **NAC Entitlements** table lists the following information about NAC entitlement allocations:

- **Entitled Serial Number**: The serial number of the NAC device associated with this entitlement. The device can be running ExtremeCloud IQ Site Engine version 21.9 and newer, or ExtremeCloud A3 version 4.0 and newer.
- **Name**: The name of the NAC device.

- **Allocated %**: The percentage of the total allocations that are available to this device. You can modify this number as needed. To confirm and save your changes, click **Save**.
- **Allocated Entitlements**: The maximum number of entitlements that can be used by this device.

Legacy Entitlements

The information that this table displays depends on whether you entered an evaluation or permanent entitlement key. If you entered an evaluation key, the number of days remaining until the entitlement key expires and the number of devices licensed appears at the top of the window. If you entered a permanent key, the table displays only the number of licensed devices.

You can use unused entitlements in addition to any active licenses. For more information, see, Manage Licenses on page 41.

The **Legacy Entitlements** table displays the following information:

- **Current State**: Can be active or expired. Use the drop-down list above the column to filter these values.
- **Evaluation Period**: For evaluation licenses, the number of days remaining in the evaluation period appears here. For permanent licenses, N/A appears.
- **Entitlement Key**: The 30-character string that you received from Sales or Support. To remove or deactivate a key, select the check box for it and then select **Remove/ Deactivate**. If you deactivate an active key, you can add it back later.
- **Type**: The license type can be evaluation or permanent.
- **Devices**: The number of devices the entitlement key supports. The total number of devices you can manage is the sum of all the numbers associated with active keys.
- **Subscription Start and End Dates**: The start and end dates for this entitlement key. These columns can be sorted. The date is in the UTC time zone.
- **Support End Date**: The date on which the support contract expires. This column can be sorted. The date reflects the time zone setting in your browser.
- **Activation Date**: The date on which the license was activated. This column can be sorted.
- **Description**: The license description, if one was entered.

Related Topics

Link Your Extreme Networks Portal Account on page 41

Manage Licenses on page 41

ExtremeCloud IQ Licensing Guide

Link Your Extreme Networks Portal Account

Use this task to link your Extreme Networks Portal account so that when you enter your credentials, ExtremeCloud IQ retrieves the license information from your Extreme Networks Portal account and applies it to your ExtremeCloud IQ account.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Administration** menu, select **License Management**.
3. Select **Link My Extreme Portal Account**.
4. Enter your Extreme Networks Portal credentials.

   The license information appears in the **Entitlements** or the **NAC Entitlements** table.

Manage Licenses

Use this task to manage your device licenses in ExtremeCloud IQ.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Administration** menu, select **License Management**.
3. To change the number of devices that you manage, select **Contact Sales**.
4. If you have a NAC device that does not appear in the **NAC Entitlements** table, onboard the NAC device to ExtremeCloud IQ.

   If the NAC device is compatible, it appears in the table automatically.
5. For **NAC Entitlements**, to modify the percentage allocated for a NAC device, select the serial number of the device and enter a new number in the **Allocated %** column.
6. To save changes to **NAC Entitlements**, select **SAVE**.
7. For **Legacy Entitlements** only, to enter an entitlement key, select **Enter it here**, enter the entitlement key text string in the **Enter Entitlement Key** field, select **Submit**, and accept the end user license agreement.
8. For **Legacy Entitlements** only, to remove or deactivate an Entitlement Key, select the check box and then select **Remove/Deactivate**.

   If you deactivate an active key, you can add it back later.
9. For **Legacy Entitlements** only, select **DOWNLOAD** to download the **Legacy Entitlements** table into a CSV file.

Related Topics

Manage Licenses Overview on page 38

ExtremeCloud IQ Licensing Guide

Set a Device Default Password

Use this task to set the default password for Extreme Networks devices.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Administration** menu, select **Device Management Settings**.

3. For **Default Password**, enter the password the root admin uses to log in to a new device.

   The password must be an alphanumeric string containing at least one number and one uppercase character, and cannot be the same as the user name or a previously used password.
4. **Confirm** the new password.
5. (Optional) Select **Show Password**.
6. For Switch Engine or EXOS switches, select **Enable device management settings for EXOS switches.**

   This setting enables you to set **Device Credentials** at the device level for these switch series.
7. Select **Save**.

Related Topics

About Global Settings on page 32

Manage the Virtual IQ

ExtremeCloud IQ administrators with read and write permission can perform the following administrative tasks:

- Manually back up and restore Virtual IQ (VIQ) account data.
- Delete data to reset the Virtual IQ database.
- Export and import Virtual IQ data.
- Enable the CoPilot feature for the VIQ
- Enable and disable SSH (see Enable SSH Availability on page 54)
- Enable and disable the supplemental CLI tool.
- Enable and disable the verification of APs using the out-of-the-box wireless onboarding feature.

Use this task to manage the VIQ.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Global Settings** menu, select **VIQ Management**.
3. To perform a manual backup, select **Backup Now**.

   To ensure data integrity, ExtremeCloud IQ suspends activity in the Virtual IQ during both the backup and the restore process. The **Current Status** changes from **ACTIVE** to **SUSPENDING** during these processes. When a backup is complete, ExtremeCloud IQ displays the backup event in the **Backup History** table at the bottom of the page.
4. To restore a backup, choose a Backup File from the **Backup History** table, then select **Restore**.

   Note

   You must restore the Virtual IQ in the same version of ExtremeCloud IQ from which you performed the backup. If the versions are different, a compatibility error message (`Version Mismatch`) is displayed.

5. Select **Reset VIQ** to delete the Virtual IQ database.

   This resets it to its initial state before any inventory or configurations were added.

6. To export Virtual IQ data:

   a. Select **Export Virtual IQ** and follow the instructions in the dialog boxes.

      ExtremeCloud IQ suspends the Virtual IQ during the export operation and displays a progress report showing its status. When it is complete, a message displays stating that the Virtual IQ was successfully exported. A link to the exported .tar.gz file is displayed to the right of the **Export Virtual IQ** button.

   b. Select the link to download and save the `.tar.gz` file to a local directory on your management system.

      The tarball contains numerous files for different areas of the Virtual IQ, such as certificate files in PEM format, captive web portal files in HTML, JavaScript, and graphic image file formats, background image files for topology maps, and configuration objects and Virtual IQ settings in XML format.

      Note
      Global Settings > **VIQ Management** > **Download** is not available for trial VIQs.

7. To import Virtual IQ data:

   a. Select **Import Virtual IQ**.

   b. Select either **Import Virtual IQ from ExtremeCloud IQ** or **Import Virtual IQ from HM Classic**, depending on the source of the data.

   c. Either drag the `.tar.gz` file into the first field at the top or select **Choose** to navigate to the location of the file and select it.

   d. Select **Import Now**.

      Optionally, you can change the import timeout, which is 30 minutes by default, and the action to take if an error occurs; abort (default) or continue.

8. Slide the **Enable CoPilot feature for this VIQ** toggle to **ON** to enable it.

   The CoPilot feature requires a ExtremeCloud IQ CoPilot license. If CoPilot is disabled for this VIQ, the CoPilot features are not available, and the administrator does not receive ML/AI-driven insights and proactive follow-ups.

9. Slide the **SSH Availability** toggle to **ON** to enable it.

   Note
   Enabling SSH availability potentially gives others direct access to your devices during the time that SSH access is available. While active, SSH Availability exposes your device to the public Internet through an SSH proxy, protected only by the device administrator credentials, because SSH FTP assumes that it is running over a secure channel. For more information, see Enable SSH Availability on page 54.

10. Slide the **Supplemental CLI** toggle to **ON** to enable it.

    Use the **Supplemental CLI** tool to append CLI commands to a network policy when you upload the configuration to managed devices. You can access this feature in multiple places in the GUI, after you enable it for the Virtual IQ.

11. To enable the Virtual IQ to permit APs to respond to mesh-join requests, slide the **AP Out-of-the-box Wireless Onboarding** toggle to **ON**.

    This setting permits or prohibits AP responses to mesh-join requests. When this setting is off, the Virtual IQ prohibits managed APs from responding even if the serial number of the requesting AP is listed in the Virtual IQ.

Related Topics

About Global Settings on page 32

Enable Single Sign On (SSO)

Configure an Identity Provider (IdP) for ExtremeCloud IQ before you enable Single Sign On (SSO).

Note
SSO is currently available as a technology preview only on select Regional Data Centers.

The following IdPs are supported by ExtremeCloud IQ:

- Generic SAML Server
- Active Directory Federation Service (ADFS)
- Ping
- Okta
- Microsoft Entra ID
- OneLogin
- Auth0

If you are using Microsoft Entra ID, see the *ExtremeCloud IQ Self-Service Single Sign On, Entra ID SAML Integration Guide*.

Set Email Notifications

Before you can activate the switch port email notification function, you must activate **Port Status Reports** for the monitored ports. You can do this in the **Manage Devices** section.

Note
Email Notification is a legacy function. Extreme Networks recommends using Alerts. For more information, see Manage Alerts on page 380.

If you have permission, you can configure ExtremeCloud IQ to send email notifications for changes of device status. After you activate an email notification rule and save the settings, ExtremeCloud IQ automatically sends notification emails when the configured conditions are met.

For APs, ExtremeCloud IQ averages the AP status over five-minute periods (by default) to minimize unnecessary repetitions of the same notification email. For switches, ExtremeCloud IQ sends a notification email after all port up and down events.

Note
To view a graphical representation of alerts, select **Try the new Alerts Management feature.** You can also configure alert policies.

1. Mouse over 👤, , and then select **Global Settings**.
2. From the **Administration** menu, select **Email Notifications**.
3. Configure the alert settings as follows:

Setting	Description
AP Status	(Not supported for WiNG devices) Toggle the setting **ON** to receive notifications for the selected events: **Alert if Up**, **Alert if Down**.
Hardware CPU	Toggle the setting **ON** to receive notification when the CPU usage of an AP is greater than 80 percent. ExtremeCloud IQ polls the AP every 60 seconds to check the CPU threshold and sends an email at a specified interval, reporting how long the AP exceeded the threshold.
Hardware Memory	Toggle the setting **ON** to receive notification when the memory usage of an AP exceeds a high (10.2 MB) threshold or dips below a low (10.1 MB) threshold. ExtremeCloud IQ polls APs every 60 seconds to check the memory threshold and sends an email at a specified interval, stating how long an AP exceeded the threshold.
Switch (Port) Up/Down Status	(Applicable only when an Extreme Networks Aerohive switch model SR22/23xx enables the up/down status as an alert.) Toggle the setting **ON** to receive notification when a switch port, with authorized email notifications configured, goes up or down.
Aerohive Port Security Violation	(Applicable only when an Extreme Networks switch enables port security violation as alert.) Toggle the setting **ON** to receive notification when a switch port, with authorized email notifications configured, encounters a security violation.

4. Enter the **To Email** addresses, each separated by a comma.
5. Select **SAVE SETTINGS**.

Related Topics

Alerts on page 379

Manage API Access Tokens

Global Settings > **API Token Management**

The **API Access Tokens** window displays a table containing the following information for the API access tokens that have been added to ExtremeCloud IQ:

- **Application**: The name of the application that can use the API token, from the **My Profile** section on the developer portal
- **Access Token**: The text string of the access token
- **Grantor**: The admin who granted access to the application or who generated the access token
- **Generated On**: The date that the access token was created
- **Expiration**: The date that the access token expires in the year-month-day hour: minutes: seconds format

  For tokens that are already expired, ExtremeCloud IQ replaces the date with **Expired**.
- **Refresh Token**: A token for temporary use, to allow time to obtain a new access token with a new expiration date

Use the table to view the access tokens added to ExtremeCloud IQ. You can sort the results by column. To delete an access token, select the corresponding check box, and then select 🗑.

Related Topics

Generate API Access Tokens on page 46

Generate API Access Tokens

Use this task to generate API access tokens that applications use to make REST API calls to ExtremeCloud IQ. For more information about API Tokens, see Manage API Access Tokens on page 45.

1. Mouse over 👤, , and then select **Global Settings**.
2. From the **API** menu, select **API Token Management**.
3. Select +.
4. Enter a valid **Client ID**.

   The client ID is the **Credentials** value from **My Profile** > **Your API Developer Application** in the Extreme Networks **Developer Portal**. This step connects the token you generate with your developer account.
5. Select an **Expiration Setting** for the access token:
   - **Expires in 30 days**
   - **Time from enrollment**

     Enter the number of days, months, or years, after which the access token expires.
   - **Date**

     Use the calendar control to select a specific date for the access token expiration.
6. Select **GENERATE**.

Related Topics

Manage API Access Tokens on page 45

Add an API Presence and Data Location Feed

Using the presence and location API feature, Extreme Networks wireless devices can detect the presence of clients (such as smart phones) and obtain location data for all connected and unconnected clients.

Use this task to configure a Presence and Data Location feed to stream raw presence and location data from the ExtremeCloud IQ Cloud Services platform to an external server.

1. Mouse over 👤, , and then select **Global Settings**.
2. From the **API** menu, select **API Data Management**.
3. Select +.
4. Enter the **Post URL** for the server to receive presence and location-based services.

   The Extreme Networks Cloud Services platform streams real-time presence and location data through a webhook to this URL.

   > Note
   > Because client MAC addresses and positions are being transmitted, an HTTPS connection is strongly recommended. If you use an SSL certificate, ensure that it is well known and contains the entire CA certificate chain because ExtremeCloud IQ will not connect to a server if it cannot validate its certificate.

5. Enter an access token, which is either automatically generated when you create a new application in the Develop Portal or which you manually generate (see Generate API Access Tokens on page 46).
6. Select a **Message Type**:
   - **Client-Centric** presents a single view of a client device and shows the Access Points observing it.
   - **AP-Centric** sent for each Access Point that observes client devices. If a client device is observed by multiple access points, information about the device will appear in multiple messages, one for each AP observation. This feature does not scale for customers with high density environments.
7. Select **Enable**.
8. Select **SAVE**.

Related Topics

Generate API Access Tokens on page 46

Manage API Access Tokens on page 45

Add a Third-Party API Token

Use this task to add a third-party API token for applications to use to make REST API calls to ExtremeCloud IQ. For more information, see Manage API Access Tokens on page 45.

1. Mouse over 👤, , and then select **Global Settings**.

2. From the **API** menu, select **3rd Party API Connections**.
3. Select an existing token, and then select ✏, or select +.
4. Type the character string for the **API Token**.
5. Select **SAVE**.

Related Topics

Manage API Access Tokens on page 45

Download Logs

ExtremeCloud IQ uses logs to record and display information for the following categories:

- GDPR Audit Log on page 49
- KDDR Logs on page 50
- Authentication Logs on page 51
- Accounting Logs on page 52
- Credential Logs on page 52
- Email Logs on page 53
- SMS Logs on page 54

Audit Logs

The **Audit Logs** table contains a historical record of the administrative operations performed on ExtremeCloud IQ. The maximum page size is 500 entries per page. You can see the following information for each operation:

- **Organization**: Your network organization.
- **Timestamp**: The time when the operation was performed.
- **Category**: The type of operation.
- **Admin User**: The email address of the admin who performed the operation.
- **Description**: A description of the operation.

Sort entries by selecting any of the column headers. The **Timestamp** column sorts entries chronologically, and the other columns sort alphabetically. Select the same column header again to reverse the sorting direction.

By default, ExtremeCloud IQ displays audit logs for 24 hours.

Choose from the following actions to customize the display:

- Use the calendar controls to display logs for a specified time period, up to a maximum of 30 days history.
- Use the **Category** menu to narrow the logs list to those associated with a specific function.
- Use the Admin User drop-down list to narrow the logs list to those associated with a specific user.

Related Topics

Download Audit Logs on page 49

Download Audit Logs

Administrators with full access can download the entire log or only the entries pertaining to a specific administrator, which is important for compliance with GDPR (General Data Protection Regulation). If administrators are EU citizens working in the EU, they have the right to access PII (personally identifiable information) gathered about them. This includes personal information collected by ExtremeCloud IQ and contained in the log. If an administrator leaves the company and asks for this information, you can sort for log entries pertaining to that administrator, and then download and save them in a CSV (comma-separated values) file.

Use this task to download an entire log, or only the log entries for a specific administrator.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **LOGS** menu, select **Audit Logs**.
3. Select a **Category**:
   - ALL
   - ADMIN
   - SYSTEM
   - DEPLOYMENT
   - CONFIG
   - MONITOR
   - ALARM

   Select **All** to display and download the logs for all categories.
4. From the **Admin User** menu, select an administrator or select **All** to display and download the logs for all administrators.
5. Select ⤓.
6. Select **OK**.

   ExtremeCloud IQ generates a file in CSV format.
7. Select ⤓.

Related Topics

Audit Logs on page 48

GDPR Audit Log

The GDPR (General Data Protection Regulation) audit log displays information about download tasks performed on client data, and deletion tasks performed on user, client, and admin data to support compliance with GDPR requirements for EU citizens. Use this log to track actions that are currently being processed, that are complete, or that have failed.

The **GDPR Audit Log** table displays the following information about logged tasks, such as preparing client data for download, and deleting user, client, and admin data:

- **Start**: The time the process to download or delete data started.
- **End**: The time the process ended.
- **Status**: Whether the process is currently in progress, completed, or failed.
- **Log ID**: The download or deletion process ID number.
- **Category**: The task type.
- **MAC**: The MAC address of the client.
- **Admin**: The admin who initiated the data download or deletion.
- **Description**: A descriptive note about the task status.

Related Topics

Download the GDPR Audit Log on page 50

Download the GDPR Audit Log

Use this task to download the GDPR audit log.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **LOGS** menu, select **GDPR Audit Log**.
3. Select ⤓ **DOWNLOAD**.

Related Topics

GDPR Audit Log on page 49

KDDR Logs

Kernel Diagnostic Data Recorder (KDDR) logs record failures or interruptions of ongoing processes. The KDDR log format is binary. Generally these logs are for more advanced troubleshooting. Extreme Networks support might ask for these logs for troubleshooting unexplained reboots or crashes.

You can view the following information:

- **File Name**: The KDDR log file name.
- **Size**: The KDDR log file size.
- **Timestamp**: The time the unexpected event occurred.
- **Device Name**: The device where the unexpected event occurred.
- **Device MAC**: The MAC address of the device.

Related Topics

Download KDDR Logs on page 50

Download KDDR Logs

Use this task to download KDDR logs.

1. Mouse over 👤, and then select **Global Settings**.

2. From the **LOGS** menu, select **KDDR Logs**.
3. Select a file name link to download a KDDR log.

Related Topics

KDDR Logs on page 50

Authentication Logs

The **Authentication Logs** table displays information about successful authentication attempts involving cloud-based PPSK and RADIUS users, and users authenticating through a cloud-hosted captive web portal using either social log in credentials or a PIN. The table includes authentication events for the time range that you define using the **Start**, **End**, and **Time** controls at the top of the page. Search for a specific client or user name in the **Search** field above the table.

The table displays the following information about successful network authentication attempts:

- **Auth Status**: The status of the authentication.
- **User Name**: The name of the cloud-based PPSK or RADIUS user, or the email address of a user authenticating through a cloud-hosted captive web portal.
- **SSID**: The SSID associated with this authentication.
- **Auth Type**: The method of authentication:
  - Private PSK
  - Enterprise (for RADIUS)
  - One of the social log in options: Facebook, Google, LinkedIn
  - PIN
- **Client Device**: The MAC address of the authenticated client device.
- **Reject Reason**: The reason why an authentication attempt failed.
- **NAS Device**: The MAC address of the AP running guest management and serving as the network portal.
- **NAS Identifier**: The network name for the NAS device
- **Auth Date**: The date of the authentication attempt.

Note

These entries are not real-time, but are historical records showing when individuals were authenticated. Entries are automatically deleted after seven days.

Related Topics

Download Authentication Logs on page 51

Download Authentication Logs

Use this task to download authentication logs.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **LOGS** menu, select **Authentication Logs**.

3. Select **DOWNLOAD**.

Related Topics

Authentication Logs on page 51

Accounting Logs

The **Accounting Logs** table displays information about cloud-based PPSK and RADIUS user sessions on your network. The table includes authentication events for the time range that you define using the **Start**, **End**, and **Time** controls at the top of the page. Use the **Search** field above the table to search for a specific client or user name.

The table displays the following information about cloud-based PPSK and RADIUS user sessions on your network:

- **Start Time**: The session start time.
- **Stop Time**: The session end time.
- **Session Time**: The session duration.
- **User Name**: The cloud-based PPSK or RADIUS user name
- **Client Device**: The MAC address of the device.
- **SSID**: The SSID over which this session was conducted.
- **Usage**: The amount of data transmitted during the session.
- **NAS Device**: The MAC address of the Extreme Networks AP client.
- **NAS Identifier**: The host name of the Extreme Networks AP.

Related Topics

Download Accounting Logs on page 52

Download Accounting Logs

Use this task to download accounting logs.

1. Mouse over , and then select **Global Settings**.
2. From the **LOGS** menu, select **Accounting Logs**.
3. Select **DOWNLOAD**.

Related Topics

Accounting Logs on page 52

Credential Logs

The **Credential Logs** table displays information about cloud-based RADIUS user credentials that have expired. To set a time range to view expired user credentials, use the **Start**, **End**, and **Time** controls at the top of the page. Use the **Search** field above the table to search for a specific client or user name.

The table displays the following credentials information:

- **Time Expired**: The time that the credentials expired.
- **User Name**: The user name associated with the expired credentials.

Related Topics

Download Credential Logs on page 53

Download Credential Logs

How to download credential logs.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **LOGS** menu, select **Credential Logs**.
3. Select ⤓ **DOWNLOAD**.

Related Topics

Credential Logs on page 52

Email Logs

The **Email Logs** table displays information about email notifications to users who requested network access. ExtremeCloud IQ creates email log entries for the following events:

- When an email message is sent to a visitor
- When an email message is sent for employee approval
- When an administrator approves user credentials

To filter the display, use the **Start**, **End**, and **Time** controls at the top of the page. You can also search for email messages sent to a specific address by using the **Search** field above the table.

The table displays the following information:

- **Time Sent**: The time the SMS was sent.
- **User Name**: The user name associated with the sent credentials.
- **Approver Email**: The email address of the approving employee.
- **Status**: Whether or not approval is required for the visitor.

Related Topics

Download Email Logs on page 53

Download Email Logs

Use this task to download email logs.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **LOGS** menu, select **Email Logs**.
3. Select ⤓ **DOWNLOAD**.

Related Topics

Email Logs on page 53

SMS Logs

The **SMS Logs** table displays information about SMS notifications sent to users who request network access. ExtremeCloud IQ creates SMS log entries for the following events:

- SMS notifications sent to visitors.
- User credentials approved by an administrator.

To filter the display, use the **Start**, **End**, and **Time** controls at the top of the page. You can also search for SMS messages sent to a specific phone number in the **Search** field above the table.

The table displays the following information:

- **Time Sent**: The time the SMS was sent.
- **Phone Number**: The text message phone number.
- **Status**: The SMS message transmission status.

Related Topics

Download SMS Logs on page 54

Download SMS Logs

Use this task to download SMS logs.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **LOGS** menu, select **SMS Logs**.
3. Select ⤓ **DOWNLOAD**.

Related Topics

SMS Logs on page 54

Enable SSH Availability

ExtremeCloud IQ provides a way to access devices remotely using the SSH protocol. Because best practices suggest that SSH access to internal devices be blocked from external access, ExtremeCloud IQ uses an SSH proxy server to mediate the end-to-end connection between an external device that manages files on your client device.

> Note
> Enabling SSH Availability potentially gives others direct access to your devices during the time that SSH access is available. While active, SSH Availability exposes your device to the public Internet through an SSH proxy, protected only by the device administrator credentials, because SSH FTP assumes that it is run over a secure channel.

Use this task to enable SSH Availability.

1. Mouse over 👤, and then select **Global Settings**.
2. From **Administration** menu, select **VIQ Management**.
3. Toggle the **SSH Availability** setting **ON**.

Navigate to **Manage > Devices > host_name > Additional Device Settings > SSH**, select the length of time during which you want to make SSH available, and then select **Enable SSH**. ExtremeCloud IQ then creates an SSH session for the specified length of time between the SSH proxy server and the external device.

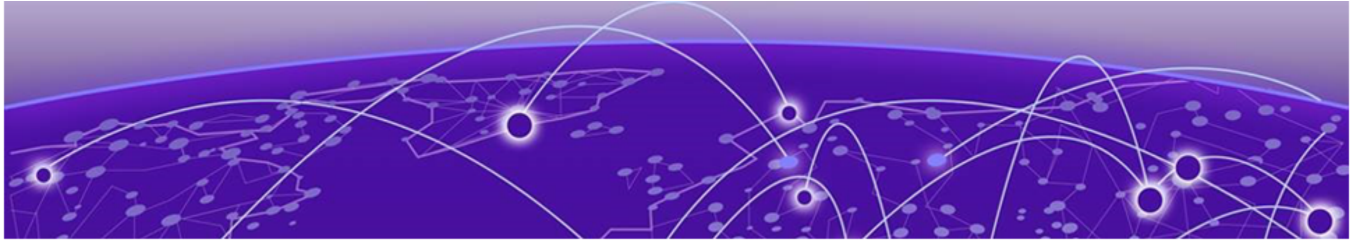
Enable Supplemental CLI

Use this task to enable supplemental CLI for ExtremeCloud IQ.

1. Mouse over 👤, and then select **Global Settings**.
2. From the **Administration** menu, select **VIQ Management**.
3. Toggle the **Supplemental CLI** setting **ON**.

Related Topics

Configure Supplemental CLI on page 233



Configure Users

After you complete **Onboarding**, your ExtremeCloud IQ system is ready for daily use.

Add users and assign them to user groups to manage which SSIDs they access, what their access limitations are, and how they access your network. Administrators and operators can configure user groups with limited access privileges for VIPs and non-employees such as guests, visitors, and contractors who request network access.

Create user groups for a selected network policy or for all network policies. Add users before you create user groups, or add them when you create the user group.

On the **Configure** > **User Management** > **Users** page, you can view, add, sort, select, modify, and delete user groups and user accounts.

> Note
> For existing user groups, some settings are not available to edit. This limitation prevents issues with creating passwords. To modify these settings, you must create a new user group.

You can also create and assign PPSK (Private Pre-Shared Key) users for use in private client groups.

For information about user profiles, see Add a User Profile on page 217.

Related Topics

Onboarding on page 18
Add a User Profile on page 217

Add a User

You must first create the user group to which you want to assign the user.

Use this task to add a new user and assign an existing user group.

Note
You cannot edit the user group for an existing user.

1. Go to **Configure** > **User Management** > **Users**.
2. Select + and then configure the settings.

   See User Settings on page 57.
3. Select **SAVE**.

Related Topics

User Settings on page 57

User Settings

Table 9: Settings for new user accounts

Setting	Description
Create account in user group	(Required) Select a user group from the menu.
Name	Type the name of the user. This name appears in messages sent to the email address in the **Deliver Password** section. The email message, which contains login credentials and wireless connection instructions, begins with **`Welcome`** <**`this_name`**>. Note: Required only if you select **Name** from the **User Name** menu.
Organization	Type the name of the organization for the user. For permanent users, leave this field empty.
Purpose of Visit	Type the purpose of the user's visit. For permanent users, leave this field empty.
Email Address	Type the user's email address. Note: Required only if you select **Name** from the **User Name** menu.

Table 9: Settings for new user accounts (continued)

Setting	Description
Phone Number	Type the user's phone number, and use the menu to set the international dialing code. Note: Required only if you select **Phone Number** from the **User Name** menu.
User Name	From the menu, select a field to use as the **User Name**. Choose from the following options: • **Name** • **Email Address** • **Phone Number** • **Other** If you select **Other**, type a user name for the account. Example: jsmith
Password	(Required) Type a password, or select **Generate** to automatically generate a password for the user. To see the password, select **Show Password**. Note: For either method, the password must conform to the password rules configured for the associated user group.
Description	(Optional) Type a description for the user account.
Deliver Password	Select a password delivery method: • **Email Address** Type the email address for the user in the corresponding field. The auto-populates if you already entered an email address. This option is available only if you previously selected **Email** in the **Delivery Settings** section of the user group configuration. • **Text Message** Type the cell phone number for the user in the corresponding field. This option is available only if you previously selected **Text Messages (SMS)** in the **Delivery Settings** section of the user group configuration.

Related Topics

Add a User on page 57

Add a User Group on page 59

Add a User to a User Group on page 65

Bulk Create Users

You must first create the user group to which you want to assign the users.

Use this task to bulk-create and add users to an existing user group.

1. Go to **Configure** > **User Management** > **Users**.
2. Select **Bulk Create** and configure the settings.

   See Bulk Create Settings on page 59.
3. Select **SAVE**

Related Topics

Bulk Create Settings on page 59

Add a User Group on page 59

Bulk Create Settings

Table 10: Settings for the bulk creation of users

Setting	Description
Create account in user group	Select a user group from the menu.
Username Prefix	Type a prefix for the user names. Bulk-created user names include this prefix for each user name, starting with 1. For instance, if the user name prefix is 1250, the first bulk-created user is 12501, the second user is 12502, and so on.
Number of Accounts	Type the number of users to add. Range: 1–1000
Email User Account info to	Type the email address to which you want ExtremeCloud IQ to send the user credentials.

Related Topics

Bulk Create Users on page 59

Bulk Add Users to a User Group on page 65

Add a User Group

You must first create the user group to which you want to assign the user.

ExtremeCloud IQ supports user groups for PPSK (Private Pre-Shared Key) users and RADIUS users. Configure PPSK user groups in the **User Groups** section of a Wireless Network (SSID). Configure RADIUS user groups in one of two places in ExtremeCloud IQ, depending on where you intend to store the RADIUS users:

- In the **User Groups** section of a Wireless Network (SSID) when you want to store them in the ExtremeCloud IQ Authentication Service cloud database.
- In **Configure** > **User Management** > **User Groups** > **Add** and then reference them in AAA server profiles that you apply to APs configured as RADIUS servers when you want to store users there. See About RADIUS Authentication on page 95.

Administrators and operators can configure ExtremeCloud IQ user groups with limited access privileges for VIPs and non-employees such as guests, visitors, and contractors who request network access.

Note
For existing user groups, some settings are not available to edit. This limitation prevents issues with creating passwords. To modify these settings, you must create a new user group.

Use this task to create user groups for a selected network policy or for all network policies.

1. Go to **Configure** > **User Management** > **User Groups**.
2. Select +, and then configure the settings.

   For a cloud-based user group, see Cloud User Group Settings on page 60.

   For a local user group, see Local User Group Settings on page 62.
3. Select **SAVE**.

Related Topics

About RADIUS Authentication on page 95

Cloud User Group Settings on page 60

Local User Group Settings on page 62

Cloud User Group Settings

When you configure a user group for an Enterprise 802.1X SSID, the password database always resides in the cloud. For a user group for a Private Pre-Shared Key (PPSK) SSID, the password database can reside in the cloud or on all SSID APs. The following settings are available when you configure a cloud-based user group.

Table 11: Settings for Cloud User Groups

Setting	Description
User Group Name	Type a name for the user group.
Password DB Location	Select **Cloud** for a cloud-resident password database.
Password Type	Select **PPSK** or **RADIUS**.
Description	Type an optional **Description** for the user group.
Enable CWP Register	Select **Enable CWP Register** to require users in this user group to log in using a captive web portal. Available only if a captive web portal is enabled for this SSID.
PCG Use	(Optional) Available only for the PPSK password type. Select **Enable use for Private Client Group**.
Password Settings	

Table 11: Settings for Cloud User Groups (continued)

Setting	Description
Generate Password Using	(Required) Select any combination of characters that you want to include in the password: **Letters**, **Numbers**, and **Special Characters**.
Enforce the use of	Select one of the password enforcement options from the menu: • **All selected character types** • **Any selected character types** • **Only one character type**
PSK Generation Method	Available only for the PPSK password type. Select **Password Only** or **User String Password** from the menu. With the **User String Password** option, you can include the user name and a string of characters in front of the generated Private PSKs. If the password generation method is **Password Only**, then the PPSK password can be between eight and 63 characters. If the generation method is **User + String + Password**, the maximum passphrase for the Private PSK can be between eight and 31 characters.
Generated Password Length	Select the length for automatically-generated passwords for this user group. Range: 8–63
Concatenating String	Available only for the **User String Password** PSK Generation Method. Range: 0–8 Use this string to generate PPSKs as User name + Character String + Password. For example, if you enter `Extreme`, as the string, then the generated PPSKs are **<User name>Extreme<Password>**.
Expiration Settings	

Table 11: Settings for Cloud User Groups (continued)

Setting	Description
Account Expiration	Select one of the options from the menu: - **Never Expire** - **Valid During Dates** Use the calendar and time controls to specify the **Start** and **End** dates and times. - **Valid For Time Period** Specify the time period for which the password is valid after **ID Creation** or **First Login**. Type the number of **hours**, **days**, or **weeks**. Select the unit of time and the **after**-condition from the menus. Optionally, select **Renew user credentials**. To delete credentials after a specific time period, select **Delete credentials after**, type a value, and then select the unit of time from the menu. - **Daily** Use the **Start** and **End** controls to specify the daily time period.
Action at Expiration	Not available for accounts set to never expire. Select **Access Rejected** to have ExtremeCloud IQ block users from renewing their credentials. Select **Show Expiration Message** to have ExtremeCloud IQ present to users an on-screen prompt that they can use to renew their credentials.
Delivery Settings	
Deliver Access Key by	Select the methods for delivery of the access key. Select one or both: - **Text Messages (SMS)** - **Email** Use the menus to select an email template for each method.

Related Topics

Add a User Group on page 59

Local User Group Settings

When you configure a user group for an Enterprise 802.1X SSID, the password database always resides in the cloud. For a user group for a Private Pre-Shared Key (PPSK) SSID, the password database can reside in the cloud or local on all SSID APs. The following settings are available when you configure a cloud-based user group.

Table 12: Settings for Local User Groups

Setting	Description
User Group Name	Type a name for the user group.
Password DB Location	Select **Local** to store login credentials on all APs using this SSID. You must select **Local** to create a private client group in this user group. See Classification Rules Overview.
Password Type	Select **PPSK** or **RADIUS**.
Description	Type an optional **Description** for the user group.
Set the maximum number of clients per private PSK	(Optional) Available only for the PPSK password type. Select **Set the maximum number of clients per private PSK** to set per-user PPSK limits for different users in the same wireless network (SSID). Because you can set per-user PPSK limits for different users in the same SSID, you no longer need to configure an SSID for each user group (for instance, with three devices per employee). You can set multiple per-user PPSK limits can be set in the same (SSID). Range: 0-15, 0 = no limit
PCG Use	(Optional) Available only for the PPSK password type. Select **Enable use for Private Client Group**.
PPSK Classification Use	(Optional) Available only for the PPSK password type. Select **Enable user for PPSK Classification only** to create a single SSID and distribute unique guest passwords for each location. Use this option with a **Private Pre-Shared Key** SSID Authentication network policy. See Configure Private Pre-Shared Key SSID Authentication on page 85 for more information.
Password Settings	
Generate Password Using	(Required) Select any combination of characters that you want to include in the password: **Letters**, **Numbers**, and **Special Characters**.
Enforce the use of	Select one of the password enforcement options from the menu: · **All selected character types** · **Any selected character types** · **Only one character type**

Table 12: Settings for Local User Groups (continued)

Setting	Description
PSK Generation Method	Available only for the PPSK password type. Select **Password Only** or **User String Password** from the menu. With the **User String Password** option, you can include the user name and a string of characters in front of the generated Private PSKs. If the password generation method is **Password Only**, then the PPSK password can be between eight and 63 characters. If the generation method is **User + String + Password**, the maximum passphrase for the Private PSK can be between eight and 31 characters.
Generated Password Length	Select the length for automatically-generated passwords for this user group. Range: 8–63
Concatenating String	Available only for the **User String Password** PSK Generation Method. Range: 0–8 Use this string to generate PPSKs as User name + Character String + Password. For example, if you enter `Extreme`, as the string, then the generated PPSKs are **<User name>Extreme<Password>**.
Expiration Settings	
Require Authentication After	To force re-authentication after a session is inactive for a period of time, select **Require Authentication After** and enter a time in the minutes field.
Account Expiration	Select an option from the menu: • **Never Expire** • **Valid During Dates** (Available only for PPSK.) Use the calendar and time controls to specify the **Start** and **End** dates and times.
Action at Expiration	Not available for accounts set to never expire. Select **Access Rejected** to have ExtremeCloud IQ block users from renewing their credentials. Select **Show Expiration Message** to have ExtremeCloud IQ present to users an on-screen prompt that they can use to renew their credentials.
Delivery Settings	
Deliver Access Key by	Select the methods for delivery of the access key. Select one or both: • **Text Messages (SMS)** • **Email** Use the menus to select an email template for each method.

Related Topics

Add a User Group on page 59

Add a User to a User Group

You must first create the associated user group.

Use this task to add a single user by editing an existing user group.

1. Go to **Configure** > **User Management** > **User Groups**
2. Select +, or select an existing user group, and then select ✎
3. Expand the **Add Users** section.
4. Select + and then configure the settings.

   See User Settings on page 57.
5. Select **DONE**.

Related Topics

User Settings on page 57

Bulk Add Users to a User Group

You must first create the user group to which you want to assign the users.

Use this task to bulk-add users to an existing user group, or while creating a new user group.

1. Go to **Configure** > **User Management** > **User Groups**
2. Expand the **Add Users** section.
3. Select **Bulk Create** and configure the settings.

   See Bulk Create Settings on page 59.
4. Select **DONE**.

   ExtremeCloud IQ saves your changes, creates the requested user accounts, and emails the bulk-created login credentials to the email addresses in the CSV file. The CSV file contains the SSID, user ID, user name, user group, access key, and expiration date for each bulk-created user.

If you are configuring a network policy, continue with that configuration.

Related Topics

Bulk Create Settings on page 59

Configure a Private Client Group

Create a Private Pre-shared Key (PPK) standard wireless network. Enable **Private Client Group Options** and configure the settings. See Configure Private Pre-Shared Key SSID Authentication on page 85.

After you enable Private Client Groups (PCGs), you can designate them as using one of two main operating modes:

- **AP-based** PCG uses unique user and shared keys. This mode supports common shared devices within personal network spaces. It also requires room assignments for AP anchoring and traffic tunneling.

- **Key-based** PCG requires one password used by the entire device group. Key-based PCG does not need room assignments, and no traffic tunneling is used on anchor-based APs.

> Note
> Each network policy can have only one AP-based PCG wireless network (SSID), one key-based PCG SSID, and any number of non-PCG SSIDs.

Use this task to configure a private client group for a PPK standard wireless network.

1. Go to **Configure** > **User ManagementPrivate Client Groups**.
2. Select a **Network Policy** from the menu.
3. Select **AP-Based Groups** or **Key-Based Groups** and configure the settings.
   a. Toggle the corresponding setting **ON** to enable the feature.
      - **Enable AP-Based Groups**
      - **Enable Key-Based Groups**

   b. (Optional) For AP-based groups, select **Distribute Shared Keys**.
4. Select + to add rooms for AP-based groups, or users for key-based groups.
5. Type a name for an AP-based group and then select users from the menus, or for key-based groups select a user from the menu.

   Alternately, for key-based groups, you can bulk add users by selecting **IMPORT** and uploading a CSV file.
6. Repeat steps 4–5 until you finish adding groups or users.
7. Select **SAVE CHANGES**.

Related Topics

Configure Private Pre-Shared Key SSID Authentication on page 85

Unlock Users

ExtremeCloud IQ authenticates PPSK clients against a large list of passwords. Users that repeatedly submit incorrect, deleted, or expired passwords can trigger a DoS attack. To prevent this, ExtremeCloud IQ temporarily puts the MAC address of a client device that repeatedly fails authentication 10 times in 7 minutes (default settings) into a sandbox and blocks future attempts for 30 minutes. For all authentication attempts, ExtremeCloud IQ first checks the client MAC address against the list of locked users in the sandbox.

Use this procedure to unlock users.

1. Go to **Configure** > **User Management** > **Locked Users**.
2. Select entries in the locked users list.
3. Select **Unlock**.

Perform a RADIUS Test

The RADIUS Test tool tests network connectivity between a device acting as a RADIUS authenticator (RADIUS client) and RADIUS authentication server, which can be an

Extreme Networks RADIUS server, or an external RADIUS authentication or accounting server.

Use this task to test the connectivity between a RADIUS authenticator and a RADIUS server.

1. Go to **Configure** > **User Management** > **RADIUS Test**.
2. Select the type of RADIUS server that you want to test.
   - To test connectivity to an Extreme Networks RADIUS server, choose **Select a Server (local RADIUS)**, and then select a RADIUS server from the drop-down list.
   - To test connectivity to an external RADIUS authentication or accounting server, select **Enter a Server (external RADIUS)**, and enter the IP address of the server in the field.
3. Select a managed device that is acting as a RADIUS authenticator (client) from the drop-down list.

   This is the device from which the **RADIUS Access-Request** or **Accounting-Request** message is sent.
4. Select either **RADIUS Authentication Server** or **RADIUS Accounting Server**.

   If you select an authentication server, you must also enter supplicant credentials (a user name or barcode, and a password or PIN) for a valid user account on the RADIUS authentication server. You can also enter a user name and password that do not match an account on the RADIUS server.
5. Select **Test**.

Results appear under **Test Result**. A successful test result is shown below.

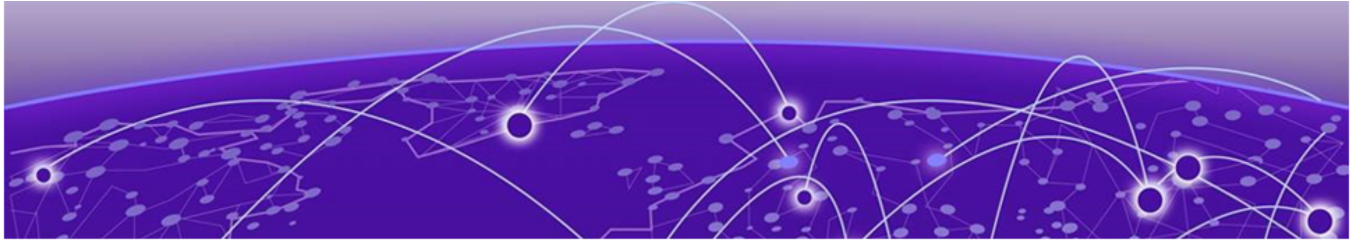
```
RADIUS server is reachable. Get attributes from RADIUS server: User-
Group-ID:0=13; VLAN-ID:1=1; Session-Timeout=1800
```

Unbind a Device

Use this task to unbind a cloud-based PPSK from a client device to free up that key or device. You can unbind the client MAC address, the PPSK, or both.

1. Go to **Configure** > **User Management** > **Unbind Device**.
2. Select the method for unbinding from the drop-down list.

   Choose **MAC address**, **PPSK**, or **MAC address and PPSK**.
3. Enter the MAC address, the PPSK, or both.
4. Select **Unbind**.



Configure Network Policies

A network policy is a combination of configuration settings that can be applied to multiple APs, switches, and routers that share a common characteristic, such as being located at the same site or working together to connect multiple remote sites through VPN tunnels. The type of network policy depends on whether your deployment consists of only wireless AP devices, only switches, only routers, or any combination of these devices. One of the strengths of creating a single policy for multiple device types is that you might only need one unified policy for all your devices. The policy can include one or more SSIDs, device templates, and port types, as well as other configuration elements for networking, including management services such as QoS and VPN tunneling. The policy items are as follows:

- **Policy Details**: Select the policy type: **Wireless** (APs), **Switching** (Universal switches), **SR/Dell Switching** (Legacy switches), **Branch Routing**, or any combination of these. See Configure Policy Settings on page 70.
- Standard Wireless Networks: Define the wireless network (SSID) and the bands on which to broadcast each SSID, plus SSID usage (authentication, including RADIUS configuration), user access, and additional settings.
- Device Templates: Configure Access Point and Switch device templates.
- Router Settings: Define wired or wired and wireless router templates, assign port usage settings, and specify authentication.
- Deploy Policy: Push the configuration to your network devices.

Related Topics

Add a Network Policy on page 69
Configure Policy Settings on page 70
Configure the SSID for a Standard Wireless Network on page 79
Configure a RADIUS Server Group on page 96
Configure Device Templates on page 120
About Router Settings on page 128
Deploy a Network Policy on page 78

Add a Network Policy

This topic guides you through the basic steps to provide clients with network access via Extreme Networks devices. This process assumes that APs and routers have been deployed and have established secure CAPWAP connections with ExtremeCloud IQ. Switches do not use CAPWAP connections. Extreme Networks routers and APs run IQ Engine and communicate with ExtremeCloud IQ using CAPWAP on UDP port 12222 or CAPWAP-over-HTTP on TCP port 80. This is true whether they communicate with ExtremeCloud IQ on premises or in the cloud. Other supported devices communicate with ExtremeCloud IQ using HTTPS on TCP port 443.

The network policy configuration process is defined by sequential workflow tabs at the top of the page. Depending on where you are in the process, the related tab appears blue. These tabs are 1 Policy Details, 2 Wireless, 3 Switching, 4 SR/Dell Switching, 5 Branch Routing, and 6 Deploy Policy.

Use this task to add a new network policy.

1. Go to **Configure** > **Network Policies**.

   Network policies appear in a list (☰) or in a thumbnail (⊞) format.

2. Select + from the list view, or select **Add Network Policy** from the thumbnail view.
3. In the **New Policy** window, select a policy type: (Wireless, Switching/Routing, SR/Dell Switching, Branch Routing, or any combination, including all them).
4. Type a **Policy Name**.
5. (Optional) Type a **Description**.
6. Enable or disable **Presence Analytics**.

   Enable this option to collect customer behavior data. After you enable it, go to the **2 Wireless** workflow step, and from the left navigation bar, under **Application Management**, select **Presence Analytics**. This is where you configure analytics settings, such as trap interval, aging time, and aggregate time.

7. Select **SAVE**.
8. Configure Policy Settings on page 70, as required.
9. Select **NEXT**.

   The highlighted tab changes from **1 Policy Details** to **2 Wireless**, **3 Switching/ Routing**, **4 SR/Dell Switching**, **5 Branch Routing** and **6 Deploy Policy**, depending on your configuration choices.

After you have configured the network policy, Deploy a Network Policy on page 78.

Related Topics

Configure Policy Settings on page 70
Configure the SSID for a Standard Wireless Network on page 79
Configure Device Templates on page 120
Deploy a Network Policy on page 78

Configure Policy Settings

The network policy settings that you configure depend on your requirements. For example, determine which default routing instance to use for NTP, DNS, Syslog, and SNMP for a switch.

This task is part of the network policy configuration workflow. Use this task to configure policy settings.

1. Go to **Configure** > **Network Policies**
2. Select an existing network policy, and then select ✏, or select + to create a new policy.
3. Configure the **Policy Settings**.
   a. Configure DNS Server Policy Settings on page 71. (Switches only)
   b. Configure NTP Server Policy Settings on page 71. (Switches only)
   c. Configure SNMP Server Policy Settings on page 72. (Switches only)
   d. Configure Syslog Server Policy Settings on page 73. (Switches only)
   e. Configure Device Credentials Policy Settings on page 74.
   f. Configure the Device Time Zone on page 74.
   g. Configure HIVE Policy Settings on page 75.
   h. Configure Management and Native VLAN Policy Settings on page 75.
   i. Configure IP Tracking Policy Settings on page 76.
   j. Configure LLDP/CDP Policy Settings on page 76. (Switches only)

   Note
   To configure LLDP port configurations on SR22XX, 23XX, VOSS, and EXOS devices, go to the device template or device configuration page. Configuring LLDP from this page can affect APs, XR, and 20XX/21XX switches, along with certain EXOS, VOSS, SR22XX, and 23XX Global LLDP parameters.

4. Configure the **Management Settings**.
   a. Configure Management Options on page 77.
   b. Configure Traffic Filters Policy Settings on page 77.
   c. Configure MGT IP Filter Policy Settings on page 78.
5. Select **SAVE**.
6. Select **Policy**, and then select **NEXT**.

Related Topics

Configure Classification Rules for a Device Template on page 120

Configure DNS Server Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **DNS Server Policy Settings** for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Policy Settings** menu, select **DNS Server**.
4. Toggle the **DNS Server** setting to **ON**.
5. (Optional) To use existing DNS server settings, choose a DNS object from the ☰ menu.
6. Configure the DNS Server Settings on page 253.
7. To add a new DNS server, select +.
   1. Type the IP address of the new DNS server.
   2. Select **ADD**.

   You can add up to three servers. The first entry is the primary server. The secondary entry is the secondary server, and the third entry is the tertiary server. Use the arrows in the **Order** column to change the order.
8. If you want to use classification, select **Apply DNS servers to devices via classification**.
9. Select **SAVE DNS SERVER**.

Related Topics

DNS Server Settings on page 253

Configure Policy Settings on page 70

Configure NTP Server Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **NTP Server** policy settings for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Policy Settings** menu, select **NTP Server**.
4. Toggle the **NTP Server** setting to **ON**.
5. (Optional) To use existing NTP server settings, choose an NTP object from the ☰ menu.
6. Configure NTP Server Settings on page 254.
7. To add a new NTP server to the list, select +.
   1. To use an existing NTP server, select it from the ☰ menu.
   2. To add a new NTP server, select +, and then select **IP Address** or **Host Name**.
   3. Type a **Name** for the new IP object.

   d. (Optional) If you want to change your previous selection, select **IP Address** or **Host Name** from the menu.
   e. Select **SAVE IP OBJECT**.
   f. Select **ADD**.

   ExtremeCloud IQ accesses NTP servers in order, from the top down. Use the up and down arrows to rearrange them if necessary.

8. If you want to use classification, select **Apply NTP servers to devices via classification**.
9. Select **SAVE NTP SERVER**.

Related Topics

NTP Server Settings on page 254

Configure Policy Settings on page 70

Configure SNMP Server Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **SNMP Server Policy Settings** for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Policy Settings** menu, select **SNMP Server**.
4. Toggle the **SNMP Server** setting to **ON**.
5. (Optional) To use existing SNMP server settings, choose an SNMP server from the ☰ menu.
6. Configure the SNMP Server Settings on page 255.
7. To add a new SNMP server, select +, and then select **IP Address** or **Host Name**.

   You can add up to three SNMP servers to the profile.
8. To use an existing SNMP server, select it from the menu.
9. Type a **Name** for the new IP object.
10. (Optional) If you want to change your previous selection, select **IP Address** or **Host Name** from the menu.
11. Select **SAVE IP OBJECT**.
12. Select the version of SNMP that is running on the management station you intend to use from the **Version** menu.

13. From the **Operation** menu, select the type of activity to permit between the specified SNMP management station and the devices in the network policy that are assigned to this profile.
    - **None**: Disable all SNMP activity for the specified management station.
    - **Get**: Permit GET commands sent from the management station to a device to retrieve MIBs.
    - **Get and Trap**: Permit the reception of GET commands from the management station and the transmission of traps to the management station.
    - **Trap**: Permit devices to send messages notifying the management system of events of interest.
14. In the **Community** field (for SNMP V2C and V1), enter a text string that must accompany queries from the management station.

    The community string acts similarly to a password, such that devices only accept queries from management stations that send the correct community string.
15. Select **ADD SNMP SERVER**.
16. If you want to use classification, select **Apply SNMP servers to devices via classification**.
17. Select **SAVE SNMP SERVER**.

Related Topics

SNMP Server Settings on page 255

Configure Policy Settings on page 70

Configure Syslog Server Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **Syslog Server Policy Settings** for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Policy Settings** menu, select **Syslog Server**.
4. Toggle the **Syslog Server** setting to **ON**.
5. (Optional) To use existing syslog server settings, choose a syslog server from the ☰ menu.
6. Configure the Syslog Server Settings on page 258.
7. To add a new syslog server to the table, select +.

   Use the up or down arrows to reorder the list of syslog servers in the table.
8. Select an existing syslog IP Address or host name from the ☰ menu, or select +.
9. For **Severity**, select the log level.
10. Type the **Port** number.
11. Select **ADD**.
12. (Optional) Select **Assign Syslog servers via Classification**.
13. Select **SAVE SYSLOG SERVER**.

Related Topics

Syslog Server Settings on page 258

Configure Policy Settings on page 70

Configure Device Credentials Policy Settings

ExtremeCloud IQ uses device credentials for remote access to devices through Telnet, SSH, or console connections. If you do not configure the Administrator and Read Only Administrator accounts, global device management settings apply.

> Note
> If you configure a new administrator account, the new account replaces the default account.

This task is part of the network policy configuration workflow. Use this task to configure **NTP Server Policy Settings** for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✏, or select + to create a new policy.
3. From the **Policy Settings** menu, select **Device Credentials**.
4. Configure the following settings:

Table 13: Device Credentials

Setting	Description
Administrator Account	
Admin Name	Type the name of the **Administrator** account.
Password	Type the password for the **Administrator** account.
Show Password	Select the check box to show the password.
Read Only Administrator	
Admin Name	Type the name of the **Read Only Administrator** account.
Password	Type the password for the **Read Only Administrator** account.
Show Password	Select the check box to show the password.

5. Select **SAVE**.

Related Topics

Configure Policy Settings on page 70

Configure the Device Time Zone

This task is part of the network policy configuration workflow. Use this task to configure **Device Time Zone** for a network policy.

1. Go to **Configure** > **Network Policies**.

2. Select an existing network policy, and then select ✏, or select + to create a new policy.
3. From the **Policy Settings** menu, select **Device Time Zone**.
4. From the **Time Zone** menu, select a time zone.
5. If you want to use classification, select the **Apply time zone to devices via classification** check box.
6. Select **SAVE**.

Related Topics

Configure Policy Settings on page 70

Configure HIVE Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **HIVE** policy settings for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✏, or select + to create a new policy.
3. From the **Policy Settings** menu, select **HIVE**.
4. (Optional) To use existing HIVE settings, choose a HIVE object from the ☰ menu.
5. Configure the HIVE Profile Settings on page 162.
6. Apply MAC filters to restrict devices that can join the hive.

   You can select existing filters from the table, or add new filters.
7. From the menu, choose the default action (**Permit** or **Deny**) for devices that have a MAC address or OUI that does not match the selected MAC filter.
8. Select **SAVE**.

Related Topics

Configure Policy Settings on page 70

HIVE Profile Settings on page 162

Configure Management and Native VLAN Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **Management and Native VLAN** policy settings for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✏, or select + to create a new policy.
3. From the **Policy Settings** menu, select **Management and Native VLAN**.
4. Select an **MGT Interface VLAN** from the ☰ menu, or select +.
5. For a new **MGT Interface VLAN**, configure the settings.
   a. Type a **Name** for the new VLAN object.
   b. Type a **VLAN ID** for the new VLAN object.

   c. If you want to use classification, select **Apply VLANs to devices using classification**.

      See Configure Classification Rules on page 158.

6. Select an **Native (Untagged) VLAN***For IQ Engine devices only* from the ☰ menu, or select +.
7. For a new **Native (Untagged) VLAN**, configure the settings.
   a. Type a **Name** for the new VLAN object.
   b. Type a **VLAN ID** for the new VLAN object.
   c. If you want to use classification, select **Apply VLANs to devices using classification**.

      See Configure Classification Rules on page 158.
8. Select **SAVE VLAN**.

Related Topics

Configure Classification Rules on page 158

Configure Policy Settings on page 70

Configure IP Tracking Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **IP Tracking** policy settings for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Policy Settings** menu, select **IP Tracking**.
4. Toggle the **IP Tracking** setting to **ON**.
5. Select a tracking group and use the single-arrow controls to move it from **Available IP Tracking Groups** to **Selected IP Tracking Groups**, or vice versa.

   Use the double-arrow controls to move all of the tracking groups.
6. To add a new IP tracking group, select **ADD ANOTHER IP TRACKING GROUP**, and then configure the IP Tracking Group Settings on page 264.
7. Select **SAVE**.

Related Topics

IP Tracking Group Settings on page 264

Configure Policy Settings on page 70

Configure LLDP/CDP Policy Settings

This task is part of the network policy configuration workflow. Use this task to configure **LLDP/CDP** policy settings for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.

3. From the **Policy Settings** menu, select **LLDP/CDP**.
4. Toggle the **LLDP/CDP** setting to **ON**.
5. (Optional) To use existing LLDP/CDP settings, choose an LLDP/CDP object from the ☰ menu.
6. Configure the LLDP and CDP Settings on page 262.
7. Select **SAVE**.

Related Topics

LLDP and CDP Settings on page 262

Configure Policy Settings on page 70

Configure Management Options

After you enable **Management Options** in the network policy, you can re-use an existing **Management Options** object, or configure the settings manually.

This task is part of the network policy configuration workflow. Use this task to configure **Management Options** for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Management Settings** menu, select **Management Options**.
4. Toggle the **Management Options** setting to **ON**.
5. To reuse existing management options settings, select **Re-use MGT IP Filter**, and then select an existing **Management Option**.
6. Enter a **Name**.
7. (Optional) Enter a **Description**.

   Although optional, entering a description is helpful for troubleshooting and for identifying the **Management Options** object.
8. Configure the settings for Management Options on page 274.
9. Select **SAVE**.

Related Topics

Management Options on page 274

Configure Policy Settings on page 70

Configure Traffic Filters Policy Settings

After you enable **Traffic Filter** in the network policy, you can re-use an existing Traffic Filter object, or configure the settings manually.

This task is part of the network policy configuration workflow. Use this task to configure **Traffic Filter** policy settings for a network policy.

1. Go to **Configure** > **Network Policies**.

2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Management Settings** menu, select **Traffic Filter**.
4. Toggle the **Traffic Filter** setting to **ON**, and configure the settings.
5. (Optional) To use an existing filter, select **Re-use Traffic Filter Settings** and then select an existing filter from the ☰ menu.
6. Configure the Traffic Filter Settings on page 239.
7. Select **SAVE**.

Related Topics

Traffic Filter Settings on page 239

Configure Policy Settings on page 70

Configure MGT IP Filter Policy Settings

After you enable MGT IP Filter in the network policy, you can reuse an existing MGT IP Filter object, or configure the settings manually.

This task is part of the network policy configuration workflow. Use this task to configure **MGT IP Filter** policy settings for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select + to create a new policy.
3. From the **Management Settings** menu, select **MGT IP Filter**.
4. Toggle the **MGT IP Filter** setting to **ON**.
5. To use an existing filter, select **Re-use MGT IP Filter** and then select an existing filter.
6. Configure the MGT IP Filter Settings on page 237.
7. To add a new IP Object, select **Add Another IP Object**, configure the settings, and then select **SAVE SUBNET**.

   See Table 33 on page 238.
8. Select **SAVE MGT IP FILTER**.

Related Topics

MGT IP Filter Settings on page 237

Configure Policy Settings on page 70

Deploy a Network Policy

When you create a new network policy or make changes to an existing policy, the final step is to push the policy to the devices. ExtremeCloud IQ pushes all configuration uploads as complete uploads. This requires devices to reboot and activate the new configurations. Network policies can only be pushed to real devices (not simulated devices).

This task is part of the network policy configuration workflow. Use this task to deploy a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎, or select +.
3. After you configure the network policy, select the devices to which you want to upload the policy.
   - To automatically select the check boxes for all of the devices, select the check box in the top left of the table header.
   - To upload your network policy to specific devices only, select the corresponding check boxes for those devices.

     Use the **Assigned**, **Eligible**, and **Filtered** controls to customize your view of the devices that appear in the table.
4. Select **UPLOAD**.
5. In the **Device Update** window, select the type of update (**Delta** or **Complete**), whether to update IQ Engine and Extreme Networks switch images, and the activation times for the updated devices.
6. Select **Enable Distributed Image Upgrade** when WAN speed and traffic usage are concerns.

   When ExtremeCloud IQ updates the IQ Engine firmware for multiple, same-model APs, it can send the first upgrade to one device and enable the other devices using the same firmware to get their image from that first updated (seed) device.
7. Select **PERFORM UPDATE**.

Related Topics

Configure Network Policies on page 68

Configure the SSID for a Standard Wireless Network

A network policy can include one or more wireless networks, commonly referred to as SSIDs. A wireless network SSID is an alphanumeric string that identifies a wireless network, including the set of authentication and encryption services that wireless clients and access point devices use to communicate with each other over the network.

This task is part of the network policy configuration workflow. Use this task to configure an SSID for a a standard wireless network.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy, and then select ✎, or select +.
3. Select **2 Wireless**.
4. (Optional) Select **Assign SSIDs using Classification Rules**.

   a. To add a classification rule, select ⊞.

   b. To specify an existing classification rule, select ⇱.

For more information, see Configure Classification Rules on page 158

> Note
>
> If you have more than 16 SSIDs, the check box appears dimmed. To enable the check box, reduce the number of SSIDs to fewer than 16.

5. Select an existing SSID from the ☰ menu, or select +.
6. Type a **Name** for the wireless network SSID.

   ExtremeCloud IQ and IQ Engine use this name to group all the settings related to this wireless network, such as required and optional data rates, DoS policies, MAC filters, and the broadcast SSID.
7. Type a **Broadcast Name** for this wireless network, or accept the one automatically derived from the SSID name.

   Clients discover this broadcast name from beacons and probe responses.
8. Select SSID radio broadcast bands:
   - **Wi-Fi 0 Radio (2.4 GHz or 5 GHz)**: Broadcast the SSID based on the configuration of the Wi-Fi 0 radio.
   - **Wi-Fi 1 Radio (5 GHz only)**: Broadcast the SSID on the Wi-Fi 1 radio operating in the 5 GHz band. Most Extreme Networks devices have two radios: radio 1 is bound to Wi-Fi 0 and radio 2 is bound to Wi-Fi 1. Radio 1 generally operates in the 2.4 GHz band but can also operate in the 5 GHz band on some models. Radio 2 operates in the 5 GHz band.

     > Note
     >
     > Mapping an SSID to both radio types is a good approach if the devices need to work with some wireless clients that only support 802.11n/b/g, and others that only support 802.11ac/n/a/ac/x. In this case, both Wi-Fi 0 and Wi-Fi 1 must be in access mode or dual mode. If hive members need to support wireless backhaul communications with each other and you want both interfaces to provide client access, then one of the wireless interfaces must be able to provide both access and backhaul links.

   - **Wi-Fi 2 Radio (6 GHz only)**: This option currently supports only Enterprise WPA3, Personal WPA3, and Open Enhanced. After you select this check box, a message reminds you that WiFi2 supports only 6Ghz band for client access. The configuration menu shows only options applicable to 6Ghz.
9. Select an SSID Authentication method and configure the settings.
   - Select **Enterprise WPA/WPA2/WPA3** to require users to authenticate by entering a user name and password, and validating against a RADIUS server. Only WPA3 is supported for 6 GHz devices. See Configure Enterprise SSID Authentication on page 83.
   - Select **Personal WPA/WPA2/WPA3** to require users to enter a shared PPSK to authenticate. Only Personal WPA3 is supported for 6 GHz devices. See Configure Personal SSID Authentication on page 84.
   - Select **Private Pre-Shared Key** to require users to authenticate by entering a PPSK unique to each user (not available for 6 GHz). See Configure Private Pre-Shared Key SSID Authentication on page 85.

- Select **Open** (not available for 6 GHz) or **Enhanced Open** so users do not use any form of authentication, but can be directed to a captive web portal before they can access other network resources.
- Select **Enhanced Open** (available only for 6 GHz devices) to provide improved data privacy in open Wi-Fi networks, such as Wifi hotspots and guest WLANs.

> Note
> The WEP protocol is no longer effective for securing wireless networks. For security reasons, WEP configuration is no longer available in the UI. If you require WEP for business continuity purposes, you can enable it via Supplemental CLI.

10. If you intend to use MAC Authentication, see Configure MAC Authentication on page 87.
11. To create a captive web portal for open authentication, see:
    - Customize and Preview Cloud-based Captive Portal Settings on page 89
    - Customize and Preview Device-based Captive Web Portal Settings on page 90
    - Import Captive Web Portal HTML Files on page 94
12. If you intend to authenticate via RADIUS servers, either select an existing **Default RADIUS Server Group** from the current list or select the plus sign to add a new group.

    See Configure RADIUS Server Settings on page 97 to add a wireless network (SSID)-specific RADIUS object. See Configure an External RADIUS Server on page 98 to add an external RADIUS common object.

    To use classification, select **Apply RADIUS server groups to devices via classification**.
13. If you intend to authenticate via user groups (Enterprise only), turn on **Authentication with ExtremeCloud IQ Authentication Service**.
14. Either select an existing User group from the current list or select + to Add a User Group on page 59.
15. Use the existing **Default User Profile**, select a profile from the list, or select + to Add a User Profile on page 217.
16. (Optional) Under **User Access Settings**, select the **Apply a different user profile to various clients and user groups** check box.

    See Apply Different User Profiles to Clients and User Groups on page 107.
17. To customize the **SSID Availability Schedule**, select the **Restrict the availability of this SSID to selected schedules** check box to enable SSID schedules.
18. Select **Customize**.

    To create a new schedule, see Configure an Availability Schedule on page 187.
19. To customize **Advanced Access Security Controls**, see Customize Advanced Access Security Settings on page 108.
20. To customize **Optional Settings** (not available for 6 GHz), see Customize Wireless Network Optional Settings on page 111.
21. Toggle **Client Monitor ON** (default) to enable a device to detect client issues, and report client connection activities and problems to ExtremeCloud IQ.

22.Select **SAVE**.

Continue configuring the network policy.

Related Topics

Configure Classification Rules for a Device Template on page 120
Configure Enterprise SSID Authentication on page 83
Configure Personal SSID Authentication on page 84
Configure Private Pre-Shared Key SSID Authentication on page 85
Customize and Preview Device-based Captive Web Portal Settings on page 90
Import Captive Web Portal HTML Files on page 94
Configure MAC Authentication on page 87
Configure RADIUS Server Settings on page 97
Configure an External RADIUS Server on page 98
Add a User Group on page 59
Add a User Profile on page 217
Apply Different User Profiles to Clients and User Groups on page 107
Configure an Availability Schedule on page 187
Customize Advanced Access Security Settings on page 108
Customize Wireless Network Optional Settings on page 111
Configure the SSID for a Standard Wireless Network on page 79

About SSIDs

An SSID is an alphanumeric string that identifies a wireless or guest network. For information about adding wireless networks, see Configure the SSID for a Standard Wireless Network on page 79.

The SSID table displays the following information about your network SSIDs:

- **SSID Name**: The name assigned to an SSID when it was created. This is the name that APs advertise in beacons (unless the SSID is in stealth mode) and respond to during client probes.
- **SSID Broadcast Name**: This name can be the same as the SSID Name.
- **Access Security**: The method that the SSID uses to secure network access.
- **VLAN**: The VLAN to which this SSID is assigned.
- **Default User Profile**: The user profile that is assigned to this SSID.
- **Used By**: Displays the number of APs and network policies that use this SSID. Hover over any non-zero number to see details.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

About SSID Usage in Standard Wireless Networks

As part of configuring a standard wireless network, you must determine how authentication takes place. You can choose SSID authentication or MAC authentication. MAC Authentication is typically used to support legacy clients.

Note
Client mode radios use only PSK or Open SSID authentication.

SSID Authentication

SSID Authentication offers the following types of access security methods:

- **Enterprise WPA/WPA2/WPA3** requires users to authenticate by entering a user name and password, validated against a RADIUS server. Only WPA3 is supported for 6 GHz devices. See Configure Enterprise SSID Authentication on page 83.
- **Personal WPA/WPA2/WPA3** requires users to enter a shared PPSK to authenticate. Only Personal WPA3 is supported for 6 GHz devices. See Configure Personal SSID Authentication on page 84.
- **Private Pre-Shared Key** requires users to authenticate by entering a PPSK unique to each user (not available for 6 GHz). See Configure Private Pre-Shared Key SSID Authentication on page 85.
- **OPEN** (not available for 6 GHz) or **Enhanced Open** does not require users to use any form of authentication, but can direct them to a captive web portal before they are allowed to access other network resources. **Enhanced Open** is available only for 6 GHz devices.

MAC Authentication

In Extreme Networks, MAC authentication works by checking a client MAC address against a RADIUS server. The RADIUS server, or an external database with which the RADIUS server communicates, must have an entry with the client MAC address as both user name and password. If the client MAC address matches the entry, it is authenticated, and the AP allows it to access the network as determined by the user profile.

MAC authentication can provide an additional or sole means of authentication. If an SSID employs MAC authentication with another type of access control—PPSK or a captive web portal—MAC authentication occurs first. If it is successful, the AP continues with the rest of the authentication procedure. Otherwise, the authentication process stops, the AP denies network access to the client, and the AP disassociates the client. If you enable MAC authentication and use an open SSID, then MAC authentication becomes the sole means of access control. See Configure MAC Authentication on page 87.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

Configure Enterprise SSID Authentication

First, create a standard wireless network policy. For more information, see Configure the SSID for a Standard Wireless Network on page 79.

This task is part of the network policy configuration workflow. Use this task to configure the **SSID AUTHENTICATION** options for Enterprise SSID authentication.

1. On the **2 Wireless** page for the policy, select **Enterprise**.

   This option requires users to authenticate by entering a user name and password, which the system checks against a RADIUS authentication server.
2. Select the required **Key Management** from the menu, or keep the default value.

   Key Management options:

   - **WPA3-802.1X** uses 192-bit encryption, and simultaneous authentication of equals (SAE) instead of PSK exchanges. If all wireless clients support WPA3, it is a better choice than WPA2.
   - **WPA2-802.1X** supports PMK caching and preauthentication (WPA does not). If the wireless clients support WPA2, it is the better choice over WPA, and is the default.
   - **WPA-802.1X** does not support PMK caching or preauthentication. However, if you know that all the clients that are going to use this SSID were released before IEEE 802.11i was ratified in 2004 and only support WPA (not WPA2), this option allows the Extreme Networks devices to support them.

   The **Encryption Method** is **CCMP (AES)**. Counter Mode-Cipher Block Chaining Message Authentication Code Protocol (CCMP) uses AES (Advanced Encryption Standard) encryption. CCMP provides message integrity by combining counter mode with CBC (cipher block chaining) to produce a MAC (message authentication code).
3. Select **SAVE**.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

Configure Personal SSID Authentication

First, create a standard wireless network policy. For more information, see Configure the SSID for a Standard Wireless Network on page 79.

This task is part of the network policy configuration workflow. Use this task to configure the **SSID AUTHENTICATION** options for Personal SSID authentication.

1. On the **2 Wireless** page for the policy, select **Personal** SSID Authentication.

   This option requires all users to authenticate by entering the same pre-shared key.

2. Choose one of the following **Key Management** options:
    - Select **WPA3 (SAE)** to negotiate using WPA3 with clients. If all the wireless clients support WPA3, it is a better choice than WPA2.
    - Select **WPA2-(WPA2 Personal)-PSK** to use WPA2 for key management. WPA2 supports PMK caching and pre-authentication, whereas WPA does not.
    - Select **WPA-PSK** to use WPA for key management. WPA does not support PMK caching or pre-authentication, but if the clients were released before IEEE 802.11i was ratified and they support WPA (not WPA2), this option allows the Extreme Networks devices to support them.

    The **Encryption Method** for WPA3 and WPA2 is **CCMP (AES)**. Counter Mode-Cipher Block Chaining Message Authentication Code Protocol (CCMP) uses AES (Advanced Encryption Standard) encryption. CCMP provides message integrity by combining counter mode with CBC (cipher block chaining) to produce a MAC (message authentication code).

    > Note
    > When the SSID is configured for WPA3 (SAE), the encryption method is always set to 128-bit encryption.

    The **Encryption Method** for WPA-PSK is **TKIP**. Temporal Key Integrity Protocol (TKIP), uses RC4 as its cipher and provides a rekeying mechanism. TKIP ensures that every data packet is sent with a unique encryption key, which is a combination of an Interim Key/Temporal Key and a Packet Sequence Counter. TKIP provides more secure encryption than Wired Equivalent Privacy (WEP), and works on older or legacy WEP hardware with minor upgrades.

    > Note
    > ExtremeCloud IQ supports TKIP only for AP3000, AP3000X, AP4000, AP4000U, AP5010, AP5010U, AP5050D, AP5050U models.

3. For **Key Value**, enter the pre-shared key and **Confirm** it.

    The **Key Type**is **ASCII Key**.
4. (Optional) To show the **Key Value**, select **Show Password**.
5. Select **SAVE**.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

Configure Private Pre-Shared Key SSID Authentication

First, create a standard wireless network policy. For more information, see Configure the SSID for a Standard Wireless Network on page 79.

A PPSK is a unique pre-shared key assigned to a user rather than to an SSID. With this approach, you can assign different PPSKs and user profiles to different users on the same SSID. If a user is no longer permitted to use the WLAN or a wireless client becomes lost, stolen, or compromised, you can revoke just that user's PPSK without having to reconfigure the PPSKs on all the other clients.

Note
ExtremeCloud IQ Connect does not support Private Pre-Shared Keys.

This task is part of the network policy configuration workflow. Use this task to configure Private Pre-Shared Key SSID authentication options.

1. On the **2 Wireless** page for the policy, under **SSID Usage**, select **Private Pre-Shared Key**.

   Private Pre-Shared Key SSID authentication uses WPA2-(WPA2 Personal)-PSK for **Key Management**.

   The **Encryption Method** for WPA2-(WPA2 Personal)-PSK is **CCMP (AES)**. Counter Mode-Cipher Block Chaining Message Authentication Code Protocol (CCMP) uses AES (Advanced Encryption Standard) encryption. CCMP provides message integrity by combining counter mode with CBC (cipher block chaining) to produce a MAC (message authentication code).
2. Select **Set the maximum number of clients per private PSK**, and then type the maximum number of simultaneous clients allowed for each PPSK user. (Range: 1 through 15, or type 0 for an unlimited number.)

   Note
   Setting the maximum number of clients per PPSK in the user group to a custom (non-zero) value overrides this setting in the SSID.
3. Select **MAC binding**, and then select an Extreme Networks AP from the menu to define it as a PPSK server.

   When you enable this option, an Extreme Networks AP functions as a PPSK server and automatically binds MAC addresses to PPSKs. When the first client authenticates with a PPSK, the PPSK server creates an internal MAC address-to-PPSK binding list for it. If a second client authenticates with the same PPSK, the server automatically binds its MAC address to the PPSK and adds it to the list—if allowed by the configuration. You can configure a PPSK server to bind up to five MAC addresses to one PPSK so users can submit the same PPSK for all their smart phones, tablets, PCs, and other clients.

   Note
   Only APs that you previously configured with static network settings appear in the PPSK server list.

   A PPSK server stores PPSK users, binds multiple client MAC addresses to a PPSK, and automatically updates and tracks PPSK-to-MAC address bindings. The AP must be at the site location defined in the network policy. Extreme Networks APs (PPSK authenticators) at the same site contact this server when checking and requesting a user-submitted PPSK binding to the client MAC address.
4. To configure **Private Client Group Options**, see Configure Private Client Group Options on page 87.

5. Select **PPSK Classification Options** to use this network policy with associated local user groups.

   See Add a User Group on page 59 for more information.

Related Topics

Configure Private Client Group Options on page 87

Add a User Group on page 59

Configure the SSID for a Standard Wireless Network on page 79

Configure Private Client Group Options

First, Configure Private Pre-Shared Key SSID Authentication on page 85.

This task is part of the network policy configuration workflow. Use this task to to configure the options for Private Client Groups.

1. On the **2 Wireless** page for the policy, under **SSID Usage**, select **Private Pre-Shared Key**.
2. Select **Private Group Options**.
3. Select **AP-Based** or **Key-Based**.

   AP-Based PCG mode requires a unique user and shared keys. This mode supports common shared devices within personal network spaces. It also requires room assignments for AP anchoring and traffic tunneling.

   Key-Based PCG requires one password used by the entire device group. Key-based PCG does not require room assignments for AP anchoring and traffic tunneling.
4. If you selected **Key-Based**, select the following **Private Client Groups Traffic Filtering** options as required.
   - **Enable Broadcast Filtering**: When selected, broadcast frames are not propagated beyond the current PCG domain.
   - **Enable Multicast Filtering**: When selected, multicast frames are not propagated beyond the current PCG domain.
     - **Enable MDNS** (multicast DNS) Filtering—When applied, multicast DNS frames are not forwarded outside the PCG domain.
     - **Enable SSDP** (Simple Service Discovery Protocol)—When enabled, SSDP frames are not forwarded outside of the PCG domain.

   When you select **Multicast Filtering**, both mDNS and SSDP filtering are auto-selected. If you do not select **Multicast Filtering**, you can independently select mDNS and SSDP filtering. This capability depends solely on site requirements.

Related Topics

Configure Private Pre-Shared Key SSID Authentication on page 85

Configure a Private Client Group on page 65

Configure the SSID for a Standard Wireless Network on page 79

Configure MAC Authentication

Create a standard wireless network (SSID).

MAC authentication checks a client MAC address against a RADIUS server, and can provide an additional, or sole means of authentication. If an SSID employs MAC authentication with another type of access control, such as PPSK, PSK, or a captive web portal, MAC authentication occurs first. If it is successful, the AP continues the authentication procedure. Otherwise, the authentication process stops, the AP denies network access to the client, and the AP disassociates the client. If you enable MAC authentication and use an OPEN SSID, then MAC authentication becomes the sole means of access control.

This task is part of creating or editing a network policy. Use this task to configure an MAC authentication.

1. Go to **Configure** > **Network Policies**.
2. Select **MAC Authentication**, and then toggle the setting to **On**.
3. Select an **Authentication Protocol** to determine how the AP forwards authentication requests from users to an external RADIUS or Active Directory server:
   PAP: The AP sends an unencrypted password to the RADIUS server.

   CHAP or MS CHAP V2: The AP sends the result of an operation it performs on the password, instead of the password itself, to the RADIUS or Active Directory authentication server. The authentication server performs the same operation, and then compares the results to see if they match.
4. Select + to add a Radius Server Group, or select ☰ and then select an existing Radius Server Group.
   For more information, see Configure an AAA Server Profile on page 100

Continue configuring a standard wireless network.

Related Topics

Configure an AAA Server Profile on page 100

About Captive Web Portals

Extreme Networks provides two types of captive web portals (CWPs): those that individual APs host on built-in web servers and those that ExtremeCloud IQ hosts on web servers in the cloud. The former supports several user registration types (user authentication, self-registration to provide user data, use policy acceptance, self-registration to obtain a PPSK) plus an extensive set of configuration options. The latter supports two registration options: users can register by authenticating with their social media credentials or by requesting and submitting a PIN. A cloud-based CWP also has a simpler set of configuration options.

After defining a CWP, you must take one of two actions for your changes to take effect:

- For device-hosted CWPs, you must upload the configuration, web page files, and, for secure communications using HTTPS, certificates to your devices.
- For cloud-hosted CWPs, you must upload the configuration to your devices. ExtremeCloud IQ automatically stores the web page files and certificates in the cloud.

ExtremeCloud IQ can include multiple CWPs.

Related Topics

Customize and Preview Cloud-based Captive Portal Settings on page 89
Customize and Preview Device-based Captive Web Portal Settings on page 90
Import Captive Web Portal HTML Files on page 94

Customize and Preview Cloud-based Captive Portal Settings

To configure a cloud-based CWP (captive web portal), you must first create a wireless network SSID with **Open** access security. For more information, see About Captive Web Portals on page 88.

Extreme Networks provides two types of cloud-hosted CWPs. One controls network access by leveraging user credentials in social media services like Google, Facebook, and LinkedIn. The other type authenticates users by requiring them to enter a PIN, which is sent to them by email, to gain network access. Both CWP types are available in ExtremeCloud IQ and ExtremeCloud IQ Connect.

This task is part of the network policy configuration workflow. Use this task to configure a cloud-based CWP.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy with open access security, and then select ✏, or select +.
3. On the **Wireless** tab, select an existing SSID, and then select ✏, or select +.
4. In the **SSID Usage** section, toggle the **Enable Captive Web Portal** setting **ON**.
5. Select **Cloud Captive Web Portal**.
6. To use social media services, select **Social Login**, or to require a PIN for logging in, select **Request a PIN**.

   If you require a PIN, ExtremeCloud IQ sends a randomly generated PIN to authenticate the user.
7. Select an existing CWP or select **ADD**.
   a. If you selected **ADD**, enter a new **Name** for the CWP.
   b. Enter the length of time that the PIN remains valid.

      The validity period begins when ExtremeCloud IQ receives the PIN request and can last from 1 to 24 hours.
   c. Enter an email address where you want ExtremeCloud IQ to send daily reports about successfully authenticated users on this CWP.

      Each report is in CSV format and shows the login time (in UTC, or universal coordinated time) when the user submitted a PIN, the user name, and the MAC address of the client device used for the connection. ExtremeCloud IQ sends a separate email for when there are no entries to report.
   d. Set the hour and minute when ExtremeCloud IQ generates a daily report of successful user authentications.

      ExtremeCloud IQ reports the time in UTC, and the report contains events for the previous 24 hours.
   e. Use the default CWP without customization, or toggle **Customize** to **ON** and select **PIN-Login-Example** to export the necessary files.
   f. Modify the files and import them in the **New Captive Web Portal** window.

g. Select **Upload/Remove**, navigate to the files on your system and upload them.

h. Select **Done**.

i. Select the files you want to use for the **Login** and **Success** pages, and then select **SAVE CWP**.

The imported files are immediately saved to ExtremeCloud IQ.

> Note
> If you previously completed the configuration with default files and uploaded the network policy to your APs, you do not need to upload the configuration again.
>
> If the customized files have the same name as the default files, the custom files overwrite the default files after import to ExtremeCloud IQ.

8. Select **Use a different captive web portal for various clients** to use other CWPs for different clients based on device classification and classification rules.
9. Select **Select a Classification Rule** to choose an existing rule, and then select **Link**.

   To add a new classification rule, select **Add a Classification Rule** and complete the steps. For more information, see Configure Classification Rules for a Device Template on page 120.

Return to the Wireless Network page to complete the network policy configuration.

Related Topics

Configure Classification Rules for a Device Template on page 120

Configure the SSID for a Standard Wireless Network on page 79

Customize and Preview Device-based Captive Web Portal Settings

To configure a device-based captive web portal (CWP), you must first create a wireless network SSID with **Enterprise 802.1X** access security.

To join the SSID, users enter a user name and password, which are checked against a RADIUS server. When they open a web browser, the captive web portal opens to the **Use Policy Acceptance** (UPA) page. After the user agrees to the UPA, the AP allows them to access the rest of the network as determined by settings in the user profile applied to them.

This task is part of the network policy configuration workflow. Use this task to configure a device-based captive web portal.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy with open access security, and then select ✎, or select +.
3. On the **Wireless** tab, select an existing SSID, and then select ✎, or select +.
4. In the **SSID Usage** section, toggle the **Enable Captive Web Portal** setting **ON**.
5. Select **Captive Web Portal**.
6. Select **SELECT** to use an existing CWP, or select **ADD**.
7. Enter a **Name** for the CWP.

8. Select **Customize and Preview** to see a preview of the captive web portal profile.
    a. Select **Customize** to modify the landing page colors, logo, language, and message text.
    b. Select **SAVE CONFIGURATION**.

    Alternately, you can import HTML files. See Import Captive Web Portal HTML Files on page 94.
9. Enable or disable the **Success Page**.
10. Select **Customization and Preview** to view the enabled Success Page.
    a. Select **Customize** to modify the landing page colors, logo, language, and message text.
    b. Select **SAVE CONFIGURATION**.
11. Enable or disable **Success Page > Redirect clients after a successful login attempt**.

    When enabled, successful clients are sent to either the initial page or to a specified URL.
12. Enter the **Default Language**.
13. Select any additional languages you intend to support.
14. Select the check box for **Display session timer alert before session expires** to display the session timer in the client's browser.

    The timer shows the login status for the registered client, the time remaining in the session, and the elapsed time. You can choose to display the timer alert 5, 15, or 30 minutes before the session expires.
15. Enable **Network Settings Use default settings** to use the default IP address and netmask for the interface hosting the SSID with the captive web portal, or an admin-defined IP address and netmask.
    a. Select **Customize** to enter an IP address and netmask for each of the interfaces.

        You can use IPv4 or IPv6 addresses.
16. Enable **Use external servers** to forward DHCP and DNS traffic from unregistered clients to external servers on the network.

    When enabled, unregistered and registered clients must be assigned to the same VLAN.

    a. Select **Override the VLAN ID used during registration** and choose a previously defined VLAN ID from the drop-down list to assign to clients before and during the registration process.
    b. You can also select the plus sign to add a new VLAN ID.
    c. Enter the name and VLAN ID.
    d. Select **SAVE VLAN**.

17. Select **Use Extreme Network Devices** to forward DHCP and DNS traffic from unregistered clients to internal servers on the AP hosting the CWP.

    When enabled, unregistered and registered clients can be assigned to the same VLAN or to different VLANs because unregistered clients use DHCP and DNS servers on the AP, and registered clients use servers on the network.

    > Note
    > When the client of a previously unregistered guest first associates with the Guest Access SSID, the AP acts as a DHCP server, DNS server, and web server. The client's network access is limited to only the AP with which it associated and the client browser is redirected to a registration page. After the guest registers, the AP stores the client's MAC address as a registered client and allows the guest to access external servers.

    a. Set the length of the DHCP lease assigned to the quarantined client of an unregistered guest.

       DHCP clients typically renew at the midpoint of the lease. After the client successfully registers, the AP allows the next DHCP lease request to pass to an external DHCP server. Keeping the lease short allows the client to obtain new network settings very soon after registering.

    b. From the drop-down list, choose how you want the AP to respond to a DHCP lease renewal request for a nonexistent lease.

       - **Renew-NAK-Broadcast**: By default, the AP responds by broadcasting DHCPNAK messages. Choosing either this option or the unicast DHCPNAK option can accelerate the transition to an external DHCP server on the network, or back to a quarantined address after the client logs out or the session times out.
       - **Renew-NAK-Unicast**: Choose to have the AP respond by sending unicast DHCPNAK messages. Sending unicast messages can reduce traffic on the network; however, broadcasting the DHCPNAK is safer in environments where there is a large and uncontrollable variety of clients.
       - **Keep Silent**: Choose to have the AP ignore the renewal request completely and enable the external DHCP server to respond. With this approach, the transition between DHCP servers can be slightly longer.

18. For **Web Servers Registration Period**, set the length of time that a registered client with an active session remains registered.

    If the client closes one session and later starts a new one while the AP still has a roaming cache entry for that client (one hour by default), the client does not have to register with the captive web portal again. If the client closes a session and starts a new session after the roaming cache entry has been removed, the client must complete the registration process again, even if the new session begins within the registration period.

19. For **Web Servers Domain Name**, enter the same domain name as the CN (common name) value in the server certificate that the CWP uses for HTTPS.

    The domain name must be a valid domain name that a DNS server can resolve to the IP address of the interface hosting the CWP. This option allows you to use a server certificate from a CA that supports domain names as CNs, but not IP addresses.

    > Note
    > If the CN has a wildcard domain name that can match multiple valid domain names, enter one of the valid domain names instead of selecting **Override Web server domain name with CN value in the certificate**. For example, if the CN is *.aerohive.com, then you can enter something like `cwp.aerohive.com` in the Web Server Domain Name field, and the clients' browsers will not show a security warning when they make an HTTPS connection to the captive web portal.

20. Select **Enable HTTP** to enable HTTPS on the CWP
21. Select **Default-CWPCert.pem** for preloaded CWPs.

    The AP hosting the CWP then uses HTTPS to secure traffic between the client and its CWP server. The certificate file must have the following properties:

    - The file format must be PEM (Privacy Enhanced Mail).
    - It must contain a server private key stored in an unencrypted format.
    - It must contain a server certificate concatenated to the private key.
22. For **Client Redirection**, select **Use HTTP 302** to redirect code as the redirection method instead of JavaScript.

    This option is useful for clients accessing the network with mobile browsers.
23. Select **Introduce a delay before redirecting after a successful login attempt** to determine how long the CWP displays the Success page before initiating the redirection.
24. Select **Introduce a delay before redirecting after a failed login attempt** to determine how long the CWP displays the failure page before initiating the redirection.

    > Note
    > This redirection differs from that in the **Captive Web Portal Failure Page Settings** section, which the AP applies after a failed log in attempt.

25. Select **Prevent the Apple CNA (Captive Network Assistant) application from requesting credentials** to bypass the Apple CNA application for redirect actions.
26. To create a walled garden, select the plus sign.
    a. In the **Service Type** box, select one of the following:
       - **Web**: Permit client access only to the World Wide Web.
       - **All**: Permit client access to the World Wide Web and all other servers.
       - **Advanced**: Permit client access only to the admin-defined IP object or host name.

    b. If you selected **Web** or **All**, then paste IP addresses or host names separated by commas into the **Service Type** text box.

c. If you selected **Advanced**, then enter or select the following:

- **IP Object/Host Name**: Enter an IP object or host name of the external web server. Choose a previously-defined IP address or host name from the drop-down list, enter a new IP address or domain name, or select the plus sign and define a new one.
- **Service**: Choose **Web** to permit HTTP and HTTPS traffic from unregistered clients to the external web server, choose **All** to permit all types of traffic, or choose **Protocol**, enter a protocol number (from 0 to 255), and a port number to define the type of service you want to permit.

d. Select **Add**.

Your changes appear in the Walled Garden table.

e. To remove a rule, select the check box next to the rule ID and select **Remove**.

27. Select **SAVE CWP**.

Return to the **Wireless Network** page to complete the network policy configuration.

Related Topics

Import Captive Web Portal HTML Files on page 94

Configure the SSID for a Standard Wireless Network on page 79

Import Captive Web Portal HTML Files

To import an HTML file for a captive web portal (CWP), you must first create a wireless network SSID and enable CWP.

This task is part of the network policy configuration workflow. Use this task to to import an HTML file for your captive web portal configuration.

Note
Import HTML overrides the settings that are configured in **Customize and Preview**.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎, or select +.
3. On the **Wireless** tab, select an existing SSID, and then select ✎, or select +.
4. In the **SSID Usage** section, toggle the **Enable Captive Web Portal** setting **ON**.
5. Select **Captive Web Portal**.
6. On the **New Captive Web Portal** page, select **IMPORT HTML**.
7. Select **UPA-Example** to download a template that you can modify.
8. Select an existing **Web File Directory**, or select **Create** and type a new file directory name.
9. Select **Upload/Remove**, navigate to the files on your system and upload them.
10. Select **DONE**.
11. Select a file to use for the **Login Page**.
12. Select a file to use for the **Success Page**.
13. (Optional) Select **Redirect clients after a successful login attempt**.

14. Select the files you want to use for the **Login** and **Success** pages, and then select **SAVE CWP**.

    There is no need for a failure page because error messages appear on the **Login** page rather than requiring navigation to a separate page. ExtremeCloud IQ immediately saves the imported files.

    > Note
    > If you previously completed the configuration with default files and uploaded the network policy to your APs, you do not need to upload the configuration again.
    >
    > If the customized files have the same name as the default files, the custom files overwrite the default files after import to ExtremeCloud IQ.

Return to the **Wireless Network** page to complete the network policy configuration.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

About RADIUS Authentication

RADIUS authentication is for use by Enterprise WPA/WPA2 802.1X and WEP 802.1X SSIDs, MAC authentication, and captive web portals that require user authentication. Extreme Networks devices use the wireless network (SSID) RADIUS server group for RADIUS lookups, unless there is a classification rule directing them to a different group based on location or other parameters. The servers in the group can be external RADIUS servers, Extreme Networks RADIUS servers, Extreme Networks proxy servers, or a combination of these three types.

> Note
> The WEP protocol is no longer effective for securing wireless networks. For security reasons, WEP configuration is no longer available in the UI. If you require WEP for business continuity purposes, you can enable it via Supplemental CLI.

Related Topics

Configure a RADIUS Server Group on page 96
Configure RADIUS Server Settings on page 97
Configure an External RADIUS Server on page 98
Configure an Extreme Networks RADIUS Server on page 100
Configure a RADIUS Proxy Server Realm on page 105
Configure an Extreme Networks RADIUS Server on page 100
Add an Active Directory Server on page 103
Add an LDAP Server on page 104
Add a User Group on page 59

Configure a RADIUS Server Group

You must first create a wireless network SSID with **Enterprise 802.1X (WPA/WPA2/WPA3)** access security. This option requires users to authenticate themselves by entering a user name and password, which are checked against a RADIUS authentication server.

RADIUS servers offer two different types of services:

- Authentication for user credentials (usually on port 1812)
- Accounting (logging) (usually on port 1813)

Extreme Networks devices use the default wireless network (SSID) RADIUS server group, which can include up to four RADIUS servers, for RADIUS lookups, unless there is a device classification rule directing them to a different RADIUS server group. The servers in the group can be external RADIUS servers, Extreme Networks A3 RADIUS servers, Extreme Networks RADIUS servers, Extreme Networks proxy servers, or a combination of these four types.

Security for RADIUS servers uses simple passwords. Configure one password on the server, and the other on each of the clients.

This task is part of the network policy configuration workflow. Use this task to to configure a RADIUS server group for an SSID, as part of a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎, or select +.
3. After you save the **Policy Details**, select **NEXT** to open the **2 Wireless** page.
4. In the **Authentication Settings** section, toggle the **Authentication with ExtremeCloud IQ Authentication Service** setting **OFF**.

   The **Authenticate via RADIUS Server** section becomes available.
5. Select an existing RADIUS sever group from the ☰ menu, or select +.
6. Type a **RADIUS Server Group Name**.
7. (Optional) Type a **RADIUS Server Group Description**.

   Although optional, entering a description is helpful for troubleshooting and for identifying the RADIUS server group.
8. Configure the RADIUS server settings for IQ Engine devices.

   See Configure RADIUS Server Settings on page 97.
9. Depending on the type of server that you want to add, select one of the following tabs:

Tab	Configuration task
EXTERNAL RADIUS SERVER	Configure an External RADIUS Server on page 98
EXTREME NETWORKS A3	Configure an Extreme Networks A3 Server on page 99
EXTREME NETWORKS RADIUS SERVER	Configure an Extreme Networks RADIUS Server on page 100
EXTREME NETWORKS RADIUS PROXY	Configure an Extreme Networks RADIUS Proxy on page 104

Select up to four existing servers to add to your wireless network (SSID) RADIUS server group.

10. Select **SAVE RADIUS**.

> Note
> In addition to those set by you, or by default, Extreme Networks APs report updated DHCP-snooped IP addresses of associated clients to the RADIUS server asynchronously, or as soon as the information is available.

Related Topics

Configure RADIUS Server Settings on page 97

Configure RADIUS Server Settings

First begin configuring a RADIUS server group. See Configure a RADIUS Server Group on page 96.

This task is part of the network policy configuration workflow. Use this task to configure RADIUS server settings for IQ Engine devices for a RADIUS server group, as part of a network policy.

1. On the **Configure RADIUS Servers** page, select ⚙ and configure the following settings:

Setting	Description
Retry Interval	Specify the time between retries for an unresponsive primary RADIUS server Access-Request. The device retries the primary server after the interval elapses, even if the current backup server is responding. Range: 60–100000000 (seconds) Default: 600 **Note:** Do not enter commas in this field. Enter 100,000,000 as 100000000.
Accounting Interim Update Interval	Specify the interval for sending RADIUS accounting updates to report the client session status and cumulative length. Range: 10–100000000 (seconds) Default: 600 **Note:** Do not enter commas in this field. Enter 100,000,000 as 100000000.

Setting	Description
Permit Dynamic Change Of Authorization Messages (RFC 3576)	Enable the RADIUS server to dynamically change the authorization for a user, or to disconnect a user per RFC 3576. When you enable this parameter, devices acting as RADIUS authenticators can accept unsolicited disconnect and Change of Authorization (CoA) messages from a RADIUS authentication server, such as GuestManager, per RFC 3576. Disconnect messages terminate a user session immediately, and CoA messages modify session authorization attributes such as VLANs and user profile IDs.
Inject Operator-Name attribute	Select to include the Operator-Name attribute in the Access-Request and Accounting-Request messages that the Extreme Networks RADIUS authenticators send to the RADIUS authentication server. The attribute value is the domain name suffix of the Extreme Networks authenticator, usually assigned by DHCP, and helps to identify the authentication requests source. Providing source information like this can aid in troubleshooting authentication problems.
Message Authenticator attribute	The Message Authenticator attribute is an HMAC-MD5 checksum of the entire Access-Request packet, containing the Type, ID, Length, and Authenticator field, using the shared secret as the key. This ensures the authenticity and integrity of the packet. ExtremeCloud IQ uses this attribute to authenticate RADIUS server replies, and to encrypt passwords.
Override default failover settings	Select this option to override the default RADIUS server failover and retry interval. The retry interval is the number of seconds between RADIUS server requests. Select **Aggressive** or **Custom (Range 1-5)**. Set the **First retry interval**. (Default: 1) Set the **Max-retries** value, which is the maximum number or retries, before failing over to a configured backup RADIUS server. (Default: 3)

2. Select **SAVE RADIUS SETTINGS**.

Finish configuring the RADIUS server group.

Related Topics

Configure a RADIUS Server Group on page 96

Configure an External RADIUS Server

First begin configuring a RADIUS server group. See Configure a RADIUS Server Group on page 96.

To add an external RADIUS server, you require the IP address, authentication port number, and the shared secret for the RADIUS server.

This task is part of the network policy configuration workflow. Use this task to configure a RADIUS server for a RADIUS server group, as part of a network policy.

1. On the **Configure RADIUS Servers** page, select **EXTERNAL RADIUS SERVER**.
2. Select an existing server, or select +.
3. Type a **Name** for the server.
4. (Optional) Type a **Description** for the server.
5. Select the **IP/Host Name** for the server.

   If you do not see the IP address that you need, select + to define a new one (IPv4 or IPv6).

   If the address object is a host name, ensure that the devices can resolve it to an IP address. If you configure a domain name for the devices, or if the devices dynamically receive a domain name through DHCP, and the RADIUS server belongs to the same domain, the RADIUS server name can be just the host name without the domain name. If the RADIUS server belongs to a different domain, the address object must be the fully qualified domain name (FQDN): the host name + the domain name.
6. For **Server Type**, choose the RADIUS server role:
   - **Authentication**: As an authentication server, the RADIUS service requests that the client device demonstrate its identity.
   - **Port**: Set the RADIUS authentication port.
   - **Accounting**: As an accounting server, the RADIUS service tracks client-server session details.
   - **Port**: Set the RADIUS accounting port number.
7. Type the **Shared Secret** for authenticating communications with the RADIUS server.
8. (Optional) Select **Show Password**.
9. Select **SAVE EXTERNAL RADIUS**.

Finish configuring the RADIUS server group.

Related Topics

Configure a RADIUS Server Group on page 96

Configure an Extreme Networks A3 Server

You must have existing A3 RADIUS server services.

First, begin configuring a RADIUS server group. See Configure a RADIUS Server Group on page 96.

This task is part of the network policy configuration workflow. Use this task to configure an A3 server for a RADIUS server group, as part of a network policy.

1. On the **Configure RADIUS Servers** page, select **EXTREME NETWORKS A3**.
2. Select an existing server, or select +.
3. Type a **Name** for the server.
4. Type an optional **Description**.

5. Enter the **IP/Hostname** of the server.
6. Accept the defaults or enter specific **Server Type** ports.
7. Type the **Shared Secret** for authenticating communications with the A3 server.
8. (Optional) Select **Show Password**.
9. Select **SAVE EXTREME NETWORKS A3**.

Finish configuring the RADIUS server group.

Related Topics

Configure a RADIUS Server Group on page 96

Configure an Extreme Networks RADIUS Server

First begin configuring a RADIUS server group. See Configure a RADIUS Server Group on page 96.

Extreme Networks devices can serve as RADIUS authentication servers and respond to 802.1X requests from other Extreme Networks devices acting as RADIUS authenticators. The Extreme Networks RADIUS server can store user accounts locally, or check user login credentials against user accounts stored externally on the following user database servers: Active Directory, or LDAP.

This task is part of the network policy configuration workflow. Use this task to configure an Extreme Networks RADIUS server for a RADIUS server group, as part of a network policy.

1. On the **Configure RADIUS Servers** page, select **EXTREME NETWORKS RADIUS SERVER**.
2. Select a **User Database Type** from the menu.
3. Select an existing server, or select +.
4. Select the devices to configure.
5. Configure the AAA Server Profile.

   See Configure an AAA Server Profile on page 100.

Related Topics

Configure an AAA Server Profile on page 100

Configure an AAA Server Profile

First, configure an Extreme Networks RADIUS Server. See Configure an Extreme Networks RADIUS Server on page 100.

Extreme Networks devices can serve as RADIUS authentication servers and respond to 802.1X requests from other Extreme Networks RADIUS authenticators. The Extreme Networks RADIUS server can store user accounts locally or check user login credentials against user accounts stored externally on Active Directory or LDAP (lightweight directory access protocol) user database servers.

This task is part of the network policy configuration workflow. Use this task to configure an AAA server profile.

1. On the **Wireless** tab, select **Add Radius Server Group**.
2. Select **EXTREME NETWORKS RADIUS SERVER**.
3. Type a **RADIUS Server Group Name**.
4. Type an optional **RADIUS Server Group Description**.
5. Select the **User Database** type.
   - **Active Directory**: Select to enable an Extreme Networks RADIUS server to interoperate with an Active Directory server.
   - **LDAP Server**: Select to direct user account look-ups to one or more LDAP servers.
   - **Local Database**: Select to enable an Extreme Networks device to support authentication for local user groups.
6. Select the corresponding check boxes for the devices that you want to configure.
7. Select **CREATE NEW** to add a new AAA server profile.

   Alternately, select **USE EXISTING**, and then select an AAA server profile from the list.
8. Type a **Profile Name**.
9. Type an optional **Profile Description**.
10. Select the **User Database** type: **Active Directory**, **LDAP Server**, or **Local Database**.

    Available configuration options depend on the type of database that you select.
11. Type a **User Group Attribute**, and then select an existing user group from the ☰ menu.
12. Expand the **Additional Settings** section, and then enter the number of seconds for each response scenario.

    The **Additional Settings** section is not available for local databases.
13. Select **Enable Caching of Credentials** to improve performance across WAN links.
14. Type the number of seconds to retain the credential cache.
15. Complete the database-specific configuration options as follows:

User database type	Configuration
Active Directory	See Add an Active Directory Server on page 103.
LDAP Server	See Add an LDAP Server on page 104.
Local Database	The Extreme Networks device that authenticates users directly, maintains the user database locally.

16. Select **Security Options**, and then Configure AAA Server Security Options on page 102.
17. Select **Approved RADIUS Clients**, and then Add Approved RADIUS Clients on page 106.
18. Select **SAVE RADIUS SERVER**.

Continue configuring the RADIUS server profile.

Related Topics

Configure an Extreme Networks RADIUS Server on page 100

Add an Active Directory Server on page 103

Add an LDAP Server on page 104
Configure AAA Server Security Options on page 102
Add Approved RADIUS Clients on page 106

Configure AAA Server Security Options

Configure an Extreme Networks device as a RADIUS Server.

Use this task to add increased security to the AAA Server Profile. For more information, see Configure an AAA Server Profile on page 100.

Note
Default certificates are intended to be used for testing only.

1. Select an **Authentication Protocol** from the drop-down list.
   - **TLS** requires mutual authentication using client-side certificates. With a client-side certificate, a compromised password is not enough to break into TLS-enabled systems because the intruder still needs the client-side certificate. A password is only used to encrypt the client-side certificate for storage. Credentials are used for a one-time certificate enrollment. The certificate is sent to the RADIUS server for authentication.
   - **PEAP** encapsulates EAP within a potentially encrypted and authenticated TLS tunnel. The user must enter their credentials, which are sent to the RADIUS Server that verifies the credentials, and authenticates them for network access.
   - **TTLS** extends TLS. The client can, but does not have to, be authenticated via a CA-signed PKI certificate to the server. This greatly simplifies the setup procedure since a certificate is not needed for every client.
   - **LEAP** uses dynamic WEP keys and mutual authentication between the client and RADIUS server. Uses an authentication protocol in which user credentials are not strongly protected and are easily compromised. Users who absolutely must use LEAP should do so with sufficiently complex passwords.

     Note
     The WEP protocol is no longer effective for securing wireless networks. For security reasons, WEP configuration is no longer available in the UI. If you require WEP for business continuity purposes, you can enable it via Supplemental CLI.

   - **MD5** offers minimal security, is vulnerable to dictionary attacks, and does not support key generation. This method is commonly used in a trusted network.
2. Select a **Default Authentication Protocol** from the drop-down list.
3. Select the default certification authority digital certificate type.
4. Select the default server digital certificate type.
5. Select whether to verify the server certificate file.
6. Enter the client key file password.
7. Select whether to **Check common name in certificate against the user for TLS authentication**.
8. Select the authentication that has been assigned to a user.

9. If you **Enable Authentication**, the recommended value for the **Age Timeout for Active Session** is three times the value of the **Accounting Interim Update Interval** in the RADIUS Client.

   For example, if the Accounting Interim Update Interval is set to 600 seconds, set the Age Timeout for Active Session to 1800 seconds.

Continue configuring the server.

Add an Active Directory Server

First, configure an AAA server profile. See Configure an AAA Server Profile on page 100.

This task is part of the network policy configuration workflow. Use this task to add an Active Directory (AD) database to an Extreme Networks device acting as a RADIUS Server.

1. For Step 3, on the **Configure RADIUS Servers** page, select an existing AD server from the ☰ menu, or select +.
2. Type a **Name** for the AD server.
3. Type the name of the **Domain**, to which the RADIUS authentication server and the AD server both belong.

   (Range: 1–64 characters). Include parent domains, such as .com, .net, and .org.
4. Select **Auto** or **Manual**.

Setting	Description
Auto	ExtremeCloud IQ automatically populates the Active Directory Server and the base distinguished name (BaseDN) parameters. Go to Step 9 on page 104.
Manual	Go to Step 5.

5. From the drop-down list, choose a previously-defined IP object or host name for the **Active Directory Server** that contains the user accounts the RADIUS authentication server will authenticate.

   If you do not see the one that you need listed, select **New** and enter an IP object or host name.
6. Type the **BaseDN**—The starting point for directory server searches, and the point in the directory tree structure where the server stores user accounts.
7. Type a **Short Domain Name**.
8. Type the **Realm** name that corresponds to the user account location, which is often the same as the domain name.

9. Set the organizational unit (OU) where the Extreme Networks RADIUS server has privileges to add itself as a computer in the domain or leave it blank.

   > Note
   > By default, the RADIUS server attempts to add itself into **Computers** unless you specify a computer-ou here. If you do not want to give a device access to the Computers container, you can create your own OU and give the device user permissions to create computers (that is, to add itself) to the specified OU. For example, the computer OU might be `wireless/APs`.

10. Select **Enable TLS Encryption** to encrypt the user look-up requests that the Extreme Networks RADIUS server sends to the Active Directory server.
11. Select **NEXT**.
12. Select an existing **DNS Server**, or select + to create a new one.
13. Select **NEXT**.

Continue configuring the RADIUS server.

Related Topics

Configure an AAA Server Profile on page 100

Add an LDAP Server

First, configure an AAA server profile. See Configure an AAA Server Profile on page 100.

This task is part of the network policy configuration workflow. Use this task to add an Lightweight Directory Access Protocol (LDAP) database to an Extreme Networks device acting as a RADIUS Server.

1. On the **Configure RADIUS Servers** page, select an existing LDAP server from the ☰ menu, or select +.
2. Configure the settings.

   See LDAP Server Settings on page 295

Continue configuring the RADIUS server.

Related Topics

LDAP Server Settings on page 295
Configure an AAA Server Profile on page 100

Configure an Extreme Networks RADIUS Proxy

First begin configuring a RADIUS server group. See Configure a RADIUS Server Group on page 96.

This task is part of the network policy configuration workflow. Use this task to to configure an Extreme Networks device as a RADIUS proxy server.

1. On the **Configure RADIUS Servers** page, select **EXTREME NETWORKS RADIUS PROXY**.
2. Select the device to configure as a proxy.

3. Type a **Name** for the proxy.
4. Type a **Description**.

   Although optional, entering a description is helpful for troubleshooting and for identifying the proxy server.
5. For the **Realms** section, see Configure a RADIUS Proxy Server Realm on page 105.
6. For the **Approved RADIUS Clients** section, see Add Approved RADIUS Clients on page 106.
7. For the **Realm Settings** section, see Configure Realm Settings on page 106.
8. Select **SAVE RADIUS PROXY**.

Related Topics

Configure a RADIUS Server Group on page 96

Configure a RADIUS Proxy Server Realm on page 105

Add Approved RADIUS Clients on page 106

Configure Realm Settings on page 106

Configure a RADIUS Proxy Server Realm

First configure an Extreme Networks Device as a RADIUS proxy server. See Configure an Extreme Networks RADIUS Proxy on page 104.

You can add a postfix notation realm after a user name, separated by an "@" symbol, and the result resembles an email address domain name. Or you can add a prefix notation realm before a user name, with a backslash "\" separator. User names can also include multiple realms, for example `domain1.com\username@domain2.com` is a valid user name with two realms. Realms can be arbitrary text and do not need to contain real domain names, even though they can look like domains.

This task is part of the network policy configuration workflow. Use this task to configure realms for a RADIUS proxy.

1. On the **Configure RADIUS Servers** page, select **REALMS**.
2. Select **ADD A RADIUS SERVER GROUP** to display and configure the settings.

   See Configure a RADIUS Server Group on page 96.
3. Configure **Required Realms**.
   a. Select the **Default Realm** from the menu.
   b. Select **Strip the realm name from the proxied access requests** to remove the realm name from proxied access requests.
   c. Select the **RADIUS Server Group** from the menu.
4. To create a realm, select an existing realm and then select ✎, or select +.
   a. Type the **Realm Name**.
   b. Select a RADIUS server group from the menu.
   c. Select **Strip the realm name from the proxied access requests** to remove the realm name from proxied access requests.
   d. Select **ADD**.
5. Select **SAVE RADIUS PROXY**.

Continue configuring the proxy server.

Related Topics

Configure an Extreme Networks RADIUS Proxy on page 104

Configure a RADIUS Server Group on page 96

Add Approved RADIUS Clients

Configure an Extreme Networks device as a RADIUS proxy server. See Configure an Extreme Networks RADIUS Proxy on page 104.

This task is part of the network policy configuration workflow. Use this task to add one or more approved RADIUS clients to each configured realm associated with a RADIUS proxy server.

1. On the **Configure RADIUS Servers** page, select **APPROVED RADIUS CLIENTS**.
2. Select +.
3. Select an existing **IP/Host Name/Network** for a client, from the ☰ menu, or select +.
4. Type the associated **Shared Secret** (password).
5. To see the password, select **Show Password**.
6. (Optional) Type a **Description**.

   Although optional, entering a description is helpful for troubleshooting and for identifying the approved RADIUS client list.
7. Select **ADD**.
8. Select **SAVE RADIUS PROXY**.

Next, see Configure Realm Settings on page 106.

Related Topics

Configure an Extreme Networks RADIUS Proxy on page 104

Configure Realm Settings on page 106

Configure Realm Settings

Configure an Extreme Networks device as a RADIUS proxy server and create a realm.

- Configure an Extreme Networks RADIUS Proxy on page 104
- Configure a RADIUS Proxy Server Realm on page 105

This task is part of the network policy configuration workflow. Use this task to optimize the realm settings for a RADIUS proxy.

1. On the **Configure RADIUS Servers** page, select **REALM SETTINGS**.
2. Select a **User and Realm Name** format:
   - NAI (Network Access Identifier)—The standard syntax is `user@realm`.
   - Windows NT Domain—The standard syntax is `user1@example.com`.
   - SPN (service principal name)—The standard syntax is `serviceclass/host`.
   - AUTO—Extreme automatically applies a format.
3. Type the **Retry Delay**—The time interval between retries.

4. Type the **Retry Count**—The number of retries before declaring failure.
5. Type the **Dead Time**—The time elapse (in seconds) before declaring failure.
6. Select **Inject Operator-Name Attribute**.

   If you do not want to inject an operator-named attribute, clear the check box.
7. Select **SAVE RADIUS PROXY**.

Finish configuring the RADIUS proxy.

Related Topics

Configure an Extreme Networks RADIUS Proxy on page 104
Configure a RADIUS Proxy Server Realm on page 105

Apply Different User Profiles to Clients and User Groups

Before you can apply different user profiles, configure the SSID for the network. For more information, see Configure the SSID for a Standard Wireless Network on page 79.

While editing an existing network policy or creating a new one, use this procedure to apply different user profiles to clients and user groups. With user-profile assignment rules, you can assign clients to user profiles that match all configured conditions. The available conditions are as follows:

- Advanced Guest Policy
- Client OS Type
- Client MAC Address
- Client Location
- Schedule
- Cloud Config Group

1. Go to **Configure** > **Network Policies**, select a preconfigured policy, and then select **Next**.
2. Under **User Access Settings**, select **Apply a different user profile to various clients and user groups**.
3. Select ☰ to choose an existing user profile, or select + to add a new profile.
4. To add an existing user profile assignment rule, select ⇱.
   a. Select one of the existing rules.
   b. Select **Link**.
5. To add a new user profile assignment rule, select ⊞.
   a. Type a **Name** for the user profile assignment rule.
   b. (Optional) Type a description.
   c. Select + and choose a category.
   d. Complete the configuration for the selected category.

      See Configure Classification Rules on page 158.

   You can add multiple assignment rules to create more granular control.
6. Select **Save**.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

Configure Classification Rules on page 158

Customize Advanced Access Security Settings

Use this task to configure and manage the cryptographic keys used to encrypt Wi-Fi traffic during the four-way handshake authentication process between an AP and clients, manage and set up Pairwise Transient Keys.

1. For **Generate new Group Master Key (GMK) after**, enter the time interval until a new GMK is generated.

   The GMK is a large random number that an Extreme Networks device chooses. From the GMK, the device derives a GTK (Group Temporal Key), which it then sends to all associated clients within EPOL-key messages. The Extreme Networks device and clients use the GTK to encrypt and decrypt broadcast or multicast traffic transmitted between themselves.
2. For **Generate New Group Temporal Key (GTK) after**, enter the time interval until a new GTK is generated.

   The wireless client and Extreme Networks device use a GTK to encrypt to and decrypt broadcast and multicast traffic transmitted between themselves. A GTK is a temporal key that an Extreme Networks device derives from a GMK (Group Master Key) by performing a cryptographic hash on the concatenation of the GMK, a nonce, and the MAC address of the Extreme Networks device. The Extreme Networks device then sends the GTK to all associated clients within EAPOL-Key messages.
3. For **GTK Timeout Period**, set the interval that the device waits for client replies during the handshake process.

   To accommodate clients that have shorter or longer timeout values, you can change this to a value from 100 (the standard timeout value) to a maximum of 8000 milliseconds.
4. For **Number of GTK Retries**, set the maximum number of times the device will retry sending GTK messages.
5. Select **Generate a new Pairwise Transient Key (PTK) after** to enable PTK rekeying, and enter a value between 10 and 50,000,000 seconds (~231 days).

   If you enable PTK rekeying, an interval between 2 and 10 minutes (120 and 600 seconds) is the best practice recommendation, which is short enough to thwart the known TKIP exploit. Enable this option only if you know that the clients using the SSID support it. (In addition to configuring PTK rekeying on devices, it might also need to be enabled on the clients.)

   Note

   There is a flaw in TKIP that allows an attacker to decrypt unicast packets sent from an access point to a wireless client, and then send the client-forged packets, possibly with the purpose of poisoning ARP or DNS caches. If it is not possible to transition to AES-CCMP—which is not susceptible to this attack—you can mitigate attacks against TKIP-encrypted data by setting the PTK (pairwise transient key) to rekey at short intervals.

6. For **PTK timeout period**, set the interval that the device waits for client replies during the four-way handshake in which they derive a PTK for encrypting and decrypting unicast traffic.

   To accommodate clients that have shorter or longer timeout values, you can change the value from 100 milliseconds (the standard timeout value) to a maximum of 8000 milliseconds.
7. For **Number of PTK retries**, set the maximum number of times the device will retry sending PTK messages.
8. For **Replay window**, set a window size within which the device accepts replies to previously sent messages during four-way handshakes.

   0 indicates that the device does not accept any messages other than a reply to the last message that it sent. You might want to accept replies to previously sent messages if there are clients that reply more slowly than the device retries sending it messages.
9. Select **Local TKIP Countermeasure** (available when the encryption method is Auto-TKIP or CCMP (AES) or TKIP) to enable or disable the deauthentication of all clients when the local device detects message integrity check failures during TKIP operations.

   Even if just one key fails an integrity check, the discovery of such a failure suggests that other keys in current use might also be compromised. The cautious security stance is to deauthenticate all clients and stop using all existing keys immediately. When clients reauthenticate, they use newly generated pairwise and group primary and temporal keys. If this feature is disabled, the device continues to use its existing keys and maintain currently connected clients after detecting MIC failures.
10. Select **Remote TKIP Countermeasure** (available when the encryption method is Auto-TKIP or CCMP (AES) or TKIP) to deauthenticate all previously authenticated clients when a client reports MIC failures during TKIP operations.

    The distinction between the local and remote countermeasure options is where the discovery of the failure occurs: local = the device discovered it, remote = the client discovered—and reported—it.
11. Deselect **Refresh GTK when client disassociates from the SSID** to refresh the GTK whenever a client disassociates from the SSID.

Configure VLAN Settings

Create a user profile that will use these VLAN settings. See Add a User Profile on page 217.

This task is part of configuring an SSID. Use this task to configure VLAN settings.

1. Go to **Configure** > **Network Policies**.
2. Select an existing network policy and then select ✏, or select +.
3. Select the **Wireless** tab.
4. Select an existing SSID and then select ✏, or select +.
5. Scroll to **User Access Settings** and select the **Default User Profile**.
   - To use the default profile, select the link and configure the settings.

- To assign a VLAN group to this profile, select ☰ and choose an existing VLAN group from the menu.

  Select ✎ to make changes to the selected VLAN group.
- To create a new VLAN group, select +.

Typically, the default VLAN is 1. For more information about adding a new VLAN group, see Add a VLAN Group on page 111.

6. Type a **User Profile Name**.
7. Select **VLAN** or **VLAN Group**.
8. Select ☰ and choose an existing VLAN object from the menu, or select +.

   To edit an existing VLAN object, select it and then select ✎.
9. Type a **Name** for the new VLAN object.
10. Type a **VLAN ID** for the new VLAN object.
11. Select the **Apply VLAN to devices for classification** check box to create VLANs that you can apply to specific devices based on their location.
12. Select +.
13. Enter the new VLAN ID, and then select **Add** to add the it to the VLAN table.
14. Under **Classification Rules** in the VLAN table, select an existing classification rule, or select the add icon to add a new rule.

    See Configure Classification Rules for a Device Template on page 120 for more information.
15. Select **Link**.
16. Enter a name for the classification rule.

    For easier tracking, you might want to add the locations and device models using this VLAN classification rule (for example, `VLAN-AP230-Sunnyvale`).
17. Enter an optional description.
18. Select the plus sign to choose the device location.
19. Assign your VLAN profile based on the location of managed devices.

    Note

    When selecting a location, drill down to the level where the devices are located. For example, if the devices are located on the floor of a building, select that specific floor.

20.Choose **Select**.

21. Select **SAVE VLAN**.

Complete the user profile configuration.

Related Topics

Add a VLAN Group on page 111

Configure Classification Rules for a Device Template on page 120

Add a User Profile on page 217

Add a VLAN Group

Create the VLANs that you will assign to this group and the user profile to be associated with this group.

VLAN groups combine multiple VLANs as a single common object. Use the following steps to create a VLAN group, and then bind the group to a user profile.

1. Select the add icon.
2. Enter a name for the VLAN group.
3. Enter an individual VLAN or a range of VLANs.

   Indicate a range with a hyphen. Separate VLAN entries with commas, for example, 1-30, 100-200, 500.
4. Enter an optional description.
5. Select **Save**.

Bind this group to a user profile.

Customize Wireless Network Optional Settings

Complete the Add a Network Policy on page 69 task.

When you configure an SSID, you can configure and apply radio rates, DoS prevention settings, traffic filters, and other options.

Use this task to configure the **Optional Settings** for a standard wireless network.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✏.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Customize Radios and Rates Settings on page 111.
6. Customize DoS Prevention on page 112.
7. Customize Traffic Filters on page 113.
8. Customize the User Profile Application Sequence on page 114.
9. Customize Voice Enterprise Options on page 115.
10. Customize Wi-Fi Multimedia™ on page 116.
11. Customize Broadcast and Multicast Handling Settings on page 117.
12. Customize Client Related Network Settings on page 118.
13. Customize Other Options on page 119.
14. Select **SAVE OPTIONAL SETTINGS**.

Continue configuring the wireless network policy.

Customize Radios and Rates Settings

Complete the Add a Network Policy on page 69 task.

By default, Extreme Networks devices advertise support for all rates. By setting specific rates, you can restrict access to just those clients that can support them. Use these controls to force clients to connect at higher data rates on an SSID, which can help increase average data transfer rates.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **Radios and Rates** section.
6. Select a radio frequency and configure the basic (mandatory) and optional data rates per SSID.
7. Select **SAVE RATE SETTING**.
8. Repeat steps 6–7 for each radio frequency.

Continue configuring **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Customize DoS Prevention

Complete the Add a Network Policy on page 69 task.

This task is part of a series for configuring the **Optional Settings** for a standard wireless network. Use this task to customize settings for broadcast and multicast handling. Use this task to configure defensive settings to protect against Denial of Service (DoS) attacks, and configure SSID access filters based on MAC addresses.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **MAC-based Dos Prevention rules for** section.
6. Select an option and configure the settings.
   - **SSID**—Select to protect against DoS attacks at the MAC layer (Layer 2) on the radio channel that an AP uses for SSID access traffic. The settings for an SSID apply cumulatively to the total amount of Layer 2 traffic that an AP receives on the access channel for the SSID.
   - **Client**—Select to protect against DoS attacks at the MAC layer (Layer 2) on the radio channel that an AP uses for SSID access traffic. The settings in the MAC DoS configuration object apply to the total amount of Layer 2 traffic that an AP receives on the access channel for the SSID from a single MAC address.
7. Under **IP-based Dos Prevention rules for**, select **SSID** and configure the settings. This configuration protects against Denial of Service attacks at the IP layer (Layer 3) on the radio channel that an AP uses for SSID access traffic.

   The settings in the IP DoS configuration object apply cumulatively to the total amount of Layer 3 traffic that an AP receives on the access channel for the SSID.

8. **Enable MAC-Based filters** and select an option for the **Default Action**.
    - **Permit**—Enable traffic from clients that do not match one of the selected filters.
    - **Deny**—Block traffic from clients that do not match any of the selected MAC filters.

    This step makes the **Add MAC-Based Filters** section available.
9. Add Mac-based filters.
    a. Scroll to the **Add MAC-Based Filters** section, and select +
    b. Specify a MAC or a MAC Oui.
        - Select ☰ and choose an existing MAC or MAC Oui.
        - Select + to add a new **MAC Address**, or **MAC Oui**.

    c. Select an **Action** from the menu.
    d. Select **ADD**.

Continue configuring **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69
Customize Wireless Network Optional Settings on page 111

Customize Traffic Filters

Complete the Add a Network Policy on page 69 task.

Select traffic filters to control which management and diagnostic services an AP may receive, and whether to allow traffic between clients connected to the AP.

This task is part of a series for configuring the **Optional Settings** for a standard wireless network. Use this task to customize optional traffic filter settings.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **Traffic Filters** section.
6. Select or clear the following check boxes to permit or deny specific types of management and diagnostic access to the mgt0 interface, or to enable traffic between clients connected to the AP.
    - **Enable SSH**
    - **Enable Telnet**
    - **Enable Ping**

- **Enable SNMP**
- **Enable Inter-station Traffic**

> Note
> When an Ethernet interface is in access mode, stations can communicate directly with each other without sending traffic through the AP. In this case, the AP cannot control their traffic. However, the AP can block traffic between stations connected to an Ethernet interface and stations connected to a wireless interface through an SSID.

Continue configuring **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Customize the User Profile Application Sequence

Complete the Add a Network Policy on page 69 task.

You can specify which profile you want to apply to user traffic. By default, an AP applies user profiles in the following order (the last one is the profile that the AP ultimately applies to user traffic):

- First, the AP applies the user profile indicated by attributes returned by a RADIUS server performing MAC authentication.
- Second, the AP applies the user profile specified in an SSID for traffic management. This overrides the first user profile.
- Third, the AP applies the user profile indicated by attributes returned from a RADIUS server when a captive web portal requires user authentication. This user profile overrides both the first and second profiles.

To give priority to a user profile by applying it later in the sequence, reorder the profiles.

This task is part of a series for configuring the **Optional Settings** for a standard wireless network. Use this task for configurations that have different components in the SSID referencing different user profiles.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **Choose User Profile Application Sequence** section, and then use the arrows to change the application sequence.

Continue configuring **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Customize Voice Enterprise Options

Complete the Add a Network Policy on page 69 task.

Navigate to **Optional Settings CUSTOMIZE** under **Additional Settings** in the **Configure Standard Wireless Networks** window.

This task is part of a series for configuring the **Optional Settings** for a standard wireless network. Use this task to customize Voice Enterprise options.

Note
To enable Voice Enterprise or 802.11r, the SSID must be configured to use WPA2 key management.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **Voice Enterprise** section.
6. Select an option.
   - **Enable Voice Enterprise**—Select to enable all options that are required for full voice enterprise support.
   - **Custom**—Select and choose one of the following options:
     - **Enable 802.11k**: (Radio Resource Measurement of Wireless LANs): Select to enable the devices to monitor the RF environment and network performance to help manage network usage and client roaming.
       - **Enable dualband neighbor list**: Select to enable APs to monitor both 2.4 GHz and 5 GHz bands at the same time to widen the search for a less-loaded AP channel.
       - **Max. neighbor APs**: Set the maximum neighbor APs to send to the client to reduce the computational resources required for 802.11k handover.
     - **Enable 802.11v**: (IEEE 802.11 Wireless Network Management): Select to enable network devices and clients to share information such as location and neighbor information.
     - **Enable forced disassociation**: Select to enable APs to send disassociate or deauthenticate frames for a variety of reasons per 802.11v.
     - **Disassociate after**: (If forced disassociation is enabled.) Range: 0 to 5 seconds.
     - **SNR Checking**: (If forced disassociation is enabled.) Select to enable APs to consider signal-to-noise ratio to determine when to disassociate.
       - **Disassociate the Client**: : (If forced disassociation and SNR checking are enabled.) Select to enable APs to send disassociation frames to client devices.

        - **BSSID Transition Request**: (If forced disassociation and SNR checking are enabled.) Select to enable APs to send BSSID transmission management request frames to client devices.
    - **SLA Checking**: (If forced disassociation is enabled.) Select to enable Extreme Networks APs to consider service level agreement performance thresholds to determine when to disassociate.
        - **Disassociate the Client**: : (If forced disassociation and SLA checking are enabled.) Select to enable APs to send disassociation frames to client devices.
        - **BSSID Transition Request**: (If forced disassociation and SLA checking are enabled.) Select to enable APs to send BSSID transmission management request frames to client devices.
    - **Enable 802.11r**: (Fast BSS Transition): Select to optimize roaming by forcing stations to forward QoS state and encryption keys preemptively.

Continue customizing **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Customize Wi-Fi Multimedia™

Complete the Add a Network Policy on page 69 task.

Enable Wi-Fi Multimedia™ (WMM) to prioritize network traffic according to the settings.

This task is part of a series for configuring the **Optional Settings** for a standard wireless network. Use this task to enable WMM and customize the settings.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✏.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **WMM** section, and then select **Enable WMM**.
6. Select and clear the following check boxes as required:
    - **Voice**—Select to enable admission control algorithms for voice traffic.
    - **Video**—Select to enable admission control algorithms for video traffic.
    - **Enable Unscheduled Automatic Power Save Delivery**—Select to enable stations to request queued traffic at any time, rather than receiving queued traffic scheduled with the beacon.

Continue configuring **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Customize Broadcast and Multicast Handling Settings

Complete the Add a Network Policy on page 69 task.

To reduce unnecessary airtime usage for multicast transmissions, a device can convert multicast frames to unicast frames under certain conditions or at all times, and can drop multicast frames when there are no group members present to receive them. Unicast traffic can increase the reliability of video delivery. If a wireless client does not receive a unicast frame and does not reply with an ACK, the AP will retransmit. Multicast traffic does not support wireless frame delivery confirmation.

This task is part of a series for configuring the **Optional Settings** for a standard wireless network. Use this task to customize settings for broadcast and multicast handling.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✏.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **Broadcast and Multicast Handling** section, and then select one of the following **Convert IP Multicast to Unicast** options:
    - **Auto**: The device is enabled to convert multicast frames to unicast when the channel utilization or membership count conditions are met.
    - **Always**: The device makes the conversion unconditionally.
    - **Disable**: The device does not use the multicast-to-unicast conversion feature, but instead follows the standard 802.11 behavior for sending multicast frames.
6. Set the **Channel Utilization Threshold** from 1 to 100%.
7. Set the **Membership Count Threshold** from 1 to 30.
8. Select **Enable Non-Essential Broadcast Filtering** to reduce unnecessary broadcast and multicast traffic forwarding (such as AMRP, HSRP, LLC, and STP) from APs with no registered listeners.
9. Select **Enable Multicast Drop** to drop multicast and broadcast traffic, excluding frames for any of the selected protocols. With the exception of **MDNS**, by default, all protocols are selected and are therefore included in multicast and broadcast traffic. To exclude protocols in multicast and broadcast traffic, proceed as follows:
    - **DHCPv4**: Clear the check-box to drop Dynamic Host Configuration Protocol version 4.
    - **DHCPv6**: Clear the check box to drop Dynamic Host Configuration Protocol version 6.
    - **ARP**: Clear the check box to drop Address Resolution Protocol.
    - **IGMP-query**: Clear the check box to drop Internet Group Management Protocol queries.
    - **IPv6-Discovery**: Clear the check box to drop Internet Control Message Protocol router discovery messages.
    - **MDNS**: This check box is not selected by default and is therefore preset to drop multicast DNS frames. Select this check box to include multicast DNS frames in multicast and broadcast traffic.

Continue configuring **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Customize Client Related Network Settings

Complete the Add a Network Policy on page 69 task.

Use this task to define client usage parameters that control how devices in the SSID transmit data, how neighboring devices exchange information with each other, and the maximum number of clients that the SSID supports.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✏.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Go to the **Client Related Network Settings** section, and then configure the settings:
   - **Maximum client limit**: Set the maximum number of clients that can associate with an SSID on a device.
   - **EAP Timeout** (Enterprise Security Mode Only): During the 802.1x authentication phase, in the event of an EAP retry due to packet loss or lack of response from the client, the AP can retry the EAP request. Some clients cannot properly handle fast retry timers, so this might need adjustment to facilitate fast recovery for bad RF environments.
   - **RTS threshold**: The RTS (request-to-send) threshold indicates the minimum packet size to trigger an RTS/CTS (request-to-send/clear-to-send) exchange. The purpose of this exchange is to reserve the medium and thereby reduce collision interference.
   - **Fragment threshold**: The fragment threshold indicates the minimum packet size to begin fragmenting packets before transmitting them. If there is a high level of interference, smaller packet sizes can reduce the need to retransmit packets and improve performance.
   - **DTIM settings**: Extreme Networks devices include delivery traffic indication messages (DTIM) in beacons at scheduled intervals. DTIMs are included in beacons according to the DTIM period that you set. Increase the DTIM setting to improve battery life or shorten it to deliver buffered broadcast and multicast traffic more frequently.
   - **Inactive client ageout**: Set the length of time to age out and automatically disassociate inactive clients.
   - **EAP Retries** (Enterprise Security Mode Only): After the EAP timeout, authentication fails and the client tries to reconnect per this value.
   - **Roaming cache update interval**: An Extreme Networks AP updates its neighbors about its currently associated clients. Neighboring APs use this information to

update their roaming caches—if necessary—with the most up-to-date client information from their neighboring APs.

- **Roaming cache ageout**: By default, an Extreme Networks device removes an entry from its roaming cache if it is absent from 60 consecutive updates from a neighbor. You can change the number of times an entry must be absent.

Continue configuring **Optional Settings** in the **Wireless Networks** configuration window. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Customize Other Options

Complete the Add a Network Policy on page 69 task.

This task is part of a series for configuring the **Optional Settings** for a standard wireless network. Use this task to customize the **Other Options**.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎.
3. Select **Next** to open the **Wireless Network** page.
4. Go to **Additional Settings** > **Optional Settings**, and then select **CUSTOMIZE**.
5. Select **Ignore broadcast probe request** to enable Extreme Networks devices hosting this SSID to ignore probe requests from wireless clients.
6. Select **Hide SSID (Stealth mode)** to enable a simple but ineffective method to secure a wireless network; it hides the SSID (Service Set Identifier).

   Note
   This method provides very little protection against anything but the most casual intrusion efforts.

7. Select **FTM(11mc) Responder Support** to enable client devices to determine how far they are from the AP.

   If the civic address or latitude/longitude/altitude of the AP is configured, the AP advertises it in the beacon.

   Note
   Enabling FTM (Fine Timing Measurement) 11mc causes a radio reset.

8. Select **SAVE OPTIONAL SETTINGS** to save your changes.

Finish configuring the network policy.

Related Topics

Add a Network Policy on page 69

Customize Wireless Network Optional Settings on page 111

Configure Device Templates

Create a network policy.

A device template allows you to configure default port settings and other device functions for a specific Extreme Networks model using a visual diagram of the physical ports. After you configure a specific device template, you can:

- assign various port types to the device ports, then apply this device template and its configuration settings to large numbers of devices of the same type.
- apply different device templates to other devices in the same network policy.

> **Note**
> Each network policy has only one template corresponding to each device model. To update devices with different configurations for the same model, you must create a new network policy or modify an existing policy, and then configure a new template.

1. To add an AP template to the network policy, select **Wireless** in the workflow and proceed to Configure AP Templates on page 144.
2. To add a switch template to the network policy, select **Switching** in the workflow and proceed to Configure Switch Templates on page 187.

   For legacy and Dell switch models, select **SR/Dell Switching** in the workflow.
3. To add a branch router template to the network policy, select the **Branch Routing** step in the workflow and proceed to Configure a Router Template on page 129.

Continue configuring the network policy.

Related Topics

Configure AP Templates on page 144

Configure Switch Templates on page 187

Configure Classification Rules for a Device Template

Before you can add classification rules to a network policy, you must add a default AP device template and a location for the target AP. Also, create cloud config groups, IP addresses, and IP subnets.

You can create classification rules as part of a network policy or as a common object. Use this task to create classification rules associated with a network policy. ExtremeCloud IQ supports multiple classification rules for DNS servers, VLANs, RADIUS servers, device templates, user groups, and private client groups (PCGs).

- Configure **Device Location** rules to assign different DNS and RADIUS servers, and different time zones to different physical locations.
- Configure **Cloud Config Groups** (CCGs) to create user passwords which restrict access to private and personal network devices.
- Configure **IP Address** classification rules to associate user groups so they can communicate using their own private networks.

- Configure **IP Subnet** classification rules to support multiple user-group private networks.
- Configure **IP Range** classification rules for multiple user-group private networks.

This task is part of the network policy configuration workflow. Use this task to configure classification rules for a device template, as part of a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✏, or select +.
3. After you save the **Policy Details**, select **NEXT** to open the **2 Wireless** page.
4. From the **Configuration Settings** menu, select **AP Template**.
5. From the ☰ menu, select the desired default template.

   Default templates apply to all of the devices of the selected template type, which do not have a matching classification rule.
6. Select +, and then select the desired device template.

   Classification rules templates apply only to the devices of the selected template type that match the rules.
7. Type the new **Template Name**.
8. Select **SAVE TEMPLATE**.

   The new template appears in the table, in the main AP template window. The **Classification Rules** column for the template contains the controls for configuring classification rules.
9. To assign an existing classification rule, in the **Classification Rules** column, select ⇱.
   a. Select an existing classification rule.
   b. Select **Link**.
10. To create and assign a new classification rule, in the **Classification Rules** column, select ⊞.
    a. Type a **Name** for the rule.
    b. Type a **Description**.

       Although optional, entering a description is helpful for troubleshooting and for identifying the rule.

c. Select +, and then select the rule type to configure.

Choose from the following rule types:

Table 14: Rule types

Selected rule type	Do this
Device Location	i. Drill down until you reach the location level at which the device resides. ii. Select **Select**. The location appears in the **Classification Rules** table.
Cloud Config Group	i. Select the **Match Type**. ii. Select an existing group from the ☰ menu, or select +. For more information, see Add a Cloud Config Group on page 161. iii. Select **CLOUD CONFIG GROUP** iv. Select **CONTINUE**.
IP Address	i. From the **Match Type** menu, select **Contains** or **Does Not Contain**. ii. Select +, or select an existing IP address from the ☰ menu. If you do not see the IP address that you want, select **New** to create a new IP address. iii. Select **SAVE IP**. iv. Select **CONTINUE**.
IP Subnet	i. From the **Match Type** menu, select **Contains** or **Does Not Contain**. ii. Select +, or select an existing IP subnet from the ☰ menu. If you do not see the IP subnet that you want, select **New** to create a new IP subnet. iii. Select **SAVE SUBNET**. iv. Select **CONTINUE**.
IP Range	i. From the **Match Type** menu, select **Contains** or **Does Not Contain**. ii. Select +, or select an existing IP range from the ☰ menu. If you do not see the IP range that you want, select **New** to create a new IP range. iii. Select **SAVE IP**. iv. Select **CONTINUE**.

11. Use the up and down arrows in the **Order** column to define the order in which the location, cloud config group, IP address, IP subnet, and IP range objects appear.

    ExtremeCloud IQ uses a top-down, first-match, stop-on-match processing method for these objects. Therefore, if a device is a member of more than one matching object for an element, only the first match applies.
12. Select **SAVE RULE**.

Related Topics

Add a Cloud Config Group on page 161

Configure the SSID for a Standard Wireless Network on page 79

Fabric Attach

Fabric Attach is a software-based feature that automates the connection to the Fabric Connect environment, enabling devices and their associated end-points to be quickly mapped to the appropriate virtualized Fabric Connect service.

Provisioning a non-fabric AP to the Fabric Connect network is as easy as taking the Fabric Attach-enabled AP out of the box and physically connecting it to a Fabric Connect-enabled switch. The Fabric Attach device then automatically configures itself with the appropriate management VLAN, preparing itself for the dynamic extension of virtualized fabric services on behalf of its connected end-point devices or users. This can speed the deployment of edge devices to the Fabric Connect environment since no manual configuration is required, and can be especially valuable at locations where networking skills are at a premium, such as remote offices.

ExtremeCloud IQ APs support the following functions:

- Discover the Fabric Attach Server upon start up.
- Receive management VLAN configuration from the Fabric Attach Server, if discovered.
- Configure received management VLAN on the Management interface and Ethernet interface of the AP.
- Establish the management plane communication path to ExtremeCloud IQ.
- Support Native VLAN Tagging on the Management interface.

ExtremeCloud IQ APs do not support the following functions:

- Get VLAN to I-SID Mapping from ExtremeCloud IQ as management command.
- Configure the Fabric Attach Server port with VLAN to I-SID mapping.
- Establish data plane communication path for every configured VLAN.

Related Topics

Configure Fabric Attach on page 123

Configure Fabric Attach

Before you begin, physically connect the device to a Fabric Connect-enabled switch. To perform the following task, you require the device VLAN ID and I-SID number.

For more information about Fabric Attach, see Fabric Attach on page 123.

This task is part of the network policy configuration workflow. Use this task to configure Fabric Attach for a device connected to an existing Fabric Connect network.

1. Go to **Configure** > **Network Policies**.
2. Locate the network policy, and select the **Device Template** to modify.
3. Scroll down to the **Wired Interfaces** section.
4. Select + next to the **Fabric Attach** field.

   Alternately, select an existing profile from the menu. To edit the selected profile, select ✎. See Configure a Fabric Attach Profile on page 161.
5. Type a **Name** for the new profile.
6. (Optional) Type a description for the new profile.

   Although optional, entering a description is helpful for troubleshooting and for identifying the profile.
7. Select + to add a VLAN.
8. Type the associated **VLAN ID** for the device.
9. Select the **I-SID#** for the device from the drop down.
10. Select **SAVE**.

Related Topics

Fabric Attach on page 123

Configure a Fabric Attach Profile on page 161

Configure Device Data Collection and Monitoring Options

First create a network policy.

This task is part of the network policy configuration workflow. Use this task to set the following data collection and monitoring options:

- **Application Visibility and Control (AVC)**: AVC gives you information that can help you manage network traffic and applications. AVC detects the application-layer contents of the frame to determine the application or protocol that is transmitting the data. ExtremeCloud IQ can then track the amount of data being transmitted by a particular application or protocol.
- **Device Wireless Activity Thresholds**: Set activity threshold limits above which event alarms are generated.
- **Client Wireless Activity Thresholds**: These alarms identify when violations occur that affect the wireless health of a client as reported in SLA reports for non-compliant clients. To trigger more alarms, lower thresholds. To reduce the number of alarms, increase thresholds.

- **Kernel Diagnostic Data Recorder (KDDR)**: KDDR logs capture run-time statistical data about unexpected events for Extreme Networks devices. Extreme Networks Support analyzes the content of these binary log files for troubleshooting.
- **Automatic Synthetic Traffic Generation**: Some of the Client 360, Device 360 and Network 360 monitoring capabilities require synthetic traffic generation.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✏, or select +.
3. After you save the **Policy Details**, select **NEXT** to open the **2 Wireless** page.
4. From the **Application Management** menu, select **Device Data Collection And Monitoring**.
5. Toggle the **Application Visibility and Control** setting **ON** to detect frame application-layer contents.
6. Toggle the **Statistics Collection** setting **ON** to record wireless activity statistics between the device and connected clients.
7. To change the data collection interval, select the number of minutes from the menu.
8. For **Device Wireless Activity Thresholds**, type values for the following fields:
   - **CRC error rate exceeds**: The point at which the percent of CRC errors in received wireless frames during the collection interval is considered to be excessive.
   - **Tx drop rate exceeds**: The point at which the percent of transmitted wireless unicast frames that a device drops during the collection interval is considered excessive. A transmitted wireless frame is dropped when the device tries to transmit the same unicast frame a maximum number of times without receiving an acknowledgment from the intended recipient.
   - **Rx drop rate exceeds**: The point at which the percent of dropped wireless frames during collection interval is considered excessive. A device might drop wireless frames on its ingress Wi-Fi interface for several reasons, such as the arrival of duplicate frames or frames that cannot be decrypted.
   - **Tx retry rate exceeds**: The point at which the percent of retransmitted wireless frames during the collection interval is considered excessive. A device tries to resend a unicast frame if the first effort does not elicit an acknowledgment from its intended recipient.
   - **Airtime Consumption exceeds**: The point at which the percent of transmitted and received airtime usage for a wireless interface during the collection interval exceeds the maximum airtime consumption threshold.

9. For **Client Wireless Activity Thresholds**, type values for the following fields:

   Tx drop rate exceeds: Indicates the point at which the percent of wireless unicast frames that a device drops during transmission to the same client during the statistics collection interval is considered excessive.

   Rx drop rate exceeds: Indicates the point at which the percent of dropped wireless frames received from the same client during the statistics collection interval is considered excessive.

   Tx retry rate exceeds: Indicates the point at which the percent of retransmitted wireless frames to the same client during the collection interval is considered excessive.

   Airtime Consumption exceeds: Indicates the point at which the percent of airtime that a device consumes while transmitting traffic to and receiving traffic from the same client during the collection interval is considered excessive.
10. Toggle the **Kernel Diagnostic Data Recorder** setting **ON** to capture run-time statistical data about unexpected events.
11. For **Automatic Synthetic Traffic Generation**:
    a. Enable **RADIUS Authentication** to create synthetic traffic.
    b. Toggle the **Check Radius service connectivity via Status-Server** setting **ON** to check RADIUS service connectivity.

       Ensure that **Status-Server** is enabled on the RADIUS server.
    c. Adjust the check **Interval** if necessary.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

Configure iBeacon Service

First configure a network policy.

Consider the following:

- The iBeacon Service settings configured in this task apply to the Device template associated with the network policy. You can override the settings configured here, and also configure device-level settings, by going to **Manage** > **Devices** > **Configure** > **Interface Settings** > **Wireless Interfaces** > **iBeacon**.
- IoT Thread profile configuration automatically takes precedence over iBeacon configuration. If iBeacon is configured and deployed, and later IoT Thread is configured and deployed, iBeacon becomes disabled and IoT Thread is enabled. If iBeacon configuration exists but has yet to be deployed, and then later IoT configuration is done and deployed, only the IoT configuration is pushed to the AP.

You can configure the embedded iBeacon transmitter in APs. As transmitters, these beacons broadcast numerical advertisements that trigger an action on Bluetooth-enabled devices that come within range. For example, an app running on a mobile device might react to an iBeacon signal by displaying welcome messages, sale announcements, or coupons.

This task is part of the network policy configuration workflow. Use this task to configure the iBeacon service for a network policy.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎, or select +.
3. After you save the **Policy Details**, select **NEXT** to open the **2 Wireless** page.
4. From the **Application Management** menu, select **iBeacon Service**.
5. Toggle the **iBeacon Services** setting **ON**.
6. Type a **Service Name**.
7. (Optional) Type a **Description**.

   Although optional, entering a description is helpful for troubleshooting and for identification.
8. If your organization already has a UUID number, type it in the **iBeacon UUID** field.

   UUID format: 32 hexadecimal (base 16) digits, displayed in five groups separated by hyphens, in the form 8-4-4-4-12 for a total of 36 characters (32 alphanumeric and four hyphens). For example: 123e4567-e89b-12d3-a456-426655440000

   You can also automatically create a UUID with an online UUID generator, such as the one at https://www.uuidgenerator.net/.
9. Select **Enable iBeacon Monitoring**, and then enter a value in the range of 10-1200 seconds in the **iBeacon Interval** field.

   The default value is 60 seconds.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

Configure Presence Analytics

First, configure a network policy.

Note
It is not necessary to change the default values if devices are connected over faster links.

Adjust these settings to accommodate situations where devices are connected over slower links and where the data must be aggregated at different rates.

This task is part of the network policy configuration workflow. Use this task to specify how frequently APs send data to ExtremeCloud IQ.

1. Go to **Configure** > **Network Policies**.
2. Select an existing policy, and then select ✎, or select +.
3. After you save the **Policy Details**, select **NEXT** to open the **2 Wireless** page.
4. From the **Application Management** menu, select **Presence Analytics**.
5. Toggle the **Enable Presence Analytics** setting **ON**.
6. Type a **Name**.

7. (Optional) Type a **Description**.

   Although optional, entering a description is helpful for troubleshooting and for identification.
8. For **Trap Interval**, specify (in seconds) how often the presence sensor reports data to ExtremeCloud IQ.

   Lowering this interval below 15 seconds pushes data faster but also increases network traffic. Raising this interval above 15 seconds pushes data at a slower rate and decreases network traffic.
9. Specify the **Aging Time** (in seconds) for a given presence profile.
10. Specify the **Aggregate Time** interval (in seconds) for the period of time that aggregation will occur for the presence profile.

Related Topics

Configure the SSID for a Standard Wireless Network on page 79

About Router Settings

As part of a network policy that applies to multiple devices, you can configure the following router settings:

- Network Allocation - You can add or import subnetwork allocations, and allocate VLANs to subnetwork spaces defining management, internal, and guest networks. When ExtremeCloud IQ uploads the network policy to routers with these VLANs assigned to their Ethernet ports, it also assigns the subnetwork space to those ports.
- Router Templates - A router template is a diagram of the physical ports for a specific Extreme Networks router model and allows you to assign port types to the device ports, which defines how the ports assigned to it will function.
- VPN Service - Layer 3 IPsec VPN tunnels securely send traffic between Extreme Networks routers and one or two Extreme Networks VGVAs (VPN Gateway Virtual Appliances). ExtremeCloud IQ applies Layer 3 IPsec VPNs to routers and Layer 3 VPN gateways through a network policy that supports routing.
- SD-WAN - Enable SD-WAN to configure policies that make routing decisions based on Layer 7 application service sets, user profiles, incoming LAN interfaces, or source and destination addresses. An SD-WAN route group is a list of prioritized WAN ports that you can use as a forwarding action in a routing policy.
- Routing Policy - Policy-based routing enables you to assign route priorities to traffic based on various factors, including Layer 7 application service sets, user profiles, incoming LAN interfaces, and source and destination addresses. There are three general configurations for policy-based routing: split tunnel, tunnel all, and custom. When routing is enabled in the network policy and SD-WAN is disabled, you can use any of these routing policy types. When both routing and SD-WAN are enabled, you can only define custom routing rules.
- URL Filtering - Some routers support HTTP URL filtering rules, which define URL filtering by whitelist, blacklist, and category, and can be assigned to one or more user profiles.
- Firewall - A network firewall policy is a set of up to 2048 rules that a router uses to permit or deny traffic to and from the networks it controls. For more information, see Configure a Firewall Policy on page 294.

- Dynamic DNS - The DNS translates human-friendly domain names into IP addresses. You can supply external DNS server IP addresses or use Extreme Networks routers to provide proxy DNS services for every local network under their control.
- WAN Tracking - You can configure one or two WAN tracking destination IP addresses in a network policy so that routers can send probe packets to the destination IPs to check WAN availability.

Configure a Router Template

A router template is a diagram of the physical ports for a specific Extreme Networks router model and allows you to assign port types to the device ports. A port type defines how the ports assigned to it will function. You can add one or more templates for the router models to which the network policy applies. To use more than one template for the same router model, you must use classification rules to distinguish which template to apply to which device. You can select a previously defined template to use as is, or copy it and modify the settings in the copy to customize it for a particular policy. When you modify a device template that is used in multiple network policies, your changes are applied to that template everywhere. If you do not want to change the template in other network policies, make a copy, save it with a different name, and modify the new template for use in a single policy.

1. Select **ADD** and choose the appropriate device template your model.
2. In the device template, assign ports with the connection types that you want them to provide: access, 802.1Q, and WAN.
3. Enter a template name.
4. To assign an existing port type:
   a. Highlight one or more ports in the router template, and then select **Assign** > **Choose Existing**.
   b. Select the type you want for the selected port or ports:
      - **Access port**: for a port connected to an individual host
      - **WAN port**: for a port connected to the WAN
      - **Trunk port**: for a port connected to a forwarding device such as an AP and switch that supports multiple VLANs
5. To create a new port type, select **Assign** > **Create New** and enter the following in the **New Port Type** section:
   a. Enter a port type name.
   b. Enter an optional description.
   c. Toggle the **Port Status ON** to enable the port, or **OFF** to disable it.
   d. For **Port Usage**, select **Access Port** for ports connected to individual hosts, **Trunk Port** (802.1Q VLAN Tagging) for ports providing network access through forwarding devices such as APs and switches that support multiple VLANs, or **WAN Port** for a port acting as a backup WAN interface.
   e. Configure parameters for the port type you selected.

6. For **Access Port**:
    a. For **Port Usage Settings**, select one of four possibilities for authentication:
        - **No user authentication and no MAC authentication**. This is the default and is common for sites where you know all connections will come from trusted devices so no authentication is necessary. An employee home offices is one example.
        - **User authentication for clients with a RADIUS supplicant running on them but no MAC authentication**. Use this option to authenticate users before allowing network access, if you know that permitted devices will have a RADIUS supplicant running on them, and if your infrastructure is set up for RADIUS user authentication.
        - **MAC authentication for clients without a RADIUS supplicant but no user authentication**. Use this option to control network access when you know that permitted devices connecting to the port will not have a RADIUS supplicant and your RADIUS infrastructure is set up to authenticate them by MAC address.
        - **User authentication for clients with a RADIUS supplicant or MAC authentication for clients without**. This option is useful for situations where you cannot know in advance if a device connected to the access port will have a RADIUS supplicant, perhaps when users at different branch sites connect devices with different RADIUS capabilities to the port.

    b. For **Wired Connectivity**, Toggle **OFF** to enable clients to connect to the port without requiring user authentication, and **ON** to enable user authentication through EAP/802.1X and RADIUS.
    c. Configure a default RADIUS server group and, if you want different APs to use different RADIUS servers based on their location, select **Apply RADIUS server groups to devices via classification** and select or configure additional RADIUS server groups.

        See Configure RADIUS Server Settings on page 97 for more information about RADIUS server settings.
    d. For **MAC Authentication**, toggle **OFF** to allow clients to connect to the port without requiring MAC authentication, and **ON** to enable device authentication using the MAC address as both user name and password.

        When a client without a RADIUS supplicant connects, the RADIUS server tries MAC authentication, also referred to as MAB (MAC authentication bypass).

e. For **Authentication Protocol**, choose **PAP** (Password Authentication Protocol), **CHAP** (Challenge Handshake Authentication Protocol), or **MS CHAP V2** (Microsoft CHAP Version 2), depending on which protocol the RADIUS authentication server supports.

   If you are using an Extreme Networks RADIUS server, use the default choice: **PAP**. For an external RADIUS authentication server, choose the protocol that it supports. The Extreme Networks device functioning as the RADIUS authenticator uses the chosen protocol to authenticate communications between itself and the RADIUS server when submitting client credentials (MAC address) for authentication.

   If you already enabled **User Authentication** on the **Wired Connectivity** tab and configured one or more RADIUS server groups for it, those servers will also perform MAC authentication. If you enable only MAC authentication on the access port, then you must define a default RADIUS server group and optionally other groups via classification.

f. For **Multiple Clients**, select **Allow multiple clients connected to the same port on the same VLAN**.

   Only the first device needs to authenticate successfully for all others to connect as well.

g. For **Primary authentication using**, when both **Wired Connectivity** and **MAC Authentication** are enabled, this option enables you to control which authentication method is attempted first.

   For example, if you select **Primary authentication using 802.1X**, the RADIUS authentication server first attempts to prompt the client for a user name and password. If the client has a RADIUS supplicant, it must submit a valid user and password to pass authentication. If the client does not have a RADIUS supplicant, the RADIUS server then tries to authenticate the client using the MAC address as both user name and password. If one of the authentication methods succeeds, the client is allowed on the network. If neither succeeds, the client is denied network access. To change the authentication sequence so that MAC authentication is attempted first, select **Primary authentication using MAC**.

7. For **User Access Settings**:

   a. For **Default User Profile**, set the user profile that you want the router to apply by default to users connecting to the port.

   b. Either select and choose an existing user profile, or select the plus sign and create a new one.

      See Add a User Profile on page 217 for more information about creating user profiles.

c. Select **Apply a different user profile to various clients and user groups** and add one or more user profiles for different categories of users that you expect to make wired connections to the access port.

   If a single device, such as a printer, is always connected to this port, leave the check box cleared and just apply the default user profile for infrastructure devices like printers. If you expect different types of users, such as employees, consultants, and visiting VIPs, to use the port as needed to connect their computers to the network, then select the check box and set up classification rules to govern when to apply different user profiles.

d. For **Traffic Filter Management**, select which management and diagnostic services—SSH, Telnet, Ping, and SNMP—to enable access to the mgt0 interface through the access port.

8. Configure the following settings for **Trunk Ports** connected to network forwarding devices such as switches and APs that support multiple VLANs on trunk ports:

   a. For **VLAN Object**, set the native (untagged) VLAN and all VLANs that you want the port to support.

      - **Native VLAN**: The native (untagged) VLAN is the VLAN assigned to frames that do not have any 802.1Q VLAN tags in their headers. By default, Extreme Networks devices use VLAN 1 as the native VLAN.
      - **Allowed VLANs**: Enter the VLANs—including the native VLAN—that you want the trunk port to enable. You can list the VLANs individually, separated by commas, or as a range of VLANs using a hyphen. Alternatively, you can enter the word `all` to support all existing VLANs previously configured in the network policy. When you enter `all`, the router allows all VLANs configured in the network policy, not all VLANs from 1 to 4094.

   b. For **Traffic Filter Management**, select which management and diagnostic services—SSH, Telnet, Ping, and SNMP—to enable access to the mgt0 interface through the trunk port.

9. For **WAN Ports**, because the ETH0 and USB ports are always enabled as WAN links, they must be set as primary, backup1, backup2, or backup3, therefore, you can set one or more Ethernet ports as WAN links.

10. **Port Types In Use** provides an overview of the port settings and configuration options available from the port settings tabs:

    - **Port Details**: View information about the interfaces on the router, add or modify the port type assigned to each interface, and modify the WAN priority settings.
    - **Port Settings**: Displays the physical interface names, and allows you to select the transmission types and speeds.
    - **PSE**: Choose the PSE (power sourcing equipment) power settings for the router to provide to PDs (powered devices) through the ETH1 and ETH2 ports.

Configure Network and IP Address Allocation

Create a **Network Policy** and select **Branch Router** in the workflow.

You can allocate VLANs to subnetwork spaces, defining management, internal, and guest networks. When ExtremeCloud IQ uploads the network policy to routers with these VLANs assigned to their Ethernet ports, it also assigns the subnetwork space to those ports.

1. Select **Add** to create a new VLAN-to-subnetwork mapping.
2. Choose **Select** and either choose a VLAN from the drop-down list or select **New** to define one.

   To add a VLAN, see Configure VLAN Settings on page 109.
3. Choose **Select** to choose an existing subnetwork from the list or select **New** to define one.

   To add a subnetwork, see Add a Subnetwork Space on page 290.
4. To map a VLAN to more than one subnetwork, select **+** and then either choose an existing subnetwork or define a new one.

   This action is helpful if your deployment expands beyond your original estimates and you need to add a new subnetwork for the additional branch sites. By keeping the VLAN the same, you can maintain the same user profile-to-VLAN relationship in your existing configuration, regardless of differing IP address spaces. ExtremeCloud IQ assigns address scopes to branch sites from the next subnetwork when it has used all of those from the first one.
5. Select **Save**.
6. Select the add icon to add IP allocation settings.
7. Select a branch name for the router from the drop-down list.
8. Select the serial number of this device from the drop-down list.

   The host name for the router is automatically displayed.
9. Select a subnet entry from the dropdown list.
10. Select **Next**.

Configure DNS settings.

About VPN Services

VPN Services consist of configurations for Layer 3 IPsec VPNs, used for communication between routers, and Layer 2 IPsec VPNs, used for communication between access points (APs).

Layer 3 IPsec VPNs

Layer 3 IPsec VPN tunnels securely send traffic between Extreme Networks routers and one or two Extreme Networks VGVAs (VPN Gateway Virtual Appliances). Each router functions as a VPN initiator and does a route look up to determine whether to send traffic from hosts in its sub-network through an IPsec tunnel to destinations in different subnets on the other side of the gateway, and which functions as a VPN terminator. When using a hub-and-spoke design, the destination might lie on the other side of a second tunnel that connects the Layer 3 VPN gateway to another router at a different remote site. ExtremeCloud IQ applies Layer 3 IPsec VPNs to routers and Layer 3 VPN gateways through a network policy that supports routing. For information about configuring Layer 3 IPsec VPNs, see Configure Layer 3 VPN Services on page 134. Use **Manage** > **VPN Services** to view the existing VPN services in your network configuration.

Layer 2 IPsec VPNs

Layer 2 IPsec VPNs tunnel traffic between APs functioning as VPN clients at remote sites and a VPN Gateway Virtual Appliance or Extreme Networks APs functioning as VPN servers at the corporate site, providing Layer 2 extensions of the main network. You can define at least one VPN server or two for redundancy. Each VPN client must belong to the same management network as the VPN server and build a GRE (Generic Routing Encapsulation) tunnel between the client and server. DHCP traffic is also tunneled, so clients receive IP addresses from the DHCP server at the corporate site just as if they were on the primary network.

When a wireless client associates with a device, the device applies a user profile to traffic from that client. If the device is a VPN client with a user profile tunnel policy, then the device tunnels that traffic back to a VPN server at the primary site. The clients receive network settings from a DHCP server at the primary site, query DNS servers at the primary site for domain name resolution, and access other network servers through the tunnel to any site in the VPN network.

Because the NAT mechanism on the device involves both the source IP address and source port number, wireless clients can only send TCP or UDP traffic. Note that the clients will not be able to ping local servers because ICMP does not use port numbers. For information about configuring Layer 2 IPsec VPNs, see Configure Layer 2 IPsec VPN Services on page 264.

Note
A Layer 2 VPN server on an AP can terminate a maximum of 128 tunnels. A Layer 2 VPN Gateway Virtual Appliance can terminate up to 1024 tunnels.

Configure Layer 3 VPN Services

Enable VPN Services for the router in the **Router Settings** section of the network policy.

Use this task to configure Layer 3 IPsec VPNs. You can create a Layer 3 VPN Services profile that makes use of all the default settings, choose the VPN gateway and define its external IP address, and configure the default routing policy and any policy exceptions.

1. Select to add a new VPN Service.
2. Enter a name for this service.
3. Enter an optional description.
4. Select either **Extreme Networks VPN Gateway** or **Third Party Gateway**.
5. If you selected **Extreme Networks VPN Gateway**, configure the following information:
    a. Enter the number of branch sites that you expect will build tunnels to the VPN gateway.
    b. Enter the maximum tunnels per gateway.

c. Select whether to have VPN tunnel addressing be automatic or use a WAN interface IP address.

d. Select the add icon below **VPN Gateway Settings** and then **Select** a VPN Gateway from the drop-down list.

The VGVAs that display in this list have been added to the network as Layer 3 VPN gateways. To change a VGVAs setting, go to **Manage** > **Devices**.

6. Select **Auto** to have IP addresses automatically generated, or **WAN Interface IP addresses** to use a specific address.
7. If you selected **Third Party Gateway**, configure the following information:

   a. Select a vendor from the drop-down list.

   b. Enter the IP address of the third-party VPN gateway.

   c. For the **VPN Access List** at the bottom of the page, select the plus sign and enter the required source and destination networks in the respective VPN access list text boxes.
8. Select **Generate** to create credentials for servers and clients.
9. For the remaining optional settings see:
   - Configure IPsec VPN Authority Settings on page 135
   - Configure Advanced Server Options on page 137
   - Configure Advanced Client Options on page 138

After you apply a VPN gateway, ExtremeCloud IQ automatically displays its WAN and LAN IP addresses and whether the VPN gateway uses dynamic routing protocols to learn routes from routing peers on its local network.

Configure IPsec VPN Authority Settings

Create or edit a Layer 2 IPsec VPN service. For more information, see Configure Layer 2 IPsec VPN Services on page 264.

The authentication mechanism between a VPN gateway and a VPN client operates in hybrid mode, which employs a combination of certificates and passwords for VPN peer authentication. Use this task to import certificates in PFX or DER formats, to import a pair of DER-formatted files, one containing a certificate and the other its accompanying private key, and convert their format from DER to PEM.

Note

Default certificates are intended to be used for testing only.

Extreme Networks VPN gateways do not support password-encrypted certificates.

For hybrid mode authentication, ExtremeCloud IQ distributes the certificates as follows:

- **VPN Certificate Authority**: The CA certificate is loaded on VPN clients so that they can validate the server certificate that the VPN gateway presents.
- **VPN Server Certificate**: The server certificate on the VPN gateway is used during IKE Phase 1 negotiations to authenticate itself to the VPN client.
- **VPN Server Cert Private Key**: The private key accompanies the public key in the server certificate. This is also loaded on the VPN gateway.

Use the following procedure to configure IPsec VPN Authority settings.

1. In the **Optional Settings** section, expand **IPsec VPN Authority Settings**.
2. If you do not have a certificate or key that you want to use, select **Import**.
3. To import a PFX-formatted file, which contains a certificate and private key combined, and convert its format from PFX to PEM:
   a. Choose **Select**, navigate to and select the .PFX file.
   b. Select **Convert the certificate format from PFX to PEM**.
   c. Enter the password that was used to encrypt the PFX file.
   d. Select **Import**.

      Later, when you use the PEM-formatted file that contains both the certificate and private key, you must choose the same file as both the VPN Certificate and the VPN Cert Private Key.
4. To import a pair of DER-formatted files, one containing a certificate and the other its accompanying private key, and convert their format from DER to PEM:
   a. Choose **Select**, navigate to and select the .DER file.
   b. Select **Convert the certificate format from DER to PEM**.
   c. Select the type of file you are importing; in this case, **Certificate**.
   d. Select **Import**.
   e. To import the private key file matching the public key in the certificate you just imported, repeat Steps a-c, but select **Key** for the file type.
   f. When importing a DER-formatted private key, enter the password used to encrypt the file.
   g. Select **Import**.

      When you choose the VPN Server Certificate and VPN Server Cert Private Key, make sure they correspond with each other.

For information about **Optional Settings** > **Server-Client Credentials**, see About Server-Client Credentials on page 136.

Related Topics

About Server-Client Credentials on page 136

Configure Layer 2 IPsec VPN Services on page 264

About Server-Client Credentials

When you save the Layer 2 IPsec VPN service configuration, ExtremeCloud IQ populates this table with randomly generated text strings that VPN clients use to identify themselves to VPN gateways. Extreme Networks VPN clients use these strings like passwords when identifying themselves to the VPN gateway during the Xauth stage between IKE Phase 1 and 2 negotiations.

After a device is configured as a VPN client, ExtremeCloud IQ allocates one of the credentials to it. The name of the VPN client appears in the **VPN Client Name** column and the entry in the **Allocated** column changes from false to true. The primary and secondary VPN servers assigned to that client appear in their respective columns.

Next, configure **Optional Settings** > **Advanced Server Options**. See Configure Advanced Server Options on page 137.

Related Topics

Configure Advanced Server Options on page 137

Configure Layer 2 IPsec VPN Services on page 264

Configure Advanced Server Options

Create a Layer 2 IPsec VPN service. For more information, see Configure Layer 2 IPsec VPN Services on page 264.

Use the following procedure to change the IKE Phase 1 and Phase 2 options.

1. In the **Optional Settings** section, expand **Advanced Server Options**.
2. For **IKE Phase 1 Options**:
    a. Set the **Encryption Algorithm** as 3DES (Triple DES, Data Encryption Standard), or AES (Advanced Encryption Standard) with a 128-bit key, a 192-bit key, or a 256-bit key.
    b. Set the **Hash Algorithm** as MD-5 (Message Digest, version 5) or SHA-1 (Secure Hash Algorithm).
    c. Set the **Diffie-Hellman Group** for generating a shared key during Phase 1 negotiations to 1, 2, or 5.
    d. Set the phase 1 SA (security association) **Lifetime**.

       Before the SA expires, the authentication and encryption keys are automatically refreshed with new ones. You can set it to a different value, from 180 seconds (3 minutes) to 10,000,000 seconds (a very long time).
3. For **IKE Phase 2 Options**, the options are the same as for Phase 1, except you can choose to not perform a Diffie-Hellman key exchange.
4. Select **Enable peer IKE ID validation** to enable VPN clients to validate the IKE ID that the VPN gateway sends them, and choose the type of IKE ID to use.

   When you create a server certificate, you have the option to define one or more of these subject alternative names: IP address, FQDN (fully-qualified domain name), user FQDN. You can use any of them as the IKE ID for the VPN gateway. You can also use the ASN.1 DN (Abstract Syntax Notation One Distinguished Name), which is automatically created by concatenating various values in the certificate— including the common name, different organizational units, and the email address.

   When you update the configured devices with a configuration that includes a VPN services profile that references this server certificate, ExtremeCloud IQ pushes the server certificate and the specified IKE ID type to the VPN gateway. At the same time, ExtremeCloud IQ also pushes the CA certificate, IKE ID type, and IKE ID string to all the VPN clients. In this way, the VPN clients are ready to authenticate the VPN server certificate and its IKE ID when the time comes to do so during IKE negotiations.

Next configure **Optional Settings** > **Advanced Client Options**, see Configure Advanced Client Options on page 138.

Related Topics

Configure Advanced Client Options on page 138

Configure Layer 2 IPsec VPN Services on page 264

Configure Advanced Client Options

Create a Layer 2 IPsec VPN service. For more information, see Configure Layer 2 IPsec VPN Services on page 264.

For Layer 2 IPsec VPN tunnels, all management servers (CAPWAP, Syslog, SNMP, NTP, RADIUS, Active Directory, and LDAP) should be reachable from the VPN client without tunneling by default. However, you might want to tunnel some or all management traffic from the VPN client to servers on the main network. Use the following procedure to specify which type of management traffic you want VPN clients to send through the tunnel and which to forward locally.

1. In the **Optional Settings** section, expand **Advanced Client Options**.
2. For **Management Tunnel Traffic Options**:

   Note
   Set the following options only when the servers are in a different subnet from that of the tunnel interface. When they are in the same subnet, tunneling is automatic. In addition, the IP address/host name objects for the following servers must have IP address definitions as opposed to host name definitions.

   a. Select **ExtremeCloud IQ (CAPWAP)** to tunnel all CAPWAP (Control and Provisioning of Wireless Access Points) traffic from VPN clients to ExtremeCloud IQ, which is a CAPWAP server.
   b. Select **Syslog** to send log entries to a syslog server through the VPN tunnel.
   c. Select **SNMP Traps** to send all SNMP traps through the VPN tunnel to an SNMP management system.
   d. Select **NTP** to tunnel all NTP traffic from VPN clients to an NTP server.
   e. Select **RADIUS** to tunnel all RADIUS traffic from VPN clients to a RADIUS authentication server.
   f. Select **Active Directory** to tunnel all traffic from an Extreme Networks RADIUS authentication server to an Active Directory server.
   g. Select **LDAP** to tunnel all traffic from a RADIUS authentication server to an LDAP server.
3. Select **Enable NAT Traversal** to enable VPN traffic to traverse NAT devices encountered along its data path.
4. For **DPD (Dead Peer Detection) Settings**:

   The DPD and tunnel heartbeat settings control when to fail over from the primary to the secondary VPN server. The DPD messages verify the presence of an IKE peer, and AMRP (Advanced Mobility Routing Protocol) tunnel heartbeats verify communications through the GRE and VPN tunnel. The failure of either mechanism can trigger a failover.

   a. Set the **Heartbeat Interval** for sending DPD R-U-There heartbeat messages from the VPN client to the VPN gateway.
   b. Set the number of times to retry sending a DPD R-U-There message when it does not elicit a response.
   c. Set the amount of time between retries.

5. For **Tunnel Heartbeat Settings**:
    a. Set the **Interval** for sending AMRP heartbeats through the GRE and VPN tunnel from the VPN client to the VPN server.
    b. Set the number of times to **Retry** sending a heartbeat if the VPN server fails to respond.

       After a heartbeat fails to elicit a response from the VPN server, the VPN client retries every second.

Related Topics

Configure Layer 2 IPsec VPN Services on page 264

Configure an SD-WAN Route Group

Before you can enable SD-WAN, you must assign a branch ID to the router, and have one or two Extreme Networks VGVAs configured as part of a **VPN Service**. Then create a Network Policy with Router Settings.

An SD-WAN route group is a list of prioritized WAN ports used as a forwarding action in a routing policy. Enable SD-WAN in a network policy to configure policies that make routing decisions based on Layer 7 application service sets, user profiles, incoming LAN interfaces, or source and destination addresses.

1. Select **Enable SD-WAN**.
2. Select **Add**.
3. Enter a **Group Name**.
4. Enter an optional description.
5. Set the **WAN Priority** for the following WAN links on routers:
    - **WAN0**: The highest prioritized Ethernet link in the router template.
    - **WAN1**: The second highest prioritized Ethernet link in the router template.
    - **USB**: The WAN link of a connected USB LTE modem.
6. For **Routing Decision Rule**, define the following responses to operational faults for your SD-WAN routing decisions:
    - **Include Jitter**: Select **ON** to have jitter considered for WAN path changes.
    - **Packet Loss**: Select an aggressive, normal, or moderate response to packet losses.
    - **Latency**: Select an aggressive, normal, or moderate response to detected latency.
    - **Jitter**: (Only if **Include Jitter** is set to **ON**): Select an aggressive, normal, or moderate response to jitter.

Continue configuring the network policy.

Configure a Routing Policy

Create a Network Policy. For more information about router policies, see About Router Settings on page 128.

There are three **Policy Types** for policy-based routing: **Split Tunnel**, **Tunnel All**, and **Custom**. When routing is enabled and SD-WAN is disabled, you can use any of these routing policy types. When both routing and SD-WAN are enabled, you can only define custom routing rules. The **Split Tunnel** or **Tunnel All** options involve fewer routing considerations. If you configure the router to use **Split Tunnel**, the router applies the split tunnel template to the traffic, forwarding corporate traffic through the VPN tunnel and forwarding Internet traffic through the preferred interface to the Internet. If you configure the router to use **Tunnel All**, the router forwards corporate traffic through the VPN interface, but drops Internet traffic.

1. Select **Enable Routing Policy** under the **Router Settings** tab.
2. If not selecting an existing policy, select **ADD**.
3. Enter a name.
4. Enter an optional description.
5. Select a **Policy Type**:
    - **Split Tunnel**: Use the **Forwarding Action** drop-down list to choose the forwarding interface to drop or forward traffic to the Internet. Choose a **Backup Forwarding Action** secondary interface from the drop-down list to drop or forward traffic to the Internet in the event that the primary interface goes down.
        - **None**: Takes no forwarding action.
        - **Primary WAN**: Routes traffic through the interface designated as the primary WAN interface in the device template. By default, the primary WAN interface on an Extreme Networks branch router is ETH0.
        - **Backup WAN-1**: Routes traffic through the interface designated as the backup WAN interface in the device template.
        - **Backup WAN-2**: Routes traffic through the interface designated as the secondary backup WAN interface when there are three interfaces in WAN mode. By default, the Backup WAN-2 interface on a router is the wireless USB modem.
        - **VPN**: Routes traffic through the tunnel interface on a router that connects a branch site to the corporate site through an IPsec VPN tunnel.
        - **Drop**: Drops traffic rather than forwarding it.

      Note
      The routes for **Forwarding Action** and **Backup Forwarding Action** cannot be the same.

    - **Tunnel All**: Read-only.
6. If you choose the **Custom Policy Type**, select **Add** and select these options:
    a. Choose a **Source Type**:
        - **Any**: Use when you want a routing policy rule to apply to traffic from any source.
        - **Network**: Use when you want a rule to apply to traffic from an entire subnetwork, such as a network reserved for contractors and guests.
        - **IP Range**: Use when you want a rule to apply to traffic from a range of IP addresses, such as the addresses in a DHCP pool reserved for a specific group of users.
        - **Interface**: Use when you want to apply a rule to all traffic arriving at a specific interface.

  - **User Profile**: Use when you want to apply rules to specific types of users.
  - **Application Service Set**: Use to apply rules to specific application types.

  b. Choose a traffic **Destination**.

  - **Any**: The rule applies to any traffic destination.
  - **Network Address**: Sets a specific host name, subnet, or IP address range as the destination.
  - **Private**: The rule applies to traffic destined to the corporate network (VPN).

  c. Select **Forwarding Actions** and **Backup Forwarding Actions** as described under **Split Tunnel** above.

7. To configure **Path MTU Discovery**, see Configure Path MTU Discovery on page 141.
8. For more information, see Configure a Firewall Policy on page 294, Configure Dynamic DNS on page 141, and Configure URL Filtering Rules on page 216.

Continue configuring the network policy.

Configure Path MTU Discovery

Create a **Network Policy** and a **Routing Policy**.

Path MTU Discovery allows the router to monitor the value set in the MSS option in TCP SYN and SYN-ACK messages, which enables it to reduce the MSS value below the TCP-MSS thresholds.

1. Select **Enable Path MTU Discovery** to enable the Extreme Networks router to learn the maximum packet size, or maximum transmission unit (MTU), that can be sent between two hosts without fragmentation.
2. Select **Monitor the MSS Option in TCP SYN and SYN-ACK Messages and Perform Clamping if the MSS Threshold is Exceeded** to monitor the MSS option in TCP SYN and SYN-ACK messages and, if necessary, reduce the MSS value as determined by one of the following TCP-MSS thresholds.
   - **MSS Threshold for All TCP Connections**: Set the TCP-MSS threshold for all TCP connections passing through the device. If you do not enter a threshold value, TCP-MSS clamping uses Path MTU (40 bytes) for the IP and TCP headers.
   - **MSS Threshold for TCP Connections Through the VPN Tunnel**: Set the TCP-MSS threshold for TCP connections that pass through a Layer 3 VPN tunnel. If you do not enter a threshold value, the device uses the value set for the MSS threshold for all TCP connections.

Continue configuring the network policy.

Configure Dynamic DNS

Dynamic DNS (DDNS) automatically and periodically updates your DNS server IPv4 or IPv6 information when your IP address changes.

Use the following steps to configure DDNS.

1. Toggle the Dynamic DNS switch to **On.**
2. Select a DDNS provider.

3. Enter a user name.
4. Enter a password.
5. Enter the domain name, which must be the full router name and domain name.

   The router host name must be unique.
6. Select **Save**.

Configure WAN Tracking

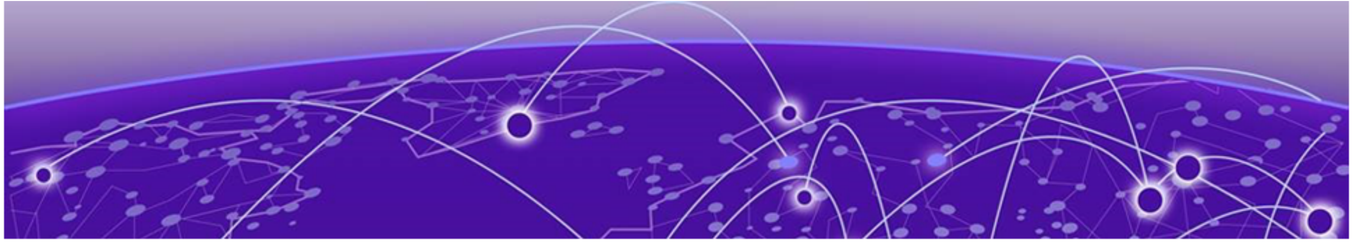
Create a Network Policy with Router Settings.

Configure one or two WAN tracking destination IP addresses in a network policy so routers can check WAN availability by sending probe packets to these destination IPs.

1. Enter a different **Primary IP Target** or accept the default.

   The default primary IPv4 target is 8.8.8.8, which is the Google Public DNS, a free domain name system (DNS). This DNS is available from anywhere in the world.
2. Enter an optional **Secondary IP Target**.
3. Specify the **Number of Retries** before the router marks the link as unavailable.
4. For the **Measurement Interval**, enter the number of seconds between retries.
5. Select **Reset to Default** to return these settings to the factory defaults.

Continue configuring the network policy.



Configure Common Objects

Use the information and procedures in this chapter to define objects for use throughout the configuration process, in particular when you are configuring network policies.

Policy Configuration

The topics in this section provide details about policy configuration objects, such as AP Templates, Auto Provisioning, Bonjour Gateways, Client Monitor Profiles, Cloud Config Groups, Fabric Attach Profiles, Hives, Port Types, Radio Profiles, SDR Profiles, Schedules, and Classification Rules.

Related Topics

Configure AP Templates on page 144
Configure Auto-Provisioning on page 153
Configure a Bonjour Gateway on page 155
Configure Classification Rules on page 158
Configure Client Monitor Profile Policies on page 160
Add a Cloud Config Group on page 161
Configure a Fabric Attach Profile on page 161
IoT Profiles on page 165
Manage Port Types on page 171
Instant Port Profiles List on page 172
About Radio Profiles on page 172
Configure an SDR Profile on page 185
About SSIDs on page 82
Configure Switch Templates on page 187

Configure URL Filtering Rules on page 216

Add a User Profile on page 217

Configure AP Templates

Before you begin, create a network policy for the APs (see Configure Device Templates on page 120). You can also configure an AP template directly from the **Common Objects** tab.

Create AP device templates with default settings for all APs, and settings that ExtremeCloud IQ applies when APs are onboarded. Default AP settings can then be modified individually as required. AP templates enable quick AP deployment, with most of the port settings already applied by the associated template. Some devices have extra possible configuration options, depending on the device model.

> Note
> When AP device templates and auto-provisioning rules (see Configure Auto-Provisioning on page 153) are both in place for an AP when it is onboarded, the auto-provisioning rules are applied and the device template is ignored.

Use this task to configure an AP device template.

1. Go to **Configure** > **Common Objects** > **Policy** > **AP Template**.
2. Select an existing AP Template, and then select ✎, or select +.

   To delete the selected template, select 🗑.
3. For a new template, enter a name, and for an existing template, edit where necessary.
4. Select the ports or interface icons on the template graphic.
   a. To select all of the ports and interfaces, choose **Select All Ports**.
   b. To deselect all of the ports and interfaces, select **Deselect All Ports**.
5. To **Assign** an Ethernet port profile, see Assign an Ethernet Port Profile on page 145.
6. To configure **Wireless Interfaces**, see Configure Wireless Interfaces for an AP Template on page 146.
7. To configure **Wired Interfaces**, see Configure Wired Interfaces for an AP Template on page 147.
8. To configure **SES-imagotag**, see Configure SES-Imagotag on page 149.
9. To configure **Advanced Settings**, see Configure AP Device Template Advanced Settings on page 151.
10. Select **SAVE TEMPLATE**.

Continue configuring the network policy.

Related Topics

Configure Device Templates on page 120

Configure Auto-Provisioning on page 153

Policy Configuration on page 143

Assign an Ethernet Port Profile

An Ethernet port profile lets you manage a variety of features such as port status (on or off), port usage (bridge access, bridge 802.1Q, or uplink), wired connectivity, and MAC authentication.

Use this task to assign a port profile to device ports.

1. Go to **Configure** > **Common Objects** > **Policy** > **AP Template**.
2. Select an existing AP Template, and then select ✎, or select + to create a new template.
3. To assign an existing port profile, select one or more Ethernet ports on the AP template graphic.
    a. Select **Assign**.
    b. Select **Choose Existing**.
    c. Choose any of the options from the **Port Type Assignment** list, and select **Save**.
4. To create a new port profile, select **Create New**.
    a. Type a **Port Name** for the port type.
    b. (Optional) Type a **Description** for the port profile.
    c. Select the **Port Usage** type:
        - **Uplink Port**: Use to connect the AP to the WAN.
        - **Access Port**: Use for an AP in client access mode, connected to a forwarding device like a switch that supports multiple VLANs.
        - **Trunk Port**: Use to connect the AP in bridge mode to a forwarding device, such as a switch that supports multiple VLANs.
5. For **Wired Connectivity**, enable **User Authentication**.
6. See Configure an External RADIUS Server on page 98 if you are not selecting an existing RADIUS Server Group.
7. Enable **MAC Authentication**, see Configure MAC Authentication on page 87.
8. For **QoS Settings**, see Configure Marker Maps on page 249.
9. For **User Access Settings**, to add a new User Profile, see Add a User Profile on page 217.
10. For **Traffic Filter Management**, see Configure Traffic Filters on page 238.
11. For **Port Settings**, see Configure LLDP and CDP on page 261.
12. For **STP Settings**, see Configure STP Settings on page 194.
13. For **Storm Control Settings**, see Configure Storm Control on page 204.

Continue configuring the AP template.

Related Topics

Configure Port Types on page 145

Configure Port Types

After you select ports in a new device template, you must assign a port type. For AP ports, select **Choose Existing** or **Create New**. For switch ports, select from **Choose Existing**, **Create New**, or **Advanced Actions > Aggregate**.

For 1- and 2-port APs, there are three port types:

- **Bridge-Access ports** connect to individual hosts. You can configure captive web portal access, MAC authentication via a RADIUS server, change the user profile, and configure traffic management.
- **Bridge-802.1Q ports** provide network access through forwarding devices and support multiple VLANs. You can change the default user profile and manage incoming traffic.
- **Uplink Ports** act as WAN uplinks. You can change the default user profile and configure traffic control settings.

For 24- and 48-port switch templates there are three port types:

- **Access Ports** are connected to individual hosts such as printers, servers, and end user computers. A VLAN ID tag is added to the frame before it is forwarded using the 802.1Q tagging protocol. You can enable User Authentication or MAC Authentication, and configure QoS settings, Client Detection and VLAN ID.
- **Phone Data Ports** are used for voice transmission.
- **Trunk Port frames that are not VLAN-aware**. Frames are in a native VLAN (default) or Management VLAN.

You can also configure ports at the device level. Port settings that you configure there override any settings you make in the network policy device template.

Use this task to configure port types.

1. Go to **Configure** > **Common Objects** > **Policy** > **AP Template**.
2. Select an existing AP Template, and then select ✎, or select +.
3. To assign an existing port type, select the port and then select **Assign**.
4. To create a new port type and assign it to a port at the same time, highlight an interface port, then select **Assign** and **Create New** from the drop-down list.
5. Enter a **Name** for the port type.
6. (Optional) Enter a brief **Description** for the port type.
7. Turn the port off or on.
8. Select **Save**.

Related Topics

Assign an Ethernet Port Profile on page 145

Manage Port Types on page 171

Configure Wireless Interfaces for an AP Template

Use this task to configure the Wi-Fi 0, Wi-Fi 1, Wi-Fi 2, and IoT 0 ports for an AP template.

1. Go to **Configure** > **Common Objects** > **Policy** > **AP Template**.
2. Locate a **Device Model** and select an existing **Template**, or a default template.
3. Scroll down to the **Wireless Interfaces** pane.
4. Select an **Operating Mode** from the drop-down list.

5. Select either the **WiFi0**, **WiFi1**, **WiFi2**, or **IoT0** tab.

   Note
   The **IoT0** tab applies only to AP5010/AP5010U/ AP5020 models.

6. Set the **Radio Status** to **On**.
7. Select a **Radio Profile**—or **IoT Profile** if applicable—from the drop-down list.

   You can also add a new Radio Profile or IoT Profile here, or clone and modify an existing profile.
8. Select the **Radio Usage** type.
   - Select **Client Mode** to configure a device for AP client mode radio usage, and to configure advanced features such as **Port Forwarding Rules** and **DHCP Server** settings. Choose a **Client Mode Profile** from the drop-down list. If required, you can configure a new Client Mode Profile or edit an existing profile.
   - Select **Client Access** for normal client operation. Optionally, select **Backhaul Mesh Link** for wireless portal and mesh backhaul operation.
   - Select **Sensor** for presence operation.
9. Continue configuring the AP template, or select **Save Interface Settings**.

Configure Wired Interfaces for an AP Template

Create or edit an AP template.

Use this task to configure wired interfaces on the AP.

1. Go to **Configure** > **Common Objects** > **Policy** > **AP Template**.
2. Locate a **Device Model** and select an existing **Template**, or a default template.
3. Scroll down to the **Wired Interfaces** pane.
4. Set the Interface State to **ON** to activate the Ethernet port, or set to **OFF** to deactivate.
5. Select one of the following **Port Types**:
   - **Uplink Port**: Use when connecting the AP to the WAN. Use when dynamic trunk port configurations are desired. The Uplink Port automatically translates SSDI configurations as well as global native and Management ports to reduce the need for static trunk port configurations.
   - **Access Port**: Use when the AP is working in client access mode and is connected to a forwarding device, such as a switch that supports multiple VLANs.
   - **Trunk Port**: Use when connecting the AP in bridge mode to a forwarding device, such as a switch that supports multiple VLANs.
6. For **Native VLAN (read only)**: The native (untagged) VLAN assigned to frames that do not have any 802.1Q VLAN tags in their headers.

   By default, Extreme Networks devices use VLAN 1 as the native VLAN. To apply VLANs to devices using classification (uplink port only; not trunk ports), highlight the Ethernet port icons and see Configure Classification Rules for a Device Template on page 120.

7. For **Allowed VLANs (read only)**: Enter the VLANs—including the native VLAN—that you want the trunk port to permit.

   You can list the VLANs individually, separated by commas, or as a range of VLANs using a hyphen. Alternatively, you can enter the word `all` in this field to support all existing VLANs previously configured in the network policy (the default). To apply VLANs to devices using classification (uplink port only; not trunk ports), highlight the Ethernet port icons and see Configure Classification Rules for a Device Template on page 120.
8. For **Fabric Attach**: Select the add icon, enter the device's associated **VLAN ID** and select its **I-SID#** from the drop down.

   Use this field to configure a device connected to an existing Fabric Connect network. The device must already be physically connected to the Fabric Connect switch.
9. For **Transmission Type**, select one of the following:

   - **Auto**: The switch negotiates the best common duplex mode with the connected device.
   - **Full-Duplex**: Forces the switch to communicate with the connected device using full duplex communication.
   - **Half-Duplex**: Forces the switch to use half duplex communication.
10. Select the **Speed** the Ethernet port uses to communicate with the connected device.
11. Select **LLDP** for devices to advertise their identities, status, and capabilities to each other.

    Devices can transmit data about themselves and receive transmitted data from other devices, but they cannot solicit and retrieve data from other devices.
12. Select **CDP** for devices to advertise an IP address that can send and receive SNMP traps.
13. Select **MCast Filter** to enable Multicast Rate Limiting on the interface for multicast/ broadcast traffic, and configure **Multicast Rate Limit** to set the maximum rate (in Kbs) for incoming multicast traffic for the interface.
14. Optionally, set **USBNET** to **On** to activate the USB Port, and configure the **VLAN**.

    > Note
    > By default, the USB port will provide power when the AP is powered by 802.3 at the power source. If USBNET is enabled, it will be configured as an access port. The USBNET interface can be configured only for IQ Engine version 10.2r4 and later.
15. (Optional) Toggle **Enable Imagotag** to **ON**.

    To configure SES-Imagotag in the device template, see Configure SES-imagotag in a Device Template on page 150.

Continue configuring the AP template.

Configure SES-Imagotag

SES-Imagotag is a solution for Electronic Shelf Labeling (ESL). The solution consists of the following components:

- ESL tags, which are 2.4 GHz RF based battery powered devices
- An ESL communicator used to communicate with the ESL tags
- A server that provides the configuration and updates to the ESL tags

The following access points support SES-Imagotag:

- AP305C
- AP410C
- AP5010

Configure SES-Imagotag on a device template or for an individual AP override.

> **Note**
> Consider the following for the SES-Imagotag support.
> - An ESL Server behind a NAT (Network Address Translation) or firewall is not supported.
> - Do not make configuration changes during SES-Imagotag programming and setup.

Related Topics

Configure SES-imagotag in a Device Template on page 150
Configure SES-Imagotag on a Device Override on page 150
SES-Imagotag Setup on page 149
Configure AP Templates on page 144

SES-Imagotag Setup

This topic outlines everything that you must consider when configuring the SES-Imagotag.

1. AP device considerations:
   a. Ensure that the access point is getting 3AT/3AT+ power.
   b. Connect ESL communicator to access point USB port.
   c. Ensure that the LED on the ESL communicator is red.
2. ExtremeCloud IQ considerations:
   a. Enable SES-Imagotag on the AP Device Template or Override for a supported AP model.

      The following access points support SES-Imagotag:

      - AP305C
      - AP410C
      - AP5010

b. Ensure that the LED on the ESL communicator is amber.

Important
Troubleshooting Tips:

No LED light on ESL communicator

Check the power supply. The AP requires 3AT/3AT+ power supply to work with a USB port.

The LED continues to be red

Check the AP logs to verify that ThinAP2 has started.

The LED continues to be Amber

Check the IP address of AP, the AP-ID, and the connectivity between the AP and the ESL server.

Related Topics

Configure SES-Imagotag on page 149
Configure SES-imagotag in a Device Template on page 150
Configure AP Templates on page 144
Configure SES-Imagotag on a Device Override on page 150
SES-Imagotag Settings on page 151

Configure SES-imagotag in a Device Template

To configure SES-Imagotag in the device template, perform the following steps:

1. Go to **Configure** > **Common Objects** > **Policy** > **AP Templates**.
2. Select an AP template for one of the supported AP models.

   The following access points support SES-Imagotag:

   - AP305C
   - AP410C
   - AP5010
3. Scroll down to the SES-Imagotag pane and select **Enable Imagotag**.
4. Configure the SES-Imagotag settings.

Related Topics

SES-Imagotag Settings on page 151
Configure SES-Imagotag on a Device Override on page 150
Configure SES-Imagotag on page 149
SES-Imagotag Setup on page 149

Configure SES-Imagotag on a Device Override

To configure SES-Imagotag on a device override, perform the following steps:

1. Go to **Manage** > **Devices**.

2. Select one of the supported AP models.

   The following access points support SES-Imagotag:

   - AP305C
   - AP410C
   - AP5010
3. From the left pane, select **Configure** > **Interface Settings**.
4. Scroll down to the SES-Imagotag pane and select **Enable Imagotag**.
5. Configure the SES-Imagotag settings.

Related Topics

SES-Imagotag Settings on page 151
Configure SES-imagotag in a Device Template on page 150
Configure AP Templates on page 144
Configure SES-Imagotag on page 149
SES-Imagotag Setup on page 149

SES-Imagotag Settings

Configure the following settings for SES-Imagotag support:

Server

The IP address of the SES-Imagotag server.

Channel

The RF channel used for SES-Imagotag communications. Set the channel to **Managed (Auto)** to have ExtremeCloud IQ select the communications channel.

Port

The port associated with the defined rule. Enter the port number to explicitly specify the port number. Traffic from this port is subject to the defined rule.

VLAN

The VLAN used to route SES-Imagotag traffic.

Related Topics

Configure SES-imagotag in a Device Template on page 150
Configure SES-Imagotag on a Device Override on page 150
Configure SES-Imagotag on page 149
SES-Imagotag Setup on page 149

Configure AP Device Template Advanced Settings

ExtremeCloud IQ can update device firmware and reboot the device during onboarding.

Use this task to configure **Advanced Settings** for an AP device template.

1. Go to **Configure** > **Common Objects** > **Policy** > **AP Template**.
2. Select an existing AP Template,and then select ✏, or select +.
3. Select the **Advanced Settings** tab.

4. For **Upload device firmware upon device authentication**, turn the setting **On** to upgrade the device firmware upon onboarding.

   If you have activated device firmware upgrading, select one of two options:

   - Update firmware to the latest version.
   - Upgrade to a specific device firmware version.
5. To **Reboot after uploading**, turn the setting **On**.

   Note
   As a best practice, disable the reboot option when deploying devices in a meshed environment.

6. For **Antenna Location Type**, select a location from the drop-down list.

   Note
   You must have IQ Engine Version 10.2r2 or higher. The 6 GHz radio is supported Low Power Indoor (LPI) only.

   Note
   Antenna Location Type does not apply to AP5020.

   Note
   A full config push is required as different radio tables are used.

7. To enable or disable **Supplemental CLI**, see Configure Supplemental CLI on page 233.
8. Select a **Country Code** from the menu.

   Note
   For Legacy World and EU SKU devices, the template country code assignment only takes place when a device is initially onboarded.

9. Enable **Override MGT0 MTU** to manually enter a maximum transmission unit (MTU) value, ranging from 100-1500 Bytes. Default value is 1500 Bytes.
10. Enable **POE Profile Override** (AP5010 only), and select the override option from the menu.

    Hover over the **i** to view the corresponding override table.

Finish configuring the device template.

Configure Auto-Provisioning

Although AP device templates function similarly to auto-provisioning rules, the best-practice recommendation is to use AP device templates rather than auto-provisioning rules to configure APs as they are onboarded.

> **Note**
> If AP device templates and auto-provisioning rules are both in place when the AP is onboarded, ExtremeCloud IQ ignores the AP device template and applies the auto-provisioning rules.

Identify devices for auto provisioning by adding or importing serial numbers or IP subnetworks. Import serial numbers by selecting devices that have already been on-boarded, importing a CSV file populated with serial numbers, or entering serial numbers manually. You can use a combination of any of these methods. To add or import IP subnetworks to an auto-provisioning profile, enter IP subnetworks manually or import a CSV file containing the subnetworks. You can also use IPv6 addresses to identify subnetworks.

> **Note**
> Auto-provisioning rules are based on device models. You can define multiple profiles for the same model and distinguish which devices get which profile by specifying a serial number or IP address.

1. Go to **Configure** > **Common Objects** > **Policy** > **Auto Provisioning**.
2. Select an existing rule, and then select ✎, or select +.
3. Enter a **Name** for the rule.
4. (Optional) Enter a **Description** for the rule.
5. Select a **Device Function**.
6. Select a **Device Model**.

   The model that you choose determines the available device functions, interface settings, and radio settings.
7. Select **Serial Number** to restrict automatic provisioning to particular serial numbers.
   a. Choose the **Select Serial Numbers** bar.
   b. Add serial numbers from the imported list, import them from a CVS file, or add them manually.
8. Choose **IP Subnetworks** to auto-provision devices by IP subnetworks.

9. Choose **Select IP Subnetworks**, then add IP Subnetworks from either a CVS file or manually.

   > Note
   > To create an auto provisioning profile that contains IP subnetworks, the devices in the profile cannot have been previously onboarded.

   When you create multiple auto provisioning profiles for the same device model and use serial numbers or IP subnetworks to identify them, be aware of the following situations:

   - If a conflict arises because two auto provisioning profiles applied to the same device, for example, one profile based on the serial number and the other based on the subnetwork, the profile based on the serial number takes precedence.
   - The same serial number must not appear in more than one auto provisioning profile.
10. Select a **Network Policy** from the drop-down list.
11. Select the **Country** for the device from the dropdown list.

    If you later select the **Upload configuration automatically** check box, ExtremeCloud IQ applies the country code specified here when it automatically pushes a configuration to devices during the initial CAPWAP connection.

Auto-assign Location

12. Select **Assign** to assign a **Default Location** to all the devices in the auto provisioning profile.

    > Note
    > You can only assign devices to a floor within a building.

13. If you enabled **Select IP Subnetworks**, select + to **Select a Location and IP Subnetwork**.
    a. Select a **Subnet** and **Location**.
    b. Select **Save**.

Advanced Settings

14. Select **Upload device firmware upon device authentication** to upload an image automatically.
    a. Select the **Golden** version if you want to automatically upload the version with fewer features, but fully tested and super stable for those environments where stability is more important than feature richness.
    b. Select the **Latest** version if you want to automatically upload new features, some of which might contain bugs.
15. Select **Upload configuration automatically** to automatically upload a pre-defined configuration, which consists of a network policy, two radio profiles, a topology map, a pair of root and read-only administrators, and CAPWAP settings.
16. Select **Reboot after uploading** to activate the uploaded image and configuration by rebooting the devices.

    If your deployment includes mesh points, do not select this option. Reboot the devices manually so that you can control the order in which the devices reboot.

Device Credentials

17. Select **Enable Device Credential** to set device credentials.
    - **Root Admin Configuration**: Enter a name and password for the root admin for the device. ExtremeCloud IQ uses root admin log in credentials to make SSH connections to configured devices and upload full configurations to them. This admin can also access the device through Telnet, SSH, or console connections.
    - **Read-Only Admin Configuration**: Enter a name and password for an admin that has read-only privileges.
18. Select **Enable CAPWAP configurations** to configure primary and secondary CAPWAP servers.
    - **Primary CAPWAP Server**: From the Primary CAPWAP Server drop-down list, choose the ExtremeCloud IQ address with which you want devices to form a CAPWAP connection first. If you do not see the address you need, select the plus sign and add an IP address or host name.
    - **Backup CAPWAP Server**: If you are deploying ExtremeCloud IQ as a standalone device, leave this field empty. If it is in an HA pair behind a NAT device from its configured devices, use the drop-down menu to select the domain name or MIP linking to its MGT interface. If you do not see the address you need, select the plus sign and add an IP address or host name.
    - **Shared Key for Authentication**: To change the passphrase, enter a new alphanumeric string in the **Passphrase** and **Confirm Passphrase** fields.

Interface Settings

19. To **Enable Interface Settings**, set the slider to **On**.
20. Configure a Wireless interface. See Configure Wireless Interfaces for an AP Template on page 146 for general instructions.
21. Configure Wired interface. See Configure Wired Interfaces for an AP Template on page 147 for general instructions.
22. When the auto-provisioning rule configuration is complete, select **Save** to commit the changes, or select **Cancel**.

Configure a Bonjour Gateway

Extreme Networks devices can function as Bonjour Gateways and forward service advertisements across VLAN or subnet boundaries.

> **Note**
> You must add at least one filter rule to the Bonjour Gateway profile before you can save it.

Use this task to define a Bonjour Gateway profile that specifies which VLANs the Bonjour Gateway scans, and which services it shares with other Bonjour Gateways.

1. Go to **Configure** > **Common Objects** > **Policy** > **Bonjour Gateway Settings**.
2. Select an existing Bonjour Gateway, and then select ✎, or select +.

3. Configure the following settings.

Table 15: Bonjour Gateway Settings

Field	Description
Name	The Bonjour Gateway name for referencing in a network policy.
Description	An optional description for the Bonjour Gateway.
Scan the following VLANs for services	The VLANs that you want the Bonjour Gateway to scan for service advertisements. **Note:** Use commas to separate multiple VLAN IDs (do not include a space after a comma) and dashes to indicate ranges.

4. Select + to add a Bonjour filter rule.
5. Configure the settings for the Bonjour filter rule.

   See Bonjour Filter Rule Settings on page 157.
6. Select **Save**.

Related Topics

Bonjour Filter Rule Settings on page 157

Bonjour Filter Rule Settings

Table 16: Bonjour Filter Rule Settings

Field	Description
Service	Choose the name of a previously defined Service from the drop-down list, or enter the name of the service in the field. To add a new Service: 1. Select +. 2. Enter the service **Name**. 3. Enter the **Type**. 4. Select **Save**.
From VLAN Group	Choose the VLAN group from which to share services. Note: If you do not want to restrict sharing services based on source VLANs, choose **Any**. To create a new VLAN group, select the plus sign. Enter a name for the group, the VLANs to include, a description, and then save your new group. To add a new From VLAN Group: 1. Select +. 2. Enter the service **Name**. 3. Enter the **VLANs**. VLANs can be configured as ranges or individually. Indicate a range with a hyphen. Separate VLAN entries with commas, for example, 1-30, 100-200, 500. 4. Enter an optional **Description**. 5. Select **Save**.
To VLAN Group	Choose the VLAN group to which services are advertised. Note: If you do not want to restrict sharing services based on destination VLANs, choose **Any**. To create a new VLAN group, see the previous step. To add a new To VLAN Group: 1. Select +. 2. Enter the service **Name**. 3. Enter the **VLANs**. VLANs can be configured as ranges or individually. Indicate a range with a hyphen. Separate VLAN entries with commas, for example, 1-30, 100-200, 500. 4. Enter an optional **Description**. 5. Select **Save**.
Max Wireless Hop	Enter the maximum number of management subnet hops between one Bonjour device and another for the recipient to accept service advertisements.

Table 16: Bonjour Filter Rule Settings (continued)

Field	Description
Realm	Choose the name of an existing **Realm** to apply this rule only to members of that realm. Note: If the members are not within radio range, you can put them in the same realm by doing either of the following: Place all of the devices on the same map, or manually set the same Bonjour **Realm** name in the **Bonjour Gateway Settings** section in individual device configuration.
Apply Realm Filter Advertisement	Enable **Apply Realm Filter Advertisement** to direct the Bonjour Gateway to detect and retransmit only from the specified realm. Note: By default, the Bonjour Gateway detects and retransmits from the selected VLAN group.

Related Topics

Configure a Bonjour Gateway on page 155

Configure Classification Rules

Before you can use classification rules, you must create a network location, along with cloud config groups, IP addresses, and IP subnets.

You can create classification rules as part of a network policy or as a common object.

- Configure **Device Location** rules to assign different DNS and RADIUS servers and different time zones to different physical locations.
- Configure **Cloud Config Groups** (CCGs) to create user passwords which restrict access to private and personal network devices.
- Configure **IP Address** classification rules to associate user groups so they can communicate using their own private networks.
- Configure **IP Subnet** classification rules to support multiple user-group private networks.
- Configure **IP Range** classification rules for multiple user-group private networks.

Use this task to create a classification rules common object. ExtremeCloud IQ supports multiple classification rules for DNS servers, VLANs, RADIUS servers, device templates, user groups, and private client groups (PCGs).

1. Go to **Configure** > **Common Objects** > **Policy** > **Classification Rules**.
2. Select an existing rule, and then select ✎, or select +.
3. Enter a **Name** for the rule.
4. (Optional) Enter a **Description** for the rule.

5. Select +, and then choose the rule type to configure.

   Choose from the following rule types:

Table 17: Rule types

Selected rule type	Do this
Device Location	a. Drill down until you reach the location level at which the device resides. b. Select **Select**. The location appears in the **Classification Rules** table.
Cloud Config Group	a. Select the **Match Type**. b. Select an existing group from the ☰ menu, or select +. For more information, see Add a Cloud Config Group on page 161. c. Select **CLOUD CONFIG GROUP** d. Select **CONTINUE**.
IP Address	a. From the **Match Type** menu, select **Contains** or **Does Not Contain**. b. Select +, or select an existing IP address from the ☰ menu. If you do not see the IP address that you want, select **New** to create a new IP address. c. Select **SAVE IP**. d. Select **CONTINUE**.
IP Subnet	a. From the **Match Type** menu, select **Contains** or **Does Not Contain**. b. Select +, or select an existing IP subnet from the ☰ menu. If you do not see the IP subnet that you want, select **New** to create a new IP subnet. c. Select **SAVE SUBNET**. d. Select **CONTINUE**.
IP Range	a. From the **Match Type** menu, select **Contains** or **Does Not Contain**. b. Select +, or select an existing IP range from the ☰ menu. If you do not see the IP range that you want, select **New** to create a new IP range. c. Select **SAVE IP**. d. Select **CONTINUE**.

6. Select **SAVE RULE**.

Related Topics

Add a Cloud Config Group on page 161

Configure Client Monitor Profile Policies

Use this task to configure client monitor profile policies.

1. Go to **Configure** > **Common Objects** > **Policy** > **Client Monitor Profiles**.
2. Select an existing client monitor profile, and then select ✎, or select +.
3. Configure the settings for the Client Monitor Profile policy.

   See Client Monitor Profile Settings on page 160.
4. Select **Save**.

Related Topics

Client Monitor Profile Settings on page 160

Client Monitor Profile Settings

Table 18: Single Tunnel Concentrator

Field	Description
Name	Type a name to identify the Client Monitor Profile policy.
Association Problem	
Trigger Times	Set the number of times an association problem can be triggered, between 1 and 10.
Report Interval	Set the interval between reporting an association problem, between 30 and 3600 seconds.
Authentication Problem	
Trigger Times	Set the number of times an authentication problem can be triggered, between 1 and 10.
Report Interval	Set the interval between reporting an authentication problem, between 30 and 3600 seconds.
Networking Problem	
Trigger Times	Set the number of times a network problem can be triggered, between 1 and 10.
Report Interval	Set the interval between reporting a network problem, between 30 and 3600 seconds.

Related Topics

Configure Client Monitor Profile Policies on page 160

Add a Cloud Config Group

Before you begin, configure devices to associate with the cloud configuration groups.

Cloud configuration groups enable administrators to create network-level policies that can be replicated for multiple network roll-out scenarios. Use this task to create a new group.

1. Go to **Configure** > **Common Objects** > **Policy** > **Cloud Config Groups**.
2. Select an existing group, and then select ✎, or select +.
3. Enter a **Name** for the new group.
4. (Optional) Enter a **Description** for the new group.
5. Select real and simulated devices to have their host names display in the **Selected Devices** field.

   Note
   You can also import a comma-separated-values (CSV) file including the host names, serial numbers, and optional MAC addresses of other devices.

   a. Select **Import**.
   b. Select the CSV file, or drag the CSV file to the **Import Cloud Config Group Members** window.
   c. Select **Submit**.
6. Select **SAVE CLOUD CONFIG GROUP**.

Configure a Fabric Attach Profile

Before you begin, physically connect the device to a Fabric Connect-enabled switch. To perform the following task, you require the device VLAN ID and I-SID number.

For more information about Fabric Attach, see Fabric Attach on page 123.

Use this task to configure Fabric Attach profiles that you can assign to network policies.

1. Go to **Configure** > **Common Objects** > **Policy** > **Fabric Attach Profiles**.
2. Select an existing profile, and then select ✎, or select +.
3. (Optional) Type a **Description** for the new profile.
4. Type a **Name** for the new profile.
5. Select + to add a VLAN.
6. Type the associated **VLAN ID** for the device.
7. Select the **I-SID#** for the device from the drop down.
8. Select **SAVE**.

Related Topics

Fabric Attach on page 123

Configure Fabric Attach on page 123

Configure a HIVE Profile

Use this task to configure a HIVE profile object.

1. Go to **Configure** > **Common Objects** > **Policy** > **Hives**.
2. Select an existing hive profile, and then select ✏, or select +.
3. Apply MAC filters to restrict devices that can join the hive.

   You can select existing filters from the table, or add new filters.
4. From the menu, choose the default action (**Permit** or **Deny**)for devices that have a MAC address or OUI that does not match the selected MAC filter.
5. Select **SAVE**.

Related Topics

HIVE Profile Settings on page 162

HIVE Profile Settings

Table 19: HIVE profile settings

Setting	Description
Name	Type a **Name** for the new profile.
Hive Control Traffic Port	Type the port number for Hive traffic control. Hive communications operate at Layers 2 and 3. The default port number for Layer 3 hive communications and for roaming-related traffic is UDP 3000. If a different service on your network is already using port 3000, you can change this to any number from 1024 to 65535, as long as the new setting is at least 50 greater or less than the current setting. For example, if the current port number is 3000, you can set a new port number higher than 3050.
Description	(Optional) Type a description for the new profile. Although optional, entering a description is helpful for troubleshooting and for identifying the profile.
Alarms	
CAPWAP Delay Alarms	Toggle the setting **ON** or **OFF**.
Security	
Encryption Protection	Toggle the setting **ON** or **OFF**. Disable **Encryption Protection** to have ExtremeCloud IQ derive a default password from the hive name.
Encryption Password	Choose between **Auto Generate** and **Manual**. Hive members use this password to authenticate to each other over the wireless backhaul link using WPA-PSK CCMP (AES). To see the password that you entered, clear the **Shared Secret** > **Show Password** check box.

Table 19: HIVE profile settings (continued)

Setting	Description
MAC-based DoS Prevention Rules	Select **Hive** or **Client**, and modifying the settings in the dialog box. Extreme Networks devices ship with the default hive- and SSID-lever DoS detection settings for a number of frame types that are commonly used when launching DoS attacks. You can raise the thresholds to avoid receiving too many false alarms or lowering them to receive more alarms indicative of spikes in certain types of traffic. • **DoS prevention rules for hives** apply to wireless traffic from all radios that might reach the backhaul or access channel from wireless clients or nearby access points broadcasting on the same channel. You can define settings to detect DoS attacks on the radio channels that a device uses for hive communications and for SSID access traffic. • **DoS prevention rules for clients** apply to traffic originating from a single neighboring radio. The source might be a neighbor member or a nearby device outside the network that is broadcasting on the same channel the Extreme Networks device is using for its wireless backhaul communications, or for SSID access traffic. For both types of rules, you can change the alarm thresholds and enable or disable settings for each DoS Detection type: Probe Requests and Responses, (Re) Associations, Association and Disassociation Requests and Responses, Authentication and Deauthentication, and EAP over LAN (EAPoL). Wireless clients periodically send probe requests to see if any access points are within range. The threshold determines the number of messages per minute required to trigger an alarm about a possible DoS attack. The alarm interval determines the length between repeated alarms when the number of messages continues to exceed the threshold.
Wireless Mesh Settings	
Request to Send Threshold	Type a value in bytes. This is the maximum frame size in bytes that requires the device to first send an request to send (RTS (request to send) message before sending a large frame. The default setting is 2346 bytes.
Fragment Threshold	Type a value in bytes. This is the maximum IEEE 802.11 frame size in bytes that the device uses when sending control traffic over the wireless backhaul link to other members. If the device needs to send a frame that is larger, it first breaks it into smaller fragments. The default setting is 2346 bytes.
Require minimum wireless signal strength for creating wireless mesh	Select the check box to require a minimum wireless signal strength for creating wireless mesh, and configure the related settings.

Table 19: HIVE profile settings (continued)

Setting	Description
Signal Strength Threshold	Use the slider to specify a signal strength between 90 dBm and - 55 dBm. This value is the minimum signal strength required to enable members to form a wireless backhaul link. The default is -80 dBm.
Polling Interval	Type a value for the time interval from 1 to 60 minutes for polling the signal strength of neighboring members. A lower interval increases traffic on the network slightly, especially in environments where there are lots of members, however it also increases the responsiveness of members to changes in signal strength. A higher interval reduces responsiveness to signal strength changes, which can be preferable in an environment where severe and frequent signal strength fluctuations would cause members to continually drop and re-establish connections. The default is every 60 seconds.
Client Roaming > **Detect neighbor devices**	
Devices send keepalive heartbeats every	Type a value and select a unit of time from the menu to set the interval between keepalive heartbeats. The default is 10 seconds, and the range is 5 to 360,000 seconds (100 hours). To calculate the length of time, multiply the keepalive interval by the number of missed keepalives. Using the default settings, 10 seconds (interval) x 5 (missed keepalives), a neighbor ages out after 50 seconds.
Remove neighbor if the number of missed keepalive heartbeats exceeds	Type the number of the number of missed heartbeats before ExtremeCloud IQ removes a neighbor.
Client Roaming > **Share connected client information(Roaming cache)**	
Devices send client information every	Type a value and select a unit of time from the menu to specify how often devices send client information. The default is 60 seconds.
Remove cached client information when absent from updates after	Type the number of missed updates, after which ExtremeCloud IQ deletes cached client information for the affected client.
Update all hive members within radio range, including Layer 3 neighbors	Select the check box to update all hive members within radio range, including Layer 3 neighbors.
Update hive members in the same subnet and VLAN.	Select the check box to update hive members in the same subnet and VLAN.
IP Address Preference	
Use IP address type first with	(Required) From the menu, select **IPv4** or **IPv6**.

Related Topics

Configure HIVE Policy Settings on page 75

Configure a HIVE Profile on page 162

IoT Profiles

The IoT (Internet of Things) is a network of interconnected smart devices. Smart devices are embedded with software, sensors, and network connectivity that enables them to collect and share data. The smart devices communicate with each other and with other internet-enabled devices, like smartphones and gateways, creating a vast network of interconnected devices that can exchange data and perform a variety of tasks autonomously.

ExtremeCloud IQ uses IoT profiles to support IoT applications.

Related Topics

Manage IoT Profiles on page 167
Thread Application on page 165
Configure IoT Profile Settings on page 167
Configure the Thread Commissioner on page 169

Thread Application

Thread is an IP-based, low-power wireless protocol designed to facilitate connecting to and controlling IoT devices. Thread uses a mesh architecture, which supports more efficient and robust networking.

Elements of a Thread network include the following:

- Thread Router
  - Manages communication between devices within the Thread network.
  - Maintains a routing table to promote the efficient routing of messages.
  - Generally has no ability to communicate with networks outside the Thread network.
- Border Router
  - Extends the capabilities of a Thread Router to allow communication with networks outside the Thread network.
  - Acts as a gateway to external networks.
  - Performs NAT (Network Address Translation) to facilitate communication between external networks and the Thread network.
- Backbone Border Router
  - Extends the capabilities of a Border Router to allow communication between the Thread network and backbone networks.
  - Supports fail-over mechanisms to ensure network resilience.
  - Generally supports higher capacity and greater speeds compared to regular routers for faster and more reliable communication with external networks.

With ExtremeCloud IQ, assign an IoT Thread profile to an AP5010/AP5010U/ AP5020 wireless interface to have the device function as a BBR (Backbone Border Router).

Note

ExtremeCloud IQ IoT Thread application is supported on AP5010/AP5010U/ AP5020 only.

IoT Thread is not supported on simulated devices.

With ExtremeCloud IQ, the BBRs in the network negotiate and together elect one PBBR (Primary Backbone Border Router). The PBBR routes traffic between the Thread network and the Backbone network.

Although there can be multiple BBRs in a Thread network, only one can be PBBR at any time. The others act as secondary BBRs. If the PBBR is unreachable, failover occurs to a negotiated secondary BBR, which then becomes the new PBBR.

The IoT Thread profile allows for:

- Specifying key properties of the Thread network, such as its name, network key, PAN ID, Extended PAN ID, channel, and whether or not to enable NAT64.
- Optionally specifying the behavior of the Commissioner for the Thread network, including its credentials, timeout, and list of allowed devices.
- Optionally configuring the Default User Profile to be associated with the IoT Thread profile by applying only the VLAN.

Consider the following:

- IoT Thread profile configuration automatically takes precedence over iBeacon configuration. If iBeacon is configured and deployed, and later IoT Thread is configured and deployed, iBeacon becomes disabled and IoT Thread is enabled. If iBeacon configuration exists but has yet to be deployed, and then later IoT configuration is done and deployed, only the IoT configuration is pushed to the AP.
- Only one Commissioner can be active at any given time in a Thread network.

Related Topics

IoT Profiles on page 165

Configure IoT Profile Settings on page 167

Configure the Thread Commissioner on page 169

Manage IoT Profiles

The **IoT Profiles** list displays the following information:

Table 20: IoT Profiles List Column Headings

Column Heading	Description
Name	Displays the name assigned to the profile.
IoT Application	Indicates the type of IoT application for which the profile is used.
Used By	Indicates at which device configuration level the profile is assigned: Device Template or Device Configuration.

Use this task to add a new IoT profile to the list, or to edit, clone, or delete existing IoT profiles.

1. Go to **Configure** > **Common Objects** > **Policy** > **IoT Profiles**.
2. Select an existing profile, and then select ✎, or select +.
   See Configure IoT Profile Settings on page 167.
   - To clone an existing IoT profile, select the profile in the list, then select ⧉. In the **Clone** pop-up window, enter a new profile name in the **Save As** field, then select **Clone**.
   - To delete an existing IoT profile, select the profile in the list, then select 🗑.

Related Topics

IoT Profiles on page 165

Configure IoT Profile Settings

Before you begin, configure a network policy. See Add a Network Policy on page 69.

Use this task to configure an AP5010/AP5010U/ AP5020 to function as a Backbone Border Router in a Thread network.

1. Go to **Configure** > **Common Objects** > **Policy** > **IoT Profiles**
2. Select an existing profile, and then select ✎, or select +.
3. Configure the settings as described in Table 21 on page 168 or Table 22 on page 169.
4. Select **Save**.
5. (Optional) Select **Customize** to Configure the Thread Commissioner on page 169.

Proceed to Configure Wireless Interfaces for an AP Template on page 146 to enable the Thread **IoT0** radio interface of the AP.

You can override the AP Template IoT0 radio interface settings by configuring the settings under **Manage** > **Devices** > **Configure** > **Interface Settings** > **Wireless Interfaces** > **IoT0**.

Related Topics

IoT Profiles on page 165

Thread Application on page 165

IoT Profile Settings

- Thread Profile Settings (Single IoT Application)
- Thread Profile Settings (Multiple IoT Applications)

Table 21: Thread Profile Settings (Single IoT Application)

Setting	Description
Name	Enter a **Name** for the profile.
IoT Application(s) Supported	Select **Single** from the menu.
Function	The default is **Thread**.
Application	The default is **Thread Gateway**.
Network Name	Enter a **Network Name** for the Thread network of an AP. Each AP participates in a Thread network identified with the PAN ID and EXT PAN ID configured for the Thread Profile.
Network Key	Enter the **Network Key** used to encrypt communication between devices in a Thread network.
PAN ID	The **PAN ID** (Personal Area Network Identifier) identifies the Thread network of the AP. Enter a 16-bit value for use in RF data transmissions between devices in a Thread network.
EXT PAN ID	Enter a 64-bit value for use in RF data transmissions between devices in a Thread network. The **EXT PAN ID** must be unique. It is used for a more specific network identification.
Channel	Choose an IEEE 802.15.4 AP **Channel** number from the drop-down list (11-26). The default is channel 15. Note: Thread channel 25 is only supported if the country supports IEEE 802.11 channels 12, 13, or 14. Thread channel 26 is only supported if the country supports IEEE 802.11 channels 13 or 14.

Table 21: Thread Profile Settings (Single IoT Application) (continued)

Setting	Description
Default User Profile	Set the default VLAN user profile. Select an existing user profile to associate with this VLAN or create a new profile. To create a new user profile, see Add a User Profile on page 217. Note: Currently, only the VLAN of the associated User Profile is configured by the IoT profile.
Enable NAT64	**Enable NAT64** is selected by default, allowing an AP to perform IPv6 to IPv4 translations between the Thread and backbone networks.

Table 22: Thread Profile Settings (Multiple IoT Applications)

Setting	Description
Name	Enter a **Name** for the profile.
IoT Application(s) Supported	Select **Multiple** from the menu.
BLE Beacon	
Application	Select the corresponding check boxes for the applications that you want to configure: **iBeacon**, and **Eddystone-url**.
iBeacon	Edit the settings as required and select **SAVE**.
Eddystone-url Beacon	Edit the settings as required and select **SAVE**.
BLE Scan	
Application	Select the corresponding check boxes for the applications that you want to configure: **iBeacon**, **Eddystone-url**, and **Generic**.
iBeacon Filter	Edit the settings as required and select **SAVE**.
Eddystone-url Beacon Filter	Edit the settings as required and select **SAVE**.
Generic Filter	Edit the settings as required and select **SAVE**. Note: If you select Custom for the **Vendor**, type the **Company Name** and the **Company ID**.

Related Topics

IoT Profiles on page 165

Configure the Thread Commissioner

Before you begin this task, complete procedure Configure IoT Profile Settings on page 167.

Use this task to define the behavior of the Thread Commissioner role, which can later be assigned to an AP5010/AP5010U/ AP5020. The Thread Commissioner securely screens endpoint devices attempting to join the Thread network. The Commissioner uses an Allow List to identify the IoT endpoint devices which have permission to join the Thread network.

> Note
> Only one Commissioner can be active at any given time in a Thread network.

1. Go to **Configure** > **Common Objects** > **Policy** > **IoT Profiles**.
2. Select an existing Thread Application profile, and then select ✎, or select +.
3. Scroll down to **Commissioner**, and select **CUSTOMIZE**.
4. (Optional) Type the **Commissioner Credential** consisting of 6 to 250 alphanumeric characters.
5. (Optional) Set the **Commissioner Timeout** to a value in the range of 1-2000000 seconds.

   This value represents the ideal or known amount of time it takes for all the IoT endpoint devices defined in the Allow List to join the Thread network. The default is 120 seconds.

   > Note
   > If all of the IoT endpoint devices defined in the Allow List have joined the network but the Commissioner is still running because the Timeout value is set too high, you can force the Commissioner to stop running. See Actions Menu Overview on page 347.

6. Under **Allow List of Thread-End Devices**, choose from the following actions:
   - Add devices to the Allow List either manually or in bulk, or using a combination of both methods.
     - To add devices manually, proceed to step 7.
     - To add devices in bulk, proceed to step 8.

     > Note
     > This method is available only after the Thread profile is saved.

   - Edit a device entry in the Allow List. Select the target entry, then select ✎. Edit the entry in accordance with steps 7.b and 7.c, then select **Save**. When editing is complete, proceed to step 9.
   - Delete entries in the Allow List. Select one or more entries, then select 🗑. Proceed to step 9.
   - Download the entries in the Allow List to a csv file. Select ⤓.
   - Search for an entry in the Allow List. Enter a Joiner ID or PSKd in the search field, then select 🔍.
7. Optionally, add devices to the Allow List manually, as follows:
   a. Select +.
   b. In the **Joiner ID** field, enter a value consisting of 16 hex digits (excluding 16 "F"s) representing the device's EUI-64 (64-bit Extended Unique Identifier). Alternatively, enter ***** to admit any joiner.

   c. In the **Pre-Shared-Key for Device (PSKd)** field, enter a value for the shared password in the range of 6-32 alphanumeric characters (0-9, upper-case A-Y, excluding I, O, Q, and Z).
   d. Select **Add**.
   e. Repeat steps 7.a through 7.d for each device added.
   f. Proceed to step 9.

8. Optionally, add devices in bulk. Select **Import** to upload a csv file containing the device details. From the **Import Allow List of Thread End-Devices** window, choose from the following actions:
   - Deselect the **Delete all Allow List entries prior to import** check box to append the IoT device entries in a csv file to the existing Allow List. By default, this option is selected, resulting in the removal of existing Allow List entries before device entries in a csv file are imported.
   - Select **Download an example CSV import file** to view the required format of device entries to successfully import the list.
   - Drag to the **Choose File** field a csv file containing device entries to be imported, or select **Choose** to upload a locally stored csv file.
   - Select **Submit** to upload and add the device entries from the csv file to the Allow List, or select **Close** to exit the window.
9. Select **Save** to save settings, or select **Cancel** to close the window without saving settings.

To assign the Thread Commissioner role to an AP, go to **Manage** > **Devices** < *select an AP5010, AP5010U, or AP5020*> **Actions** > **Start Thread Commissioner**. If necessary, you can **Stop Thread Commissioner** and reassign the Commissioner role to another AP. See Actions Menu Overview on page 347 for details.

Related Topics

IoT Profiles on page 165

Thread Application on page 165

Actions Menu Overview on page 347

Manage Port Types

The **Port Types** table displays a list of the configured port types. Use this procedure to clone or delete configured port types.

1. Go to **Configure** > **Common Objects** > **Policy** > **Port Types**.
2. To clone a port type, select the corresponding check box and then select ⧉.
3. To delete a port type, select the corresponding check box and then select 🗑.

Related Topics

Configure Port Types on page 145

Instant Port Profiles List

Configuring Instant Port Profiles (IPP) in ExtremeCloud IQ is an automated approach to configuring switch ports based on the connected devices. Instant Port Profiles streamline the management of network-connected devices, such as access points (AP), security cameras, and VoIP devices by dynamically provisioning the appropriate port configuration automatically.

The **Instant Port Profiles List** displays the configured Instant Port Profiles in your network. Configure IPP as part of a switch template configuration or a device template configuration. To delete a profile from the IPP list, select the corresponding check box, and then select 🗑.

Related Topics

Configure an Instant Port Profile on page 195

About Radio Profiles

A radio profile contains settings for the radios in APs. The radios generally operate in two frequency bands: radio 1 (WiFi0) operates at 2.4 GHz, and radio 2 (WiFi1) operates at 5 GHz. WiFi2 supports only the 6 GHz band for client access. The number of radios and frequency bands supported vary by AP model.

In the **Radio Profiles** window, you can view, add, modify, and delete radio profile settings. You can also modify radio profile settings when you configure a device template. See Configure Device Templates on page 120.

The **Radio Profiles** table displays the following information:

- **Radio Profile Name**: The name assigned to a profile when it was created. It is a convenient reference when assigning radio profiles to the WiFi0 and WiFi1 interfaces for an AP.
- **Applied to Radio**: 2.4 GHz, 5 GHz, or 6 GHz.
- **Radio Mode**: 802.11a, a/n, ac, b/g, g/n, ax, or be.
- **Used By**: Shows the number of devices associated with this radio profile. Hover over any non-zero number in this column to see the associated device templates.

Related Topics

Configure Device Templates on page 120
Add a Radio Profile on page 173
Configure Neighborhood Analysis on page 174
About Channel Selection on page 174
Configure Dynamic Channel Switching on page 177
Optimize Radio Usage on page 177
About Radio Settings on page 179

Add a Radio Profile

Use this function to create a new radio profile for 2.4-GHz, 5-GHz or 6-GHz device interfaces. For more information about radio profiles, see About Radio Profiles on page 172.

> Note
> Extreme Networks provides defaults for each item in this section. The following steps are optional, except for the required radio profile **Name**.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select and existing profile, and then select ✎, or select +.
3. Enter the radio profile **Name**.
4. (Optional) Enter a **Description**.

   Although optional, entering a description is helpful for troubleshooting and for identifying specific radio profiles.
5. Select the desired 802 specification from the **Support Radio Modes** menu.
6. To set the optimal maximum power level, enter a value for **Maximum Transmit Power**.
7. To set the minimum power level, enter a value for **Transmission Power Floor**.
8. To set the maximum value the radio power can drop below the current power level, enter a value for **Transmission Power Drop**.
9. To set the maximum number of wireless clients that can use the radio if the AP is permitted to change channels, enter a value for **Maximum Number of Clients**.

   If the number of associated clients is equal to or less than this setting, and if the AP finds a better channel, it can switch to the new channel. Any associated clients will lose their connections and need to reconnect. If the number of clients exceeds this setting, the AP will not switch to the new channel. Whenever a client de-authenticates during the scheduled time range, the AP checks if the number of clients still exceeds this setting. If not, the AP switches channels. If the number of clients exceeds this setting for the entire defined channel switching period, the AP will not change channels.
10. Select **SAVE RADIO PROFILE**.

Now that you have completed the basic configuration, you can modify advanced radio profile settings. Remember to select **SAVE RADIO PROFILE** after changing advanced settings.

Related Topics

About Radio Profiles on page 172

Configure Device Templates on page 120

Configure Neighborhood Analysis on page 174

About Channel Selection on page 174

Configure Dynamic Channel Switching on page 177

Optimize Radio Usage on page 177

About Radio Settings on page 179

Configure Neighborhood Analysis

Using background scanning, an AP divides a full background channel scan into several shorter partial scans so they do not interfere with the beacons sent by the AP. The scan takes less time than the beacon interval (100 TU by default), and is spread out over a number of beacon intervals until the AP scans all available channels. Full scans occur at admin-defined intervals, with a default of 10 minutes.

Use this task to configure neighborhood analysis (background scanning) settings.

> Note
> Extreme Networks provides defaults for each item in this section. The following steps are optional.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. and then select ✎, or select +.
3. In the **Neighborhood Analysis** section, toggle **Background Scan ON** or **OFF**.

   Background scanning is necessary for WIPS and Layer 3 roaming to function.
4. Set the interval between background scans of all radio channels.

   Perform Background Scan Every: The range is 1 to 1440 minutes (24 hours).
5. For **Skip Background Scan When**, specify when to skip background scans:
   - Select **Clients are connected** to enable an AP with connected clients to scan channels.
   - Select **Connected clients are in power save mode** to enable an AP to scan channels when connected clients are in power save mode.
   - Select **Network traffic with voice priority is detected** to prevent an AP from performing a background scan when voice traffic is detected.

   Voice traffic takes priority and is the least forgiving of slow or degraded connections.
6. Select **SAVE RADIO PROFILE**.

Related Topics

Configure Channel Selection on page 176
Add a Radio Profile on page 173

About Channel Selection

2.4 GHz Radio Settings

The 2.4 GHz radio has between 11 and 14 channels, depending on the country code, but only three are completely non-overlapping (channels 1 - 6 - 11). Most wireless vendors recommend choosing one of the non-overlapping channels to avoid interference. However, in some cases, especially in very dense deployments, it can be better to use four channels, particularly in European countries where there are more channels available.

You can set the channel model as three or four channels, depending on the selected region (USA or Europe). When you select Europe, you can modify the channel choices and set a different combination of channels. If you disable limiting channel selection, the AP uses Advanced Channel Selection Protocol (ACSP) to determine the best among all available channels in its region, using data about channel utilization, interference, CRC errors, noise floor, and the number of neighbors and their signal strength. The AP then selects the best channel available.

5 GHz Radio Settings

The 5 GHz radio mode is 802.11a, 802.11n, or 802.11ac. One of the key features in the 802.11n and 802.11ac standards is channel bonding, in which the radio bonds two or four adjacent 20-MHz channels into one 40-MHz or 80-MHz channel to increase the transmit data bandwidth. Unlike the 2.4 GHz radio band, the 5 GHz band has enough space for channel bonding. When you enable channel bonding on an AP whose region code is **FCC** and choose **40 MHz** or **80 MHz**, ACSP automatically chooses the primary channel based on the current RF environment and optimizes channel usage.

You can also use channel bonding in the European Community in conjunction with Dynamic Frequency Selection (DFS), which makes channels 52-64 and 100-140 available in addition to channels non-DFS channels 36-48. Without DFS enabled, channel bonding is not recommended for client access in the European Community because only the Unlicensed National Information Infrastructure (U-NII) lower band would be available (5.15-5.25 GHz; bandwidth: 100 MHz; channels 36 - 40 - 44 - 48) and there would not be enough space for three non-overlapping 40-MHz channels.

Note
The DFS option only takes effect when the AP is configured with the country code of a country complying with European Telecommunications Standards Institute (ETSI) or Federal Communications Commission (FCC) regulations. All Extreme Networks APs are certified to use DFS channels in the ETSI region and all are certified for the FCC region.

The 5-GHz radio frequency spectrum is partitioned U-NII bands. Extreme Networks devices support the following:

- U-NII Low: 5.15-5.25 GHz (bandwidth: 100 MHz; available in the U.S. and E.C.)
- U-NII Upper: 5.725-5.85 GHz (bandwidth: 125 MHz; available in the U.S.)

Note
When a hive contains some APs that do not support channel bonding and others that do, the dynamic channel selection process works as follows:

- Channel selection for backhaul mode: The APs that support only 20-MHz channels converge on the control channel that the other members use as part of their 40-MHz channel.
- Channel selection for access mode: The APs that support only 20-MHz channels avoid choosing either the control channel or extension channel that the other members are using as part of their 40-MHz channels.

6 GHz Radio Settings

Wi-Fi 6 is the next generation of Wi-Fi based on 802.11ax HE (high efficiency) technology. Currently, AP3000, AP4000, and AP5000 devices support Wi-Fi 6 on 160 MHz channels.

Wi-Fi 7 is a tri-radio based on 802.11be technology on 320 MHz channels. Currently, only AP5020 devices support Wi-Fi 7 across three bands - 2.4 GHz (4x4:4), 5 GHz (4x4:4), and 6 GHz (4x4:4). For more information, see AP5000 Series Radios and 6 GHz Support on page 30.

Related Topics

Configure Channel Selection on page 176

Configure Channel Selection

Use this section to make changes to the device channel width. The available settings depend on the **Supported Radio Mode** that you selected in the basic configuration section.

> Note
> Extreme Networks provides defaults for each item in this section. The following steps are optional.
>
> Channel selection is dimmed and set to **Auto**. Perform channel selection at the device level.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select +.
3. Specify the **Channel Width and Exclusions**.
   a. To customize the display, select and clear the check boxes as desired:
      - **Show UNII Groups**
      - **Show Frequency Markers**
      - **Show Primary Channels**
      - **Show Preferred Scan Channels (PSC)**
4. To manually exclude channels, select a specific channel.
5. Enable **Dynamic Frequency Selection** to help maintain a balance between Wi-Fi performance and avoid interference with essential radio services.

   > Note
   > Dynamic Frequency Selection (DFS) settings do not apply to AP121, AP141, AP330, and AP350 access points that were shipped after 2 June 2016 and operate in the FCC domain.

   a. Select **Enable manual channel selection return** to return the affected radio to its original statically assigned DFS channel after a DFS event.
   b. Select **Enable ZeroWait DFS** to dedicate a single antenna chain to quickly identify a usable DFS channel. With ZeroWait DFS enabled, a 4x4 AP become a 3x3 AP.

      > Note
      > ZeroWait DFS is only available for 3- or 4-stream APs.

6. To manually set **Transmission Power**, select **Manual** and then use the slider to select a dBm setting.
7. Enable **Enable client transmission power control (802.11h)**.

8. To manually enable client transmission power control (802.11h), use the slider to select a dBm setting.
9. Enable **Limit Channel Selection** to limit channel selection to non-overlapping channels.
   a. Select the operating **Region** for the device from the drop-down list.
   b. For **Channel Model**, select 3 channels for USA and 4 channels for Europe.
   c. For **Limit Channel Selection**, USA defaults are 1, 6, and 11, and European defaults are 1, 5, 9.
10. Enable **Use the last known power and channel during the AP boot up process**.
11. Select **SAVE RADIO PROFILE**.

Related Topics

About Channel Selection on page 174

Configure Dynamic Channel Switching on page 177

Add a Radio Profile on page 173

Configure Dynamic Channel Switching

Enable Dynamic Channel Switching (DCS) to dynamically select and switch channels based on specified criteria.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile,and then select ✎, or select +.
3. Enable **Dynamic Channel Switching**.
4. Select **Automatically select and switch channels during specified time interval**.
   a. In the **From** field, enter the start time for the interval.
   b. In the **To** field, enter the end time for the interval.
   c. In the **Do not switch channels if the number of connected clients exceeds** field, enter the number of connected clients.
5. Select **Switch channels anytime if RF interference exceeds the threshold**.
   a. In the **Interference Threshold** field, enter the value (%).
   b. In the **CRC Error Threshold** field, enter the value (%).
   c. Select **Do not switch channels if clients are connected**
6. Select **SAVE RADIO PROFILE**.

Related Topics

Optimize Radio Usage on page 177

Add a Radio Profile on page 173

Optimize Radio Usage

Management frames such as beacons, and probe and association requests and responses, consume airtime that might otherwise be used to transmit user data. Configure the following settings to minimize management traffic by using higher data rates, and suppressing and reducing probe and association responses under certain circumstances.

Note
Use caution when configuring radio optimization settings. When device configuration limits specific clients, there is a risk that end user clients will deny access to the WLAN. Extreme Networks provides default values for each setting. Modifying the radio configuration is optional and should be done with caution.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select +.
3. Choose **High data rates** to transmit management frames at the highest basic data rate specified in an SSID or **Low data rates** to use the lowest basic data rate.
4. Select **Suppress successive requests within the same beacon interval** to enable APs to suppress responses to repeated probe requests from the same client received within a single beacon interval.
5. Select **Suppress response to broadcast probes by** to reduce responses to broadcast probe requests by enabling only one of several SSIDs to respond, in rotation, or reduce responses from specific client device types.

   With this feature enabled, select a suppression method:

   a. Select **Allowing only one SSID to respond at a time** to enable a single SSID to respond at a time.
   b. For **Reducing responses to certain client device types** select the add icon to add a new MAC OUI.

      See Add a MAC Object and Host Name on page 230.

   Note
   The suppression setting is disabled by default when high-density WLAN optimization is enabled.

6. Enable **Band Steering** and select a mode from the menu.
7. Use the slider to set the **Allowed percentage distribution of 2.4 and 5.0 GHz clients**.

8. Enable **Client Load Balancing** and configure the threshold settings.

Table 23: Load balance clients based on

Airtime	Number of clients
Ignore probe and association requests per device when threshold exceeds: • CRC Error Rate • RF Interference • Average Airtime Per Client	Ignore probe and association requests from clients associated with other Extreme Networks devices until: • Anchor Period Elapses • Query neighbors about client load every
Ignore probe and association requests from clients associated with other Extreme Networks devices until: • Anchor Period Elapses • Query neighbors about client load every	

9. Enable **Radio Load Balancing** and specify the **Number of Connection Attempts**.
10. Enable **Weak Signal Probe Request Suppression** and specify the **Signal-to-Noise Threshold** in dB.
11. Enable **Safety Net** and specify the time elapse, in seconds or minutes, before a device again responds to association requests after an overload incident.
12. Configure Configure Radio Settings on page 180.
13. Select **SAVE RADIO PROFILE**.

Related Topics

Add a MAC Object and Host Name on page 230

Configure Radio Settings on page 180

Add a Radio Profile on page 173

About Radio Settings

Preambles

When you enable short preambles, the AP broadcasts support of short preambles and attempts to negotiate using them with clients. If a client also supports short preambles, the client and AP agree to use them. If a client only supports long preambles, then the AP automatically adjusts to accommodate it, and they agree to use long preambles instead. When you select long preambles, the AP and client both agree to use long preambles. Although a short preamble saves time and improves throughput, a long preamble allows more time for the receiver to tune into and synchronize with the transmitting radio, providing additional decoding accuracy in noisier environments.

Beacon Periods

APs broadcast beacons to all clients within range, and by default, send beacons every 100 TUs (approximately 10 times per second). If APs are in an area with lots of background noise, you might want to add more time between beacon broadcasts, or set an interval from 40 to 3500 TUs (about 24 times per second to about every 3.5 seconds).

Guard Intervals

A guard interval is the amount of time between transmissions to ensure that they do not collide. The default is 800 nanoseconds, which is still suitable for large areas, such as warehouses or outdoors, where the distances between points of reflection are great. For smaller areas, such as office spaces, you can use a shorter interval of 400 nanoseconds. Enabling this option in the right environment can improve data rates.

Aggregate MAC Protocol Data Unit (AMPDU)

AMPDU transmissions reduce overhead when the transmission channel is busy. When AMPDU is enabled, the AP combines data frames into fewer, larger frames before transmission, and recognizes the format of larger frames when it receives them. Generally, enabling AMPDU increases performance.

Frame Bursts

Frame bursts enable a wireless client to transmit data at a higher throughput by using the inter-frame wait intervals to burst a sequence of up to three packets without releasing control of the transmission medium.

BSS Colors

A basic service set (BSS) is the cornerstone topology of any 802.11 network. The communicating devices that make up a BSS consist of one access point radio with one or more client stations. The BSS color is a numerical identifier of the BSS. 802.11ax radios are able to differentiate between BSSs using BSS color identifiers when other radios transmit on the same channel. If the color is the same, this is considered to be an intra-BSS frame transmission. In other words, the transmitting radio belongs to the same BSS as the receiver. If the detected frame has a different BSS color from its own, then the station considers that frame as an inter-BSS frame from an overlapping BSS.

Related Topics

Configure Radio Settings on page 180

Configure Radio Settings

You can configure whether you want to use long or short preambles, adjust the beacon period (or interval), and enable the detection of spoofed BSSIDs. For more information about radio settings, see About Radio Settings on page 179.

> **Note**
> Extreme Networks provides defaults for each item in this section. The following steps are optional.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✏, or select +.
3. Expand the **Advanced Settings** section.
4. Select **Auto (Short/Long)** to enable support for short preambles or **Long** to disable short preamble support.
5. Set the period during which APs send beacons.
6. Set the Guard Interval to 800 nanoseconds by deselecting **Enable Short Guard Interval**.

7. To no longer combine data frames into larger frames before transmission, clear the check box for **Enable MAC Aggregate Protocol Data Units**.
8. Select **Enable Frame Burst** so a wireless client will transmit a burst sequence of up to three packets without releasing control of the transmission medium.
9. Select **Enable Transmit Beamforming** to improve data transfer rates for directional signal transmission processing.
10. Select **Enable MU-MIMO** to enable multiple users to receive data using different simultaneous spatial streams from an AP transmit radio chain.
11. If you selected **Enable MU-MIMO**, set **Station Receive Chain** to **Auto** or **1**, which is the chain the AP uses to receive data from the wireless client.
12. If you are using 802.11ax radios, enable **ODFMA**.
13. If you selected **Enable ODFMA**, select **Uplink** or **Downlink**.
14. If you are using 802.11ax radios, enable **BSS Coloring**.
15. If you selected **Enable BSS Coloring**, enter the numerical value of the new BSS color the AP will transmit after surpassing the beacon threshold.
16. Select **Enable Target Wake Time** to enable an AP to minimize medium contention between stations, and to reduce the required amount of **time** that a station in the power-save mode needs to be **awake**.
17. Select **SAVE RADIO PROFILE**.

Related Topics

Optimize Radio Usage on page 177

Configure Backhaul Failover on page 181

Add a Radio Profile on page 173

Configure Backhaul Failover

When **Backhaul Failovers** are enabled, the AP forms a mesh link with other hive members and can failover backhaul communications from Eth0 to a wireless interface if the Ethernet link goes down.

Note
Extreme Networks provides defaults for each item in this section. The following steps are optional.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select +.
3. Enable **Backhaul Failover**.
4. Configure the following settings to define when to failover the backhaul link from Ethernet to wireless, and when to return the backhaul to Ethernet:
   a. In **Switch to Wireless Backhaul**, set how long the Ethernet link must be down to trigger a failover to the wireless link.
   b. In **Revert Back to Wired Backhaul**, set how long the Ethernet link must be up before the AP returns backhaul communications to Ethernet.

      Use the menu to specify the time in seconds or minutes.
5. Select **SAVE RADIO PROFILE**.

Related Topics

Configure Outdoor Deployment on page 182
Add a Radio Profile on page 173

Configure Outdoor Deployment

You can configure outdoor APs to communicate wirelessly with each other across a great distance by using a directional antenna for the backhaul link, while continuing to use omnidirectional antennas for access. However, you must make some adjustments to the radios to accommodate the longer transmission intervals. A Wi-Fi radio expects to receive an ACK for every transmitted Unicast frame. If it does not receive an ACK, it retransmits the frame. If the distance between the transmitter and receiver is too great, the ACK timeout period elapses before the ACK from the receiver reaches the transmitter, causing the transmitter to retransmit frames repeatedly until concluding that the frames are not reaching their target. To counter this, use this task to define the ACK timeout range between APs. By increasing the range, the radio increases the ACK timeout period accordingly.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select +.
3. Set a distance (between 300 and 10,000 meters) over which to support the radio.
4. Select **SAVE RADIO PROFILE**.

Related Topics

Configure RF Interface Reports on page 182
Add a Radio Profile on page 173

Configure RF Interface Reports

ExtremeCloud IQ can periodically poll APs and collect RF interface-related data. ExtremeCloud IQ forces APs to adopt a shorter polling interval if CRC error, channel interference, or short-term polling thresholds are exceeded.

> Note
> Extreme Networks provides defaults for each item in this section. The following steps are optional.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select +.
3. Set the level of CRC errors for polling.

   The default threshold is 20% for 802.11g/n, and 35% for 802.11a and 802.11ac. The range is from 15 to 60%.
4. Set the level of channel interference for polling.

   The default threshold is 20% for 802.11g/n, and 35% for 802.11a and 802.11ac. The range is from 15 to 60%.
5. Set the short-term average for polling.

   The range is 5 to 30 minutes.
6. Select **SAVE RADIO PROFILE**.

Related Topics

Configure Client SLA Definitions on page 183

Add a Radio Profile on page 173

Configure Client SLA Definitions

For each radio mode (or phymode)—11a, 11b, 11g, 11n, 11ac, 11ax—there are default settings for bit rate, success rate, and usage.

In most cases, the AP and client use several different rates to transmit and receive packets, changing rates as factors such as RSSI and packet loss change. To determine a common mid point to which various client scores can be compared, ExtremeCloud IQ provides three settings for each phymode:

Rate: This setting defines the transmission bit rated used by clients with healthy connectivity. For 80211a/b/g, rates are Mbps. For 802.11n, the rates are Mbps and modulation coding scheme (MCS).

Success: This setting defines the percentage of packets that you expect clients with healthy connectivity to transmit successfully (without retries) at the defined rate.

Usage: This setting defines the percentage of time that clients with healthy connectivity will transmit at the defined rate. The aggregated usage for the two bit rates must be equal to or less than 100%.

> Note
> To counter traffic congestion from clients with otherwise healthy Tx/Rx bit rates, APs can monitor client throughput and report SLA status to ExtremeCloud IQ. APs can also dynamically increase the amount of airtime for clients with a significant backlog of queued packets and improved throughput.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select + and then select ✎.
3. To use the default settings, select one of the three options: **High Density (performance-oriented)**, **Normal Density**, or **Low Density (coverage-oriented)**.

   Alternately, to customize the settings for each option, select **CUSTOMIZE** and configure the settings on each tab.
4. Select **SAVE RADIO PROFILE**.

Related Topics

Configure WMM QoS Settings on page 183

Add a Radio Profile on page 173

Configure WMM QoS Settings

Wi-Fi Multimedia (WMM) classifies traffic into Voice, Video, Best-effort, and Background access categories, and provides mechanisms to prioritize each category at differing levels. **Contention Window Minimum**, **Contention Window Maximum**, and **AIFS** work together to determine the back-off time for each category. The first two define the minimum and maximum contention window parameters. When there is contention for access to the wireless medium, the AP calculates a random value between these two parameters. The higher the values, the longer the AP will back off during periods of access contention, resulting in longer delays for that traffic category. The lower the values, the shorter the back-off period, with shorter delays for traffic delivery. The AP adds the fixed arbitration interframe space (AIFS) back-off value to the first two values. The higher the setting, the longer the AP backs off, and the longer traffic is delayed during times of contention. The smaller the setting, the less time the AP backs off, resulting in shorter delays.

Use this task to configure Wi-Fi Multimedia.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select +.
3. If necessary, modify the default settings in the **Contention Window Minimum**, **Contention Window Maximum**, and **AIFS** columns.
4. If necessary, modify the default setting in the **TXOP Limit** column to determine how long bursts of traffic last before relinquishing the medium.
5. Set the **No ACK** flag to inform the recipient not to send ACKs of the frames it receives, which is useful for the video category where lost packets in streaming video go unnoticed, and retransmissions are unnecessary.
6. Select **SAVE RADIO PROFILE**.

Related Topics

Configure Sensor Mode Scan Settings on page 184
Add a Radio Profile on page 173

Configure Sensor Mode Scan Settings

These settings determine how your APs behave during the scanning process. You can specify how long a device scans each channel and which channels are to be scanned.

Note
Dwell time defines how long the radio transmits on a specific channel frequency to scan client probe requests before moving to the next channel in the sequence. For presence data collection, setting the dwell time above the default value raises the throughput of data collected on each channel. Setting the minimum dwell time below the default value reduces latency but also reduces the throughput of data collected on each channel.

Use this task to configure scan settings for sensor mode.

1. Go to **Configure** > **Common Objects** > **Policy** > **Radio Profiles**.
2. Select an existing radio profile, and then select ✎, or select +.
3. If necessary, modify the **Dwell Time**.
4. Deselect **Scan All Channels** and set individual channel numbers to collect client probe request data.
5. Select **SAVE RADIO PROFILE**.

Related Topics

Add a Radio Profile on page 173

Configure an SDR Profile

Before you begin, you must create radio profiles. For more information, see Add a Radio Profile on page 173.

Software Defined Radio (SDR) scans the surrounding environment and chooses a channel based on those scans. It can also go to a different radio if it finds no suitable channels on the first radio. For example, if it finds no usable channels on the 2.4 GHz radio, then it will switch to the 5 GHz radio instead (so long as the device is capable of dual 5 GHz radios).

1. Go to **Configure** > **Common Objects** > **Policy** > **SDR Profiles**.
2. Select an existing profile, and then select ✎, or select +.
3. Type a **Name** for the profile.
4. (Optional) Type a **Description** for the profile.

   Although optional, entering a description is helpful for troubleshooting and for identifying the profile.
5. Select the radio profiles to be applied.

   This allows the device to switch radios automatically and still know which radio profile to use.

   > Note
   > If an AP with a 2.4GHz radio for wifi0 is in use (as opposed to a dual 5GHz radio AP), set the static radio profile (radio profile settings on the device specific settings, separate from the SDR profile) to radio_ng_0. If this default radio profile is not in use within device specific settings, the update will fail and the SDR profile will not work.

6. Select **Enable SDR during initial ACSP** (the initial boot up of the device) to enable the AP to choose the best channel it can see for the environment upon start up.
7. Select **Enable SDR during initial ACSP** (the initial boot up of the device) to enable the AP to choose the best channel it can see for the environment upon start up.
8. Select **Enable SDR to periodically run in the background** to set the interval for how often the SDR runs in the background.

   If there is a concern that the AP might switch channels and interrupt too many client connections, set a limit of client devices that can be connected and still enable an SDR scan and change.

   a. Type the **Interval** to specify the time period between SDR scans.
   b. In the **Do not switch when station number exceeds** field, enter the number of client devices that can be connected.
9. Select **Enable SDR during a schedule time range** to specify the time range.

   SDR profiles can limit the number of client connections to interrupt, and enable the profile to run in the background. If both settings are enabled, make sure both station number counts are the same.

   a. Enter values for the time range.
   b. In the **Do not switch when station number exceeds** field, enter the number of client devices that can be connected.

      If the station number count is 0, the rule does not apply.

10. Select **SAVE**.

Related Topics

Add a Radio Profile on page 173

Configure a Schedule

Use this procedure to configure a schedule as a common object for reuse.

1. Go to **Configure** > **Common Objects** > **Policy** > **Schedules**.
2. Select an existing schedule, and then select ✎, or select +.
3. Configure the settings.
   See Schedule Settings on page 186.
4. Select **SAVE SCHEDULE**.

Related Topics

Schedule Settings on page 186

Schedule Settings

Table 24: Settings for a One Time Schedule

Setting	Description
Name	Type a name for the schedule.
Description	(Optional) Type a description for the schedule.
One Time	Select to apply this schedule one time only.
Start Time	Use the **Start** and **Time** controls to specify the starting date and time for the schedule.
End Time	Use the **End** and **Time** controls to specify the end date and time for the schedule.

Table 25: Settings for a Recurring Schedule

Setting	Description
Name	Type a name for the schedule.
Description	(Optional) Type a description for the schedule.
Recurring	Select to apply this schedule on an ongoing basis.
Recurrence	Select **Every Day**, or select **From** and use the menus to select the day of the week to start, and the day to end the recurrence.
Limit recurrence between	Select the check box to apply the schedule to a specific date range. Use the controls to specify the start and end dates.

Related Topics

Schedule Settings on page 186

Configure an Availability Schedule on page 187

Configure an Availability Schedule

You can make the user profile available for specific dates, days, and times by assigning defined availability schedules to the profile. Profile members can access the network through the device only during these scheduled times. When the user profile is inactive the device blocks access to the network.

Use this task to enable the Availability Schedule feature, and configure the settings.

1. Go to **Configure** > **Common Objects** > **Policy** > **User Profiles**.
2. Select an existing profile, and then select ✎, or select +
3. On the **Availability Schedule** tab, turn on **Availability Schedule**.
4. Select + and configure the settings.
   See Schedule Settings on page 186.
5. Select **SAVE USER PROFILE**.

> Note
> To apply your SSID availability schedule to a wireless network, you must activate it in the **Additional Settings** section of the Standard Wireless Networks configuration page. See Configure Enterprise SSID Authentication on page 83.

Related Topics

Schedule Settings on page 186
Configure Enterprise SSID Authentication on page 83
Add a User Profile on page 217

Configure Switch Templates

You can create a switch template during the network policy creation process, or at the device level after you have a network policy in place. Device-level changes to a switch template override settings in the network policy. For more detailed information about switch use in ExtremeCloud IQ, see the ExtremeCloud IQ Universal Switch Deployment Guide.

A switch template is a visual depiction of the physical ports on a switch. Configure how ports function by assigning port types and port usage settings to the template, and then applying the template to managed switches. The following steps describe how to create a switch template inside the network policy creation workflow.

Under **Device Configuration**, you can choose to override settings made under **Common Settings** in a network policy. The Switch Template Override feature allows you to create and manage switch templates based on common settings for the SwitchEngine, ExtremeXOS, Fabric Engine, and VOSS platforms. These common settings include STP, MAC Locking, IGMP, Extreme Loop Recovery Protocol Settings (ELRP), MTU, PSE, and Management Interfaces (Switch Engine only). The default values for these settings are defined within the common switch settings for each platform type. When you create a new switch template and enable the override option, you can customize device configuration settings that will override the network policy switch common settings. If the override option is disabled, the network policy common settings inherit the device configuration.

To make changes to a switch template at the device level, go to **Manage** > **Devices** and select a device name.

Use this task to configure a switch template.

1. Go to **Configure** > **Common Objects** > **Policy** > **Switch Template**.
2. Select an existing switch template, and then select ✎, or select + and select the switch model from the list.
3. Type a **Name** for the template.
4. To make changes to device configuration (Switch Engine only), enable **Override Policy Common Settings**.
5. For STP Configuration, enable **STP (Spanning Tree Protocol)** and configure the settings.

   See Configure Switch STP Settings on page 205.
6. For **MAC Locking Settings**, select to control the forwarding database for learned MAC address entries on a port.

   Note
   MAC Locking must also be enabled on a per-port basis.
7. Enable **IGMP Snooping** and configure the settings.
   - **Enable immediate leave**: Instructs the switch to remove a multicast host from the multicast forwarding table immediately upon receipt of a leave-group-membership message.
   - **Suppress redundant IGMP membership reports to optimize traffic**: Suppresses redundant IGMP membership reports from multiple hosts on a subnet. The switch sends a single report to the IGMP router, reducing traffic.
8. For **Extreme Loop Recovery Protocol Settings**, select to configure ELRP client periodic packet transmission for VLANs assigned to a port type to detect and prevent loops.

   This option enables an ELRP client and disables a port when a loop is detected on the applied access or trunk VLANs assigned to the port type.

   Note
   ELRP must also be enabled within the switch template.
9. Enable **DHCP Snooping**, and select **Enable drop rogue DHCP Packets action**

   Ports configured as trusted do not apply the drop action. By default, port types configured as Trunk Port are trusted.
10. For **MTU Settings**, enter a maximum transmission unit value for Ethernet interfaces.

    The MTU value determines the largest packet size that can be transmitted through your system.

11. For **PSE Settings**, toggle to **On** to configure maximum power thresholds to generate alerts to ExtremeCloud IQ about exceeding maximum power levels.
12. Select **Enable Flow Control** to manage the port data receive transmission rate.
13. For **Management Interface Settings**, select one of the following options:
    - **Infer from device** (Dell EMC switches only): Select when the switch supplies the management interface.
    - **VLAN Interface**: Select when the management interface is to be supplied by the management VLAN.
        - **Management VLAN**: Enter the VLAN to be used by the switch.
        - **Management IP Settings**: Select to enable DHCP on this interface.
14. For the **Port Configuration** section, see the following:
    - To configure **Instant Port Profile**, see Configure an Instant Port Profile on page 195.
    - To **Configure Ports in Bulk**, see Create a New Port Type on page 191
    - To **Configure Ports Individually**, see Configure Individual Ports on page 200
15. For **sFlow Control**, see Configure an sFlow Receiver on page 288.
16. For **Supplemental CLI**, see Configure Supplemental CLI on page 233.
17. For **Advanced Settings**, see Configure Switch Device Template Advanced Settings on page 215.
18. Select **Save**.

Continue configuring the network policy. To create a switch stack template, see Manually Create a Switch Stack on page 213.

Configure Switch Common Settings

This section contains configuration elements applicable to all Switch Engine, EXOS, Fabric Engine, and VOSS switches assigned to a specific network policy.

Use this task to configure common settings for switches.

1. For **Management Servers** (Switch Engine/EXOS only), select **VR-Default** or **VR-mgmt** to apply the correct routing instance to defined network policy DNS, NTP, SNMP, and Syslog server settings.
2. For **STP Configuration**, see *Configure STP Settings* in the *ExtremeCloud IQ Universal Switch Deployment Guide*.
3. For **MAC Locking Settings**, select to control the forwarding database for learned MAC address entries on a port.

    Note
    MAC Locking must also be enabled on a per-port basis.

4. For **IGMP Settings**, if necessary, toggle to **On** and make the following selections:
   - **Enable immediate leave**: Instructs the switch to remove a multicast host from the multicast forwarding table immediately upon receipt of a leave-group-membership message.
   - **Suppress redundant IGMP membership reports to optimize traffic**: Suppresses redundant IGMP membership reports from multiple hosts on a subnet. The switch sends a single report to the IGMP router, reducing traffic.
5. For **Extreme Loop Recovery Protocol Settings**, select to configure ELRP client periodic packet transmission for VLAN(s) assigned to a port type to detect and prevent loops.

   This option enables an ELRP client and disables a port when a loop is detected on the applied access or trunk VLANs assigned to the port type.

   Note
   ELRP must also be enabled within the switch template.

6. For **DHCP Snooping Settings**, toggle to **On**.
   - **Drop Rogue Packets Action**: Instructs the switch to drop all packets marked as rogue.
7. For **MTU Settings**, enter a maximum transmission unit value for Ethernet interfaces.

   The MTU value determines the largest packet size that can be transmitted through your system.
8. For **PSE Settings**, toggle to **On** to configure maximum power thresholds to generate alerts to ExtremeCloud IQ about exceeding maximum power levels.
9. For **Management Interface Settings** (Switch Engine devices only), select one of the following options:
   - **VLAN Interface**: Select when the management interface is to be supplied by the management VLAN.
     - **Management VLAN**: Enter the VLAN to be used by the switch.
     - **Management IP Settings**: Select to enable DHCP on this interface.

Port Type Settings

Use **Port Types** to manage Switch Engine (EXOS) and Fabric Engine (VOSS) SKU port types within the network policy. View, create, edit, clone and delete switch port types from the **Port Types** menu item under **Switch Settings**. Use the plus sign to add a new port type. See Create a New Port Type on page 191 for more information about port type configuration.

Note
You cannot delete a port type if it is currently assigned to a switch associated to any network policy.

The table displays information about the port device family, usage, status, and VLAN. For the **Used by** column, hover over, select the number (Total number of usages), and the Device configuration, Device Template, and Network Policy this port type is being used in displays on the right. For example:

- Device Template
- 2ndSlot_5720_copied
- AVM-5720-Stack-2
- Network Policy
- Edge_IOT_Policy

Other columns display based on a filter that enables you to view Switch Engine, EXOS or Fabric Engine, VOSS, or both.

Related Topics

Create a New Port Type on page 191

Create a New Port Type

Create or modify a Switch Template.

Use this task to create ports in bulk.

1. Either under **Create Ports in Bulk**, select one or more ports and select **Assign > Create New** or select the plus sign next to **Port Type** under **Configure Ports Individually**.
2. If this template applies to a 5570 or 5520 switch, you can define VIM Port Channelization ports; otherwise, proceed to Step 3.
   a. Under **Configure Ports in Bulk**, choose **Select VIM**.
   b. For a 5570 switch, select **VIM-6YE** or **VIM-2CE**.
   c. For a 5520 switch, select **VIM-4X**, **VIM-4XE**, or **VIM-4YE**.

   > Note
   > If different templates for the same switch SKU are required to be created with different VIMs, then a classification rule can be created to assign the same template SKU with different VIM options to different devices. See Configure Classification Rules for a Device Template on page 120 for more information about classification rules.

   d. Select one or more of these VIM ports and continue to Step 3.
3. Enter a name.
4. Edit the associated description if necessary.
5. Toggle the port **On** or **Off**.
6. In the **Port Usage Settings** section, select one of the following port types:
   - **Access Port**: Ports connected to individual hosts such as printers, servers, and end-user computers.
   - **Phone with a data port**: Ports connected to IP phones, and optionally, to computers cabled to the phones.

   - **Trunk port**: Ports connected to network forwarding devices, such as switches and APs that support multiple VLANs on trunk ports.
   - **Mirror port**: Ports that mirror data from one or more other ports for diagnostic purposes. Configure one of the following settings for a new mirror port type:
     - **Ingress-and-Egress mirror**: Route all traffic.
     - **Anomaly mirror**: Route all anomalous traffic.
     - **Egress mirror**: Route outbound traffic only.
     - **Ingress mirror**: Route inbound traffic only.
     - **VLAN mirror**: Route traffic from all ports belonging to that VLAN.

   Use the switch-specific CLI commands set to configure the switch.

7. Select **Next**.
8. Select an existing VLAN or select the add icon to add a new one.

   To add a new VLAN, see Configure VLAN Settings on page 109.
9. Select **Next**.
10. For **User Authentication**:
    - **User Authentication**: Turn **On** for wired devices, such as printers, servers, and end-user computers.
    - **MAC Authentication**: Turn **On** for legacy devices that use MAC addresses as the user name and password to authenticate clients.
      - **Authentication Protocol**: If you selected **MAC Authentication**, choose **PAP**, **CHAP**, or **MS CHAP V2** (for users on an Active Directory server) to determine how the port forwards authentication requests from users to an external RADIUS or Active Directory server. If you choose PAP, the port sends an unencrypted password to the RADIUS server. If you choose CHAP or MS CHAP V2, the port sends the RADIUS or Active Directory authentication server the result of an operation it performs on the password, instead of the password itself. The authentication server performs the same operation, and then compares the two results to check if they match.
11. Select **Next**.
12. Add RADIUS Servers under **RADIUS Settings** to use this form of user authentication.

    Either select an existing **RADIUS Server Group** or select the add icon to add a new one. See Configure an External RADIUS Server on page 98.
13. For **Authentication Method Priority**, use the up or down arrows to determine the authentication method use order.
14. For **QoS Settings**, toggle **On** to create custom settings.

    Select the 802.1p classification system (marked in the L2 frame header in Ethernet frames) or the DiffServ codepoint marking system (marked in the L3 packet header) on outgoing packets from the drop-down list. See Configure Marker Maps on page 249.
15. Select **Next**.
16. For **Transmission Settings**, configure the following:
    - **Transmission Type**: Select **Auto**, **Half-Duplex**, or **Full-Duplex**. Auto causes the switch to negotiate the best possible duplex mode possible with the connected device. Full-Duplex forces the switch to communicate with the connected device

using full-duplex communication. Half-Duplex forces the switch to use half-duplex communication.

- **Transmission Speed**: Choose the speed the switch port uses to communicate with the connected device.
- **Debounce Timer**: Select the amount of time the switch does not register another input.
- **CDP Receive**: Enables the switch to receive and parse the information within Cisco CDP frames.
- **Auto MDIX**: Automatically detects the required cable connection type (straight through or crossover) and configures the connection appropriately.
- **LLDP Transmit**: Enables the switch to transmit LLDPDU frames.
- **LLDP Receive**: Enables the switch to receive LLDPDU frames.

17. Select **Next**.
18. For **STP**:

    - **STP Enabled**: Toggle **ON** to enable STP for the port.
    - **Edge Port**: Connects to a user terminal or server, instead of other switches or shared network segments. A port configured as an Edge port does not cause a loop upon network topology changes.
    - **BPDU Protection**: Use the drop-down list to change BPDU protection to guard or filter status.
        - **Guard** - Controls whether a port explicitly configured as Edge disables itself upon reception of a BPDU. The port enters the error-disabled state, and is removed from the active topology.
        - **Filter** - Controls whether a port explicitly configured as Edge transmits and receive BPDUs. You must select this option for Fabric Engine switches.
        - **Disabled** - Turns off BPDU Protection.
    - **Priority**: When this port is an STP edge port, select a port priority for STP from the drop-down list.

19. Select **Next**.
20. For **Storm Control**:

    - **Broadcast**: Select to include traffic that is forwarded to all destinations simultaneously.
    - **Unknown Unicast**: Select to include traffic whose destination address does not appear in the forwarding database.
    - **Multicast**: Select to include traffic whose destination is a multicast address.
    - **TCP-SYN**: Select to include TCP-SYN flood traffic.
    - **Thresholds**: Select **Byte Based** or **Packet Based**.
    - **Rate Limit Type**: Select **Kbps** (kilobytes per second) or **Percentage** if you selected **Byte Based** and **PPS** (packets per second) if you selected **Packet Based**.
    - **Rate Limit Value**: Enter when the switch should discard traffic of the selected types.

21. For **MAC Locking**, enable the per port type with the option to specify **Maximum First Arrival Limit** and specify the **Link Down Action**.

    By default, **Link Down Action** it is set to clear first arrival MACs, with the option to retain MAC's. We also have the option to take action when MACs are aged out.
22. For **ELRP**, toggle to **ON** to enable ELRP per port.
23. For **PSE**, select an existing profile or select the plus sign to add a new one.

    See Configure PSE Parameters on page 202.
24. Review all the port settings in the **Summary** section and select **Save** when complete.

Configure STP Settings

Create an Ethernet port profile.

Extreme Networks switches can use Spanning Tree Protocol (STP) to activate links with the lowest cost (highest bandwidth), establish backup links where possible, and prevent Layer 2 network loops, which can result in duplicate unicast frames and broadcast storms. Bridge Protocol Data Unit (BPDU) protection is a security feature designed to protect the active STP topology by preventing spoofed BPDU packets from entering the STP domain. BPDU protection is applied to edge ports connected to end-user devices that do not run STP. If STP BPDU packets are received on a protected port, this feature disables that port and alerts the network admin.

The BPDU Restrict feature disables the port as soon as a BPDU is received on the BPDU restrict port, blocking the loop. Specify a BPDU recovery timeout, enabling the port after the configured amount of time.

> Note
> BPDU Restrict can only be enabled when Edge port is also enabled.

1. Go to **Configure** > **Common Objects** > **Policy**
2. Toggle the switch to **On** to enable **STP (Spanning Tree Protocol)**.
3. If you are enabling **BPDU Protection**, toggle the switch to **On** to enable **Edge Port**.
4. Select the **Bridge Protocol Data Units (BPDU) Protection** setting.
   - **Guard**: Controls whether a port explicitly configured as Edge disables itself if it receives a BPDU. The port enters the error-disabled state and is removed from the active topology.
   - **Filter**: Controls whether a port explicitly configured as Edge will transmit and receive BPDUs.
   - **Disable**: Turn off BPDU Protection.
5. Select a **Priority** for STP from the drop-down list.
6. Toggle the switch to **On** to enable **BPDU Restrict**.
7. For BPDU recovery timeout, input a time between 60-600 seconds.

   > Note
   > The port is re-enabled automatically when time expires.

Continue configuring the Ethernet port.

Instant Port Profiles

Configuring Instant Port Profiles (IPP) in ExtremeCloud IQ is an automated approach to configuring switch ports based on the connected devices. Instant Port Profiles streamline the management of network-connected devices, such as access points (AP), security cameras, and VoIP devices by dynamically provisioning the appropriate port configuration automatically.

Instant Port Profile configuration comprises the following tasks:

- Create an Instant Port Profile
- Create Instant Port Device Type

For additional information about Instant Port Profiles, see *ExtremeCloud IQ Universal Switch Deployment Guide*.

Related Topics

Configure an Instant Port Profile on page 195

Create an Instant Port Device Type Profile on page 196

Configure an Instant Port Profile

Add or edit an IPP for a switch on the **Port Configuration** tab of the switch template.

1. Go to **Configure** > **Network Policies** and select a device template for the switch.
2. On the switch template page, select **Port Configuration** and then choose one of the following actions:

   Add a new IPP

   Select +, and then go to Step 3.

   Edit a new IPP

   Select an existing IPP from the drop-down menu, select ✎ and then go to Step 3.
3. Configure the profile settings.

Related Topics

Instant Port Profile Settings on page 195

Create an Instant Port Device Type Profile on page 196

Delete an Instant Port Profile on page 196

Instant Port Profile Settings

Configure the following IPP settings.

Table 26: IPP Configuration Settings

Field	Description
Name	Enter a **Name** for the Instant Port Profile.
Description	Enter a **Description** for the Instant Port Profile.

Table 26: IPP Configuration Settings (continued)

Field	Description
Non-Forwarding VLAN	From the menu, select a VLAN to use for the detection of attached devices; this VLAN will not forward traffic. The non-forwarding VLAN cannot be utilized within a port type assigned to the switch.
Default Port Type	From the menu, select the default port type: • **Access Port**—Use for a port connected to an individual host. • **Trunk Port**—Use for a port connected to a forwarding device such as an AP and switch that supports multiple VLANs. Ports assigned with an Instant Port Profile inherit the selected port type settings such as type, speed, STP, MAC locking, ELRP, and PSE port settings.
Non-Match Action	Select one of the options: • **Non-Forwarding VLAN**—Does not forward traffic for devices that do not match an assignment rule. • **Use Default Port Type VLAN**—Assigns the VLANs associated with the port type. Storm control settings are inherited when the non-match action is set to use the default port type and the device does not match a defined device type.
Device Types	Add a new **Device Type**, edit or delete an existing **Device Type**. Configure the IPP Device Type settings.

Related Topics

Instant Port Profiles on page 195

IPP Device Type Settings on page 197

Configure an Instant Port Profile on page 195

Delete an Instant Port Profile

You can delete IPPs that you no longer use.

1. Go to **Configure** > **Common Objects** > **Policy** > **Instant Port Profiles**.
2. Select the corresponding check boxes for the IPPs that you want to delete, and then select 🗑.

Create an Instant Port Device Type Profile

Configure a Network Policy with a Switch Template and an Instant Port Profile.

The Port Device Type profile is part of the Instant Port Profile. When a device connects to a switch port, ExtremeCloud IQ uses the criteria defined in this task to determine whether the device port is eligible for application of the Instant Port Profile.

1. From the **Create Instant Port Profile** dialog, select + under **Device Types**.
2. Configure the Instant Port Device Type settings as described in IPP Device Type Settings on page 197.
3. Select **Save** to commit changes, or select **Cancel**.

Related Topics

Configure an Instant Port Profile on page 195

IPP Device Type Settings

Configure the following Instant Port Profile Device Type settings.

Table 27: IPP Device Type Settings

Field	Description
Name	Enter a **Name** for the Device Type profile.
Description	Optionally, enter a **Description** of the Device Type profile.

Table 27: IPP Device Type Settings (continued)

Field	Description
Match Category	Use the drop-down menu to choose a **Match Category**. Options are: • MAC Learning — Matches the device based on the MAC address learned on the port from untagged traffic. The match criteria can be an exact MAC, OUI-based MAC, or custom MAC mask format. • LLDP Src MAC — Matches the device based on the source MAC of a LLDP PDU. The match criteria can be an exact MAC, OUI-based MAC, or custom MAC mask format. • LLDP Capability — Matches the device based on the LLDP capability from the source LLDP PDU. Options are: • LLDP Src MAC + LLDP Capability — Matches the device based on the source MAC of a LLDP PDU and the selected LLDP capability from the source LLDP PDU. If you choose MAC Learning or LLDP Src MAC, configure the following fields: • **MAC Address/OUI** ◦ Select ☰ and choose a MAC address. ◦ Select + to add a custom **MAC Address** or **MAC OUI**. ◦ Select ✎ to edit a custom MAC Address or MAC OUI. • **MAC Mask** ◦ Enter a custom MAC mask format. ◦ Select the **Edit MAC Mask** check box, then edit the entry in the MAC Mask field. If you choose **LLDP Capability**, use the drop-down menu to choose one of the following options: • Avaya Phone • Gen Tel Phone • Router • Bridge • Repeater • WLAN Access Pt • Docsis Cable Ser • Station Only • Other If you choose **LLDP Src MAC + LLDP Capability**, configure the parameters as described above.
PORT USAGE tab	
Port Usage	Select a **Port Usage** option, as follows: • Access Port • Trunk Port (802.1Q VLAN Tagging) • Phone with a Data Port
VLAN tab	

Table 27: IPP Device Type Settings (continued)

Field	Description
VLAN	This field appears if **Port Usage** is configured as **Access Port**. Choose from the following actions: • Select ☰ and choose a VLAN. • Select + to add a custom VLAN. Optionally, select the **Apply VLANs to devices using classification** check box. • Select ✎ to edit a custom VLAN.
Native VLAN	This field appears if **Port Usage** is configured as **Trunk Port (802.1Q VLAN Tagging)**. Choose from the following actions: • Select ☰ and choose a Native VLAN. • Select + to add a custom Native VLAN. Optionally, select the **Apply VLANs to devices using classification** check box. • Select ✎ to edit a custom Native VLAN.
Allowed VLANs	This field appears if **Port Usage** is configured as **Trunk Port (802.1Q VLAN Tagging)**. Enter the VLAN names using comma delimiters (vlan1,vlan2,vlan3...).
Voice VLAN (tagged)	This field appears if **Port Usage** is configured as **Phone with a Data Port**. Choose from the following actions: • Select ☰ and choose a Voice VLAN. • Select + to add a custom Voice VLAN. Optionally, select the **Apply VLANs to devices using classification** check box. • Select ✎ to edit a custom Voice VLAN.
Data VLAN (untagged)	This field appears if **Port Usage** is configured as **Phone with a Data Port**. Choose from the following actions: • Select ☰ and choose a Data VLAN. • Select + to add a custom Data VLAN. Optionally, select the **Apply VLANs to devices using classification** check box. • Select ✎ to edit a custom Data VLAN.
STORM CONTROL tab	
Broadcast	Select **Broadcast** to include traffic that is forwarded to all destinations simultaneously.
Unknown Unicast	Select **Unknown Unicast** to include traffic whose destination address does not appear in the forwarding database.
Multicast	Select **Multicast** to include traffic whose destination is a multicast address.
Thresholds	The default is **Packet Based**.
Rate Limit Type	The default is **PPS** (packets per second).
Rate Limit Value	Enter (in packets per second) when the switch should discard traffic of the selected types.

Related Topics

Create an Instant Port Device Type Profile on page 196

Configure Individual Ports

Create or modify a Switch Template, then select the **Port Configuration** tab.

> Note
> To modify an existing port, use the drop-down menu to set the **Port Type** to **OFF**. Then select the edit icon. You can edit all port parameters from the **Summary** page.

To configure or modify settings for individual ports, refer to the following procedures:

1. For **Port Details**, see Configure Port Details on page 200.
2. For **Port Settings**, see Configure Port Settings Parameters on page 202.
3. For **STP**, see Configure STP Parameters on page 203.
4. For **Storm Control**, see Configure Storm Control on page 204.
5. For **PSE**, see Configure PSE Parameters on page 202.

Continue configuring the Switch Template.

Configure Port Details

Create or modify a switch template.

Use this task to configure the first portion of the **Configure Ports Individually** section.

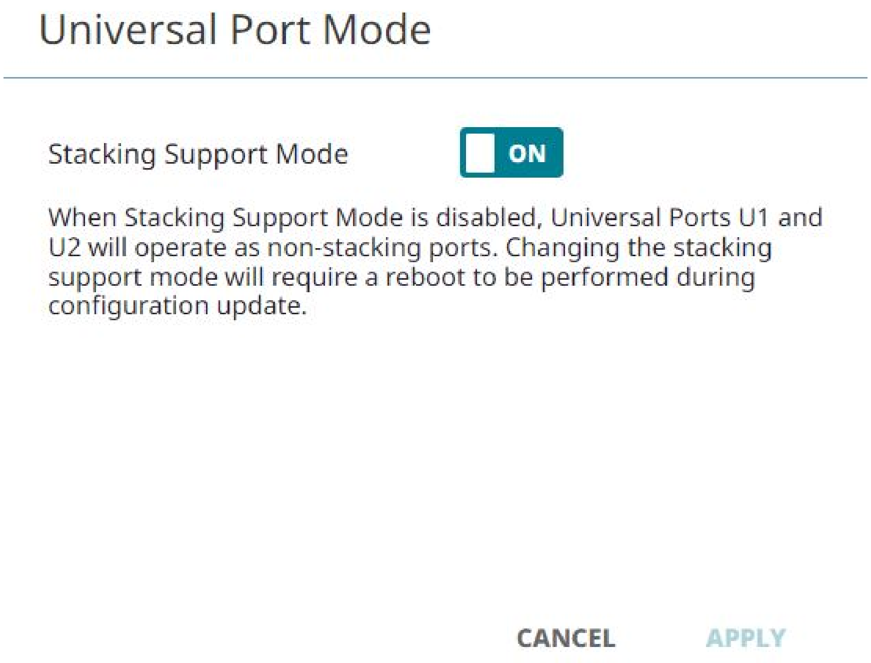
1. Configure the columns as follows:
   - **Interface**: The interfaces available for the switch, such as Eth1/0/1-Eth1/0/52.
   - **Port Type**: The current port usage setting:
     - **Access Port**: Ports connected to individual hosts such as printers, servers, and end-user computers.
     - **Phone with a data port**: Ports connected to IP phones, and optionally, to computers cabled to the phones.
     - **Trunk port**: Ports connected to network forwarding devices, such as switches and APs that support multiple VLANs on trunk ports.

     Use the drop-down to select a different port type or to turn this port off. Select the plus sign to create a new port type. See Create a New Port Type on page 191.
   - **Enabled**: Indicates whether the port is currently activated.
   - **LACP**: Activate to apply link aggregation control protocol to a member of a link aggregation port group . See Aggregate LAG and LACP Ports on page 204.
   - **VLAN**: This column displays the VLAN assigned to the port. Change the VLAN number directly in the VLAN text box.
   - **Description**: A brief description of the port.
2. Continue to the next port configuration section.

Universal Port Stacking Support Mode

Switch Engine 4000 Series hardware allows for the configuration of Universal Port Stacking Support Mode. When Stacking Support Mode is **disabled**, Universal Ports U1 and U2 will operate as non-stacking ports. Once stacking ports are no longer defined as stacking, then all ExtremeCloud IQ supported port configurations apply, including configuration by port type and configurations associated with ports such as Instant Port configurations.

Note
Changing the stacking support mode will require a reboot to be performed during configuration update.



Universal Port Mode

Stacking Support Mode: ON

When Stacking Support Mode is disabled, Universal Ports U1 and U2 will operate as non-stacking ports. Changing the stacking support mode will require a reboot to be performed during configuration update.

Figure 1: Universal Port Stacking Support Mode

To Enable or Disable Universal Port Stacking Support Mode:

1. Go to **Configure** > **Network Policies**, to edit or create a new policy.
2. Select **Switch Template**.
3. From the Details page, select **Switching** > **Port/VLAN Configuration**.
4. Select ✎ beside the Universal Ports.
5. Choose your Stacking Support Mode with the **Toggle**.
6. If the device is a Switch Engine 4120 series, additional channelization options appear. Select the Channelization options for both Universal Ports.

   Note
   The default value selected for the 4120 SKUs is 1x100G.

7. Select **Apply**.

> Note
> Universal Port Stacking Support Mode can also be configured at the device-level, within the **Port / VLAN Configuration** page. Device level configuration overrides the template configuration.

Configure Port Settings Parameters

Create or modify a switch template and select the **Port Configuration** tab.

> Note
> To modify an existing port, use the drop-down menu to set the **Port Type** to **Off**, and select the edit icon. You can then edit all port parameters from the **Summary** window.

This task is part of **Port Configuration**.

1. Enter a maximum transmission unit value for **MTU Settings**, to define the largest packet size that can be transmitted through your system.
2. For **Flow Control**, select how to manage the receive transmission speed, which enables a feedback mechanism between a transmitting port and the receiving port on the switch.
3. For **Transmission Type**, select **Auto**, **Half-Duplex**, or **Full-Duplex**.

   Auto causes the switch to negotiate the best possible duplex mode possible with the connected device. **Full-Duplex** forces the switch to communicate with the connected device using full-duplex communication. **Half-Duplex** forces the switch to use half-duplex communication.
4. Select the **Speed** the switch port uses to communicate with the connected device.
5. Select **LLDP Transmit** to enable the switch to transmit LLDPDU frames.
6. Select **LLDP Receive** to enable the switch to receive LLDPDU frames.
7. Select **Client Reporting** to display learned switch port client MAC addresses on ExtremeCloud IQ monitoring screens.

   When client reporting is disabled, client MAC addresses are not displayed. It is disabled when **CDP Receive** is turned off.

Configure PSE Parameters

Create or modify a switch template.

Use this task to configure PSE settings, which define how ports manage the power that they supply to devices.

1. Select the add icon.
2. Enter a name.
3. For **Power Mode**, select **802.3af** or **802.3at**.

   802.3af (PoE) can deliver 15.4 watts over Cat5 cables. **802.3at (PoE+)** can deliver up to 30 watts over Cat 5 cables with 25.5 watts available to devices.
4. For **Power Limit**, limit the available PoE power to a level lower than the maximum allowed by the power mode.

5. Select a **Priority** from the drop-down list:

   Low: If the total powered device (PD) power consumption exceeds the PSE power budget, power output is modified to bring the total consumption back to within the PSE power budget.

   High: When the total PD power consumption exceeds the PSE power budget, power output is modified only after ports with low priority PSE profiles are regulated.

   Critical: When the total PD power consumption exceeds the PSE power budget, power output is shut down last.
6. Enter an optional description.
7. Select **Save**.

Configure STP Parameters

Create or modify a switch template, then select the **Port Configuration** tab.

> Note
> To modify an existing port, use the drop-down menu to set the **Port Type** to **Off**, and select the edit icon. You can then edit all port parameters from the **Summary** page.

By default, STP is disabled. Use this task to toggle it on and configure settings. Extreme Networks and Dell EMC recommend you enable STP for Dell EMC switches.

1. Toggle **STP On**.
2. Toggle **Edge Port On** so the port connects to a user terminal or server, instead of other switches or shared network segments.

   A port configured as an edge port will not cause a loop upon network topology changes.
3. For **BPDU Protection**, use the drop-down list to change BPDU protection to guard or filter status.
   - **Guard**: Controls whether a port explicitly configured as Edge disables itself upon reception of a BPDU. The port enters the error-disabled state, and is removed from the active topology.
   - **Filter**: Controls whether a port explicitly configured as Edge transmits and receive BPDUs.
   - **Disabled**: Turns off BPDU Protection.
4. When this port is an STP edge port, select a port priority for STP from the drop-down list.

   You can manually designate a port to act as a root bridge by assigning port priorities.

Configure Storm Control

Create or modify a switch template, then select the **Port Configuration** tab.

> Note
> To modify an existing port, use the drop-down menu to set the **Port Type** to **Off**, and select the edit icon. You can then edit all port parameters from the **Summary** page.

Extreme Networks switches can mitigate traffic storms by tracking the source and type of frames to determine whether they are legitimately required. Switches then discard frames that are determined to be the products of a traffic storm. You can apply storm control to broadcast, unknown unicast, and multicast traffic, and configure packet-based or byte-based rate limit thresholds for each interface.

Use the following procedure to configure traffic storm mitigation.

1. Go to **Configure** > **Common Objects** > **Policy** > **Switch Template**.
2. Select an existing switch template and then select ✏, or select + to create a new template.
3. Select the **Port Configuration** tab.
4. While configuring ports in bulk or individually, configure the Storm Control settings as follows:
   - Select **Broadcast** to include traffic that is forwarded to all destinations simultaneously.
   - Select **Unknown Unicast** to include traffic with a destination address does not appear in the forwarding database.
   - Select **Multicast** to include traffic with a multicast address as a destination.
   - Select **TCP-SYN** to include TCP-SYN flood traffic.
5. For **Rate Limit Type**, select **KBps** or **Percentage** if you selected **Byte Based**, and **PPS** if you selected **Packet Based**.
6. Type the **Rate Limit Value** for discarding traffic of the selected types.

Related Topics

Configure Switch Templates on page 187

Aggregate LAG and LACP Ports

Create or modify a Switch Template.

You can group individual ports into aggregate ports on 24- and 48-port switches by selecting two or more ports of the same type on the switch template.

1. Select the ports you want to aggregate on the switch template, and then select **Assign > Advanced Actions > Aggregate**.
2. Enter an optional description.
3. Add or remove ports from the LAG.

4. For **Inherit Port Settings**, select the appropriate settings from the drop-downs.

   > Note
   > You can change the LAG port type after a port has been assigned to a LAG, without having to delete and recreate the LAG.

Continue configuring the Switch Template.

Configure Switch STP Settings

Before you begin this task, create or modify a switch template.

By default, STP is disabled. Use this task to toggle it on and configure the settings. Extreme Networks and Dell EMC recommend you enable STP for Dell EMC switches.

1. Toggle the switch to **On** and then select one of the following modes:

   STP: Uses a single spanning tree without regard to VLANs. After convergence, only the root bridge sends configuration BPDUs, and other switches only relay those BPDUs.

   RSTP: Uses a single spanning tree without regard to VLANs. After convergence, all switches send BPDUs every two seconds in the event of a physical link failure.

   MSTP: Can map a group of VLANs into a single multiple spanning tree instance (MSTI). MSTP uses BPDUs to exchange information between spanning-tree compatible devices, to prevent loops in each MSTI by selecting active and blocked paths.
2. Select an **STP Bridge Priority** from the drop-down list.

   Every switch taking part in spanning tree has a bridge priority. The switch with the lowest priority becomes the root bridge. If there's a tie, the switch with the lowest bridge ID number wins. The ID number is typically derived from a MAC address on the switch.
3. Set the following **STP Timers** parameters:

   Forward Delay: The time the switch spends in the listening and learning state.

   Max Age: The maximum time before a bridge port saves its configuration BPDU information.

Assign an sFlow Receiver to a Switch Template

Before you can assign an sFlow receiver to a switch template, you must first configure an sFlow receiver as a common object. sFlow is not available for all Extreme switch models. See Configure an sFlow Receiver on page 288.

Use the following steps to assign sFlow receivers that you have configured as common objects to switch templates.

1. Go to **Configure** > **Common Objects** > **Policy** > **Switch Template**.
2. Select an existing switch template and then select ✎, or select + to create a new template.
3. Select the **sFlow Receivers** tab.

   The sFlow Receivers feature is available only for supported switches.

4. Type a **Name** for the template.
5. Select +.
6. Select a receiver object from the **Available sFlow Receivers** menu.
7. Enable **sFlow Receiver**.
8. Enable **Interface Packet Sampling**.
9. Move interfaces you want to sample from the **Available** column to the **Selected Interfaces** column using the arrows.
10. Enable **Counter Polling**.
11. Move interfaces you want polled from the **Available** column to the **Selected Interfaces** column.
12. Select **Save**.
13. Select **Save sFlow Receivers**.

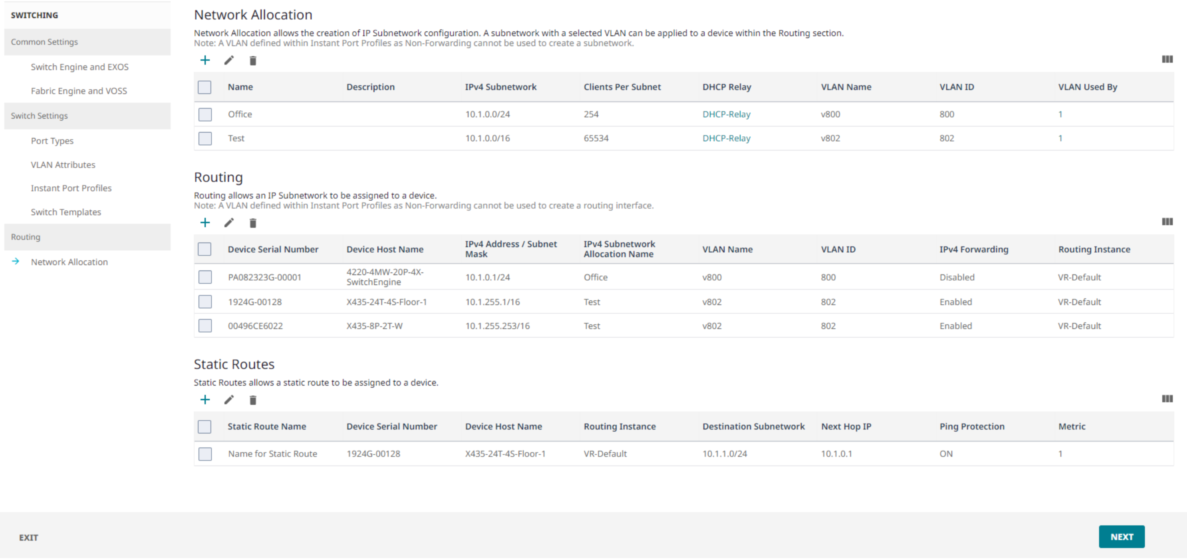
Related Topics

Configure an sFlow Receiver on page 288

Routing

The Routing feature in ExtremeCloud IQ allows for configuration of IPv4 forwarding, DHCP Relay, and Static Routing for Universal Hardware running Switch Engine or x435 devices.

Network Allocation within the Network Policy Switching Section allows for an IPv4 Subnetwork to be defined with a VLAN created from VLAN attributes with a defined local IP Address Subnetwork space, IP address of the IPv4 interface, and DHCP Relay Server configuration.



Network Allocation

Network Allocation allows the creation of IP Subnetwork configuration. A subnetwork with a selected VLAN can be applied to a device within the Routing section.
Note: A VLAN defined within Instant Port Profiles as Non-Forwarding cannot be used to create a subnetwork.

□	Name	Description	IPv4 Subnetwork	Clients Per Subnet	DHCP Relay	VLAN Name	VLAN ID	VLAN Used By
□	Office		10.1.0.0/24	254	DHCP-Relay	v800	800	1
□	Test		10.1.0.0/16	65534	DHCP-Relay	v802	802	1

Routing

Routing allows an IP Subnetwork to be assigned to a device.
Note: A VLAN defined within Instant Port Profiles as Non-Forwarding cannot be used to create a routing interface.

□	Device Serial Number	Device Host Name	IPv4 Address / Subnet Mask	IPv4 Subnetwork Allocation Name	VLAN Name	VLAN ID	IPv4 Forwarding	Routing Instance
□	PA082323G-00001	4220-4MW-20P-4X-SwitchEngine	10.1.0.1/24	Office	v800	800	Disabled	VR-Default
□	1924G-00128	X435-24T-4S-Floor-1	10.1.255.1/16	Test	v802	802	Enabled	VR-Default
□	00496CE6022	X435-8P-2T-W	10.1.255.253/16	Test	v802	802	Enabled	VR-Default

Static Routes

Static Routes allows a static route to be assigned to a device.

□	Static Route Name	Device Serial Number	Device Host Name	Routing Instance	Destination Subnetwork	Next Hop IP	Ping Protection	Metric
□	Name for Static Route	1924G-00128	X435-24T-4S-Floor-1	VR-Default	10.1.1.0/24	10.1.0.1	ON	1

Figure 2: Network Allocation

The IPv4 interface assigned to a device allows the ability to define IPv4 forwarding, VLAN loopback, and DHCP relay assignment.

IPv4 Static routes can also be defined with the destination subnetwork, next hop IP, next hop IP ping protection, and metric.

Network Allocation

Network Allocation allows the creation of IP subnetwork configuration. A subnetwork with a selected VLAN can be applied to a device within the Routing section.

Note
A VLAN defined within Instant Port Profiles as Non-Forwarding cannot be used to create a subnetwork.

On the **Network Allocation** page, you can add, edit, or delete Network Allocation configurations. The table includes the following parameters:

- Name
- Description
- IPv4 Subnetwork
- Clients Per Subnet
- DHCP Relay
- VLAN Name
- VLAN ID
- VLAN Used By

To configure Network Allocation:

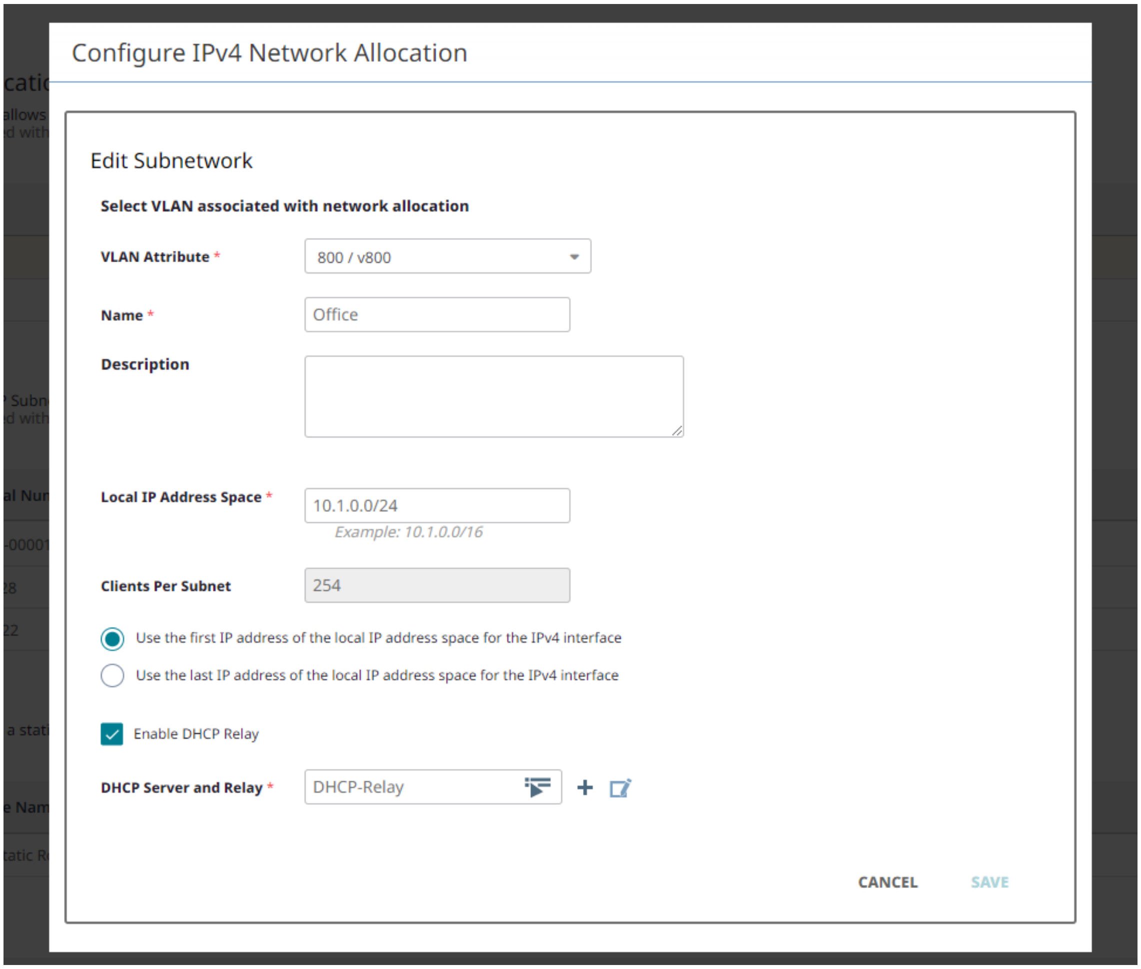
1. Go to **Configure** > **Network Policies**.
2. Create or select a Network Policy.
3. Select **Switching** > **Routing** > **Network Allocation**.
4. Select + to add or ✏ to edit.
5. Enter the IPv4 Network Allocation Attributes according to the table below:

Table 28: Network Allocation Attributes

Field	Description
VLAN Attribute	A VLAN attribute can be created from within the VLAN attribute section within the Network Policy Switching Section.
Name	The name of your subnetwork.
Description	A description of your subnetwork.
Local IP Address Space	Define the local IP address space using CIDR notation, such as `10.1.0.0/16`.
Clients Per Subnet	Shows the clients per subnet.

Table 28: Network Allocation Attributes (continued)

Field	Description
Select One	- Use the first IP address of the local IP address space for the IPv4 interface - Use the last IP address of the local IP address space for the IPv4 interface
Enable DHCP Relay	Enable DHCP Relay. If enabled, select or create a DHCP Relay Common Object.



Configure IPv4 Network Allocation

Edit Subnetwork

Select VLAN associated with network allocation

VLAN Attribute * 800 / v800

Name * Office

Description

Local IP Address Space * 10.1.0.0/24

Example: 10.1.0.0/16

Clients Per Subnet 254

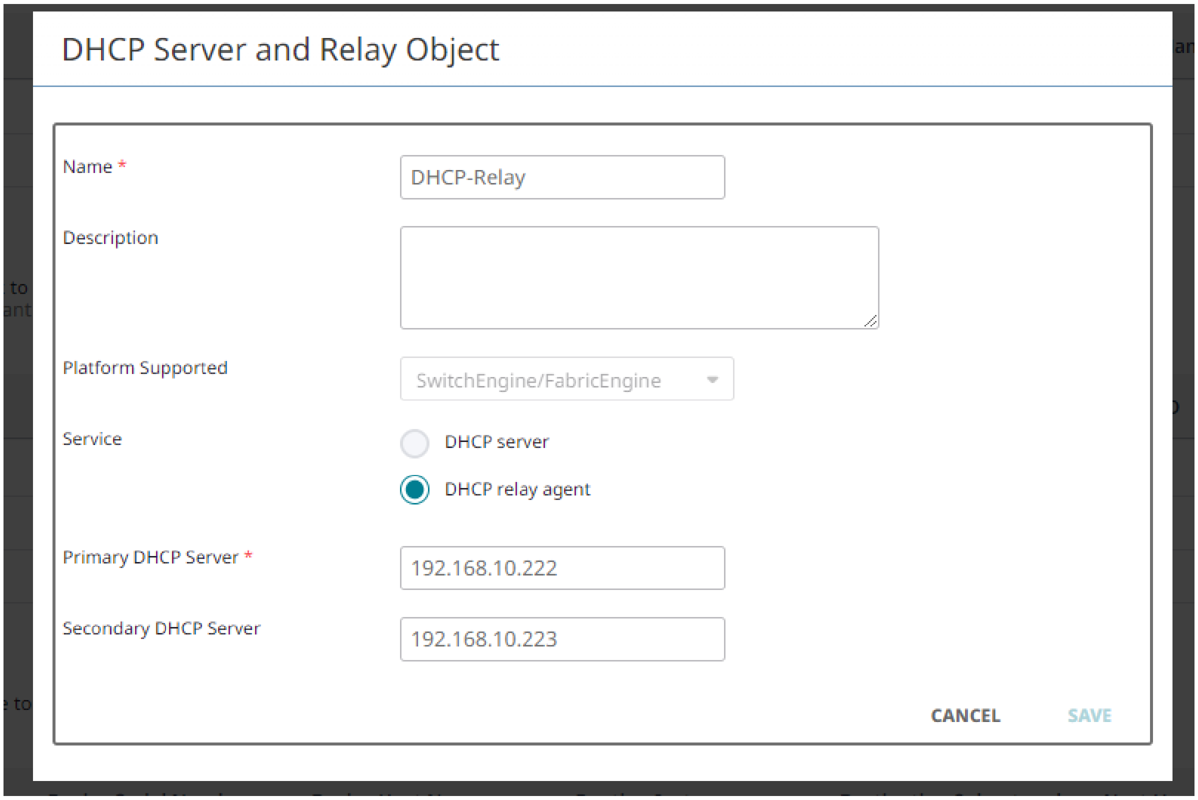
● Use the first IP address of the local IP address space for the IPv4 interface

○ Use the last IP address of the local IP address space for the IPv4 interface

☑ Enable DHCP Relay

DHCP Server and Relay * DHCP-Relay

Figure 3: Network Allocation



DHCP Server and Relay Object

Name * DHCP-Relay

Description

Platform Supported SwitchEngine/FabricEngine

Service ○ DHCP server ● DHCP relay agent

Primary DHCP Server * 192.168.10.222

Secondary DHCP Server 192.168.10.223

Figure 4: DHCP Server and Relay Object

Network Allocation - Routing

Routing allows an IP subnetwork to be assigned to a device.

Note
A VLAN defined within Instant Port Profiles as Non-Forwarding cannot be used to create a routing interface.

To configure routing:

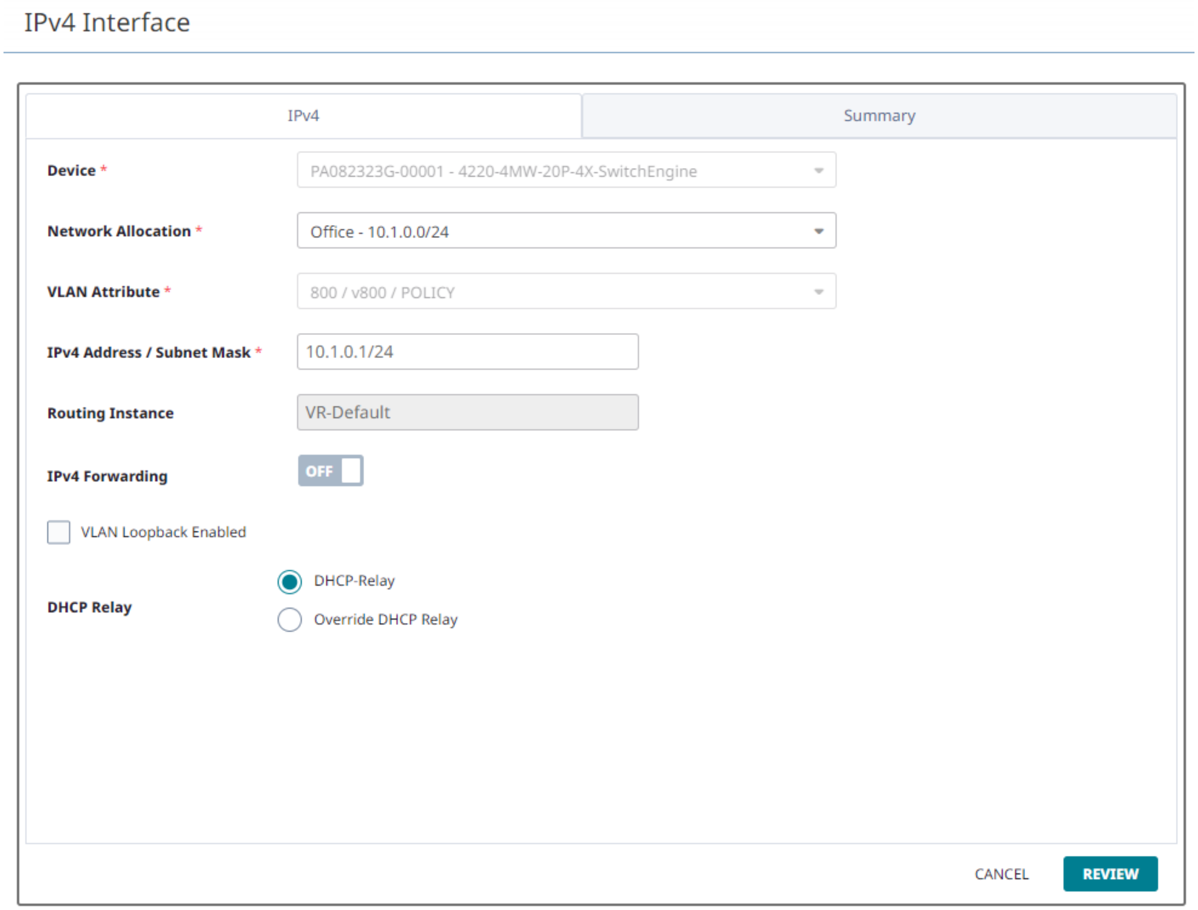
1. Go to **Configure** > **Network Policies**.
2. Create or select a Network Policy.
3. Select **Switching** > **Routing** > **Network Allocation** and scroll to the Routing table.
4. Select + to add or ✎ to edit.
5. Enter the Routing Attributes according to the table below:

Table 29: Routing Attributes

Field	Description
Device	Select a Device from the **drop-down menu**.
Network Allocation	Select a Network Allocation from the **drop-down menu**.

Table 29: Routing Attributes (continued)

Field	Description
VLAN Attribute	Select a VLAN Attribute from the **drop-down menu**.
IPv4 Address / Subnet Mask	Shows the assigned IP Address, such as `10.1.0.0/16`.
Routing Instance	Shows the Routing Instance.
VLAN Loopback	**Enable** or **Disable** VLAN Loopback.
DHCP Relay	Leave selection of DHCP-Relay or choose to override the DHCP relay.



IPv4 Interface

IPv4 | Summary

Device * PA082323G-00001 - 4220-4MW-20P-4X-SwitchEngine

Network Allocation * Office - 10.1.0.0/24

VLAN Attribute * 800 / v800 / POLICY

IPv4 Address / Subnet Mask * 10.1.0.1/24

Routing Instance VR-Default

IPv4 Forwarding OFF

□ VLAN Loopback Enabled

DHCP Relay ● DHCP-Relay ○ Override DHCP Relay

Figure 5: IPv4 Interface

The Summary tab shows a summary of the routing details.

> **Note**
> IPv4 Interface Routing configuration can also be performed at the device-level, within the **Manage Devices** > **Select Supported Device** > **Configure** > **Network Allocation** > **Interface Configuration** page. If an IPv4 Interface is created from device level configuration, then a Network Allocation created from a Network Policy is not applicable. IPv4 Interfaces for devices are still viewable within the **Switching** > **Routing** > **Network Allocation** section.

Static Routes

Static Routes allows a static route to be assigned to a device.

Static route configuration in a Network Policy allows you to create one static route entry and assign that static route entry to multiple devices. The device is required to have the corresponding directly connected interface present in the routing section.

If adding a static route configuration at device-level, then the device is still required to have a corresponding directly connected interface present in the device-level routing section.

To configure Static Routes:

1. Go to **Configure** > **Network Policies**.
2. Create or select a Network Policy.
3. Select **Switching** > **Routing** > **Network Allocation** and scroll to the Static Routes table.
4. Select + to add or ✎ to edit.
5. Enter the Static Route Attributes according to the table below:

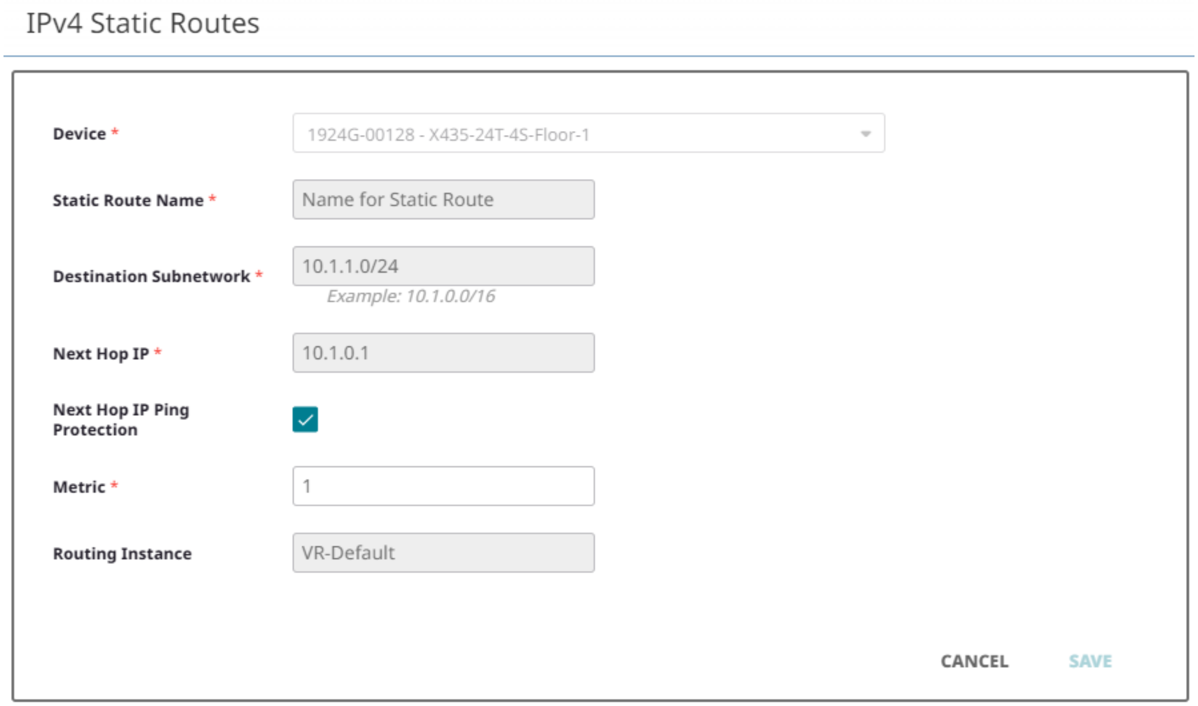
Table 30: Static Route Attributes

Field	Description
Device	Select a Device from the **drop-down menu**.
Static Route Name	Enter the name of the Static Route.
Destination Subnet	Enter the desired subnet, such as `10.1.0.0/16`.
Next Hop IP	Enter the desired IP Address for the next Hop, such as `123.321.132.312`.
Next Hop IP Ping Protection	**Enable** or **Disable** Next Hop IP Ping Protection. Note: Enabling Ping Protection will generate a Ping Protection Status tool tip when viewing your device within **Manage** > **Devices** > **Monitoring** > **Routing**.

Table 30: Static Route Attributes (continued)

Field	Description
Metric	Enter your desired metric value.
Routing Instance	Shows the Routing Instance.

> Note
> IPv4 Static Routes can also be added within **Manage Devices** > **Select Supported Device** > **Configure** > **Network Allocation** > **Routing Configuration**.



IPv4 Static Routes

Device *	1924G-00128 - X435-24T-4S-Floor-1
Static Route Name *	Name for Static Route
Destination Subnetwork *	10.1.1.0/24 Example: 10.1.0.0/16
Next Hop IP *	10.1.0.1
Next Hop IP Ping Protection	☑
Metric *	1
Routing Instance	VR-Default

Figure 6: IPv4 Static Routes

About Switch Stacks

ExtremeCloud IQ can manage switch stacks. You can instantly create a Switch Engine switch stack or create a switch stack manually.

- To instantly create Switch Engine switch stacks, see Instantly Create a Switch Engine Stack on page 212.
- To manually create a switch stack, see Manually Create a Switch Stack on page 213.

Instantly Create a Switch Engine Stack

To instantly create a stack, onboard the switches into ExtremeCloud IQ via the ExtremeCloud IQ MobileApp. Unbox the switches, connect the stacking/power/uplink cables, and push the **Mode** button until the **STK LED** lights up. Depress the **Mode** button for at least 5 seconds. All of the front panel ports LED will flash. The stack forms automatically, all the slots reboot, and ExtremeCloud IQ detects the newly formed stack.

Use this task to instantly configure a Switch Engine switch stack in ExtremeCloud IQ.

1. Navigate to **Manage** > **Devices**
2. Find the new stack in the **Devices List** and select its checkbox.
3. In the **Template** column, select **Assign/Create Template**.
4. Select the **Create template based on currently selected device.**
5. Select an existing stack template from the dropdown.
6. Select **Assign**.

The assigned template now displays in the **Policy** column.

Manually Create a Switch Stack

The following prerequisites for creating a switch stack template must be met:

- You must have an ExtremeCloud IQ license key for every switch in the physical stack. As a best practice, onboard keys for the primary, then the standby, and then the remaining stack members.
- Onboard each switch. Ensure that you have followed the procedures in Configure Switch Templates on page 187 before you complete the cable connections and power on the switches to form the physical stack.
- Ensure the switches are cabled and powered on in the required stack configuration order (primary, standby, and members).

After you have onboarded the switches in your stack, you must create a stack template in ExtremeCloud IQ that exactly matches the physical stack.

1. Select the add icon.
2. Select the switch models for the switch stack from the drop-down list,.
3. Enter a name for your template and select the first switch model to add from the drop-down list.
4. Select **Add** to add each switch to the stack.
5. Continue to add switches to the template until you have added all of the switches in your physical stack.

   Make sure the template switch numbers match the numbers of the physical switches.
6. Select **Save**.

Push a network policy to the stack. For more information, see Manage Switch Stacks on page 213.

Manage Switch Stacks

Create a switch stack template. See About Switch Stacks on page 212.

After you create a template for a stack, you can edit each stack member switch template to reconfigure the ports. If you change your physical stack, add or remove switches, you must create a new stack template to match the new physical stack.

When you create a new stack template, you must also perform a configuration update. If the template does not match the physical stack exactly, the configuration update will fail. The following are examples of common changes that can occur to a stack, with the actions you need to take for each example.

1. When the primary and standby switches reverse roles:

   If the primary and standby switches change their roles (for example, as the result of a CLI command), after a delay of approximately 3 minutes, the Devices List updates to show the new primary and standby switches. To display the Devices List, navigate to **Manage > Devices**. See Devices on page 322 for more information.
2. If you remove the primary switch from a stack, the stack retains the MAC address of the removed primary, resulting in duplicate MAC addresses for the stack and the standalone former primary switch.

   If you need to remove the primary switch from a stack, you must perform the following steps to prevent duplicate MAC addresses:

   a. Delete the entire stack from ExtremeCloud IQ.
   b. Perform the following CLI command:

      `no member {n}` where *n* is the unit number of the primary switch.
   c. Enter the serial numbers of the stack members and the standalone switch in ExtremeCloud IQ.
   d. Recreate the stack template to reflect the change.
3. Add a new switch to an existing stack:

   To add a new switch to an existing stack, click **Add** underneath the template name, and add another device to the stack.
4. Add an existing switch to a stack:

   You must cable the switch to the physical stack, then use the previous step to add an existing switch to a stack.
5. Remove a switch from one stack and add it to another stack:

   To move a switch from one stack to another stack, you must disconnect the switch from the original stack, then re-cable it in the new stack. Create two new stack templates, one to match the diminished stack configuration, and one to match the new stack configuration.
6. When a stack member goes offline:

   If a stack member is offline (is powered down but remains a member of the stack), ExtremeCloud IQ updates the Devices List to show that member as **Disconnected**. When the offline stack member comes back online, the Devices List is updated to show it as **Connected**. To display the Devices List, navigate to **Manage > Devices**.
7. Manage a switch that has been uncabled from a stack:

   If a stack member is uncabled, ExtremeCloud IQ updates the Devices List to show that member as **Disconnected**. This action alerts you that there might be a problem with this switch. If this switch has been accidentally or inadvertently uncabled, you can then re-cable it. ExtremeCloud IQ updates the Devices List to show the switch is working correctly.

8. Remove a switch from a stack in ExtremeCloud IQ:
    a. To remove stack members from the ExtremeCloud IQ database (but not from the actual physical stack), select **Remove Stack Members** from the **Actions** drop-down list in the Devices List window.
    b. Select the check box for the stack member or members that you want to remove and then select **Remove**.

        See Devices on page 322 for more information.

        Note
        If you accidentally remove a primary stack member, you have only removed it from ExtremeCloud IQ. It remains as the operational physical primary of the stack, and you can onboard it again.

9. Split stacks:

    When you reconfigure a physical stack so that some of the switches become independent stacks, you create a split stack. If no CLI commands are issued to explain the change, the stack still reports having the original number of switches, with the removed switches showing as not connected. For example, Stack A has Switches 1, 2, 3, 4, 5, and 6. Then someone creates a split stack by cabling Switches 5 and 6 into their stack, Stack B. At this point, both Stack A and Stack B think that all six switches belong to them. A show switch command on Switch 1 shows six members (two with a management status of **Disconnected**). A show switch command on Switch 5 shows six members (four with a management status of **Disconnected**).

    If the primary of the new smaller 2-member stack tries to communicate with ExtremeCloud IQ as an independent stack, ExtremeCloud IQ ignores this communication because it still recognizes the service tag for this switch as belonging to the original stack. Any communication from this switch is ignored because this new primary switch has a different MAC Address. If the 3rd and 4th stack members rejoin the original stack, they again display as valid and healthy stack members in the Devices List. .

    a. If you want the stacks to remain split, in the Devices List, select **Remove Stack Members** from the **Actions** drop-down list.
    b. Select the check boxes for the stack members to remove from the stack, and select **Remove**.

        The switches you removed display in the Devices List as a separate stack. See Devices on page 322 for more information.

If necessary, create a new switch stack template to reflect any of the above changes.

Configure Switch Device Template Advanced Settings

Create or edit a switch template.

ExtremeCloud IQ can update device firmware and reboot the device during onboarding.

1. Select the **Advanced Settings** tab.

2. For **Upgrade device firmware upon device authentication**, select **On** to upgrade the device firmware upon onboarding.

   If you have activated device firmware upgrading, select one of two options:

   - Update firmware to the latest version.
   - Upgrade to a specific device firmware version.
3. To reboot and roll back a device to a previous configuration if there are issues with the template configuration, select **On** for **Upload Configuration Automatically**, followed by the checkbox below.
4. To use **Supplemental CLI**, select **On**.

   For more information, see Configure Supplemental CLI on page 233.

Complete configuring the device template.

Configure URL Filtering Rules

First create the user profiles to be associated with your URL filtering rules.

Extreme Networks routers support HTTP URL filtering rules, which define URL filtering by allowed list, blocked list, and category. Use this task to create a new URL rule, add filters to that rule, and then associate the rule with a user profile.

1. Go to **Configure** > **Common Objects** > **URL Filtering**.
2. Select the add icon.
3. Enter a name for the rule.
4. Enter an optional description.
5. Select an existing URL filter from the table.

   To create a new URL filter, select the add icon above the table.

   > Note
   >
   > Allowed lists and blocked lists can be applied to both HTTP and HTTPS, but there are some differences. For HTTPS, you can only get the domain name (for example, `www.google.com`), so if you configure the URL as `www.google.com/xxxx`, HTTPS cannot match it, but if you configure the URL as `www.google.com` or `*.google.com`, then HTTPS can match it. This does not apply to HTTP.

6. Select the **Whitelist** subtab.

   a. Manually enter up to 32 allowed URLs.

   b. You can also import a `.cvs` file containing up to 32 URLs by dragging the file into the field or searching for an existing `.cvs` file.

   The file format must be as follows:

```
cloud-whitelist1.aerohive.com
cloud-w2.aerohive.com
cloud-w3.aerohive.com
cloud-w4.aerohive.com
cloud-w5.aerohive.com
cloud-w6.aerohive.com

cloud-blacklist1.aerohive.com
```

```
cloud-b2.aerohive.com
cloud-b4.aerohive.com
cloud-b6.aerohive.com
```

7. Select the **Blacklist** subtab.
    a. Manually enter up to 32 allowed URLs.

       You can also import a .cvs file containing up to 32 URLs by dragging the file into the field or searching for an existing .cvs file.
8. Select the **Categories** subtab.
9. Choose the categories this rule blocks.
10. Schedule when this filter is actively applied to the rule.
    a. Select an existing **Schedule**.
    b. Select **Add** to create a new **Schedule**.
        - Enter a name and an optional description.
        - Select one time or recurring.
        - For one time, enter a start and end date and time.
        - For recurring, choose to have this report generated daily, or customize using the day and time range option. You can also add multiple time ranges to this schedule. To limit the recurrence of this schedule, select the calendar icons to insert dates into the **Start** and **End** fields.
    c. Select **Save Schedule**.
11. Select **Save Detail**.
12. Continue adding filters if needed.
13. Select **Save URL Rule**.
14. Select user profiles to associate with this rule or create new profiles.

    To create a new user profile, see Add a User Profile on page 217.

Add this **URL Filtering Rule** to a network policy **Router Settings**.

Add a User Profile

Use this task to create user profiles that define user traffic settings on APs. After a user associates with a device, the device assigns the user to a user profile. The device can make this assignment dynamically from attributes returned by a RADIUS authentication server or statically by using the default user profile set.

1. Go to **Configure** > **Common Objects** > **Policy** > **User Profiles**
2. Select +.
3. Type a **Name** for the profile.
4. Select **VLAN** or **VLAN Group** for the profile.
5. Select a VLAN or VLAN group from the menu, or select +.

   See Configure VLAN Settings on page 109 for more information.
6. On the **Security** tab, apply IP or MAC firewall rules.

   For more information, see Configure User Profile Security on page 218.

7. On the **Traffic Tunneling** tab, enable generic routing encapsulation (GRE) traffic tunneling for a user profile.

   For more information, see Configure User Profile Traffic Tunneling on page 220.
8. On the **QoS** tab, set rate limits and traffic forwarding rules for each traffic class.

   For more information, see Configure User Profile QoS on page 221.
9. On the **Availability Schedule** tab, define user profile availability for specific dates, days, and times.

   For more information, see Configure an Availability Schedule on page 187.
10. On the **Client SLA** tab, enable devices to monitor client throughput and take action if the actual throughput is below the targeted minimum level.

    For more information, see Configure User Profile Client SLA on page 219.
11. On the **Date/Time Limit** tab, configure access restrictions for users based on the user's assigned profile.

    For more information, see Configure User Profile Access Restrictions on page 220.
12. Select **Save User Profile**.

Related Topics

Configure VLAN Settings on page 109

Configure User Profile Security on page 218

Configure User Profile Traffic Tunneling on page 220

Configure User Profile QoS on page 221

Configure an Availability Schedule on page 187

Configure User Profile Client SLA on page 219

Configure User Profile Access Restrictions on page 220

Configure User Profile Security

Use this task to apply IP or MAC firewall rules to a user policy.

1. Go to **Configure** > **Common Objects** > **Policy** > **User Profiles** and either create a new user profile, or select an existing profile to edit.
2. On the **Security** tab, turn on **Firewall Rules**.
3. To redirect a user device to an external web site, select **IP Firewall** and complete the following steps:

   a. Select +.

   b. Enter a name for the firewall rule.

   c. Select whether this firewall rule is for **Inbound Traffic** or **Outbound Traffic**.

   d. Select whether this firewall rule is used to **Permit** or **Deny** traffic.

      Permit enables traffic to traverse the firewall. **Deny** prevents the device from allowing traffic inside the firewall.

   e. Select an existing IP firewall rule or select the add icon to create a new rule.

      See Add IP Firewall Policies on page 234.

4. To determine how the device manages traffic based on source and destination IP addresses, select **MAC Firewall** and complete the following steps:
    a. Enter a name for the firewall rule.
    b. Select whether this firewall rule is for **Inbound Traffic** or **Outbound Traffic**
    c. Select whether this firewall rule is used to **Permit** or **Deny** traffic.
    d. Select an existing MAC Firewall Rule or select the plus sign to create a new rule.

       See Add MAC Firewall Policies on page 235.

Related Topics

Add IP Firewall Policies on page 234
Add MAC Firewall Policies on page 235
Add a User Profile on page 217

Configure User Profile Client SLA

Service-level agreements (SLAs) are contracts that specify the performance parameters within which a network service is provided.

Extreme Networks devices monitor client throughput and take action if the actual throughput is below the defined target minimum level. Use this task to enable client SLA settings for the user profile.

1. Go to **Configure** > **Common Objects** > **Policy** > **User Profiles** and either create a new user profile, or select an existing profile to edit.
2. On the **Client SLA** tab, turn on **Client SLA**.
3. Use the **Targeted minimum throughput** slider bar to adjust the minimum throughput level.
4. Select **Log** to generate a log entry about the performance sentinel violation.
5. Select **Boost Airtime** to increase the airtime available to clients so they can reach their targeted minimum throughput level.
6. Select both **Log** and **Boost Airtime** to combine the previous two actions.

> Note
> Using just the Log option to see if wireless clients throughout the corporate network are SLA-compliant is useful even without the Boost Airtime option. When clients are not getting the expected level of throughput, you can see the results in graphs in the ExtremeCloud IQ SLA reports. For Extreme Networks devices with non-compliant clients, you can drill down in the graph to see an SLA report for each client and determine why it is not meeting the SLA. If you conclude that the Extreme Networks devices are being oversubscribed, you can add more devices in that area to improve client throughput.

Related Topics

Add a User Profile on page 217

Configure User Profile Access Restrictions

Use this task to configure access restrictions (date and time limits) for users based on their assigned user profiles. This is particularly helpful when you manage non-employee guest users, such as visitors, VIPs, and contractors.

1. Go to **Configure** > **Common Objects** > **Policy** > **User Profiles** and either create a new user profile, or select an existing profile to edit.
2. On the **Data/Time Limit** tab, turn on **Access Restrictions**.
3. Select **Time Limit**.
   a. Select the limit in minutes, hours, days, or weeks (the number of minutes in a number of hours, or hours in days, or days in weeks).
   b. Select how to define an hour (either a fixed or rolling time window).
4. Select **Data Usage Limit**.
   a. Configure a data usage limit (in MB or GB).
   b. Limit the duration to days, weeks, or months.
   c. Select how a day is measured (either a fixed or rolling time window).
5. Select **Save**.

Related Topics

Add a User Profile on page 217

Configure User Profile Traffic Tunneling

You can enable the following types of GRE traffic tunneling for new and existing user profiles:

Layer 3 Roaming

Adjusts roaming thresholds so that a device disassociates with a wireless client that has roamed to it from another subnet and has either been idle for a period of time, or for which traffic is below a specified threshold.

Identity-Based Traffic Tunneling

Tunnels guest traffic directly to the network.

Standard GRE Tunneling

Tunnels traffic to non-Extreme Networks tunnel endpoints.

Tunnel Concentrator

Tunnels traffic to Extreme Networks Tunnel Concentrator.

1. Go to **Configure** > **Common Objects** > **Policy** > **User Profiles** and either create a new user profile, or select an existing profile to edit.

   Select an existing profile from the **Re-use Tunnel Policy** menu.
2. On the **Traffic Tunneling** tab, turn on **Traffic Tunneling (GRE)**, and then select the type of traffic tunneling.
3. For **Layer 3 Roaming**:
   a. Specify a time period between 10 and 600 seconds.
   b. Specify a threshold number between 0 and 2147483647 packets per minute.

4. For **Identity-Based Traffic Tunneling**:
    a. For the **Tunnel Source**, select a subnet from the drop-down list, or add a new subnet.

       To add a new IP address or host name, see Add IP Objects and Host Names on page 229.
    b. For **Tunnel Destination**, choose an IP address or host name from the drop-down list or add a new address or host name.

       To add a new IP Address or Host Name, see Add IP Objects and Host Names on page 229.
    c. For **Tunnel Authentication**, type the password the AP uses to authenticate to the GRE termination point.
5. For **Standard GRE Tunneling**:
    a. For **Tunnel Destination**, choose an IP address or host name from the drop-down list or add a new address or host name.

       To add a new IP address or host name, see Add IP Objects and Host Names on page 229.
    b. If you select **Tunnel Mode dot1q**, type, select, edit, or add the 802.1Q native VLAN ID.

       To add a VLAN ID, see Configure VLAN Settings on page 109.
    c. If you select **Tunnel Mode Access Mode**, type, select, edit, or add the VLAN ID.

       To add a VLAN ID, see Configure VLAN Settings on page 109.
6. For **Tunnel Concentrator**, select the **Tunnel Destination** from the drop-down list.

   You can add a new Tunnel Concentrator service by selecting +, or select ✎ to modify an existing instance. For more information, see Configure Tunnel Concentrator Services on page 284.
7. Select **Save**.

Related Topics

Add IP Objects and Host Names on page 229

Configure VLAN Settings on page 109

Configure Tunnel Concentrator Services on page 284

Add a User Profile on page 217

Configure User Profile QoS

Extreme Networks devices can apply QoS to traffic originating from members of user profiles to prioritize traffic by category, set rate limits and traffic forwarding rules for each traffic class, and set the maximum traffic forwarding rate and scheduling weight at two levels: for individual users in a user profile and for all users to whom the user profile applies. Through the rate control and queuing profile, you define QoS policing rates and scheduling weights at the individual user level. In the **QoS** section in a user profile configuration, you define the rates and weights at the user profile level. Through the combined configuration of forwarding mechanisms and rate limits, you control how a device schedules traffic forwarding.

1. Go to **Configure** > **Common Objects** > **Policy** > **User Profiles** and either create a new user profile, or select an existing profile to edit.

2. On the **QoS** tab, turn **Quality of Service (QoS)** on.
3. Configure the **Rate Limit per User Profile per AP** to set the aggregate rate limit for all the users in the user profile.
4. Select **Manage Rate Limit per Client**.
   a. Set the **Rate Limit Per Client** from 0 to 2000 Mbps (0-2000000 Kbps).
   b. Set a weight percentage for each of the seven traffic classes in **Traffic Queue Management Per User per AP**, and set other details as required.
   c. Select **Save**.
5. Enter the **Scheduling Weight**.

   Note
   Devices forward traffic of a higher class and greater weight faster than traffic of a lower class and lesser weight.

6. For **Mark outgoing traffic using**, Extreme Networks devices can apply priority and class mappings to outgoing traffic based on either of these standard QoS classification systems.
7. To add a marker map, see Configure Marker Maps on page 249.
8. Select **Save User Profile**.

Related Topics

Configure Marker Maps on page 249
Add a User Profile on page 217

Basic Configuration

The topics in this section provide details about basic configuration objects, such as Application Sets, Client Mode Profiles, DHCP and DNS, IP, MAC, and OS Objects, Notification Templates, and VLANs.

Related Topics

Add Application Sets on page 222
Client Mode Profiles on page 223
Configure DHCP Servers and DHCP Relay Agents on page 226
Add a DNS Service on page 228
Add IP Objects and Host Names on page 229
Add a MAC Object and Host Name on page 230
Add a Notification Template on page 230
Configure OS Objects on page 231
Configure VLAN Settings on page 109
Add a VLAN Group on page 111
Configure Supplemental CLI on page 233

Add Application Sets

Along with predefined sets of Layer 7 applications, ExtremeCloud IQ allows administrators to define sets of custom applications. An admin can choose to identify multiple sets of applications and feed them through an SD-WAN route group to support application-based routing policies. Use this task to create one or more custom application sets. Application sets are available as common objects for all SD-WAN routing policies.

1. Go to **Configure** > **Common Objects** > **Application Sets**.
2. Select **Add**.
3. Enter a **Name** for the new application.
4. Select **Application** or **Category**.
5. Enter a character string to search for the application or category name you want to add.

   Search results appear in the **Application Name and Category table**.
6. In the **Application Name and Category table**, select applications for your application set.

   ExtremeCloud IQ are automatically added to the **Selected Applications** box.
7. Select **Save**.

Related Topics

Applications on page 402

Applications List on page 403

Add a Custom Application on page 404

Client Mode Profiles

You can set a radio on some APs to client mode, which allows the AP to connect to existing Open and PSK wireless networks— including third-party networks—as a generic BYOD client.

The best-practice recommendation is to use a wired interface to configure client mode APs, because the configuration process is much faster than it is with a wireless backhaul.

Related Topics

Manage Client Mode Profiles on page 223

Configure a Client Mode Profile on page 224

Configure a Client Mode AP Profile using a Wired Connection and a Device Template on page 225

Manage Client Mode Profiles

Go to **Configure** > **Common Objects** > **Basic** > **Client Mode Profiles**.

The **Client Mode Profiles** window includes:

- A list of Client Mode Profiles.
- Tools that allow users to manage Client Mode Profiles.

By default, the **Client Mode Profiles** window dispalys all configured profiles in tabular form. Table 31 describes the type of information displayed under each column and any actions that a user can employ.

Table 31: Client Mode Profile List Column Headings

Column Heading	Description
Name	Displays the **Name** assigned to the Client Mode Profile.
Description	Displays the **Description** assigned to the Client Mode Profile.
Local Web	Indicates the status of **Enable Local Web Page** option. Possible values are On or Off.
DHCP Server Scope	Displays the reserved IP address or the first in a range of IP addresses used for DHCP client connections.
Used By	Identifies the number of Device Templates currently using a Client Mode Profile. Hover over the number to view the list of Device Templates.

Choose from the following actions:

- To add a new Client Mode Profile, select +.
- To edit a Client Mode Profile, select the profile in the list, then select ✎.
- To clone a Client Mode Profile, select the profile in the list, then select ⧉. In the Clone pop-up window, enter a new profile name in the **Save As** field, then select **Clone**.
- To delete a Client Mode Profile, select the profile in the list, then select 🗑.

Configure a Client Mode Profile

Go to either of the following user interfaces:

- **Configure** > **Common Objects** > **Policy** > **AP Template** > **Device Configuration** > **Wireless Interfaces** > **Client Mode** > **Client Mode Profile**
- **Configure** > **Common Objects** > **Basic** > **Client Mode Profiles**

Use this procedure to configure a Client Mode Profile.

1. Enter a **Client Mode Profile Name**.
2. Enter a **Description** (optional).
3. The **Enable Local Web Page** option is enabled by default.

   The client mode AP activates a local SSID portal web page, which includes choices to select and connect the client mode AP WAN-side radio to a WAN Wi-Fi network. Clear this check box to configure other options for this profile.

4. Choose one of the following DHCP server options:
   - In the **DHCP Server Scope** field, enter the first IP address of the DHCP server range. The first IP address in this range is the IP address used to display the client mode SSID portal web page. Make a note of this first IP address for later reference.
   - In the **DHCP Server Scope** field, enter a single IP address to reserve a specific client (MAC address) to an IP. A DHCP reservation is a permanent IP address assignment. It is a specific IP address within a DHCP scope that is permanently reserved for a specific DHCP client. DHCP reservations on the AP support security on the local side of the Network Address Translation (NAT) and ensure that the client IP address does not change.
   - Set the **Advanced DHCP Server** slider button to **On**, then choose a pre-configured **DHCP Server and Relay** agent from the dropdown list.
5. Set the **Enable Port Forwarding** slider button to **On**, then configure **Port Forwarding Rules** as follows:
   a. Select the plus sign to add a new port forwarding rule.
   b. Enter a description of how this rule is to be used (optional).
   c. Select a number for the outside port in the range of 1025-65535 (reserved ports cannot be used).
   d. Select a number for the local port in the range of 1-65535.
   e. Select **TCP**, **UDP**, or **Both** from the **Protocol** drop-down list.
   f. Select a **Host IP Address** for the internal device from the drop-down list, or select the plus sign to add a new address.
   g. Select **Add**.
6. When configuration of the Client Mode Profile settings is complete, select **Save**.

Related Topics

Configure DHCP Servers and DHCP Relay Agents on page 226

Configure Wireless Interfaces for an AP Template on page 146

Configure a Client Mode AP Profile using a Wired Connection and a Device Template on page 225

Configure a Client Mode AP Profile using a Wired Connection and a Device Template

There must be at least one client mode profile configured before you can define a LAN-side AP radio for client mode. See Configure a Client Mode Profile on page 224.

You can set a radio on some AP models to client mode, which allows the AP to connect to existing open and PSK wireless networks, including third-party networks as a generic BYOD client. The method described here is recommended because it is often the fastest way to perform this task.

1. In a network policy, configure a wireless network (SSID).
2. Add an Open, or PSK SSID without a captive web portal.
3. Configure a client mode AP device template.
4. Select **Add** and an AP model to use as the client mode AP.
5. In the template panel, name the template.

6. Configure the WAN-side backhaul (WiFi0 or WiFi1) radio for **Backhaul Mesh Link**.
7. Select **Client Mode Profile** for the LAN-side client mode radio (WiFi0 or WiFi1).
8. Select the LAN-side client mode radio icon for WiFi0 or WiFi1.
9. From the drop-down list, select an existing client mode profile.
10. Select **Save**.

Configure DHCP Servers and DHCP Relay Agents

For small networks, you can configure and enable a DHCP server on a device to provide network settings dynamically to clients. After you configure one hive member as a DHCP server, the other hive members process the `DHCPDISCOVERY` and `DHCPREQUEST` messages that they receive from clients as usual, forwarding them to their neighbors through which they connect to the network. The only requirement about which device to use as the DHCP server is that it must be a portal.

When all hive members are in the same subnet and all devices in that subnet are on a single VLAN, you only need to configure the device that you want to be the DHCP server with a pool of IP addresses from which it can draw when responding to DHCP client requests.

When some hive members are in a different subnet from that of the DHCP server, you must also configure those devices to forward DHCP traffic to the IP address of the DHCP server. In this case, the other devices act as DHCP relay agents. You can configure both DHCP servers and relay agents here.

The DHCP Server and Relay Objects table displays the following information:

- **Name**: The name of the object.
- **Interface**: The management interface. For example, mgt0.
- **IP Address/Netmask**: The IP address and netmask that defines the subnet.
- **Used By**: The number of network policies to which this DHCP server and relay object is applied. Hover over the number in this column to see a list.

Use the following procedure to add a new DHCP Server and Relay object.

1. Select the plus sign.
2. Enter a name for this object.
3. Enter a description for this object.

   Although optional, descriptions can be helpful when you are troubleshooting your network.
4. Select the management interface on which the DHCP Server or Relay agent is set.
5. Select the type of service.

6. If you select **DHCP Server**, configure the following steps:
   1. **Set the DHCP server as authoritative** (enabled by default): Select the check box to set the DHCP server as authoritative.

      If this DHCP server is the only one on your network, it knows what the valid IP numbers on the network are. If a client tries to register with an invalid IP address (for example, if a client device sill has an active lease with another network), an authoritative DHCP server denies access to that client.
   2. **Use ARP to check for IP address conflicts** (enabled by default): By default, this DHCP server uses ARP to check for IP address conflicts on the network before assigning an IP address to a DHCP client.

      Clear the check box to disable this feature.
   3. **Enable NAT support**: Select this check box to automatically generate ARP responses for the default gateway specified in the DHCP server options.
   4. **Configure the IP Pool**: Define the IP address pool from which the DHCP server draws IPv4 or IPv6 addresses when making assignments.

      To add a new IP pool, select the plus sign, enter the start and end IP addresses, and then select **Add**.
   5. **Configure DHCP Server Options**: Define custom DHCP options to provide additional network settings to connected clients.

      You can use IPv4 or IPv6 addresses. Configure the following settings:

      - **Default Gateway**: Enter the IP address of the default gateway or the subnet to which the addresses in the IP pool belong.
      - **DNS Server1 IP**: Enter the IP address of the primary DNS server for clients to contact when resolving domain names to IP addresses (DHCP option 6).
      - **DNS Server2 IP**: Enter the IP address of a secondary DNS server for clients to contact if the primary DNS server is unresponsive (DHCP option 6).
      - **DNS Server3 IP**: Enter the IP address of a third DNS server for clients to contact if neither the primary nor secondary DNS servers respond (DHCP option 6).
      - **POP3 Server IP**: Enter the IP address of the POP3 server for clients to use (DHCP option 70).
      - **SMTP Server IP**: Enter the IP address of the SMTP server for clients to use (DHCP option 69).
      - **WINS Server1 IP**: Enter the IP address of the primary WINS server for NetBIOS name-to-address resolution (DHCP option 44).
      - **WINS Server2 IP**: Enter the IP address of the secondary WINS server for NetBIOS name-to-address resolution (DHCP option 44).
      - **Lease Time**: Enter the length of time (60-86400000 seconds) for the DHCP lease; by default, DHCP leases last for 86,400 seconds, or 24 hours (DHCP option 51).
      - **Netmask**: Enter the netmask defining the subnet to which the addresses in the IP pool belong.
      - **Domain Name**: Enter the domain name to assign to DHCP clients. This is the default domain name for DNS name resolution (DHCP option 15).

- **MTU**: Set the path MTU aging timeout in seconds for clients to use; the minimum value is 68 seconds, and the maximum is 8192 seconds (DHCP option 24).
- **NTP Server1 IP**: Enter the IP address of the primary NTP (Network Time Protocol) server with which DHCP clients can synchronize their clocks (DHCP option 42).
- **NTP Server2 IP**: Enter the IP address of the secondary NTP server with which DHCP clients can synchronize their clocks (DHCP option 42).
- **Log Server IP**: Enter the IP address of the logging server for DHCP clients (DHCP option 7).

f. **Configure Custom Options**: Define custom DHCP options to provide additional network settings to connected clients.

You can use IPv4 or IPv6 addresses. To add a new custom DHCP option select the plus sign and complete the fields:

- **Number**: Enter a custom option number from 2 to 5, 8 to 14, 16 to 25, 27 to 41, 43, 45 to 50, 52 to 57, 60 to 68, 71 to 224, 227, 228, or from 232 to 254.

  Note
  The following numbers are reserved: 226, ExtremeCloud IQ domain name; 225, ExtremeCloud IQ IP address; 229, PPSK server IP address; 230, RADIUS server authentication IP address; 231, RADIUS server accounting IP address. The following DHCP option numbers are reserved for other information: 3, 6, 7, 15, 26, 42, 44, 51, 58, 59, 69, and 70.

- **Type**: Select the type of data that the option will provide:
  - **Integer**: 0-2, 247, 483, 547
  - **IP Address**: Four octets of an IP address or eight groups of two octets each for an IPv6 address.
  - **String**: 1-255 characters
  - **Hex**: 1-254 hexadecimal digits

7. If you select **DHCP relay agent**, designate a Primary DHP Server and a Secondary DHCP Server (optional).
8. Select **Save**.
9. To update the device immediately, select **Update Now**.
10. In the **Device Update** dialog box, select the type of update, and then select **Save as Defaults**.
11. Select **Perform Update**.

Add a DNS Service

Add or modify a subnetwork space. See Add a Subnetwork Space on page 290. It will also be helpful to have configured your DNS Servers. See Configure a DNS Server on page 252.

Extreme Networks routers use DNS services in their subnetwork configurations (see Configure Subnetwork Space Advanced Settings on page 292). When the network type is for internal or guest use, an Extreme Networks router applies this service to the DNS requests from clients connecting to the router either directly or through an intermediary AP or switch. When the network type is management, the router applies this to DNS requests from APs and switches on the same management network behind the router, and to the mgt0 interface of the router itself. Use this task to add a DNS service for use at the network policy level, or at the device level for routers and VPN Gateway Virtual Appliances.

1. Enter a name.
2. Enter an optional description.
3. Select **Enable DNS Snooping for static DNS clients** to enable access data collection.
4. With DHCP enabled, if you select **Supply external DNS server IP addresses in DHCP offers**, enter the static IP address of at least one external DNS server.
5. If you select, **Set the router as the DNS server in DHCP offers**, options display:
    - **Set the router to use the same DNS servers for all domain name lookups**: This is non-split mode. With this option, the router sends DNS requests for names that match domains to the DNS servers you specify. Specify external domain name lookups:
        - **Resolve client name requests using the same DNS servers as configured for the router**: With this option, the router sends all requests to the DNS servers it learns through DHCP.
        - **Specify name servers**: Enter the static IP address of at least one DNS name server to resolve all domain name lookups.
    - **Set the router to use separate DNS servers for internal and external domain name lookups**: This is split mode. You must specify at least one DNS server, which can be accessed through either a VPN tunnel or on the Internet. The router sends DNS requests for names that match internal domains to the specified internal DNS servers, and sends other requests through DHCP to specified external DNS servers. For internal and external domain name lookups:
        - Enter the internal domain names that the internal DNS servers will use for comparison and name resolution. Enter each domain name on a separate line. Enter the static IP address of at least one internal DNS server.
        - Under **Domain Name Specific Settings**, to restrict a domain name to a single DNS server for security purposes, select the plus sign, enter the domain name and DNS server IP address, and select **ADD**.
        - **Resolve client name requests using the same DNS servers as configured for the router**: With this option, the router sends all requests to the DNS servers it learns through DHCP.
        - **Specify name servers**: Enter the static IP address of at least one DNS name server to resolve all domain name lookups.
6. Select **Save**.

Return to Configure Subnetwork Space Advanced Settings on page 292.

Add IP Objects and Host Names

An IP object or host name is a network object that you can reference in IP firewall policy rules as a Layer 3 source or destination, and as a DNS server in a DNS assignment. An IP object or host name can be used by configuration objects throughout the ExtremeCloud IQ GUI. IP objects and host names can be used to identify RADIUS clients that belong to the same user profile. For more information about RADIUS clients, see Configure an External RADIUS Server on page 98. Use this task to add a new IP object and Host name.

1. Select the plus sign.
2. Enter a name for the new object.
3. Select the object type from the drop-down menu.
4. Fill in the required information.
5. Select **Save**.

Add a MAC Object and Host Name

A MAC address is a 48-bit number typically written in hexadecimal notation that provides a unique address for each client device. An OUI is the first 24 bits of a MAC address. After a MAC object is assigned to a device, it can be grouped to a specific hive. In a MAC firewall policy rule, you can determine which traffic to permit or deny based on the source or destination MAC address. For more information about firewall policies, see Add MAC Firewall Policies on page 235. In QoS traffic classification and marking policies, you can prioritize traffic based on its OUI.

1. Select the plus sign.
2. Select **MAC Address**.
3. Enter the new name.
4. Enter the new address.
5. Select **Save**.
6. Select the plus sign.
7. Select MAC **OUI**.
8. Enter the new name.
9. Enter the new OUI.
10. Select **Save**.

Add a Notification Template

There are two default notification templates available in ExtremeCloud IQ; an SMS template and an Email template. You can also configure customized notification templates with this task for non-employees who need to obtain network access (for example, guests, contractors, and VIPs).

1. Select the plus sign.
2. Enter the new name.
3. Select the template type from the drop-down list.
4. For **SMS**, enter the following information:
   - **Security Type**: Select **PPSK** (private pre-shared key) or **RADIUS**.
   - **Template Content**: Enter the text that you want the SMS message to contain. Insert any of the variables (**Login Name**, **Password**, **SSID**, or **Expiration**) by selecting a variable button below the text box and filling in that information.

5. For **Email**, enter the following information:
    - **Security Type**: Select **PPSK** or **RADIUS**.
    - **Icon URL**: Enter the URL path.
    - **Logo URL**: Enter the path to upload a logo image.
    - **Description Text**: Enter the text that you want to appear in the email message. You can insert an **SSID** variable and a **Link** variable using the variable buttons. To see how your message will display, select **Preview**.
6. Select **Save**.

Configure OS Objects

You can add, modify, and delete OS objects. Extreme Networks devices can reassign users to different user profiles based on several characteristics of their clients. The operating system of a client is one way to categorize a device (the other two are MAC address or OUI and device domain name).

To modify an existing OS object, select the edit icon and make your changes. To delete OS objects, select the check box and then select the delete icon.

Use these steps to configure a new DHCP or HTTP OS object:

1. Select the add icon.
2. Enter a name for the object.
3. Enter a description for the object.

    Although optional, descriptions can be helpful when you are troubleshooting your network.
4. Select either **DHCP Option** or **HTTP Agent**.
5. For either choice, select the add icon above the table.
6. Select an OS type from the drop-down menu.

    If you do not see the OS you need, you can enter a new one in the field. For **DHCP Option**, if you select a default OS types, the Parameter Request List field is automatically filled in with the default DHCP option 55 string. If you add a new OS type, you can then enter your own parameter request list, which is a number string, separated by commas, that determines the order by which the DHCP client requests specific parameter information from the DHCP server. An example string to detect Windows 7 is: 1,15, 3, 6, 44, 46, 47, 31, 33, 121, 249, 43.

    If you selected **HTTP Agent**, enter a description.

    > Note
    > Because devices use HTTP snooping to learn clients' operating systems, the OS version string that you enter must match the version that appears in the user-agent field in HTTP request headers. Lists of user-agent strings for most OS versions are available online.

7. Select **Add**.

Add a VLAN Object

Although you can manage VLANs from **Common Objects**, it is a best practice that you configure them inside a network policy workflow. See Configure VLAN Settings on page 109.

Use this task to add a VLAN object.

1. Go to **Configure** > **Common Objects** > **Basic** > **VLANs**.
2. Select an existing VLAN and then select ✎, or select +.
3. Type a **Name** for the new VLAN.
4. Type a **VLAN ID**.
5. (Optional) Select **Apply VLANs to devices using classification**.

   See Apply VLANs to Devices Using Classification on page 232.
6. Select **SAVE**.

Apply VLANs to Devices Using Classification

Add a VLAN Object on page 232 and select **Apply VLANs to devices using classification**.

This task is part of adding a VLAN object. Use this task to apply VLANs to devices by using classification.

1. Select +
2. Type the **VLAN ID**, and then select **ADD**.
3. Add or select classification rules.
   a. Select the VLAN to configure.
   b. To choose an existing classification, select ↖, and then select **LINK**.
   c. To add a new classification rule, select ⊞.
   d. Configure the settings for the new rule.

      See Configure Classification Rules on page 158.
4. Select **SAVE**.

Related Topics

Add a VLAN Object on page 232
Configure Classification Rules on page 158

Add a VLAN Group Object

Although you can manage VLANs from **Common Objects**, it is a best practice that you configure them inside a network policy workflow. See Configure VLAN Settings on page 109, and Add a VLAN Group on page 111.

Use this task to add a VLAN Group object.

1. Go to **Configure** > **Common Objects** > **Basic** > **VLAN Group**.
2. Select an existing VLAN Group and then select ✎, or select +.

3. Type a **Name** for the new VLAN Group.
4. Type the IDs for the **VLANs**.

   Configure VLANs as ranges, or individually. Indicate a range with a hyphen. Separate VLAN entries with commas, for example, 1-30, 100-200, 500.
5. Type a **Description** for the VLAN Group.
6. Select **SAVE**.

Configure Supplemental CLI

To use the supplemental CLI (sCLI) tool, first navigate to **Global Settings > VIQ Management**, and enable **Supplemental CLI**.

Use this task to update CLI commands to multiple devices simultaneously from ExtremeCloud IQ. After you save supplemental CLI objects containing CLI commands, you can update the commands for devices automatically, each time you update the network policy.

To avoid an unnecessary system reboot, select **Delta Configuration Update**. ExtremeCloud IQ attempts to update only the configuration deltas. If a full update is required, the system prompts you to select **Complete Configuration Update**. Examples of CLI commands that require a full configuration update are: **`system antenna-type`** and **`system environment`**.

1. Go to **Configure** > **Common Objects** > **Basic** > **Supplemental CLI Objects**.
2. Select existing supplemental CLI objects using the drop-down list next to **Re-use Supplemental CLI Settings**.
3. To add a new supplemental CLI object, select +.

   To edit an existing CLI object, select the corresponding check box and then select ✎.
4. Type a **Name**.
5. Type an optional **Description**.
6. Type or paste the **CLI commands** into the field.
   - Enter multiple CLI commands, one command per line, not exceeding a maximum total of 8192 characters.
   - Use CLI Commands that contain IP and VLAN objects: **`${ip:ip_object_name}`** and **`${vlan:vlan_object_name}`**.
   - Perform a complete configuration update each time commands are appended to device configurations.
   - For Dell EMC switches, enter the CLI commands, `enable`, and `config` in the beginning of a sequence of CLI commands.
7. Select **SAVE**.

Related Topics

Enable Supplemental CLI on page 55

Security Configuration

The topics in this section provide details about network security configuration objects, including AirDefense Policies, IP and MAC Firewall Policies, MGT IP and Traffic Filters, and WIPS Policies.

Related Topics

Add IP Firewall Policies on page 234
Add MAC Firewall Policies on page 235
Configure MGT IP Filters on page 236
Configure Traffic Filters on page 238
Add a WIPS Policy on page 240
Configure Rogue AP Detection on page 240

Add AirDefense Policies

Extreme AirDefense simplifies the management, monitoring, and protection of your WLAN networks. Use the following procedure to add policy objects for AirDefense.

1. Go to **Configure** > **Common Objects** > **Security** > **AirDefense Policies**.
2. Select an existing AirDefense policy object and then select ✎, or select +.
3. Enter a **Name** for the new policy.
4. Enter an optional **Description**.
5. (Optional) Select **Enable 3rd radio to act as a sensor**.
6. For the **Primary Server**, type the IP address of the server and the **Port** number.
7. (Optional) For the **Secondary Server**, type the IP address of the server and the **Port** number.
8. Select **SAVE**.

Related Topics

Security Configuration on page 234

Add IP Firewall Policies

Use the following procedure to create IP firewall policy objects and rules that determine how the device manages traffic based on network or application services, and source and destination IP addresses.

1. Go to **Configure** > **Common Objects** > **Security** > **IP Firewall Policy Rules**.
2. Select an existing IP firewall policy rule and then select ✎, or select +.
3. Enter a **Name** for the new policy.
4. Enter an optional **Description**.
5. Select + to add a new rule.
6. Select one or more network or application services.

   Network Service objects identify Layer 4 traffic by protocol and port number. Extreme Networks provides a number of predefined services. Select the add icon to create a new network service. For more information, see Configure Network Services on page 289.

a. Choose either **Network Services** or **Application Services**.

   You cannot select both.
b. Select up to 100 items.
c. Select **Add Service**.

7. Select a source IP address, host name, network, or **Any** from the drop-down list, or select **New** to add a new IP address, host name, or network.
8. Select a destination IP address, host name, network, or **Any** from the drop-down list, or select **New** to add a new IP address, host name, or network.
9. Select the action the device performs when it receives traffic matching the source address-destination address-service.

   The firewall can perform the following actions:

   - **Permit**: Allows traffic to traverse the firewall.
   - **Deny**: Blocks traffic from traversing the firewall.
   - **Drop traffic between stations**: Drops traffic between stations if both stations are associated with one or more members of the same hive. This setting applies to unicast, broadcast, and multicast traffic that the device receives on an interface in access mode.
   - **NAT**: Translates the source IP address of a packet permitted to traverse the firewall to that of the mgt0 interface on the device.
10. Choose one of the following logging options from the drop-down list:
    - **Off**: Disables logging for packets and sessions that match the IP firewall policy rule.
    - **Session Initiation**: Log details about a session created after passing an IP firewall policy lookup.
    - **Session Termination**: Log details about a session matching an IP firewall policy termination.
    - **Both**: Log details after initiating and terminating a session.
11. Select **Save**.

As you continue to add rules to a policy, each subsequent rule is positioned at the bottom of the list. Use the up and down arrows in the rules table to rearrange the position of rules to determine their application order.

Related Topics

Configure Network Services on page 289

Security Configuration on page 234

Add MAC Firewall Policies

MAC firewall policies determine how the device manages traffic based on source and destination IP addresses, and the actions (permit or deny) the device can take. When the policy contains multiple rules, the order of the rules affects how they are applied. Use this task to create a new rule.

Use the following procedure to add MAC firewall policy objects and rules.

1. Go to **Configure** > **Common Objects** > **Security** > **MAC Firewall Policies**.
2. Select an existing IP firewall policy and then select ✎, or select +.
3. Enter a **Name** for the new policy.
4. Enter an optional **Description**.
5. Select + to add a new rule.
6. For **Source MAC**, select **Any**, an existing MAC OUI or the plus sign.

   If you choose to add a new **Source MAC**, select **MAC Address** or **MAC OUI** and perform the following:

   a. Enter a new name.
   b. Enter the **MAC Address** or **MAC OUI**.
7. For **Destination MAC**, select **ANY**, an existing MAC OUI or the plus sign.

   If you choose to add a new **Source MAC**, select **MAC Address** or **MA OUI** and do the following:

   a. Enter a new name.
   b. Enter the **MAC Address** or **MAC OUI**.
8. Select the action the device performs when it receives traffic matching the source address-destination address-service.

   The firewall can perform the following actions:

   - **Permit**: Allows traffic to traverse its firewall.
   - **Deny**: Blocks traffic from traversing its firewall.
9. Choose one of the following logging options from the drop-down list:
   - **Off**: Disable logging for packets and sessions that match the MAC firewall policy rule.
   - **Session Initiation**: Log session details about a session created after passing a MAC firewall policy lookup.
   - **Session Termination**: Log session details about a session matching a MAC firewall policy termination.
   - **Both**: Log session details after initiating and terminating a session.
10. Select **Save**.

As you continue to add rules to a policy, each new rule is positioned at the bottom of the list. Use the up and down arrows in the rules table to rearrange the position of rules to determine their application order.

Related Topics

Security Configuration on page 234

Configure MGT IP Filters

Before you begin, enable **MGT IP Filter** in the network policy settings. See Configure MGT IP Filter Policy Settings on page 78.

By default, ExtremeCloud IQ devices enable administrative access from all IP addresses. To provide tighter security, you can restrict administrative access. As soon as you apply a filter to a device—which you do by applying the filter to a network policy and then applying that policy to a device—the device denies access from all other IP addresses except those specified in the filter.

Use the following procedure to configure MGT IP Filter objects for use in network policies.

1. Go to **Configure** > **Common Objects** > **Security** > **MGT IP Filters**.
2. Select an existing MGT IP Filter and then select ✎, or select +.
3. Configure the settings.

   See MGT IP Filter Settings on page 237.
4. To add a new IP Object, select **Add Another IP Object**, configure the settings, and then select **SAVE SUBNET**.

   See Table 33 on page 238.
5. Select **SAVE MGT IP FILTER**.

Related Topics

MGT IP Filter Settings on page 237

Security Configuration on page 234

MGT IP Filter Settings

Table 32: Settings for MGT IP Filters

Setting	Description
Name	Type a **Name** for the filter.
Description	(Optional) Type a **Description** for the filter. Although optional, entering a description is helpful for troubleshooting and for identifying the filter.
Permitted Management Traffic Source	

Table 32: Settings for MGT IP Filters (continued)

Setting	Description
Available IP Objects	IP objects in this list are preconfigured. To add to the list, select **ADD ANOTHER IP OBJECT**. See Table 33 on page 238. Select an IP address in the **Available IP Objects** column, and then select the single arrow (**>**) to move it to the **Selected IP Objects** column. Use the double arrow **>>** to move all available IP addresses.
Selected IP Objects	IP objects in this list are the IP addresses from which administrators can access the devices. Select an IP address in the **Selected IP Object** column, and then select the single arrow (**>**) to move it to the **Available IP Objects** column. Use the double arrow **>>** to move all available IP addresses.

Table 33: Settings for IP Objects

Setting	Description
Name	(Required) Type a **Name** for the new IP object.
Subnet	(Required) Type the new **IP Address** and **Subnet**.

Configure Traffic Filters

Before you begin, enable **Traffic Filters** in the network policy settings. See Configure Traffic Filters Policy Settings on page 77.

The Traffic Filter table displays services (SSH, Telnet, ping, and SNMP) that Extreme Networks devices permit between connected clients. The table displays the name of the traffic filter, a description (if one was configured), and identifies the SSID using the filter (Used by). Hover over a number in the Used by column to see more information.

By default, Extreme Networks devices permit SSH and pings to access the mgt0 interface through the Ethernet and wireless interfaces to which you bind SSIDs.

You can control which management and diagnostic services a device can receive, and whether the device permits traffic between connected clients. You can apply traffic filters to Ethernet interfaces (in backhaul or access mode), to the wireless backhaul interface, and to the wireless access interface of individual SSIDs. These options permit certain types of traffic to reach the mgt0 interface through Ethernet interfaces eth0, eth1, red0, or agg0 (through the wireless backhaul interface), and through select SSIDs.

You can clone, modify, and delete traffic filters using the icons above the table.

Use this task to configure a new Traffic Filters object.

1. Go to **Configure** > **Common Objects** > **Security** > **Traffic Filters**
2. Select an existing Traffic Filter, and then select ✎, or select +.
3. Configure the settings.

   See Traffic Filter Settings on page 239.
4. Select **SAVE**.

Related Topics

Traffic Filter Settings on page 239

Security Configuration on page 234

Traffic Filter Settings

Table 34: Settings for Traffic Filters

Setting	Description
Name	Type a **Name** for the new Traffic Filters object.
Description	Type a **Description** for the new Traffic Filters object.
IQ Engine APs, Routers and Switches	
Control the following types of traffic to devices	Select the corresponding check boxes to enable the selected types of traffic. • **Enable SSH**: Permit an SSH connection to the mgt0 interface. By default, SSH is enabled. • **Enable Telnet**: Permit a Telnet connection to the mgt0 interface. By default, Telnet traffic is disabled. • **Enable Ping**: Permit ICMP echo requests (pings) to reach the mgt0 interface. By default, pinging mgt0 is allowed. • **Enable SNMP**: Permit an SNMP connection to the mgt0 interface. By default, SNMP is disabled. • **Enable Inter-station Traffic**: (Only for APs) Permit inter-station traffic between APs.
Non-IQ Engine Switches (Dell & Extreme Networks)	
Control the following types of traffic to devices	Select the corresponding check boxes to enable the selected types of traffic. • **Enable Telnet**: Permit a Telnet connection to the mgt0 interface. By default, Telnet traffic is disabled. • **Enable Ping**: Permit ICMP echo requests (pings) to reach the mgt0 interface. By default, pinging mgt0 is allowed. Does not apply to N1100 series devices.

Related Topics

Configure Traffic Filters on page 238

Configure Traffic Filters Policy Settings on page 77

Add a WIPS Policy

The Extreme Networks Wireless Intrusion Prevention System (WIPS) uses a variety of techniques for detecting unauthorized Access Points (APs) by checking for those that do not conform to specified criteria and ad hoc networks.

> **Note**
> You can configure both AP-based WIPS services (Rogue Access Point Detection) and advanced Extreme AirDefense Essentials WIPS services. The second option requires that you first install an Extreme AirDefense Essentials on-premise service. Models that support AirDefense Essentials will default to that platform. All others will be on legacy WIPS.
>
> Rogue Access Point Detection is supported on 802.11ac or older model APs ONLY.
>
> Extreme AirDefense Essentials is supported on Wi-Fi6/6E (802.11ax) and newer model APs ONLY.

Use the following procedure to add a WIPS policy object for reuse in network policies.

1. Go to **Configure** > **Common Objects** > **Security** > **WIPS Policies**.
2. Select an existing WIPS policy object and then select ✎, or select +.
3. Enter a **Name** for the new policy.
4. Enter an optional **Description**.
5. (Optional) Set the **AirDefense Essentials** slider to **OFF** to disable it, and then select **Save**.

   By default, **AirDefense Essentials** is **ON** (enabled).
6. (Optional) To **Allow change of operating channel for air-termination**, select the check box.
7. (Optional) Set the **Rogue Access Point Detection (Legacy)** slider to **ON** to enable detection of unauthorized access points in the area.

   By default, **Rogue Access Point Detection (Legacy)** is **OFF** (disabled).
8. Select **Save**, or proceed to Configure Rogue AP Detection on page 240 to complete the configuration.

Related Topics

Security Configuration on page 234

Configure Rogue AP Detection

Create or edit a WIPS policy object, and enable Rogue Access Point Detection (Legacy). See Add a WIPS Policy on page 240

This legacy WIPS configuration enables you to detect unauthorized access points in the area.

> **Note**
> Rogue Access Point Detection is supported on 802.11ac or older model Access Points ONLY.

While configuring a WIPS policy object, use the following procedure to configure Rogue Access Point Detection (Legacy).

1. Use **Determine if detected rogue APs are connected to your wired (backhaul) network** in combination with other WIPS techniques to determine if a detected rogue AP is in the same network as compliant APs.

   An Extreme Networks AP builds a MAC learning table from source MAC addresses in the broadcast traffic it receives from devices in its Layer 2 broadcast domain. When an AP running XOS 5.0r2 or later detects a rogue AP through any of the rogue detection mechanisms in the WIPS policy, it checks the MAC learning table for an entry within a 64-address range above or below the BSSID of the invalid SSID. If there is a match, it is assumes that both MAC addresses belong to the same device. Because one of its addresses is in the MAC learning table, the rogue is considered to be in the same backhaul network as the detecting AP, and **In Net** displays in the **In Network** column for that rogue in the list of rogue APs. You can then take appropriate steps to mitigate the rogue.
2. Select **Detect rogue access points based on their MAC OUI** to detect rogue access points by MAC OUI.
   a. Choose **Select MAC OUIs of wireless devices that are permitted in the WLAN** to create a list of MAC OUIs with network access enabled.
   b. Select an OUI from the drop-down list.

      Select the add icon to add a new OUI if you don't want to use the ones in the drop-down list.
   c. Select **Add**.
3. Select **Detect rogue access points based on hosted SSIDs and encryption type** to detect rogue access points for SSID names that other access points advertise, along with the type of encryption they use.

   For example, if you have a network security policy that requires all SSIDs to use Enterprise 802.1x, then any valid SSID using Enterprise 802.1x makes the access point hosting it valid. On the other hand, an access point is categorized as a rogue if it hosts an SSID using WEP or no encryption at all.
4. Select **Detect rogue access points based on hosted SSIDs and encryption type** to include SSID checks in the WIPS policy.
5. Select the add icon.
6. Select **Add**.
7. Select an SSID from the drop-down list.
8. If the SSID does not appear in the drop-down list, you can type the name in the field.

9. Select **Check the type of encryption used by this SSID** and choose one of the following to restrict access to this WLAN based on the encryption that the client device uses within the chosen SSID:
   - **Open**: Enable only devices in the chosen SSID using no encryption to access the WLAN.
   - **WEP**: Enable only devices in the chosen SSID using WEP encryption to access the WLAN.

     Note
     The WEP protocol is no longer effective for securing wireless networks. For security reasons, WEP configuration is no longer available in the UI. If you require WEP for business continuity purposes, you can enable it via Supplemental CLI.

   - **Enterprise 802.1x**: Enable only devices in the chosen SSID using a valid WPA encryption to access the WLAN.

   Note
   You can add up 1024 SSIDs to a WIPS policy. If you enable SSID detection but do not add any SSIDs to the list, the AP will consider all SSIDs to be rogue because no SSID is indicated as being valid.

10. **Detect clients in an ad hoc network** (default).

    Note
    When stations in an ad hoc network or IBSS (independent basic service set), transmit 802.11 beacons and probe responses, the ESS (extended service set) bit is set to 0 and the IBSS bit is set to 1, indicating IBSS capability. When APs detect these types of management frames, they categorize those stations transmitting them as members of an ad hoc network and as rogue.

11. Select **Enable rogue client reporting** to report rogue clients.

    Note
    You can change the duration that elapses before disconnected rogue clients are deleted from the reports.

12. Configure the following information to control how you want to mitigate rogue APs and their clients:
    - **Mitigation Mode Manual**: Manually mitigate rogue APs and their clients. In manual mode, you must periodically check for rogue APs and their clients on the heat map pages in your network hierarchy..

      Note
      Use caution when mitigating a suspected rogue AP. If your WLAN is within range of other neighboring wireless networks, the access point that might initially be considered a rogue AP, along with its clients, might be valid in another WLAN.

- **Mitigation Mode Automatic**: APs automatically mitigate rogue APs and their clients, starting and stopping the mitigation process without any administrator involvement.

  Note
  Use only the automatic mode for rogue APs that are in-network (in the backhaul network of your organization). Otherwise, automatic mitigation can impact the normal operation of valid APs belonging to a nearby business by blocking their wireless clients from connecting to their APs. Reference the appropriate FCC regulations that prohibit Wi-Fi blocking in these cases.

- **Automatically mitigate rogue APs if they are connected to your wired (backhaul) network**: This ensures that APs only mitigate rogue APs that are in their backhaul network, not APs in external networks that happen to be within radio range.
- **Detect and mitigate rogue clients every**: After you enable rogue detection on an AP, it scans detected rogue APs for clients during the period that you specify. If you manually start mitigation against a rogue, the AP not only continues scanning for clients during this period, it also sends deauthentication frames to the rogue AP and any detected clients during the same period. For example, if you leave this at the default setting of 1 second, the AP checks for rogues and attacks them every second. Each time an AP checks if there are clients associated with a detected rogue, it must switch channels for about 80 milliseconds (unless it happens to be using the same channel as the rogue). To minimize channel switching, choose an AP that is on the same channel as the rogue to perform the mitigation. The Rogue AP list shows which channel the rogue is using. If none of the APs are using the same channel, choose the one with the fewest clients. Finally, if all the APs are busy and on different channels from the rogue, consider reducing the amount of channel switching by increasing the period so that the associated client check occurs less frequently. You can change the duration from 1 to 600 seconds (10 minutes).
- **Repeat mitigation for detected rogue clients**: Specifies how many consecutive periods to spend attacking a rogue AP and its clients before allowing client inactivity to cause a ceasefire and commence a countdown to end the mitigation. If you use the default settings for both the length of the mitigation period and the consecutive number of periods, an attack will last for 60 seconds before entering a cease-fire period due to client inactivity. The range is from 0 to 2,592,000 seconds (30 days). A value of 0 means that mitigator APs send deauthentication frames for the entire amount of time that a mitigation effort is in effect (as defined in the next setting).
- **Limit mitigation efforts per rogue AP to**: The maximum amount of time that an attack against a rogue AP can last. If the length of client inactivity does not cause the attack to be suspended or if you do not manually stop the attack, the AP will stop it when this time limit elapses. The default duration is 14,400 seconds (4 hours), which means that an AP continues checking for clients of a detected rogue for up to four hours and mitigates them if it finds them. (The mitigation might stop sooner if the period of client inactivity lasts long enough to stop it.) You can change the maximum time limit between 0 and 2,592,000 seconds (30

days). In cases where the response time to detect a rogue AP would be greater than the default duration of four hours, consider increasing the duration to enable more time to locate the AP before ending the mitigation process. A value of 0 means that the client detection and mitigation process will continue indefinitely unless the client inactivity period elapses.

- **Stop mitigation if no client activity is detected in**: Set a period of time to stop the mitigation process if the AP no longer detects that clients are associated with the rogue AP. During this time, the AP stops sending DoS attacks but continues checking if any clients form new associations with the targeted AP. If the AP detects any associated clients before this period elapses, it sends a deauthentication flood attack and resets the counter. If there are no more clients associated with the AP after this period, the AP stops the mitigation process even if there is still time remaining in the maximum time limit.
- **Max number of mitigator APs per rogue AP**: (Applies to automatic mode only.) For automatic mitigation, hive members choose one AP to be the arbitrator, which is the one to which all the detector APs send reports. The arbitrator AP also determines which detector APs perform mitigation. When they start, they become mitigator APs. Set the number of mitigator APs that the arbitrator AP can automatically assign to attack a rogue AP and its clients. If you set the maximum as 0, all the detector APs can be assigned to perform rogue mitigation.

13. Select **Save**.

Related Topics

Add a WIPS Policy on page 240

Security Configuration on page 234

QoS Configuration

The topics in this section provide details about QoS configuration objects, including Classifier and marker maps, and rate control rules.

Related Topics

About QoS on page 244

About Classifier Maps on page 246

Configure Marker Maps on page 249

Configure Rate Limiting and Queuing on page 250

About QoS

Traditional Quality of Service (QoS) separates client traffic into queues based on traffic type, and schedule the transmission of the traffic based on data rates from the queues. In a WLAN, a slower client (802.11b) uses significantly more airtime to transmit the same amount of data as a faster client (802.11ax). To make airtime access more equitable, Extreme Networks provides airtime-based QoS scheduling. Instead of using just bandwidth in the QoS calculations, APs allocate airtime per client, traffic class, and user profile by dynamically calculating airtime consumption per packet. When multiple client types (802.11a, ac, b, g, n or ax) are active in the same WLAN, all clients receive the same amount of airtime (10 ms for example), regardless of the client type. For example, an 11ax client could send 128 Kbps of traffic in the allocated slot, while an 11b client could only send 50 Kbps, but both clients receive the same amount of airtime.

A visual representation of the difference between bandwidth-based scheduling and airtime-based scheduling when two clients are transmitting at different data rates looks like this:

Dashes (—) indicate airtime for frames transmitted at a low data rate.

Bullets (•) indicate airtime for frames transmitted at a high data rate.

Bandwidth-based scheduling:

— • — • • — • — — • — • — • — •

Airtime-based scheduling:

— • • • • — • • • • — — — — — —

The faster client might be using 802.11ax and the slower client 802.11 a, b, g, or n, or they might both be using the same protocol, but one is farther away and must use a slower speed than the other.

With bandwidth-based scheduling, both slow and fast clients finish at the same time regardless of their data rates, and they compete the entire time for the air. Because both clients have an equal opportunity to transmit frames, the faster client's throughput slows down to the rate of the slower client.

With airtime-based scheduling, both clients get their proportion of airtime. The faster client finishes four times faster, and the slower client finishes at the same time as it did with bandwidth-based scheduling. The fast client is rewarded, and the slow client is not penalized.

Note
QoS rate control and queuing on routers applies to traffic from the LAN to the WAN, but not the reverse, primarily because there is typically much less bandwidth on the WAN interface than on LAN interfaces. APs apply QoS rate control and queuing to both outbound and inbound traffic. They perform data rate limiting on incoming Ethernet and Wi-Fi interfaces, and they queue packets on outgoing Wi-Fi interfaces. APs do not queue any packets that they send out through their Ethernet interfaces because the Ethernet link is not a point of congestion; however, they do set the 802.1p or DSCP priority in the packet headers as defined in the marker map so that the next-hop router can perform QoS queuing.

The benefits of airtime-based scheduling include:

- **Multiple-service WLAN infrastructure**: When integrated with service-based QoS scheduling in user policies, Dynamic Airtime Scheduling lets you manage the air optimally to support different application types.
- **Dense deployments**: When there are many clients and the air is congested with wireless traffic, airtime-based scheduling ensures that faster clients get off the air faster, reducing the likelihood of collisions and contention among all client traffic.
- **Sparse or Partial Deployments**: When a few clients are spread out at various distances from the AP, airtime-based scheduling prevents fringe or distant clients from slowing down closer, faster clients and allows for phased roll-outs.
- **Environments with a mixture of 802.11 a/ac/ax/b/g/n clients**: When there is a mixed environment with clients using different protocols when connecting to the AP, airtime-based scheduling enables the faster clients to get the benefit of their speed without penalizing the legacy clients.

The Rate Limits table lists the following information:

- **Name**: The name of the user profile in which traffic policing and rate limiting are enabled.

  Note
  Extreme Networks devices apply airtime-based scheduling to traffic assigned to admin-defined user profiles but not to traffic assigned to a predefined user profile "default-profile". To apply airtime-based scheduled QoS to client traffic, make sure that the SSIDs reference only user profiles that you or another admin created.

- **Used By**: Hover over any number in the Used By column to see the user names of devices that are using this rate limit

You can use the icons above the table to add, modify, or clone rate limits. To delete a rate limit, select the check box for the rate limit and then select the delete icon.

About Classifier Maps

Quality of Service (QoS) prioritizes and optimizes the forwarding of different types of traffic through a network. You can use classifier maps to map traffic to Extreme Networks QoS classes by service type, specific MAC OUIs, individual SSIDs, and priority numbers in various standard QoS classification system (802.1p/DiffServ/802.11e). The device prioritizes, processes, and forwards the incoming traffic as determined by the QoS level to which it is mapped. For outgoing traffic, devices use marker maps.

For more information about QoS in general, see About QoS on page 244.

When a device applies a classifier map, it checks to see if an incoming packet matches a setting in the map by checking for matches in the following order. It then uses the first match it finds.

1. Services

2. MAC OUIs

3. SSIDs

4. 802.1p/DiffServ/802.11e

To map a traffic category to a QoS class, select the specified map and then define the traffic settings as described in Configure Classifier Map Services on page 247.

Configure Classifier Map Services

To map a traffic category to a QoS class, select the specified tab, and then define the traffic settings described in the following procedures.

> Note
> Be sure to enable all the categorization methods you want devices to use when assigning incoming traffic to various QoS classes. A network policy can reference just one classifier map.

1. Go to **Configure** > **Common Objects** > **QOS** > **Classifier Maps** > **Services** tab.
2. Select an existing map and then select ✎, or select +.
3. Type a **Name** for the Classifier Map.
4. Type an optional **Description**.
5. To add a new service, select +.
6. Select either **Network Services** or **Application Services**.

   Extreme Network devices can map incoming traffic to classes based on the network or application service type defined in the classifier map.
7. Select one or more services (up to a maximum of 100) that you want to map to a class.
   a. Choose **Select from the following** and filter services by typing part or all of a service name in the **Filter** field.
   b. Select a QoS class to which you want to map the selected services or applications.
   c. For the action, choose **Permit** or **Deny**.

      The permit and deny actions in a QoS policy enable devices to enforce a simple stateless firewall policy that inspects packets individually, instead of within the context of an ongoing session. Because a stateless firewall configured to permit outgoing requests does not associate the corresponding incoming responses, you must configure a separate policy to permit the return traffic. A stateful firewall uses an internal table to associate corresponding outgoing and incoming traffic.

   d. Enable **Logging** to permit devices to log traffic that matches the service-to-Extreme Networks class mapping.

      Devices log traffic whether the action is permit or deny. The main reason to log traffic is to see if the devices are receiving expected or unexpected types of traffic when you debug connectivity issues. You can see these log entries in the even log using the

      ```
      show logging buffered
      ```

      command, or you can configure the device to send event logs to a syslog server and view them there.

   e. Select **Save**.

   As an alternative, you can select services individually.

8. Select **Save.**

Configure Classifier Maps Based on MAC OUIs

Devices can map traffic to classes based on either the source or destination MAC organizationally unique identifiers (OUIs) in a packet. To configure this mapping, follow these steps:

1. Go to **Configure** > **Common Objects** > **QOS** > **Classifier Maps** > **MAC OUIs** tab.
2. Select an existing map and then select ✎, or select +.
3. Type a **Name** for the Classifier Map
4. Type an optional **Description**.
5. To add a new MAC OUI, select +.
   a. Select the name of a **MAC OUI** (also known as a MAC vendor ID) from the drop-down list.

      If you do not see the MAC OUI that you want, select **New** and define one.

   b. Choose a **QoS Class** to which you want to map traffic using this SSID.
   c. For **Action**, select either **Permit** or **Deny**.

      Permit allows traffic that matches the source MAC OUI to pass through the device. Deny blocks it. These actions in a QoS policy enable devices to enforce simple stateless firewall policies.

   d. Enable **Logging** to log traffic that matches the MAC-OUI-to-Extreme Networks class mapping.

      Logging is enabled by default, and helps you determine if the devices are receiving expected or unexpected types of traffic when you debug connectivity issues. You can see log entries in the event log on devices using the **`show logging buffer`** command. You can also configure the device to send logs to a syslog server where you can view log entries.

   e. Select **Save**.
6. To add more MAC-OUI-to-Extreme Networks QoS class definitions, select + and repeat steps 3–5.
7. Select **Save**.

Configure Classifier Maps Based on SSIDs

Devices can map traffic to classes based on either the SSID on which a packet arrives or the SSID on which it leaves. Use the following steps:

1. Go to **Configure** > **Common Objects** > **QOS** > **Classifier Maps** > **SSIDs** tab.
2. Select an existing map and then select ✏, or select +.
3. Type a **Name** for the Classifier Map
4. Type an optional **Description**.
5. To add a new SSID, select +.
   a. Select the name of an **SSID**.
   b. Choose a **QoS Class** to which you want to map traffic using this SSID.
   c. Select **Save**.
6. Select **Save**.

Configure Classifier Maps Based on 802.1p/DiffServ/802.11e

Extreme Networks devices can apply priority and class mappings to incoming traffic based on the priority markers of standard QoS classification systems in use in the surrounding network, such as IEEE 802.1p, DSCP (DiffServ codepoint), or IEEE 802.11e. A device can map the values to the classes in the QoS classification system, process the traffic accordingly, and then use a marker map to map the classes back to appropriate values in an external classification system before forwarding. By doing this, the device can apply its own QoS system to optimize the flow of traffic it processes while supporting a different QoS system used in the surrounding network.

The QoS classification tables show the mapping of priority values on incoming packets to classes. To enable the mapping of one of these classification systems, select 802.1p/DiffServ/802.11e, and then select a system. You can use the default mappings or modify them if necessary.

1. Go to **Configure** > **Common Objects** > **QOS** > **Classifier Maps** > **802.1p/DiffServ/802.11e** tab.
2. Select an existing map and then select ✏, or select +.
3. Type a **Name** for the Classifier Map
4. Type an optional **Description**.
5. Select a classification system **802.1p**, **DiffServ**, **802.11e**.

   You can use the default mappings or modify them if necessary.
6. Select **Save**.

Configure Marker Maps

For outgoing traffic, you can define marker maps to map classes to priority numbers in standard classification systems (802.11e, 802.1p, and DSCP). After you define classifier and marker maps, you then define classifier and marker profiles that enable one or more of the methods defined in the maps. Finally, you associate those profiles with SSIDs or interfaces to apply the mappings to traffic arriving at or exiting those interfaces.

Use the following procedures to configure marker maps for outgoing traffic. When you configure marker maps at the network policy level, you can reuse existing maps. Select the list, and in the dialog box, select the check box of a map and choose Select. All fields are automatically populated with the information for the selected map.

> Note
> Deleting a marker map from the Location Server dialog box also deletes it from the Common Objects list. You can only delete a marker map if no other configuration object is using it. to see a list of configuration objects that reference a marker map, hover over the number in the Used By column for that map in the Marker Maps window in the Common Objects section.

1. Go to **Configure** > **Common Objects** > **QOS** > **Marker Maps**.
2. Select an existing map and then select ✎, or select +.
3. Enter a **Name** for the marker map.
4. Enter an optional **Description** for the map.
5. On the **802.1p Markers** tab, toggle **802.1p Markers** to **On**.

   The QoS marking table shows the mapping of classes to WMM® (Wi-Fi Multimedia™) queues and the 802.1p classification system (marked in the L2 frame header in Ethernet frames). You can modify these mappings if necessary.

   Extreme Network devices always include 802.11e priority marking in the L2 headers of wireless frames automatically, so it is not included here as a configurable option.

   Depending on the classification systems used in the surrounding network, select the appropriate check boxes to map classes to one or both systems for outgoing traffic. A network policy can reference just one marker map.
6. On the **Diffserv** tab, toggle **Diffserv** to **On**.

   The QoS marking table shows the mapping of classes to WMM® (Wi-Fi Multimedia™) queues and the DiffServ codepoint marking system (marked in the L3 packet header) on outgoing packets. You can modify these mappings if necessary.

   > Note
   > If both 802.1p and DiffServ are enabled, only DiffServ takes effect.

Configure Rate Limiting and Queuing

Through the combined configuration of rate limits and forwarding mechanisms, you can control how a device schedules traffic forwarding for users belonging to a user profile. You can apply QoS to traffic originating from members of user profiles to determine the prioritization of various categories of traffic. Through these settings, you can set rate limits and traffic forwarding for each traffic class.

Use the following procedures to configure rate limiting and queuing profiles for network traffic.

1. Go to **Configure** > **Common Objects** > **QOS** > **Marker Maps**.
2. Select an existing map and then select ✎, or select +.

3. Enter a **Name** for the rate limiting profile.
4. Type the **Rate Limit per Client** and use the menu to specify **Mbps** or **Kbps**
5. Configure **Traffic Queue Management Per User per AP**.

   The **Class Number/Name** is a read-only list of the eight classes.

   > Note
   > Extreme Networks devices control the maximum amount of concurrent, cumulative bandwidth that members of a user profile can use by enforcing a maximum rate limit.

6. Select from one of two types of scheduling methods, **Strict** or **Weighted Round Robin**.

   Strict forces devices to immediately forward traffic with strict scheduling. This type of traffic is not queued.

   Devices forward **Weighted Round Robin** traffic based on class and weight of the traffic. Traffic with a higher class and greater weight is forwarded more quickly.
7. Set the scheduling method that you want the device to use for each traffic class.

   The default scheduling methods for each class are:
   - 7 - Network Control: Strict
   - 6 - Voice: Strict
   - 5 - Video: WRR
   - 4 - Controlled: WRR
   - 3 - Excellent Effort: WRR
   - 2 - Best Effort 1: WRR
   - 0 - Background: WRR
8. Enter a number for the scheduling weight preference.

   This is a defined preference for forwarding traffic using WRR scheduling. The weight that you enter affects the automatically calculated percentage of weight of each class of traffic in relation to the weights of the other classes.
9. Set a rate limit for each of the eight classes.

   Devices allocate bandwidth by rate limiting traffic based on its class. For each class, you can set a different rate limit for devices supporting IEEE 802.11a/b/g, 802.11n, and 802.11ac/x. The default rate limits for each class are as follows:
   - 7 - Network Control: 512 Kbps for 802.11a/b/g, 20,000 for 802.11n, 40,000 for 802.11ac and 802.11ax.
   - 6 - Voice: 512 Kbps for 802.11a/b/g, 20,000 for 802.11n, 40,000 for 802.11ac/x.
   - 5 - Video: 10,000 Kbps for 802.11a/b/g, 1,000,000 for 802.11n, 2,000,000 for 802.1ac/ax.
   - 4 - Controlled: 54,000 Kbps for 802.11a/b/g, 1,000,000 for 802.11n, 2,000,000 for 802.11ac/ax.
   - 3 - Excellent Effort: 54000 Kbps for 802.11a/b/g, 1,000,000 for 802.11n, 2,000,000 for 802.11ac/ax.
   - 2 - Best Effort 1: 54000 Kbps for 802.11a/b/g, 1,000,000 for 802.11n, 2,000,000 for 802.11ac/ax.

- 1 - Best Effort 2: 54,000 Kbps for 802.11a/b/g, 1,000,000 for 802.11n, 2,000,000 for 802.11ac/ax.
- 0 - Background: 54,000 Kbps for 802.11a/b/g, 1,0000,00 for 802.11n, 2,000,000 for 802.11ac/ax.

10. Select **Save**.

Management Configuration

The topics in this section provide details about management server configuration objects, such as DNS, NTP, SNMP, and Syslog server objects.

Related Topics

Configure a DNS Server on page 252

Configure an NTP Server on page 253

Configure an SNMP Server on page 254

Configure a Syslog Server on page 257

Configure a DNS Server

The DNS (Domain Name System) translates human-friendly domain names into IP addresses. You can supply external DNS server IP addresses or use routers to provide proxy DNS services for every local network under their control. The DNS service transparently proxies DNS requests and responses to and from internal or external DNS servers.

Use this task to configure a DNS server profile object.

1. Go to **Configure** > **Common Objects** > **Management** > **DNS Servers**.
2. Select an existing DNS server profile object, and then select ✎, or select +.
3. Configure the DNS Server Settings on page 253.
4. To add a new DNS server, select +.
   a. Type the IP address of the new DNS server.
   b. Select **ADD**.

   You can add up to three servers. The first entry is the primary server. The secondary entry is the secondary server, and the third entry is the tertiary server. Use the arrows in the **Order** column to change the order.
5. Select **SAVE**.

Related Topics

DNS Server Settings on page 253

Management Configuration on page 252

DNS Server Settings

Table 35: Settings for DNS server profiles

Setting	Description
Name	(Required) Type a **Name** for the default DNS server.
Domain Name	Type a **Domain Name** for the default DNS server.
Description	Type a description for the default DNS server. Although optional, entering a description is helpful for troubleshooting and for identifying the DNS server.

Related Topics

Configure DNS Server Policy Settings on page 71

Configure a DNS Server on page 252

Configure an NTP Server

Extreme Networks devices typically obtain the time and date for their internal clocks from an NTP server. Create NTP server profiles in the Common Objects area first, before creating Network Policies and the VGVAs that reference them.

1. Go to **Configure** > **Common Objects** > **Management** > **NTP Servers**.
2. Select an existing NTP Server and then select ✎, or select +.
3. Configure the NTP Server Settings on page 254.
4. To add an NTP server, select +.
   a. To use an existing NTP server, select it from the ☰ menu.
   b. To add a new NTP server, select +, and then select **IP Address** or **Host Name**.
   c. Type a **Name** for the new IP object.
   d. (Optional) If you want to change your previous selection, select **IP Address** or **Host Name** from the menu.
   e. Select **SAVE IP OBJECT**.
   f. Select **ADD**.

   ExtremeCloud IQ accesses NTP servers in order, from the top down. Use the up and down arrows to rearrange them if necessary.
5. Select **SAVE**.

Related Topics

Configure NTP Server Policy Settings on page 71

Management Configuration on page 252

NTP Server Settings

Table 36: Settings for NTP server profiles

Setting	Description
Name	Type a **Name** for the NTP server.
Domain Name	(Optional) Type a **Domain Name** for the NTP server.
Synchronize the device clock with the NTP servers.	1. Type the **HiveOS Device Sync Interval** value (in minutes). 2. From the **Switch Sync Interval**, select a value.

Related Topics

Configure NTP Server Policy Settings on page 71

NTP Server Settings on page 254

Configure an SNMP Server

SNMP (Simple Network Management Protocol) exchanges information between network devices and one or more central network management stations (referred to in ExtremeCloud IQ as an SNMP server). The devices send traps, which are unsolicited messages, to the management stations on UDP port 162 when events of note occur. Management stations also query monitored devices to check their operational status. The queries are in the form of get commands that management stations send on UDP port 161.

The **SNMP Server Profiles** table displays information about SNMP server profiles and their assignments to network policies and VGVAs (VPN Gateway Virtual Appliances), including the server profile name, a description, and the number of network policies or VGVAs that reference the SNMP server profile. Hover over any non-zero number to see the names of the policies and VGVAs.

You can create an SNMP server profile at the device level for a specific VGVA to override the SNMP server profile inherited from the network policy to which the VGVA belongs.

> Note
> You can only add an SNMP server profile at the device level if SNMP is first enabled and configured at the network policy level.

Complete the following steps to configure an SNMP server profile.

1. Go to **Configure** > **Common Objects** > **Management** > **SNMP Servers**.
2. Select an existing SNMP Server and then select ✎, or select +.
3. Configure the SNMP Server Settings on page 255.
4. To add a new SNMP server, select +, and then select **IP Address** or **Host Name**.

   You can add up to three SNMP servers to the profile.

5. To use an existing SNMP server, select it from the **SNMP Server** menu.

   Choose the IP address or host name object for the SNMP server or servers that will access the devices. To permit management access from a single SNMP server, choose an IP address or host name that defines just that server. To permit management access from an entire subnet, choose an IP address or host name that defines that subnet. If you do not see the IP address or host name that you need, select **New** and define one.
6. Type a **Name** for the new IP object.
7. (Optional) If you want to change your previous selection, select **IP Address** or **Host Name** from the menu.
8. Select **SAVE IP OBJECT**.
9. Select the version of SNMP that is running on the management station you intend to use from the **Version** menu.
10. From the **Operation** menu, select the type of activity to permit between the specified SNMP management station and the devices in the network policy that are assigned to this profile.

    Options include:

    - **None**: Disable all SNMP activity for the specified management station.
    - **Get**: Permit GET commands sent from the management station to a device to retrieve MIBs.
    - **Get and Trap**: Permit the reception of GET commands from the management station and the transmission of traps to the management station.
    - **Trap**: Permit devices to send messages notifying the management system of events of interest.
11. In the **Community** field (for SNMP V2C and V1), enter a text string that must accompany queries from the management station.

    The community string acts similarly to a password, such that devices only accept queries from management stations that send the correct community string.
12. Select **ADD SNMP SERVER**.
13. Select **SAVE SNMP SERVER**.

Related Topics

SNMP Server Settings on page 255

Management Configuration on page 252

SNMP Server Settings

Table 37: Settings for SNMP servers

Setting	Description
Name	Type a **Name** for the server.
Description	(Optional) Type a brief **Description** for the server. Although optional, entering a description is helpful for troubleshooting and for identifying the server.

Table 37: Settings for SNMP servers (continued)

Setting	Description
SNMP Contact	Type the **SNMP Contact** contact information for the SNMP server administrator, so they can be contacted if necessary. This can be an email address, telephone number, physical location, or a combination.
Disable to Send traps over CAPWAP	Clear the check box for **Disable to Send traps over CAPWAP** to enable devices to send trap information (events and alarms) to ExtremeCloud IQ over a CAPWAP connection, or leave the box checked to disable this action.
SNMP Server	Select an SNMP server from the drop-down list. Choose the IP address or host name object for the SNMP server or servers that will access the devices. To permit management access from a single SNMP server, choose an IP address or host name that defines only that server. To permit management access from an entire subnet, choose an IP address or host name that defines that subnet. If you do not see the IP address or host name that you need, select **+** and define one.
Version	From the drop-down list, select the version of SNMP that is running on the management station that you intend to use.

Table 37: Settings for SNMP servers (continued)

Setting	Description
Operation	Select the type of activity to permit between the specified SNMP management station and the devices in the network policy to which you will assign this profile. Options include: • **None**: Disable all SNMP activity for the specified management station. • **Get**: Permit GET commands sent from the management station to a device to retrieve MIBs. • **Get and Trap**: Permit the reception of GET commands from the management station and the transmission of traps to the management station. • **Trap**: Permit devices to send messages notifying the management system of events of interest.
Community	For SNMP V2C and V1, enter a text string that must accompany queries from the management station. The community string acts similarly to a password, such that devices accept queries only from management stations that send the correct community string.

Related Topics

Configure SNMP Server Policy Settings on page 72

Configure an SNMP Server on page 254

Configure a Syslog Server

You can configure syslog server profiles for device log entry storage. The syslog administrator can then sort messages by facility and see all the ones relating to Extreme Networks devices. The administrator can further sort the messages by IP address and by severity. Syslog server settings can be configured as common objects, from within the network policy workflow, and at the device level. Device-level settings override network policy settings.

> **Note**
> Using NTP to synchronize the time stamp on messages from all syslog clients can ensure that all messages reported to the syslog server appear in their proper chronological order. Otherwise, it can be very difficult to interpret a series of events affecting multiple network devices, such as reconnaissance probes and network intrusion exploits. To further ensure synchronicity, as a best practice, have all syslog clients use the same NTP time server. See Configure an NTP Server on page 253.

1. Go to **Configure** > **Common Objects** > **Management** > **Syslog Servers**.
2. Select an existing Syslog Server and then select ✎, or select +.
3. Configure the Syslog Server Settings on page 258.
4. To add a syslog server to the table, select +.

   Use the up or down arrows to reorder the list of syslog servers in the table.
5. Select an existing syslog IP Address or host name from the ☰ menu, or select +.
6. For **Severity**, select the log level.
7. Type the **Port** number.
8. Select **ADD**
9. Select **SAVE SYSLOG SERVER**.

Related Topics

Syslog Server Settings on page 258

Management Configuration on page 252

Syslog Server Settings

Table 38: Settings for Syslog servers

Setting	Description
Name	Type a **Name** for the syslog server.
Description	(Optional) Type a **Description** for the syslog server. Although optional, entering a description is helpful for troubleshooting and for identifying the server.
Syslog Facility	
IQ Engine Syslog Facility	Select an **IQ Engine Syslog Facility** to categorize messages sent to syslog from IQ Engine devices. Because syslog servers can receive messages from many types of network devices, such as routers, firewalls, mail servers, you can designate one of the twelve syslog facilities reserved for local use—Auth, Authpriv, Security, User, and Local0 to Local7—to mark messages from all the devices to which you apply this management service set.

Table 38: Settings for Syslog servers (continued)

Setting	Description
Non-IQ Syslog Facility	Select a **Non-IQ Syslog Facility** to categorize messages sent to syslog from non-IQ Engine devices.
Syslog Group	Select the arrow to expand the **Syslog Group** section, and use the menus to select the log level for each category. • Emergency • Alert • Critical • Error • Warning • Notification • Info • Debug Syslog groups organize messages by category and limit the number of messages sent based on severity level. APs do not send messages that are below the assigned level to the syslog server.
Syslog servers are on the same internal network as the reporting Extreme Networks devices (for PCI DSS compliance)	If you must make PCI DSS compliance reports, select the check box. If the servers are on an external network outside the firewall, clear the check box.

Related Topics

Configure Syslog Server Policy Settings on page 73

Configure a Syslog Server on page 257

Network Configuration

The topics in this section provide details about network configuration objects, including: Access consoles, ALG, LLDP/CDP profiles, IP tracking groups, Layer 2 IPSec/VPN services, location servers, management options, tunnel policies, sFlow receivers, network services, subnetwork space, firewalls, and VPN services.

Related Topics

Configure an Access Console on page 260

Configure ALG Services on page 261

Configure LLDP and CDP on page 261

Configure an IP Tracking Group on page 263

Configure Layer 2 IPsec VPN Services on page 264

Configure Location Servers on page 270

Add Management Options on page 273

Configure Tunnel Concentrator Services on page 284

Configure Tunnel Policies on page 287

Configure an sFlow Receiver on page 288

Configure Network Services on page 289

Add a Subnetwork Space on page 290

Configure a Firewall Policy on page 294

Configure an Access Console

An access console is a special SSID that provides wireless console access to a device when it is not accessible through the wired network.

> Note
> Access Console is only supported by IQ Engine APs and cannot be used with other devices.

1. Go to **Configure** > **Common Objects** > **Network** > **Access Consoles**.
2. Select an existing Access Console and then select ✎, or select +.
3. Enter a **Name** for the Access Console.
4. Enter an optional **Description**.
5. Set the **Mode** for the console.
   - **Auto**—Automatically enabled
   - **Enable**—Manually enabled
   - **Disable**—Manually disabled
6. Select one of the following **Access Security** options:

   WPA-(WPA or Auto)-PSK: Use WPA for key management on devices introduced before ExtremeCloud IQ 6.1r5; and for Extreme Networks devices introduced in ExtremeCloud IQ 6.1r5 or later, to negotiate the use of WPA2 or WPA with their associated clients.

   WPA2 -(WPA2 Personal)-PSK: Force clients to use the WPA2 key management scheme. WPA supports PMK caching and preauthentication where WPA does not.

   Auto-(WPA or WPA2)-PSK: Negotiate the use of WPA2 or WPA with clients based on their supported version.

   > Note
   > This option automatically chooses the **Encryption Method**.

   Open: Unsecured network access.

   > Note
   > This option does not require an **Encryption Method** or **ASCII Key**.

7. Select an **Encryption Method** based on your chosen Access Security option.
8. When using one of the preshared key options, enter the **ASCII Key**.
9. Set the maximum number of wireless clients that can concurrently connect to the access console.
10. Select **Hide the SSID in beacons and probe responses** so that the device does not announce the SSID for the access console in its beacons or in its responses to clients' probes.

11. Select **Enable Telnet Access** to enable Telnet connectivity to the device through the access console.
12. To add a MAC Filter, select the plus sign.
13. For **MAC Filters/Default Action**, select **Permit** to enable traffic from clients that do not match one of the selected filters, or **Deny** to block traffic from clients that do not match any of the selected MAC filters.
14. Select the plus sign.
15. Either select an existing MAC Filter or select the plus sign to create a new **MAC Address** or **OUI**.
16. If you create a new address or OUI, enter the information and select **Save**.
17. For **Action**, select **Permit** to enable traffic from clients that do not match one of the selected filters, or **Deny** to block traffic from clients that do not match any of the selected MAC filters.
18. Select **Add**.
19. Select **Save**.

Configure ALG Services

You can configure ALG services from inside the network policy or as common objects.

Complete the following steps to configure ALG services.

1. Select the add icon.
2. Enter a name for the ALG service.
3. Enter an optional description for the service.
4. From the table, select check boxes to enable the protocols you want to associate with this ALG service.
5. Select the quality of service to apply to each protocol for which QoS is available.
6. Enter the timeout for FTP, SIP, and TFTP to keep devices from timing out during long file transfers.

   The range is 1 to 1800 seconds, and defaults vary by protocol.
7. Enter the maximum session length for FTP, SIP, and TFTP.

   The range is 1 to 7200 minutes, and defaults very by protocol.
8. Select **Save**.

Configure LLDP and CDP

To enable LLDP/CDP for a port, ensure that LLDP/CDP is enabled in both the policy level and the port level configuration.

Extreme Networks devices can advertise LLDP data and receive, cache, and display both LLDP and CDP data. However, they do not advertise CDP data. You can use LLDP and CDP data to help debug network issues. For example, the CDP data can be used when debugging VLAN issues on Cisco switches.

Use this task to configure a new LLDP/CDP object.

1. Navigate to **Configure** > **Common Objects** > **Network** > **LLDP/CDP**.

2. Select an existing LLDP/CDP object, and then select ✎, or select +.
3. Configure the settings.

   See LLDP and CDP Settings on page 262.
4. Select **SAVE**.

Related Topics

LLDP and CDP Settings on page 262

Network Configuration on page 259

LLDP and CDP Settings

Table 39: Settings for LLDP and CDP

Setting	Description
Name	Type a **Name** for the new LLDP/CDP object.
Description	(Optional) Type a **Description** for the new LLDP/CDP object. Although optional, entering a description is helpful for troubleshooting and for identifying the LLDP/CDP object.
Enable LLDP on access ports	Select the check box to permit LLDP on access ports. **Note:** LLDP is enabled on other port types by default.
Enable receive only mode.	Select the check box to permit devices to receive, cache, and display LLDP advertisements from other devices, but to not advertise their own data.
LLDP entries to cache	(IQ Engine Only) Type the maximum number of LLDP entries from neighboring network devices that a device can store in its cache.
Neighbors keep Extreme Networks advertisements for	Type the number of seconds for which neighboring devices retain LLDP advertisements. Increase the time while troubleshooting a network issue and decrease it if you need to reduce overall network traffic.
Advertisements Interval	Type the number of seconds between LLDP advertisements sent to neighboring network devices.
Timer Hold	Type a multiple of the advertisements interval. (EXOS/ Switch Engine, VOSS/Fabric Engine, SR22XX/23XX, Dell)
Max power for LLDP advertisements	Select **Use the default max power in IQ Engine** to use the maximum power level that devices can request in LLDP advertisements.
LLDP Initialization Delay Time	Type the length of time that you want the interface to wait before initializing LLDP.
Fast start repeat count	Type the number of advertisement LLDP frames to send when the connected device (such as an IP phone) starts up or is discovered.

Table 39: Settings for LLDP and CDP (continued)

Setting	Description
CDP (Cisco Discovery Protocol)	Toggle CDP **ON** to enable devices to receive and cache CDP advertisements. **Note:** You can enable LLDP and CDP concurrently. CDP is a proprietary Data Link Layer protocol developed by Cisco Systems.
Enable CDP on access ports.	Select the check box to permit CDP on access ports. By default, CDP is enabled on other port types.
CDP entries to cache	Type the maximum number of CDP entries that a device can store in its cache.

Related Topics

Configure LLDP/CDP Policy Settings on page 76

Configure LLDP and CDP on page 261

Configure an IP Tracking Group

You can specify groups of IP addresses to track and take action if one or more IP addresses become unreachable. IP group tracking logs and sends alerts when group IPs are unresponsive, and when actions are taken. A customized tracking group can be used to disable specific SSIDs when an IP is unavailable.

This task is part of the network policy configuration workflow. Use this task to configure **NTP Server** policy settings for a network policy.

1. Go to **Configure** > **Common Objects** > **Network** > **IP Tracking Groups**.
2. Select an existing IP tracking group, and then select ✎, or select + to create a new group.
3. Configure the settings.

   See IP Tracking Group Settings on page 264.
4. Select **SAVE**.

Related Topics

IP Tracking Group Settings on page 264

Network Configuration on page 259

IP Tracking Group Settings

Table 40: Settings for IP Tracking Groups

Setting	Description
Name	Type a **Name** for the group.
Description	(Optional) Type a **Description** for the group. Although optional, entering a description is helpful for troubleshooting and for identifying the group.
Connectivity	Select either **Backhaul Connectivity Tracking for APs** or **WAN Interface Connectivity Tracking for APs**.
Enable IP Tracking	To activate this IP tracking group, select the check box. Clear the check box to exclude the group from **Available IP Tracking Groups**.
Track the Following Targets	
IP Addresses	Enter up to four IP addresses, separated by commas. If you are also tracking the default gateway, enter up to three IP addresses.
Default Gateway	If the IP addresses use the default gateway, select **Default Gateway**. Otherwise, clear the check box.
Take action when	From the menu, select a condition for which to take action. Choose between **All targets become unresponsive** and **A single target becomes unresponsive**.
Tracking Interval	(Required) Type the tracking interval for this group. Default: 6
Tracking Retries	(Required) Type the number of retries before taking action for an IP address failure. Default: 3
Actions to take when target becomes unresponsive	
Enable the virtual access console	Select the check box to take this action when the target is unresponsive.
Disable all active SSIDs	Select the check box to take this action when the target is unresponsive.
Start the backhaul (mesh) failover procedure	Select the check box to take this action when the target is unresponsive.

Related Topics

Configure IP Tracking Policy Settings on page 76

Configure an IP Tracking Group on page 263

Configure Layer 2 IPsec VPN Services

To configure a Layer 3 IPsec VPN service, see Configure Layer 3 VPN Services on page 134.

Layer 2 IPsec VPN is a logical extension of the Layer 2 broadcast domain across an IPsec VPN tunnel. After configuration, it is available for use in multiple network policies. Use the following procedure to configure a new Layer 2 IPsec VPN service.

1. Go to **Configure** > **Common Objects** > **Network** > **Layer 2 IPsec VPN Services**.
2. Select an existing Layer 2 IPsec VPN service and then select ✎, or select +.
3. Enter a **Name** for the service.
4. Enter an optional **Description**.
5. Select either **Single Device VPN Server** or **Redundant Device VPN Server**.

   If you selected **Single Device VPN Server**, continue with the next step. If you selected **Redundant Device VPN Server**, proceed to Step 13.
6. If you selected **Single Device VPN Server**, select an AP with Layer 2 IPsec VPN services enabled from the drop-down list.
7. **Server Public IP Address** is auto-filled based on the selected VPN server settings, but to change it, enter the IP address of the VPN server that VPN clients can reach across the network.

   a. If the VPN server is behind a NAT device, enter the address of the MIP address on the NAT device.

   b. If there is no NAT device in front of the VPN server, enter the server's mgt0 address, which is the same address as that in the next field.
8. **Server MGT0 IP Address** is auto-populated and is read-only.
9. **Server MGT0 Default Gateway** is auto-populated and is read-only.
10. Enter the first IP address of a range of addresses that the VPN server assigns to tunnel interfaces on VPN clients during the Xauth phase of tunnel setup.

    Best practice suggests putting this address pool in the same subnet as the VPN server mgt0 interface, and the same subnet as the addresses that the DHCP server assigns to wireless clients through the tunnel. If the tunnel interfaces are in a different subnet, you must define a route the VPN server default gateway router uses to forward traffic destined for the tunnel interface, and traffic destined for the wireless clients to the VPN server mgt0 interface.
11. Enter the IP address at the end of the range of IP addresses in the address pool.
12. Enter the netmask that defines the subnet to which the tunnel interfaces belong.
13. Select the DNS server IP address or host name that VPN clients use to resolve domain names on the VPN server network.

    If you do not see the object you want, select the add icon and add a new one.
14. If you selected **Redundant Device VPN Server** in Step 4, enter the following information for **Device VPN Server 1** and **Device VPN Server 2**:

    - **Device VPN Server**: Select an AP with Layer 2 IPsec VPN services enabled from the drop-down list.
    - **Server Public IP Address**: Auto-filled from the selected VPN server settings; editable.
    - **Server MGT0 IP Address**: Auto-filled from the selected VPN server settings; read-only.
    - **Server MGT0 Default Gateway**: Auto-filled from the selected VPN server settings; read-only.

- **Client Tunnel IP Address Pool Start**: Enter the first IP address for the client pool.
- **Client Tunnel IP Address Pool End**: Enter the last IP address for the client pool.
- **Client Tunnel IP Address Pool Netmask**: Enter the netmask for the client pool of IP addresses.

> Note
> The VPN client IP address pools for redundant VPN servers can be in the same subnet or different subnets. However, the address pools must not overlap. If there is overlap, VPN clients can receive duplicate IP address assignments.

15. For **Device VPN Client DNS Server**, choose the DNS server IP address or host name object that VPN clients use to resolve domain names, or select the add icon to define a new one.
16. For **User Profiles for Traffic Management**, select **Enabled** in the VPN Tunnel Mode column to enable VPN clients to tunnel traffic for specific user profiles.

    ExtremeCloud IQ displays a list of user profiles whose traffic can be forwarded through the Layer 2 IPsec VPN tunnel or forwarded without tunneling.

    a. After enabled, to tunnel all client traffic, select **Tunnel All Traffic**.
    b. To enable split mode tunneling, select **Split Tunnel**.
17. Select **SAVE**, or configure **Optional Settings**.

Configure **Optional Settings** > **IPsec VPN Authority Settings**, see Configure IPsec VPN Authority Settings on page 135.

Related Topics

Configure IPsec VPN Authority Settings on page 135
About Server-Client Credentials on page 136
Configure Advanced Server Options on page 137
Configure Advanced Client Options on page 138

Configure IPsec VPN Authority Settings

Create or edit a Layer 2 IPsec VPN service. For more information, see Configure Layer 2 IPsec VPN Services on page 264.

The authentication mechanism between a VPN gateway and a VPN client operates in hybrid mode, which employs a combination of certificates and passwords for VPN peer authentication. Use this task to import certificates in PFX or DER formats, to import a pair of DER-formatted files, one containing a certificate and the other its accompanying private key, and convert their format from DER to PEM.

> Note
> Default certificates are intended to be used for testing only.
> Extreme Networks VPN gateways do not support password-encrypted certificates.

For hybrid mode authentication, ExtremeCloud IQ distributes the certificates as follows:

- **VPN Certificate Authority**: The CA certificate is loaded on VPN clients so that they can validate the server certificate that the VPN gateway presents.
- **VPN Server Certificate**: The server certificate on the VPN gateway is used during IKE Phase 1 negotiations to authenticate itself to the VPN client.
- **VPN Server Cert Private Key**: The private key accompanies the public key in the server certificate. This is also loaded on the VPN gateway.

Use the following procedure to configure IPsec VPN Authority settings.

1. In the **Optional Settings** section, expand **IPsec VPN Authority Settings**.
2. If you do not have a certificate or key that you want to use, select **Import**.
3. To import a PFX-formatted file, which contains a certificate and private key combined, and convert its format from PFX to PEM:
   a. Choose **Select**, navigate to and select the .PFX file.
   b. Select **Convert the certificate format from PFX to PEM**.
   c. Enter the password that was used to encrypt the PFX file.
   d. Select **Import**.

   Later, when you use the PEM-formatted file that contains both the certificate and private key, you must choose the same file as both the VPN Certificate and the VPN Cert Private Key.
4. To import a pair of DER-formatted files, one containing a certificate and the other its accompanying private key, and convert their format from DER to PEM:
   a. Choose **Select**, navigate to and select the .DER file.
   b. Select **Convert the certificate format from DER to PEM**.
   c. Select the type of file you are importing; in this case, **Certificate**.
   d. Select **Import**.
   e. To import the private key file matching the public key in the certificate you just imported, repeat Steps a-c, but select **Key** for the file type.
   f. When importing a DER-formatted private key, enter the password used to encrypt the file.
   g. Select **Import**.

   When you choose the VPN Server Certificate and VPN Server Cert Private Key, make sure they correspond with each other.

For information about **Optional Settings** > **Server-Client Credentials**, see About Server-Client Credentials on page 136.

Related Topics

About Server-Client Credentials on page 136

Configure Layer 2 IPsec VPN Services on page 264

About Server-Client Credentials

When you save the Layer 2 IPsec VPN service configuration, ExtremeCloud IQ populates this table with randomly generated text strings that VPN clients use to identify themselves to VPN gateways. Extreme Networks VPN clients use these strings like passwords when identifying themselves to the VPN gateway during the Xauth stage between IKE Phase 1 and 2 negotiations.

After a device is configured as a VPN client, ExtremeCloud IQ allocates one of the credentials to it. The name of the VPN client appears in the **VPN Client Name** column and the entry in the **Allocated** column changes from false to true. The primary and secondary VPN servers assigned to that client appear in their respective columns.

Next, configure **Optional Settings** > **Advanced Server Options**. See Configure Advanced Server Options on page 137.

Related Topics

Configure Advanced Server Options on page 137

Configure Layer 2 IPsec VPN Services on page 264

Configure Advanced Server Options

Create a Layer 2 IPsec VPN service. For more information, see Configure Layer 2 IPsec VPN Services on page 264.

Use the following procedure to change the IKE Phase 1 and Phase 2 options.

1. In the **Optional Settings** section, expand **Advanced Server Options**.
2. For **IKE Phase 1 Options**:
    a. Set the **Encryption Algorithm** as 3DES (Triple DES, Data Encryption Standard), or AES (Advanced Encryption Standard) with a 128-bit key, a 192-bit key, or a 256-bit key.
    b. Set the **Hash Algorithm** as MD-5 (Message Digest, version 5) or SHA-1 (Secure Hash Algorithm).
    c. Set the **Diffie-Hellman Group** for generating a shared key during Phase 1 negotiations to 1, 2, or 5.
    d. Set the phase 1 SA (security association) **Lifetime**.

       Before the SA expires, the authentication and encryption keys are automatically refreshed with new ones. You can set it to a different value, from 180 seconds (3 minutes) to 10,000,000 seconds (a very long time).
3. For **IKE Phase 2 Options**, the options are the same as for Phase 1, except you can choose to not perform a Diffie-Hellman key exchange.

4. Select **Enable peer IKE ID validation** to enable VPN clients to validate the IKE ID that the VPN gateway sends them, and choose the type of IKE ID to use.

   When you create a server certificate, you have the option to define one or more of these subject alternative names: IP address, FQDN (fully-qualified domain name), user FQDN. You can use any of them as the IKE ID for the VPN gateway. You can also use the ASN.1 DN (Abstract Syntax Notation One Distinguished Name), which is automatically created by concatenating various values in the certificate— including the common name, different organizational units, and the email address.

   When you update the configured devices with a configuration that includes a VPN services profile that references this server certificate, ExtremeCloud IQ pushes the server certificate and the specified IKE ID type to the VPN gateway. At the same time, ExtremeCloud IQ also pushes the CA certificate, IKE ID type, and IKE ID string to all the VPN clients. In this way, the VPN clients are ready to authenticate the VPN server certificate and its IKE ID when the time comes to do so during IKE negotiations.

Next configure **Optional Settings** > **Advanced Client Options**, see Configure Advanced Client Options on page 138.

Related Topics

Configure Advanced Client Options on page 138

Configure Layer 2 IPsec VPN Services on page 264

Configure Advanced Client Options

Create a Layer 2 IPsec VPN service. For more information, see Configure Layer 2 IPsec VPN Services on page 264.

For Layer 2 IPsec VPN tunnels, all management servers (CAPWAP, Syslog, SNMP, NTP, RADIUS, Active Directory, and LDAP) should be reachable from the VPN client without tunneling by default. However, you might want to tunnel some or all management traffic from the VPN client to servers on the main network. Use the following procedure to specify which type of management traffic you want VPN clients to send through the tunnel and which to forward locally.

1. In the **Optional Settings** section, expand **Advanced Client Options**.
2. For **Management Tunnel Traffic Options**:

   > Note
   > Set the following options only when the servers are in a different subnet from that of the tunnel interface. When they are in the same subnet, tunneling is automatic. In addition, the IP address/host name objects for the following servers must have IP address definitions as opposed to host name definitions.

   a. Select **ExtremeCloud IQ (CAPWAP)** to tunnel all CAPWAP (Control and Provisioning of Wireless Access Points) traffic from VPN clients to ExtremeCloud IQ, which is a CAPWAP server.
   b. Select **Syslog** to send log entries to a syslog server through the VPN tunnel.
   c. Select **SNMP Traps** to send all SNMP traps through the VPN tunnel to an SNMP management system.

d. Select **NTP** to tunnel all NTP traffic from VPN clients to an NTP server.

e. Select **RADIUS** to tunnel all RADIUS traffic from VPN clients to a RADIUS authentication server.

f. Select **Active Directory** to tunnel all traffic from an Extreme Networks RADIUS authentication server to an Active Directory server.

g. Select **LDAP** to tunnel all traffic from a RADIUS authentication server to an LDAP server.

3. Select **Enable NAT Traversal** to enable VPN traffic to traverse NAT devices encountered along its data path.
4. For **DPD (Dead Peer Detection) Settings**:

   The DPD and tunnel heartbeat settings control when to fail over from the primary to the secondary VPN server. The DPD messages verify the presence of an IKE peer, and AMRP (Advanced Mobility Routing Protocol) tunnel heartbeats verify communications through the GRE and VPN tunnel. The failure of either mechanism can trigger a failover.

   a. Set the **Heartbeat Interval** for sending DPD R-U-There heartbeat messages from the VPN client to the VPN gateway.

   b. Set the number of times to retry sending a DPD R-U-There message when it does not elicit a response.

   c. Set the amount of time between retries.

5. For **Tunnel Heartbeat Settings**:

   a. Set the **Interval** for sending AMRP heartbeats through the GRE and VPN tunnel from the VPN client to the VPN server.

   b. Set the number of times to **Retry** sending a heartbeat if the VPN server fails to respond.

   After a heartbeat fails to elicit a response from the VPN server, the VPN client retries every second.

Related Topics

Configure Layer 2 IPsec VPN Services on page 264

Configure Location Servers

Create a network policy for these settings.

Extreme Networks devices perform background monitoring for Wi-Fi devices, RFID tags, rogue APs, and others. When found, they send information to ExtremeCloud IQ, AeroScout location servers, or location services such as Ekahau that use Tazmen Sniffer Protocol (TZSP) to be monitored and tracked.

1. Toggle **Location Server ON**.
2. Use the **Re-use Location Server Settings** option to select a previously configured location server profile.

   If you are not choosing this option, complete the next steps.
3. Enter a name.
4. Enter an optional description.

5. Toggle **Client Location Tracking ON** to enable location tracking and reporting to the location processing engine.
6. For **Track Client Location Using**:

   Extreme Networks Location Server: See Configure Track Client Location Using an Extreme Location Server on page 272.

   AeroScout Location Server: See Configure Track Client Location Using an AeroScout Location Server on page 271.

   Tazmen Sniffer Protocol (Ekahau, etc...): See Configure Track Client Location Using the Tazmen Protocol on page 272.

Continue configuring the network policy.

Configure Track Client Location Using an AeroScout Location Server

Configure a Location Server.

> Note
> When tracking AeroScout RFID tags, you must use the **AeroScout Tag Manager** to configure the tags to broadcast beacons using the IBSS data frame format. Navigate to the **Transmission** tab in the **Configuration** window. Choose **IBSS** from the Data Frame Format drop-down list, make sure that the MAC address in the **IBSS/WDS** field is `01-0C-CC-00-00-00`, which it is by default with **IBSS** chosen, and then select **Save**.

To integrate devices with AeroScout real-time locating services (RTLS), define the IP address or domain name of the AeroScout Engine, designate the types of wireless devices locations to track, set a threshold for the maximum number of packets per second, and enable the feature.

1. Select **AeroScout Location Server**.
2. For **IP Address or Domain Name**, from the drop-down list, choose the IP address or host name of the AeroScout location processing engine that will receive tracking reports.

   Extreme Networks devices receive messages from the server on UDP port 1144. To add a new IP Address or Host Name, see Add IP Objects and Host Names on page 229.
3. Select **Enable location detection for tags** to enable Extreme Networks devices to track Wi-Fi enabled tags and then forward them together with their RSSI values to the AeroScout location processing engine.

   Set a rate limit threshold to protect devices from CPU overload and attack by floods of malformed tag frames.
4. Select **Enable location detection for stations** to enable tracking currently active wireless stations.

   Set a rate limit threshold to determine the maximum number of station-transmitted packets to process each second. This threshold limits the amount of device CPU resources allocated to station tracking and protects the device from packet flood attacks.

5. Select **Enable location detection for rogue APs** to enable Extreme Networks devices to track the location of rogue APs, and report captured packets and rogue AP RSSI values to the AeroScout location processing engine.

   Set a rate limit threshold to protect Extreme Networks devices from CPU overload and packet flood attacks.

Continue configuring a network policy.

Configure Track Client Location Using an Extreme Location Server

Configure a Location Server.

Devices configured as location servers take readings on the RSSI. The RSSI indicates the RF signal strength of the link between the AP and the wireless client. Each Extreme Networks device within the client range sends its most recent RSSI measurement for that client to the owner device. The owner device is the one to which a client is associated. Then the owner device sends an aggregated RSSI report to ExtremeCloud IQ.

1. Select **Extreme Networks Location Server**.
2. For **RSSI Change Threshold**, set the number of decibels (dB) a client RSSI must increase or decrease to trigger an Extreme Networks device to update its report to the owner device, and for the owner device to update its report to ExtremeCloud IQ.
3. For **RSSI Valid Period**, set the time that a client RSSI measurement remains valid.

   After this period elapses, an updated report for that client is transmitted even if the RSSI value has not crossed the RSSI change threshold.
4. For **RSSI Hold Count**, set the number of times the owner device can include the same client RSSI measurement from another device in its aggregate report to ExtremeCloud IQ before omitting it from future reports.
5. For **Location Report Interval**, set the interval between RSSI measurements from an Extreme Networks device to an owner device, and the owner device to ExtremeCloud IQ.
6. For **Report Suppression Count**, select the number of consecutive reports to suppress when a client RSSI measurement does not change significantly.

Continue configuring a network policy.

Configure Track Client Location Using the Tazmen Protocol

Create a Location Server.

> Note
> To integrate Extreme Networks devices with location services such as Ekahau that use the Tazmen Sniffer Protocol (TZSP), you must first configure the RFID tags with the SSID settings that they will use to associate with a device. With the IP address of the location processing engine or domain name, they will connect through the device. Refer to Ekahau product documentation for details on configuring tags through the Ekahau Activator and Ekahau Positioning Engine.

Use this task to configure Extreme Networks devices to work with a TZSP-based location service.

1. Select **Tazmen Sniffer Protocol**.
2. For **IP Address or Domain Name**, from the drop-down list, choose the IP address or host name for the location server that will receive TZSP-encapsulated multicast data frames, RSSI measurement, and channel information for each multicast frame.

   To add a new IP Address or Host Name, see Add IP Objects and Host Names on page 229.
3. For **Port**, the Extreme Networks device listens for the connection request on the UDP port that you enter here.

   It must be the same port configured on the server.
4. Enter the **Multicast MAC Address** that RFID tags periodically transmit data frames to, so that devices can listen for them on their wireless interfaces, and forward them to the location engine specified in the **IP Address or Domain Name** field.
5. Enter the **Rate Limit Threshold for Tags** to protect Extreme Networks devices from CPU overload and attack by floods of malformed tag frames.

   The threshold applies to tags transmitting frames within the same second to the same set of Extreme Networks devices. The larger the number of tags, the less probable they will all happen to be sending multicast frames within the same second, and the less likely they will all associate within radio range of the same set of Extreme Networks devices. The threshold can be considerably lower than the number of deployed tags.

Continue configuring the network policy. If you have not already done so, configure an SSID with which the RFID tags will associate, and add it to the network policy.

Add Management Options

For more information about the settings, see Management Options on page 274.

Use these settings to control how administrators are authenticated and how they access the devices they manage.

1. Go to **Configure** > **Common Objects** > **Network** > **Management Options**.
2. Select an existing management object, and then select ✏, or select +.
3. Enter a **Name**.
4. Enter an optional **Description**.
5. Configure Forwarding Engine Control Management Options on page 283.
6. Configure System Settings Management Options on page 284.
7. Configure Authentication Settings Management Options on page 284.
8. After you have completed all the relevant sections, select **SAVE**.

Related Topics

Management Options on page 274

Configure Forwarding Engine Control Management Options on page 283

Configure System Settings Management Options on page 284

Configure Authentication Settings Management Options on page 284

Management Options

Use these settings to control how administrators authenticate and how they access the devices they manage. You can configure global and device-level settings. For example, you can enable or disable the reset button and console port, enable or disable proxy ARP requests and replies, enable APs and routers to forward broadcasts and multicasts between SSIDs, and a variety of other options such as adjusting LED brightness, and setting temperature alarms.

Forwarding Engine Control Management Options

The forwarding engine controls the type of traffic being forwarded between interfaces, between GRE tunnels, and sets logging features.

Table 41: Forwarding Engine Control Settings

Setting	Description
Forwarding Engine Control	
GRE Tunneling Selective Multicast Forwarding	Select one of the following options: • **Block All**—Prohibits forwarding multicast and broadcast traffic through tunnels. • **Allow All**—Enables forwarding multicast and broadcast traffic through tunnels. ExtremeCloud IQ devices can selectively block or permit broadcast and multicast traffic through GRE tunnels to reduce traffic congestion. You can filter using a blocked list that blocks the forwarding of all broadcast and multicast traffic through GRE tunnels (or blocks all except to a few select destinations) or using an allow list that permits all broadcast and multicast traffic through GRE tunnels (or allows all, except to a few destinations).
Exception IP List	Add an entry (destination IP Address and Netmask) to the **Exception IP List**. Type the values, and then select **ADD**.
Service Control	
Limit MAC Sessions per Station	Select **Limit MAC Sessions per Station** to enable the feature, and then type the maximum number of (Layer 2 sessions) that can be created to or from a station. By default, devices do not enforce MAC or IP session limits per station. By default, devices do not enforce IP session limits per station.
Limit IP Sessions per Station	Select **Limit IP Sessions per Station** to enable the feature, and type the maximum number of sessions per station. This feature enables a device to monitor the TCP MSS (maximum segment size) option in TCP SYN and SYN-ACK messages for traffic that the device is going to pass through GRE tunnels (for Layer 3 roaming and static identity-based tunnels) and GRE-over-IPsec tunnels (for IPsec VPN tunnels). The device can then notify the sender to adjust the TCP MSS value if it exceeds a maximum threshold.

Table 41: Forwarding Engine Control Settings (continued)

Setting	Description
Enable TCP Maximum Segment Size	Select **Enable TCP Maximum Segment Size** to enable the feature, and then type the maximum segment size. When establishing a TCP connection, neither end is aware of the packet processing done by network forwarding equipment in between. For example, if a device has to send traffic through an IPsec VPN tunnel, then it adds a GRE header, IPsec header, and possibly a UDP header for NAT-Traversal to each packet. Since the additional headers expand packet size, the device is forced to fragment them, which increases packet processing and slows down throughput. To avoid fragmentation, the device can adjust the MSS (maximum segment size) value inside the initial SYN packet to provide room for the additional headers. The default thresholds are 1414 bytes for GRE tunnels and 1336 bytes for GRE-over-IPsec tunnels and are based on encapsulation overhead of the corresponding tunnel type and the maximum transmission unit (MTU) for the mgt0 interface, which is 1500 bytes by default. If you change the MTU and use "auto" for the TCP MSS option, the device automatically readjusts the TCP MSS thresholds.)
ARP Shield	Enable **ARP Shield** to prevent Man-In-the-Middle attacks by client devices attempting to impersonate critical network resources on the network such as a network gateway or DNS server through an ARP poisoning attack. ARP Shield should not be used if any clients on the network are assigned static IP addresses. ARP Shield is disabled by default and can only be enabled on access points running IQ Engine 6.8.1 and above. Enabling ARP Shield is not enforced on access points running IQ Engine 6.5, switches, routers, or Virtual Gateway appliances.
DHCP Shield	Disable **DHCP Shield** to turn off the built-in ability for IQ Engine to prevent attached clients from impersonating a DHCP server. In the default enabled state, connected clients are blocked from responding to DHCP server discovery or IP lease requests. When disabled, connected clients can respond to DHCP discovery or IP lease requests. DHCP Shield is enabled by default on access points running IQ Engine 6.8.1 and above. Disabling DHCP Shield results in no changes to access points running IQ Engine 6.5, switches, routers, or Virtual Gateway appliances.

Table 41: Forwarding Engine Control Settings (continued)

Setting	Description
Proxy ARP	**Proxy ARP** requests enable learning MAC addresses and proxy replies to ARP requests. Select one of the following slider bar options: • **Disabled**: Not recommended. Disabling turns off all proxy ARP handling capabilities. It increases air time utilization by having to send ARPs to clients in the roaming cache. Use for troubleshooting only. When diagnosing a network issue, you might need to permit ARP requests and replies between wireless clients and network devices (such as the default gateway) to flow directly across the device without proxy. • **Legacy**: Not recommended, but is available for legacy Wi-Fi 4 APs. • **Enhanced**: Preferred and is the highest level of adoption. Supported on Wi-Fi 5 APs and newer. Does not support ARP suppression for devices not in the roaming cache. Wired clients can flood the air with ARPs. • **ARP Suppression**: Recommended, but support is limited to AP3000, AP5010, and AP5050. Protects airtime from overuse by unneeded ARP traffic.
Disable Inter SSID Flooding	Select **Disable Inter SSID Flooding** to prohibit a device from forwarding traffic that it receives from clients in one SSID to clients associated with the same device in another SSID. Instead, such traffic must first cross the device from an interface in access mode to an interface in backhaul mode. From there, the traffic might pass through an internal firewall that performs deep-packet inspection, URL filtering, or antivirus checking, and other operations, before sending the traffic back across the device to reach the clients in the destination SSID.
Disable WebUI Without Disabling CWP	Select **Disable WebUI Without Disabling CWP** to disable the local web user interface on a device to improve system security without disabling the associated captive web portal.
Enable legacy HTTP redirect	Select **Enable legacy HTTP redirect** to enable redirects to legacy HTTP sites. Note: Extreme Networks recommends HTTPS for best security. This option is provided for legacy clients, for which HTTPS is not suitable.
Global Logging Options for Firewall Policies	

Table 41: Forwarding Engine Control Settings (continued)

Setting	Description
Log	Select the corresponding check boxes to enable the generation of logs for the following scenarios: • **Drop packets that are denied by IP or MAC firewall policies** • **The first packets of the session destined for the Extreme Networks device itself**
Drop	Select the corresponding check boxes to enable the generation of logs for the following scenarios: • **Fragmented IP Packets** • **All non-management traffic destined for the Extreme Networks device itself**

System Settings Management Options

Use the settings in this section to adjust various device-level functions, including device health alarm thresholds, VoIP features, and client OS detection types. Miscellaneous settings cover reset, console, PoE, and data collection features.

Table 42: System Settings

Setting	Description
LED Brightness	Set the device status LED brightness level. Select an option from the menu: **Bright**, **Soft**, **Dim**, or **Off**.
Temperature Alarm Threshold	Specify the ambient celsius temperature threshold that triggers an alarm.
Fans Underspeed Alarm Threshold	Specify the minimum RPM operating speed for fans. Speeds below this value trigger an alarm.
Call Admission Control	To enable **Call Admission Control**, toggle the setting to **ON**. If enabled, devices monitor VoIP traffic to determine if there is enough available airtime for new VoIP calls.
Airtime per Second	Set the amount of airtime reserved for VoIP traffic. Decreasing the amount of reserved airtime for VoIP traffic frees more airtime for traffic other than VoIP. This can be useful if there are only a few VoIP users on the WLAN. For a high number of VoIP users, increase the amount of reserved airtime. Type a value in microseconds. By default, a device reserves 500 milliseconds of airtime per second for all VoIP calls. You can change the reserved airtime per second for VoIP from 100 to 1000 milliseconds per second.

Table 42: System Settings (continued)

Setting	Description
Guaranteed Airtime for Roaming Clients	Set the percentage of airtime that a device reserves on the access interface for receiving VoIP calls from roaming clients. Type a value as a percentage (%). By default, a device guarantees 20% of the reserved VoIP airtime for VoIP calls from roaming clients. You can change the percent of guaranteed airtime for roaming clients from 0% to 100%. Consider lowering the percent if VoIP users rarely roam, and raising the setting if roaming often occurs. Because VoIP traffic from a roaming client belongs to an existing session, the device to which the client roams always accepts it. If there is not enough airtime available in the guaranteed roaming reserve, the device deducts available airtime from the relevant user profile.
OS Detection	Enable devices to detect the OS of client devices based on a combination of DHCP option 55 contents and the contents of the HTTP headers. To enable, set the toggle to **ON**. The following detection methods are available: • **Use DHCP option 55 contents**: Select to use the DHCP option 55 parameter list. • **Use HTTP user agent IDs**: Select to use the contents of the HTTP user agent ID within the HTTP headers. • **Use both detection methods (DHCP=primary method, HTTP=secondary method)**: Select to use both the DHCP option 55 parameter list and the HTTP user agent information to identify the client operating system. When you select this option, devices first check the contents of the DHCP option 55 parameter list. If it finds no match, then the device examines the HTTP header for the HTTP user agent ID to determine the operating system. If no match is found in either pass, then ExtremeCloud IQ displays **unknown** as the client OS.
Disable Reset Button	Disable the reset button on the front panel of the chassis to prevent non-administrators from using it to reset the device to its default settings or to a bootstrap configuration. Select the check box.

Table 42: System Settings (continued)

Setting	Description
Disable Console Port	Disable the functionality of the console port on a device to block all administrative access through that port. Select the check box. Disabling the console port on a device that is deployed in a publicly accessibly location is a good security precaution. Disabling the console port means that all administrative access must flow over the network, and if there are any connectivity issues with the network or if the device is configured to use only DHCP to get an IP address and cannot get its network settings from a DHCP server, attempts to log in to the device fail. Note: Disabling the console port means that all administrative access must flow over the network, and if there are any connectivity issues with the network or if the device—if configured to use only DHCP to get an IP address—cannot get its network settings from a DHCP server, you will not be able to log into the device.

Table 42: System Settings (continued)

Setting	Description
Enable Smart PoE	To enable Smart PoE, select the check box. Smart PoE lets an AP230, AP320 or AP340 adjust power consumption automatically based on the current power supply. The AP230 and AP320 support PoE on the ETH0 interface. The AP340 supports PoE on both its ETH0 or ETH1 interfaces, and can simultaneously draw power through either one or both. Using Smart PoE, an AP can detect if there are power injectors connected to one or both of its Ethernet ports and how many watts are available for each PoE channel. The AP uses this information to manage its internal use of power resources based on the currently available power level as follows: • 20 W or higher: No adjustments are needed when the power level is 20 W or higher. • 18 - 20 W: The device disables the ETH1 interface. • 15 – 18 W: The device switches from 3x3 MIMO (Multiple In, Multiple Out) to 2x3. • 13.6 - 15 W: In rare cases when the power drops between 13.6 and 15 W and further power conservation is necessary, the device reduces the speed on its active Ethernet interface from 10/100/1000 Mbps to 10/100 Mbps. • 0 - 13.6 W: If there is a problem with the PoE switch or Ethernet cable and the power falls between 0 and 13.6 W, the device disables its wireless interfaces and returns its ETH0 and ETH1 interfaces to 10/100/1000 Mbps speeds. Note: When using smart PoE, the maximum power consumption setting must be set to **No limitation** (the default). Manually setting the PoE maximum power consumption level to anything else overrides smart PoE and essentially disables it.
Enable PCI Wireless Control Data Collection	Enable this feature to collect data about MAC DoS, IP DoS, and MAC filter violations in PCI compliance reports. Select the check box.
Accept ICMP Redirect Message	Enable this feature to accept ICMP redirect messages from routers on their subnet. Select the check box. By default, devices reject ICMP redirects because crafted ICMP redirect messages can be maliciously used to cause a victim host to send traffic to an attacker's host or even back to the victim itself, which is what occurs during a WinFreeze attack. However, you can enable this feature if you believe that your network is safe from such threats and you want multiple routers on the local subnet to be able to update the routing table on devices.

Table 42: System Settings (continued)

Setting	Description
Report client information gathered from captive web portals	Enable this feature to require devices to forward client information (such as name and email address) to ExtremeCloud IQ, where the information is logged as an event. Select the check box.
Hostname in Beacon	Activate iBeacon for or APs that have internal iBeacon transmitters and that belong to a network policy. Slide the toggle to **ON**. To use this setting, you must first define the iBeacon service in the associated network policy and then turn it on via the **Device Management** page.

Authentication Settings Management Options

Authentication settings specify the database location for storing administrator accounts, and control authentication for administrators.

Table 43: Authentication Settings

Setting	Description
Extreme Networks Device Admin Authentication	Specify the location of the database storing administrator accounts with which the AP authenticates administrators when they log in. Choose one of the following options: • **Local**—Stores admin accounts locally on the APs. • **RADIUS**—Stores admin accounts remotely on RADIUS authentication servers. • **Both**—Stores admin accounts both locally and remotely. If one or more RADIUS servers are already in place, for convenience and security, you can keep all the accounts there and configure the AP to look up administrators on those servers. Note: Be careful about using the RADIUS option. If all the AP admin accounts are on a RADIUS server and the device cannot connect to it, attempts by administrators to log in to the device fail. If there is no central RADIUS server containing a user database, or if you prefer to keep the admin accounts locally on the AP, select **Local**. To use accounts located on an external RADIUS server and locally on the device, select **Both**. In this case, the device authenticates administrators by first checking accounts on the external RADIUS servers specified in the RADIUS profile, and then by checking accounts stored on the local database second.
Private PSK Server Auto-Save Interval	Type the length of time that a device acting as a private PSK server automatically saves its list of private PSK-to-client MAC address bindings to flash memory. Depending on how frequently the server is binding private PSKs to client MAC addresses, you can make the interval as short as 60 seconds or as long as 3600 seconds (1 hour).
MAC Address Format	Define the **MAC Address Format**: • **Delimiter**—Choose the type of delimiter: Colon (:), Dash (-), or Dot (.). • **Style**—Choose **No delimiters**, **Two delimiters**, or **Five delimiters**. • **Case Sensitivity**—Choose between **Lower Case** and **Upper Case**. Some servers only accept MAC addresses in a particular format. These parameters control MAC authentication for local users on an Extreme Networks RADIUS server. For

Table 43: Authentication Settings (continued)

Setting	Description
	example, if you set case sensitivity as lower case and store local users with upper case MAC addresses for their user names and passwords, MAC authentication checks fail. By default, a device formats MAC addresses using lower case without any delimiter; for example: 0016cF8d55bc. You can reformat this address by making the following selections: Colon, no delimiter, upper case: 0016CF8D55BC Colon, two-delimiter, upper case: 0016:CF8D:55BC Colon, five-delimiter, upper case: 00:16:CF:8D:55:BC Dash, five-delimiter, upper case: 00-16-CF-8D-55-BC Dot, five-delimiter, upper case: 00.16.CF.8D.55.BC

Related Topics

Configure Management Options on page 77

Add Management Options on page 273

Configure Forwarding Engine Control Management Options on page 283

Configure System Settings Management Options on page 284

Configure Authentication Settings Management Options on page 284

Configure Forwarding Engine Control Management Options

The forwarding engine controls the type of traffic being forwarded between interfaces, GRE tunnels, and sets logging features. Extreme Networks devices can selectively block or enable broadcast and multicast traffic through GRE tunnels to reduce traffic congestion. This task is part of creating or modifying a Management Option and applies only to APs.

1. Go to **Configure** > **Common Objects** > **Network** > **Management Options**.
2. Select an existing management object, and then select ✏, or select +.
3. Configure the settings for **Forwarding Engine Control**.

   See Forwarding Engine Control Management Options on page 274.
4. To add an entry to the **Exception IP List**, select +.
   a. In the dialog box, enter the destination **IP Address** and the **Netmask**.

      You can also enter an IPv6 address.
   b. Select **ADD**.
5. Select **SAVE**

Continue to Configure System Settings Management Options on page 284.

Related Topics

Forwarding Engine Control Management Options on page 274

Add Management Options on page 273

Configure System Settings Management Options

Use **System Settings** to adjust various device-level functions, including device health alarm thresholds, VoIP features, and client OS detection types. This task is part of creating or modifying a Management Option.

1. Go to **Configure** > **Common Objects** > **Network** > **Management Options**.
2. Select an existing management object, and then select ✎, or select +.
3. Configure the **System Settings**.

   See System Settings Management Options on page 277.

Continue to Configure Authentication Settings Management Options on page 284.

Related Topics

System Settings Management Options on page 277

Add Management Options on page 273

Configure Authentication Settings Management Options

Use this procedure to configure a database location for storing administrator accounts, set the PPSK (Private PSK) save list, and the MAC address format.

1. Go to **Configure** > **Common Objects** > **Network** > **Management Options**.
2. Select an existing management object, and then select ✎, or select +.
3. Configure the **Authentication Settings**.

   See Authentication Settings Management Options on page 282.
4. Select **SAVE**.

Related Topics

Authentication Settings Management Options on page 282

Add Management Options on page 273

Configure Tunnel Concentrator Services

Add the Tunnel Concentrator as a device type. See Quick Add Tunnel Concentrators on page 21.

Perform this procedure to configure a new Tunnel Concentrator service.

1. Go to **Configure** > **Common Objects** > **Network** > **Tunnel Concentrator Services**.
2. Configure the settings for the Tunnel Concentrator Service.

   See Single Tunnel Concentrator Services Settings on page 285 or Redundant Tunnel Concentrator Services Settings on page 285.
3. Select **Save**.

Related Topics

Quick Add Tunnel Concentrators on page 21

Single Tunnel Concentrator Services Settings on page 285

Redundant Tunnel Concentrator Services Settings on page 285

Single Tunnel Concentrator Services Settings

Table 44: Single Tunnel Concentrator

Field	Description
Name	(Required) Type a name to identify the new Tunnel Concentrator service.
Description	(Optional) Provide a description that might be helpful when troubleshooting.
Single Tunnel Concentrator	(Required) Select this option to create a single Tunnel Concentrator without redundancy.
Tunnel IP Address/CIDR	(Required) Type the IP Address for the tunnel (CIDR).
Gateway	(Optional) Type the IP address of the gateway.
Native VLAN ID	(Required) Type the Native VLAN ID. The Native VLAN is untagged.
Device Tunnel Concentrator	(Required) Select a Tunnel Concentrator from the menu.
Tunnel Port	(Required) Select a port from the menu.
VLAN ID	(Required) Type the VLAN ID. (Optional) For an untagged VLAN, select the corresponding check box.
Bridge Port	(Required) Select a bridge port for the tunnel from the menu.

Related Topics

Configure Tunnel Concentrator Services on page 284

Redundant Tunnel Concentrator Services Settings

Table 45: Redundant (Primary and Backup) Tunnel Concentrators

Field	Description
Name	(Required) Type a name to identify the new Tunnel Concentrator service.
Description	(Optional) Provide a description that might be helpful when troubleshooting.

Table 45: Redundant (Primary and Backup) Tunnel Concentrators (continued)

Field	Description
Redundant Tunnel Concentrator	(Required) Select this option to create a redundant Tunnel Concentrator.
Tunnel IP Address/CIDR	(Required) Type the IP Address for the tunnel (CIDR).
Gateway	(Optional) Type the IP address of the gateway.
VRRP Router ID	(Required) Type the ID for the VRRP router. ExtremeCloud IQ configures the same VRRP Router ID for both the primary and backup Tunnel Concentrators (range 1-255). The **VRRP Router ID** must be different for each cluster of VRRP devices.
Native VLAN ID	(Required) Type the Native VLAN ID. The Native VLAN is untagged.
Device Tunnel Concentrator	(Required—Primary and Backup) Select a primary Tunnel Concentrator from the menu. Select a backup Tunnel Concentrator from the menu.
Tunnel Port	(Required—Primary and Backup) Select a port for the tunnel from the menu for the primary Tunnel Concentrator from the menu. Select a port for the tunnel from the menu for the backup Tunnel Concentrator from the menu.
VLAN ID	(Required—Primary and Backup) Type the VLAN ID for the primary and for the backup Tunnel Concentrators. (Optional) For an untagged VLAN, select the corresponding check box.
IP Address	(Required—Primary and Backup) Type the IP address for the primary and the backup Tunnel Concentrators.
Bridge Port	(Required—Primary and Backup) Select a bridge port for the tunnel from the menu for the primary Tunnel Concentrator. Select a bridge port for the tunnel from the menu for the backup Tunnel Concentrator.

Related Topics

Configure Tunnel Concentrator Services on page 284

Configure Tunnel Policies

A tunnel policy sets parameters for Layer 3 roaming, identity-based tunnels, standard GRE tunnels, or Layer 2 roaming using Tunnel Concentrator. Extreme Networks devices use dynamic tunnels to support client roaming between subnets and identity-based tunnels to transport user traffic from one part of the network to another. You can add new tunnel policies and view, modify, and remove previously defined policies.

You can enable the following types of GRE traffic tunneling:

Layer 3 Roaming

Adjusts roaming thresholds so that a device disassociates with a wireless client that has roamed to it from another subnet and has either been idle for a period of time, or for which traffic is below a specified threshold.

Identity-Based Traffic Tunneling

Tunnels guest traffic directly to the network.

Standard GRE Tunneling

Tunnels traffic to non-Extreme Networks tunnel endpoints.

Tunnel Concentrator

Tunnels traffic to Extreme Networks Tunnel Concentrator.

Use the following steps to add a new tunnel policy.

1. Go to **Configure** > **Common Objects** > **Network** > **Tunnel Policies**.
2. Select the plus sign.
3. Enter a name for this policy.
4. Enter an optional description for the policy.

   Although optional, descriptions can be helpful when you are troubleshooting your network.
5. Select **Layer 3 Roaming** to adjust Layer 3 roaming thresholds.
   a. Specify a time period between 10 and 600 seconds.
   b. Specify a threshold number between 0 and 2147483647 packets per minute.
6. Select **Identity-based Traffic Tunneling** to configure the tunnel source and destination, and to create a password or tunnel authentication.
   a. For the **Tunnel Source**, select a subnet from the drop-down list, or add a new subnet.

      To add a new IP address or host name, see Add IP Objects and Host Names on page 229.
   b. For **Tunnel Destination**, choose an IP address or host name from the drop-down list or add a new address or host name.

      To add a new IP Address or Host Name, see Add IP Objects and Host Names on page 229.
   c. For **Tunnel Authentication**, type the password the AP uses to authenticate to the GRE termination point.

7. Select **Standard GRE Tunneling** to configure non-Extreme Networks tunnel endpoints.
   a. For **Tunnel Destination**, choose an IP address or host name from the drop-down list or add a new address or host name.

      To add a new IP address or host name, see Add IP Objects and Host Names on page 229.
   b. If you select **Tunnel Mode dot1q**, type, select, edit, or add the 802.1Q native VLAN ID.

      To add a VLAN ID, see Configure VLAN Settings on page 109.
   c. If you select **Tunnel Mode Access Mode**, type, select, edit, or add the VLAN ID.

      To add a VLAN ID, see Configure VLAN Settings on page 109.
8. Select **Tunnel Concentrator** and then select the **Tunnel Destination** from the drop-down list.

   You can add a new Tunnel Concentrator service by selecting +, or select ✎ for an existing instance. For more information, see Configure Tunnel Concentrator Services on page 284.
9. Select **Save**.

   The **Tunnel Policies** table displays the following information for the configured tunnel policies in your network:

   - **Name**: The name of the tunnel policy.
   - **Description**: An optional description of the policy.
   - **Used by**: The number of network policies to which the tunnel policy is applied. Hover over a number in this column to see the names of the network policies.

Related Topics

Configure Tunnel Concentrator Services on page 284

Configure User Profile Traffic Tunneling on page 220

Configure an sFlow Receiver

Use sFlow receivers to provide visibility into your switch traffic patterns. Configure sFlow receivers as common objects that you can assign to specific devices. Use the following procedure to configure an sFlow receiver as a common object.

1. Go to **Configure** > **Common Objects** > **Network** > **sFlow Receivers**.
2. Select an existing sFlow Receiver, and then select ✎, or select +, and then select **Switch** from the menu.
3. Type a **Name**.
4. Type an optional **Description**.
5. Type the IP address of the receiver, to which the accumulated data will be sent.
6. Select a **UDP Port Number**.

   This is the UDP port number of the sFlow receiver where the data will be sent. The default UDP port number is 6343. (Range: 1-65535).

7. Select a **Maximum Datagram Size**.

   This is the maximum number of data bytes that can be sent in a single sFlow diagram. Select a value that avoids datagram fragmentation.
8. The **Owner String** is an identity string required for the sFlow receiver configuration to take affect.

   This is usually the same as the receiver name.
9. Select a timeout value.

   This is the time, in seconds, before the sFlow sampler stops sending data to the receiver. A zero receiver timeout displays the sFlow receiver configuration in the running config.
10. Select a sampling rate (number of packets) and sample size (in bytes).

    A higher sampling rate lowers the CPU burden on the device, and helps ensure that all collected samples can be sent to the receiver.
11. Select an interval for the sFlow receiver.
12. Select **SAVE SFLOW RECEIVERS**.

    You can delete a single sFlow receiver or multiple receivers. Select the corresponding check boxes for the receivers and then select the delete icon.

    You can add a new sFlow receiver by creating a clone of an existing receiver and then renaming it. Select the check box for the sFlow receiver that you want to clone and then select the clone icon. Type the new **Name** and then select **Clone**.

Related Topics

Assign an sFlow Receiver to a Switch on page 367

Assign an sFlow Receiver to a Switch Template on page 205

Configure Network Services

Network service objects identify Layer 4 traffic by protocol and port number. ExtremeCloud IQ provides a number of predefined services and you can create custom network services to use when defining firewall policies (see Configure a Firewall Policy on page 294) and QoS traffic classification and marking policies (see About Classifier Maps on page 246 and Configure Marker Maps on page 249).

The Network Services table displays the following information about predefined and custom network service objects:

- **Name**: The name of the network service object.
- **Protocol Number**: The type of protocol (followed by its standard protocol number) that the service uses. Predefined services use the following protocols:
  - 1 : ICMP (Internet Control Message Protocol)
  - 6: TCP (Transmission Control Protocol)
  - 17: UDP (User Datagram Protocol)
  - 89: OSPF (Open Shortest Path First)
  - 119: SVP (SpectraLink Voice Priority)
- **Port Number**: The standard destination port number of the service. The receiving device uses the port number to map the service to a particular processor.

- **Service Idle Timeout**: The amount of time (in seconds) after which the device terminates an inactive session using this service. (For IP firewall policies, this field is only supported by APs.)
- **ALG Type**: An ALG (application layer gateway) links certain port numbers to a service so that the device can apply the proper QoS (Quality of Service) and firewall policies. For example, the TFTP service has a control stream and data stream that each use different port numbers. The port number for the TFTP control stream is static (port 69 by default), but the port number for the TFTP data stream is dynamic and is negotiated within the control session. The TFTP ALG links these two streams together logically so that the device can apply the proper QoS and firewall policies to both TFTP streams. You can apply different QoS settings to the TFTP control and data sessions, for example, to ensure high reliability but tolerate high latency, or to ensure accept a medium level of reliability but require low latency.
- **Description**: An optional description for the object. Descriptions can be very useful when troubleshooting or managing a complex network.
- **Virtual IQ** : The name of the Virtual IQ (virtual ExtremeCloud IQ) to which the service belongs. All predefined services are marked as global to indicate that they belong to all Virtual IQs. This column only appears when you are logged in to "All Virtual IQs" with super-user privileges.

Use the following procedure to configure a network service:

1. Select the plus sign.
2. Enter a name for the service.
3. Select a service idle timeout (for APs and routers only).

   This is the amount of time (in seconds) after which the device terminates an inactive session using this service.
4. Select an IP Protocol number.

   The number of the protocol the service will use. Predefined services appear in the drop-down list, or you can configure a custom protocol.
5. Enter the standard destination port number of the service.

   For services that use TCP or UDP, you must set a destination port number, which the receiving device uses to map the service to a specific processor. When you use a custom protocol, a destination port number is not required because the receiving device can use the protocol to map the service to the appropriate processor.
6. Select an ALG type from the drop-down list.

   ALG is supported for APs and routers only. If the service you are defining needs to use an ALG, select DNS, FTP, HTTP, SIP, or TFTP, from the drop-down list. Otherwise, leave this empty.

Add a Subnetwork Space

When you create a subnetwork for branch sites, you have a choice between making one large parent subnetwork that ExtremeCloud IQ sections into individual segments for each site or a smaller subnetwork that each site reuses. You define the subnetwork type—whether it is for internal, guest, or management traffic—and configure options for DHCP, DNS, NTP, and NAT.

1. Select the plus sign.
2. Enter an optional description.
3. Choose a network type from the drop-down list as follows:
   - **Internal Use** - Routers can apply internal subnetworks to regular users, such as employees or students. DNS and DHCP services are optional. The addressing for internal subnetworks can be unique among all branch sites so that routers can tunnel traffic through a VPN gateway to a central site and to other branch sites without needing NAT. If you decide to replicate the same subnetwork at each site, then routers will require NAT to send traffic between themselves and a VPN gateway.
   - **Guest Use** - Routers use a subnetwork for guest use for temporary users, such as visitors. DHCP or DHCP relay is required and DNS service is optional. Because guests are not expected to access resources through VPN tunnels at the corporate or other branch sites, the addressing for a guest subnetwork is the same for all routers at all branch sites. Routers do not enable guest traffic to pass through a VPN tunnel to the main site. Guests are only allowed to access the Internet.
   - **Management** - An Extreme Networks router, and Extreme Networks APs and switches at the same branch site communicate with each other. DNS and DHCP services are required.
4. **Create a unique subnetwork at each site**, as follows:
   - **Local IP Address Space**: Enter the parent IP address scope. The parent scope contains the IP address scopes of all remote sites.
   - **Partition the local IP address space into subnetworks**: Use the slider to select the best match for how many branch offices you need to configure and how many clients there are at each branch. Select the maximum number of foreseeable branches and be sure the number of clients per branch exceeds the maximum foreseeable number of clients at any one branch. If you cannot fit the maximum number of clients and branches within your chosen parent scope, you must increase the parent scope.
   - **Use the first IP address of the partitioned subnetwork for the default gateway**: Select to use the first IP address as your default gateway.
   - **Use the last IP address of the partitioned subnetwork for the default gateway**: Select to use the last IP address as your default gateway.

5. **Replicate the same subnetwork at each site**, as follows:
   - **Local IP Address Space**: Enter the IP address and netmask of the local subnetwork at each branch site, and select either the first or last IP address as the default gateway, depending upon its configuration.
   - **Use the first IP address of the partitioned subnetwork for the default gateway**: Select this option to use the first IP address as your default gateway.
   - **Use the last IP address of the partitioned subnetwork for the default gateway**: Select this option to use the last IP address as your default gateway.

   Note

   If you have any branch sites in your enterprise topology that have overlapping or conflicting IP address schemes, and making changes to those address structures will pose difficulties, you can use NAT on the tunnel interfaces on the routers at each site. The branch routers can then map local subnetworks to different addresses that can be routed through VPN tunnels across your network. With this approach, you can configure the Extreme Networks branch routers, which function as NAT gateways, to map their local subnetwork addresses, one-for-one, to NAT subnetwork addresses. ExtremeCloud IQ maps each host address on the local subnetwork side of the router uniquely to a corresponding network host address on the NAT subnetwork side of the router.

6. Select **SAVE** or proceed to Configure Subnetwork Space Advanced Settings on page 292.

Configure Subnetwork Space Advanced Settings

Create or modify a subnetwork space. For more information, see Add a Subnetwork Space on page 290.

This task contains the next set of optional steps for creation of a new subnetwork space.

1. Select **Enable DHCP** to enable branch routers to dynamically provide client devices with network settings.
2. Enable the DHCP server on the routers to remove the necessity for additional hardware at remote sites.

   When you select this option, additional configuration items appear.

   a. Use the controls to select where you want your DHCP pool of addresses to begin and end.

      The left slide control reserves addresses at the start of the pool. The right slide control reserves addresses at the end of the pool. Below the slide control is the total number of remaining unreserved addresses in the pool.

      Note

      IP Address 172.28.0.1 is reserved for Extreme Networks routers and is not available to client devices.

   b. Enter the DHCP address lease time.

c. Enter the NTP server's IP address that clients use to synchronize their system clocks.

d. Enter your network domain name.

e. Select **Use ARP to check IP address conflicts** to enable Extreme Networks routers functioning as DHCP servers to check if an IP address is in use before offering to lease it to a DHCP client.

   Clear to disable ARP broadcasts during the DHCP message exchange. You might do this if there are a large number of clients requesting DHCP leases and the extra effort to check address availability is unnecessarily consuming resources.

f. For **Custom Options**, enter standard (1 – 224) and custom (225 – 254) DHCP options.

   Note
   Options 1, 3, 6, 7, 15, 26, 42, 44, 51, 58, 59, 69, and 70 are not supported here because the information is automatically retrieved elsewhere.

g. Select **Enable DHCP Relay** to support a centralized DHCP server on a branch router.

   If you have deployed a centralized DHCP server on your network, you must first enable the DHCP relay on an Extreme Networks branch router to disable the branch router's DHCP server function. This enables the device to redirect client DHCP requests to a centralized DHCP server. The branch router now behaves as a proxy for client DHCP requests and no longer performs DHCP services. This is part of the DHCP Reservations and DHCP Relay feature.

3. Choose the **DNS Service** profile from the drop-down list.

   If you do not see a service profile that you want to use, select the plus sign to create a new one. For more information about adding a DNS Service, see Add a DNS Service on page 228.

   Note
   When the network type is for internal or guest use, an Extreme Networks router applies this service to the DNS requests from clients connecting to the router either directly or through an intermediary AP or switch. When the network type is management, the router applies this to DNS requests from Extreme Networks APs and switches on the same management network behind the router, and to the mgt0 interface of the router itself.

4. Select **Enable NAT through the VPN tunnels** to enable routers to perform NAT on traffic traversing their tunnel interfaces.

   Note
   If you selected **Replicate the same subnetwork at each site**, NAT is always enabled and this check box cannot be cleared.

   a. Enter the number of branch sites you want to replicate.

   b. Enter the NAT IP address space, which must be large enough to be mapped to the local subnetwork at every branch site of the local subnetwork IP address space.

5. Select **SAVE**.

Configure a Firewall Policy

If you intend to use a User Profile as a source, create one first. See Add a User Profile on page 217.

You can add a firewall policy to control the traffic crossing routers, defining rules that either permit or deny traffic based on its source, destination, and network service type.

1. Go to **Configure** > **Common Objects** > **Network** > **Firewalls**.
2. To add a new firewall policy, select +.

   To edit an existing firewall policy, select the corresponding check box, and then select ✎.
3. Enter a **Name** for the policy.
4. Enter an optional **Description**.
5. To add and configure a new source, select +.
6. Choose the traffic **Source** from the drop-down list as follows:
   - **Any**: Applies to traffic from any source.
   - **Network Address**: Applies to traffic from an IP address. Depending on the netmask, this could indicate the address of a single host or an entire subnetwork; for example, as a network reserved for one or more types of users, such as contractors and guests. Choose an existing network address or define a new one.
   - **User Profile**: Applies to specific types of users. Choose an existing user profile or define a new one.
   - **VPN**: Applies to all traffic forwarded through an L3 IPsec VPN tunnel. For example, you might want to apply a rule to traffic tunneled from the main and other branch sites through the router firewall, to destinations at the branch site behind the router.
7. Choose the traffic **Destination** from the drop-down list as follows:
   - **Any**: Applies to traffic from any source.
   - **Network Address**: Applies to traffic from an IP address. Depending on the netmask, this could indicate the address of a single host or an entire subnetwork; for example, as a network reserved for one or more types of users, such as contractors and guests. Choose an existing network address or define a new one.
   - **VPN**: Applies to all traffic forwarded through an L3 IPsec VPN tunnel. For example, you might want to apply a rule to traffic tunneled from the main and other branch sites through the router firewall, to destinations at the branch site behind the router.
8. Select **Any** or an existing **Network Service** from the drop-down list, or create a new network service.
9. Choose **Permit** to pass traffic through the firewall or **Deny** to block it.
10. Turn logging **ON** or **OFF** for instances when the rule is enforced.

11. Select **Add** and repeat these steps for each new rule.

    Note
    The router applies firewall rules in order from the top. To reposition a rule, select it in the table and use the up and down arrows in the **Order** column.

12. Select **SAVE FIREWALL**.

Related Topics

[Add a User Profile](#) on page 217
[Network Configuration](#) on page 259

Authentication Configuration

The topics in this section provide details about configuration objects for authentication.

Related Topics

Configure an LDAP Server on page 295

Configure an LDAP Server

Use this task to create an LDAP server with AAA Server profiles for devices configured as RADIUS servers. To appear in the table in this window, LDAP servers must first be created in the network policy workflow.

Use this task to clone an existing LDAP server profile and customize the settings.

1. Select a server from the table.

   Note
   If the table is empty, you must first create an LDAP server inside of a network policy workflow.

2. Select ⧉, and then configure the settings.

   See LDAP Server Settings on page 295
3. Select **SAVE**.

Related Topics

LDAP Server Settings on page 295

LDAP Server Settings

Table 46: Settings for LDAP servers

Setting	Description
Name	Type a **Name** for the new or cloned server.
LDAP Server	Select an **IP Address** or **Host Name** from the ≡ menu, or select +.

Table 46: Settings for LDAP servers (continued)

Setting	Description
Description	(Optional) Although optional, entering a description is helpful for troubleshooting and for identifying the server.
RADIUS User Base DN	Type the RADIUS user base distinguished name, or the starting point for directory server searches, such as cn=visitors, and the point in the directory tree structure under which the server stores user accounts in its database. Note: ExtremeCloud IQ supports up to 2000 users per user group. For more than 2000 users, you must separate the users into different user groups.
Bind DN Name	Type the LDAP client distinguished name used during the authentication part of an LDAP session, such as cn=users, cn=students, dc=southamerica, ou=student, and ou=school.
Bind DN Password	Type the password for the LDAP client distinguished name for use during the authentication part of an LDAP session.
Show Password	Select **Show Password** to see the password.
Communication	Select **LDAP** or **LAPDS** for the required communication protocol.
Optional Settings	
Filter Attribute	Enter required **Filter Attribute** for searching for elements below the baseObject.
Strip realm name from filter	Select the check box to disable the realm, which is commonly appended to a user name and delimited with an @ sign, from the filter.
Destination Port	(Required) Enter the LDAP server **Destination Port**.
TLS Authentication/ Encryption	Select the check box to enable Transport Layer Security authentication and encryption, and configure the settings.
TLS Authentication/Encryption	
CA Certificate File	(Required) Select the default certification authority digital certificate type from the list.
LDAP Client Certificate	(Required) Select the default LDAP client digital certificate type from the list.
Client Key File	(Required) Select the default client key digital certificate type from the list.
Key File Password	Type the client key file password.

Table 46: Settings for LDAP servers (continued)

Setting	Description
Show Password	Select the check box to see the password.
Verify Server	Choose how often the Extreme Networks device checks the relationship between a certificate and its server: • **Try** (on first authorization or authentication) • **Never** • **Demand** (as required, on demand)

Certificate Configuration

The topics in this section provide details about certificate configuration objects, including how to create certificates and keys, and how to import them.

Related Topics

Create a Certificate and Key on page 297

Create an ExtremeCloud IQ Certificate of Authority on page 298

Create a CSR for a Server on page 299

Concatenate an Existing Certificate and Private Key on page 301

Create a Self-signed Certificate on page 301

Import a Certificate or Key on page 302

Create a Certificate and Key

Before generating a certificate, make sure the time and date on the ExtremeCloud IQ clock are accurate. Otherwise, the certificate might be rejected during validation because the starting date has not occurred or the expiration date has passed.

To support secure wireless client traffic and captive web portal configurations using HTTPS, ExtremeCloud IQ provides features that enable you to create Certificate Management objects.

1. Select the plus sign.

2. Create one of the following types of certificates:
    - **ExtremeCloud IQ CA**: Select to generate your own Certificate Authority (CA) certificate. See Create an ExtremeCloud IQ Certificate of Authority on page 298.
    - **Server CSR**: Select to generate a certificate that consists of three parts used during the verification process. The first part describes the content of the certificate. The second part contains the server's public key. The third part consists of the same fields hashed with the server's message digest, or public key, and then encrypted with the issuing CA digital signature (the ExtremeCloud IQ CA, for example) private key. See Create a CSR for a Server on page 299.
    - **Concatenate an existing certificate and private key**: Select this option when working with captive web portals. One option in a captive web portal configuration is to secure wireless client traffic using HTTPS. The type of web server that an Extreme Networks device supports requires the server certificate be concatenated with an unencrypted private key that corresponds with the certificate's public key. You can concatenate an existing server certificate and private key or generate a new self-signed server certificate that already has the private key and certificate concatenated. See Concatenate an Existing Certificate and Private Key on page 301.
    - **Self-signed certificate**: Select to generate a new self-signed server certificate that already has the private key and certificate concatenated. See Create a Self-signed Certificate on page 301.
3. Select **Save**.
4. You can also import a certificate or key.

    See Import a Certificate or Key on page 302.

Create an ExtremeCloud IQ Certificate of Authority

Before generating a certificate, make sure the time and date on the ExtremeCloud IQ clock are accurate. Otherwise, the certificate might be rejected during validation because the starting date has not occurred or the expiration date has passed.

Use this task to generate your own Certificate Authority (CA).

1. Select the add icon.
2. Enter a descriptive name or the domain name of the ExtremeCloud IQ appliance or Virtual IQ that you are going to use to sign server certificates.

    This name will later be used to verify server certificates to authenticate participants in AAA exchanges. Examples: SophiaCA, HiltonCA, Extreme NetworksCA.
3. Enter the name of the ExtremeCloud IQ organization.

    Examples: Sophia University, Hilton Hotel, Extreme Networks.
4. Enter the name of the ExtremeCloud IQ division.

    Examples: Marketing, Engineering, Sales.
5. Enter the ExtremeCloud IQ location.
6. Enter the ExtremeCloud IQ State or Province.
7. Enter the ExtremeCloud IQ two-character country code.
8. Enter an optional contact email address.

9. Enter the number of days the CA will be valid.

   A CA is typically valid for a much longer period than the server certificates it signs.
10. Choose a key size for the key pair: 512, 1024, or 2048 bytes.

    The encryption produced by the smallest key size (512 bytes) can be cracked with relatively common tools and is not generally recommended. However, it might be needed if the devices on which the CA must be loaded do not support larger key sizes. Keys of 1024 or 2048 bytes provide far stronger encryption, but require greater processing power.
11. Enter the corresponding password for encrypting and decrypting the private key linked to the public key in the CA.
12. Select **Save**.

    ExtremeCloud IQ saves the CA with the file name `Default_CA.pem` and the accompanying private key as `Default_key.pem`.

Create a CSR for a Server

Before generating a certificate, ensure that the time and date on the ExtremeCloud IQ clock are accurate. Otherwise, the certificate might be rejected during validation because the starting date has not occurred or the expiration date has passed.

Use this task to create a Certificate Signing Request (CSR).

1. Go to **Configure** > **Common Objects** > **Certificate** > **Certificate Management**.
2. To create a new CSR, select +.
3. Type a descriptive name or the domain name of the ExtremeCloud IQ appliance or Virtual IQ that you are going to use to sign server certificates.

   The appliance or VIQ name you assign is used to verify the server certificates when they are used to authenticate participants in AAA exchanges. Examples: SophiaCA, HiltonCA, Extreme NetworksCA.
4. Type the name of the ExtremeCloud IQ organization name.

   Examples: Sophia University, Hilton Hotel, Extreme Networks.
5. Type the name of the ExtremeCloud IQ division.

   Examples: Marketing, Engineering, Sales.
6. Type the ExtremeCloud IQ location.
7. Type the ExtremeCloud IQ State or Province.
8. Type the ExtremeCloud IQ two-character country code.
9. Type an optional contact email address.

10. Type an optional **Subject Alternative Name**.

    When using the server certificate to verify a VPN server, the VPN client that receives the certificate during IKE (Internet Key Exchange) negotiations uses the SAN (subject alternative names) in that certificate to perform two validity checks for the server: The VPN client checks that the SAN which the VPN server presents as its IKE ID matches the SAN in the certificate that the server supplies, and the VPN client verifies that the IKE ID it receives from the VPN server matches the peer IKE ID in its configuration. Fill in the associated fields as follows:

    - **User FQDN**: Type a text string in the form of a fully-qualified domain name for an individual. It resembles an email address: **`<string>@<domain>`**. For example, `jhan@extremenetworks.com`.
    - **FQDN**: Type a text string in the form of a fully-qualified domain name, such as `portal.extremenetworks.com`.
    - **IP Address**: Type an IP address in dotted decimal notation, for example, `10.1.1.1`.

11. Choose a key size for the key pair: 512, 1024, or 2048 bytes.

    The encryption produced by the smallest key size (512 bytes) can be cracked with relatively common tools and is not generally recommended. However, it might be needed if the devices on which the CA certificate must be loaded do not support larger key sizes. Keys of 1024 or 2048 bytes provide far stronger encryption, but require greater processing power.

12. Type the corresponding password for encrypting and decrypting the private key linked to the public key in the CA.
13. Type a name to distinguish the CSR file.
14. Select **Save**.

    ExtremeCloud IQ saves the CA certificate with the file name `Default_CA.pem` and the accompanying private key as `Default_key.pem`.

15. Select a **Generate Method** as follows:

    - To send the CSR to a third-party CA to generate a server certificate, select **Export** and **OK**, save the CSR file to your management system, and then send it to the CA.
    - To generate a server certificate using ExtremeCloud IQ as a CA, select **Sign by ExtremeCloud IQ CA**, enter a valid time period, clear or select **Combine key and certificate into one file** as explained below, and then select **OK**:
        - Clear **Combine key and certificate into one file** to create two separate files—one with the certificate and another with the private key. Extreme Networks RADIUS servers use these two files to authenticate themselves to RADIUS supplicants using PEAP (Protected Extensible Authentication Protocol), TTLS (Tunneled Transport Layer Security), or TLS (Transport Layer Security).
        - Select **Combine key and certificate into one file** to create a single file that combines the certificate and private key. This simplifies the organization of server certificates and their related private keys so that they cannot accidentally become mismatched. You can use the concatenated server certificate/private key file to provide authentication between RADIUS authentication servers and their supplicants.

Related Topics

Certificate Configuration on page 297

Concatenate an Existing Certificate and Private Key

Before generating a certificate, make sure the time and date on the ExtremeCloud IQ clock are accurate. Otherwise, the certificate might be rejected during validation because the starting date has not occurred or the expiration date has passed.

Use this task to create a new file containing a concatenation of a server certificate and an unencrypted private key.

1. Enter a name for the concatenated certificate/private key file.
2. Enter an optional note about the certificate for later reference.
3. Select the certificate you want to use from the drop-down list.

   You can also select **Import** to import a certificate. See Import a Certificate or Key on page 302.
4. Select a private key method from the drop-down list.

   You can also select **Import** to import a key. See Import a Certificate or Key on page 302.
5. Enter the corresponding password for encrypting and decrypting the private key linked to the public key in the CA.
6. Select **Save.**.

> Note
> Although you cannot change the certificate and private key in a concatenated file, you can modify the name and description. For example, if you give a certificate file a name and description based on the location of the device, and then you have to move it, you can easily modify these attributes for your own reference. Select the name of the file, modify the **Certificate Name** and **Description** fields, and then select **Update**.

Create a Self-signed Certificate

Before generating a certificate, make sure the time and date on the ExtremeCloud IQ clock are accurate. Otherwise, the certificate might be rejected during validation because the starting date has not occurred or the expiration date has passed.

Use this task to create a self-signed certificate.

1. Enter a name.
2. Enter the ExtremeCloud IQ organization name.

   Examples: Sophia University, Hilton Hotel, Extreme Networks.
3. Enter the ExtremeCloud IQ division name.

   Examples: Marketing, Engineering, Sales.
4. Enter ExtremeCloud IQ location.
5. Enter ExtremeCloud IQ State or Province.

6. Enter ExtremeCloud IQ two-character country code.
7. Enter an optional contact email address.
8. Enter the number of days the CA will be valid.

   A CA is typically valid for a much longer period than the server certificates it signs.
9. Choose an optional key size for the key pair: 512, 1024, or 2048 bytes.

   The encryption produced by the smallest key size (512 bytes) can be cracked with relatively common tools and is not generally recommended. However, it might be needed if the devices on which the CA certificate must be loaded do not support larger key sizes. Keys of 1024 or 2048 bytes provide far stronger encryption, but require greater processing power.
10. Select **Save**.

Import a Certificate or Key

If you use a third-party CA to sign certificates, generate and export a CSR, send it to the CA, and when the CA returns the signed certificate and private key file, import the certificate into ExtremeCloud IQ. Extreme Networks devices support PEM-formatted certificates.

Use the following procedure to import a CSR:

1. Select the import icon.
2. Use **Select** to navigate to the location of the certificate file.
3. Select **Open**.
4. Select **Import**.
5. Select whether this file is a certificate or key.

   To import certificates in PFX or DER formats, you must first use the conversion tool to reformat them as PEM files.
6. To import a PFX-formatted file, which contains a certificate and private key combined, first convert its format from PFX to PEM:

   a. Select **Convert the certificate format from PFX to PEM**.

   b. Enter the password that was used to encrypt the PFX file.

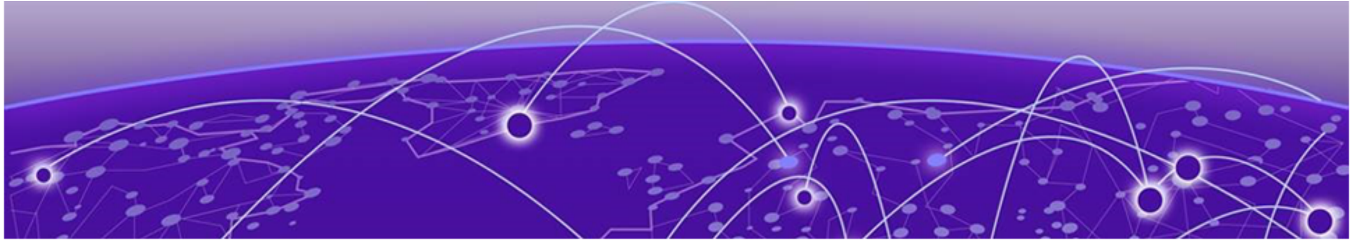
   c. Select Save.

   > Note
   > When you use the PEM-formatted file that contains both the certificate and private key, you must choose the same file for both the Certificate and Private Key fields.
7. To import a pair of DER-formatted files, one containing a certificate and the other its accompanying private key, first convert their format from DER to PEM:

   a. Select **Convert the certificate format from DER to PEM**.

   b. If converting a key, enter the password that was used to encrypt the file.

   a. Select **Save**.
8. Select **Save**.



Manage

Use **Manage** to monitor real-time network statistics, manage devices, and reports as follows:

- Summary: Presents a summary of traffic on your network and the number of access points, routers, and switches. It also provides a summary of the number of unique wired/wireless devices on your network.
- Planning: View and modify your network by adding locations, buildings, floors, and network zones. Place simulated devices to help determine where you might need to add or redistribute devices for the best wireless network capability. View heat map data and modify floor plans to include obstructions that can affect your wireless signal strength.
- Devices: View, add, and update managed and unmanaged devices, check connections to a RADIUS server, and perform other management actions.
- Users: View details about active users in your network; information about all users, or by authentication type: RADIUS users, PPSK, or Others.
- Events: All of the above statistics displayed on one page.

- Alerts on page 379: View a graphical representation of event and metric alerts, and configure new alerts.
- Reports: Configure and generate reports.
- Applications: View information about the applications that are most active in your network.
- Security: View Rogue APs and Clients.
- Client Monitor and Diagnosis: View and sort client objects, including IoT clients, plus historical and real-time client data.
- VPN Management: Manage keys for VPNs. You can assign keys, revoke keys, and change keys for VPNs that appear in this list.

Summary

The ExtremeCloud IQ Pilot dashboard gives you a comprehensive overview of how your network is performing. Here you can see details about application usage, the number of connected clients and users, network alarms, and security issues.

Use the **Time Range** controls to specify the time frame for which you want to display captured data. Select any blue item to display more details about that item. Select **Create Report** to generate and distribute customized reports in HTML format. Download report data in `.csv` format.

The dashboard contains eight data widget. Select the ⤓ icon within each widget to download widget data in `.csv` format. Use the filter sidebar to filter the information displayed in the widgets. For more information, see Use the Filter Sidebar on page 305.

Each widget presents the following information:

- **Network Summary**: Provides a summary of traffic on your network and the number of access points, routers, and switches. It also provides a summary of the number of unique wired/wireless devices on your network. The data updates hourly.
- **Top Application Groups**: Provides top **Application Groups** usage and associated users. The detailed data displays in a drop-down format sorted from highest to lowest application group type for both data usage and users. You can download the data details in a spreadsheet.

  Note
  Because the dashboard refreshes data hourly, no data displays for the first hour after new ExtremeCloud IQ Pilot accounts become active.

- **Top Applications**: Provides top usage in **Top Applications Groups**. The top application types are displayed in selectable, sorted format showing data usage, number of users and clients. You can download the data details in a spreadsheet.
- **Top Usage**: Provides top data usage for clients or users. The data for displays in sortable table format. Top client usage data includes the client ID, data usage, # of apps, top app, and top app group ID. Top user data includes user name, # of apps, usage level, user profile and top associated application. You can download the data details in a spreadsheet.

- **Wi-Fi Clients by OS**: Provides a listing of Wi-Fi clients by OS type. You can customize the information to show the frequency band distribution (2.4 GHz, 5 GHz, or both). You can download the data details in a spreadsheet.
- **Top Wired**: Displays top usage by clients with a wired connection. This information displays in a tabular format that includes port name, network usage volume and %. You can download the data details in a spreadsheet.
- **Top (switches or access points) by (clients or usage)**: Provides top-ranked usage access points or switches by user or client. This data is presented as a bubble graph to indicate the magnitude by usage or client. You can download the data details in a spreadsheet.
- **Max Number of Simultaneous Connections**: Displays a bar graph showing the simultaneous client types within the selected period. You can download the data details in a spreadsheet.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

Use the Filter Sidebar on page 305

Use the Filter Sidebar

The filter sidebar lets you customize what information is displayed in the Devices list and other ExtremeCloud IQ tables. You can save and reuse custom-defined filters. The filters that are available to you vary depending on the window you are in. For example, for the devices list, you can filter based on location, network policy, device type, etc. To see all available options, in the Filter area, select **More**, or select **Less** to see fewer items.

Filter By > **Devices** > **Locations** includes an **Unassigned** option. Select this option to list devices without a location assignment and see their current health status. As a best practice, assign a location to all devices.

Filter By > **Devices** > **Network Policies** includes an **Unassigned** option. Select this option to list all devices that are not assigned to a network policy.

The Filter icon changes depending on whether a filter is applied. When there are no filters applied, the original icon is shown. When one or more filters are applied, the icon contains a colored dot.

You can save individual filters or a list of filters. Saved filters are displayed in the saved filters section.

NEW! Real-Time Maps

Real-time network heat maps use a color spectrum, ranging from warm to cool, to illustrate real-time device signal strength throughout a building floor plan. Warm colors represent a stronger signal strength. Cool colors represent a weaker signal strength.

ExtremeCloud IQ supports the following map type views:

- Wi-Fi Map

- IoT Map

Note
Maps generated within the **Manage** > **Planning** section are visible in real-time maps.

With ExtremeCloud IQ real-time network heat maps, you can adjust thresholds and change color schemes.

Use this task to view real-time nework data coverage.

1. Go to **Manage** > **Real Time Maps**.
2. From the **Global View** location list, select a floor.

   Note
   The selected floor must include a floor plan. For more information, see Add a Floor Plan on page 307.

3. From the floor view pane, select **Map Type**.
4. To view the heat map for Wi-Fi devices, select **Wi-Fi**, configure the following Wi-Fi map settings, and then select **Show map**.

Table 47: Wi-Fi Map Settings

Map Type	Radio Frequency
RSSI	2.4 GHz, 5 GHz, or 6 GHz
Coverage Overlap	2.4 GHz, 5 GHz, or 6 GHz
Channel	All frequencies: 2.4 GHz, 5GHz, and 6 GHz

5. To view the heat map for IoT devices, select **IoT**, and then select **Show map**.

   Note
   IoT heat maps support **RSSI** Map Types and **2.4 GHz** radio frequencies only.

6. To view AP device details, select an AP on the map.

   The device information popup window shows Wi-Fi details specific to that device. For detailed device information, select the **AP Name**. For more information, see Device Details Overview on page 351.

7. Select 📈 to set Wi-Fi coverage thresholds, configure threshold settings, and then select **Apply**.

   Thresholds provide a visual to see where coverage is optimal, acceptable, and where improvements are needed.

Table 48: Wi-Fi Coverage Threshold Settings

Threshold	Description
Excellent	Above this set threshold, for example -30 dBm, the signal is considered excellent.
Good	Near this set threshold, for example -67 dBm, the signal is considered good.
Medium	Near this set threshold, for example 72 dBm, the signal is considered medium.
Poor	Below this set threshold, for example -90 dBm, the signal is considered poor.

8. To change the color scheme, select ● and select a new color scheme.

   Note
   The **Select Color Map** icon might display different colors, depending on the last colour scheme selected.

9. Select **+** to zoom in, and **-** to zoom out. Select and drag the map to move within the window.

   Note
   When you zoom in or out, the scale of the heatmap changes in real time below the zoom icons. The scale represents the relationship between the displayed area on the heatmap and the original map scale.

Related Topics

Add a Floor Plan on page 307
Import a Third-Party RF Heatmap on page 309
Edit a Real-Time Floor Map on page 309

NEW! Add a Floor Plan

Use this task to add a floor plan to a building.

1. From the **Global View** location list, expand a location and select +.

   To delete a floor plan, expand the building and select 🗑 next to the floor to remove.

2. Configure floor details and then select **Next**.

Table 49: Add Floor Configuration Details

Field Name	Description
Name	The floor name.
Associated with	Select a building to associate with the floor.
Environment Type	Floor environmental conditions can influence network behaviour. Select one of the following environment types: • Auto • Outdoor Free Space • Outdoor Suburban • Outdoor Dense Urban • Office • Obstructed in Building • Warehouse
Floor Attenuation	The impact (in dB) of physical obstacles (such as walls, doors, and glass) on wireless signal strength within the floor.
AP Installation Height	The installation height of the access point (AP).
Unit	The AP Installation Height unit of measurement (meters or feet).

3. To Upload a Floor Plan, from **Background image for floor plan**, select **Choose background image**.
4. To use an existing floor plan:
   a. Select **Choose from Libary**.
   b. Select a floor plan image.
   c. Select **Next**.
5. To upload a new floor plan:
   a. Select **Upload New**.
   b. Select **Choose**, navigate to the location of the file, and then select it.
   c. If applicable, select the **Override floor plan images with same names** checkbox.
   d. To select a specific area of the floor plan, in the floor plan preview, use the selection box to highlight the area, and then select **Upload selected area**.
   e. To use the entire floor plan, select **Upload all**.
6. To scale the floor plan:
   a. Zoom in to the floor plan to get a clear view of the area you want to measure.
   b. Identify two points that represent the distance you want to measure, and then select a Point A to Point B.
   c. Enter the distance (meters).
7. Select **Save**.

Related Topics

Real-Time Maps on page 305

Import a Third-Party RF Heatmap on page 309

Edit a Real-Time Floor Map on page 309

NEW! Import a Third-Party RF Heatmap

ExtremeCloud IQ supports the following third-party radio frequency (RF) heatmaps:

- Ekahau
- Hamina

Use this task to import a third-party RF heatmap.

1. Go to **Manage** > **Real time maps** and select the ⇥ icon.
2. To import a floor map from Ekahau, select **Import Ekahau**:
   a. Select **Choose**, then browse to your local folder, select a .esx floor plan, and then select **Open**.

      Note
      Include device serial tags in your .esx files to import devices with your floor plan.

   b. Select **Next**.
   c. From **Import floors**, select a **Building** from the drop down list.

      Note
      With Real-time maps you can only import building floors. To import a site, site folder, or a building, go to **Manage** > **Planning**.

   d. If the configuration is custom, select the **Import Custom AP Configuration** checkbox.
   e. To select a floor plan(s), double-click an **Available floor** to move it to **Selected floors**.

      To move all available floors, select the applicable arrow.
   f. Select **Import**.
3. To import a floor map from Hamina, select **Import Hamina**:
   a. Log in to your active Hamina account and select **Export**.
   b. Select **Extreme Networks** and follow the instructions.
   c. Select **Export**.

      Your floor map now displays APs in the correct building on the correct floor.

Related Topics

Real-Time Maps on page 305
Add a Floor Plan on page 307
Edit a Real-Time Floor Map on page 309

NEW! Edit a Real-Time Floor Map

A heatmap provides a visual representation of device signal strength across a floor plan. By editing the heatmap, you can identify areas with weak coverage, interference, and dead zones. This information helps network administrators optimize device placement and improve overall network performance.

ExtremeCloud IQ supports the following real-time floor map editing functions:

- Draw Inner Walls
- Add a Device to a Floor Plan
- Move a Device to a New Location on a Floor Plan
- Remove a Device from a Floor Plan
- Layer Opacity Adjustment

Use this task to edit a floor map.

1. Go to **Manage** > **Real time maps**.
2. Select a floor from the location list.

   Note
   The selected floor must include a floor map. For more information, see Add a Floor Plan on page 307.

3. Select the ✎ icon.
4. To draw inner walls:
   a. Select **Walls**.
   b. Select a wall type.

Table 50: Floor Plan Wall Types

Wall Colour	Description
🟤	Bookshelf 5dB
⚫	Cubicle 2dB
🟤	Dry Wall 3dB
🔴	Brick Wall 5dB
🔴	Concrete 15dB
⚫	Elevator Shaft 10dB
🟠	Thin Door 4dB
🟢	Thick Door 10dB
🔵	Thin Window 1dB

Table 50: Floor Plan Wall Types (continued)

Wall Colour	Description
🔵	Thick Window 6dB
Draw Perimeter	Draw the outside boundary of the building. Note: When importing a new map, a perimeter is automatically established around the entire image unless the map already has a predefined preimeter. To adjust the perimeter, select **Draw Perimeter**, and then double-click the perimeter and drag to the desired location.

c. Select each corner of an inner wall on the floor plan to draw a wall boundary.

d. When you reach the end of the wall boundary, double-click the last corner to complete the wall.

Note
Right-click on a wall to change its type or delete it.

e. To disable the pen tool, press the **ESC** key on your keyboard.

5. To add a device to the floor plan, select **Devices**:

a. Select a device, or use the **Search** field to find a device.

b. Hover your cursor over the floor map and select the desired location to add the device to the floor plan.

Note
Only devices that are not associated with the floor plan are displayed.

6. To move a device to a new location on the floor plan, select a device and drag it to the desired location.

7. To remove a device from the floor plan, right-click the device and then select 🗑.

Note
The removed device displays in the **Devices** list.

8. To adjust the opacity of the heat map layers, select **Layers** and adjust the opacity slider bar to make a layer more or less transparent.

Note
As you adjust the slider bar, the layer opacity changes on the map in real time.

Related Topics

Real-Time Maps on page 305
Add a Floor Plan on page 307
Import a Third-Party RF Heatmap on page 309

Planning

Network locations are organized into the following location hierarchy:

Site Group

Site groups are optional folders into which you can organize sites. Two levels of site groups are permitted. Site group names must be unique within the organization.

Site

Sites are a mandatory component of the location hierarchy. A site is the parent container for buildings and can include multiple buildings. There is no default site; at account creation, only the global (org) level exists. Sites can have, but do not require addresses.

Sites replace locations as the parent container for buildings and serve the following purposes:

- Column picker
- Configuration applicability
- Monitoring unit
- Troubleshooting and health score unit

Site names must be unique within the organization. A site cannot belong to more than one site group.

Building

Buildings are physical premises with addresses. A building is the parent container for floors and it must be associated with a site.

The physical address format is adjusted for the selected country, that is USA or international format.

Building names must be unique within the parent site.

Floor

Floors are physical subdivisions of buildings. A floor is the parent container for zones.

Floor names must be unique within the parent building.

Zone

Zones are defined areas of building floors.

For more information about changes to the location hierarchy after upgrading to this release, see Location Tree Changes on page 314.

Use the **Manage** > **Planning** page to view and modify your network locations. Define site groups, sites, maps, buildings, floors, and network zones. Place simulated devices to help determine where you might need to add or redistribute devices for the best wireless network capability. View heat map data and modify floor plans to include obstructions that can affect your wireless signal strength.

> **Note**
> Because complex factors affect radio signals in the real world, Extreme Networks cannot guarantee that actual radio coverage will match the estimated coverage results.

This page contains the following features:

- **Search Maps** helps you find a specific location in a large network. Enter the first few characters of a building or site name here to see a list of locations. The more characters you enter, the more precise the search results will be.
- **Google Maps** also provides location search functionality.
- **Global View** provides an overall view of your network in the map. The **Global View** location tree lists the names of all site groups (📁), sites (📍), buildings (🏢), and floors (🗺). You can add multiple buildings to a site, and multiple floors to a building by importing floor plans or by drawing your own floor plan. ExtremeCloud IQ supports the PNG file format.
- **Location Maps**: On the top-level map (the network location map) a building icon indicates your network location. The location map contains **Import Map** and **Add Building** buttons, an option to choose between map or satellite view, and a zoom option.
- **Building Maps**: Select a building in the hierarchy to open the corresponding building map. A building map contains a floor plan of the building. Building maps include **Import Map** and **Add Floor** buttons, an expand screen option, and a **Details** panel, which shows the number of devices, alarms, and active clients at this location. To drill down for more specific network information, select any blue text in the expanded **Details** panel. If a building has multiple floors, you can toggle between them to see floor plans and device deployment.
- **Floor Maps**: Select a floor name in the hierarchy to open the corresponding floor map. A floor map should contain at least one floor perimeter and information about the types of walls and obstructions that appear on the floor. Floor map tabs let you plan and view your network deployments:
  - **Edit Floor Plan**: Upload a floor plan, and draw, change, or remove building parameters and walls. A details panel displays the number of devices installed on the floor.
  - **Plan Devices**: Manually or automatically add simulated and real devices, and change plan parameters for the floor.
  - **View Heat Map**: See coverage details for simulated and real devices on this floor. For more information, see View Heatmaps on page 321 and Real-Time Maps on page 305.
  - **Zones**: Create and name zones. Zones help you track roaming clients and enable you to identify groups of APs on floors where their locations must be clearly defined and differentiated from each other.
- Each item in the network hierarchy panel contains **Delete**, **Move**, **Export**, **Clone**, **Edit**, and **Add** tools.
- Use **Network Summary** to view the current status of each network hierarchy item.

Related Topics

Location Tree Changes on page 314
Network 360 Monitor Overview on page 423
Add a Site Group on page 315
Add a Site on page 315
Import a Map on page 316
Add a Building on page 316
Add a Floor on page 317
Zone View on page 426
Manually Add Simulated Devices on page 320
Automatically Add Simulated Devices on page 319
View Heatmaps on page 321
Real-Time Maps on page 305

Location Tree Changes

During the upgrade from the previous release, most existing locations will migrate to the new site concept. Some cases require manual resolution. The following scenarios illustrate both successful migrations, and migrations that require administrator action to complete:

Scenario 1: Location > Building > Floor

Migrates to **Site** > **Building** > **Floor**

Scenario 2: Location > Location > Building > Floor

Migrates to **Site Group** > **Site** > **Building** > **Floor**

Scenario 3: Location > Location > Location > Building > Floor

Migrates to **Site Group** > **Site Group** > **Site** > **Building** > **Floor**

Scenario 4: Location > Location > Location > Location > Building > Floor

Migrates to **Site Group** > **Site Group** > **Site Group** > **Site** > **Building** > **Floor**. However, the site cannot be edited and you cannot make changes within the third nested site group.

Manually move the affected sites so that they have no more than two levels of nested site groups. ExtremeCloud IQ supports two levels of site groups.

Scenario 5: Building > Floor

Migrates to **Building** > **Floor**. As a best practice, Extreme Networks recommends that you manually define a site and associate the building to the new site.

➡ Important
Initially, locations migrated to sites are not editable because they do not have the country code specified. The country code is required; manually specify the country code for each migrated site.

Related Topics

Planning on page 312

Add a Site Group

Use the following procedure to add a new site group folder to your network plan.

1. Go to **Manage** > **Planning** > **Global View**, and select **Add**.

   To add a new site group to an existing site group folder, select the corresponding **Add** button for the site group.
2. On the **Site Group** tab, enter the **Name** of the new site group folder.
3. From the **Associated With** menu, choose the global org level, or another **Site Group**.

   This menu is available only when you add a new site group to an existing site group. At the Global level, the menu appears dimmed.
4. Select **SAVE**.

Related Topics

Planning on page 312

Add a Site

Use the following procedure to add a new site to your network plan.

1. Go to **Manage** > **Planning** > **Global View**, and select **Add**.

   To add a new site to an existing site group folder, select the corresponding **Add** button for the site group.
2. Select the **Site** tab and enter the **Name** of the new site.
3. Select the **Country**.
4. (Optional) Enter an **Address** and **City**, and then select the **State** from the drop-down menu.

   Only the United States (country code 840) follows the US address format. All other countries follow the international address format: **Address**, **Address 2**, **Province/State/Town**, **City**, **Postal Code**.
5. (Optional) For an outdoor location, set the toggle to **ON** and specify the following:
   a. Choose an environment type that most closely matches your installation.
   b. Enter the most common installation height for APs, in feet or meters.
   c. Enter the map size, in feet or meters.
   d. Enter a background image floor plan from your library.

      Choose an image from your library, or upload a new image. For more information about floor plans, see Add a Floor on page 317.
6. From the **Associated With** menu, choose the global org level, or an existing **Site Group**.

   This menu is available only when you add a new site to an existing site group. At the Global level, the menu appears dimmed.
7. Select **Save**.

Related Topics

Planning on page 312

Network 360 Monitor Overview on page 423

Import a Map

Use the following procedure to add a new map to your network plan.

1. Go to **Manage** > **Planning** and select the corresponding **Import Map** button for a site, building, or floor.

   Or, go to **ML Insights** > **Device View**.
2. Select **Import Map**.
3. Select **Choose**, then browse to your local folder and select the map. Select **Open**.

   Note
   You can import a single .xml file or a package with floor plan images exported from ExtremeCloud IQ.
4. Select **Import**.

Related Topics

Planning on page 312

Network 360 Monitor Overview on page 423

Add a Building

Your network hierarchy must contain at least one site with the country code defined, before you can add buildings and floors.

Use the following procedure to add a new building to your network plan, and to upload building perimeters and floor plan images. ExtremeCloud IQ stores the images in the image library for future use.

1. Go to **Manage** > **Planning**, and select the corresponding **Add** button for a site.
2. Select the **Building** tab, and enter a name for the new building.
3. Enter the building **Address** and **City**, and then select the **State** from the drop-down menu.

   Alternately, use Google Maps search to automatically populate the address. If you manually adjust the marker on the map, the address updates automatically.

   While sites do not require addresses, it is expected that buildings have addresses.
4. Select **Save**.

Related Topics

Planning on page 312

Network 360 Monitor Overview on page 423

Draw a Building Perimeter

You must have a site that includes at least one building before you can draw a building perimeter.

It is a good practice to define the building perimeter before you add internal walls, windows, doors, and other RF obstructions. The perimeter helps estimate how much radio signal passes outside the walls of the building.

1. Select **Draw Perimeter**.
2. Select a corner of the building and drag to the next corner.
3. Before you reach the last corner, double-select to close the shape and exit drawing mode.
4. To change the perimeter wall type, highlight the perimeter and select **Change Wall Type.**

   You can draw multiple perimeters on the same map to define different buildings or buildings with open spaces, such as courtyards. To draw a second perimeter on a map, select **Draw Perimeter** again and draw the new perimeter. You can draw perimeters inside each other, or two or more non-intersecting perimeters. The only invalid combination is a perimeter that intersects another perimeter.
5. Select a wall type from the drop-down list.
6. To remove a perimeter, highlight a perimeter line and select **Remove**.

The next step is to add internal walls and obstructions to the floors in your building. See Add Interior Walls and Obstructions on page 317

Add Interior Walls and Obstructions

Use the drawing tools to add physical obstructions to floor plans. Specifying internal obstructions helps ExtremeCloud IQ estimate the amount of coverage needed for your deployment. From **EDIT FLOOR PLAN**, you can draw in physical elements directly onto your floor plan images. These elements can include elevator shafts, concrete walls, bookcases, and other obstructions. Specifying internal obstructions helps to estimate the amount of coverage needed for your deployment.

1. To change the default wall line color and line type assignments, select the gear icon.
2. Select **Planning Tool** from the drop-down list.
3. To change a wall type, position your cursor on a line segment to highlight it and select **Change Wall Type**.

   The drop-down list next to **Draw Wall** contains a variety of obstruction types. The number following each obstruction type indicates the estimated amount of path loss in decibels (dB) when the radio signal strikes the object at a 90° angle. Each line type displays in a different color.
4. To move a wall or object, position your cursor on a line segment to highlight it.
5. Select **Move**.
6. To clone a wall or object, position your cursor in a line segment to highlight it.
7. Select **Clone** .
8. To remove all walls, select the **-** icon.

Add a Floor

Your network hierarchy must contain at least one building before you can add floors.

Perform the following steps to add a floor to a building.

1. Go to **Manage** > **Planning** > **Global View**, and select **Add**.

   Alternatively, double-click the name of a building, or select **Add Floor** above the corresponding building map.
2. Select the **Floor** tab, and enter a name for the new floor.
3. From the **Associated With** menu, select a building.
4. From the **Environment** menu, choose the environment type that most closely matches your installation.
5. From the **Floor Attenuation** menu, select the noise level of the floor.
6. Enter the installation height (distance from floor to ceiling) of the APs on the floor.

   If the height varies from AP to AP, enter the average height. This setting has a minimal effect on location estimates except for sites such as warehouses where the height of ceilings or high crossbeams is substantial.
7. Enter the dimensions of the floor plan.
8. Upload a background image of a floor plan from the drop-down list, or use the drawing tools to draw a floor plan.
9. To scale the map for imported images, select the gear icon, and then select **Rescale Plan**.
10. Enter dimensions, or size the image manually by moving the red cross hairs to the end points of a known distance, such as a standard doorway.
11. Enter the known distance and select **Apply**.
12. Select **SAVE**.

Related Topics

Draw a Floor Plan on page 318

Size a Floor Plan on page 319

Planning on page 312

Draw a Floor Plan

If you do not have a floor plan image to upload, you can draw a floor plan using the drawing tools.

Note
Floor plans can only be added to floors, not to buildings or locations.

1. Use the single line tool to draw a single line.
2. Use the **Open Shape** tool to draw walls and partitions that are joined at corners.
3. Use the **Closed Shape** tool to draw walls and partitions such as elevator shafts and stairwells.
4. To exit a drawing tool, double-select anywhere on the map.
5. To change a wall type, position your cursor on a line segment to highlight it, right-select and select **Change Wall Type**.
6. To move a wall or object, highlight a line segment, right-select and select **Move**.

   The appearance of the line changes, indicating that you can now move it in the map.
7. To clone a wall or object, highlight a line segment, right-select and select **Clone**.

   A copy of the original line or object displays on the map.

8. To remove a line segment, highlight it, right-select and select **Remove**.
9. To remove all walls, select the **Remove All** icon.

   You can only modify, move, clone, or remove individual line segments. Even if you drew an object consisting of multiple lines with the open-shape or closed-shape tool, you can only change the wall type or remove the lines of an object one segment at a time.

Size a Floor Plan

When you import a floor plan with a background image, you need to scale the floorplan. Use the following steps.

1. Select the **Resize** icon.
2. Select **Rescale**.
3. Enter the map dimensions, or use the red crosshairs on the map to enter the size manually.
4. Select the width and height.
5. Move the cross hairs to the end points of a known distance on the image.

   For example, a standard-sized doorway (2.5 feet or 76 cm).
6. Enter that distance in the field.
7. Select **Apply**.

   When you toggle between the width and height icons, the cross hairs in the map reposition appropriately.

Plan Devices

The following options appear at the top of the **Plan Devices** tab when you are adding a floor:

- **Choose Devices**: Displays the number of devices available to deploy. Use this option to assign real, simulated, and planned devices to the floor plan.

  > Note
  > You must first Onboard the devices before you can assign them to a floor.

- **Auto Plan For**: After you select the location wireless coverage type (basic, high-speed, voice, or location tracking), select **Auto Place** to automatically place the devices in the optimal locations for the selected wireless coverage type.
- **Add Devices**: Manually place devices based on radio band (5 GHz or 2.4 GHz), device model, signal strength, channel, and power. Select **More** to see additional settings for this function.

After you have placed simulated or planned devices on a map, or after you have onboarded real or simulated devices, you can view the Heat Map for all devices.

Automatically Add Simulated Devices

Create a network hierarchy with at least one location, building, and floor.

Use this task to automatically add simulated devices to your network to plan deployment and determine future needs. To manually place devices, see Manually Add Simulated Devices on page 320.

1. Select the type of connectivity you want from the drop-down list under **AUTO PLAN FOR**.
2. Select **AUTO PLACE**, or enter more parameters by expanding the **More** tab.

   If you select a connectivity type and then select **AUTO PLACE**, ExtremeCloud IQ calculates the number and placement of devices and the radio band, channel width, device type, and signal strength settings based on the type of connectivity you selected. Expand the **More** tab, to enter these settings yourself and have ExtremeCloud IQ calculate based on your choices.
3. Select **AUTO PLACE**.

   Target coverage is one factor that determines the number of devices ExtremeCloud IQ automatically places. For example, for coverage with a signal strength of -50 dBm, ExtremeCloud IQ places multiple devices on the map to ensure adequate coverage. A lower signal strength, such as -70 dBm, requires fewer devices.

ExtremeCloud IQ places simulated devices on your floor plan in the locations determined to be optimal for the type of wireless network you selected. You can now move these devices around, add known obstructions, and view heat maps for each device.

Manually Add Simulated Devices

Create a network hierarchy with at least one location, building, and floor.

Use this task to manually add simulated devices to your network to plan deployment and determine future needs. To have ExtremeCloud IQ automatically plan for you, see Automatically Add Simulated Devices on page 319.

1. From a floor plan in a building at a network location, select **PLAN DEVICES**.
2. Select the type of connectivity you need from the drop-down list under **AUTO PLAN DEVICES**.
3. In the **ADD DEVICES** section, enter the number of devices you want to add.
4. Expand the **More** tab.
5. Select the **RADIO** band.

   The Channel selections available to you in the next step will change depending on whether you select 2.4 GHz or 5 GHz.
6. Select the **Channel Width**.

   Channel width options vary depending on the radio band setting.
7. Select the simulated **DEVICE** model that you want to place.
8. Select the RF **SIGNAL STRENGTH**.
9. Select the **CHANNEL**.

   If you select **Auto**, ExtremeCloud IQ automatically selects the channel for you.
10. Select a **POWER** setting.

    This is the transmission power for the devices. The range is 1 - 20 dBm.

Icons for the simulated devices appear in the upper left corner of your floor plan. Drag them to various locations, add known obstructions to your floor plans (Add Interior

Walls and Obstructions on page 317), and view heat maps (View Heatmaps on page 321) to calculate the best deployment sites.

View Heatmaps

Populate your maps with real devices, simulated devices, or a combination.

Use this task to view device heat maps to see data about your wireless network coverage, including RSSI, SNR, channels, data rates, and interference.

1. From **Radio**, select 2.4 GHz or 5 GHz.
2. From **Devices**, choose to show heat maps for all devices on a map, only for real devices, or only for simulated devices.

   If you choose to show only real devices, you can also show clients, rogues, meshed, and Ethernet devices.
3. From **Show on Heat Map** select the type of heat map.

   For any option besides **None**, a panel displays the multiple floors icon, a legend to explain the colored areas on the map, and a drop-down list where you can change the power setting. For any active heat map, you can change the signal strength by selecting from a range of -40 dBm to -90 dBm in the dBm.
4. Select **None** to clear heat maps.

Heat maps display the following information:

- **RSSI**: The RSSI color bar indicates the strength of the signals, with red being the strongest and light blue the weakest. When you raise the signal strength threshold toward -40 dBm, the color bar shows only colors representing signal strength levels strong enough to pick up clients at or above that threshold. When you lower the threshold closer to -90 dBm, the color bar shows more colors, indicating more signal strength levels at which clients can connect. Hover your cursor over the color bar to see the RSSI values represented by colors.
- **SNR Heat Map**: SNR (signal-to-noise ratio) is the difference between the RSSI and the noise (low-level background radio signals that can interfere with a wireless network) in the RF environment. A high SNR means that the potential for interference is slight. A low SNR means that there is a greater potential for interference. For good wireless performance, the SNR should be at least 25 dB and never lower than 20 dB.
- **Channels Heat Map**: ExtremeCloud IQ dynamically assigns channels when you add devices either manually or automatically. Channels are displayed in different colors so that you can easily identify which channel each devices is using. You can adjust the lower end of the RSSI range to change the area of coverage depicted.

  Note
  Channels and RSSI heat maps both display channel and RSSI values. The difference is in the emphasis that each map places on different types of data. The Channels option also shows RSSI data, but uses a single color per device to make it easier to see which channels are in use in any area. The RSSI option also shows channel data, but uses of different colors to make it easier to distinguish RSSI values.

- **Data Rates Heat Map**: Set the minimum data rate that you want the APs to provide. Radio cells are colored to show the estimated data rates that are available at various distances from the AP. The colors cover a range from the minimum data rate to a maximum of 270 Mbps.

  Note
  Data rates above 54 Mbps are only possible when the radio mode is 802.11n.

  Choose the estimated noise level of the site from -75 to -95 dB in increments of 5 dB to estimate the amount of interference to the RF signal from the APs.
- **Interference**: Identify sources of interference from obstructions inside your building, other electronic devices, or from other wireless networks located nearby. There are many causes of interference, such as microwave ovens, cordless phones, Bluetooth devices, wireless video cameras, and even fluorescent lights. If your network is experiencing a great deal of interference, you can try relocating devices, changing the power levels, and changing the radio band.

Devices

The **Manage** > **Devices** window is where users land after logging in to ExtremeCloud IQ. It features the following elements:

- A list of configured devices in the network—including controllers and controller-managed devices—along with device status and configuration details
- Filters to narrow the list of devices displayed
- Device management resources

The Devices window displays in Default view. To optimize loading performance, a limited number of Device list table columns display in the Default view. Change the **View** setting to filter the Device list, and to add to or change the informational columns displayed. See Filter the Device List for details.

Related Topics

Manage Devices on page 322
Filter the Device List on page 325
Device List Columns on page 327
Device Status Icons on page 334
Inventory View on page 330
Add or Edit a Custom View of Device List Columns on page 334
Utilities on page 339
Actions Menu Overview on page 347

Manage Devices

The **Manage** > **Devices** window provides resources to facilitate device management. These resources include:

- Status indicators
- Management tools

Status Indicators

Status indicators appear in the Device list and in the banner above the Device list.

Under the **Status** column in the Device list, icons appear that are designed to provide useful device status information. Multiple status icons can be associated with a device. Hover over any icon to view a label indicating what the icon represents. Some status icons are interactive. For example, select either the Configuration Audit Match ✓ icon or Configuration Audit Mismatch ! icon to open a pop-up window detailing device configuration changes that have been made since the last configuration update.

Note
The Configuration Audit icons do not apply to locally managed switches.

See Device Status Icons for a description of each icon that may appear in the Device list and the actions users can take.

The status indicators in the banner above the Device list display network-level connection information and notifications. This data automatically updates whenever you open the Devices window. Table 51 describes the information each indicator provides and actions users can take:

Table 51: Banner Status Indicators

Status Indicator	Description
Connection Status	Shows the total number of connected devices and how many are online versus offline. Select the adjacent ⛶ icon to view how many of the devices are APs versus switches.
Total Apps	Shows the number of applications in use. Select the adjacent ⛶ icon to view the **Most Active App** and the **Most Active User**. Select the adjacent (non-zero) value to open the **Manage** > **Applications** window to view more details about the applications. See Manage Network Applications and Application Groups for more information.
Clients	Shows the number of connected clients. Select the adjacent (non-zero) value to open the **ML Insights** > **Client360** window to view more details about the clients. See About Client 360 for more information.
Users	Shows the number of connected users. Select the adjacent (non-zero) value to open the **Manage** > **Users** window to view more details about the users. See Manage Users for more information.

Table 51: Banner Status Indicators (continued)

Status Indicator	Description
Anomaly Detection	The Anomaly Detection indicator shows the number of anomalies detected over the past 24 hours. Hover over the ▦ icon to view a summary of the three most recent anomaly detections, or select **View All** to open the ExtremeCloud IQ CoPilot Dashboard and view more details about the anomalies.
Alerts	The Alerts indicator shows the number of Unacknowledged Critical alerts raised over the last 24 hours. Hover over the 🔔 icon to view a summary of the five most recent Critical alerts. Select **View All** to open the Alerts dashboard and review details of, and optionally acknowledge, the Critical alerts. See Alerts for more information.

Management Tools

Most of the tasks performed in the Device list require that you first identify the target(s) of any actions to be taken by selecting the check box associated with the device(s) in the Device list. There are multiple ways to select devices:

- Individually select the check box associated with each target device.
- First, select all of the devices in the list by selecting the table header row check box located at the top-left side of the list (bulk select). Next, clear the check boxes for individual devices for which you do not want to apply an action.
- When there are multiple pages of devices, to select all the devices on all pages, choose **All Pages** above the table. To deselect all the devices on all pages, choose **None**.

The number of devices you select displays in Showing <*devices selected*> of <*total filtered devices*> Selected.

Choose from the following actions:

- Select + to add a new device.

  See Add Devices Overview for information about the different methods you can use to add devices to the ExtremeCloud IQ network.
- To modify an AP or switch configuration at the device level, or to view monitoring data for an AP or switch, choose from the following methods to open the **Device Details** panel where you can find **Monitoring** and **Configuration** resources:
  - Select the target device, then select ✎.

    This option is not available for locally-managed devices.
  - Select the **Host Name** of a device.
  - Select the **MAC** address of a device.
  - Select the value under the **Clients** column for the target device.

  See Device Details Overview for details about the Monitoring and Configuration resources available at the device level.

- To download data in .csv format for one or more devices, select each target device in the list, then select ⤓.
- To delete one or more devices, select each target device in the list, then select 🗑 and confirm the deletion.
- Select one or more devices in the list, then use the drop-down menus to see which Utilities and Actions are available for the device(s).

  Note
  Most device options are **unavailable** if an unmanaged device is selected, either alone or together with managed devices. To change the management status for one or more devices, select each target device in the list, then select Actions and use the drop-down menu to choose **Change Management Status**.

- To apply configuration changes to one or more devices, select each target device in the list, then select **Update Devices**. Alternatively, to update configuration changes for a single device, select **Update** in the **Device Details** panel.

  See Push the Device-Level Configuration to the Device for details.
- Select ▥ to customize the informational columns that display in the Device list.

  See Device List Columns for further detail.
- Select ⟳ to refresh the status indicators and device data displays.
- Select the policy name under the **Network Policy** column to open the Policy configuration window and examine or edit settings.
- Select the path of the target device under the **Location** column to open the **Assign Location** window and view or edit the associated details.

Related Topics

Devices on page 322

Device Details Overview on page 351

Filter the Device List

This section describes the options available for filtering the Device list under **Manage** > **Devices**.

Sidebar Filter

Use the sidebar filter to customize the information displayed in the Device list. The filter icon changes depending on whether a filter is applied. When there are no filters applied, the icon appears normal. When one or more filters are applied, the icon contains a colored dot. You can save and name multiple filters. Sidebar filter settings persist after logging out.

View Options

Filter the Device list using the **View** drop-down menu, as follows:

- **Default**: Displays a limited set of table columns for optimal page loading performance. You can arrange Default view table columns independently of the other views using the Default column picker.
- **Wireless**: Displays information about only the wireless devices on your network.
- **LAN**: Shows data for LAN devices in a specific location. You can arrange LAN view table columns independently of the other views using the LAN column picker.
- **WAN**: Shows data for only WAN routers and is set to L3 mode. You can arrange WAN view table columns independently of the other views using the WAN column picker.
- **Locally Managed**: Displays devices that are managed locally, such as those managed by ExtremeCloud IQ Virtual Appliance or by a controller.
- **Controller**: Displays all onboarded controllers.
- **Inventory**: Displays device inventory at all sites or a specified site. The Inventory view is distinct from, and does not filter, the Device list view. See Inventory View for details.
- **Site Engine Managed**: Displays devices that are managed by ExtremeCloud IQ Site Engine.
- **Custom**: Displays Device list table columns according to selections made in the Custom column picker. See Add or Edit a Custom View of Device List Columns for details.

The selected **View** persists—even if you change windows—until you log out, after which the view setting reverts to Default view. The exception to this is for the Custom view, which you can set as the default view for the landing page when you log in to ExtremeCloud IQ.

Search Options

Use the **Search** tool to narrow the Device list. Valid search field entries include a device's Host Name, MAC address, Serial #, or Management IP address.

Note

The ExtremeCloud IQ search facility supports commonly used MAC address formats. Common formats include:

- aa-bb-cc-dd-ee-ff
- aa:bb:cc:dd:ee:ff
- aabb.ccdd.eeff
- aabbccddeeff

Column Picker

Select ▥ to open the Column Picker and select the table columns to include in the Device list view. The options available to choose from depends on the current View. Select **Reset to Defaults** to reset the column selection to the default view.

Related Topics

Use the Filter Sidebar on page 305

Inventory View on page 330

Add or Edit a Custom View of Device List Columns on page 334

View Options on page 325

Manage Devices on page 322

Device List Columns on page 327

Device List Columns

The device list displays in tabular format, with device provisioning details arranged under various columns. Some columns are displayed by default. Other columns must be selected to appear in the display, using the column picker ▥.

The columns that appear in the device list by default, and the optional columns users can select with the column picker, depends on the selected **View**. See View Options in Filter the Device List for details.

Choose from the following options to alter the columns display:

- Rearrange the order of the column headings by selecting a column heading and dragging it horizontally. A dotted line indicates where the heading will be inserted.
- If the columns do not fit the width of the window, scroll horizontally to view all the columns.
- Select and drag the right edge of any column to change the column width.

Note
Display alterations are maintained even after exiting the window and logging out.

To optimize loading performance of the **Manage** > **Devices** landing page, a limited number of columns appear in the **Default** view.

Table 52 lists the default columns that appear in the **Default** view, and describes the type of information that is found under these columns, as well actions that users can take.

Table 53 on page 329 lists and describes other columns users can add to the display, as well actions that users can take. It is not possible to add these colums to the Default view.

Table 52: Default View — Device List Columns

Column Heading	Description
OS	The operating system currently running on the device. For example, FABRIC, WiNG, CLOUD-IQ ENGINE, CISCO.
Status	Status icons indicate a device's connection status and provide other important device indications. Hover over an icon to view its function or other related information. For details about each icon's purpose, see Device Status Icons on page 334. Note: The Configured at Device Level 📋 icon indicates that a switch or AP uses device-level configuration settings instead of the device template (network policy) configuration. To revert to the device template configuration, select the check box associated with the device, then from the **Actions** menu, choose **Revert Device to Template Defaults**.
Host Name	The host name of the device. Select the host name to open the Device Details panel, which provides monitoring and configuration resources for managing this device. This column is sortable.
Network Policy	The network policy assigned to this device. If you have not assigned a network policy, you can do so now. Select the check box for the device, and then select **Actions** > **Assign Network Policy**. Note: This option is not available for locally managed devices.
Uptime	The amount of time since the device last rebooted and re-connected.
MGT IP Address	The IP address of the device.
Clients	The number of clients connected to this device.
MAC	The MAC address of the device.
Location	The location of the device in your network. To assign or change the location, choose one of the following methods: • Select the corresponding checkbox for a device, and then select **Actions** > **Assign Location**. • Select the name in the **Location** column. In the dialog box under **Global View**, select a new location and then select **Assign**. Note: For devices managed by ExtremeCloud IQ Site Engine the location is read-only. You can assign the location in ExtremeCloud IQ Site Engine.
Serial #	The serial number of the device.

Table 52: Default View — Device List Columns (continued)

Column Heading	Description
Model	The hardware model of the device. The hardware model and serial number appear on a label on the underside of the chassis.
OS Version	The version that is currently running on the device.
Updated On	The last time the configuration on this device was updated. If an update was not successful, ExtremeCloud IQ displays a **`Device Update Failed`** error message that includes configuration, firmware, certificate, and signature update issues, reboot timeouts, and error information specific to devices configured using Auto Provisioning. Hover over the error message to see details. To view error message descriptions listed by device and timestamp, select the error message link.
IPv6	The IPv6 address of the client device.

Table 53: Device List Columns

Column Heading	Description
Cloud Config Groups	Identifies all associated cloud config groups for this device. This includes client associated config groups and subgroups.
IoT0 EUI-64	A unique identifier assigned to a device in a Thread network.
IoT0 Extended MAC	A unique identifier assigned to a device in a Thread network.
Managed By	Identifies which product manages the device, as follows: • ExtremeCloud IQ • ExtremeCloud IQ Site Engine (Site Engine also manages third-party devices) • ExtremeCloud IQ Controller When devices are managed locally, this column is empty.
Feature License	Identifies the licensed features the device is using. Valid values are: None, MacSec, Premier. MACsec features require a **MACsec** license. Feature requirements for a **Premier** license are platform- and network operating system-specific. For details and ordering information, see the switch datasheet(s).
Device License	Identifies the ExtremeCloud IQ license type that is used to manage the device. Valid values are: • Pilot—ExtremeCloud IQ Pilot license • Navigator—ExtremeCloud IQ Navigator license • Legacy—Legacy entitlement key • Not Required—Ping Only device reported by ExtremeCloud IQ Site Engine, APs reported by ExtremeCloud IQ Controller, Digital Twin (DT), Simulated, or Unmanaged by user • Trial—Trial VIQ

Table 53: Device List Columns (continued)

Column Heading	Description
IQ Agent	For switches, the IQ Agent version. IQ Agent enables communication between switches and ExtremeCloud IQ.
WiFi0 Power	The power level of the WiFi0 radio.
WiFi1 Channel	The channel currently used by the WiFi1 radio. Refer to the data sheet for your device and your software-defined radio (SDR) configuration to determine the band on which the WiFi0 radio is operating.
WiFi1 Power	The power level of the WiFi1 radio.
WiFi2 Channel	The channel currently used by the WiFi2 radio. Refer to the data sheet for your device and your software-defined radio (SDR) configuration to determine the band on which the WiFi0 radio is operating.
WiFi2 Power	The power level of the WiFi2 radio.
MGT VLAN	The management VLAN for this device.
MAKE	Extreme Networks: For example, Fabric Engine, Switch Engine, EXOS, VOSS, WiNG. External: For example CISCO.
Stack Unit	The unit number of a switch in a stack.
Stack Role	The role (primary, secondary, or member) of a switch in a stack.
CoPilot	Identifies whether the CoPilot license is used by ExtremeCloud IQ. Valid values are: • None—This indicates one of the following conditions: ◦ CoPilot is disabled. ◦ Device is not compatible. ◦ Device is unmanaged. ◦ Customer intentionally revoked CoPilot license. • CoPilot Active—CoPilot license is active for the device. • Grace Period—CoPilot license has expired and the grace period applies. • Unlicensed—CoPilot license has expired. • Trial—Device is part of a trial VIQ.
WIFI0 Channel	The channel currently used by the WiFi0 radio. Refer to the data sheet for your device and your software-defined radio (SDR) configuration to determine the band on which the WiFi0 radio is operating.
Managed	Indicates whether the device is currently managed.
Country	The device country location code.
IoT0 Profile	The name of the profile assigned to the IoT0 wireless interface.

Inventory View

Go to **Manage** > **Devices**, then select **Inventory** from the **View** drop-down list.

The **Inventory** window includes:

- A list of devices at all sites or a specified site, along with details about the devices
- Filters to narrow the list of devices displayed
- Management tools

Device List Details

The Inventory device list displays in tabular format, with device provisioning details arranged under various columns. The Inventory view displays a fixed set of columns, as follows:

- Device Type
- Managed By
- Device License
- CoPilot
- OS Version
- Country
- Host Name
- Status
- MAC
- Location
- Serial #
- Model

See Device List Columns for a description of the type of information displayed under these columns.

Filters

Use the **Search** tool to narrow the device list. Valid search field entries include a device's Host Name, MAC address, Serial #, or Management IP address.

The following filters are available to refine the list of devices in the Inventory view. Use the filter drop-down menus to select from the available options.

Status

- All
- Connected
- Disconnected
- Pre Provisioned
- Undetermined

Device Type

- All
- Access Point
- Router

- Switch
- Stack

OS Version

- All
- Choose from the list of currently available OS versions.

Managed By

- All
- Choose from the list of currently available management platforms.

Management Tools

Choose form the following actions:

- Select ↻ to refresh the display.
- Select ⤓ to download a .csv file containing a record of the devices in the list.
- To exit the Inventory window, choose another option from the **View** menu.

Related Topics

Devices on page 322
Manage Devices on page 322
Filter the Device List on page 325

NEW! Site Engine Managed View

The **Site Engine Managed** view shows all Site Engine managed devices in one separate view for easier management and monitoring.

To access this view, go to **Manage** > **Devices**, then from the **View** drop-down list, select **Site Engine Managed**.

The **Site Engine Managed** view includes a list of devices and their details, filters to narrow the displayed devices, and management tools.

Device List Details

The Device List column display is configurable. The **Site Engine Managed** view displays the following columns by default:

- Last Seen On
- OS
- Status
- Hostname
- Uptime
- Mgt IP Address
- IPv6
- Model
- MAC

- OS version
- Serial #
- Location
- Managed
- Stack Unit
- Stack Role
- Cloud Config Groups

See Device List Columns for column information descriptions.

Filters

Use the Search tool to find specific device information. The following column values are valid search criteria: Host Name, MAC Address, Serial Number, or Management IP Address.

The following filters are available to refine the list of devices in the Site Engine Managed view. Use the filter drop-down menus to select from the available options.

Table 54: Site Engine Managed view filter options

Filter	Drop-down options
Status	All
	Connected
	Disconnected
	Pre Provisioned
	Undetermined
OS Version	All
	Choose from the list of currently available OS versions.
Managed	All
	New
	Setting up
	Managed
	Unmanaged

Management Tools

Choose from the following actions:

- To refresh the display, select ⟳.
- To download a .csv file containing a record of the devices in the list, select ⤓.
- To delete one or more devices, select the targe device in the list, then select 🗑 and confirm the deletion.
- To view which Utilities and Actions are available for the device, select one or more devices from the list, then use the associated menu.

- To hide and remove columns, select ▥.

> Note
> To add new columns, go to Customer view.

- To exit the Site Engine Managed window, choose another option from the **View** menu.

Related Topics

Devices on page 322
Manage Devices on page 322
Filter the Device List on page 325

Add or Edit a Custom View of Device List Columns

Go to **Manage** > **Devices**.

Use this task to create or edit a Custom view of the device list, and optionally, to set it as the default view for the ExtremeCloud IQ landing page. Only one Custom view can exist per administrator account.

> Note
> Choosing to make the Custom view the default view for the ExtremeCloud IQ landing page may impact page loading performance.

1. Use the **View** drop-down menu to select **Custom**.
2. Select ✎ adjacent to the **View: Custom** field.
3. In the **Name Custom View** pop-up window:
    a. Add or edit the name for the Custom view.
    b. Optionally, select the **Save as default** check box to set the Custom view as the default view when you log in to ExtremeCloud IQ.
4. Select **Save** to commit the changes, or select **Cancel**.
5. Select ▥ to pick the columns you want to display in the device list for the Custom view.

Related Topics

Filter the Device List on page 325
Device List Columns on page 327

Device Status Icons

Go to **Manage** > **Devices**.

Table 55 describes the icons that can appear under the **Status** column in the Device list. Actions users can take are also described.

Table 55: Device Status Icons

Icon	Icon Name	Description
☁	Provisioned Device	An administrator has provisioned the device, but the device has not yet communicated with ExtremeCloud IQ. This is an administrative state and does not reflect the actual connection status. To view the actual connection status, you must manually change the management state using the Actions > Change Manage Status > Managed Devices menu option.
☁	Connected Device	Device is actively communicating with ExtremeCloud IQ.
☁	Disconnected Device	Device is not actively communicating with ExtremeCloud IQ. Cause: The device might be physically disconnected from the network or powered off. This condition also occurs if there are interruptions in the network between the device and ExtremeCloud IQ or when there are misconfigured firewalls or ACL rules. Action: Ensure the device is connected to the network and powered on, and ensure that communication can occur through logical barriers such as firewalls.
!	Configuration Rollback	Device could not establish a connection to ExtremeCloud IQ after the configuration update. Device configuration rolled back to the last known good connection and the **Updated** status column displays *Device update failed*.
☁	Simulated Device	Device is a simulated device, which possesses only simulated configurations, conditions, and traffic. By contrast, a real device has a physical presence on the network and consumes power and network resources.
?	Undetermined	Device status is undetermined. Cause: This condition can arise when the indicators are ambiguous, unknown, or appear contradictory due to other factors. Action: Begin general troubleshooting procedures to ensure that the device is powered, connected, and is responding to traffic and CLI commands. Ensure that the device is communicating appropriately with network services, such as NTP, DHCP, etc.
⊘	Old OS Personality (Inactive)	Device formerly used another OS persona, which is no longer active. The information in this record pertains to the device when it ran using this OS persona.

Table 55: Device Status Icons (continued)

Icon	Icon Name	Description
✓	Configuration Audit Match	The network policy configuration matches the current running configuration. Select the icon to open a pop-up window detailing the configuration changes that occurred since the last **Update Devices** operation. • Audit tab — lists any modifications made since the previous configuration update. • Delta tab — shows CLI commands that have changed since the previous update. • Complete tab — shows all CLI commands (including the CLI commands in the Delta tab) that form a configuration file. ExtremeCloud IQ uses this file for the next configuration update. After a successful configuration update, the configuration in the Complete tab matches the running configuration. Note: Not applicable for locally managed switches.
!	Configuration Audit Mismatch	The network policy configuration does not match the current running configuration. Cause: The Configuration Audit Mismatch icon is visible on devices between the time that network policy changes are saved and the time that the altered network policy is uploaded to the device. Action: Upload the network policy to the device. Select the icon to open a pop-up window detailing the configuration changes that occurred since the last **Update Devices** operation. See the Configuration Audit Match icon description for details. Note: Not applicable for locally managed switches.
📋	Configured at Device Level	Device possesses a device-level configuration that is different from the configuration defined in the network policy. This is not an error condition, but this information can be useful when troubleshooting network behavior because device-level configurations supersede device templates and network policy configurations.
!	Device Update Unsuccessful	Device did not accept the OS or configuration upload. Cause: There are many reason for an unsuccessful update, but the most common include network connectivity or connection status changes, or the device rejected the command it received. Action: Hover over the update message in the Updated column to view the reason message describing the likely error condition. Ensure that the device is properly powered, that there is appropriate network connectivity, and that common causes listed here are not the issue.
IOT	Managed by ExtremeIoT	Device is provisioned to function with ExtremeIoT.

Table 55: Device Status Icons (continued)

Icon	Icon Name	Description
🛡	Thread Commissioner Running	The AP is designated Commissioner in the IoT Thread network.
	Monitoring Unassociated Clients	Device is using presence analytics to monitor client devices that are not associated to the network, such as passersby.
	Switch Stack	Device is a switch stack. Select the icon to expand the device list view to include details for the switch stack members.
	Switch Stack Warning	One or more stack member switches is not associated to the master stack node. Cause: One or more member switches within a stack has lost connectivity to the master stack node. This can happen if the member switch is powered off, physically disconnected from the stack, or if there is an issue with the switch itself. Action: Ensure that the switch slot has power and that the stacking cables are properly connected.
	RadSec Proxy Server	Device is acting as a RadSec proxy server. This service optimizes some authentication functions, especially for cloud authentication, such as cloud PPSK and cloud RADIUS.
	Rogue AP Mitigation On	Device is actively mitigating a rogue access point. Refer to the information provided by your security management platform.
◎	Sensor Mode - Interface Active	Device is functioning as a sensor and the monitoring interface is active and monitoring the RF environment.
◎	Sensor Mode - Interface Inactive	Device is functioning as a sensor, but the monitoring interface is not active and is not monitoring the RF environment.
↑↓	Swap for Real Device	Device is a simulated device that you can exchange for a real device.
	Spectrum Intelligence	Device is functioning as a Spectrum Intelligence monitor, which monitors the RF environment and provides frequency and time domain graphs and heat maps.
S↑	VPN Server - Tunnel Up	Device is functioning as a VPN server and the VPN tunnel is up, healthy, and operating properly.

Table 55: Device Status Icons (continued)

Icon	Icon Name	Description
S↓	VPN Server - Tunnel Down	Device is functioning as a VPN server, but the VPN tunnel is down. If the tunnel is administratively down, then this is not an error condition. Cause: If not administratively down, issues on the client side can cause the tunnel to go down. Additionally, if the client- and server-side configuration do not agree, then a tunnel cannot be built. Action: Consult the VPN troubleshooting tools in ExtremeCloud IQ. You can also ensure that the client device is connected to the network and that the tunnel configurations agree on both ends of the tunnel.
S↑↓	VPN Server - Tunnels Up and Down	Some of the VPN server tunnels are administratively up but operationally down. Cause: VPN client might be down, or unreachable. Action: Ensure that the VPN clients are powered on, connected to the network, and communicating with ExtremeCloud IQ. In addition, ensure that there is connectivity and communication between the VPN server and clients.
C↑	VPN Client - Tunnels Up	Device is functioning as a VPN client and the VPN tunnel is up, healthy, and operating properly.
C↓	VPN Client - Tunnels Down	Device is functioning as a VPN client, but the VPN tunnel is down. If the tunnel is administratively down, then this is not an error condition. Cause: If not administratively down, issues on the server side can cause the tunnel to go down. Additionally, if the client- and server-side configuration do not agree, then a tunnel cannot be built. Action: Consult the VPN troubleshooting tools in ExtremeCloud IQ. You can also ensure that the server device is connected to the network and that the tunnel configurations agree on both ends of the tunnel.
C↑↓	VPN Client - Tunnels Up and Down	Some of the VPN client tunnels are administratively up but operationally down. Cause: VPN server might be down, or unreachable. Action: Ensure that the VPN server is powered on, connected to the network, and communicating with ExtremeCloud IQ. In addition, ensure that there is connectivity and communication between the VPN server and client.
📍	Locally Managed (ExtremeCloud IQ)	Device is managed by a platform that is visible in ExtremeCloud IQ.

Table 55: Device Status Icons (continued)

Icon	Icon Name	Description
📍	Locally Managed (No ExtremeCloud IQ)	Device or its management platform are not visible in ExtremeCloud IQ. Cause: This is not always an error condition, but it can indicate a status communication problem. In this case, the device is functioning properly, so there is no disruption in network performance; instead, the status communication is disrupted so that ExtremeCloud IQ is unaware of the status. Action: First, ensure that the device is functioning properly to rule out problems with the device. Next, ensure that there are no logical barriers between the device and ExtremeCloud IQ. Afterward, ensure that any applications that lie in the communication path are receiving, processing, and sending data appropriately.
⁂+	ExtremeCloud Appliance Cluster (Closed)	Device is a logical cluster of appliances, but the cluster is collapsed visually to appear as a single device.
⁂−	ExtremeCloud Appliance Cluster (Open)	Device is a logical cluster of appliances, but the cluster is expanded visually to reveal the cluster members.
🟢	Fabric Attach	Device is a member of the Fabric Attach Connect Automation environment and is functioning properly in that context.
🔴	Fabric Attach Issue	Device is Fabric Attach capable, but the Fabric Attach (FA) session to the FA server is not established. Cause: This can occur if the communication link between the FA device and server is disrupted or if FA is disabled on the peer switch. Action: Ensure that there is connectivity between FA device and server, and that FA server functionality is enabled on the peer switch.
🎭	Digital Twin	Device is a simulated device.

Utilities

Go to **Manage** > **Devices** > **Utilities**

The **Utilities** drop-down list offers a variety of useful troubleshooting tools.

Note

Utilities are only available for devices managed by ExtremeCloud IQ; not devices managed by ExtremeCloud IQ Site Engine. Not all utilities are available for all device types. Depending on the type of device you select, you will see a subset of the available utilities.

If you have a large number of devices, use the steps below to help locate a specific device to which you want to apply any of these utilities.

There are a number of **diagnostics** options based on the type of device you choose. For more information on some of the more complicated options, see:

- Device Diagnostics on page 340
- Restart Device to Default on page 342
- Spectrum Intelligence Details on page 342
- Restart PSE on page 344

Status options include:

- Advanced Channel Selection Protocol
- Interface
- Wi-Fi Status Summary

Tools options include:

- Client Information on page 344
- Get Tech Data on page 344
- Locate Device on page 344
- Neighbor Information on page 345
- Packet Capture (for IQ Engine APs) on page 345
- Switch VLAN Probe Utility on page 345
- SSH Availability on page 346

Use the following steps to locate a device:

1. If you know an identifying characteristic (host name, MAC address, or serial number) of a device that you want to troubleshoot and you see it in the table, proceed to Step 2.
    a. If you know an identifying characteristic but do not see the device in the main table—perhaps because there are a large number of devices—start typing the host name, MAC address, or serial number in the **Enter Client Host Name** or **Mac Address** field.

       This field will auto-complete your entry with one or more possibilities, which are displayed in a drop-down list. The more characters you enter, the more specific the result. Choose the item you want from the list.
    b. If you do not see a device in the main table and do not recall any identifying characteristics, try applying one or more filters until you see the one you want.
2. Select the check box for that device to see the results.

Device Diagnostics

This utility enables you to run CLI commands on a device from inside the ExtremeCloud IQ interface to perform basic network connectivity diagnostics, check status, and diagnose several functions.

1. Select a device to diagnose.

2. Select **Diagnostics**.
3. Select one of the following CLI commands:
    - **Ping**: Have the selected device ping the IP address of its own mgt0 interface (default). You can change the target to any IP address, such as the default gateway, or an address beyond the gateway, such as a DNS server.
    - **Show Log**: Displays the event log for the device.
    - **Show Version**: Displays the version running on the device.
    - **Show Running Config**: Displays the configuration running on the device.
    - **Show Startup Config**: Displays the configuration used by the device on reboot.
    - **Show IP Routes**: Displays the IP routing table.
    - **Show MAC Routes**: Displays the MAC forwarding table.
    - **Show ARP Cache**: Displays the ARP cache.
    - **Show Roaming Cache**: Displays the roaming cache, which contains MAC addresses and PMKs (pairwise master keys) for wireless clients and MAC addresses for the authenticating devices. This table also includes the user profile ID number of the client and details about the PMK.
    - **Show DNXP Neighbors**: Displays neighboring hive members in the same or different subnets. This is the equivalent of entering the `show amrp dnxp neighbor` command. Hive members use AMRP to support roaming clients.

      DNXP is a component of AMRP that supports Layer 3 roaming. Hive members in different subnets use DNXP to create tunnels on an as-needed basis between themselves, allowing clients to seamlessly roam between subnets, while preserving their IP address settings, authentication state, encryption keys, firewall sessions, and QoS enforcement settings. Tunnels are not required for clients roaming among members in the same subnet.
    - **Show DNXP Cache**: Displays the DNXP cache, which provides information that the device uses to form an association with a client that has already associated with a DNXP neighbor and that could possibly roam to it.
    - **Show AMRP Tunnel**: Displays information about DNXP, INXP, and VPN tunnels, including tunnel type, the peer IP address, and how long the tunnel has been up.
    - **Show GRE Tunnel**: Displays packet statistics for client traffic that members send through GRE tunnels between themselves. Extreme Networks devices use GRE tunnels for DNXP, INXP, and wireless VPN.
    - **Show IKE Event**: Displays up to 12 recent events during IKE phase 1 and phase 2 negotiations between a VPN client device and VPN server device.
    - **Show IKE SA**: Displays the cookies and creation times of SAs (security associations) established during IKE phase 1 negotiations between a VPN client and VPN server. If there are no SAs, the negotiations were either incomplete or unsuccessful. Use this option to check the log messages for more details.
    - **Show IPsec SA**: Displays the SAs established during IKE phase 2 negotiations between a VPN client and VPN server.
    - **Show IPsec Tunnel**: View details about the IPsec tunnel including the amount of traffic between the VPN client and servers.

- **Show CPU**: Displays total, per user, and per system CPU utilization.
- **Show Memory**: Displays total, free, used, buffered, and cached memory.

Restart Device to Default

You can reset one or more selected devices to their default configuration. A warning statement displays after you select this option. If you select **Yes**, the operation removes all existing settings (except bootstrap settings) and reboots the selected devices.

Spectrum Intelligence

(Applies to APs only). Spectrum Intelligence provides a live view of the RF (radio frequency) environment to help you plan for future VLAN deployment or troubleshoot VLAN issues such as high retransmission rates caused by device interference or slow connections due to overuse. There are two main spectrum intelligence functions: providing a graphical rendering of the RF environment in an FFT (fast Fourier transform) trace and swept spectrogram and identifying interfering devices, such as cordless phones and microwave ovens.

> Note
> To use Spectrum Intelligence, you must have at least one SSID configured on your VLAN on at least one AP running ExtremeCloud IQ 11.28 and IQ Engine 8.0 or later.

1. Select the check boxes for up to five supported APs.
2. Select **Utilities** > **Spectrum Intelligence**.
3. A message warns you that performing this function can affect performance.
4. Select **Yes** to see the analysis panel, containing a status bar, a graphical analysis feedback section, and the interference reports.

   For information about the data panel, see Spectrum Intelligence Details on page 342.

Spectrum Intelligence Details

The **Spectrum Intelligence** data panel contains the following information:

Status Bar

The **Status Bar** at the top of the panel displays the current analysis parameters, including which AP or APs are running the scan, the channels, run time, and band (2.4 GHz or 5 GHz). You can change these settings for each and then select **Apply**.

Below the Status Bar, on the right side of the panel you will see the time remaining in the current scan. Select **Stop** to end the current analysis.

> Note
> Spectrum analysis automatically shuts down after 30 minutes.

Data Collect Interval: The data collection interval refers to the time interval between scans of the spectrum. Each time the AP scans the spectrum, it updates the display. If the data collection interval is five seconds, then the AP scans every five seconds and updates the display. You can change the interval from 1 to 30 seconds.

Graphical Analysis Feedback

This area displays graphs of the received signals, arranged by default in a two-by-two array. Use the expand and collapse arrows in the upper right corner of each graph to enlarge or reduce the graph for visibility.

- **Real-time FFT**: The real-time FFT trace indicates the power of a signal (vertical axis) along a domain of frequencies (horizontal axis).
- **FFT Duty Cycle**: The FFT duty cycle is the amount of time as a percent of total time that the AP receives a signal 20 dB or more above the noise floor. The FFT duty cycle is often referred to as channel utilization because it indicates to what extent a channel is actually in use in terms of the relative amount of time the signal is present (vertical axis).
- **Swept Spectrogram**: A swept spectrogram tracks the signal power over time. It produces a color-coded sweep of spectral information that shows the real time FFT in terms of its historical values. The swept spectrogram—also called a heat map—reports the frequency on the horizontal axis, the history (in sweeps) on the vertical axis, and the power encoded as a set of colors.
- **Swept Spectrogram-FFT Duty Cycle**: A swept spectrogram of the FFT duty cycle tracks the duty cycle over time. This spectrogram produces a color-coded sweep of duty cycle information with frequency on the horizontal axis, history (in sweeps) on the vertical axis, and the duty cycle encoded as a set of colors.

Interference Reporting

The Interference Signature table below the graphs displays any sources of RF interference that the spectrum analyzer can identify. This area provides a summary of all interference sources for quick review. This area contains six columns to help identify the affected channels and the approximate position of the interference.

- **Extreme Device Name**: The name of the AP that is reporting the interference. If an interference source is reported by a few APs, but not others, you can use this to approximate the physical location of the interference.
- **Device Function**: Indicates the device type of the interferer, such as a cordless phone, microwave oven, or video bridge. The device type listing can help determine whether the interference source might be a security concern.
- **Discovered**: Shows the date and time that the AP discovered the source of the interference. You can track regular, periodic, and intermittent interference sources using this information.
- **Channel Affected**: When ExtremeCloud IQ identifies an interference source, the channel in which it occurs displays here.
- **Center Frequency**: The center frequency is the midpoint between upper and lower frequency band cutoff.
- **Occupied Bandwidth**: This column displays the bandwidth of the affected range of frequencies.

The last three columns contain redundant information and provide the same information from different perspectives so that you can gain a more a complete understanding of the affected frequencies and channels.

Neighboring APs

A table displays a list of neighbor APs.

Restart PSE

(Applies to switches only.) You can restart the PSE function on PoE switches.

1. Select the switch checkbox.
2. Select **Utilities** > **Restart PSE**.
3. A warning statement displays after you select this option.
4. Select **Yes**.

   The switch briefly stops supplying PoE on all PoE-enabled ports, and then re-applies it. All devices receiving PoE from the switch are power cycled.

Client Information

Client Information presents an aggregated view of unique historical client connections within the last 30 days.

Get Tech Data

This utility collects technical data about devices to assist in troubleshooting.

1. Select one or more devices.
2. Select **Get Tech Data**.
3. Confirm the number of devices you selected.

You can save the data file to a local directory in the **`.tar.gz`** file format. To view the data in a text editor, you must first expand it with a file decompression program. A read me file identifies the devices from which information was obtained.

Locate Device

Use the Locate Device utility to alter the status LED on APs and Switch Engine devices so that you or an assistant at a remote site can locate the physical device more easily. You can also turn the LED off, which can be useful when an AP is mounted near a projection screen or is in a location where the light can be distracting.

1. Go to **Manage** > **Device**, select the check box for a single device, select **Utilities** > **Tools** > **Locate Device**.
2. Set the LED timeout, between 10-300 seconds.

   > Note
   > The default timeout is 300 seconds.

3. Select **Submit**.
4. To return the LED to normal operation, select **Return to normal LED operations**.

Neighbor Information

This utility lets you see information about the backhaul link between a device and its neighbors.

1. Select a device from the list.
2. Select **Get Layer 2 Neighbor**.

   The following information displays:

   - **Neighbor Information**: The host name of the neighbor device.
   - **MAC Address**: The MAC address of the neighbor to which there is an Ethernet or wireless backhaul link. Some neighbors might appear twice in the table, once to report information about an Ethernet link and again to report information about a wireless link.
   - **Connection Time**: The total time that the backhaul link has been up.
   - **Link Cost**: The routing cost. The lower the cost, the more preferred the link is for routing.
   - **RSSI**: The RF signal strength of the wireless link between the two neighboring devices. The RSSI range is 0 ~ 90.
   - **Link Type**: Ethernet or wireless.

Packet Capture (for IQ Engine APs)

ExtremeCloud IQ supports basic Packet Capture capabilities on all APs hosting IQ Engine OS. Additionally, AP5010/AP5010U/ AP5020, AP4000/AP4000U, and AP3000/ AP3000X models hosting IQ Engine 10.6.4 or higher support Enhanced Packet Capture capabilities.

1. Go to **Manage** > **Devices**.
2. Select the check box for an AP model.
3. Select **Utilities** > **Tools** > **Packet Capture** to add a capture session for the selected AP.

The **New Packet Capture** window opens displaying the packet capture configuration settings available, which depend on the device selected.

Related Topics

Packet Capture on page 413

Add and Start a Packet Capture Session on page 416

Switch VLAN Probe Utility

The VLAN probe function utilizes DHCP client on the switch to check for and display IP connectivity on a specified VLAN.

> **Note**
> If the VLAN selected to perform a VLAN probe already has a static IP address or is DHCP enabled, the VLAN probe will be skipped for that specific VLAN.

Use this task to locate available VLANs for devices in a complex network with multiple VLANs. VLAN probe for a Switch Engine device can also be triggered through the topology map.

Verify the VLAN probe results and status of VLAN for seleted device.

1. Go to **Manage** > **Devices** select the associated device.
2. Select **Utilities** > **Tools** > **Switch VLAN Probe**.
3. Enter the start and end of a range of VLAN IDs to probe.

   You can enter up to five ranges separated by commas, up to a total range of 12, however, range numbers cannot overlap. For example, `1,2-7,8,9-12`.
4. (Optional) Add a timeout from 5 to 60 seconds to specify how long to wait for a reply from each probe.
5. Select **Start** to start a probe.
6. Select **Stop** to stop a probe before it is complete.
7. Select **Clear** to clear entries for a probe.

When the VLAN probe is complete, a table shows the host name, MAC address, available VLANs, unavailable VLANs, and their status.

SSH Availability

Before you begin this task, complete procedure Enable SSH Availability on page 54.

You can use the SSH Availability utility to temporarily enable SSH availability on a device.

1. Select a device.
2. Select **Run**.
3. Select the length of time to make the device available for SSH access.
4. Select **Enable SSH**.

   Make a note of the IP address and port number to use when formatting an SSH session with the device. You, or another administrator with remote access to the device can now make an SSH connection and log in to it with root or read-only administrator credentials.

Download Tech Support File

To help with support related issues, you can download a technical support file, gathered from your system.

This action is only supported by one device at a time.

To download the technical support file:

1. Go to **Manage Device**, select a single device, **Utilities** > **Tools** > **Get Tech Support File**.
2. Select **Yes** when asked if you want to proceed.
3. Select **Download Tech Support**.

Actions Menu Overview

From the **Manage** > **Devices** > **Actions** menu, you can perform a number of functions for a device. Depending on the device type selected, the **Actions** drop-down list presents multiple options; for example, you can reboot, assign a country code or location, assign a network policy, create a bootstrap configuration, clone a device, or issue CLI commands to devices through ExtremeCloud IQ. Select the check boxes for the device or devices on which you want to perform actions, and then select **Actions**.

> Note
> Not all actions are available for all device types. Most device options are unavailable if an umanaged device is selected, either alone or together with managed devices. To change the management status of your device, select **Change Management Status**.

- **Add to Cloud Config Group**: Add the selected devices to an existing Cloud Config Group (CCG). In the **Add to Cloud Config Group** panel, select a CCG to assign to the selected devices, and then select **Continue**. If you need to first create a new CCG, see Add a Cloud Config Group on page 161.
- **Advanced**: This option offers three functions: **CLI Access**, **Bootstrap Configuration**, and **Update Netdump Settings**. Select the check boxes for the devices you want to update, and select one of these options from the **Advanced** menu:
  - **CLI Access**: (Real devices only) Use this feature to enter CLI commands for the selected device or devices without establishing a console cable connected to the device. Enter the command in the **CLI Command** field, and then select **Apply**. The results of the command are displayed below the command entry field.
  - **Bootstrap Configuration**: Use this simple configuration to re-establish a connection between a device and ExtremeCloud IQ. See Bootstrap Configuration on page 349 for more information.
  - **Update Netdump Settings**: Configure a device to automatically save a core netdump file to a TFTP server on the network when it next boots up after becoming unresponsive. See Update Netdump Settings on page 350 for more information.
- **Assign Country Code**: Select a country code for a managed device from the drop-down list. The country code determines which radio channels and power limitations devices will support to comply with the wireless regulations for the country in which they will operate. For devices intended for use in the United States, the region code is preset as **FCC** and the country code is preset as **United States**. Select **Save** to reboot the selected devices.
- **Assign Deployment Mode**: Assign the Pre-provisioned or Production deployment mode.

- **Assign Location**: Assign a location from your network maps to the device.

> Note
>
> For devices managed by ExtremeCloud IQ Site Engine the location is read-only. You can assign the location in ExtremeCloud IQ Site Engine.

- **Assign Network Policy**: Assign an existing network policy to the device or devices.
- **Change CoPilot License Status**: Select **Activate CoPilot License** or **Revoke CoPilot License**. This option appears only if the ExtremeCloud IQ CoPilot feature is enabled and you select a ExtremeCloud IQ CoPilot-eligible device.
- **Change Device Mode**: Change the device mode from AP to Router.
- **Change Management Status**: Select **Manage Devices** or **Unmanage Devices**.

  You can select the **Unmanage** or **Manage** action for a single device or a group of devices. If the device is a stack, it applies to all stack units that are part of the selected stack.
- **Clear Audit Mismatch**: Occasionally, there can be a mismatch between the configuration database and the device-level configuration database. If this occurs, perform this action.
- **Clone Device**: Apply the existing device-level configuration from one device to a new device with the same model. For example, if you need to replace one 5520-24T switch with another, this option allows you to apply the existing device-level configurations used by the previous 5520-24T. For more information, see Clone a Device on page 350.
- **Enhanced Discovery**: Enhanced Discovery can be used to enhance support of onboarding for Local Management (within ExtremeCloud IQ) providing an option to define the list of primary and secondary controllers running ExtremeCloud IQ Controller. For deployments that do not have a local network configuration for discovery, we offer an enhanced AP onboarding experience that provides indication of the specific IP address or Fully-Qualified Domain Name (FQDN) of the controllers to which the AP connects. For more information, see Enhanced Discovery on page 23.
- **Reboot**: Reboot devices after uploading a configuration. Rebooting momentarily disconnects any associated clients from the SSID, which could be disruptive.
- **Reset IDM Client Certificate**: Select to reset the IDM client certificate for this device.
- **Revert Device to Template Defaults**: Select to return the device settings to the network policy template. This removes any device-level configuration settings.

- **Start Thread Commissioner**: Select to designate an AP as Thread Commissioner. This menu item is only available for APs that are online, configured with an IoT Thread profile, and not already designated as the Thread Commissioner.

  > Note
  >
  > If another AP is already running as the Commissioner on this Thread network, a warning message displays prompting the user to stop the current Commissioner or wait for it to automatically shutdown.
  >
  > If Thread has not yet been enabled on the AP due to configuration changes that have yet to be deployed, the operation fails and a related error message displays.

  The **Start Thread Commissioner** pop-up window opens. Optionally, select **Override Timeout** and enter a value in the range of 1-2000000 seconds. Select **Start**.
- **Stop Thread Commissioner**: Select to stop the Thread Commissioner running on an AP. This menu item is available only for an AP that is currently designated as Thread Commissioner.

Bootstrap Configuration

From the **Actions** tab on the **Device Details** page, use this simple configuration to re-establish a connection between a device and ExtremeCloud IQ. The information you enter here allows you to log into a device when running the bootstrap configuration. When there is a bootstrap configuration on an AP, the AP fails over to it when you reset the configuration, or if the current and backup config files fail to load. When there is no bootstrap config file on an AP, it fails over to default configuration settings.

1. Select **Actions** > **Advanced** > **Bootstrap Configuration**.
2. Enter the credentials for an admin to access the device after it has loaded a bootstrap configuration.
   a. Enter the root **Admin Name** (this is required while running the bootstrap configuration for this device).
   b. Enter the **Password** for this device when running the bootstrap configuration.
   c. For **Configure the Bootstrap CAPWAP settings**:
   ExtremeCloud IQ devices use the CAPWAP protocol to communicate with each other (CAPWAP clients) and or (CAPWAP server). The client sends Discovery Request messages until it receives a Discovery Response from the server. When this happens, the CAPWAP server and client establish a secure DTLS session and mutually authenticate each other using a preshared key derived from a passphrase.
      - **Primary CAPWAP Server**: Enter the name of a primary CAPWAP server for this device (found in the Device Credentials window).
      - **Backup CAPWAP Server**: Enter the name of a backup CAPWAP server for this device (found in the Device Credentials window).
      - **VIQ Name**: Enter the name of the VIQ account which manages this device.
      - **CAPWAP UDP Port**: Enter the UDP port for CAPWAP communications. To avoid reconfiguring the firewall, you can configure devices behind the firewall to communicate with ExtremeCloud IQ using HTTP on TCP port 80 instead of CAPWAP UDP port 12222. The default is 12222. The port range is 1024 - 65535.

3. Select **Update**.

Update Netdump Settings

You can configure a device to automatically save a core netdump file to a TFTP server on the network when it next boots up after becoming unresponsive. You can then provide this file to Support to help Extreme Networks diagnose the issue.

1. Select the devices for this netdump.
2. Select **Actions** > **Advanced** > **Update Netdump Settings**.
3. Select **Enable Netdump**.
4. Complete the following fields:
    - **TFTP server for saving Netdump files**: Enter the TFTP server IP address to which you want the devices to send the core dump file.
    - **Netdump filename to save**: Enter a Netdump filename.
    - **VLAN for reaching the TFTP server**: Enter the VLAN of the interface from which the device sends the Netdump file to the TFTP server.
    - **Native VLAN of the local Extreme Networks device**: Enter the native VLAN of the device.
    - **DHCP**: Select to have the device bootloader use DHCP to obtain an address on startup.
    - **Static**: Select to have the device bootloader use a static IP address. Enter the required static IP settings that the bootloader must use to connect to the network.
5. Select **Save**.

Note
This feature becomes active after you perform a full configuration update for the selected devices.

Clone a Device

Use this task to apply the existing device-level configuration from one switch to a new switch with the same model. For example, if you need to replace one switch with another, this task describes how to do so and then apply the existing device-level configurations used by the previous switch.

Note
Licensing is not cloned.

1. Go to **Manage** > **Devices** and select the checkbox for the device in the **Device List**.
2. Select **Actions** > **Clone Device**.
3. (Optional) Select the **Perform full configuration clone** checkbox to clone additional configurations previously performed through supplemental CLI, SSH proxy, or local console saved on the original device with the same software version (minimum of 32.3.1.11).
4. Under **Replacement Device**, if the device is not yet **Onboarded**, select **Quick Onboard**, enter the device serial number and proceed to **Step 6**.

    If the device has already been **Onboarded**, proceed to **Step 5**.

5. Under **Replacement Serial Number**, select the appropriate device serial number.

> Note
> To onboard a Universal Hardware Switch, for the **Device OS**, choose **Switch Engine** or **Fabric Engine**.

6. Select **Clone**.
7. Select **Yes**.
8. Select **Perform Update** to push the configuration to all selected cloned devices.

Enhanced Discovery Action

The following is an optional way to specify the primary and backup controllers for Enhanced Discovery.

> Note
> **Enhanced Discovery** is supported on AP3000 and ExtremeCloud IQ Controller.

1. Select an AP3000 from the **Managed Devices** list.
2. Select **Actions** > **Enhanced Discovery**.
3. Enter the Primary Controller IP address or FQDN, and the Backup Controller IP address or FQDN.
4. Select **OK**.

Related Topics

Enhanced Discovery on page 23

Device Details Overview

Select the host name of a device in the Device list to see a details panel for that device. At the top of this panel, a graphic shows how this device is connected. Hover over the icon to see the node type, IP address, host name, and VLAN assignments for this device.

The sidebar displays the following:

- Device location map and floor plan
- Icon and model number of the device
- Optional uploaded images or video of the device installation in the **Media Gallery**. See Upload and Manage Media Gallery Content on page 374 for details.
- Connection state
- Active alarms
- Number of connected clients
- Real-time CPU and memory usage data

Below this information are two tabs:

- **Monitor**: Select to display details about the status of this device. Refer to Device Details Monitor Functions on page 352.
- **Configure**: Select to perform device-level configuration tasks and update your devices directly. Refer to Device Details Configuration Tasks on page 356.

The **Configure** tab is not available for locally managed switches.

Note
The options that appear under the **Monitor** and **Configure** tabs vary depending upon your selected device.

Device Details Monitor Functions

The **Overview** page provides an overview of the device status.

Depending on the device, you can further monitor its status as follows:

- **Interfaces**: Provides details of the Interfaces on page 352 for an AP.
- **Clients**: Provides details of the Clients on page 353 connected to a switch.
- **Diagnostics**: Provides a Diagnostics on page 354 details timeline for a switch, such as port transmit and receive traffic.
- **Events**: Displays changes to the network, including configuration changes, for which Events on page 354 notifications exist.
- **Alarms**: Indicates network issues for which Alarms on page 355 exist and require administrator attention.

Interfaces

Device Details for Interfaces

When you select the host name of an AP from the Devices list and then select **Monitor** > **Monitoring** > **Interfaces**, the system displays the following information (APs only):

- At the top of the main section, CPU Usage, Memory Usage, MAC Table Utilization, Last Seen time, Temperature, Power Supply Status, Fan Status, IP Address, MAC Address, Software Version, Device Model, Serial Number, Make, and IQAgent Version are all listed.
- The graphic below shows all of the ports on the device. Selecting a port displays more information.
- Within the VLAN tab are the VLAN Name, VLAN ID, Active Ports (Enabled port with VLAN assigned), STP Instance, IGMP Snooping, and DHCP Snooping information columns. Selecting a VLAN within the VLAN tab highlights the ports that are currently assigned.
- Within the IPv4 tab are the VLAN Name, VLAN ID, IPv4 Forwarding, Routing Instance, and IP Address / Subnet information columns. The VLAN can be selected when the row is highlighted. Ports using the VLAN, both tagged and untagged that are actively provisioned, light up to indicate ports using the VLAN. Clicking on a port shows the port name, port status, VLAN untagged/tagged status, and port actions.

Routing

Device Details for Routing

When you select the host name of an AP from the Devices list and then select **Monitor** > **Monitoring** > **Routing**, the following information is displayed (APs only):

- The Route Monitor Polling Graph shows:
    - A time range showing total number of routes within a 24 hour time period.
    - Route type counts:
        - Direct Routes
        - Static Routes
        - OSPF Routes
        - Total Routes
    - The Y axis resizes based on chosen routes.
    - The Y axis represents the total number of routes.
    - The X axis represents the poll time interval.
    - Hovering over the graph displays a summary of routes with the given timestamp.

    Note
    Select the graph heading to enable or disable the graph line view.

- Within the **IPv4 Routing Table** section, the destination subnetwork, next hop, VLAN Name, VLAN ID, Route Origin, Status, Metric, Route Age, Route Type Priority, and Routing Instance information are all listed. You can filter for the Route Origin and Status.

    Note
    - Up to 100 IPv4 routes are visible within the table. For additional visibility, use an SSH proxy.
    - Switch Engine software version 32.6.2.68 or newer is required.

Clients

Under **Manage** > **Devices** > **Monitor** > **Clients**, a graph displays a blue timeline representing the number of clients connected to the current device for the specified time frame. By default, the data capture time frame is 24 hours. You can change the time frame using the **Time Range** controls.

Details about the clients that are connected during the specified time range are listed in the table. These details include:

- Type of client (wired, wireless, Thread, undetermined)
- OS type
- Connection status
- Health Status
- Host name
- Alias
- IPv4
- IPv6
- Client MAC address

- Connected port name
- User name
- VLAN to which client is connected
- Client IP address
- SSID
- RSSI
- SNR

You can select any point along the timeline in the graphic to display details only for connected clients at that precise time.

Use the filter to specify what details to display. You can also use the **Search** field to filter your view.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

Diagnostics

Under **Manage** > **Devices** > **<switch device>** > **Monitor** > **Diagnostics**, a graph displays diagnostics statistical data captured for ports for the specified time frame. By default, the data capture time frame is 24 hours. You can change the time frame using the **Time Range** controls.

Depending on the type of switching device selected, the graph displays some or all of the following details over a colored timeline:

- Transmit and receive traffic and port utilization
- Transmit and receive errors
- Transmit and receive data usage types (unicast, multicast, broadcast)

After you select one or more ports on the diagram, select **Port Details** for in-depth information about each port. After you select one or more port checkboxes, you can use the **Action** drop-down to bounce those ports or bounce their PoE.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

Events

A graphic at the top of this window shows the device and its network connections. Events that occur in the network for the selected device are recorded and displayed in this window. Table data is updated hourly. Select whether you want to display events from the current day or up to seven days. There is an **Events** tab and a **Configuration Events** tab above the table. Configuration events show only changes to the device configuration, either from inside a network policy, or at the device level.

Use the key-ahead search field to search for an event by description. Use the column picker to customize the categories displayed in the table. By default, **Timestamp**, **Severity**, **Category**, and **Description** columns are displayed. Optional columns include **Host Name**, **Device MAC**, and **Client MAC**.

Sort the table by the event category using the drop-down list. To control how the information is presented, select any of the column headings. For example, if you want to organize the content by host name, select the **Host Name** heading.

Each alarm or event log entry consists of the following elements:

- **Timestamp**: Indicates the time in the month/day and time-of-day format that the alarm or event occurred.
- **Severity**: Indicates the severity of the an alarm or event. The following can be displayed: Major, Info, and Clear.
- **Category**: Indicates the issue category that triggered the alarm or event. Available categories are CAPWAP, channel power, state change, client connection down, client connection change, static route ping protection, and DHCP rogue MAC detection.
- **Description**: Describes the context of an alarm or an event.
- **Host Name**: The host name of the configured device on which the event occurred.
- **Device MAC**: The MAC address of the device that reported the alarm or event.
- **Client MAC**: The MAC address of the client that reported the alarm or event.

To copy the information pertaining to an individual log, hover over the text in the **Description** column to view the complete description in a text box. Select the text and **Copy** it.

You can download table data as a `.csv` file.

Alarms

Under **Manage** > **Devices** > **Monitor** > **Alarms**, a table lists active alarms for network issues that require administrator attention. There are two views available here: **Alarm Details** (default view) and **Timeline**.

The Alarms **Timeline** view displays a graph with colored timelines representing when and how many active alarms have occurred and were cleared. By default, the graph displays data captured for a 24-hour time frame. You can change the time frame using the **Time Range** controls.

For either view, use the **Update** button to update your devices to reflect changes you make here. Use the refresh icon to refresh the data. Use the column picker to select which columns are displayed. Your column selections are maintained even if you go to another window and return, and when you log out and log in again. Horizontal scrolling is available for this table when there are too many columns to fit in your display window.

Alarm Details default table columns include:

- **Status**: The status of the alarm.
- **Severity**: Major, minor, or informational.
- **Category**: The type of alarm, for example Agent alarm, Device disconnected, or Change OS.
- **Description** :A description of the alarm.

- **Time Raised**: The date and time when the alarm was reported.
- **Action**: Actions that can be taken with this alarm.

The following columns are optional:

- **Time Cleared**: The time that the alarm was cleared.
- **Cleared by**: The name of the person who cleared the alarm.

To remove one or more alarms, or remove redundant entries, select the check box next to the alarm, and then select **Clear Selected Alarms**. Cleared alarms then become events and are displayed in the Event log.

To clear multiple alarms at the same time, either select the check box in the table header to select all alarms, select the check boxes individually, or shift-select to select check boxes for multiple alarms. Then select **Clear Selected Alarms**.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

Device Details Configuration Tasks

Go to **Manage** > **Devices** > **<device name>** > **Configure**.

ExtremeCloud IQ enables you to perform device-level configuration tasks and update your devices at the device level. Settings made at this level apply only to the individual device and override the template settings configured for the network policy. After device-level settings are removed, the device automatically reverts back to the original network policy and device template configuration. The features that display for this tab vary depending on the type of device you selected.

After you select a switch from the Device List, you can create or modify the following:

- Device Configuration: Edit device details such as the host name, the description, the device function, IP addresses, and VLAN assignments.
- Device Management Servers: Edit management server settings for a device associated with a network policy.
- Switch Port Configuration: Edit switch ports, STP, Storm, and PSE settings.
- Device Credentials: Assign or change network administrator credentials and administrator assignments.
- SSH: Temporarily enable SSH to troubleshoot the device.
- **Web SSH** (For Digital Twin only): Temporarily enables you to SSH a console into the Digital Twin switch directly in the GUI, without the need for a third-party SSH terminal application.
- sFlow Receivers: (SR Series only): Provide visibility into your switch traffic patterns.

After you select an AP from the Device List, you can create or modify the following:

- Device Configuration: Edit device details such as the host name, the description, the device function, IP addresses, and VLAN assignments.
- Interface Configuration: View the default template settings and control actions for the Wireless (Wi-Fi) and Wired (Ethernet) ports. You can edit any field that is selectable.
- Device Credentials: Assign or change network administrator credentials and administrator assignments, and configure CAPWAP and Shared Key settings.
- **Configure Netdump**: Enable an unresponsive AP to automatically save a core dump file to a TFTP server on the network the next time it boots.
- **Location Information**: Define detailed device location information, see Location Information Configuration Settings on page 369.
- DHCP Server and Relay: For a small network, configure and enable a DHCP server on a device to provide network settings dynamically to clients.
- Neighboring Devices: Define a list of neighbor access points that will collaborate in the Layer 3 roam process.
- Bonjour Gateway Settings: Choose the AP you want to act as your Bonjour Gateway Designated Device (BDD) at the device level.
- **Troubleshoot**: Enable Client Monitor so devices can detect client issues, and report client connection activities and problems to ExtremeCloud IQ.
- SSH: Temporarily enable SSH to troubleshoot the device.

After you make changes to the configuration, you must push the configuration changes to the device.

AP Device Configuration

Device configuration is handled at the device template level. It is a best practice to configure devices using a device template. However, it is possible to override the device template settings for a specific device. To configure settings for a specific AP, perform the following steps:

1. Go to **Manage** > **Devices** and select the host name of the AP in the **Devices** list.
2. From the **Device Details** left pane, select **Configure** > **Device Configuration**.
3. The following **Device Details** display:
    - **Host Name**: Enter a unique host name for the device. It can contain up to 32 characters and can include spaces.
    - **Description**: Optional description for the device.
    - **Mgt0 MAC Address**: This is the Node ID and is listed on the printed label located on each device.
    - **Device Model**: The hardware model of the configured device.
    - **Device Function**: This describes the main function of the device. For example, AP.
    - **IQ Engine**: Lists the IQ Engine firmware version currently installed on the AP.
    - **SNMP Location**: Enter a location name, for example `headquarters, building 1`.

4. For **Network Details**:
    - **Network Policy**: Select a network policy from the drop-down list of existing policies.
    - **Device Template**: Select a device template from the drop-down list of existing templates, or clone an existing template.
5. For **Management Interface**:
    - **Static Address**: Select this option to enter a static address for this interface.
        - **IPv4 Address**: Enter the IPv4 address you want the device to use for the mgt0 interface.
        - **Subnet Mask**: Enter the appropriate netmask for the subnet to which the mgt0 interface connects.
        - **Default Gateway**: The address through which the device (and its connected hosts) can reach the Internet.
    - **Dynamic Address Configuration (DHCP)**: Select this option to have an address automatically assigned by DHCP.
        - **Use DHCP only to set IP Address (IPv4 only)**: Enable or disable this function.
        - **Advanced DHCP Options (IPv4 only)**: Select to display or hide this section. Configure the following settings:
    - **DHCP Timeout**: Enter the amount of time (in seconds) that the device waits for a response from the DHCP server before assigning itself a static IP address. By default, the timeout for reverting to a static address is 20 seconds. You can change the timeout from 0 to 3600 seconds (1 hour). A timeout of 0 means that the device continues trying to obtain network settings through DHCP indefinitely.
        - **Automatically Generate IP Address Prefix**: The Extreme Networks device automatically switches to this IP address if it cannot obtain settings through DHCP. You can also enter an IPv6 address.
        - **Automatically Generate Subnet Mask**: Enter the netmask for the subnet to which the mgt0 interface connects.
        - **Static Fallback IP Address**: Enter the IP address you want the device to use if it cannot contact the DHCP server. You can also enter an IPv6 address.
        - **Static Fallback Subnet Mask**: Enter the appropriate netmask for the subnet to which the mgt0 interface connects.
        - **Static Fallback Default Gateway**: The address through which the device (and its connected hosts) can reach the Internet.
    - **Management VLAN**: Enter the management VLAN for this interface.
    - **Native VLAN**: Enter the native VLAN for this interface.
    - **Override MGT0 MTU**: Select to manually enter an MTU, ranging from 100-1500 Bytes. Default value is 1500 Bytes.
6. For information about **Supplemental CLI**, see Device Details Configure Supplemental CLI on page 361.
7. Use **Disable WebUI on Device** to disable the local web user interface on an IQ Engine device to improve system security, without disabling the associated captive web portal.

    If you configured **WebUI** in the network policy, you can disable it for this device here.
8. For **Deployment Mode**, select **Pre-Provisioned** or **Production** to indicate whether the device has been pre-provisioned.

9. (AP5010 only) Enable **POE Profile Override**, select the override option from the dropdown, and hover over the **i** icon to view the corresponding override table.
10. For **Antenna Location Type**, select a location from the drop-down list.
11. To update the device immediately, select **Update Now** in the upper-right corner of the page.

    For information about pushing the updated configuration to the device, see Push the Device-Level Configuration to the Device on page 373.

Related Topics

Configure Device Templates on page 120

Switch Device Configuration

Use this task to make device configuration changes at the switch device level, which overrides any equivalent settings in the network policy assigned to this device after you push the updated configuration to the device.

1. To configure or modify existing settings for a specific switch, select the host name of the switch in the **Devices** list, then select the **Configure** tab in the **Device Details** panel, under the **Configure** tab, and select **Device Configuration**.
2. For **Device Details**:
    - **Host Name**: Enter a unique host name for the device. It can contain up to 32 characters and can include spaces.
    - **SNMP Location**: Enter a location name, for example `headquarters, building 1`.
3. For **Network Details**:
    - **Network Policy**: Select a network policy from the drop-down list of existing policies.
    - **Device Template**: Select a device template from the drop-down list of existing templates, or clone an existing template.
4. **Enable** or **Disable Management Settings**.

    When enabled, Switch Engine management interface settings apply and override template-level management interface settings. If disabled, you can apply template settings, or the device will use manually configured management interface settings. Leave disabled when using **Out-Of-Band Management**.
5. Configure **Supplemental CLI**.

    For more information, see Device Details Configure Supplemental CLI on page 361.
6. To update the device immediately, select **Update Now** in the upper-right corner of the page.

    For more information about how to push updated configuration to the device, see Push the Device-Level Configuration to the Device on page 373.

Device Management Servers

The **Device Management Servers** page does not appear until you apply a network policy to the device.

Use this task to override a network policy and make device-level changes to management server settings for a device. The changes affect only the specific device, not all devices associated with the network policy. You must **Unlock** before you can configure and save a device level management server configuration. You can use **Revert** to restore the network policy configuration overwrite any changes made at the device level.

Note
DNS Server, NTP Server, SNMP Server, and Syslog Server configurations can be managed at the device level for EXOS and Switch Engine devices after unlock. Not all management server tabs are available for all device types.

For stacks, the unlock and revert action applies to all units/slots within the page. This enables the full stack to revert to the currently assigned network policy. Also, the **Device Management Servers** is not available until you apply the network policy to both single switches and stacks.

1. Select **Manage** > **Devices**.
2. Select the **HOST NAME** of the device you want to manage.
3. Select **Configure** > **Device Management Servers**.
4. Select **Unlock** from the top banner.

   Changes saved after you unlock the device override the associated network policy.
5. Select each server tab to make any necessary changes to the server settings, then select **SAVE CONFIGURATION**.

   The changes only apply at the device level. See *Configure Management Server Settings* in the *ExtremeCloud IQ Universal Switch Deployment Guide* for more information about management server configuration.

Configure Switch Ports and VLAN

You can configure switch port configuration details and settings at the device level. Switch level settings always override any port configuration settings that were made in the device template for a network policy. You must first **Unlock** this page to change the switch-specific port configuration. You can also return to the original template configuration with the **Revert** option.

Note
- Only the options available to the specific switch are displayed. For details about each option, see Create a New Port Type on page 191.
- For 5520/5720 Universal Switches, VIM and partition mode are configurable at the device level.
- LLDP/CDP, MAC locking, STP Priority, BPDU Restrict, BPDU Restrict Recovery, Forwarding Delay, VLAN Attributes, and Max Age are configurable at the device level.
- BPDU Restrict and BPDU Recovery settings are found within the STP tab.

1. Go to **Manage** > **Devices**.
2. Select a switch **Host Name** to see a details panel for that switch.
3. Select the **Configure** tab.
4. Under **Configuration**, select **Port/VLAN Configuration**.
5. Select **Unlock** to enable switch-level configuration changes.

6. Select **Port Details**, and edit any field that is not selectable.
7. Select **Port Settings**, and edit any field that is not selectable.
8. Select **STP**, and edit any field that is not selectable.
9. Select **Storm Control**, and edit any field that is not selectable.
10. Select **PSE**, and edit any field that is not selectable.
11. Select **ELRP**, and edit any field that is not selectable.
12. Select **VLAN Attributes**, and edit any field that is not selectable.
13. Select **Save Configuration**.

    Note
    BPDU Restrict and BPDU Restrict Recovery Timeout settings are found within the STP settings.

14. To revert back to the network policy:
    a. From the **Devices** list, select the check box for this switch.
    b. From the **Actions** drop-down menu, use the **Revert Device Template to Device Defaults** option.

Configure Port Router Forwarding

When enabled, port forwarding allows a router to open certain ports to incoming traffic from specified IP addresses. Port forwarding is helpful when you have a server behind your router that needs a port exposed to the Internet, such as an HTTP server that needs to be accessible to people outside the VPN, Branch, or HQ network. For each port, a port forwarding rule applies. You can have up to 128 port rules. You can edit or delete rules from the table. Use the following steps to enable port forwarding and create forwarding rules.

1. Select the user name of the router for which you want to enable port forwarding.
2. On the **Configure** tab, go to **Port Forwarding**.
3. Enable **Port Forwarding**.
4. Select the plus sign to add a new port forwarding rule.
5. Enter a description of how this rule will be used (optional).
6. Select a number for the outside port from the range of 1025-65535 (reserved ports cannot be used).
7. Select a number for the local port from the range of 1-65535.
8. Select **TCP**, **UDP**, or both from the protocol drop-down list.
9. Select a host IP address for the internal device from the drop-down list, or select the plus sign to add a new address.
10. Select **Add**.
11. When you are finished adding rules, select **Save**.

Device Details Configure Supplemental CLI

First go to **Global Settings > VIQ Management**, and enable **Supplemental CLI**.

You can save supplemental CLI objects that contain CLI commands and then automatically update devices each time you update the network policy. On the **Device** page, you can keep the supplemental CLI object in the network policy and append another supplemental CLI object to the end of the running configuration list. If the supplemental CLI is appended to the delta configuration and the supplemental CLI portion fails device update, only the supplemental CLI regenerates for subsequent device updates.

If you use CLI to manage features that are not configured in the user interface, you can choose to override the user interface (or to override the CLI), benefiting deployments that rely on overly complex CLI objects.

Use this task to update CLI commands to multiple devices simultaneously from ExtremeCloud IQ.

1. Go to **Manage** > **Devices**.
2. Select the devices to update, and then select ✎.
3. Select an existing supplemental CLI object, or select + to Add a Supplemental CLI Object on page 362.
4. Select one of these options:
   - **Override Supplemental CLI in the network policy**: Enable the network policy to override supplemental CLI objects for the device.
   - **Keep Supplemental CLI in the network policy and append below at end**: Include the supplemental CLI object in the network policy and append the selected CLI object from the list. If you select a supplemental CLI object from the list, or create a new one, it is appended to the end of the configuration list, after the supplemental CLI object in the network policy.
5. Select one of these options:
   - **UI overrides Supplemental CLI**
   - **Supplemental CLI overrides UI**
6. When you are finished, select **SAVE**.
7. To update the device immediately, select **UPDATE DEVICES** at the top right.
8. In the **Device Update** dialog box, select the type of update, and then select **Save as Defaults**.

   To avoid an unnecessary system reboot, select **Delta Configuration Update**. ExtremeCloud IQ attempts to update only the configuration deltas. If a full update is required, the system prompts you to select **Complete Configuration Update**. Examples of CLI commands that require a full configuration update are: **`system antenna-type`** and **`system environment`**.
9. To update the device immediately, select **Perform Update**.

Related Topics

Add a Supplemental CLI Object on page 362

Add a Supplemental CLI Object

To use the supplemental CLI tool, go to **Global Settings > VIQ Management**, and enable **Supplemental CLI**.

You can save supplemental CLI objects containing CLI commands, and ExtremeCloud IQ can then automatically update them for devices, each time you update the network policy.

> Note
>
> - Limit CLI commands to configuration commands. Exclude `Show` or other commands used to display information.
> - Do not use supplemental CLI commands to configure any settings set via the ExtremeCloud IQ GUI as that creates a configuration sync conflict that results in future `Device Update Failed` errors.
> - These commands work as a delta mechanism. Every new supplemental CLI update must only include new commands that you want to run, not ALL commands that you want to have present on the device at start up. Re-running some commands after already applied can cause future `Device Update Failed` errors.

Use the following task to create CLI objects.

1. Go to **Configure** > **Common Objects** > **Basic** > **Supplemental CLI Objects**.
2. To add a new supplemental CLI object, select +
3. Type a **Name**.
4. Type an optional **Description**.
5. Type the CLI commands.
   - Enter multiple CLI commands, one command per line.
   - Use CLI Commands that contain IP and VLAN objects: `${ip:ip_object_name}` and `${vlan:vlan_object_name}`.
6. Select **SAVE** and perform a configuration update each time you append commands to device configurations.

   To avoid an unnecessary system reboot, select **Delta Configuration Update**. ExtremeCloud IQ attempts to update only the configuration deltas. If a full update is required, the system prompts you to select **Complete Configuration Update**. Examples of CLI commands that require a full configuration update are: `system antenna-type` and `system environment`.

Related Topics

Device Details Configure Supplemental CLI on page 361

About Digital Twin

Digital Twin allows you to create simulated devices for Universal Hardware switch models to help you prepare your network for real devices. Digital Twin devices appear in the device list and are identified by the following icon: 🎭. From the device list, you have several options:

- Select the hostname of a twin to see device details. Many of the same monitor and configuration options that apply to real devices are available for their twins.

- Select the check box for the twin device to activate the **Actions** drop-down list above the table.
- Select the check box for a twin device to activate the **Update** option above the table.

Digital Twin requires OS Version 32.6.3. To learn about Digital Twin device configuration, see Device Details Configure a Digital Twin Device on page 364.

Device Details Configure a Digital Twin Device

Digital Twin allows you to create simulated devices for Universal Hardware switch models to help you prepare your network for real devices. You can create up to 20 Digital Twin devices, each with a lifespan of 4 hours. You can perform multiple actions to see how the devices will function in your network. You can assign a location, a network policy, access the CLI, shut down or restart a twin device, and configure device settings in the same way as you would an actual device. Use this task to configure a Digital Twin device.

1. From **Manage** > **Devices**, select the plus sign above the device list.
2. Select **Quick Add Devices** > **Manage Your Devices Directly from the Cloud**.
3. Under **Device Type**, select **Digital Twin**.
4. Select an **OS Persona**.
5. Select a device model from the drop-down list.
6. Select the **OS version**.

   Digital Twin requires OS Version 32.6.3.
7. Assign a network policy from the drop-down list.

   Note
   You can do this at a later time if you have not yet configured a network policy.
8. Select **Launch Digital Twin** or **Relaunch Digital Twin**.

The Digital Twin devices now appears in the Device List.

Related Topics

About Digital Twin on page 363

Interface Configuration

On the **Interface Configuration** page, you can add, edit, or delete Interface configurations. The table includes the following parameters:

- IP Address
- IPv4 Subnetwork Allocation Name
- VLAN Name
- VLAN ID
- DHCP Relay
- IPv4 Forwarding
- Routing Instance

1. Go to **Manage** > **Devices**

2. Select a device **Host Name** to see a details panel for that device.
3. Select the **Configure** tab.
4. Under **Network Allocation**, select **Interface Configuration**.
5. Select a port icon on the template graphic to view port details, if available.
6. Select + to add, or ✎ to edit an Interface.
7. Enter the interface attributes according to the table below:

Table 56: Interface Configuration Attributes

Field	Description
Network Allocation	An IP subnetwork configuration.
VLAN Attribute	A VLAN attribute, which can be created from within the **Network Policy Switching** > **VLAN Attribute** Section.
IPv4 Address / Subnet Mask	The assigned device IP Address.
Routing Instance	The device routing instance.
IPv4 Forwarding	Toggle **ON** to enable IPv4 forwarding.
VLAN Loopback Enable	Select the checkbox to enable VLAN loopback.
DHCP Relay	To override DHCP Relay, toggle **ON Enable DHCP Relay**. If enabled, enter a **Primary DHCP Server** and an optional **Secondary DHCP Server**.

8. To delete Interfaces, select the Interface(s) and select 🗑.

Configure Device Credentials

Use device credentials to set up log in information for root or read-only administrators, change the name and password of the root admin, or add a read-only admin to a device. Device-level credentials offer access to devices through Telnet, SSH, or console connections.

> Note
> At this level, you are making changes to the selected device only. These changes always override the network policy configurations. To revert to the settings in the network policy, from the **Device List**, select the device host name, and use the **Actions** button.

A root admin has complete privileges, which include the ability to add, modify, and delete other administrators, and to reset the configuration. A read-only admin can view settings but cannot add, modify, or delete them. You can require that an admin be prompted for a password before accessing high-level privileged CLI commands. To configure a root admin with full capability, follow these steps:

1. Select the add icon.
2. Enter the name of the admin.

3. Create a password for this admin.

   Passwords should contain at least 8 characters, including at least one number, one special character, and one uppercase character.
4. Configure the primary and secondary CAPWAP connections.

   You can select an existing CAPWAP server from the drop-down list, or select the add icon to define a new server.
5. Configure a shared key passphrase for authentication.

These changes have been made at the device level and override any configuration in the network policy device template. To revert back to the network policy, from the **Devices** list, select the check box for this device, and from the **Actions** drop-down, use the **Revert Device Template to Device Defaults** option.

Configure Netdump

You must perform a full configuration update for each device on which you want to enable netdump.

If an AP or switch becomes non-responsive, you can enable it to automatically save a core dump file to a TFTP server on the network the next time it boots. You can provide this file to Support to assist in diagnosing the issue. To configure a device to save a core dump file to a TFTP server, complete the following steps:

1. Select the check box to enable Netdump.
2. Enter the IP address of the TFTP server to where you want the device to send the core file.
3. Name the netdump file.
4. Enter the VLAN of the interface the device will use to send the netdump file to the TFTP server.
5. Enter the native VLAN of the device.
6. Select the check box to have the device bootloader use DHCP to obtain an IP address at startup.
7. Select the check box to expand this section.
8. Enter the required network settings that the bootloader must use to connect to the network.
9. Enter the IP address of the reporting device.
10. Enter the netmask for the reporting device.
11. Enter the IP address of the TFTP server.
12. Select **Save**.
13. To update the device immediately, select **Update Now**.
14. Select the type of update.
15. Select **Save as Defaults**.
16. Select **Perform Update**.

The device will send a core dump file to the TFTP server the next time it reboots.

Assign an sFlow Receiver to a Switch

Before you can assign an sFlow receiver to a switch, you must first configure an sFlow receiver as a common object. sFlow is not available for all Extreme switch models. See Configure an sFlow Receiver on page 288.

Use the following steps to assign sFlow receivers that you have configured as common objects to switches at the device level.

> **Note**
> sFlow assignments made at the device level override assignments made in the network policy device template.

1. Go to **Manage** > **Devices** and select the host name of a supported device.
2. Select **Configure** > **sFlow Receivers**

   The sFlow Receivers feature is available only for supported switches.
3. Select +.
4. Select a receiver object from the **Available sFlow Receivers** menu.
5. Enable **sFlow Receiver**.
6. Enable **Interface Packet Sampling**.
7. Move interfaces you want to sample from the **Available** column to the **Selected Interfaces** column using the arrows.
8. Enable **Counter Polling**.
9. Move interfaces you want polled from the **Available** column to the **Selected Interfaces** column.
10. Select **Save**.
11. Select **Save sFlow Receivers**.

Related Topics

Configure an sFlow Receiver on page 288

Device Level WAN Stateful Firewall

WAN stateful firewall is a common feature used in branch networks to provide network level defense, typically by blocking unsolicited traffic from outside of the branch. It can also be used to control of branch traffic into and out of a router, such as allowing or denying traffic between local subnetworks, allowing or denying branch clients from going to a specific IP or range of IPs, or allowing or denying specific network protocols. To enable network policy firewall overrides and make adjustments to the firewall filtering rules for this device, perform the following steps:

1. Select **On** to enable overrides to the network policy firewall settings for a router.
2. Use the up and down arrows to change the order of the existing filtering rules in the table.

   Rules are processed in order from top to bottom.
3. Select **Add** to add a new filtering rule.
4. Select a source address from the available options.
5. Select **On** (the default) to support auditing, accounting, and monitoring.

6. Repeat these steps to add additional filtering rules.

   Use the up and down arrows to arrange your new rules in the table according to how you want to them to be processed.
7. Select **Save**.
8. To delete firewall rules, select the check box next to the rule, then select the delete icon.

Configure VRRP

To enable VRRP, you must have at least two routers with the same branch ID. VRRP changes require a complete configuration update on the devices

Virtual Router Redundancy Protocol (VRRP) allows multiple routers to function as a single logical routing unit. When using VRRP, routers that each have a different IP address share a VRRP ID and a virtual IP address that other network devices use as the router address. Routers that share a VRRP ID use VRRP to determine the state of other routers with the same VRRP ID. If one becomes unresponsive for a specific amount of time, VRRP uses the priority setting to determine which router will take over routing traffic.

Use the following steps to configure VRRP.

1. Toggle **Enable VRRP** to **On**.
2. Enter the VLAN ID for the routed traffic.
3. Enter the static subnet for the routed traffic.
4. Indicate whether a router in the VRRP routing group is included in the redundancy.
5. Enter the priority of the router.
   - **High**: This router handles the traffic.
   - **Medium**: This router handles the traffic when the high-priority router is offline.
   - **Low**: This router becomes active when the other priority routers are all offline.
6. Enter a numeric VRRP ID.
7. Enter the static virtual IP address that the routers share.
8. Enter the interval that the routers will wait before advertising their availability (the default is one second).
9. Select whether a higher-priority backup router preempts a lower-priority primary router.
10. Select whether the router monitors the state of the WAN connection.

    If the primary router WAN connection is unresponsive, VRRP activates a backup router to handle traffic.

Configure SSH

Before you can configure SSH access on a device, you must first enable **SSH Availability**. To do this, under your admin name at the top right of the ExtremeCloud IQ window, select **Global Settings** > **Administration** > **VIQ Management** > **SSH** > **SSH Availability** and enable the feature.

ExtremeCloud IQ provides a way to access devices remotely using the SSH protocol by using an SSH proxy server.

Note
It is important to remember that while SSH access is available, your device is exposed to public access through an SSH proxy. The device is protected only by the device administrator credentials, because SSH FTP assumes that it is run over a secure channel.

Use the following steps to enable SSH on a device from the device details panel, under **Configuration** > **Additional Settings** > **SSH**.

1. Select the length of time that you want SSH to be available for the device.
   ExtremeCloud IQ creates an SSH session for the specified length of time between the SSH proxy server and the device.
2. Select **Enable SSH**.
   Provide assisting technicians with the onscreen instructions and device log in credentials so they can open a session from their external SSH client to the specified IP address and port number of the proxy server.
3. When they are finished, select **Disable SSH**.
   The SSH session remains active for another minute or so and then automatically closes. If more time is required, enable a new SSH session.

Location Information Configuration Settings

Table 57: Location Information Configuration Settings

Field	Definition
LCI Override	Enable to define the following location information: • Latitude (degrees) • Longitude (degrees) • Altitude (meters)
Z-Subelement Enable	Enable to define the following location information: • Expected to Move (check/clear) • Height Above Floor (meters) • Height Above Floor Uncertainty (meters)
Civic Address Override	Enable to override the existing location civic address and enter an RF 4776 Hex String.

Related Topics

Device Details Configuration Tasks on page 356

Configure DHCP Server and Relay Settings

For small networks that do not already have a DHCP server, you can configure and enable a DHCP server on an Extreme Networks device to provide network settings dynamically to clients. After you configure one hive member as a DHCP server, the other hive members forward the DHCPDISCOVERY and DHCPREQUEST messages to their neighbors. The device you use as the DHCP server must be a portal. When all hive members are in the same subnet and all devices in that subnet are on a single

VLAN, you only need to configure the DHCP server device with a pool of IP addresses it can draw from when responding to DHCP client requests. When some hive members are in a different subnet from the DHCP server, you must also configure those devices to forward DHCP traffic to the IP address of the DHCP server. In this case, the other devices act as DHCP relay agents. You can configure both DHCP servers and relay agents here.

1. Select the add icon.
2. Enter a name.
3. Enter an optional description.
4. Select the name of the DHCP server or relay agent interface from the drop-down list.
5. Select **DHCP server** or **DHCP relay agent**.

   The DHCP relay enhancement supports deployments when a centralized DHCP server (for example, at corporate headquarters) is used. When you enable DHCP Relay, the DHCP server feature on devices is disabled so that routers redirect DHCP service requests to the centralized DHCP server.
6. Enable or disable **Set the DHCP server as authoritative**.

   If this DHCP server is the only one on your network, it contains a record of the valid IP numbers on the network. If a client tries to register with an invalid IP address (for example, if a client device still has an active lease with another network), an authoritative DHCP server denies access to that client.
7. Enable **Use ARP to check for IP address conflicts** when this DHCP server uses ARP to check for IP address conflicts on the network before assigning an IP address to a DHCP client.
8. Select **Enable NAT Support** if this DHCP server uses NAT.
9. For **IP Pool**, define the IP address pool from which the DHCP server draws IP addresses when making assignments.
   a. Select the add icon to add a new IP pool.
   b. Enter the start and end IP addresses.
   c. Select **Add**.
10. To configure each of the required parameters that the DHCP server returns to clients along with an IP address, see Configure DHCP Server Options on page 371.
11. To define custom DHCP options to provide additional network settings to connected clients, see Configure Custom DHCP Options on page 370.
12. Select **Save**.

Configure Custom DHCP Options

Create or modify **DHCP Server and Relay settings**.

Use this task to define custom DHCP options to provide additional network settings to connected clients.

1. Select the add icon.
2. Enter a custom **Number** from 2 to 5, 8 to 14, 16 to 25, 27 to 41, 43, 45 to 50, 52 to 57, 60 to 68, 71 to 224, 227, 228, or 232 to 254.

3. Choose the **Type** of data that the option provides:
    - Integer: (0-2,147,483,547)
    - IP Address: (Four octets for an IP address or eight groups of two octets each for an IPv6 address.)
    - String: (1-255 characters)
    - Hex: (1-254 hexadecimal digits)
4. Enter the **Value** for the data.
5. Select **Add**.
6. Select **Save**.

Update the device from the **Manage** > **Device** page.

Configure DHCP Server Options

Create basic **DHCP Server and Relay settings**.

Use this task to configure each of the required parameters that the DHCP server relays to clients, along with an IP address.

1. Enter the IP address of the **Default Gateway** for the subnet to which the addresses in the IP pool belong.
2. Enter the primary **DNS server** IP address for clients to contact when resolving domain names to IP addresses.
3. Enter the secondary **DNS server** IP address for clients to contact when resolving domain names to IP addresses.
4. Enter the tertiary **DNS server** IP address for clients to contact when resolving domain names to IP addresses.
5. Enter the **POP3 server** IP address for clients to use.
6. Enter the **SMTP server** IP address for clients to use.
7. Enter the primary **WINS server** IP address for clients to use.
8. Enter the secondary **WINS server** IP address for clients to use.
9. For **Lease Time**, enter the length of time for the DHCP lease to last.
10. Enter the **Netmask** that defines the subnet to which the addresses in the IP pool belong.
11. Enter the DNS name resolution **Domain Name** to assign to DHCP clients.
12. Set the path **MTU** aging timeout in seconds for clients to use.
13. Enter the primary **NTP server** IP address for DHCP client clock synchronization.
14.
15. Enter the secondary **NTP server** IP address for DHCP client clock synchronization.
16. Enter the **Log Server** IP address for DHCP clients.

Save the configuration or continue to **Custom** settings.

Configure Bonjour Gateway Settings

Define Bonjour Gateway settings in the network policy.

Use this task to choose the AP you want to act as your Bonjour Gateway Designated Device (BDD) at the device level. If possible, use the newest model AP you have in a low traffic area.

1. Select the **Hostname** of the device.
2. Select **Configure**.
3. Set the priority for the AP you want to use as your BDD to around 250.

   By default, every AP is set an automatic priority level (10-20) for the Bonjour service. The AP with the highest priority setting will act as the Bonjour Gateway. The MAC address is used if the priority is the same on all APs.
4. Optionally, rename the **Realm**, or leave blank to use the existing name.
5. Select **Save**.

Push a complete configuration to the BDD, followed by a **Delta** update to all other APs.

Device Details Neighbor Devices

Roaming Threshold helps control the number of tunnels an AP can accept during layer 3 roaming operations.

Manually add a **Neighbor** to define a Hive neighbor in the case where the APs cannot hear over the air and they are in different management subnets (which is how they ordinarily learn of each other.) Bonjour Gateway piggybacks on this functionality to learn of APs in other management subnets that cannot be heard over the air.

1. Set the volume of traffic that the selected neighbors will accept through GRE (Generic Routing Encapsulation) tunnels to support Layer 3 roaming.

   This option gives hive members the ability to push tunnels to other members for better tunnel load balancing. For example, if one AP near an entrance gets overloaded with tunnels, you can lower its threshold to medium or low so that more tunnels terminate on other APs.

   > Note
   > This setting only takes effect when the APs function as portals and Layer 3 roaming is enabled.
2. Select the plus sign to manually add a Layer 3 roaming or Bonjour gateway neighboring Extreme Networks device.
3. Select an available neighbor device from the drop-down menu and select **Add**.

   > Note
   > You can add any or all of the Layer 3 roaming and Bonjour gateway neighboring Extreme Networks devices by repeating the previous two steps.
4. Select **Save**.
5. To update the device immediately, select **Update Now**.
6. Select the type of update, and then select **Save as Defaults** to save this option as the default action.
7. To update the device immediately, select **Perform Update**.

Router URL Filtering

Some Extreme Networks routers support HTTP URL filtering rules, which define URL filtering by white list, blocked list, and category, and which can be assigned to one or more user profiles. You can select from existing user profiles or you can create a new user profile in the URL filtering rule table.

Select the host name of a router from the devices list. In the device details window, under the Configure tab, select URL Filtering. After you turn URL Filtering on, you can perform the following steps to configure URL Filtering rules,

1. Navigate to **Manage > Devices**.
2. Select the host name of a router from the Device list.
3. In the device details window, navigate to Configure > Additional Settings > URL Filtering.
4. Toggle **URL Filtering** to **On**.
5. Select an existing rule, or select the add icon to add a new rule.
6. If you are adding a new rule, enter a name and description for the rule.
7. Select the plus sign above the rules table.
8. Add or select a schedule for when this rule applies.
9. Add or import up to 32 URLs for the allowed list and the blocked list.

   You can add URLs manually or import them in the form of .csv file.
10. Select categories that you want this URL filter to block.
11. Select **Save Detail**.
12. When you see the new URL rule in the table, select **Save URL Rule**.

Push the Device-Level Configuration to the Device

Perform necessary configuration changes at the device level. After you save these changes, an exclamation mark appears in the device **Status** column, indicating that the device configuration is out of sync with the network policy.

Use this task to push configuration changes made at the device level to the selected devices, and replace the exclamation marks with green checks.

1. Go to **Manage** > **Devices** and select the devices to update.

   Alternately, got to **Manage** > **Devices** > , and select the **host_name** for a device. On the **Configure** page, select **Update**. Proceed to step 3.
2. Select **Update Devices**.
3. Select **Delta Configuration Update**.
4. Select **Perform Update**.

   To avoid an unnecessary system reboot, select **Delta Configuration Update**. ExtremeCloud IQ attempts to update only the configuration deltas. If a full update is required, the system prompts you to select **Complete Configuration Update**. Examples of CLI commands that require a full configuration update are: **`system antenna-type`** and **`system environment`**.

   The status icon changes from an exclamation mark to a green check.

5. For Universal switches, if you receive an out-of-sync error, hover over the message and review the details to reveal where the local configuration is out of sync.
    a. Match the out-of-sync local configuration within the network policy, switch template, or device level configuration and perform an update device again.
    b. If Step a is not successful, select **Perform delta configuration update and resolve local device configuration which is out of sync with ExtremeCloud IQ**.

    > Note
    > This option requires a minimum version of Switch Engine 32.3 or Fabric Engine 8.9 installed on the Universal switches.

Upload and Manage Media Gallery Content

Go to **Manage** > **Devices** *<select host name>* **Device Details** panel.

The **Media Gallery** is available only for real devices, and cannot be used with simulated devices.

Use this task to upload and manage images (.png or .jpg) or video (.mp4 or .mov) produced during installation of a device.

> Note
> It is recommended that the image file size be less than 500 KB, and the video file size be less than 5 MB.

1. To view and manage existing media files, or to add media files, select **View Device Media** under **Media Gallery** in the sidebar.
2. To upload an image file or video file:
    a. Select **Choose File**, then browse to your local folder and select the target image or video. Select Open.
    b. Optionally, select **Change File** if you want to exchange the file you selected in the previous step.
    c. Select **Upload**
3. Optionally, edit the **Title**, which is automatically populated with the file name of the uploaded image or video file.
4. Optionally, enter a **Description** of the image or video.
5. Optionally, select **Upload New** to add another image. Repeat this step for all images or videos to be added.
6. Choose from the following actions:
    - To rotate an image to get a better view of details, select the image in the sidebar, then select ↻.
    - To delete an image or video, select it in the sidebar, then select 🗑 to delete the file. Confirm the deletion.
    - Select ✕ to close the **Media Gallery**.

Related Topics

Device Details Overview on page 351

Manage Active Alarms

When you select the **Host Name** of a device from the **Devices** list and then select **Monitor** > **Alarms**, the following information is shown for the device:

- At the top of the main section, a diagram shows how the device is connected to the network.
- **Active Alarms View**: In this default view, you can see all active alarms for this device, and select and clear alarms. Use the column picker to select which columns are displayed in the table. Select or clear check boxes to display or hide columns. Your column selections are maintained if you go to another window and return, and when you log out and then log in again. Horizontal scrolling is available for this table when there are too many columns to fit in your display window.
- **Timeline View**: Switch to this view to see a graph with timelines representing alarms data captured within the specified time frame. By default, alarms are displayed for a 24-hour time frame. You can customize the time frame using the **Time Range** controls. Hover over graph lines to see more information. You can also clear alarms in the **Active Alarms** view. Cleared alarms become events and are then displayed in the **Event** log.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

NEW! Clients

Clients Health

The Client Health page shows health information based on the sites and time ranges for the active clients on your network.

To access the information, go to **Manage** > **Clients**.

Data widgets display the following:

- Overall Score - Poor (0-49), Good (50-79), Excellent (80-100) based on:
  - Wi-Fi Health Score
  - Network Health Score
  - Application Health Score
- Clients - 2.4 GHz, 5 GHz, 6 GHz
- Client Issues - Associated Issues, Auth Issues, Networking Issues

The Healthy and Unhealthy client lists display all associated client details. Use the **Connection Type**, **OS Type**, **Connected Via**, **User Profile**, and **Status** drop-down lists above the table to view real time or historical data.

Table 58: Client List Details

Column	Description
Status	This column contains icons for each client, depending on the health of the connection. • Green indicates a healthy wireless connection. • Grey indicates that the client is not connected. • Red indicates that the wireless connection is in danger of failing. • Yellow indicates a poor-quality wireless connection.
Connection Type	Wired or wireless connection.
Host Name	The name of the device hosting the client.
SNR	If enabled APs consider signal-to-noise ratio to determine when to disassociate.
RSSI	The RF signal strength of the wireless link between the two neighboring devices. The RSSI range is 0-90.
Category Assignment (IoT only)	Operator-defined IoT category, such as printer, camera, thermostat, wireless client, and so on.
Channel Utilization	The client channel utilization.
IPv4	The IPv4 address of the client.
MAC	The MAC address of the client. Select the hyperlink to view the Connection Details Pannel or to access the Client Tools menu.
User Name	The name of the user operating the client.
OS Type	The operating system running on the client as determined by the OS fingerprint. If the combination of requested DHCP parameters does not match an OS type in the client OS list, "unknown".
VLAN	The ID number of the VLAN to which the device assigned the client.
Connected Via	The port through which the client is connected.
User Profile	The user profile to which this client is assigned.

Select ⤓ to download the table information in a .csv format.

Related Topics

Connection Details Panel (Wireless) on page 429

Session Details (Wireless) on page 434

Client Tools (Wireless) on page 437

Users

ExtremeCloud IQ presents the **Connected Users** list in table format. The list provides details about connected users in real time or within a specified time frame. Use the table controls to customize your view.

The following sections describe the types of data related to connected users that ExtremeCloud IQ collects and displays, and how to customize your view.

Related Topics

View Connected Users on page 377
Connected Users List on page 378
User Details on page 378

View Connected Users

Use the following procedure to display the **Connected Users** list and customize your view.

1. Go to **Manage** > **Users**.
2. Use the table controls to customize your view.
    - Choose the time period for which to display data:
        - **Real Time**
        - **Historical**

          Historical data is updated hourly. A graph provides a visual representation of the data captured for the specified time frame. You can change the time frame using the **Time Range** controls. See Set the Time Frame for Captured Data Displays and Reports on page 421.
    - Use the **Source** menu to filter information by authentication type:
        - **All**
        - **RADIUS**
        - **PPSK**
        - **Others**
    - Select ↻ to update the data.
    - Select a user name to view detailed information about that user. See User Details on page 378.
    - Sort table rows alphabetically or numerically by selecting any of the column headings. Select the heading again to sort it in reverse order.
    - Select and drag the right edge of any table column to change the column width to display longer entries.
    - Select the ⤓ to save user data as a file named **`monitoring.activeUsers.csv`**.

Related Topics

User Details on page 378

Connected Users List on page 378

Set the Time Frame for Captured Data Displays and Reports on page 421

Connected Users List

The **Connected Users** list displays the following details for active users in your network:

- **Status**: Connected or disconnected.
- **User Name**: The name by which this user is identified.
- **User Group**: The user group to which this user is assigned, if any. You can configure user groups in the SSID portion of a network policy workflow or in **Configure** > **User Management** > **User Groups**. If the user does not belong to a group, N/A is shown in this column.
- **#Clients**: The number of active client devices this user has connected to the network.
- **Usage**: The amount of data this user has transmitted and received on the network during the current session.
- **Source**: The authentication method by which this user device accessed the network.
- **Session Time**: The length of the current session for this user.
- **Expires On**: The expiration date assigned to the account. If the user account does not have an expiration set or is set never to expire, the value is N/A or Never Expire.

Related Topics

View Connected Users on page 377

User Details

When you select a user name from the **Connected Users** table, ExtremeCloud IQ displays the **Summary View** for the user. The summary provides the following information:

- **Connection details**: The time span of the user's current connection.
- **Number of clients**: Hover over **Clients** to see more information about client devices.
- **Applications**: Details about the network applications this user accessed, including the top app and the most used apps.
- **Total Network Usage**: The amount of data that the user transmitted and received. You can download this chart as a PNG, JPEG, or PDF file.
- **Last Known Location**: The location in your network where this user was last connected, or is currently connected. Select any name in the location path to see the location on a map.
- **Timeline**: The graphical timeline reflects peak and low client usage by hour, day, or month. ExtremeCloud IQ displays any alarms that occurred during the specified time range. Hover over an alarm for details.
- **Network Usage**: This information is displayed below the timeline and shows details about network usage by client, SSID, User Profile, and Radio.
- **Top 5 Applications by Usage**: Usage information for the top 5 applications.

To refresh the data display, select ↻.

Related Topics

View Connected Users on page 377

Events

The events log shows events reported by network devices. You can use this information to audit activity or select the download icon to archive it. By default, the events log shows the most recent event at the top and is refreshed hourly.

Use the column picker to customize what appears in the table. Your selections persist if you go to another window and return, and when you log out and then log in again. Horizontal scrolling is available for this table when there are too many columns to fit in your display window. Most column headers in the Event Log are sortable. You can select and display multiple events at the same time, which can be useful for large-batch operations.

Events log entries contain the following elements:

- **Timestamp**: The time that the event occurred.
- **Severity**: Identifies the event as major, informational, or cleared.
- **Category**: The type of event, for example, status or threshold changes.
- **Description**: A brief explanation of the event.
- **Host Name**: The host name of the device on which the event occurred.
- **Device MAC**: The MAC address of the device that reported the event.
- **Client MAC**: The MAC address of the client that reported the event.

Alerts

ExtremeCloud IQ continually monitors operations, with the following objectives:

- To detect, record, and report details of specific events
- To evaluate performance metrics and report occurrences where specific criteria are met

The specific events detected and metrics evaluated, and the criteria for raising an alert, are stipulated in the **Alert Rules** of an **Alert Policy**, as follows:

- **Global Policy** — This is the default policy. The Alert Rules of this policy apply to all devices at all sites, and can be modified as desired.
- **Site Policy** — Alert Rules for a site policy apply to all devices at the specified site. Site Policy rules override Global Policy rules for the specified site.

> Note
> Each site can have only one Site Policy; however, you can assign the same Site Policy to multiple sites.

Users can receive alert notifications through email or Webhooks.

Related Topics

Manage Alerts on page 380
View Legacy Alarms on page 385
Alert Policy on page 386
Manage Notifications on page 394

Manage Alerts

Go to **Manage** > **Alerts**.

The **Alerts** dashboard includes:

- A list of alerts raised during the specified time range
- Interactive widgets that summarize, highlight, and logically group the alerts raised during the specified time range
- Tools that allow users to filter the alerts list, manage alerts, and configure alert policies

Note
Alerts are supported for devices that are connected directly to ExtremeCloud IQ cloud management only. Devices that appear in ExtremeCloud IQ but are managed by ExtremeCloud IQ Controller, the ExtremeWireless WiNG implementation, or ExtremeCloud IQ Site Engine will not generate alerts.

Note
The ExtremeCloud IQ Pilot banner displays a **Notifications** icon 🔔 and the total number of **Unacknowledged Critical** alerts raised over the last 24 hours. Hover over the icon to view a summary of the five most recent Critical alerts. Select **View All** to open the Alerts dashboard—from any user interface—and review details of, and optionally acknowledge, the Critical alerts.

Select **Alert Policy** to modify the **Global Policy** or to create or modify a **Site Policy**.

Select **View Legacy Alarms** to view legacy alarms.

Alert Details

By default, the Alerts dashboard displays information about alerts raised at all sites for the last 24 hours. You can filter the **Alert Details** list using either one or a combination of the following methods:

- Use the **Sites** drop-down menu to display alerts associated with a specific site.
- Use the **Time Range** controls to specify a time range—within the last 30 days—for which you want to display alerts.

- Use interactive widget controls to display alerts based on **Severity**, **Alert Category**, or **Top 5 Alert Type**.
- Use the **Status** drop-down list to display **All** (default), **Acknowledged**, or **Unacknowledged** alerts.

Note

After you set filters, if you exit the Alerts dashboard, the filters do not persist. You cannot save filter settings.

The **Alert Details** pane lists alerts and related details in tabular form. Table 59 describes the type of information displayed in each column and the tools users can employ.

Table 59: Alert Details List Column Headings

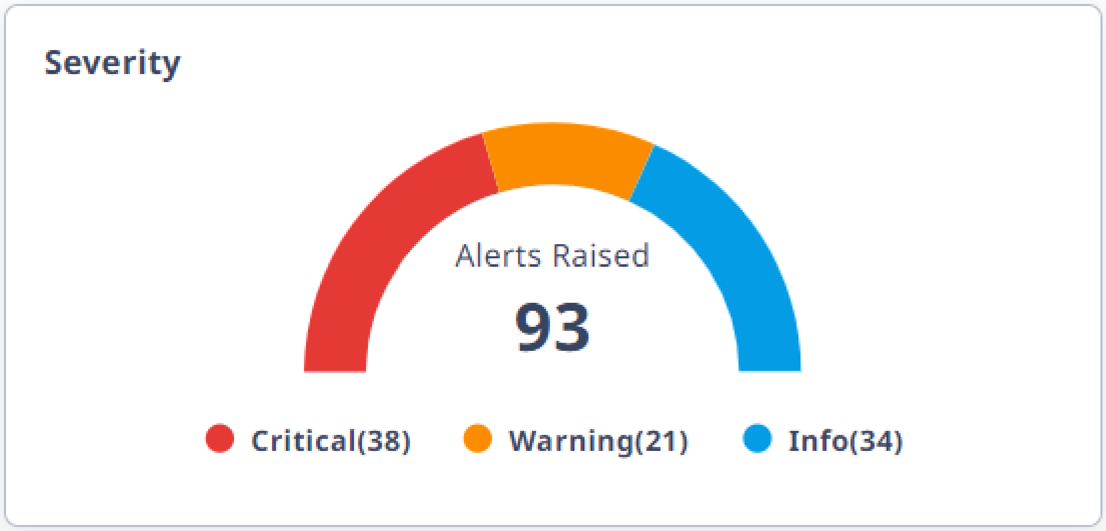
Column Heading	Description
Severity	Displays alert severity levels, as follows: • Critical - red bead 🔴 • Warning - yellow bead 🟡 • Info - blue bead 🔵
Summary	Provides an interactive description of the alert. Select the description to open the **Alert Detail** pop-up window, which displays variations of the following information, depending on the source of the alert: • **Info** ◦ Summary — Summarized alert description. ◦ Detected — The exact time the event was detected. • **Source** ◦ Type — Possibilities are: Device CPU PSU ◦ Name — Device host name. • **Description** ◦ Device ID — The identifier assigned to the device. ◦ Device Name — The name assigned to the device. ◦ Admin State — Managed or Unmanaged. ◦ IP Address — The IP address of the device. ◦ Real Device — True or False. ◦ Mac Address — The MAC address of the device. ◦ Model — The AP or switch model. ◦ Serial Number — The device serial number. ◦ Location — The site, building, and floor location of the device. ◦ PSU Number — Power supply identifier. ◦ PSU Capacity — Available power. In the **Alert Detail** window, choose from the following actions: • Select 👍 to acknowledge the alert. • Select ✕ to close the window. Note: Alerts can apply to specific device models based on the feature support. For example, the alert: *Switch SSH Login Failed* applies to switches running EXOS (Switch Engine) and VOSS (Fabric Engine) only.

Table 59: Alert Details List Column Headings (continued)

Column Heading	Description
Category	Identifies the category of the alert. Possibilities are: • Device • XIQ • Security • Performance • Client • Anomaly • Static Route Ping Protection • DHCP Snooping Rogue MAC Detection
Source	Displays an interactive device host name. Select the host name to open the **Manage** > **Device** > **Monitor** window to investigate the related alert issue.
Detected	Indicates when the event was detected or the performance metric criteria was met.
Acknowledge	Identifies the acknowledgment status of the alerts, as follows: • 👍 — Unacknowledged alert. • 👍 — Acknowledged alert. Choose from the following actions: • Hover over an alert's 👍 icon to discover which user acknowledged the alert. • Select one or more alert check boxes, then select an 👍 icon to open the **Acknowledge Alert?** pop-up window. Select **OK** to confirm acknowledgment, or select **Cancel** to quit the operation. Note: Multiple alerts of different types and at different sites can be selected and acknowledged simultaneously. Once acknowledgment is confirmed, it cannot be reversed. Acknowledged alerts cannot be deleted. They can be filtered out of the **Alert Details** list using the **Status** drop-down menu.

Alerts Summary

Alert widgets provide a graphical summary of alerts and include color-coded refinements based on severity, category, and most prolific types of alerts. Widgets are interactive, allowing users to filter the alerts in the **Alert Details** list based on the refinements.



Severity

Alerts Raised

93

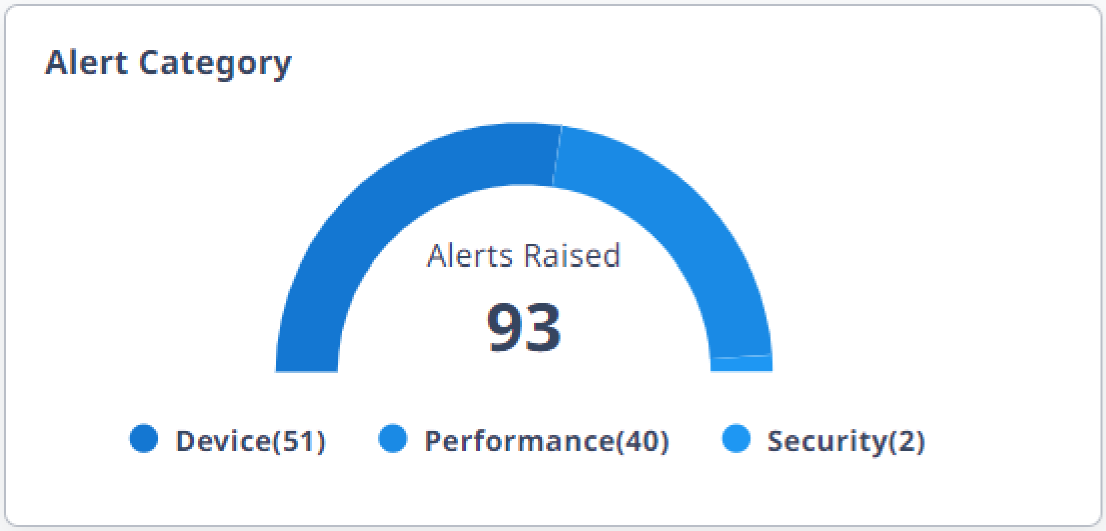
● Critical(38) ● Warning(21) ● Info(34)

Figure 7: Severity Widget

This widget displays the total number of **Alerts Raised** for the specified time range, with the colored bands of the arch and color-matched beads below it representing refinements on the basis of **Severity**, as follows:

- Critical
- Warning
- Info

Select a colored band in the graphic, or a bead, to filter the **Alert Details** list on the basis of Severity.



Alert Category

Alerts Raised

93

● Device(51) ● Performance(40) ● Security(2)

Figure 8: Category Widget

This widget displays the total number of **Alerts Raised** in all categories for the specified time range. Colored bands of the graphic and color-matched beads below it represent refinements based on **Alert Category**, as follows:

- Device
- Performance
- Security

Select a colored band in the graphic or a bead to filter the **Alert Details** list on the basis of Alert Category.

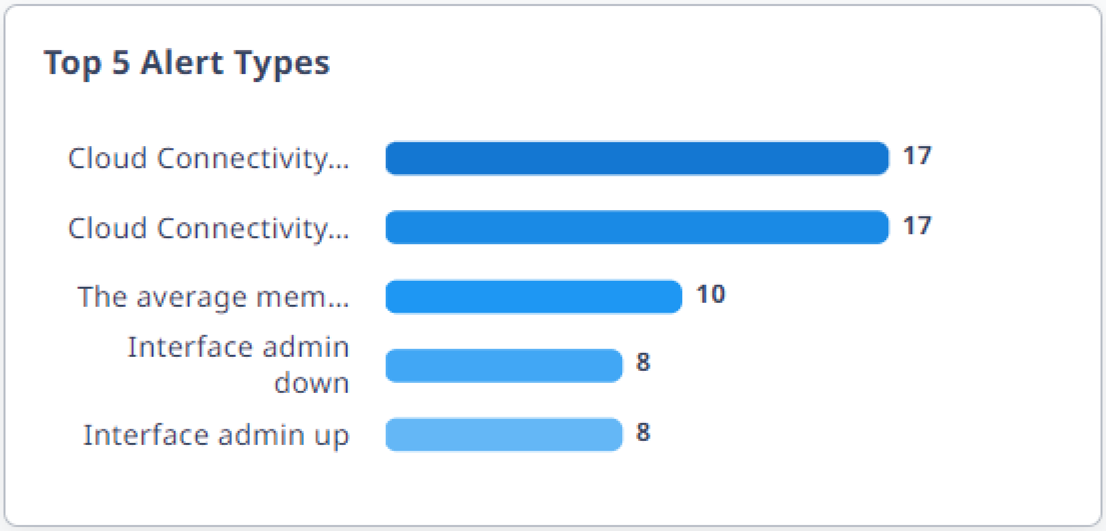


Figure 9: Top 5 Alert Widget

This widget displays the five most prolific alert types raised for the specified time range. Select a colored band in the graphic to filter the **Alert Details** list on the basis of Alert Type.

Related Topics

Alerts on page 379

Alert Policy on page 386

Manage Notifications on page 394

View Legacy Alarms

Note
This page will be deprecated in a future release.

Go to **Manage** > **Alerts** > **View Legacy Alarms**.

See Alarms on page 355 for information about the information displayed in this window, and the tools users can employ to filter the view.

Alert Policy

The **Alert Policy** window includes tools that allow users to take the following actions:

- To configure a new Site Policy, select **Add Site Policy**.
- To receive alert notifications through email or Webhooks, select **Notifications**.
- To configure Alert Rules for all devices at all sites, select the **Global Policy** tab, then see Configure Alert Rules on page 393 for details.
- To manage site policies, select the **Site Policies** tab, then take any of the following actions with configured site policies in the list:
    - Select ⊗ associated with a site to remove the assignment of the policy to that site. There must be at least one site assigned to a policy.
    - Select ⌄ associated with a site policy to configure the Alert Rules. See Configure Alert Rules on page 393 for details.
    - Select ✎ associated with a site policy to modify it.
    - Select 🗑 associated with a site policy to delete it.

Related Topics

Alert Rules Overview on page 387

Add or Edit a Site Policy on page 386

Manage Alerts on page 380

Add or Edit a Site Policy

Before you begin, review the information about managing site policies in Alert Policy on page 386.

Go to **Manage** > **Alerts** > **Alert Policy**.

Use this task to add and assign a Site Policy, or edit an existing policy. You can assign only one Site Policy to a site; however, you can assign a Site Policy to multiple sites.

Note
Site Policy alert rules override Global Policy alert rules for the specified site.

1. Select **Add Site Policy**.
2. Enter or modify the **Policy Name**.
3. Select one or more check boxes associated with the sites to which you want to apply this policy.
4. Use the **Search** field to narrow the list of sites from which to choose.
5. Select **Save** to commit the changes, or select **Cancel**.

Proceed to Configure Alert Rules on page 393.

Related Topics

Alert Rules Overview on page 387

Manage Alerts on page 380

Alert Rules Overview

Alert Rules stipulate the specific events detected and metrics evaluated, and the criteria for raising an alert.

Alert Rule settings options and default settings are identical for both Global and Site policies. See Alert Rules — Settings Options and Alert Rules — Default Settings on page 388 for details.

Alert Rules — Settings Options

The event and metric alert rule options are as follows:

Event and Metric Alert Rule Options:

Enabled or Disabled

Trigger Type:

- Immediate
- Deferred

  days
  hours
  minutes
  seconds

  An alert is raised if the condition persists for the configured deferral period.
- Repeated

  Occurred — Number of times the event occurs or criteria for the metric is met
  days
  hours
  minutes
  seconds

  An alert is raised if the condition repeats the configured number of times. Optionally, users can defer the alert by setting the slider to enable the time setting fields, then configuring the deferral period.

Raise Alert

- Critical
- Warning
- Info

Metric-only Option:

When (the metric is...)

- Operator

  >= (greater than or equal to)
  > (greater than)
  <= (smaller than or equal to)

< (smaller than)

= (equal to)

!= (not equal to)

- Threshold

  0 - 10000000 (%, V, Watt, Mw, °C, byte)

Alert Rules — Default Settings

Table 60 describes the event types that ExtremeCloud IQ can detect and the default rule criteria used for raising an alert.

Table 60: Events — Default Alert Rule Settings

Event	Default Alert Rule Settings
Device	
Cloud Connectivity Established	• Disabled • Trigger Type: Immediate • Raise Alert: Info
Cloud Connectivity Lost	• Enabled • Trigger Type: Deferred 10 minutes • Raise Alert: Info
Interface admin down	• Disabled • Trigger Type: Immediate • Raise Alert: Info
Interface admin up	• Disabled • Trigger Type: Immediate • Raise Alert: Info
Interface operation down	• Disabled • Trigger Type: Immediate • Raise Alert: Info
Interface operation up	• Disabled • Trigger Type: Immediate • Raise Alert: Info
Power supply failed	• Enabled • Trigger Type: Immediate • Raise Alert: Info
Power supply not present	• Disabled • Trigger Type: Immediate • Raise Alert: Info
Power supply recovered	• Enabled • Trigger Type: Immediate • Raise Alert: Info

Table 60: Events — Default Alert Rule Settings (continued)

Event	Default Alert Rule Settings
Power supply unplugged	• Enabled • Trigger Type: Immediate • Raise Alert: Info
Switch fan failed	• Enabled • Trigger Type: Immediate • Raise Alert: Info
Switch fan not present	• Enabled • Trigger Type: Immediate • Raise Alert: Info
Switch fan recovered	• Enabled • Trigger Type: Immediate • Raise Alert: Info
Switch power failed	• Enabled • Trigger Type: Immediate • Raise Alert: Info
Security	
Device SSH login failed	• Disabled • Trigger Type: Immediate • Raise Alert: Info

Table 61 describes the metrics that ExtremeCloud IQ evaluates and the default rule criteria used for raising an alert.

Note

When the configured threshold for an alert rule is exceeded, the system raises a single alert. If performance returns to normal, and then exceeds the threshold again, the system raises a new alert.

Table 61: Metrics — Default Alert Rule Settings

Metric	Default Alert Rule Settings
AP Radio Usage	
Total Channel Usage	• Enabled • When: Total Channel Usage Operator: >= Threshold: 80% • Trigger Type: Immediate • Raise Alert: Info

Table 61: Metrics — Default Alert Rule Settings (continued)

Metric	Default Alert Rule Settings
Total Interference Usage	• Disabled • When: Total Interface Usage Operator: >= Threshold: 20% • Trigger Type: Immediate • Raise Alert: Info
Total RX Usage	• Disabled • When: Total RX Usage Operator: >= Threshold: 80% • Trigger Type: Immediate • Raise Alert: Info
Total TX Usage	• Disabled • When: Total TX Usage Operator: >= Threshold: 80% • Trigger Type: Immediate • Raise Alert: Info
CPU & Memory Usage	
Avg CPU Usage	• Enabled • When: Avg CPU Usage Operator: >= Threshold: 80% • Trigger Type: Deferred 30 minutes • Raise Alert: Info
Avg Memory Usage	• Enabled • When: Avg Memory Usage Operator: >= Threshold: 80% • Trigger Type: Deferred 30 minutes • Raise Alert: Info
Max CPU	• Disabled • When: Max CPU Operator: >= Threshold: 80% • Trigger Type: Immediate • Raise Alert: Info

Table 61: Metrics — Default Alert Rule Settings (continued)

Metric	Default Alert Rule Settings
Min CPU	• Disabled • When: Min CPU Operator: <= Threshold: 1% • Trigger Type: Immediate • Raise Alert: Info
Device Temp	
Device Temp	• Disabled • When: Device Temp Operator: >= Threshold: 45 °C • Trigger Type: Immediate • Raise Alert: Info
Power Consumption	
Available Power	• Disabled • When: Available Power Operator: >= Threshold: 350000 Mw ** • Trigger Type: Immediate • Raise Alert: Info
Consumed Power	• Disabled • When: Consumed Power Operator: >= Threshold: 100000 Mw *** • Trigger Type: Immediate • Raise Alert: Info
Switch PSU Usage	
Avg Input Volt	• Disabled • When: Avg Input Volt Operator: >= Threshold: 120 V * • Trigger Type: Immediate • Raise Alert: Info
Avg Output Power	• Disabled • When: Avg Output Power Operator: >= Threshold: 350 Watts ** • Trigger Type: Immediate • Raise Alert: Info

Table 61: Metrics — Default Alert Rule Settings (continued)

Metric	Default Alert Rule Settings
Avg Output Volt	• Disabled • When: Avg Output Volt Operator: >= Threshold: 120 V * • Trigger Type: Immediate • Raise Alert: Info
MAX Switch Input Volt	• Disabled • When: MAX Switch Input Volt Operator: >= Threshold: 125 V • Trigger Type: Immediate • Raise Alert: Info
MAX Switch Output Power	• Disabled • When: MAX Switch Output Power Operator: >= Threshold: 650 Watts ** • Trigger Type: Immediate • Raise Alert: Info
MAX Switch Output Volt	• Disabled • When: MAX Switch Output Volt Operator: >= Threshold: 120 V • Trigger Type: Immediate • Raise Alert: Info
MIN Switch Input Volt	• Disabled • When: MAX Switch Input Volt Operator: <= Threshold: 115 V • Trigger Type: Immediate • Raise Alert: Info
MIN Switch Output Power	• Disabled • When: MIN Switch Output Power Operator: >= Threshold: 100 Watts ** • Trigger Type: Immediate • Raise Alert: Info

Table 61: Metrics — Default Alert Rule Settings (continued)

Metric	Default Alert Rule Settings
MIN Switch Output Volt	• Disabled • When: MIN Switch Output Volt Operator: >= Threshold: 120 V * • Trigger Type: Immediate • Raise Alert: Info
Wired Port Usage	
Total RX Byte Count	• Disabled • When: Total RX Byte Count Operator: >= Threshold: 10000000 byte • Trigger Type: Immediate • Raise Alert: Info
Total TX Byte Count	• Disabled • When: Total TX Byte Count Operator: >= Threshold: 10000000 byte • Trigger Type: Immediate • Raise Alert: Info
Notes: • * Can be 120 or 220 V, depending on SKU/PSU. • ** Recommended approximate setting. Varies across different SKUs. • *** Recommended approximate setting. Varies across different SKUs, and depends on what is connected to the device.	

Related Topics

Configure Alert Rules on page 393

Alert Policy on page 386

Configure Alert Rules

Before you begin, review the information about alert options and rules in Alert Rules Overview on page 387.

Use this task to configure Alert Rule settings, establishing the criteria for raising alerts.

1. Go to **Manage** > **Alerts** > **Alerts Policy**.
2. Choose from the following options:
   - To modify Global Policy rules, proceed to the next step.
   - To configure Site Policy rules, select the **Site Policies** tab, locate the target Site Policy in the list, then select the associated ⌄ to open the Alert Rules cascading menus. Proceed to the next step.

3. Select ∨ or ∧ to navigate the **Event** and **Metric** tabs, which contain the Alert Rules.
4. Use the slider control to **Enable** or **Disable** an Alert Rule.
5. Select ✎ associated with an Event or Metric to open its **Alert Rule** window, then modify the settings.
6. Select **Save** to commit changes, or select **Cancel**.
7. Repeat these steps for each event and metric for which you want to change the settings.

Related Topics

Alert Policy on page 386

Manage Notifications

Go to **Manage > Alerts > Alert Policy > Notifications**.

Users can configure notifications to send alerts to Webhook URLs for viewing alerts in real time or to email addresses for viewing alerts when it is convenient.

The **Notifications** window has two tabs:

- **Manage Emails** — This tab displays a list of configured email notifications.
- **Manage Webhooks** — This tab displays a list of configured Webhook notifications.

Each tab includes management tools that allow users to choose from the following actions:

- To add and configure an email or Webhook notification, select +.
- To delete multiple existing email or Webhook notifications, select the check boxes associated with the target entries in the list, then select 🗑 located at the top-left of the list.

  To delete a single entry in the list, under the **Actions** column, select 🗑 associated with the list entry.

  Select **OK** to confirm the deletion, or select **Cancel**.
- To edit an existing email or Webhook notification, under the **Actions** column, select ✎ associated with the target item in the list. When editing is complete, select **Save** to commit the changes, or select **Cancel**.

Manage Emails Tab

Table 62 describes the type of information displayed under each column in the Email Notifications list and any actions that a user can take.

Table 62: Email Notifications List Column Headings

Column Heading	Description
Email Address	Email address to which alerts are sent.
Created On	Date on which the notification is created.
Verify	Indicates whether the email address is verified, and allows users to initiate the email verification process, as follows: • Unverified — ✉ • Verified — ✉✓ To start the verification process, select ✉. The recipient at the configured email address must open the verification email that ExtremeCloud IQ sends, and select **Validate Your Email Address** within 30 minutes to complete the verification process. If verification is successful, ✉✓ displays when the window refreshes. To refresh the window, select ↻, or exit and return to the **Email** tab.
Actions	Choose from the following actions: • Select 🗑 to delete the associated list entry. • Select ✎ to edit the associated list entry.

Manage Webhooks Tab

Table 63 describes the type of information displayed under each column in the Webhook Notifications list and any actions that a user can take.

Table 63: Webhook Notifications List Column Headings

Column Heading	Description
Post URL	URL to which the alerts are sent.
Access Token	Access token, if configured.
Created On	Date on which the notification is created.
Actions	Choose from the following actions: • Select 🗑 to delete the associated list entry. • Select ✎ to edit the associated list entry.

Related Topics

Add or Edit an Email Notification on page 396

Add or Edit a Webhook Notification on page 396

Add or Edit an Email Notification

Go to **Manage** > **Alerts** > **Alert Policy** > **Notifications**.

Use this task to set up email notifications for alerts.

1. Select **Manage Emails**.
2. Choose from the following actions:
    - Select + to add a notification.
    - Select ✎ to edit a notification.
3. Add or modify the **Email Address** for the intended recipient.
4. Sending notifications is enabled by default. Deselect **Enable** to disable the sending of notifications to the specified email address.
5. Choose from the following options:
    - To receive notifications of alerts for all alert policies, no action is required. The **Select All Policies** option is enabled by default.
    - To receive notifications of Global Policy alerts or specific Site Policy alerts, or any combination of these, enable **Select Global/Site Policies**, then select the check box associated with the target policies. To narrow the list of policies to select from, use the **Search** tool.

    > Note
    > A user's assigned role determines which options are available.

6. Select **Save** to commit the changes, or select **Cancel**.

Newly added and modified email addresses must undergo verification. See Manage Notifications on page 394 for details on how to initiate the verification process.

Related Topics

Alerts on page 379

Add or Edit a Webhook Notification

Go to **Manage** > **Alerts** > **Alert Policy** > **Notifications**.

Use this task to set up Webhook notifications for alerts.

> Note
> Webhook notification is temporarily disabled if three consecutive notifications fail to reach the configured Webhook endpoint. ExtremeCloud IQ stops sending notifications for 10 minutes, then retries sending. This process is repeated until the notifications can be sent to this endpoint again. Any alerts raised during the 10 minute pause window are not sent.

1. Select **Manage Webhooks**.
2. Choose from the following actions:
    - Select + to add a notification.
    - Select ✎ to edit a notification.

3. Add or modify the **Post URL** destination for the notification.
4. Optionally, add an **Access Token**.
5. Deselect **Enable** to disable the sending of notifications to the specified Post URL. Sending notifications is enabled by default.
6. Choose from the following options:
   - To receive notifications of alerts for all alert policies, no action is required. The **Select All Policies** option is enabled by default.
   - To receive notifications of Global Policy alerts or specific Site Policy alerts, or any combination of these, enable **Select Global/Site Policies**, then select the check box associated with the target policies. To narrow the list of policies to select from, use the **Search** tool.
7. Select **Save** to commit the changes, or select **Cancel**.

Related Topics

Manage Notifications on page 394

Reports

The **Reports** table shows all generated reports that you have configured. Select a report name to view details. Select the plus sign to create reports. Schedule up to 500 combined weekly and daily reports. View all of the available types of reports or select a **Report Type** from the drop-down list to see just reports of that type. Filter the reports displayed.

To access **Reports**, go to **Manage** > **Reports**. ExtremeCloud IQ offers the following report types:

- **Network Summary**: This report provides visibility into how the network is being used by displaying the top applications and wireless clients for a given time period.
- **PCI DSS 3.2**: ExtremeCloud IQ audits current device configuration settings, checks them against those listed in PCI DSS 3.2, and provides a list of changes that you must make to bring non-compliant devices into compliance.
- **WIPS History**: This report summarizes data collected on rogue devices over a period of time, which can help you locate and remove these devices from your network. It can also help your organization adhere to PCI DSS record keeping requirements.
- **WiFi Statistics Summary**: This report provides a list of per-session locations, sublocations, associated VLANs, device MAC addresses, client MAC addresses, session start and end times, client IP addresses, client host names, client OS names, BSSIDs, and SSIDs. Because this report is location-based, to run it, you must first assign a map location to your devices.
- **Client Tracking**: This report provides information about a client connected to your network for a time range that you specify. You can identify the client by MAC address, user name, or host name.
- **Switch Summary**: This report provides switch port summary information. The report also includes switch device name, stack unit, status, total uptime, temperature status, average CPU/memory utilization, power supply/fan stats, PoE power availability, total client count, and total unicast/multicast/broadcast values. The

report provides a list of port errors, port operational status, and port TX/RX information.

Related Topics

Create a Network Summary Report on page 398
Generate a PCI DSS 3.2 Report on page 398
Generate a WIPS History Report on page 399
Generate a Wi-Fi Statistics Summary on page 400
Generate a Client Tracking Report on page 400
Generate a Switch Summary Report on page 401
Time Range for Reports on page 401

Create a Network Summary Report

A Network Summary report can display a great deal of information about your network and how it is functioning. You can choose to display a number of report widgets that show top usage, top applications and application groups, top wired clients, unique clients, and more.

Use this task to configure and generate a network summary report.

1. Go to **Manage** > **Reports**.
2. Select the **Network Summary** tab (selected by default).
3. Select the time range options for the report.
4. Name the report.
5. Choose which data widgets appear in the report.

   Display all widgets, or display them selectively. Select the check box to the left of a widget to include it, and clear the check box to exclude the widget. Many of the widgets are interactive, meaning that you can hover over them to see more information. There are two views: **Access** (the default view) and the **WAN** view.
6. Select the format for the report.
7. Select recurrence options for the report.
8. Share the report with others by entering valid email addresses in the **Share With** field.
9. Select **GENERATE REPORT**.

ExtremeCloud IQ automatically generates the report according to your instructions. You can view it on the **My Reports** page by selecting **My Reports** from the top-left corner of the page.

Related Topics

Reports on page 397

Generate a PCI DSS 3.2 Report

The feature audits current device configuration settings and checks them against those listed in the Payment Card Industry Data Security Standard (PCI DSS) 3.2. The report then provides a specific list of changes that must be followed to bring non-compliant devices into compliance.

Use this task to configure and generate a PCI DSS 3.2 summary report.

1. Go to **Manage** > **Reports**.
2. Select the **PCI DSS 3.2** tab.
3. Name the report.
4. Select the time range options for this report.
5. Choose the widgets that you want to display in the report:

   By default, the report displays the widgets.

   - To remove a widget, select ✕ to the right of the widget name.
   - To add a widget, select + to the right of the widget name.
6. To share this report with others, enter valid email addresses in the **Share With** field.
7. Select **GENERATE REPORT**.

ExtremeCloud IQ automatically generates the report according to your instructions. You can view it on the **My Reports** page by selecting **My Reports** from the top-left corner of the page.

Related Topics

Reports on page 397

Generate a WIPS History Report

A WIPS History report provides information about rogue and unauthorized devices, and the neighbor APs that reported them. This report can help you improve network security and comply with Payment Card Industry Data Security Standard (PCI DSS) intrusion detection and record-keeping requirements.

Use this task to configure and generate a WIPS History report.

1. Go to **Manage** > **Reports**.
2. Select the **WIPS HISTORY** tab.
3. Select time range options for this report.
4. Name the report.
5. Choose the widgets that you want to display.

   The report displays the widgets by default.

   - To delete a widget, select ✕ to the right of the widget name.
   - To add a widget, select + to the right of the widget name.
6. Select the recurrence options for the report.
7. Share the report with others by entering valid email addresses in the **Share With** field.
8. Select **GENERATE REPORT**.

ExtremeCloud IQ automatically generates the report according to your instructions. You can view it on the **My Reports** page by selecting **My Reports** from the top-left corner of the page.

Related Topics

Reports on page 397

Generate a Wi-Fi Statistics Summary

The Wi-Fi Statistics Summary provides information about your wireless clients and their connections, availability through your APs, and other wireless details.

1. Go to **Manage** > **Reports**.
2. Select the **WiFi STATISTICS SUMMARY** tab.
3. Enter a **Name** for the report.
4. Select the time range options for this report.
5. Share this report with others by entering valid email addresses in the **Share With** field.
6. Select **GENERATE REPORT**.

ExtremeCloud IQ automatically generates the report according to your instructions. You can view it on the **My Reports** page by selecting **My Reports** from the top-left corner of the page.

Related Topics

Reports on page 397

Generate a Client Tracking Report

The Client Tracking report shows information about a client connected to your network for a time range that you specify. You can identify the client by MAC address, user name, or host name.

Use this task to configure a Client Tracking report.

1. Go to **Manage** > **Reports**.
2. Select the **CLIENT TRACKING** tab.
3. Select the time range options for this report.
4. Name the report.
5. Select a **Device Identifier** for the client, and then type the MAC address, user name, or host name.
6. Choose a file format for the data.
7. To share this report with others, enter valid email addresses in the **Share With** field.
8. Select **GENERATE REPORT**.

ExtremeCloud IQ automatically generates the report according to your instructions. You can view it on the **My Reports** page by selecting **My Reports** from the top-left corner of the page.

Related Topics

Reports on page 397

Generate a Switch Summary Report

A Switch Summary Report displays information about your switches. You can choose to display a number of report widgets that show switch ports errors, switch ports status reports, and switch ports TX/RX Bps reports.

Use this task to configure and generate a Switch Summary Report.

1. Go to **Manage** > **Reports**.
2. Select the **SWITCH SUMMARY REPORT** tab (selected by default).
3. Select the time range options for the report.
4. Name the report.
5. Choose the widgets that you want to display.

   The report displays the widgets by default.

   - To delete a widget, select ✕ to the right of the widget name.
   - To add a widget, select + to the right of the widget name.
6. Select the format for the report.
7. Select recurrence options for the report.
8. Share the report with others by entering valid email addresses in the **Share With** field.
9. Select **GENERATE REPORT**.

ExtremeCloud IQ automatically generates the report according to your instructions. You can view it on the **My Reports** page by selecting **My Reports** from the top-left corner of the page.

Related Topics

Reports on page 397

Time Range for Reports

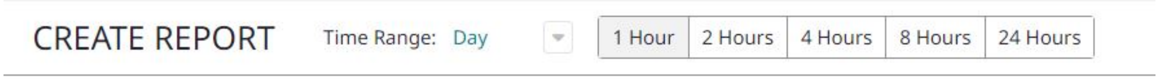


Figure 10: Report Time Range

When generating reports, multiple options exist at the top of the page for you to select the time range for the desired report:

- **Time Range** drop-down menu - Select from Day, Week, or Custom.
- Selection Buttons - Provide context-sensitive options based on your selection from the **Time Range** drop-down menu.
  - Day - 1, 2, 4, 8 or 24 hours
  - Week - 1, 2, or 7 days

When you select the **Custom** option in the **Time Range** drop-down menu a calendar opens on the screen.

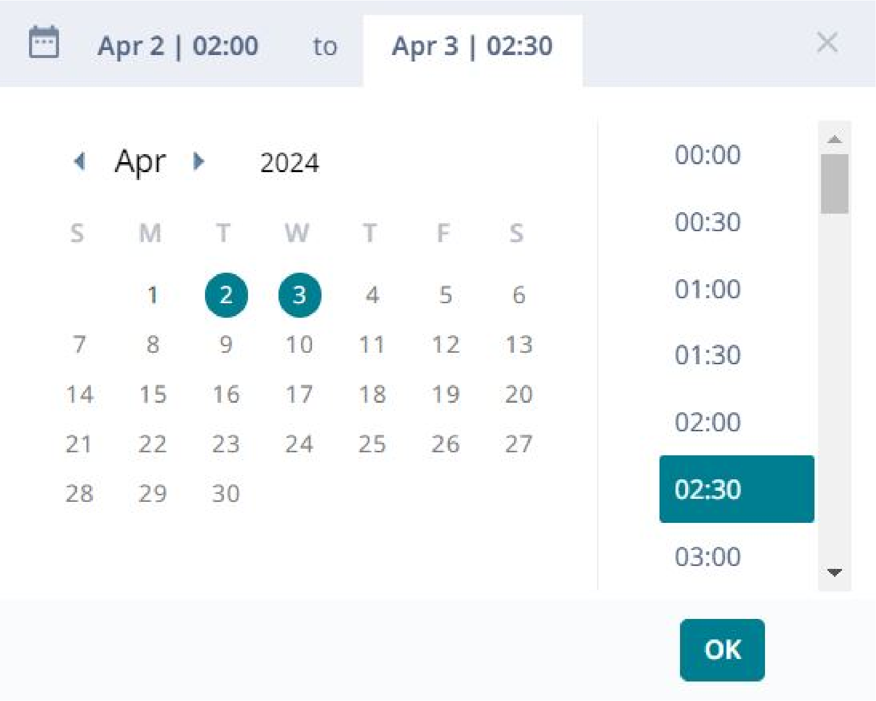


Figure 11: Time Range Calendar

To create a custom time range, select the dates and times, broken down into 30-minute segments.

Related Topics

Reports on page 397

Applications

The **Applications** and **Application Groups** windows contain status cards at the top, a filter tool at the left, and data tables in the main window. Use this window as follows:

- Select inside any status card to see more details.
- Use the **Filter** tool to filter the display of application data. You can create and save filters for later use.
- The Applications and Application Groups tables display information about the applications that are most active in your network.
- Select to display the **Top 20** or **Top 100** applications or groups. Most of the columns in this table can be sorted using up and down arrows. The following information is displayed:
    - **Application**: The name of the application or group.
    - **Data Usage (% used)**: The percentage of bandwidth used by the application (in GB, MB, or Kbps).

  - **# Clients**: The number of clients that are running the application.
  - **# Users**: The number of users accessing this application:
- Select the download icon to download the table. You can save it to a location or open it in an application such as Word or Excel.
- Select the refresh icon to refresh all of the data in this window at any time.
- Select an application name or application group name in the **Applications** table to see more information, including:
  - Application name and category (application group name)
  - Data usage, unique clients, and unique user summary for the previous hour.
  - Application description, if available.
  - A usage timeline shows data for a time period which you can define using the range options above the graph.
  - Unique clients using this application, sortable by OS, SSID, or user profile.
  - Network usage for this application, sortable by OS, SSID, or user profile.
  - Top locations where the selected application is being used.
  - Top five clients by usage, including MAC address, operating system, and connection information.
  - Top five users by name, location of their most recent connection, and usage.
- Use **MANAGE APPLICATIONS** to create custom applications. For more information, see Add a Custom Application on page 404.

Related Topics

Add a Custom Application on page 404

Application Detection Rules Settings on page 404

Applications List

To see a list of configured applications, go to **Manage** > **Applications** > **MANAGE APPLICATIONS**.

From this page, you can filter the list of applications any of the following ways:

- Kind
  - Application
  - Category
- Type
- Protocol

Use the search field to find a specific application in the list.

Select an application in the list:

- To edit the application, select ✏
- To delete an application, select 🗑.

Note
You cannot edit or delete system-defined applications.

Related Topics

Add a Custom Application on page 404

Add Application Sets on page 222

Add a Custom Application

Use this task to create a custom application definition, including an application group, optional descriptions, and application detection rules.

1. Go to **Manage** > **Applications**, and then select **MANAGE APPLICATIONS**.
2. Select **ADD CUSTOM**.
3. Enter an **Application Name** for the new application.
4. Enter an optional **Description**.
5. Select an existing **Application Category** from the drop-down list, or select + to create a new one.
    a. If you add a new group, enter a **Group Name**.
    b. Select **Save**.
6. Select + and configure the **Application Detection Rules**.
7. To delete a rule, select the corresponding check box, and then select 🗑.
8. Select **SAVE**.

Related Topics

Application Detection Rules Settings on page 404

Add Application Sets on page 222

Application Detection Rules Settings

The settings depend on the rule **Type** that you select. Choose from the following types:

- Host Name
- Server IP Address Settings on page 405
- Port Number on page 405

Host Name

Table 64: Host Name Settings

Setting	Description
Type	Select the type of rule: **Host Name**, **Server IP Address**, or **Port Number** from the menu.
Protocol	Select the protocol: **HTTP** or **HTTPS** from the menu.
Host Name	(Required) Type the host name.

Server IP Address Settings

Table 65: Server IP Address

Setting	Description
Type	Select the type of rule: **Host Name**, **Server IP Address**, or **Port Number**.
Protocol	Select the protocol: **TCP** or **UDP** from the menu.
Server IP Address	(Required) Type the IP address for the server.
Port Number	Type the port number. Range: 1-65535

Port Number

Table 66: Port Number Settings

Setting	Description
Type	Select the type of rule: **Host Name**, **Server IP Address**, or **Port Number**.
Protocol	Select the protocol: **TCP** or **UDP** from the menu.
Port	(Required) Type the port number. Range: 1-65535

Related Topics

Add a Custom Application on page 404

Rogue APs

When you enable a wireless intrusion prevention system (WIPS) on your network, APs that do not comply with the WIPS are considered rogue and are listed under **Manage** > **Security** > **Rogue APs**. If an AP that does not comply with WIPS appears here, and you are sure that it is a valid device, you can remove it. You might also want to reconfigure the WIPS policy settings.

A graph displays a colored timeline representing data captured for rogue APs within the specified time frame. You can change the time frame using the **Time Range** controls. For more information, see Set the Time Frame for Captured Data Displays and Reports on page 421. Details about the data captured within this time frame are listed in the table below the graph.

View the table as follows:

- Above the table are three viewing options with check boxes:
  - **Rogue**: An unauthorized AP that is connected to your wired network.
  - **Unauthorized**: Any unauthorized AP that is detected, but not necessarily connected to your wired network.

  - **Neighbor**: APs that you have manually classified as neighbors and that do not represent a threat.
- In the table, select and drag the right edge of any column to change the column width. Some columns can also be sorted. Select the column heading to sort column entries.
- The table displays all of the rogue APs that have been detected in your network. You can also choose to show **In-net** rogues, **Unauthorized** rogues, or **Neighbor** rogues that are not a threat.
- If a detected rogue AP is determined to be in the same backhaul network as compliant APs, ExtremeCloud IQ displays **In-net**. If the location of the AP in the network cannot be determined, a dash is displayed. Knowing whether a rogue AP is in the same network can help you decide how swiftly you need to respond to its presence.

  By default, the table displays the following information:

  - **Classification**: Whether this AP is considered a true rogue or a neighbor AP.
  - **Clients**: Shows the number of clients associated with this AP.
  - **Rogue AP BSSID**: The BSSID (basic service set identifier, which includes the MAC address) of the rogue AP.
  - **SSID**: The SSID that is being announced by the rogue AP beacons.
  - **Vendor**: The vendor of the rogue AP, Apple, for example.
  - **Approximate Location**: The location of the rogue AP in your network, or the location of the AP that reported the rogue.
  - **Reporting Device**: The authorized device in your network that reported the rogue AP.
  - **Reason**: The reason the AP has been designated as a rogue. APs can check whether the SSID names and types of encryption other access points advertise match those in a checklist. For example, if your network security policy requires all SSIDs to use WPA or WPA2, any SSID using WPA or WPA2 makes the AP hosting it valid. An AP is categorized as rogue if it hosts an SSID using WEP or no encryption at all (open).
  - **First Time Detected**: The first time this AP was detected in your network.
  - **Last Time Detected**: The last time this AP was detected in your network.
  - **Mitigation**: Displays whether mitigation has been taken against this AP.

Classify Rogue APs

You can change the classification for the rogue APs displayed in this table. Select the check box for an AP and then select **Classify**. Then select one of the following options:

- **Neighbor**: Reclassifies this device as an AP that does not present a threat to your network.
- **Auto-classify**: (For previously manually-classified APs). Use this option to return an AP to the default classification it had when first detected.

Mitigate Rogue APs

You can configure your WIPS policy to mitigate rogue APs manually or automatically. For more information about how to configure mitigation, see Configure Rogue AP Detection on page 240.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

Rogue Clients

Under **Manage** > **Security** > **Rogue Clients**, a table displays details for devices that are enabled with a wireless intrusion prevention system (WIPS) configuration that includes ad hoc network settings. These devices detect wireless clients participating in an ad hoc network.

Note
An ad hoc network (also referred to as an IBSS, or independent basis service set) consists of two or more wireless clients that communicate with each other directly instead of through an access point.

Devices can only detect rogue clients in an ad hoc network if the client uses the same channel as the device access radio, and if the device has background scanning enabled on that radio. View the table as follows:

A graph displays a colored timeline representing data captured for rogue clients within the specified time frame. You can change the time frame using the **Time Range** controls. For more information, see Set the Time Frame for Captured Data Displays and Reports on page 421. Details about the data captured within this time frame are listed in the table below the graph.

The Rogue Clients table displays all of the rogue clients that have been detected in your network. Select the **Rogue** checkbox to list in-net rogues. Select the **Unauthorized** checkbox to list unauthorized rogues, or the rogues that have been removed from your network.

The table has variable-width columns to display longer entries. Select and drag the right edge of any column left or right to change the column width. Some columns are sortable; select the column heading to sort column entries. By default, this table displays the following information:

- **MAC Address**: The MAC address of the rogue client.
- **Vendor**: The client vendor.
- **Classification**: Whether the client is considered a true rogue, or a neighbor.
- **SSID**: The SSID that is being announced by the client beacons.
- **Approximate Location**: The location of the client or reporting AP in your network.
- **Device Name**: The authorized device that reported the rogue client.
- **First Time Detected** : The first time the client was detected in your network.
- **Last Time Detected**: The last time the client was detected in your network.

Classify Rogue Clients

To classify rogue clients, select the check box for the client and then select **Classify**. From the drop-down list, select **Neighbor**, **Removed**, or **Auto-classify**.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

About Client Monitor

The client monitor tool helps identify and troubleshoot issues clients typically encounter when associating with an AP, authenticating, and accessing the network.

The **Issue List** window provides a list of all the issues that wireless clients face within the time frame defined in the graph at the top of the window, and the issue type and issue status filters also defined at the top of the table. For each issue, the table shows the following details:

- Client host name and MAC address
- Issue type and summary
- User profile applied to the client
- Host name of the Extreme Networks device with which the client connected
- Client location on a topology map
- Timestamp when the issue was detected

You can search for a particular client host name or MAC address by entering a full or partial text string. You can also use the **Filter Toggle** on the left side of the screen to filter the lists by device and location.

Issue cards below the **Unique Clients experiencing issues** header provide a high-level view of the type and number of issues wireless clients are experiencing during the period defined in the timeline. At a glance, you can see how many issues clients are having in the areas of **Association**, **Authentication**, and **Networking**.

Related Topics

Search for Clients on page 408

About the Issue List Table on page 409

Troubleshoot an Issue on page 409

Take Action for a Client Issue on page 410

Download Issue Lists on page 410

Set the Time Frame for Captured Data Displays and Reports on page 421

Search for Clients

Open a **Client Monitor** window.

You can search for clients by entering a client host name or MAC address in the search field at the top of the **Issue List**.

1. Enter a client host name or MAC address.

2. Select the name or address from the drop-down list.
3. Select the Search icon.

About the Issue List Table

The **Issue List** table lists issues clients experienced or are still experiencing, along with details that help identify the issue location. From this list, you can select issues for troubleshooting. The **Issue List** table consists of the following columns:

- **Status**: One of three icons display:
  - A red exclamation point - indicates an active issue
  - A green check mark - indicates an issue an admin manually marked as resolved
  - A maroon Up escalator icon - indicates an admin manually escalated the issue
- **Client Host Name:** The client-assigned host name. If the host name is not available, nothing displays.
- **Client MAC**: The MAC address of the wireless client.
- **Issue Type:** An issue classification. It can be Association, Authentication, Networking (DHCP or DNS server), or Unknown. Additional sub-categories are available when you select **Association**, **Authentication**, and **Networking** from the drop-down list. The Summary column displays the specific sub-category issue type for each client issue detected.
- **Summary**: The sub-category for each client issue detected.
- **User Profile:** The user profile applied to the client. If no user profile is applied, nothing displays.
- **Extreme Networks Device**: The Extreme Networks access point's host name associated with the client.
- **Location**: The device location on a topology map.
- **Detected On**: The month, day, and time-of-day the access point detected the issue.

Note
To display issues that involve a real-time troubleshooting session initiated by an admin, select **Show User Sessions**. Troubleshooting sessions are indicated by **USER** next to the **Status Icon**.

Troubleshoot an Issue

Go to **Manage** > **Client Monitor & Diagnosis**.

Use this task to troubleshoot issues listed under the **Client Monitor** tab.

1. Select an issue and **Troubleshoot Selected**.
2. Enter the following information:
   - **Selected Client**: Contains your selected client name.
   - **Troubleshooting Duration**: Select a troubleshooting length of time.
   - **Access Points**: Select the APs to troubleshoot.

3. Filter the list to show APs by location, model, connection status.
    - **Location**: Troubleshoot APs by location.
    - **Model**: Filter APs by model using the drop-down, or choose **All**.
    - **Status**: Filter APs by their connection status or select **All**.
4. Select **Start**.

Take Action for a Client Issue

Open a **Client Monitor** window.

You can act on client issues by escalating them, resolving them, commenting on them, and notifying other administrators about them through email.

1. Select an issue and **Take Action**.
2. Complete the following fields:
    - **Action**: Change the issue status to **Resolved** or **Escalate**.

      > Note
      > After an issue is marked Resolved, you cannot take further action.

    - **Comments**: Add a message describing the issue. This might be a note for yourself or—if you send an email about this to other administrators—to one or more email recipients.
    - **Email**: Select the check box and enter one or more email addresses, separating multiple addresses with semicolons.
3. Select **Save**.

   The following actions occur:
    - The Active icon changes to Resolved or Escalated in the **Issue List Status** column.
    - If you entered email addresses, emails are sent to the designated recipients.

Download Issue Lists

Open a **Client Monitor** window by navigating to **Manage** > **Client Monitor & Diagnoses** > **Client Monitor**.

You can download the **Issue List**, filtering it first to focus on certain issue types. For example, you might download only unresolved issues for tracking purposes, escalated issues for a team meeting, or resolved issues to include in a report.

1. Select **Download**.
2. Save the file to a local directory.

About Diagnosis

This window provides detailed information about a selected issue or issues associated with a client host name (or MAC address), in the form of a timeline and card.

Timeline

A timeline displays issue detection in a graph. It is useful to see multiple occurrences of the same issue. Each occurrence is represented by a bubble and a flag with a number. Hover your mouse over a bubble to display the month, day, and time-of-day an issue occurred, as well as the issue type: **Association**, **Authentication**, **Networking** (DNS or DHCP server issues), or **Unknown**. The flag shows the number of occurrences of the issue at the time.

Card

Underneath the timeline, the **Diagnosis** card contains data that can help you understand the issue, such as when problems were detected, the location of the connected AP, a description of the issue, and a suggested remedy.

- **AH Device**: The host name of the Extreme Networks device.
- **User**: The name of the user, if known.
- **Location**: The location of the Extreme Networks device.
- **User Profile**: The user profiles assigned to this device.
- **Client MAC**: The MAC address of the wireless client device.
- **Case Number**: A case number for your use. (This number is not linked to Extreme Networks Support.) Select **Assign** to access a dialog box. Enter a case number, and then select **Submit**. The number you entered displays here.
- **Problem Type**: Indicates if the issue was auto-generated by the client or initiated by an admin while troubleshooting the issue.
- **Detected On**: The month, day, year, and time-of-day the issue was first detected.
- **Description**: A detailed description of the issue, such as `External RADIUS server could not accept the access request from the client` or `DHCP server did not respond to the client`.
- **Last Successful Connection**: The month, day, year, and time-of-day the wireless client last connected successfully to the Extreme Networks device.
- **Suggested Remedy**: A solution to the issue, such as `Check RADIUS server log files and verify the authenticating user's credentials` or `Ensure DHCP server is properly configured, reachable, and that it has enough leases available`.

Events Associated with an Issue

If there are events associated with an issue, the total number of events displays, followed by a timeline that highlights events, and an information card below the timeline that describes each event. Below the card is a table populated with a description of the associated events, such as when a configuration was pushed to a device. (If no events are associated with an issue, the table is empty.) This table provides the following information:

- **Show Phases**: Select **All**, **Association**, **Authentication**, or **IP Assignment** phases from this drop-down menu. Select **Show Probe Requests** to display all probe requests related to this incident.
- **Time Stamp**: The month, day, year, and time-of-day the event occurred.
- **Device Name**: The Extreme Networks device name. By default, the Extreme Networks device name is the host name. If the host name is not available, the device name is the IP address. If the IP address is not available, the device name is the MAC address.
- **Device BSSID**: The AP wireless access interface MAC address.
- **Event Type**: The classification of the event, such as **Auto provisioning**, **Connection Change**, or **Power Mode Change**.
- **Description**: A description of the event, such as `Station sent out DHCP REQUEST message`.

You can share information about issues with colleagues, escalate issues, or mark them as resolved by selecting **Take Action**. For more information, see Take Action for a Client Issue on page 410.

Email Notification on Change of Status

To send an email indicating the status of an issue has changed, see Perform a Change Status Email Notification on page 412.

Perform a Change Status Email Notification

Run **Diagnosis** under **Manage** > **Tools**.

Use this task to send an email notification when the status of an issue changes.

1. Select the check box next to one or more issues.
2. Select **Take Action**.
3. Fill in the fields as follows:
    - **Action**: The issue status.
    - **Comment**: Add an issue description.
    - **Email**: Select the check box next to this field and supply an email address to enable ExtremeCloud IQ to automatically send an email indicating the status change.

    After you mark an issue as resolved, the status icon changes from a red active issue icon to a green resolved check mark on the **Issue List** table. After you mark an issue as resolved, you cannot take further action.

    Note
    The email notification is for your internal company use. It does not notify Extreme Networks Technical Support.

Packet Capture

Packet Capture is a process by which data packets are intercepted and recorded. Packet Capture operations reveal network performance and integrity issues such as congestion, packet loss, and security threats. Packet Capture results are stored in PCAP files that can be analyzed to obtain information required to address the issues revealed during packet capture operations.

Note
ExtremeCloud IQ stores PCAP files for 14 days. To retain PCAP files longer than 14 days, either download them to local storage or upload them to CloudShark. Uploading files to CloudShark requires an existing account.

ExtremeCloud IQ supports basic Packet Capture and Enhanced Packet Capture capabilities, as follows:

- All APs running IQ Engine OS support basic Packet Capture capabilities, which include:
  - View which packet capture operations are still in progress, and stop a packet capture session, if desired.
  - View all packet captures belonging to the same packet capture session grouped together.
  - Download PCAP files to a desktop PC or laptop.
  - Download PCAP files for each interface involved in a packet capture session, as well as files for the entire session combined.
- AP models AP5010/AP5010U/ AP5020, AP4000/AP4000U, and AP3000/AP3000X hosting IQ Engine 10.6.4 or higher support basic Packet Capture capabilities as well as Enhanced Packet Capture capabilities, which include:
  - Set various filters to narrow the focus of the packet capture operation.
  - Capture wired and wireless packets simultaneously or independently.
  - If a client is specified, a user can:
    - Select all APs in the same location.
    - Select APs where the client has roamed over the previous 7 days.

Consider the following:

- Packet Capture is not supported on simulated devices.
- A device can participate in only one packet capture session at a time. However, multiple interfaces on the same device may participate in the same packet capture session.
- Each ExtremeCloud IQ license supports a maximum of 10 simultaneous packet capture sessions.
- When capturing data packets from a location, it is recommended that a MAC address filter be specified.
- If a client is specified only one MAC address filter can be used.
- After a packet capture starts, packet capture settings cannot be modified.

Related Topics

Manage Packet Capture Sessions on page 414

Add and Start a Packet Capture Session on page 416

Manage Packet Capture Sessions

Go to **Manage** > **Client Monitor & Diagnosis** > **Packet Capture**.

The **Packet Capture** tab includes:

- A list of Packet Capture sessions.
- Management tools that allow users to perform Packet Capture operations.

Packet Capture is a client monitoring feature where administrator, operator, and help desk roles have full-access. Monitor roles have read-only access to monitoring.

View Packet Capture Sessions

By default, the **Packet Capture** tab displays a list of **all** sessions in tabular form.

Table 67 describes the type of information displayed under each column and any actions that a user can employ.

Table 67: Packet Capture List Column Headings

Column Heading	Description
Status	Indicates the operational status of sessions: • In-progress - grey bead ⚪ • Successfully completed - green bead 🟢 • Partially completed - yellow bead 🟡 • Failed - red bead 🔴 **Note:** Hover over the red bead to view the failure reason description.
Session Name	Displays the name that ExtremeCloud IQ automatically assigns to the session when it starts. The name includes the session start time.
Host Name	Displays the Host Name of the AP targeted for Packet Capture operations.
Interface	Identifies the AP's interface(s) targeted for Packet Capture operations.
Location	Identifies the location of the AP (city, building address, floor number).
Start Time	Displays the time when the session started.

Table 67: Packet Capture List Column Headings (continued)

Column Heading	Description
End Time	Displays the time when the session ended.
Download	This field provides links to PCAP files generated for individual interfaces on an AP that is targeted in a Packet Capture session. The files are uploaded to ExtremeCloud IQ and, if **Upload to CloudShark** is enabled, the files are uploaded there too. Possible links in this field include the following: • If **Upload to CloudShark** is enabled, a link to the PCAP file on CloudShark displays. • If **Upload to CloudShark** is disabled, a link to the PCAP file stored in ExtremeCloud IQ displays. • If the user selects the check box associated with a Packet Capture session and then selects ⤓, the system displays a link to a tar file containing all the individual PCAP files generated for a session and uploaded to ExtremeCloud IQ. Links to PCAP files are also provided through the Read Only view of the Packet Capture session configuration. Select a Packet Capture session in the list, then select ✎ to access the links. **Note:** If the uploading of PCAP files from the AP to ExtremeCloud IQ fails, select ⇧ to retry the upload.

To narrow the list of sessions displayed:

- Search for specific sessions. Enter a Session Name, Host Name, or an Interface type in the **Search** field, then select refresh ↻.
- Delete sessions for which PCAP files have been downloaded and stored or uploaded to CloudShark. Select a session, then select 🗑. Only one session can be deleted at a time.

To view the settings for a Packet Capture session, select the session in the list, then select ✎.

Add and Stop a Packet Capture Session

Select + to add a **New Packet Capture** session.

Select ■ to stop a Packet Capture session that is in progress.

Related Topics

Packet Capture on page 413

Add and Start a Packet Capture Session on page 416

Add and Start a Packet Capture Session

Go to any of the following user interfaces:

- **Manage** > **Devices** <*select an IQ Engine AP*> **Utilities** > **Tools** > **Packet Capture**
- **Manage** > **Client Monitor & Diagnosis** > **Packet Capture**
- **ML Insights** > **Client 360** <*optionally, select an active client*> **Utility** > **Packet Capture**

> Note
> If a packet capture is initiated through **Client 360** and an active client is selected, when the **New Packet Capture** window opens, the client's MAC address is prefilled in the **Clients** field, and the client's associated AP is preselected. Add other APs to the packet capture, as required.

Use this procedure to configure Packet Capture parameters and start a Packet Capture session.

> Note
> After a session starts, package capture parameters cannot be modified.

1. Select + to add a new Packet Capture session.
2. Select one or more target APs from the list. Optionally, narrow the list of APs displayed in the list using the **Location** filter or **Search** field.
3. Configure the Packet Capture settings.
   - For AP5010/AP5010U/ AP5020, AP4000/AP4000U, and AP3000/AP3000X models, see Table 68 on page 416.
   - For all other IQ Engine APs, see Table 69 on page 420.

   > Note
   > If the target APs selected in step 2 include model types that support Enhanced Packet Capture and other model types that support basic Packet Capture, only the basic Packet Capture parameters are available for configuration.

Table 68: Enhanced Packet Capture Settings

Parameter	Description
Filter Settings	
Direction	Filters packet capture on the basis of the direction of packet flow. Options are: • **Both** — Capture packets transmitted and received by the AP. This is the default value. • **In** — Capture packets received by the AP. • **Out** — Capture packets transmitted by the AP.

Table 68: Enhanced Packet Capture Settings (continued)

Parameter	Description
Clients	Filters packet capture on the basis of packets received from and transmitted to clients associated with the selected AP. Options are: • **All** — Capture packets from all clients. This is the default value. • Enter the MAC address of a specific client. • Initiate packet capture through **ML Insights** > **Client 360** with an **Active** client selected, and the client's MAC address automatically appears in this field.
Where has the client recently roamed?	Provides the option to add to the Packet Capture session any APs involved in client roaming over the previous seven days. Select **Update Selected APs**. In the **Select APs from Client Trail** pop-up window, select one or more APs, then select **OK**.
VLANs	Filters packet capture on the basis of packet transmission over specific VLANs. Enter an individual VLAN ID or a range of VLAN IDs. Indicate a range with a hyphen. Separate VLAN entries with commas. Example: 2,4,5-10.
Protocol	Filters packet capture on the basis of protocol. Choose from the following options: • Any (default) • User defined Enter a value in the range of 0-255 representing the IP Protocol number in the *Protocol* field of an IPv4 header or the *Next Header* field of an IPv6 header. See https://en.wikipedia.org/wiki/List_of_IP_protocol_numbers for more information. • ICMP • ICMPv6 • TCP • UDP • GRE • IPSec ESP • IPSec AH
Wireless	

Table 68: Enhanced Packet Capture Settings (continued)

Parameter	Description
Band	Filters packet capture on the basis of radio band. Select **Band**, then use the drop-down list to choose from of the following options: • All • 2.4 GHz • 5 GHz • 6 GHz Note: ExtremeCloud IQ automatically discovers the radio interface(s) on the target AP that support the selected radio band(s). If there is no radio on the AP to support the configured band, the packet capture session fails.
Interface	Filters packet capture on the basis of radio interface. Select **Interface**, then use the drop-down list to choose from of the following options: • All (default) • Radio 1 • Radio 2 • Radio 3 Note: The Radio 3 option is not available for AP3000/AP3000X models. If target APs include AP3000/AP3000X and model types that do support the Radio 3 option, then the Radio 3 option is available. However, the capture result for the AP3000/AP3000X models' Wi-Fi 2 interface fails.
WLANs	Filters packet capture on the basis of the traffic over WLAN(s). Use the drop-down list to choose from of the following options: • Select **Any** to capture packets transmitted over any WLAN. • Select a pre-configured **Broadcast Name** associated with a Wireless Network SSID to capture packets from the specified WLAN.
Filters	Filters packet capture on the basis of network traffic functions. Select one or more of the following options: • Management • Control • Data • EAPOL • Beacons • Probes
Wired	

Table 68: Enhanced Packet Capture Settings (continued)

Parameter	Description
Interface	Filters packet capture on the basis of Ethernet port. Use the drop-down list to choose either: • eth0 (default) • eth1 • All — At least one wired interface on each target AP must be enabled. Note: If a target AP has a disabled Ethernet port that is specified here, the packet capture for the interface fails.
Filters	Filters packet capture on the basis of protocol. Select one or more of the following options: • DHCP • Radius • LLDP • ARP • mDNS
Capture Settings	
Duration	Indicates the period of time after **Start Capture** is selected during which packets are captured. This option is enabled by default. Options are: • Enter a value in the range of 5-604800 seconds. The default value is 30 seconds. The capture operation continues until the specified duration has elapsed or until the maximum allowable size of captured packet data files for the platform is reached. • Deselect **Duration** to capture packets for an unspecified period of time. The capture operation continues until the maximum allowable size of captured packet data files for the platform is reached.
Upload to CloudShark	Indicates whether tar files containing PCAP files from packet capture operations on individual interfaces are uploaded to CloudShark. This option is enabled by default. Note: Uploading files to CloudShark requires an existing account.
CloudShark API Token	Specifies the API access token. Enter a value consisting of 32 hex characters (0-9, a-f).

Table 69: Basic Packet Capture Settings

Parameter	Description
Wireless	
Interface	Filters packet capture on the basis of radio interface. • All (default) • Radio 1 • Radio 2 • Radio 3 **Note:** Radio 3 is not available for AP3000/AP3000X models.
Capture Settings	
Duration	Indicates the period of time after **Start Capture** is selected during which packets are captured. This option is enabled by default. Options are: • Enter a value in the range of 5-604800 seconds. The default value is 30 seconds. The capture operation continues until the specified duration has elapsed or until a maximum of 100000 packets are captured. • Deselect **Duration** to capture packets for an unspecified period of time. The capture operation continues until a maximum of 100000 packets are captured.
Upload to CloudShark	Indicates whether tar files containing PCAP files from packet capture operations on individual interfaces are uploaded to CloudShark. This option is enabled by default. **Note:** Uploading files to CloudShark requires an existing account.
CloudShark API Token	Specifies the API access token. Enter a value consisting of 32 hex characters (0-9, a-f).

4. Select **Start Capture**.
5. After the configured packet capture session **Duration** has elapsed, select ⟳ to refresh the capture session list and view the results of the latest session.

Related Topics

Packet Capture on page 413

Manage Packet Capture Sessions on page 414

About Client 360 on page 428

VPN Management

The **VPN Management** window displays VPN management data for your network. VPNs are identified by branch ID, location, the router or WAN, the VPN gateway, status, availability, and usage data, and keys. You can revoke or refresh VPN keys here.

1. Select a VPN from the list.

2. Select an option from the **Manage Keys** drop-down list.

Set the Time Frame for Captured Data Displays and Reports

Navigate to any of the following ExtremeCloud IQ pages:

- **Manage** > **Summary**
- **Manage** > **Devices** >
    - **<switch> Hostname** > **Monitoring** > **Monitor** >
        - **Overview**
        - **Clients**
        - **Diagnostics**
        - **Alarms** > **Timeline View**
    - **<access point> Hostname** > **Monitoring** > **Monitor** >
        - **Overview**
        - **Wireless Interfaces**
        - **Wired Interfaces**
        - **Clients**
        - **Alarms** > **Timeline View**
- **Manage** > **Users** > **Historical**
- **Manage** > **Reports** > **Network Summary** or **Client Tracking**
- **Manage** > **Security**
- **Manage** > **Client Monitor & Diagnosis** > **Client Monitor**
- **ML Insights** > **Network 360 Monitor** or **Client 360** > **Inactive**

By default, ExtremeCloud IQ presents data captured for a 24-hour time frame, with hourly updates. In most cases, a graph with a colored timeline displays the captured data. The color key for timelines and the type of data captured on a timeline appears above the right-hand side of the time frame. In some cases, ExtremeCloud IQ presents data in other formats, such as reports or other types of graphical representations.

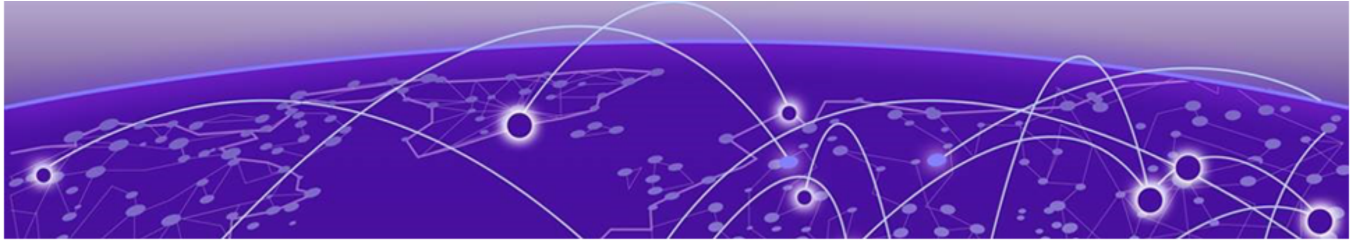
Use this procedure to set the time frame for reports containing captured data for various network operations and events.

1. From the **Time Range** drop-down menu, choose one of the following options:
    - Select **Day** to see the captured data in on an hourly basis. Select an interval of either 1, 2, 4, 8, or 24 hours to narrow the data capture time frame.
    - Select **Week** to see the captured data on a daily basis. Select an interval of either 1, 2, or 7 days to narrow the data capture time frame.
    - Select **Month** to see the data on a weekly or monthly basis. Select an interval of either 7, 14, or 30 days to narrow the data capture time frame.
    - Select **Custom** to open the **Calendar** and set a start date and time, then an end date and time, not exceeding a 30-day time period. Select **OK**.

2. Narrow the time frame using one of the following methods. The specific method available depends on the UI.
    - Select a point inside the graph and drag left or right to define a time frame. The adjusted time frame appears in grey in the graph.
    - Customize the time frame by dragging the left or right slider. Move the time frame as a block to a different part of the timeline by selecting a point within the shaded block.
3. To customize the view for graphs that display data on a timeline, do the following:
    - Select the timeline to view data for a 30 minute period along the timeline. The adjusted time frame appears grey in the graph.
    - Select a point on the timeline to view data captured at a precise time.
4. To reset a narrowed time frame, select either **Clear Selection** (where available), one of the interval controls, or an option from the **Time Range** drop-down menu.
5. Select the **Chart context menu** ≡ to download the graph in your preferred format.

Related Topics

Summary on page 304
Device Details Monitor Functions on page 352
Create a Network Summary Report on page 398
Generate a Client Tracking Report on page 400
View Connected Users on page 377
Manage Active Alarms on page 375
Rogue APs on page 405
Rogue Clients on page 407
About Client Monitor on page 408
About Diagnosis on page 410
Network 360 Monitor Overview on page 423
About Client 360 on page 428



ML Insights

Use machine learning (ML) to monitor network health, clients, devices, wireless, and services, as follows:

- **Network 360 Monitor**: View detailed network health information.
- **Network Scorecard**: View at-a-glance network health information.
- **Client 360**: View and sort client objects, including IoT clients, plus historical and real-time client data.
- **Thread Monitoring**: View detailed thread network information.

Network 360 Monitor Overview

The first time you open this window you are directed to create a network hierarchy. You can either import an existing hierarchy or create a new one from the **Manage** > **Planning** window. (See Planning on page 312). After you have created and populated your network, select a location, building, or floor from the list to the left of the map to see data. To see health data for your entire network, select **Global View**. Use the following tools to navigate the window.

- **Where's My Data?**: Because data is collected on an hourly basis, this window might be empty for up to one hour.
- **Search Maps**: For large networks with multiple locations, enter the first few characters of the location name in the type-ahead field to automatically bring up matching items. As you enter more characters, the search results become more precise.
- **Filter**: Use to manage the data that is displayed. When a filter is applied, the filter icon contains a circle in the lower right corner.

Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421
Status Cards on page 424
Device View on page 425
Zone View on page 426

Import a Map on page 316
Add a Site on page 315
Add a Building on page 316
Topology Tab on page 426
Map Tab on page 427
Network Scorecard on page 428
About Client 360 on page 428

Status Cards

Status cards across the top of the window display information about your network health. When you select a network location, the status card data automatically changes to match your selection. Network health is determined by several factors, including availability, number of reboots, average CPU and memory usage, and average power consumption, indicated by color. Green indicates excellent network health, with scores between 80 and 100. Yellow indicates good network health, with scores between 50 and 79. Red indicates poor network health, with scores between 0-50.

Select anywhere inside a status card to see additional details. From inside the detail panels, you can navigate directly to another status card, refresh data, customize the time frame of the captured data display, print the details on the timeline within the specified time frame, or download the data as a .png, .svg, .jpg, or PDF file. Many of the following data widgets are interactive and let you drill deeper for additional information:

- **Device Health**: The Devices Health timeline displays information about usage, clients, and health. Device widgets display device health, current availability, hardware health, active alarms, top device uptime, configuration and firmware status, channel change events, DFS events, reboots and more. Many sections of the widgets are interactive. For example, if there is a carat icon at the bottom of a widget, you can expand it for more information.
- **Client Health**: Displays overall and wireless health scores, bandwidth usage, issues, channel distribution, supported spatial streams, maximum client capability in the 2.4, 5 and 6 GHz bands, association and probe requests, 802.1x technology, transmit power, and more.

  The **Overall Score** is calculated by dividing the sum of the **Client WiFi Experience**, **Client IP Network Experience**, and **Client Application Experience** health scores by three (Σ(overallWifiHealthScore + overallNetworkHealthScore + overallApplicationHealthScore) / 3).
- **WiFi Health**: Displays usage, clients, and the overall Wi-Fi score over time. Widgets display wireless health details, association per radio score, channel utilization, the SNR score, data rates, and retries, and more.
- **Network Health**: Displays network health and usage. Widgets display the overall network health score, WAN, VPN, and gateway Internet availability and latency, multicast and unicast detection, Ethernet interface modes, and more.
- **Services Health**: Displays DHCP, DNS, and RADIUS activity. Widgets display the overall health score, network and authentication services scores, DHCP DNS and

NTP availability, authentication, management, and network service availability, and more.

- **Application Health**: Displays the top applications active in your wireless network. Three applications are shown by default, but you can add an application by typing the first few letters in the type-ahead search field, and then selecting the full name when it displays. To delete an application, select the **X** in the check box next to the application name. Charts and widgets display total usage, top 5 applications, and a table showing the top 20 or top 100 active application groups. You can change the number of applications displayed per window on the lower left, and scroll through the windows on the lower right.
- **Security Health**: Displays network activity involving rogue clients, rogue APs, and traffic violations. Charts and widgets display a security overview, detected Layer 2 DOS (Denial of Service) attempts, rogue APs, and traffic violations.

Note
To see Layer 2 DOS information, you must enable this feature in **SSID Additional Settings Optional Settings**. See Customize Wireless Network Optional Settings on page 111.

Related Topics

Network 360 Monitor Overview on page 423

Device View on page 425

Zone View on page 426

Import a Map on page 316

Add a Site on page 315

Add a Building on page 316

Topology Tab on page 426

Map Tab on page 427

Device View

The **Network 360 Monitor Device** view displays your network hierarchy, shown in outline form in the left navigation bar, with maps that correspond to each network location. The following viewing options are available:

- **Show Devices**: View all network devices on a floor, or select a specific device from the drop-down list.
- **Time Lapse**: Create a graphical representation of heat map changes due to client activity over a period of time. Select devices, a time period, and a speed from the drop-down lists. The **Connected Clients** option displays a heat bloom for APs where clients are connected, along with the number of connected clients.

Related Topics

Network 360 Monitor Overview on page 423

Status Cards on page 424

Zone View on page 426

Import a Map on page 316

Add a Site on page 315

Add a Building on page 316
Map Tab on page 427
Topology Tab on page 426

Zone View

The **Network 360 Monitor Zone** view displays your network hierarchy in outline form in the left navigation bar, with your network zones shown on the map. The following viewing options are available:

- **Show Devices**: View all zones or select a zone from the drop-down to see how many clients are connected to the AP that controls that zone.
- **Time Lapse**: Create a display of heat map changes due to client activity over a period of time. Select devices, a time period, and a speed from the drop-down lists. The **Connected Clients** option displays a heat bloom for APs where clients are connected, along with the number of connected clients.

Related Topics

Network 360 Monitor Overview on page 423
Status Cards on page 424
Device View on page 425
Import a Map on page 316
Add a Site on page 315
Add a Building on page 316
Map Tab on page 427
Topology Tab on page 426

Topology Tab

The **Topology** tab shows the devices in a given floor-level location, and how they are interconnected. Right-clicking on a Switch Engine device displays a list of VLANs that are currently configured on the device.

Ports configured as an LAG are displayed as a bold green line. Right-clicking an LAG link, displays the ports which are members of the LAG within the **Port Info** view. If multiple ports are connected to a Switch Engine device which are not formed as an LAG, all ports are displayed within the **Port Info** view.

The following details are displayed within each **Port Info** view:

- Port Name
- Type
- Link Aggregation
- LAG Logical Port
- Link Aggregation Status
- Default Port Mode: Access
- Port Status: Connected
- Transmission Mode

- Access VLAN
- Tagged VLAN(s)
- MAC Locking
- LLDP Neighbor
- Traffic Received
- Traffic Sent
- Port Errors
- STP Port State
- Power Used
- Port Speed

Related Topics

Network 360 Monitor Overview on page 423
Status Cards on page 424
Device View on page 425
Zone View on page 426
Import a Map on page 316
Add a Site on page 315
Add a Building on page 316
Map Tab on page 427

Map Tab

The **Map** tab displays the corresponding map for the selected floor. The floor map displays the floor perimeter and information about the types of walls and obstructions that appear on the floor. Select **+** to zoom in, and **-** to zoom out. Use the arrows to move the map within the window.

Related Topics

Network 360 Monitor Overview on page 423
Status Cards on page 424
Device View on page 425
Zone View on page 426
Import a Map on page 316
Add a Site on page 315
Add a Building on page 316
Topology Tab on page 426

Network Scorecard

The **Network Scorecard** window displays current network health scores by selected location (if you use the locations filter), a 30-day average score for the selected location, and an overall current score for all locations.

Note

Because ExtremeCloud IQ collects data in one-hour segments, when you onboard new devices, or clients first connect to your network, you will not see current score data for the first hour.

Use the filter section to manage the data displayed. When a filter is applied, the filter icon contains a circle in the lower right corner. The scorecards are described below. Scores display for a selected location if you use the locations filter.

- **Device Health**: Displays current and 30-day average scores for device availability, hardware health, and configuration and firmware.
- **Client Health**: Displays current and 30-day average scores for wireless, network, and application health.
- **WiFi Health**: Displays the current and 30-day average scores for SNR, channel utilization, and association-per-radio score.
- **Network Health**: Displays current and 30-day average scores for Internet availability, Internet performance and network usage.
- **Services Health**: Displays current and 30-day average scores for network, authentication, and management services.

About Client 360

The **Insights Client 360** view shows real time and historical data for active and inactive clients connected to your network.

Use the **Filter** section to manage the data. When a filter is applied to the view, the filter icon shows a small white dot. You can save filters for reuse.

Many of the columns in the table are interactive. Hover over icons or text to see more details.

Choose from the following actions:

- Select ⤒ to configure an alias in bulk through .csv.

  The .csv file must contain the client MAC address and the alias value. To remove an alias using the .csv file, include the client MAC address and an empty string for the alias value.
- Select ⟳ to refresh table data.
- Select ⤓ to download data in multiple formats.
- Select ✎ to assign a Client Alias to one or more active clients.

- Select **Utility** > **Packet Capture** to Add and Start a Packet Capture for the selected active client and its associated AP. It is not necessary to select an active client to initiate a Packet Capture session.
- Select ▥ to customize the table columns displayed.

For active clients (the Active tab), when you select a client from the table, a session details section appears. The data that is displayed varies depending on the type of device you have selected.

For inactive clients (the Inactive tab), a timeline enables you to change the time range for which captured client data is displayed.

By default, the window displays 10 clients. Change the number of clients displayed at the bottom left corner of the table. Use the client list to display and select multiple entries at a time, which is useful for large-batch operations.

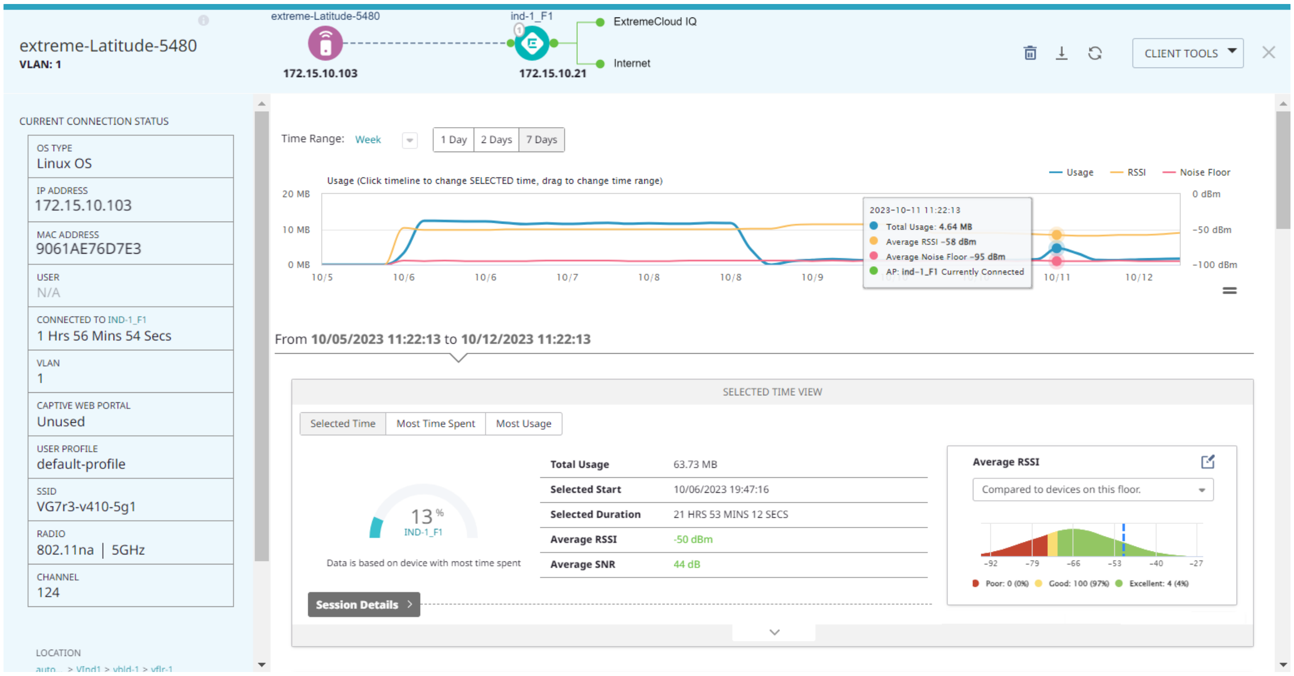
Related Topics

Set the Time Frame for Captured Data Displays and Reports on page 421

Packet Capture on page 413

Connection Details Panel (Wireless)

The connection details panel lists details about the current or last connection in a column to the left of the interactive widgets and tables.



extreme-Latitude-5480
VLAN: 1

CURRENT CONNECTION STATUS

OS TYPE
Linux OS

IP ADDRESS
172.15.10.103

MAC ADDRESS
9061AE76D7E3

USER
N/A

CONNECTED TO IND-1_F1
1 Hrs 56 Mins 54 Secs

VLAN
1

CAPTIVE WEB PORTAL
Unused

USER PROFILE
default-profile

SSID
VG7r3-v410-5g1

RADIO
802.11na | 5GHz

CHANNEL
124

LOCATION
auto... > VInd1 > vbld-1 > vflr-1

Time Range: Week

From **10/05/2023 11:22:13** to **10/12/2023 11:22:13**

2023-10-11 11:22:13
Total Usage: 4.64 MB
Average RSSI -58 dBm
Average Noise Floor -95 dBm
AP: ind-1_F1 Currently Connected

SELECTED TIME VIEW

Total Usage	63.73 MB
Selected Start	10/06/2023 19:47:16
Selected Duration	21 HRS 53 MINS 12 SECS
Average RSSI	-50 dBm
Average SNR	44 dB

13 %
IND-1_F1
Data is based on device with most time spent

Average RSSI
Compared to devices on this floor.
Poor: 0 (0%) Good: 100 (97%) Excellent: 4 (4%)

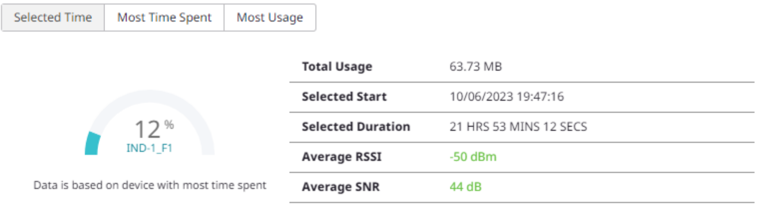
Figure 12: Connection Details Panel

The initial graph displays information about data usage, RSSI, and the noise floor. Use the **Time Range** menu to change the time period. Select from the following options:

- Day (1 Hour, 2 Hours, 4 Hours, 8 Hours, or 24 hours)
- Week (1 Day, 2 Days, 7 Days)
- Month (7 Days, 14 Days, 30 Days, or 90 Days)
- Custom (Use the Calendar controls to select the date range.)

Select one of the tabs to display relevant information:

- Selected Time
- Most Time Spent
- Most Usage



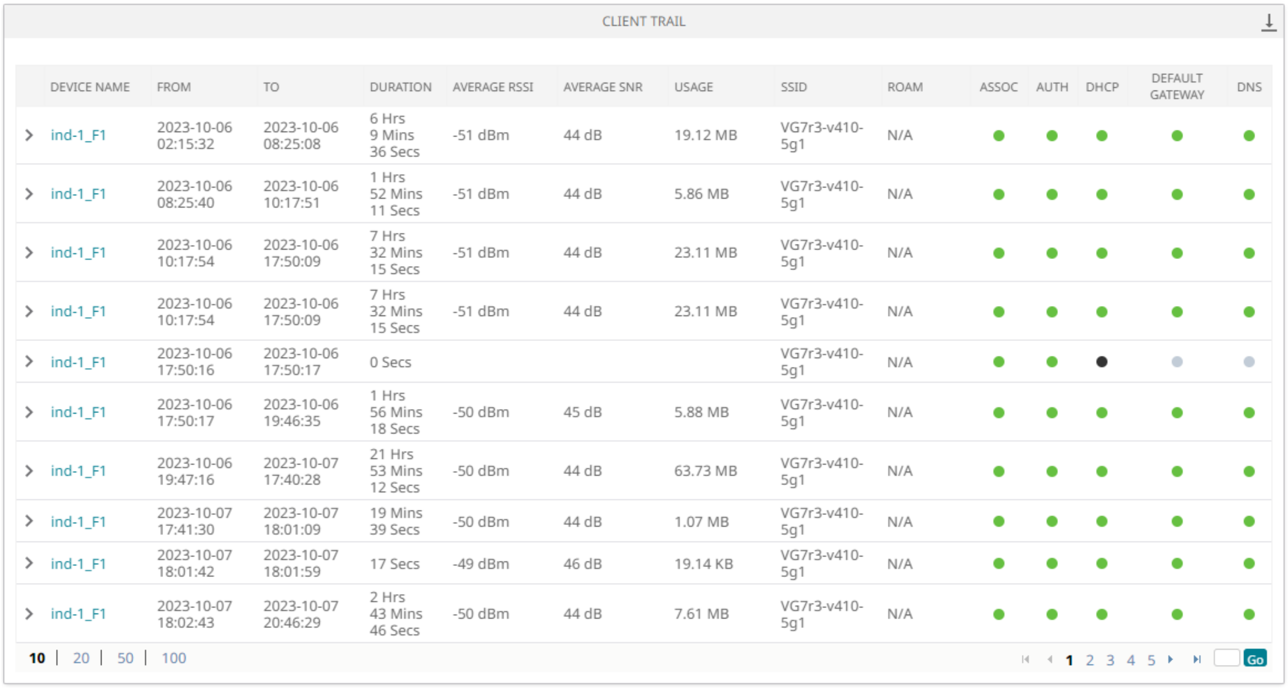
Data is based on device with most time spent

Total Usage	63.73 MB
Selected Start	10/06/2023 19:47:16
Selected Duration	21 HRS 53 MINS 12 SECS
Average RSSI	-50 dBm
Average SNR	44 dB

Figure 13: Selected Time

To expand the **SELECTED TIME VIEW** section, select **Session Details >**. For more information, see Session Details (Wireless) on page 434.

The **CLIENT TRAIL** table displays information about device connections. Display 10, 20, 50, or 100 results per page. Navigate pages by selecting the page number, or enter a page number and select **Go**. Color-coded connection status icons provide at-a-glance status information. Mouse over the icons for descriptions.



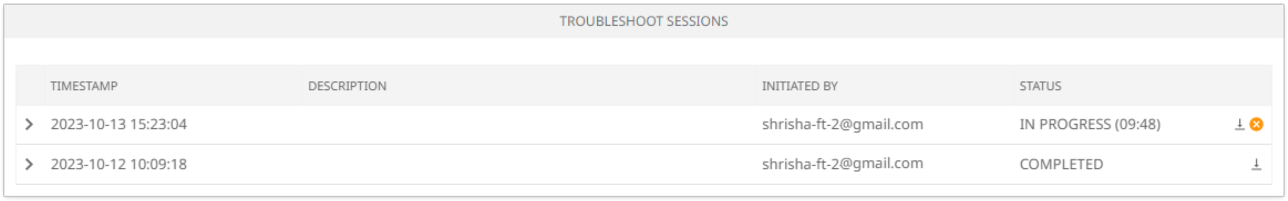
CLIENT TRAIL

	DEVICE NAME	FROM	TO	DURATION	AVERAGE RSSI	AVERAGE SNR	USAGE	SSID	ROAM	ASSOC	AUTH	DHCP	DEFAULT GATEWAY	DNS
>	ind-1_F1	2023-10-06 02:15:32	2023-10-06 08:25:08	6 Hrs 9 Mins 36 Secs	-51 dBm	44 dB	19.12 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-06 08:25:40	2023-10-06 10:17:51	1 Hrs 52 Mins 11 Secs	-51 dBm	44 dB	5.86 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-06 10:17:54	2023-10-06 17:50:09	7 Hrs 32 Mins 15 Secs	-51 dBm	44 dB	23.11 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-06 10:17:54	2023-10-06 17:50:09	7 Hrs 32 Mins 15 Secs	-51 dBm	44 dB	23.11 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-06 17:50:16	2023-10-06 17:50:17	0 Secs				VG7r3-v410-5g1	N/A	●	●	●	○	○
>	ind-1_F1	2023-10-06 17:50:17	2023-10-06 19:46:35	1 Hrs 56 Mins 18 Secs	-50 dBm	45 dB	5.88 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-06 19:47:16	2023-10-07 17:40:28	21 Hrs 53 Mins 12 Secs	-50 dBm	44 dB	63.73 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-07 17:41:30	2023-10-07 18:01:09	19 Mins 39 Secs	-50 dBm	44 dB	1.07 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-07 18:01:42	2023-10-07 18:01:59	17 Secs	-49 dBm	46 dB	19.14 KB	VG7r3-v410-5g1	N/A	●	●	●	●	●
>	ind-1_F1	2023-10-07 18:02:43	2023-10-07 20:46:29	2 Hrs 43 Mins 46 Secs	-50 dBm	44 dB	7.61 MB	VG7r3-v410-5g1	N/A	●	●	●	●	●

Figure 14: Client Trail Table

To download the results as a CSV file, select ⤓. To see more detailed information, select a device in the **Device Name** column. See Device Details Panel (Wireless) on page 437.

The **TROUBLESHOOT SESSIONS** table displays in-progress and completed troubleshooting sessions.



TROUBLESHOOT SESSIONS

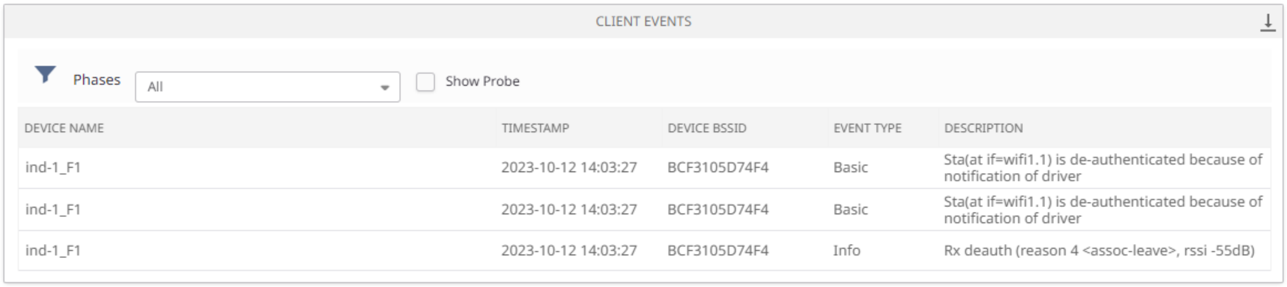
	TIMESTAMP	DESCRIPTION	INITIATED BY	STATUS	
>	2023-10-13 15:23:04		shrisha-ft-2@gmail.com	IN PROGRESS (09:48)	⤓ ⊗
>	2023-10-12 10:09:18		shrisha-ft-2@gmail.com	COMPLETED	⤓

Figure 15: Troubleshoot Sessions Table

To download the results for a session, select the corresponding ⤓ icon. For more information about troubleshooting sessions, see Client Tools (Wireless) on page 437.

The **CLIENT EVENTS** table displays client events. Filter the events according to phase:

- All
- Association
- Authentication
- IP Assignment



CLIENT EVENTS

Phases: All

□ Show Probe

DEVICE NAME	TIMESTAMP	DEVICE BSSID	EVENT TYPE	DESCRIPTION
ind-1_F1	2023-10-12 14:03:27	BCF3105D74F4	Basic	Sta(at if=wifi1.1) is de-authenticated because of notification of driver
ind-1_F1	2023-10-12 14:03:27	BCF3105D74F4	Basic	Sta(at if=wifi1.1) is de-authenticated because of notification of driver
ind-1_F1	2023-10-12 14:03:27	BCF3105D74F4	Info	Rx deauth (reason 4 <assoc-leave>, rssi -55dB)

Figure 16: Client Events Table

To download the results as a CSV file, select ⤓.

The **NETWORK USAGE** section displays usage information in an interactive graph and **Top 10 Apps** widget. Mouse over points on the graph for details. From the hamburger menu, choose from the following options:

- Print chart
- Download PNG
- Download JPEG
- Download PDF
- Download SVG vector image

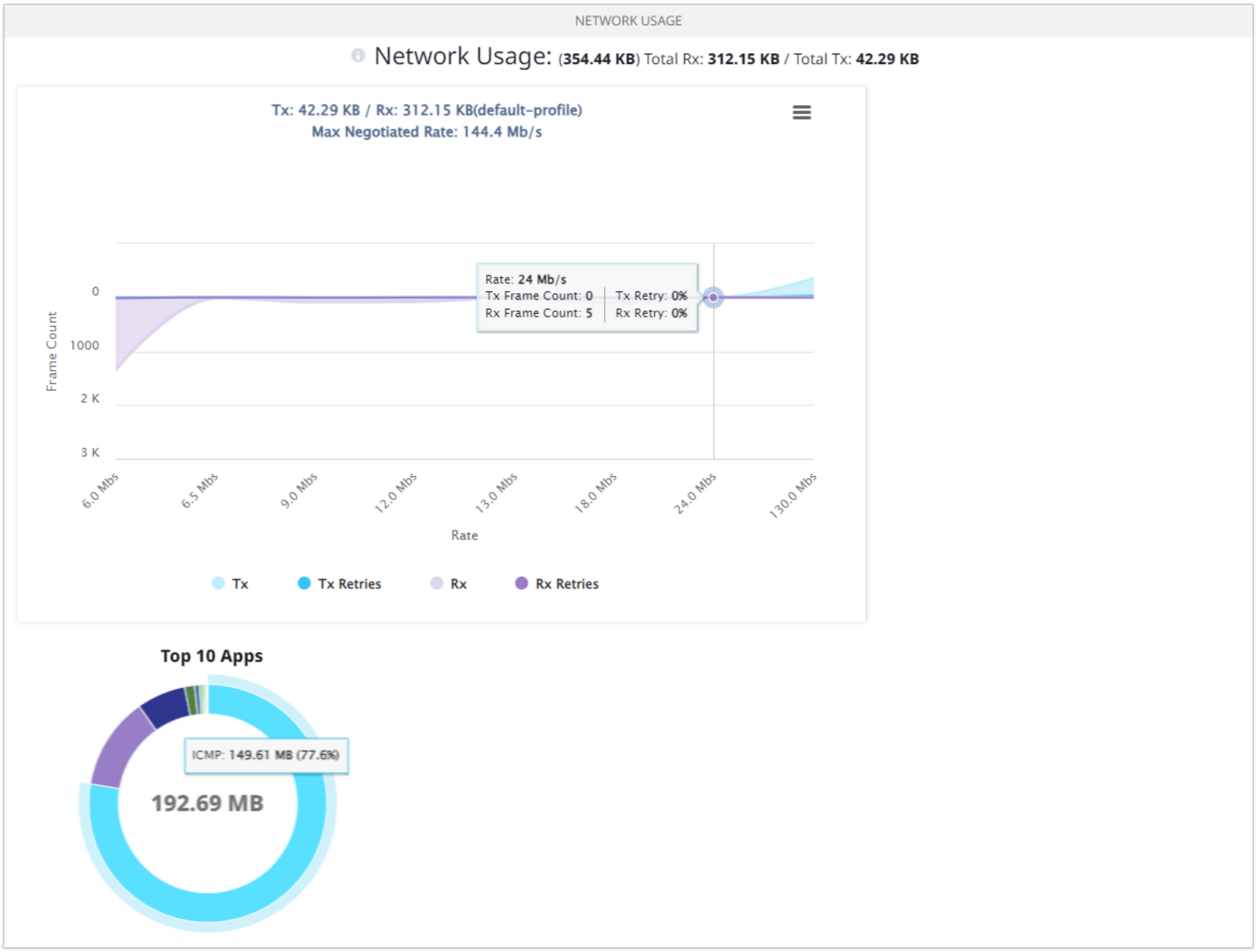
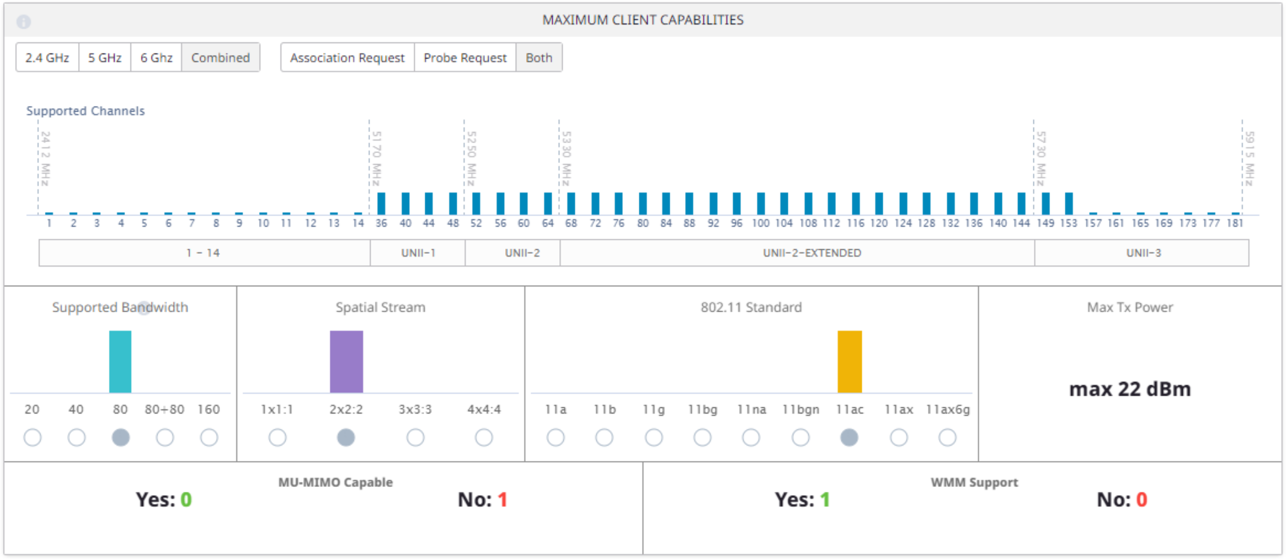


Figure 17: Network Usage Graph and Widget

Mouse over the **Top 10 Apps** widget to display information about app usage.

The **MAXIMUM CLIENT CAPABILITIES** widget displays the maximum client capabilities for all 2.4 and 5 GHz Wi-Fi clients connected to the AP during the selected period.



max 22 dBm

MU-MIMO Capable: Yes: 0 No: 1

WMM Support: Yes: 1 No: 0

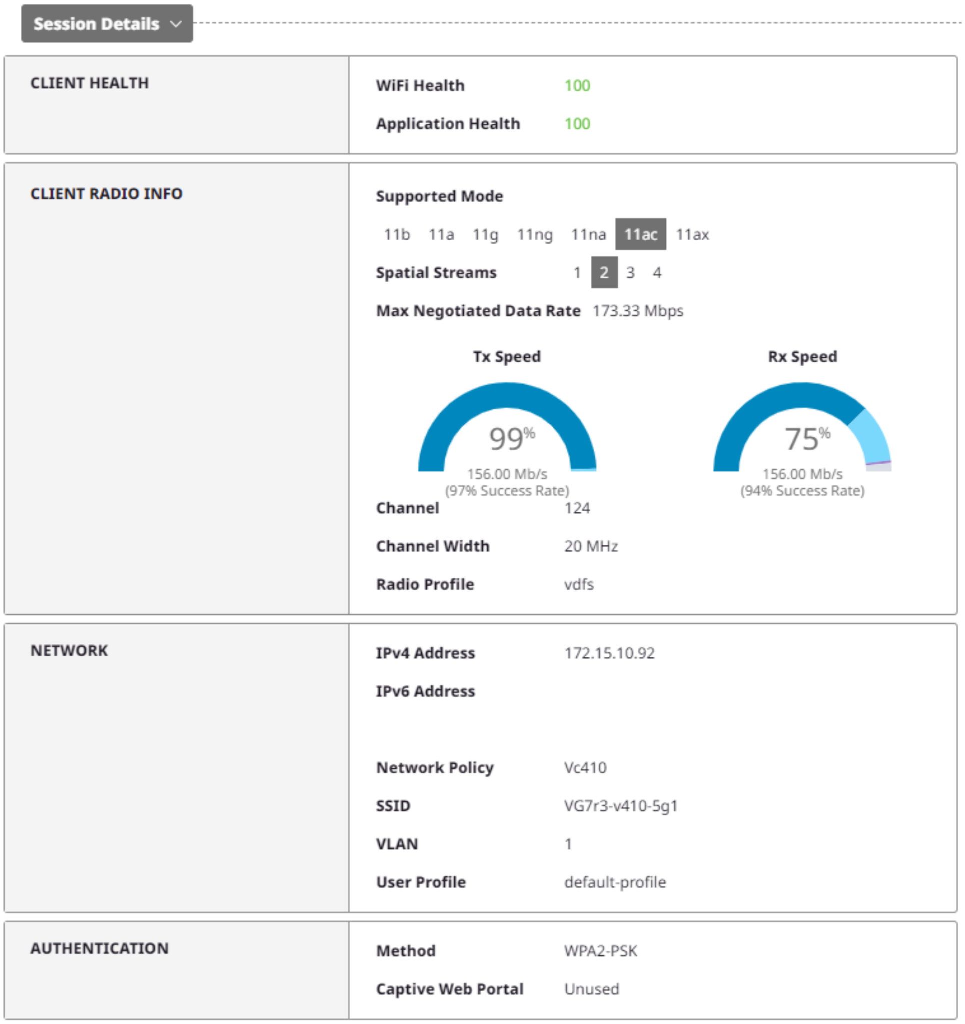
Figure 18: Maximum Client Capabilities Widget

Related Topics

Session Details (Wireless) on page 434
Device Details Panel (Wireless) on page 437
Client Tools (Wireless) on page 437
Connectivity Experiences Panel (Wireless) on page 453
Connectivity Experiences on page 450

Session Details (Wireless)

To expand the **SELECTED TIME VIEW** section, select **Session Details**.



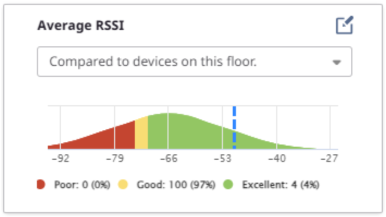
Session Details

CLIENT HEALTH	WiFi Health	100
	Application Health	100
CLIENT RADIO INFO	Supported Mode	11b 11a 11g 11ng 11na **11ac** 11ax
	Spatial Streams	1 **2** 3 4
	Max Negotiated Data Rate	173.33 Mbps
	Tx Speed	99% 156.00 Mb/s (97% Success Rate)
	Rx Speed	75% 156.00 Mb/s (94% Success Rate)
	Channel	124
	Channel Width	20 MHz
	Radio Profile	vdfs
NETWORK	IPv4 Address	172.15.10.92
	IPv6 Address	
	Network Policy	Vc410
	SSID	VG7r3-v410-5g1
	VLAN	1
	User Profile	default-profile
AUTHENTICATION	Method	WPA2-PSK
	Captive Web Portal	Unused

Figure 19: Session Details—Expanded

Mouse over the **Tx Speed** and **Rx Speed** graphs to see the percent for each category.

Interactive widgets appear to the left of the display. You can edit the thresholds and customize the view for the following widgets:



Average RSSI

Compared to devices on this floor.

Figure 20: Average RSSI

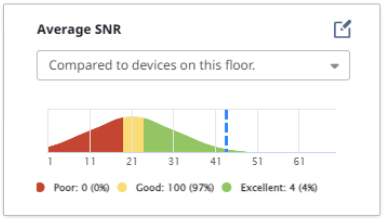


Figure 21: Average SNR

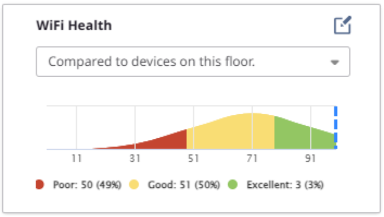
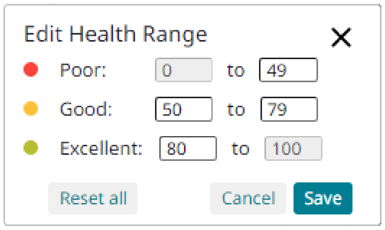


Figure 22: WiFi Health

Use the drop-down menu to choose one of the following display options:

- Compared to devices on this floor.
- Compared to the connect AP.

To edit the thresholds, select ✎.



Edit Health Range ✕

● Poor: 0 to 49

● Good: 50 to 79

● Excellent: 80 to 100

Figure 23: Edit Health Range

Mouse over a column in the **Supported Mode** widget to see the number of supported devices for that mode.

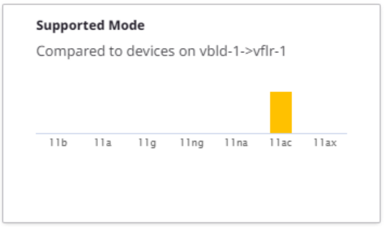


Figure 24: Supported Mode

Related Topics

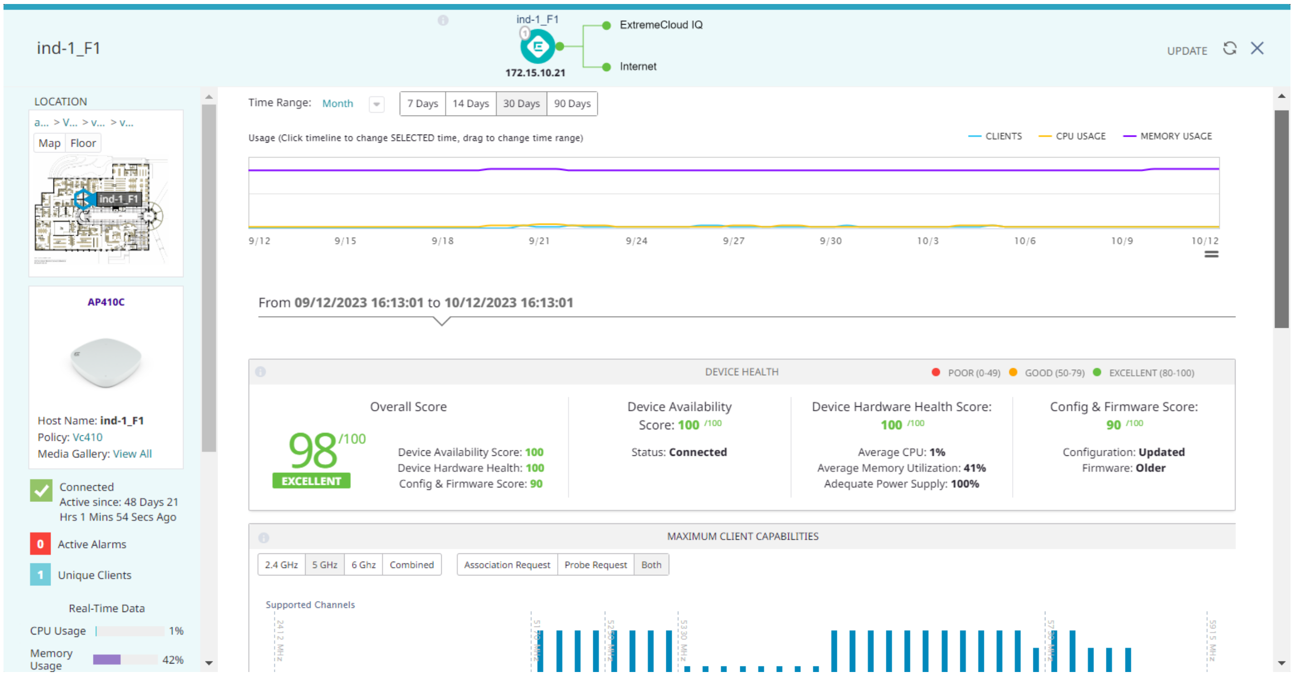
Connection Details Panel (Wireless) on page 429

Connectivity Experiences Panel (Wireless) on page 453

Connectivity Experiences on page 450

Device Details Panel (Wireless)

To open the details panel for a device, select the device link in the **Device Name** column of the **CLIENT TRAIL** table. Alternately, go to **Manage** > **Devices** and select a device.



Host Name: **ind-1_F1**
Policy: Vc410
Media Gallery: View All

Connected
Active since: 48 Days 21 Hrs 1 Mins 54 Secs Ago

0 Active Alarms

1 Unique Clients

Real-Time Data
CPU Usage 1%
Memory Usage 42%

Usage (Click timeline to change SELECTED time, drag to change time range)

From **09/12/2023 16:13:01** to **10/12/2023 16:13:01**

Overall Score
98/100
EXCELLENT
Device Availability Score: **100**
Device Hardware Health: **100**
Config & Firmware Score: **90**

Device Availability Score: **100** /100
Status: **Connected**

Device Hardware Health Score: **100** /100
Average CPU: **1%**
Average Memory Utilization: **41%**
Adequate Power Supply: **100%**

Config & Firmware Score: **90** /100
Configuration: **Updated**
Firmware: **Older**

Figure 25: Device Details Panel

The panel organizes information under tabs:

- **Monitor**
- **Configure**

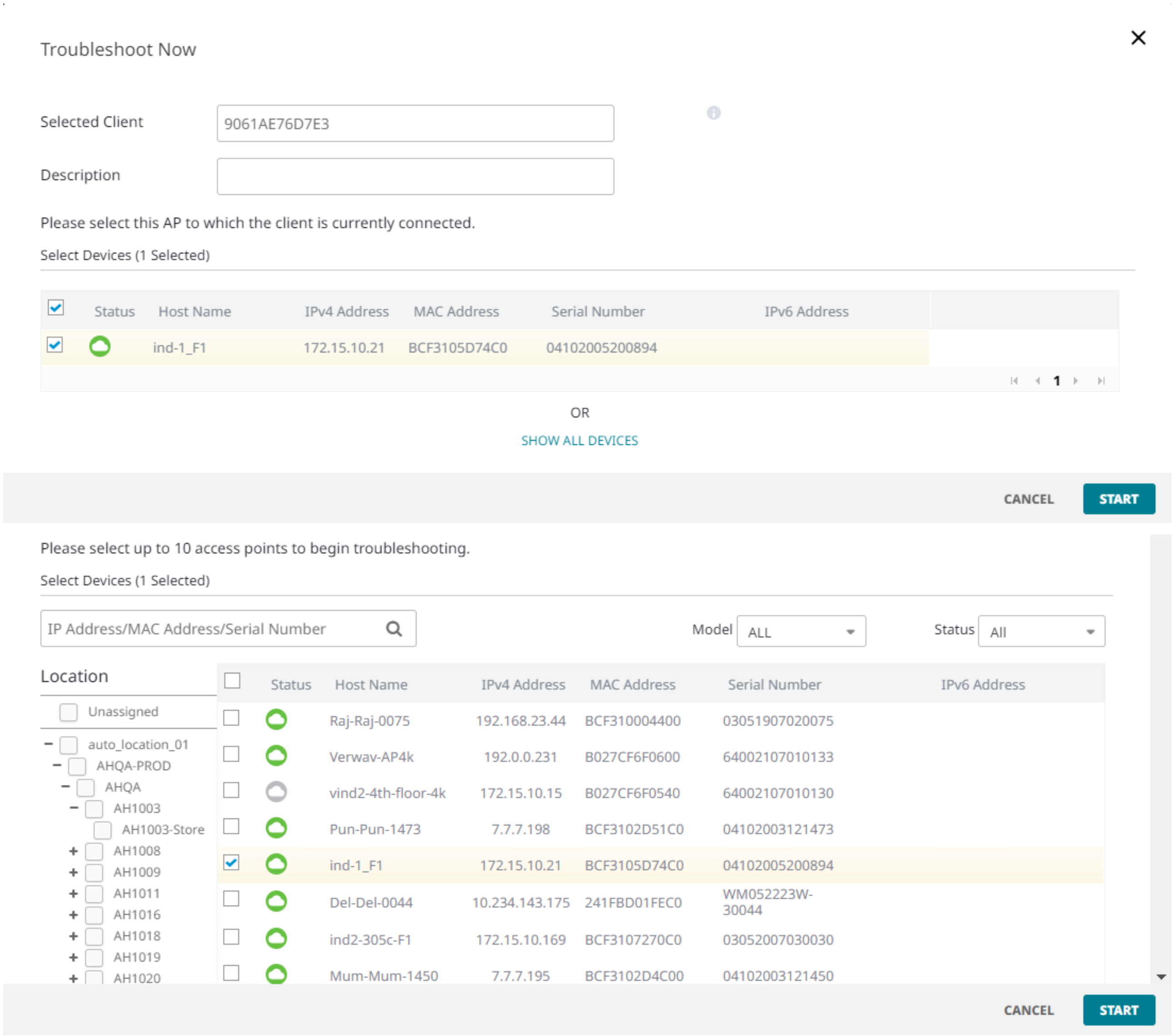
Related Topics

Device Details Overview on page 351
Device Details Monitor Functions on page 352
Device Details Configuration Tasks on page 356
Connection Details Panel (Wireless) on page 429
Connectivity Experiences Panel (Wireless) on page 453
Connectivity Experiences on page 450

Client Tools (Wireless)

To access the tools, select the **Client Tools** menu and select one of the tools:

- Troubleshoot Now
- VLAN Probe



Troubleshoot Now

Selected Client	9061AE76D7E3
Description	

Please select this AP to which the client is currently connected.

Select Devices (1 Selected)

☑	Status	Host Name	IPv4 Address	MAC Address	Serial Number	IPv6 Address
☑	●	ind-1_F1	172.15.10.21	BCF3105D74C0	04102005200894	

OR

SHOW ALL DEVICES

CANCEL START

Please select up to 10 access points to begin troubleshooting.

Select Devices (1 Selected)

IP Address/MAC Address/Serial Number

Model ALL

Status All

Location

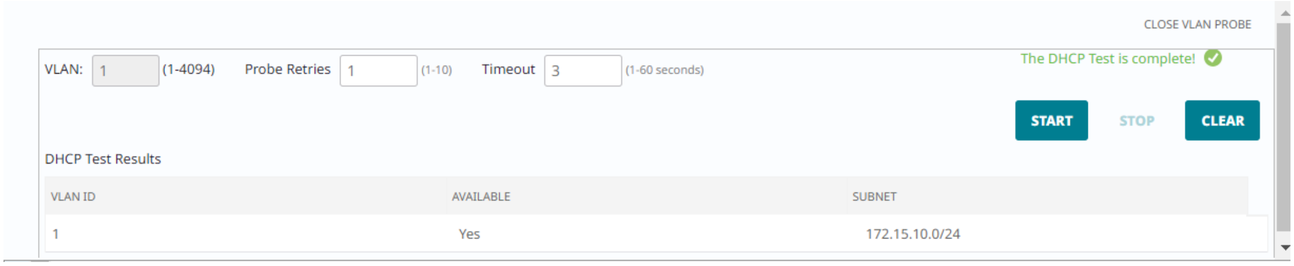
- □ Unassigned
- − □ auto_location_01
  - − □ AHQA-PROD
    - − □ AHQA
      - − □ AH1003
        - □ AH1003-Store
      - + □ AH1008
      - + □ AH1009
      - + □ AH1011
      - + □ AH1016
      - + □ AH1018
      - + □ AH1019
      - + □ AH1020

□	Status	Host Name	IPv4 Address	MAC Address	Serial Number	IPv6 Address
□	●	Raj-Raj-0075	192.168.23.44	BCF310004400	03051907020075	
□	●	Verwav-AP4k	192.0.0.231	B027CF6F0600	64002107010133	
□	○	vind2-4th-floor-4k	172.15.10.15	B027CF6F0540	64002107010130	
□	●	Pun-Pun-1473	7.7.7.198	BCF3102D51C0	04102003121473	
☑	●	ind-1_F1	172.15.10.21	BCF3105D74C0	04102005200894	
□	●	Del-Del-0044	10.234.143.175	241FBD01FEC0	WM052223W-30044	
□	●	ind2-305c-F1	172.15.10.169	BCF3107270C0	03052007030030	
□	●	Mum-Mum-1450	7.7.7.195	BCF3102D4C00	04102003121450	

CANCEL START

Figure 26: Troubleshoot Now Tool

Select the connected AP, or **SHOW ALL DEVICES** and select up to 10 APs, and then select **START**. The session appears in the **TROUBLESHOOT SESSIONS** table. See Connection Details Panel (Wireless) on page 429.



CLOSE VLAN PROBE

VLAN: 1 (1-4094) Probe Retries 1 (1-10) Timeout 3 (1-60 seconds)

The DHCP Test is complete! ✓

START STOP CLEAR

DHCP Test Results

VLAN ID	AVAILABLE	SUBNET
1	Yes	172.15.10.0/24

Figure 27: VLAN Probe

The VLAN Probe tool determines whether VLANs are operational on the wired network and reports the status, including the subnet of each VLAN. For more information about the tool, see the *ExtremeCloud IQ User Guide*.

Specify the VLAN or range, the number of **Probe Retries**, and the **Timeout**; then select **Start**.

Related Topics

Connection Details Panel (Wireless) on page 429
Connectivity Experiences on page 450
Connectivity Experiences Panel (Wireless) on page 453

Client Alias

Assign a client alias to one or more active clients to easily identify and find clients. After defining a client alias, you can search on the client alias to display all clients with that alias.

Configure Client Alias manually from the user interface, in bulk through .csv, or through the API.

ML Insights > Client 360

1. Go to **ML Insights** > **Client 360** and select one or more clients from the **Connected Clients List**.
2. Select ✏ to edit.

   The **Change Client Alias** dialog displays.

   - Enter a Client Alias for the selected clients and select **Save**.
   - To remove an alias from a client, select 🗑, then select **Save**.
3. Additionally, you can apply existing filters to restrict the number of clients displayed.

Device Details

View Client Alias from the **Device Details** page:

1. Go to **Manage** > **Devices**.
2. Select a device to display **Device Details**.
3. Select **Monitoring** > **Clients**.

The Client Alias column is shown in the list of clients.

Clients Monitor & Diagnosis

View Client Alias from a list of client issues. Go to **Manage** > **Client Monitor & Diagnosis**. You can search client issues by alias, in addition to hostname and MAC address.

Thread Monitoring

The **Thread Monitoring** view provides an administrator with real-time insight into the health and topology of their Thread networks which is crucial for diagnosing issues, optimizing performance, and understanding network behavior:

- Visualizing the topology of a Thread network provides a clear overview of the network's current state, including device connectivity, router roles, and mesh network dynamics.
- Viewing in real-time when a network segmentation has occurred (new elections).
- Interacting with the different roles to see what they are doing and how they are behaving.

As a Thread network uses a mesh network topology, it allows for multiple paths between devices, which enhances the network's resilience and flexibility to provide reliable and secure wireless communication for IoT end-devices.

- Thread networks are designed to be self-healing. Routers automatically adjust their routing tables and can change their roles (router, leader, or router eligible end-device) based on the network's needs.
- When a new router joins a Thread network the network automatically adjusts its topology to include it, potentially selecting it as a path for data transmission based on its location, signal strength, and the network's current topology.
- When a new client joins a Thread network, the client attempts to connect to the router with the strongest signal strength that has available capacity. Although the addition of thread clients might not change the network topology as significantly as the addition of thread routers, it still requires the network to adapt, ensuring all devices maintain reliable connectivity.

Due to failures or disruptions in connectivity, dynamic changes in the network topology can lead to network partitions - isolated segments of the network. By visualizing the topology of the Thread network, administrators can easily identify these network partitions, leading to quicker troubleshooting and less downtime, ensuring the network remains operational and dependable.

Go to **ML Insights** > **Thread Monitoring**.

Thread Network Details

Before you can select a Thread network, you must select the site to which it belongs. Select a **Site** and an available **Thread Network** from the drop-downs to view thread details in the Toplogy view.

Thread networks are defined by configuring the IoT interface of one or more APs with an IoT profile specifying a **Thread Gateway** configuration. Different APs configured with the same IoT profile belonging to different sites belong to different Thread networks, but have the same Thread network settings. For more information, see Thread Application on page 165.

Topology View

View the topology of the selected Thread network in the topology viewer. The "Legend" drop down describes the meaning of the different icons used in the topology diagram.

Select the **Legend** dropdown to view the different icons used in the topology diagram:

- ⬟ **Leader**: Manages the overall operation of the thread network. There is only one active Leader in a thread network at any given time.
- ⬟ **Router**: Forwards data packets within the network. However, if a Thread network becomes partitioned due to a communication breakdown between sections of the network, each isolated segment can independently elect a new Leader.
- ● **End Device**: Endpoints that interact with the network.

Select ☰ to collapse and expand the menu to enlarge or reduce the Topology viewer for visibility.

Select **+** to zoom in, and **-** to zoom out. Use the arrows to move the Thread network within the window. Alternatively, scroll the mouse wheel to zoom in and out. Select and drag the diagram to view nodes not displayed on the screen.

Select, or hover over, a router node in the topology viewer to see the following node-specific details appear:

- Host Name
- Serial Number
- EUI64
- RLOC16
- Role
- Services

Select an end-device node in the topology viewer to see the **End Device List** for the end devices connected to the parent router:

- MAC Address
- IPV6
- RLOC16

Inventory

To view device details for all the routers participating in the selected Thread network, go to **Inventory** > **Routers**.

To see a client view of all the end devices participating in the selected Thread network, go to **Inventory** > **End-Devices**.

Table 70: Thread Router Details

Parameter	Description
Status	Status icons indicate a router's connection status.
Host Name	The host name of the device.
Serial Number	Device serial number.
EUI64	A unique identifier assigned to a device in a Thread network.
Role	The role (Leader or Router) of the device in a thread.
Extended MAC	A unique identifier assigned to a device in a Thread network.
RLOC16	The RLOC16 reflects the hierarchical structure of the network. All devices in the Thread topology have an RLOC16 that is the combination of their router ID + child ID. Because a router is not a child, the child ID for a router is always 0. All child nodes with the same parent router have the same router ID.
IPV6 Link Local	The IPv6 address of the device.
Mode	The operational modes of the thread device: • **Rx On When Idle**: This flag indicates whether the device keeps its radio receiver (Rx) on when it is not actively transmitting (Idle). If this is set to true, the device is constantly listening for incoming messages, which is typical for powered devices such as routers. If it's false, the device powers down its radio when idle to save energy, which is a behavior often seen in battery-operated devices. • **Full Thread Device**: This flag specifies if the device is a Full Thread Device (FTD). An FTD is capable of performing all Thread protocol functions and can route traffic on behalf of other devices. The radio receiver is on when idle and maintains routing information for the network. If this is true, the device is an FTD; if false, it is a Minimal Thread Device (MTD), which does not route traffic and often operates at a lower power level. • **Full Network Data**: This flag indicates if the device stores a full copy of the network data. Full network data includes all the operational datasets of the Thread network. Devices with full network data have enough information to function as leaders within the Thread network, if necessary. If this is true, the device maintains a full set of the network data; if false, it only stores what is necessary for its operation as a reduced-function device.
Channel	The thread channel number.

Table 70: Thread Router Details (continued)

Parameter	Description
Border Router	The border router's connection status.
Backbone Border Router	The elected state (Primary or Secondary) of the backbone border router.

Table 71: Thread End-Devices Details

Parameter	Description
Status	Status icons indicate a router's connection status.
MAC Address	A unique identifier assigned to a device in a Thread network.
RLOC16	A unique identifier assigned to a device in a Thread network.
Extended MAC Address	A unique identifier assigned to a device in a Thread network.
IPV6 Mesh Local EID	The unique endpoint identifier assigned to a device in a Thread network.
Channel	The thread channel number.
Average RSSI	The average signal strength of the received radio signal.
Connection Time	The total time that the device has been online.

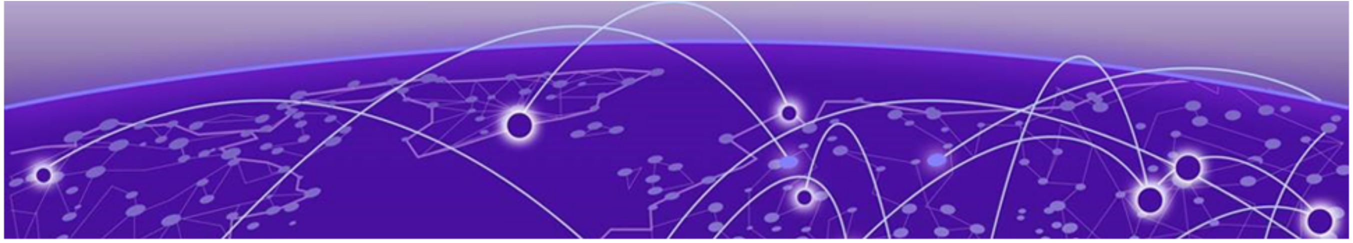
Node Details

Select a node from the Topology viewer for Network, Interface, and Services details. Select an option from the **Node Details** list to display details. The available details are determined by the type of node selected.

Related Topics

Configure IoT Profile Settings on page 167

Thread Application on page 165



Essentials

Use **Essentials** to access the following Essentials Applications in ExtremeCloud™ IQ:

- ExtremeIOT Essentials
- Extreme AirDefense Essentials
- ExtremeGuest Essentials
- ExtremeLocation Essentials

ExtremeIOT Essentials in ExtremeCloud IQ

ExtremeIOT™ Essentials™ provides security management with a simplified configuration work flow, plus traffic and application visibility of connected end devices. ExtremeIOT Essentials also enables the centralized creation of policies that define network and security settings for groups of IoT devices.

Note
ExtremeIOT Essentials is only for the protection of wired IoT end devices. The ExtremeIOT Essentials setup creates configuration for wired devices. However, Administrators can create additional wireless networks through ExtremeCloud IQ.

ExtremeIOT Essentials can help you manage IoT devices within ExtremeCloud IQ. The configuration is simplified and steps you through network policy configuration that is associated with the device.

You can use the ExtremeCloud IQ Dashboard Essentials ⠿ › icon to list the Essentials applications and choose ExtremeIOT Essentials. The ExtremeIOT Essentials navigation menu launches in ExtremeCloud IQ.

Access to ExtremeIOT Essentials functionality is dependent on your ExtremeCloud IQ user access level.

> **Note**
> ExtremeIOT Essentials functionality also requires an ExtremeCloud IQ CoPilot™ license.

The following options are available from the **ExtremeIOT Essentials** navigation menu:

Dashboard

Monitor your network activity and performance on the dashboard. The dashboard provides a graphical representation of information related to protected devices. Depending on the report, the widget represents historical data or a combination of historical and the latest data from shared memory.

Devices

List of supported access points. The devices view displays data for ExtremeIOT Essentials capable devices only.

Clients

List of IoT clients attached to any of the managed devices.

User Profiles

A user profile is a policy role that determines a client's access to the network. Define firewall rules to provide unique treatment of packet types when a user profile is applied.

Policy Groups

Policy groups map a defined user profile to a set of clients. A user profile is a set of network access services that can be applied at various points in a policy-enabled network. All clients in a policy group are subject to the rules defined in the user profile.

Extreme AirDefense Essentials in ExtremeCloud IQ

Extreme AirDefense Essentials is a cloud-based management tool you can use to configure, implement and review security protocols that evaluate and monitor threat detection for devices in your network.

You can use the ExtremeCloud IQ Dashboard Essentials ⠿ > icon to list the Essentials applications and choose Extreme AirDefense Essentials. The Extreme AirDefense Essentials Overview launches in ExtremeCloud IQ.

The Extreme AirDefense Essentials Overview launches in ExtremeCloud IQ.

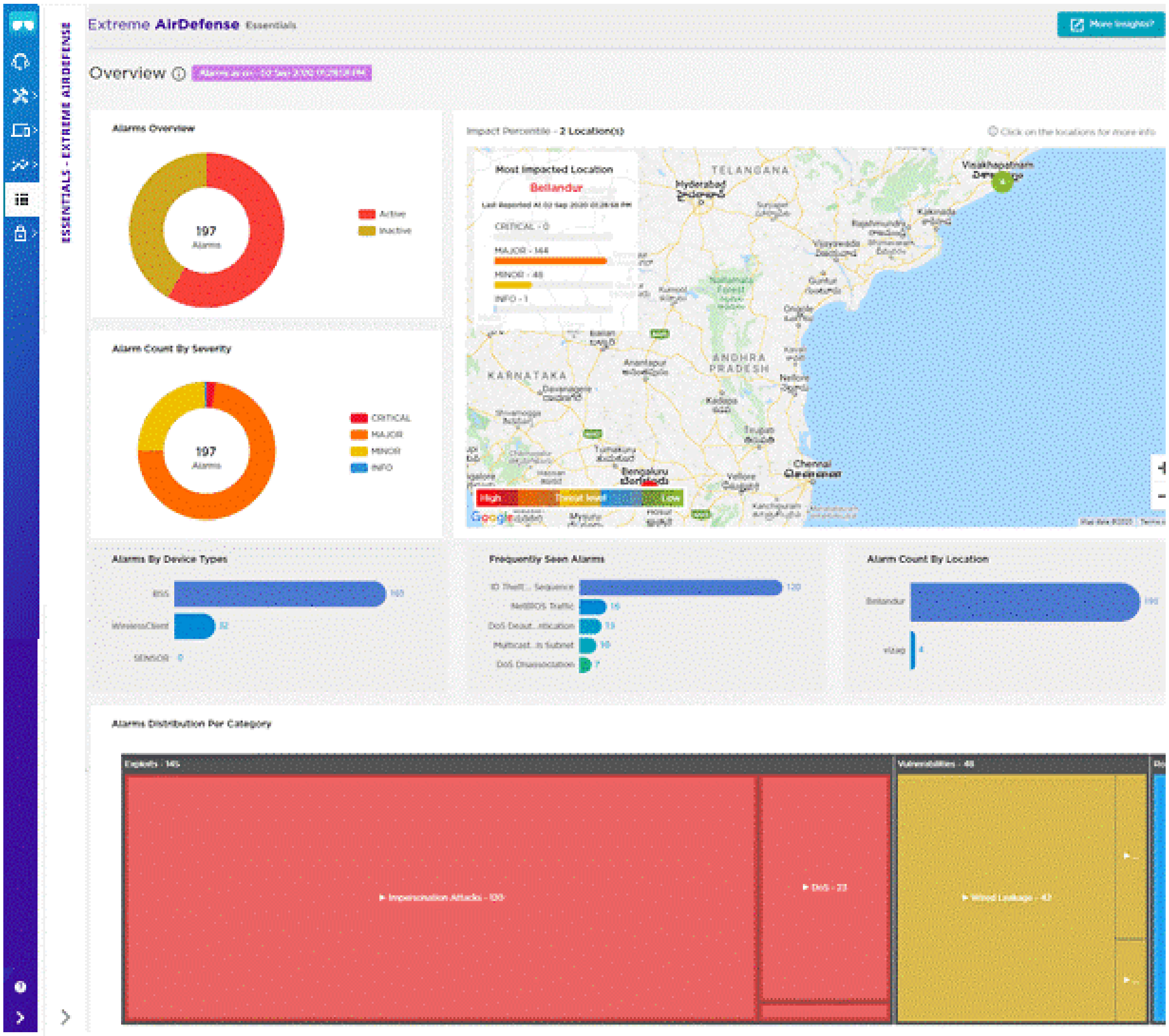


Figure 28: Extreme AirDefense Essentials Overview View in ExtremeCloud IQ

The Extreme AirDefense Essentials Overview in ExtremeCloud IQ includes the following widgets:

- Alarms Overview
- Alarm Count by Severity
- Percentile Map
- Alarms by Device Types
- Frequently Seen Alarms
- Alarm Count by Location

You can select the **More Insights** button at the top right corner of the Overview to access all the features of Extreme AirDefense Essentials and open the application in a separate browser tab.

ExtremeGuest Essentials in ExtremeCloud IQ

ExtremeGuest Essentials is a robust and comprehensive guest management and engagement solution that personalizes engagement by understanding customer behavior and interest, and then tailoring services based on those insights. For example, the number of customers that enter a store, how often they visit, and how much time they spend are all metrics that can be measured through ExtremeGuest Essentials.

ExtremeGuest Essentials can take advantage of social networking behavior to increase patronage, expand brand exposure, and understand client demographics and preferences in a more comprehensive and personal way. Guest onboarding with sponsor approval is supported, allowing a sponsor to approve or deny guest access with a single click.

ExtremeGuest Essentials supports all access point models that are supported with ExtremeCloud IQ.

For documentation on each access point, refer to the AP model number under Extreme Documentation at extremenetworks.com/documentation.

You can use the ExtremeCloud IQ Dashboard Essentials ⠿ > icon to list the Essentials applications and choose ExtremeGuest Essentials. The ExtremeGuest Essentials Connection Status launches in ExtremeCloud IQ.

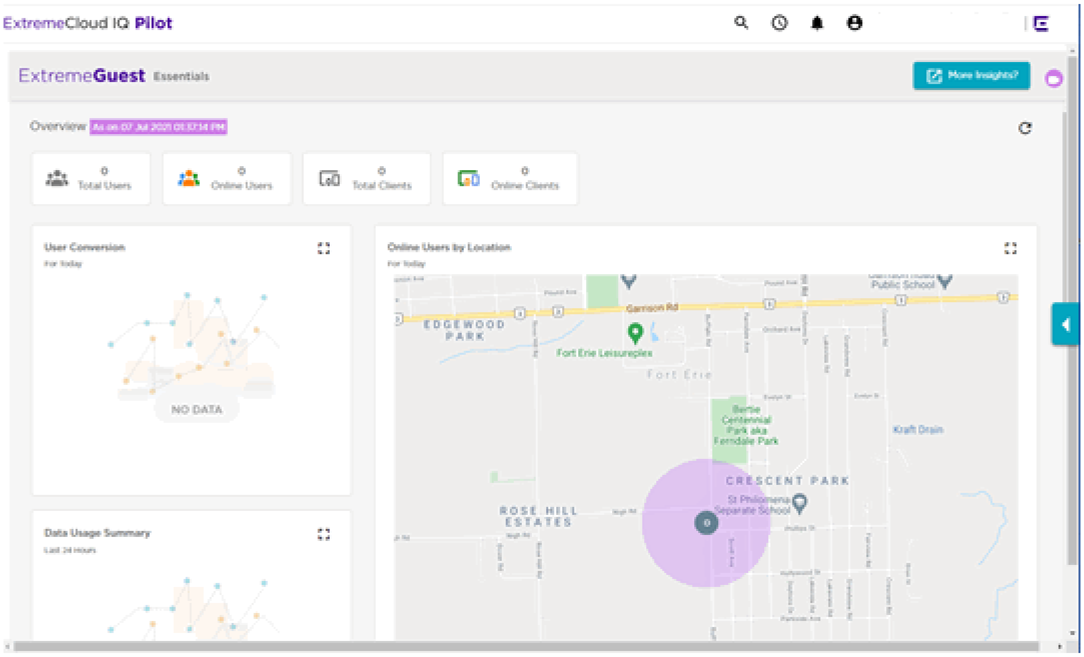


Figure 29: ExtremeGuest Essentials Overview View in ExtremeCloud IQ

You can select the **More Insights** button at the top right corner of the Overview to access all the features of ExtremeGuest Essentials and open the application in a separate browser tab.

ExtremeLocation Essentials in ExtremeCloud IQ

ExtremeLocation Essentials is a resilient, cloud-based location and analytics solutions from Extreme Networks. With real-time location and analytics, you can engage with your customers providing personalized experience for guests and visitors. ExtremeLocation Essentials can also be used to monitor your workflows and assets to improve your overall operation and efficiency.

ExtremeLocation Essentials is accessible from the Extreme Networks cloud-based network management solution ExtremeCloud IQ. ExtremeCloud IQ and Virtual IQ (or VIQ, which is virtual ExtremeCloud IQ) share client data storage functionality. If a client's data is deleted in ExtremeCloud IQ, all configured, cached, Live, and Historical data related to that client is also deleted from ExtremeLocation Essentials.

ExtremeLocation Essentials offers a range of accurate and granular location accuracy to address your deployment scenarios and includes the following functionality:

- Real-time and historical location analysis
- New and repeat visitor tracking
- Engagement time monitoring
- Site or zone specific intelligence
- Assets and employee tracking

Use the ExtremeCloud IQ Dashboard Essentials ⁝⁝⁝ > icon to list the Essentials applications and choose **ExtremeLocation Essentials**. The ExtremeLocation Essentials Overview opens in ExtremeCloud IQ.

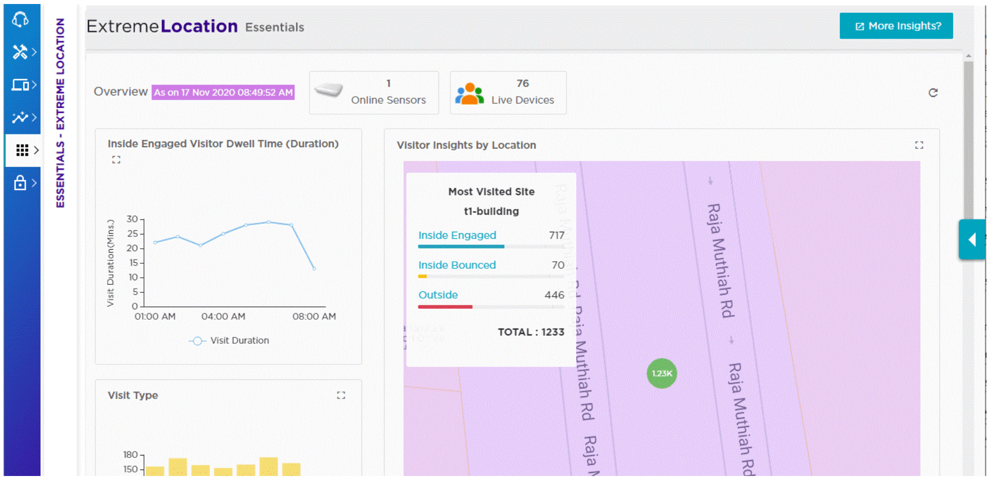
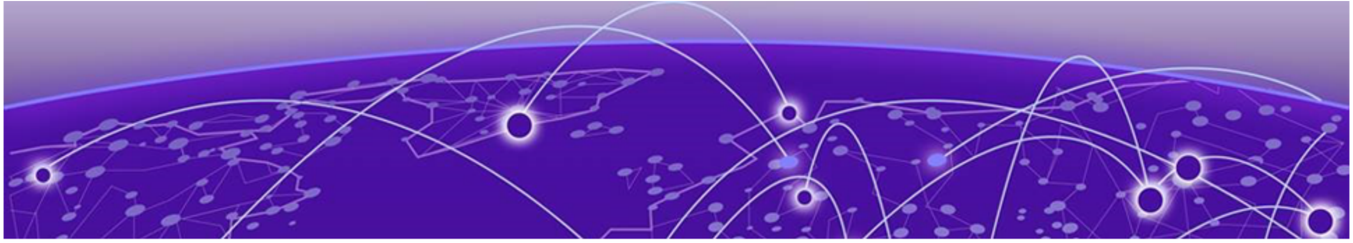


Figure 30: ExtremeLocation Essentials Overview View in ExtremeCloud IQ

To access more ExtremeLocation Essentials features and open the application in a separate browser tab, select **More Insights**.



CoPilot Dashboard

ExtremeCloud IQ CoPilot is an AIOps solution that leverages Explainable Machine Learning (ML). With CoPilot, your IT operations teams become more data-driven and proactive. The CoPilot dashboard provides access to in-depth information anomalies and client connectivity for your Extreme Networks cloud-managed wired and wireless networks. Your ExtremeCloud IQ CoPilot subscription provides the following benefits:

- Simplifies troubleshooting by providing auditable recommendations to reduce the number of out-of-context alerts that can waste time and effort
- Identifies anomalies and alerts you, providing an explanation and the best options for resolution
- Reduces risk by proactively looking for patterns ahead of time to identify significant anomalies so IT can address them early
- Utilizes continuous learning and bidirectional communication to provide the best and most accurate recommendations for your network
- Summarizes the client connectivity experience into a single quality index score, and helps you to easily track, identify, and troubleshoot connectivity issues

Table 72: Copilot Capabilities Summary

Capability	Wireless Network	Wired Network	Description
Connectivity Experiences	♦	♦	Summarizes the client experience into a single quality index score to easily track, identify, and troubleshoot connectivity issues.
Wi-Fi Capacity Anomaly	♦		Access points (APs) with unusually high channel utilization, reporting instances of excessive recurrence and duration.
Wi-Fi Efficiency Anomaly	♦		Unusually high channel utilization, reporting instances of excessive recurrence and duration.

Table 72: Copilot Capabilities Summary (continued)

Capability	Wireless Network	Wired Network	Description
DFC Recurrence Anomaly	♦		Access points with excessive channel changes due to external 5Ghz interference, such as radar.
Port Efficiency Anomaly	♦	♦	Access point and Switch (SW) ports with bad cabling, faulty ports, auto-negotiation issues.
PoE Stability Anomaly	♦	♦	Access point and SW ports with bad cabling, power supply consistency issues, insufficient power provided.
Adverse Traffic Patterns Anomaly	♦	♦	Access points and switches with traffic loading issues that cause excessive usage of CPU and memory resources.

To access the ExtremeCloud IQ CoPilot dashboard, log in to ExtremeCloud IQ and select from the left navigation panel. The dashboard uses the following tabs to organize the data:

- Anomalies on page 461
- Connectivity Experiences on page 450

You can access the dashboard from anywhere, by using the ExtremeCloud IQ Companion mobile app for AIOps.

NEW! Connectivity Experiences

The quality index scores client connectivity experiences from 1 (worst) to 10 (best). In an ideal scenario, the quality index is 10 consistently over time, while any decline in the index value indicates a degraded experience. This index is calculated for every client, every time new client metrics are obtained. By default, this interval is every 10 minutes.

Quality index scoring provides more granularity and better control. It can help mitigate the effects of single (random) events.

The global threshold is dynamically calculated based on information from all clients in the Regional Data Center. The system dynamically calculates the local threshold per location and SSID type (PSK vs Open vs Enterprise), and uses the lower threshold.

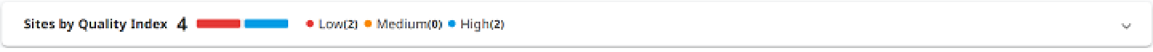
The **Connectivity Experiences** tab uses the following widgets and a table to display information about connection quality:

- Quality Index for Wireless Devices Widget on page 451
- Quality Index for Wired Devices Widget on page 451

The widgets and table are interactive. Mouse over them to see more details.

To hide the widgets and display a streamlined view of **Sites by Quality Index**, select ⌃ .

To display the widgets again, select ⌄ .



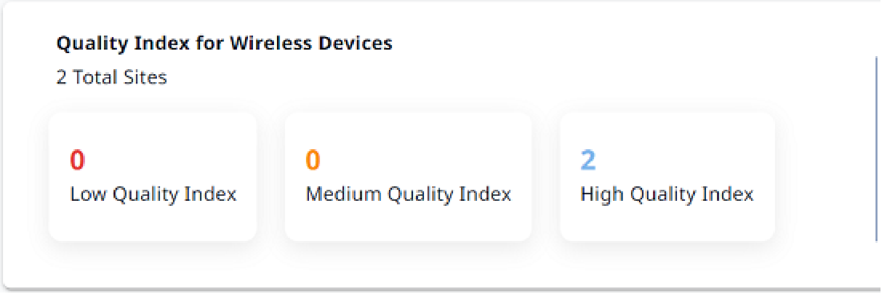
Sites by Quality Index 4 ● Low(2) ● Medium(0) ● High(2) ⌄

Figure 31: Sites by Quality Index Streamlined View

Related Topics

Quality Index for Wireless Devices Widget on page 451
Quality Index for Wired Devices Widget on page 451
Connectivity Experiences Table on page 452
Connectivity Experiences Panel (Wired) on page 459
Connectivity Experiences Panel (Wireless) on page 453

NEW! Quality Index for Wireless Devices Widget



Quality Index for Wireless Devices
2 Total Sites

0 Low Quality Index

0 Medium Quality Index

2 High Quality Index

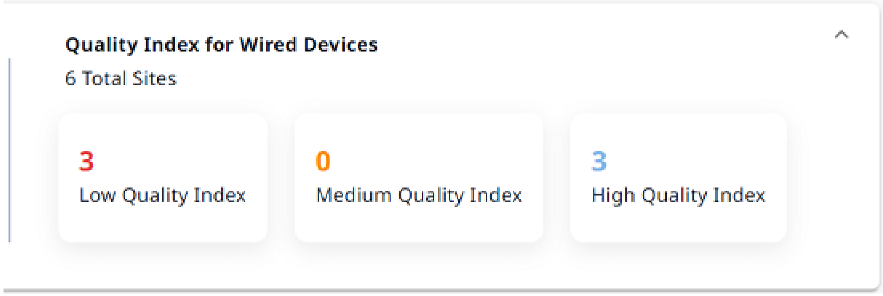
Figure 32: Quality Index for Wireless Devices

The **Quality Index for Wireless Devices** widget shows the number of wireless sites for each quality index category: Low, Medium, and High. Select a quality index category to update the table to show only sites with the selected quality index.

Related Topics

Connectivity Experiences on page 450

NEW! Quality Index for Wired Devices Widget



Quality Index for Wired Devices
6 Total Sites

3 Low Quality Index

0 Medium Quality Index

3 High Quality Index

Figure 33: Quality Index for Wired Devices

The **Quality Index for Wired Devices** widget shows the number of wired sites for each quality index category: Low, Medium, and High. Select a quality index category to update the table to show only sites with the selected quality index.

Related Topics

Connectivity Experiences on page 450

NEW! Connectivity Experiences Table

The **Connectivity Experiences** table displays connection quality information for the previous 24 hours, and includes the following information for each entry:

- **Site**
- **Connectivity Type**
- **Quality Index**
- **Trend**

The table displays connection quality information for the previous 24 hours. Use the controls found at the top of the page to customize your view of the table:

Site

Display all sites (default) or select a specific site from the menu. Start typing a site name to search the menu for a particular site.

To return to the default view, select **X**.

Connectivity Type

Display all clients (default), or select only wireless, or only wired clients.

To return to the default view, select **X**.

Quality Index

Select Low (1–5), Medium (6–8), or High (8–9). The table updates to display the wired and wireless sites that match your selection.

To return to the default view, select **X**.

Time Range

Use the calendar control to select the time period for which you want to display connection quality trends information. Select the calendar control to open it and then select one of the options:

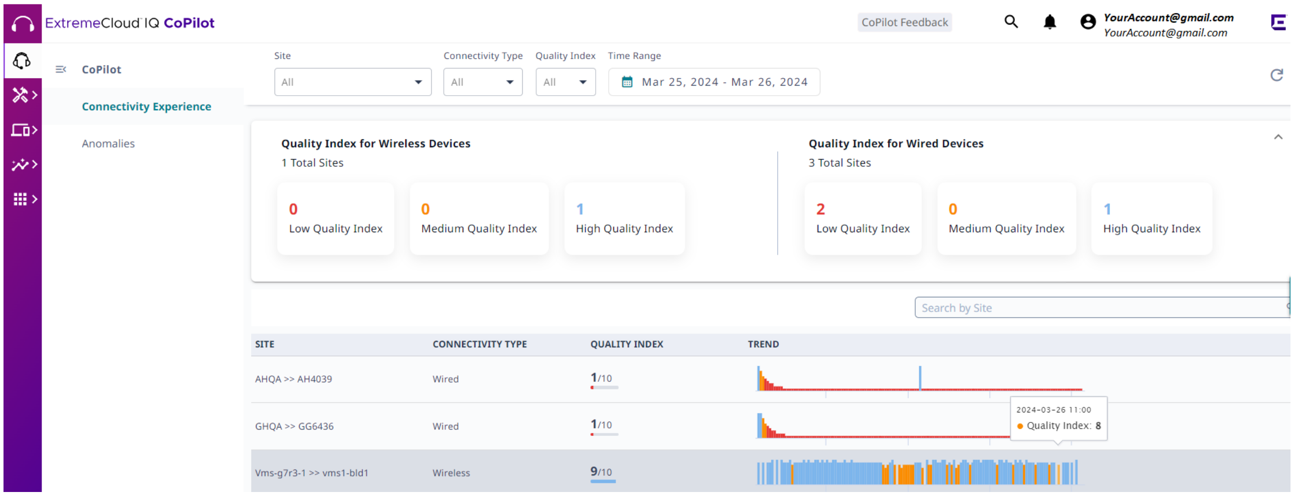
- Last 24 Hours
- 7 Days
- Custom

  Select the start date and time, and then select the end date and time for the period.

Search by Location

Start typing a site name to search the table for a site. Select **X** to clear the search string and return to the previous table view.

To sort the table results in ascending or descending order according to **Site**. Hover the mouse to the right of the corresponding column label, and select the ↑. To change the sort order again, select the ↑. You can also search for connection quality information by site. Use the **Items per page** menu to specify the maximum number of results to show, per page.



Site: All
Connectivity Type: All
Quality Index: All
Time Range: Mar 25, 2024 - Mar 26, 2024

Quality Index for Wireless Devices
1 Total Sites
0 Low Quality Index
0 Medium Quality Index
1 High Quality Index

Quality Index for Wired Devices
3 Total Sites
2 Low Quality Index
0 Medium Quality Index
1 High Quality Index

SITE	CONNECTIVITY TYPE	QUALITY INDEX	TREND
AHQA >> AH4039	Wired	1/10	
GHQA >> GG6436	Wired	1/10	
Vms-g7r3-1 >> vms1-bld1	Wireless	9/10	

Figure 34: Connectivity Experiences table

Related Topics

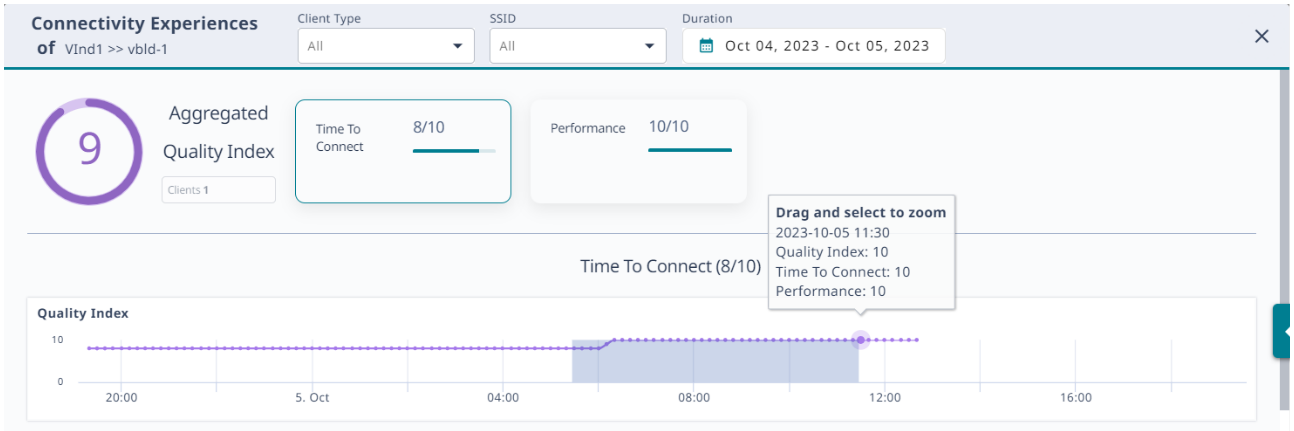
Connectivity Experiences on page 450

Connectivity Experiences Panel (Wireless)

To open the **Connectivity Experiences** panel for a site, select the site. Mouse over a point on the graph to display the following metrics at that time:

- Quality Index
- Time to Connect
- Performance

To zoom in, drag and select a time period on the **Quality Index** graph.


Connectivity Experiences of Vlnd1 >> vbld-1

Client Type: All

SSID: All

Duration: Oct 04, 2023 - Oct 05, 2023

Figure 35: Connectivity Experiences Panel (Wireless)

Your selection and the zoom function apply to all graphs that appear on the site **Connectivity Experiences** panel.

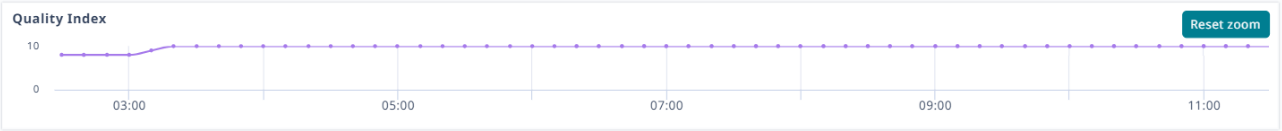


Figure 36: Quality Index Zoom

To see the number of unique clients at a particular time, mouse over a point in the **Client Count** graph.

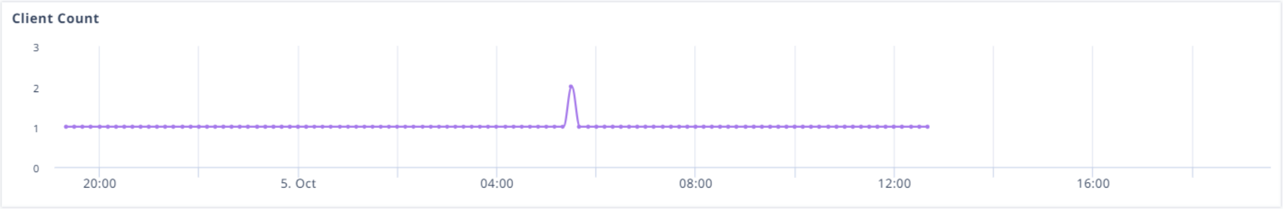


Figure 37: Client Count

Related Topics

Connectivity Experiences on page 450

Client Association (Wireless)

Mouse over a point in the **Client Association** graph to see a summary of the following information:

- Date and time stamp
- Total Unique Clients
- Time to Associate
- Clients Above Association Threshold
- Time to Authenticate

- Clients Above Authentication Threshold
- Time to Obtain IP Address
- Clients Above DHCP Threshold

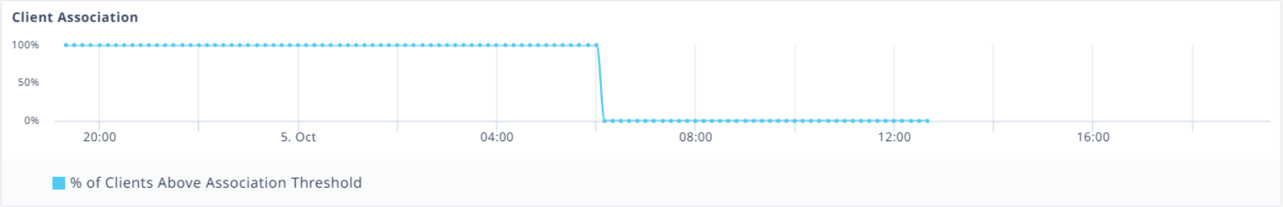
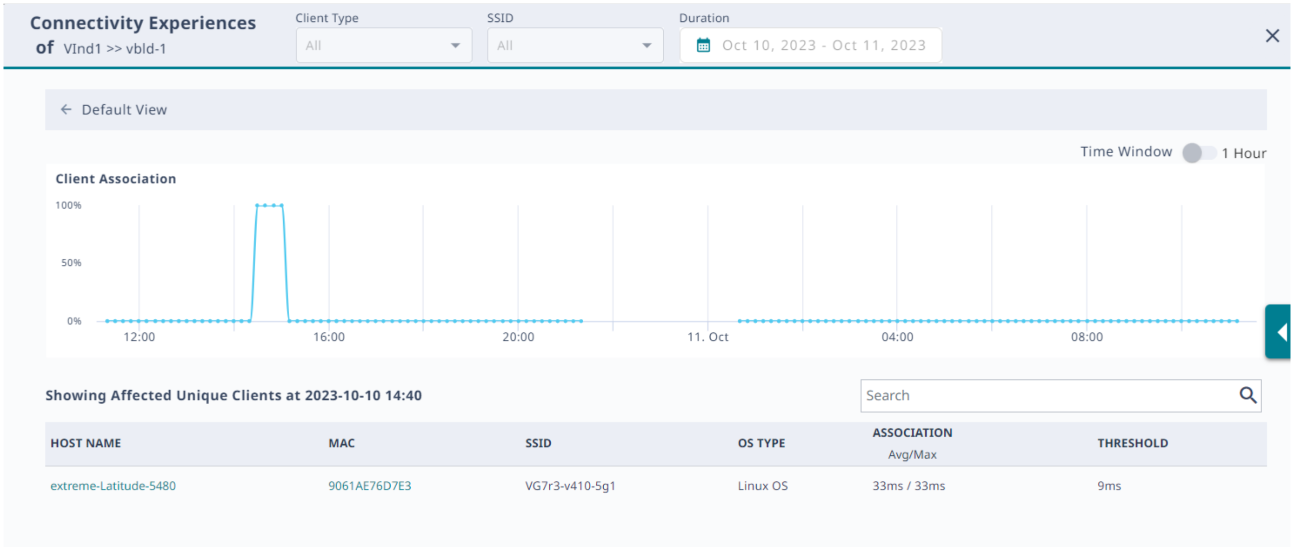


Figure 38: Client Association

To open the **Client Association** panel and see more details, select a point on the graph.



Showing Affected Unique Clients at 2023-10-10 14:40

HOST NAME	MAC	SSID	OS TYPE	ASSOCIATION Avg/Max	THRESHOLD
extreme-Latitude-5480	9061AE76D7E3	VG7r3-v410-5g1	Linux OS	33ms / 33ms	9ms

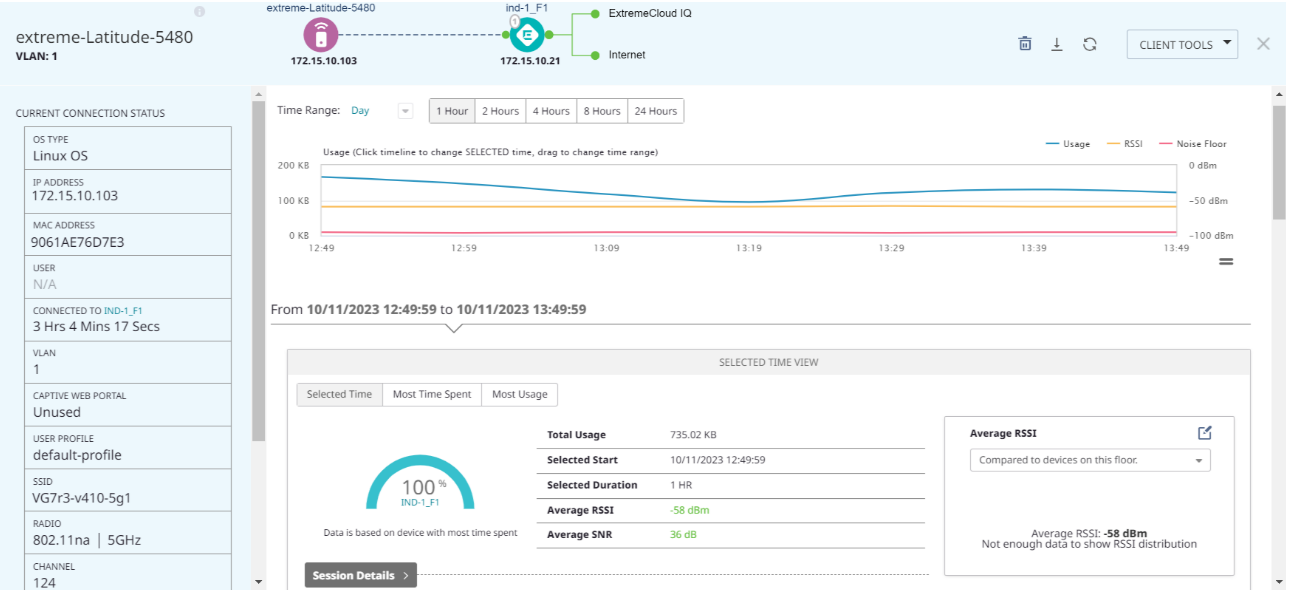
Figure 39: Client Association Panel

To zoom in, drag and select a time period. To zoom back out, select **Reset zoom**. To return to the **Default View**, select the back arrow.

Mouse over a point on the graph to see the following information:

- Date and time stamp
- Total Unique Clients
- Time to Associate
- Clients Above Association Threshold

For more information, select a point on the graph for which there are clients above the association threshold. The table updates to show the affected unique clients. To open the connection details panel, select the link from the **HOST NAME** or the **MAC** column.



extreme-Latitude-5480
VLAN: 1

CURRENT CONNECTION STATUS

OS TYPE
Linux OS

IP ADDRESS
172.15.10.103

MAC ADDRESS
9061AE76D7E3

USER
N/A

CONNECTED TO IND-1_F1
3 Hrs 4 Mins 17 Secs

VLAN
1

CAPTIVE WEB PORTAL
Unused

USER PROFILE
default-profile

SSID
VG7r3-v410-5g1

RADIO
802.11na | 5GHz

CHANNEL
124

Time Range: Day | 1 Hour | 2 Hours | 4 Hours | 8 Hours | 24 Hours

Usage (Click timeline to change SELECTED time, drag to change time range)

From 10/11/2023 12:49:59 to 10/11/2023 13:49:59

SELECTED TIME VIEW

Selected Time | Most Time Spent | Most Usage

Data is based on device with most time spent

Total Usage	735.02 KB
Selected Start	10/11/2023 12:49:59
Selected Duration	1 HR
Average RSSI	-58 dBm
Average SNR	36 dB

Average RSSI
Compared to devices on this floor.
Average RSSI: -58 dBm
Not enough data to show RSSI distribution

Figure 40: Connection Details Panel

Related Topics

Connectivity Experiences on page 450

Connectivity Experiences Panel (Wireless) on page 453

Client Authentication (Wireless)

Mouse over a point in the **Client Authentication** graph to see a summary of the following information:

- Date and time stamp
- Total Unique Clients
- Time to Associate
- Clients Above Association Threshold
- Time to Authenticate
- Clients Above Authentication Threshold
- Time to Obtain IP Address
- Clients Above DHCP Threshold

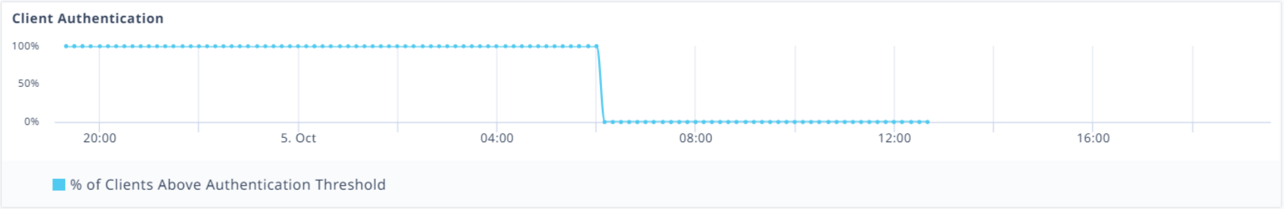
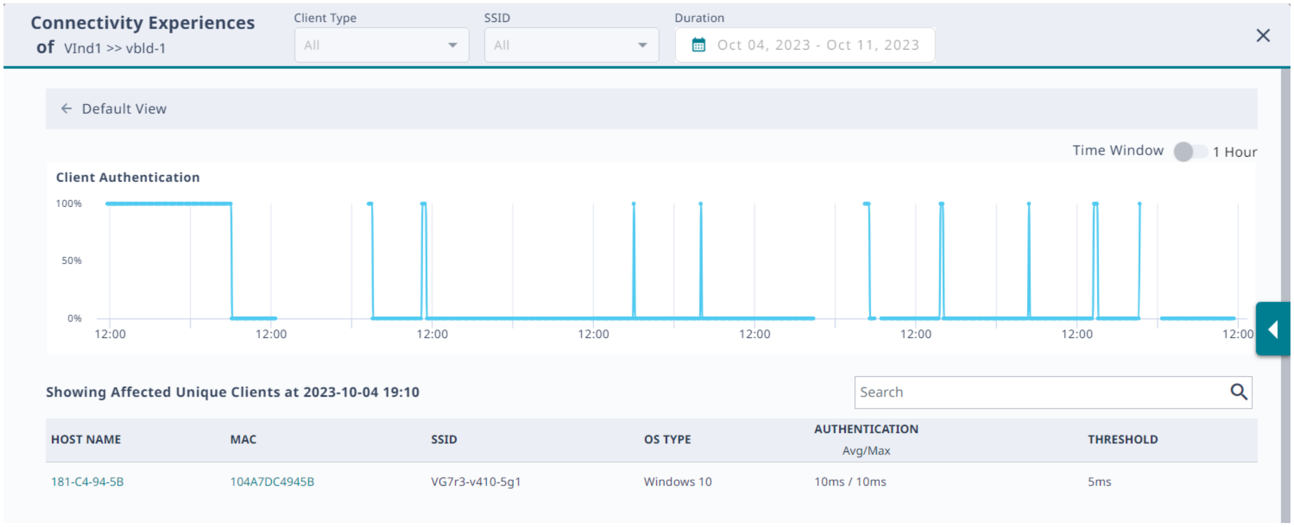


Figure 41: Client Authentication

To open the **Client Authentication** panel and see more details, select a point on the graph.



Showing Affected Unique Clients at 2023-10-04 19:10

HOST NAME	MAC	SSID	OS TYPE	AUTHENTICATION Avg/Max	THRESHOLD
181-C4-94-5B	104A7DC4945B	VG7r3-v410-5g1	Windows 10	10ms / 10ms	5ms

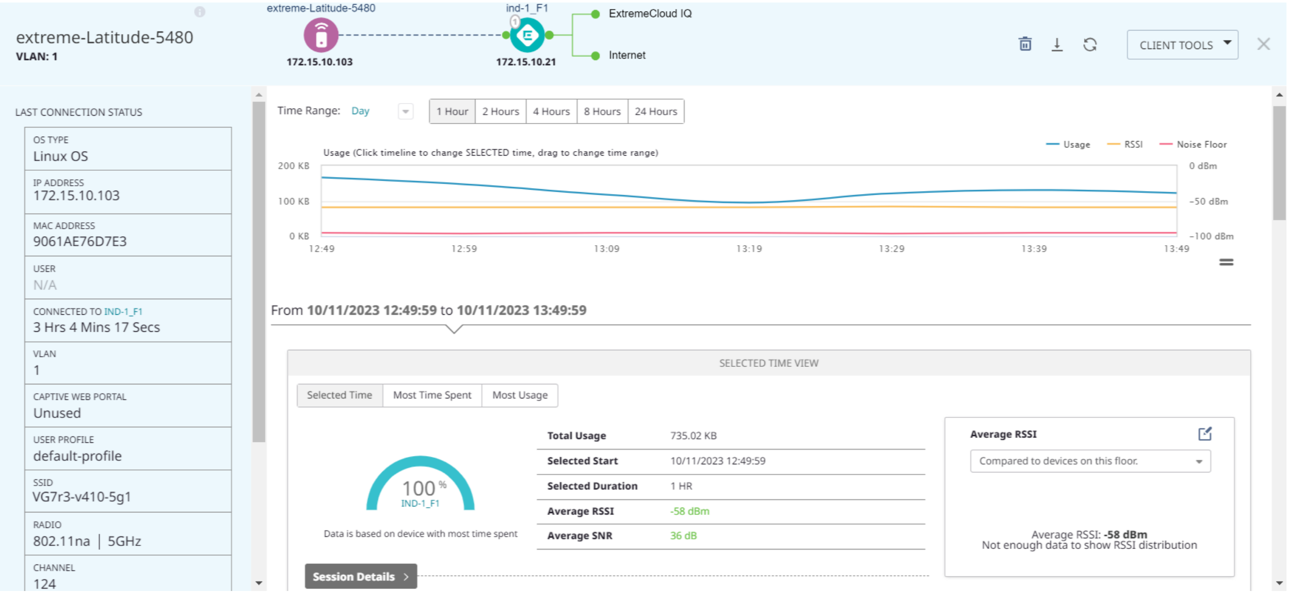
Figure 42: Client Authentication Panel

To zoom in, drag and select a time period. To zoom back out, select **Reset zoom**. To return to the **Default View**, select the back arrow.

Mouse over a point on the graph to see the following information:

- Date and time stamp
- Total Unique Clients
- Time to Authenticate
- Clients Above Authentication Threshold

For more information, select a point on the graph for which there are clients above the association threshold. The table updates to show the affected unique clients. To open the connection details panel, select the link from the **HOST NAME** or the **MAC** column.



extreme-Latitude-5480
VLAN: 1

LAST CONNECTION STATUS

OS TYPE
Linux OS

IP ADDRESS
172.15.10.103

MAC ADDRESS
9061AE76D7E3

USER
N/A

CONNECTED TO IND-1_F1
3 Hrs 4 Mins 17 Secs

VLAN
1

CAPTIVE WEB PORTAL
Unused

USER PROFILE
default-profile

SSID
VG7r3-v410-5g1

RADIO
802.11na | 5GHz

CHANNEL
124

From **10/11/2023 12:49:59** to **10/11/2023 13:49:59**

Data is based on device with most time spent

Total Usage	735.02 KB
Selected Start	10/11/2023 12:49:59
Selected Duration	1 HR
Average RSSI	-58 dBm
Average SNR	36 dB

Average RSSI

Compared to devices on this floor.

Average RSSI: **-58 dBm**
Not enough data to show RSSI distribution

Figure 43: Connection Details Panel

Related Topics

Connectivity Experiences Panel (Wireless) on page 453

Connectivity Experiences on page 450

Time to Obtain IP Address (Wireless)

Mouse over a point in the **Time To Obtain IP Address** graph to see a summary of the following information:

- Date and time stamp
- Total Unique Clients
- Time to Associate
- Clients Above Association Threshold
- Time to Authenticate
- Clients Above Authentication Threshold
- Time to Obtain IP Address
- Clients Above DHCP Threshold

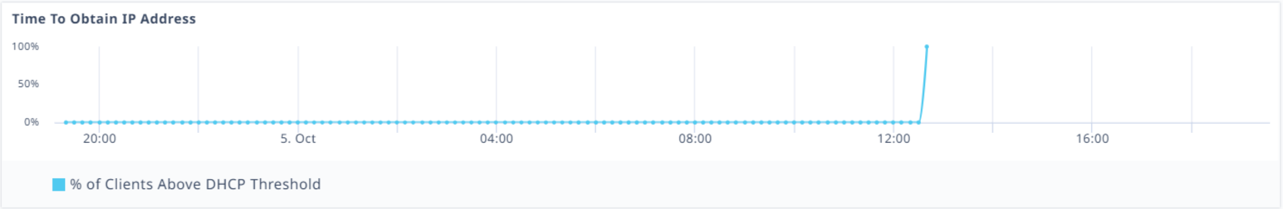
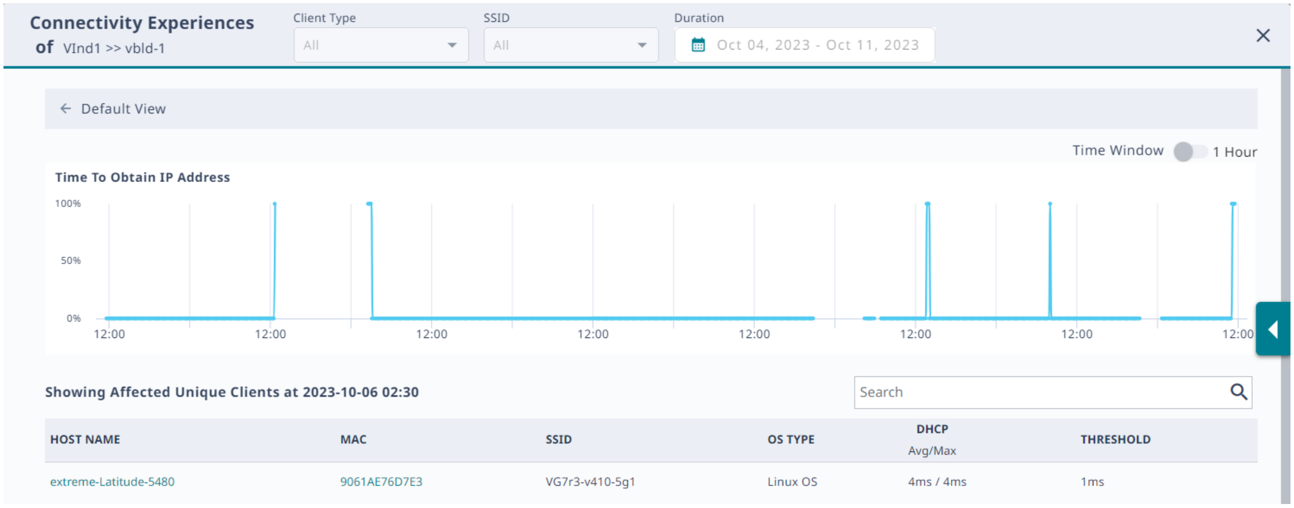


Figure 44: Time To Obtain IP Address

To open the **Time To Obtain IP Address** panel and see more details, select a point on the graph.



Client Type: All

SSID: All

Duration: Oct 04, 2023 - Oct 11, 2023

Showing Affected Unique Clients at 2023-10-06 02:30

HOST NAME	MAC	SSID	OS TYPE	DHCP Avg/Max	THRESHOLD
extreme-Latitude-5480	9061AE76D7E3	VG7r3-v410-5g1	Linux OS	4ms / 4ms	1ms

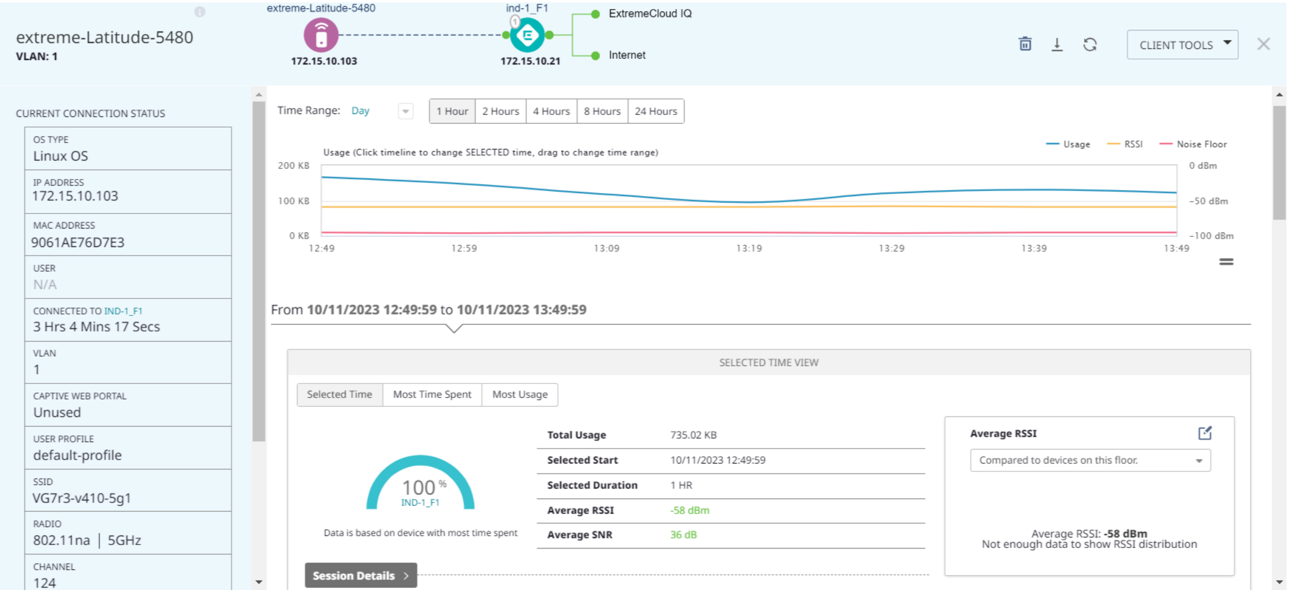
Figure 45: Time To Obtain IP Address Panel

To zoom in, drag and select a time period. To zoom back out, select **Reset zoom**. To return to the **Default View**, select the back arrow.

Mouse over a point on the graph to see the following information:

- Date and time stamp
- Total Unique Clients
- Time to Obtain IP Address
- Clients Above DHCP Threshold

For more information, select a point on the graph for which there are clients above the association threshold. The table updates to show the affected unique clients. To open the connection details panel, select the link from the **HOST NAME** or the **MAC** column.



extreme-Latitude-5480
VLAN: 1

CURRENT CONNECTION STATUS

OS TYPE Linux OS
IP ADDRESS 172.15.10.103
MAC ADDRESS 9061AE76D7E3
USER N/A
CONNECTED TO IND-1_F1 3 Hrs 4 Mins 17 Secs
VLAN 1
CAPTIVE WEB PORTAL Unused
USER PROFILE default-profile
SSID VG7r3-v410-5g1
RADIO 802.11na | 5GHz
CHANNEL 124

From **10/11/2023 12:49:59** to **10/11/2023 13:49:59**

Data is based on device with most time spent

Total Usage	735.02 KB
Selected Start	10/11/2023 12:49:59
Selected Duration	1 HR
Average RSSI	-58 dBm
Average SNR	36 dB

Average RSSI

Compared to devices on this floor.

Average RSSI: **-58 dBm**
Not enough data to show RSSI distribution

Figure 46: Connection Details Panel

Related Topics

Connectivity Experiences Panel (Wireless) on page 453

Connectivity Experiences on page 450

Connectivity Experiences Panel (Wired)

To open the **Connectivity Experiences** panel for a site, select the site. To zoom in, drag and select a time period on the **Quality Index** graph. To zoom back out again, select **Reset zoom**.

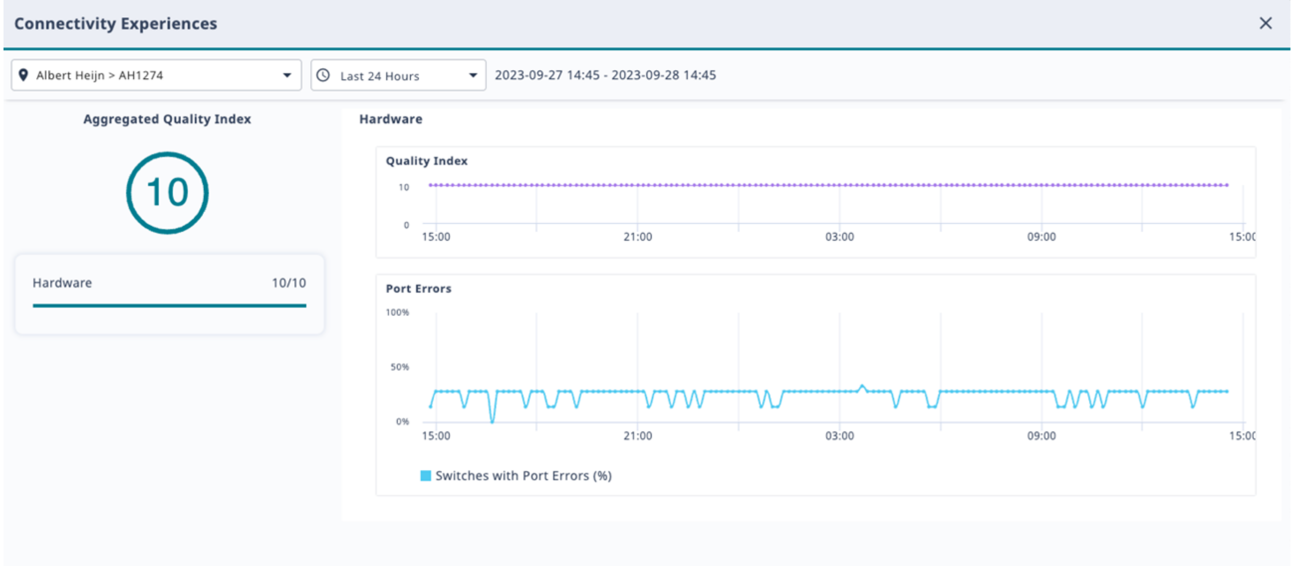


Figure 47: Connectivity Experiences Panel (Wired)

To see high-level information about a port error, mouse over a point in the **Port Errors** graph.

To open the detailed **Port Errors** panel, select the **Port Errors** graph.

Related Topics

Port Errors on page 460

Connectivity Experiences on page 450

Port Errors

To zoom in on the **Port Errors** graph, drag and select a time period.

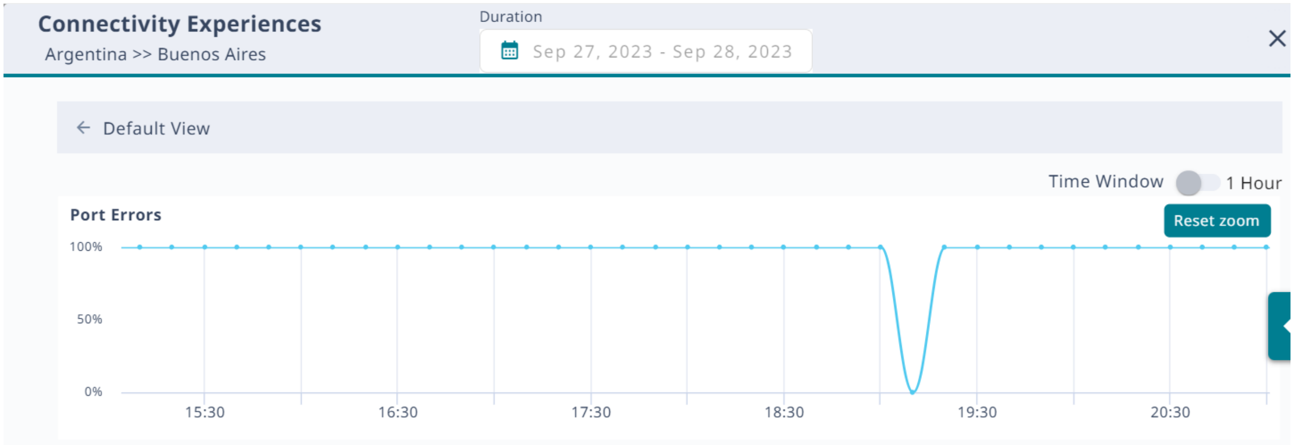


Figure 48: Port Errors

To zoom back out again, select **Reset zoom**. To return to the **Default View**, select the back arrow.

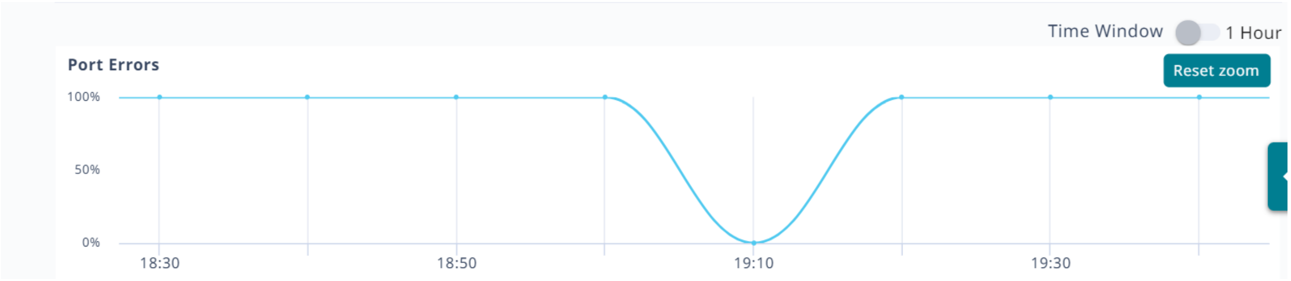
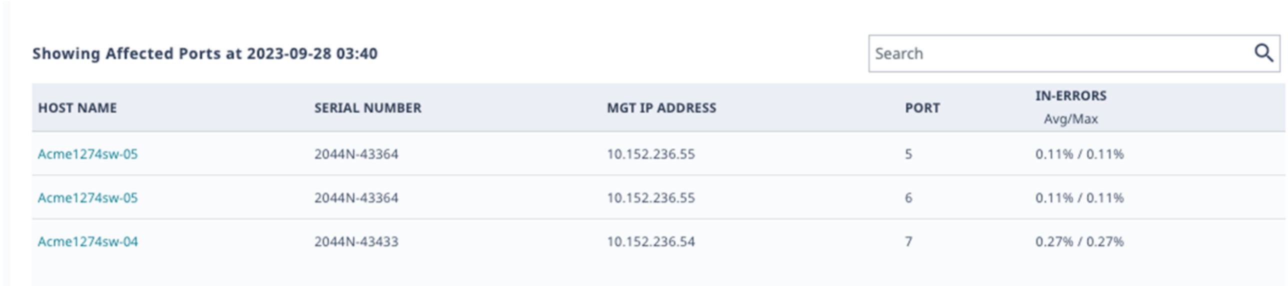


Figure 49: Port Errors Zoom

Select a point on the **Port Errors** graph to update the table with relevant information.



Showing Affected Ports at 2023-09-28 03:40

Search

HOST NAME	SERIAL NUMBER	MGT IP ADDRESS	PORT	IN-ERRORS Avg/Max
Acme1274sw-05	2044N-43364	10.152.236.55	5	0.11% / 0.11%
Acme1274sw-05	2044N-43364	10.152.236.55	6	0.11% / 0.11%
Acme1274sw-04	2044N-43433	10.152.236.54	7	0.27% / 0.27%

Figure 50: Affected Ports Table

The system calculates the metrics that appear in the graph and in the table over a 10-minute period. To change the period to one hour, select the **Time Window** toggle.

Search the table by host name, MAC address, SSID, or operating system (OS).

Related Topics

Connectivity Experiences Panel (Wired) on page 459

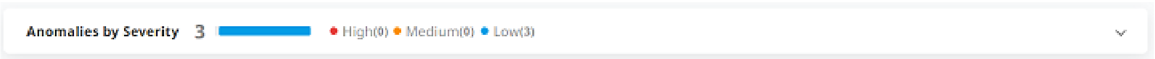
Anomalies

The **Anomalies** tab uses the following interactive widgets and a table to display information about anomalies:

- Top Anomalies by Site Widget on page 462
- Anomalies by Severity Widget on page 463
- Top Anomalies by Type Widget on page 463

To hide the widgets and display a streamlined view of **Anomalies by Severity**, select ⌃ .

To display the widgets again, select ⌄ .



Anomalies by Severity 3 ● High(0) ● Medium(0) ● Low(3) ⌄

Figure 51: Anomalies by Severity Streamlined View

Use the controls found at the top of the page to customize your view of the widgets and the table:

Site

Display all sites (default) or select a specific site from the menu. You can search the menu for a site.

Severity

Display all severity levels (default) or select a severity level from the menu.

Anomaly Type

Display all anomaly types (default) or select a type of anomaly from the menu.

Duration

Display anomalies for the past 24 hours (default), or the past 7 days.

Exclude Muted

Toggle to hide or display previously muted anomalies.

Trends

Display the **Anomaly Trends** graph that shows anomalies for all sites and severities for the past 90 days.

Refresh

Refresh the display by selecting ↻.

Related Topics

Top Anomalies by Site Widget on page 462
Anomalies by Severity Widget on page 463
Top Anomalies by Type Widget on page 463
Anomaly Trends on page 473

Instant Anomaly Detection

CoPilot provides instant anomaly detection, so no tuning is required. Instant anomaly detection provides the following benefits:

- Automatically applies and updates the historical data for newly added or licensed devices.
- CoPilot aggregates and correlates historical and latest data streams.
- Algorithms identify normal patterns and establish dynamic baselines.
- To reduce bias and false positives, CoPilot determines dynamic baselines by considering local and regional values.
- CoPilot identifies anomalies at multiple levels: local device, installed location, associated devices, and across multiple sites.

NEW! Top Anomalies by Site Widget

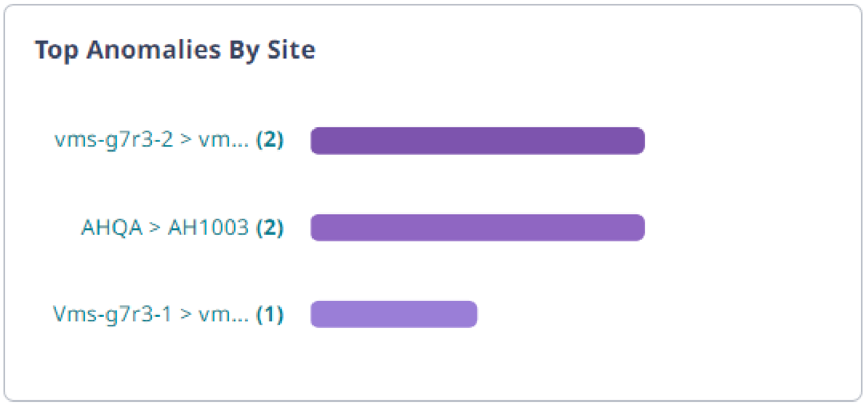


Figure 52: Top Anomalies By Site

The **Top Anomalies By Site** widget shows the sites with the most anomalies. Select a site in the widget to view only the anomalies for that site. The other widgets and the table update to show only the anomalies for the selected site.

Related Topics

Anomalies on page 461

NEW! Anomalies by Severity Widget

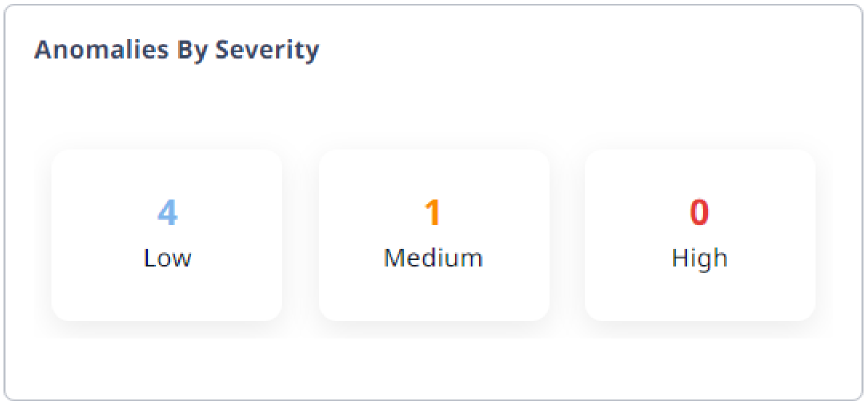


Figure 53: Anomalies By Severity

The **Anomalies By Severity** widget shows the number of anomalies for each severity level. Select a level to display only the anomalies of that severity. The other widgets and the table update to show only anomalies of the selected severity.

Related Topics

Anomalies on page 461

NEW!Top Anomalies by Type Widget

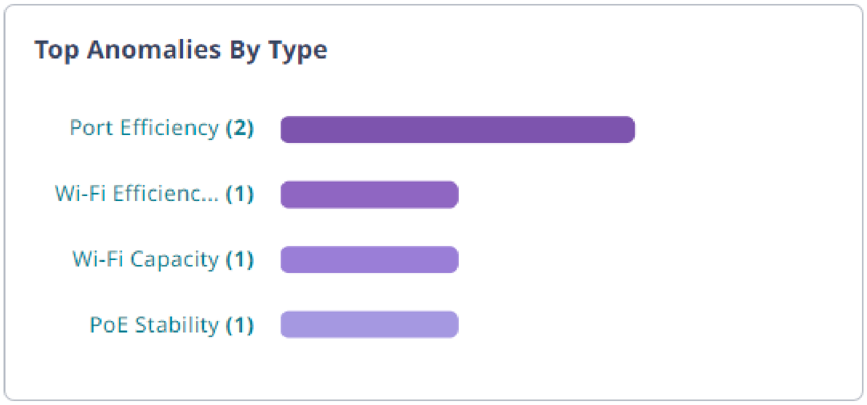


Figure 54: Top Anomalies By Type

The **Top Anomalies By Type** widget shows the most common types of anomalies for your network. From the menu, select an **Anomaly Type** to display only anomalies of that type. The other widgets and table update to display only anomalies of that type.

Related Topics

Adverse Traffic Patterns on page 464
DFS Recurrence on page 464
PoE Stability on page 465
Port Efficiency on page 469
Wi-Fi Capacity on page 469
Wi-Fi Efficiency on page 470
Anomalies on page 461

Adverse Traffic Patterns

Adverse traffic patterns are caused by TX and RX traffic loads that result in high resource use of multicast and broadcast communications. The use of multicast and broadcast requires devices to clone packets, which reduces CPU availability. This is usually not a problem, unless the traffic load begins to exceed the available CPU capacity. The CPU threshold for APs is 90%. The CPU threshold for switches is 50%. Exceeding the CPU capacity can increase latency and packet loss, and might even bring a device down.

Related Topics

Top Anomalies by Type Widget on page 463

DFS Recurrence

Dynamic Frequency Selection (DFS) recurrence anomalies are related to radar-influenced channel changes. When an access point switches channels, the quality of service for connected clients might decrease temporarily, while repeated channel changes might degrade the client experience for extended periods of time.

When an AP detects a radar pulse on the DFS channel it is using, regulations require that it switch to a non-DFS channel for at least 30 minutes. This widget identifies APs that repeatedly switch from a wireless channel within the DFS range (channels 50-144, inclusive) to a channel outside the range because it detects third party radar pulses.

ExtremeCloud IQ records the DFS channels that are affected by radar pulses. Radar is usually not in use across the entire DFS channel range (50-144). If ExtremeCloud IQ determines that only a subset of the range is in use, you can disable only those channels. The AP continues to use DFS channels that are not affected by radar. If ExtremeCloud IQ determines that the entire range of DFS channels is affected, the best practice is to completely disable DFS for the affected AP.

The severity of a DFS anomaly is classified as being:

- High—Many (more than 12) radar events in the past 24 hours
- Medium—Moderate (8-12) number of radar events in the past 24 hours
- Low—Small (5-8) number of radar events in the past 24 hours

Related Topics

Top Anomalies by Type Widget on page 463

NEW! *PoE Stability*

Access Points (AP) commonly receive power through an Ethernet backhaul cable connection to an upstream switch. This method is known as Power over Ethernet or PoE. When an AP boots, it selects a power mode based on the available PoE protocols. The AP can start with PoE and move to PoE+ after a brief interval. It uses the selected power mode until it reboots.

Table 73: PoE Standards

Standard	Description
PoE (AF)	IEEE 802.3af
PoE+ (AT)	IEEE 802.3at
PoE++ (BT)	IEEE 802.3bt

PoE stability anomalies are related to sudden changes in power draw. Data is presented over a 48-hour period, and includes date and time details. When an AP negotiates down to AF, even though it requires AT or a higher level for optimal performance and full capacity, CoPilot reports a PoE anomaly.

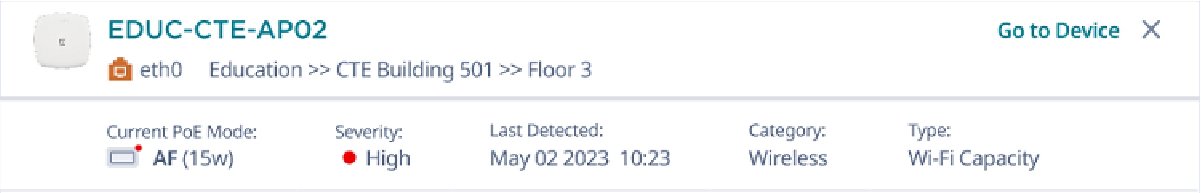
The severity definitions for PoE anomalies are based on the average number of clients connected to an AP on a given day. If there are fewer than 10 clients, the anomaly severity is considered low. If there are 50 or more clients on a given day, the severity level is considered high. If there are between 10 and 50 clients, the severity level is considered medium.

Occasionally, poorly installed cabling or MDU closet wiring, lack of power on the upstream switch, or a failing power supply on either the AP or the switch might cause APs to cycle through power modes, while never reaching a steady state.

To open the **PoE Stability Anomaly** panel, select a location (site), for which anomalies have been detected, from the table. To view more information about an anomaly, select the corresponding down arrow. The **PoE Stability Anomaly** panel includes the following information:

Header

This section provides general information about the anomaly.



EDUC-CTE-AP02

Go to Device ×

eth0 Education >> CTE Building 501 >> Floor 3

Current PoE Mode:	Severity:	Last Detected:	Category:	Type:
AF (15w)	● High	May 02 2023 10:23	Wireless	Wi-Fi Capacity

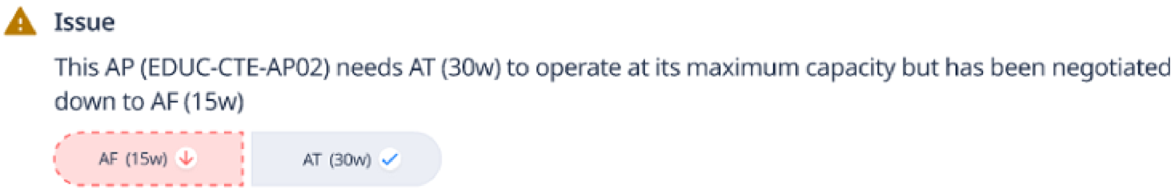
Figure 55: PoE Stability Anomaly Header

The **Current PoE Mode** shows whether the affected device is online and the current power mode—AF, AT or BT. If the AP is offline, the status is **Disconnected**.

To get more information about the device, select **Go to Device**.

Issue

This section provides a description of the problem, including the actual PoE mode and the desired PoE mode.



Issue

This AP (EDUC-CTE-AP02) needs AT (30w) to operate at its maximum capacity but has been negotiated down to AF (15w)

AF (15w) ↓ AT (30w) ✓

Figure 56: Issue

Impact

This section describes the effect the anomaly has on the system, for example: *Lower coverage and performance in the coverage area*

Recommendation

This section provides steps to resolve the anomaly, for example:

1. Verify whether there is sufficient PoE budget on the upstream switch.
2. Verify that the network cable length is not beyond 100 meters (328 feet), is properly connected to the AP, and that the cable does not have any signs of damage.

PoE Trend

The **PoE Trend** graph shows the pattern of changes in PoE mode for the 48 hours prior to the last detected timestamp. To view the graph, select the down arrow.

The graph indicates the three power modes: AF, AT and BT Type 3. Red indicates a low power mode.

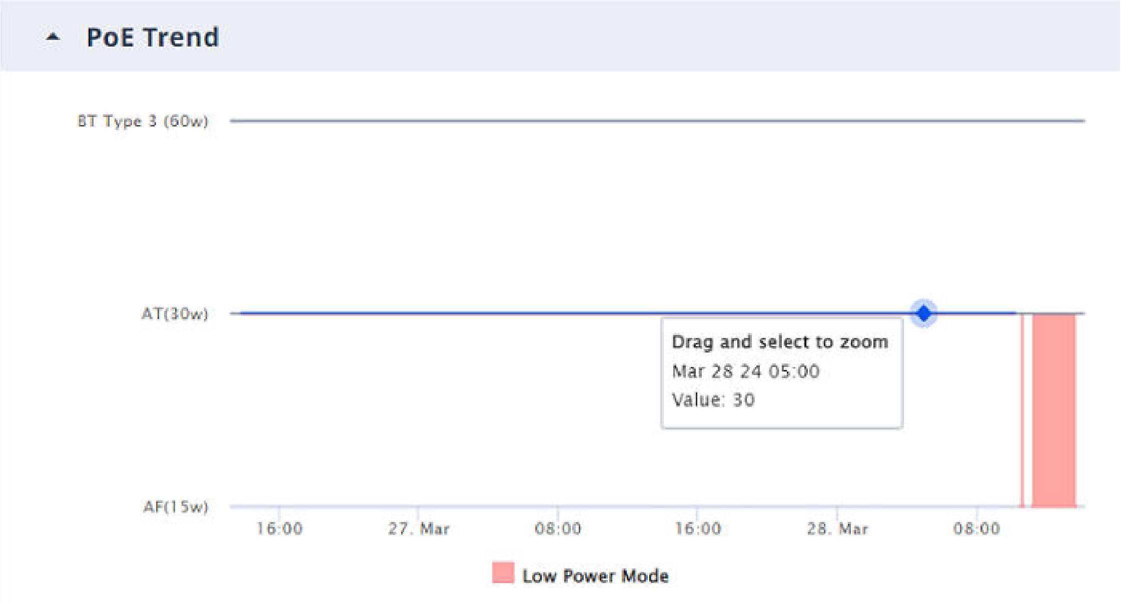


Figure 57: PoE Trend

Select and drag across the timeline to zoom in on a section. Select **Reset zoom** to return to view the entire timeline.

Neighboring Devices

If LLDP is enabled on the AP, the **Neighboring Devices** section provides useful information for troubleshooting power sourcing equipment, and nearby APs connected to the affected AP. To expand this section, select the down arrow.

> Note
> If LLDP is enabled and the upstream device is an Extreme switch managed by the current VIQ, the **Upstream System Name** value appears as a link that opens the D360 page for the switch.

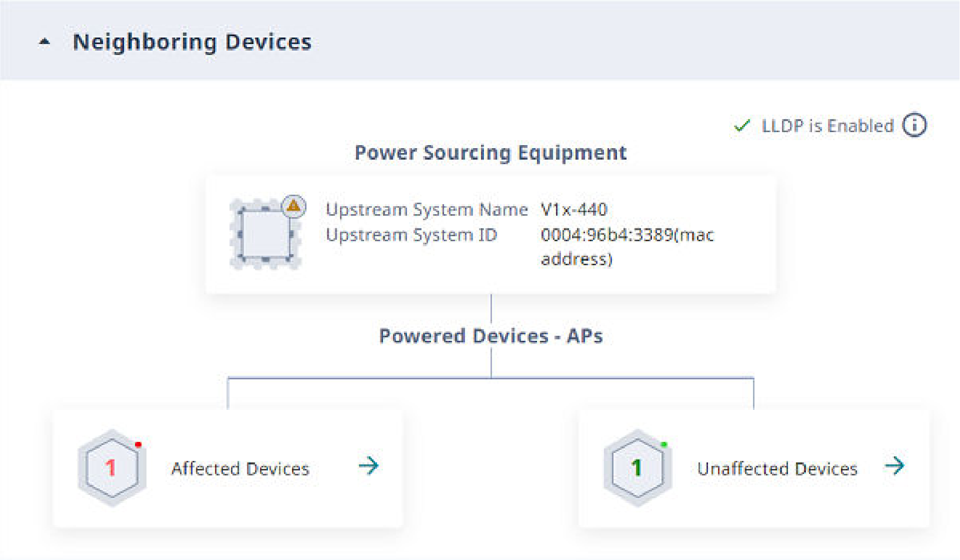


Figure 58: Neighboring Devices

Select **Affected Devices** to view a list of devices affected by the anomaly. ExtremeCloud IQ icons indicate whether the affected device is the current access point, or a neighboring access point.

Select **Unaffected Devices** to view a list of devices not affected by the anomaly.

The device lists include the following details when LLDP is enabled:

- **AP Name** (**Host Name** when LLDP is disabled)
- **AP Model** (**Product Type** when LLDP is disabled
- **AP Interface** (**Interface** when LLDP is disabled
- **PSE Port** (**Port** when LLDP is disabled
- **Last Detected Time** (only for affected devices)

If LLDP is not enabled, ExtremeCloud IQ reports the affected building and the floor, the number of devices affected by the anomaly, and the number of devices not affected.

The device lists include the following details when LLDP is enabled:

- **Host Name**
- **Product Type**
- **Interface**
- **Port**
- **Last Detected Time** (only for affected devices)

Related Topics

Top Anomalies by Type Widget on page 463

Port Efficiency

Port efficiency anomalies identify wired and wireless device interfaces that are not making efficient use of the uplink backhaul connection. This inefficiency might occur in the following scenarios:

- An interface might only use half-duplex communication—only 50% of the available throughput capacity.
- An interface might occasionally flip between full-duplex and half-duplex modes. If this happens too often, it indicates that the interface cannot maintain a full-duplex connection and is considered an anomaly.
- An interface might use an inefficient data rate relative to its capability. Allowable data rates are 10 Mbps, 100 Mbps, 1000 Mbps, 2500 Mbps, 5000 Mbps, and 10000 Mbps. A data rate of 10 Mbps is considered inefficient, while 100 Mbps and higher data rates are considered normal.
- An interface might occasionally flip between data rates, for example, from 2500 Mbps to 1000 Mbps. When this happens on a regular basis, it indicates that there is a wider issue preventing the interface from maintaining the higher data rate.

To display the following graphs, select a site with a **Port Efficiency** anomaly:

- Port Supported Speed and Full/Half Duplex Negotiation
- Number of Changes (Speed or Duplex)

Note

The **Number of Changes** graph appears only for the following anomaly types:

- Wired and wireless duplex mode anomalies
- Wired and wireless data rate inconsistency anomalies
- Anomalies that are a combination of duplex mode or data rate inconsistency and sub-optimal anomalies

Related Topics

Top Anomalies by Type Widget on page 463

Wi-Fi Capacity

Wi-Fi capacity anomalies are related to access point (AP) capacity and airtime usage. You can sort the data by location, severity, and most recent occurrence. This data contains statistical information such as client connection duration and the channel utilization information related to wireless APs. Wi-Fi capacity anomaly reports include the follow information:

- Total time a channel was in use.
- Total time peak usage for the channel was 80% or higher.
- The total number of peak and non-peak intervals (80% or more) recorded on the channel.
- The average number of clients during peak and non-peak intervals.
- The average total TX and RX usage during peak and non-peak intervals.
- The average interference during peak and non-peak intervals.

- An indication of whether or not the channel is anomalous.
- An indication of the severity of the anomaly (low, medium, high, or null).
- Date and time of the analysis (typically over the last 24 hours).
- The Regional Data Center (RDC) from which the data was obtained.

Related Topics

Top Anomalies by Type Widget on page 463

Wi-Fi Efficiency

Wi-Fi efficiency anomalies are related to wireless communication between clients and APs. For more information about packet data anomalies, select a location (site) that has a Wi-Fi efficiency anomaly. You can sort the data by location, severity, and most recent occurrence.

Related Topics

Top Anomalies by Type Widget on page 463

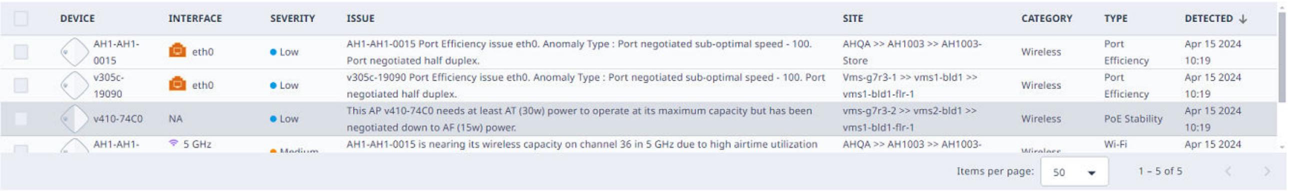
NEW! Anomalies Table

The **Anomalies** table is interactive, and displays the following information for each anomaly:

- **Device**
- **Interface**
- **Severity**
- **Issue**
- **Site**
- **Category**
- **Type**
- **Muted**

> Note
> This column appears only when the **Exclude Muted** toggle is off. The possible values for this column are **Yes** and **No**.

- **Last detected**



□	DEVICE	INTERFACE	SEVERITY	ISSUE	SITE	CATEGORY	TYPE	DETECTED ↓
□	AH1-AH1-0015	eth0	● Low	AH1-AH1-0015 Port Efficiency issue eth0. Anomaly Type : Port negotiated sub-optimal speed - 100. Port negotiated half duplex.	AHQA >> AH1003 >> AH1003-Store	Wireless	Port Efficiency	Apr 15 2024 10:19
□	v305c-19090	eth0	● Low	v305c-19090 Port Efficiency issue eth0. Anomaly Type : Port negotiated sub-optimal speed - 100. Port negotiated half duplex.	Vms-g7r3-1 >> vms1-bld1 >> vms1-bld1-flr-1	Wireless	Port Efficiency	Apr 15 2024 10:19
□	v410-74C0	NA	● Low	This AP v410-74C0 needs at least AT (30w) power to operate at its maximum capacity but has been negotiated down to AF (15w) power.	vms-g7r3-2 >> vms2-bld1 >> vms1-bld1-flr-1	Wireless	PoE Stability	Apr 15 2024 10:19
□	AH1-AH1-	5 GHz	● Medium	AH1-AH1-0015 is nearing its wireless capacity on channel 36 in 5 GHz due to high airtime utilization	AHQA >> AH1003 >> AH1003-	Wireless	Wi-Fi	Apr 15 2024

Items per page: 50 ▾ 1 – 5 of 5 ‹ ›

Figure 59: Anomalies

You can display the anomalies in ascending or descending order by column, except for the **Interface** and **Issue** columns. You can also search for anomalies by device, site, or anomaly type. Use the **Items per page** menu to specify the maximum number of results to show, per page.

To download a CSV file that contains the same information, select ⤓.

Some recurring anomalies are not problematic and you can mute or dismiss them. Select the corresponding check boxes for these anomalies, and then select **...** > **Mute** or **...** > **Dismiss**.

Related Topics

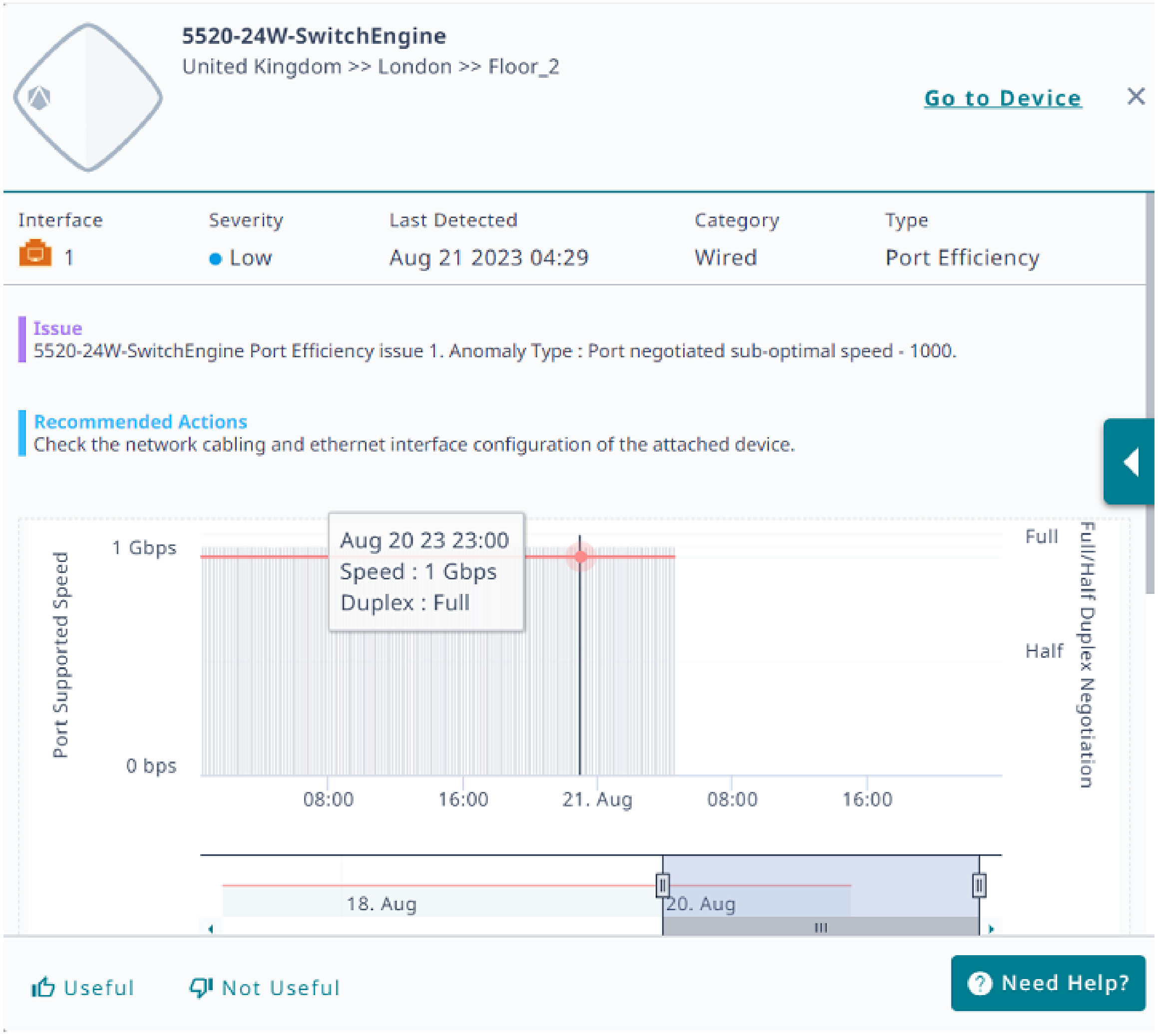
Anomaly Information for a Device on page 471

Anomalies on page 461

NEW! *Anomaly Information for a Device*

Select a device to open a panel with detailed information about the anomaly, including a description of the issue and recommended actions for resolution. To open the page for the device, select **Go to Device**.

The panel graphs display up to 3 days worth of data, including the 48 hours prior to the time stamp for the last detected anomaly.



5520-24W-SwitchEngine

United Kingdom >> London >> Floor_2

Go to Device

Interface	Severity	Last Detected	Category	Type
1	● Low	Aug 21 2023 04:29	Wired	Port Efficiency

Issue

5520-24W-SwitchEngine Port Efficiency issue 1. Anomaly Type : Port negotiated sub-optimal speed - 1000.

Recommended Actions

Check the network cabling and ethernet interface configuration of the attached device.

Aug 20 23 23:00
Speed : 1 Gbps
Duplex : Full

Figure 60: Detailed Information

If you find the detailed information helpful, select **Useful**. If you did not find the information helpful, select **Not Useful**. To get help, select **Need Help**.

Select a bar to see details; select a bar and drag along the timeline to show data for a range of time.

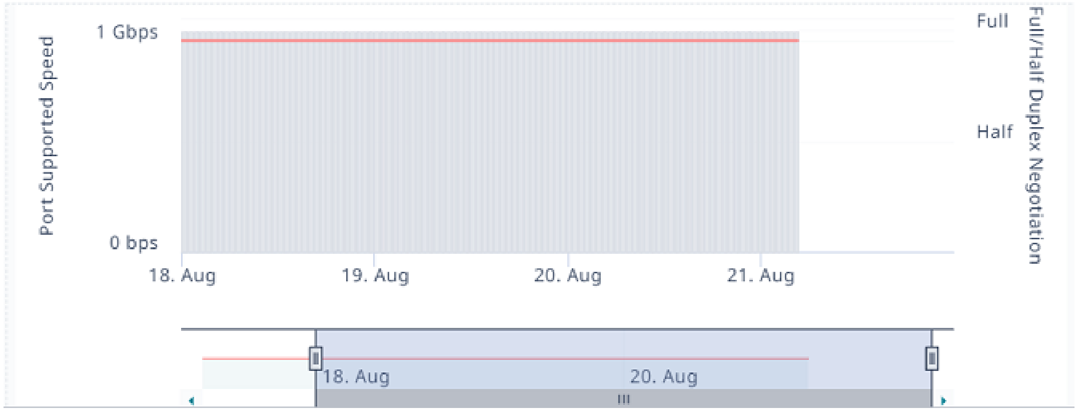


Figure 61: Detailed Information for Specific Days

Related Topics

Anomalies Table on page 470

Submit a Support Ticket

You can trigger ExtremeCloud IQ to open a support ticket if an issue cannot be resolved using the data provided by Insights. ExtremeCloud IQ collects data from the Insight and attaches an output report from the affected device to send to GTAC.

Select **Need Help** and follow the instructions.

Note

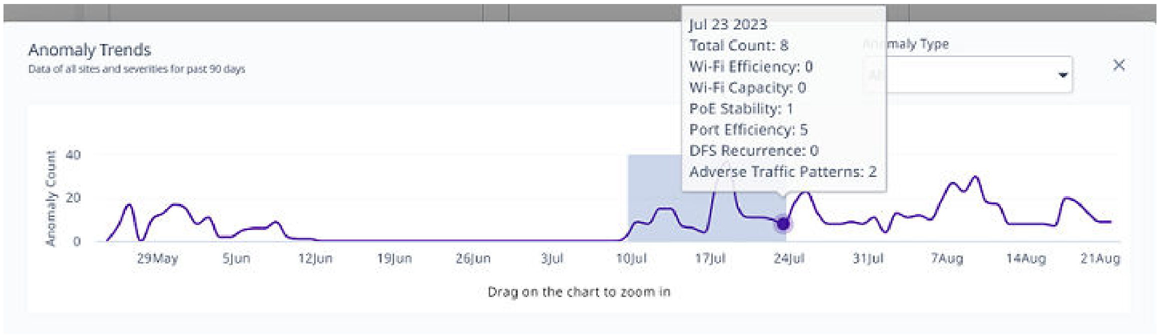
This option is only available for devices covered by an ExtremeWorks maintenance contract.

Anomaly Trends

To open the **Anomaly Trends** graph, go to **CoPilot** > **Anomalies** and select Trends.

Mouse over a bar in the timeline to see the date and types of anomalies identified for that day.

View all anomalies (default) or select a specific **Anomaly Type** from the menu. You can drag along the graph to zoom in on a time period, and then select **Reset Zoom** to zoom back out.



Jul 23 2023
Total Count: 8
Wi-Fi Efficiency: 0
Wi-Fi Capacity: 0
PoE Stability: 1
Port Efficiency: 5
DFS Recurrence: 0
Adverse Traffic Patterns: 2

Figure 62: Anomaly Trends graph

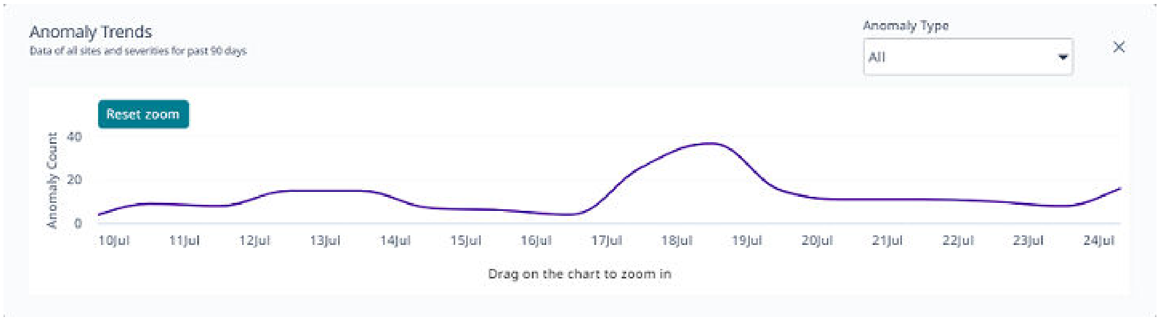


Figure 63: Anomaly Trends graph, zoomed in view

Related Topics

Anomalies on page 461