



Junos[®] OS for EX Series Ethernet Switches

Access Control on EX Series Switches

Release

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Release 15.1
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About the Documentation

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Documentation and Release Notes

To obtain the most current version of all Juniper Networks[®] technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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Supported Platforms

For the features described in this document, the following platforms are supported:

- EX Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:


```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

Documentation Conventions

Table 1 on page xvii defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xvii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
Fixed-width text like this	Represents output that appears on the terminal screen.	<code>user@host> show chassis alarms</code> <code>No alarms currently active</code>
<i>Italic text like this</i>	<ul style="list-style-type: none">Introduces or emphasizes important new terms.Identifies guide names.Identifies RFC and Internet draft titles.	<ul style="list-style-type: none">A policy <i>term</i> is a named structure that defines match conditions and actions.<i>Junos OS CLI User Guide</i>RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none">To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level.The console port is labeled CONSOLE.
< > (angle brackets)	Encloses optional keywords or variables.	stub <default-metric <i>metric</i>>;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Encloses a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none">In the Logical Interfaces box, select All Interfaces.To cancel the configuration, click Cancel.

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

- Online feedback rating system—On any page at the Juniper Networks Technical Documentation site at <http://www.juniper.net/techpubs/index.html>, simply click the stars to rate the content, and use the pop-up form to provide us with information about your experience. Alternately, you can use the online feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>.
- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>

- Download the latest versions of software and review release notes:
<http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications:
<http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

PART 1

Overview

- [Security Features Overview on page 3](#)
- [Access Control Overview on page 7](#)

CHAPTER 1

Security Features Overview

- [Security Features for EX Series Switches Overview on page 3](#)

Security Features for EX Series Switches Overview

Juniper Networks Junos operating system (Junos OS) is a network operating system that has been hardened through the separation of control forwarding and services planes, with each function running in protected memory. The control-plane CPU is protected by rate limiting, routing policy, and firewall filters to ensure switch uptime even under severe attack. Access port security features such as dynamic Address Resolution Protocol (ARP) inspection, DHCP snooping, and MAC limiting are controlled through a single Junos OS CLI command.

Juniper Networks EX Series Ethernet Switches provide the following hardware and software security features:

Console Port—Allows use of the console port to connect to the Routing Engine through an RJ-45 cable. You then use the command-line interface (CLI) to configure the switch.

Out-of-Band Management—A dedicated management Ethernet port on the rear panel allows out-of-band management.

Software Images—All Junos OS images are signed by Juniper Networks certificate authority (CA) with public key infrastructure (PKI).

User Authentication, Authorization, and Accounting (AAA)—Features include:

- User and group accounts with password encryption and authentication.
- Access privilege levels configurable for login classes and user templates.
- RADIUS authentication, TACACS+ authentication, or both, for authenticating users who attempt to access the switch.
- Auditing of configuration changes through system logging or RADIUS/TACACS+.

802.1X Authentication—Provides network access control. Supplicants (hosts) are authenticated when they initially connect to a LAN. Authenticating supplicants before they receive an IP address from a DHCP server prevents unauthorized supplicants from gaining access to the LAN. EX Series switches support Extensible Authentication Protocol (EAP) methods, including EAP-MD5, EAP-TLS, EAP-TTLS, and EAP-PEAP.

Port Security—Access port security features include:

- DHCP snooping—Filters and blocks ingress DHCP server messages on untrusted ports; builds and maintains an IP-address/MAC-address binding database (called the DHCP snooping database).
- Dynamic ARP inspection (DAI)—Prevents ARP spoofing attacks. ARP requests and replies are compared against entries in the DHCP snooping database, and filtering decisions are made based on the results of those comparisons.
- MAC limiting—Protects against flooding of the Ethernet switching table.
- MAC move limiting—Detects MAC movement and MAC spoofing on access ports.
- Trusted DHCP server—With a DHCP server on a trusted port, protects against rogue DHCP servers sending leases.
- IP source guard—Mitigates the effects of IP address spoofing attacks on the Ethernet LAN. The source IP address in the packet sent from an untrusted access interface is validated against the source MAC address in the DHCP snooping database. The packet is allowed for further processing if the source IP address to source MAC address binding is valid; if the binding is not valid, the packet is discarded.
- DHCP option 82—Also known as the DHCP relay agent information option. Helps protect the EX Series switch against attacks such as spoofing (forging) of IP addresses and MAC addresses and DHCP IP address starvation. Option 82 provides information about the network location of a DHCP client, and the DHCP server uses this information to implement IP addresses or other parameters for the client.
- Unrestricted proxy ARP—The switch responds to all ARP messages with its own MAC address. Hosts that are connected to the switch's interfaces cannot communicate directly with other hosts. Instead, all communications between hosts go through the switch.
- Restricted proxy ARP—The switch does not respond to an ARP request if the physical networks of the source and target of the ARP request are the same. It does not matter whether the destination host has the same IP address as the incoming interface or a different (remote) IP address. An ARP request for a broadcast address elicits no reply.

Device Security—Storm control permits the switch to monitor unknown unicast and broadcast traffic and drop packets, or shut down, or temporarily disable the interface when a specified traffic level is exceeded, thus preventing packets from proliferating and degrading the LAN. You can enable storm control on access interfaces or trunk interfaces.

Firewall Filters—Allow auditing of various types of security violations, including attempts to access the switch from unauthorized locations. Firewall filters can detect such attempts and create audit log entries when they occur. The filters can also restrict access by limiting traffic to source and destination MAC addresses, specific protocols, or, in combination with policers, to specified data rates to prevent denial of service (DoS) attacks.

Policers—Provide rate-limiting capability to control the amount of traffic that enters an interface, which acts to counter DoS attacks.

Encryption Standards—Supported standards include:

- 128-, 192-, and 256-bit Advanced Encryption Standard (AES)
- 56-bit Data Encryption Standard (DES) and 168-bit 3DES

**Related
Documentation**

- [802.1X for EX Series Switches Overview on page 7](#)
- *Firewall Filters for EX Series Switches Overview*
- *Understanding Port Security*
- *Understanding Proxy ARP on EX Series Switches*
- *Understanding Storm Control on EX Series Switches*
- *Understanding the Use of Policers in Firewall Filters*
- [Understanding Centralized Network Access Control and EX Series Switches on page 29](#)

CHAPTER 2

Access Control Overview

- [802.1X for EX Series Switches Overview on page 7](#)
- [Understanding Authentication on EX Series Switches on page 10](#)
- [Understanding Guest VLANs for 802.1X on EX Series Switches on page 16](#)
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802.1X for EX Series Switches Overview

How 802.1X Authentication Works

802.1X authentication works by using an authenticator port access entity (the switch) to block ingress traffic from a supplicant (end device) at the port until the supplicant's credentials are presented and match on the authentication server (a RADIUS server). When authenticated, the switch stops blocking traffic and opens the port to the supplicant.

The end device is authenticated in *single supplicant* mode, *single-secure supplicant* mode, or *multiple supplicant* mode:

- **single supplicant**—Authenticates only the first end device. All other end devices that connect later to the port are allowed full access without any further authentication. They effectively *piggyback* on the first end device's authentication.
- **single-secure supplicant**—Allows only one end device to connect to the port. No other end device is allowed to connect until the first device logs out.

- multiple supplicant—Allows multiple end devices to connect to the port. Each end device is authenticated individually.

Network access can be further defined by using VLANs and firewall filters, both of which act as filters to separate and match groups of end devices to the areas of the LAN they require. For example, you can configure VLANs to handle different categories of authentication failures depending upon:

- Whether or not the end device is 802.1X-enabled.
- Whether or not MAC RADIUS authentication is configured on the switch interfaces to which the hosts are connected.
- Whether the RADIUS authentication server becomes unavailable or sends a RADIUS access-reject message. See [“Configuring Server Fail Fallback \(CLI Procedure\)” on page 137](#).

802.1X Features Overview

The following 802.1X features are supported on Juniper Networks EX Series Ethernet Switches:

- Guest VLAN—Provides limited access to a LAN, typically only to the Internet, for nonresponsive end devices that are not 802.1X-enabled when MAC RADIUS authentication is not configured on the switch interfaces to which the hosts are connected. Also, a guest VLAN can be used to provide limited access to a LAN for guest users. Typically, the guest VLAN provides access only to the Internet and to other guests' end devices.
- Server-reject VLAN—Provides limited access to a LAN, typically only to the Internet, for responsive end devices that are 802.1X-enabled but that have sent the wrong credentials. If the end device that is authenticated using the server-reject VLAN is an IP phone, voice traffic is not allowed.
- Server-fail VLAN—Provides limited access to a LAN, typically only to the Internet, for 802.1X end devices during a RADIUS server timeout.
- Dynamic VLAN—Enables an end device, after authentication, to be a member of a VLAN dynamically.
- Private VLAN—Enables configuration of 802.1X authentication on interfaces that are members of private VLANs (PVLANS).
- Dynamic changes to a user session—Enables the switch administrator to terminate an already authenticated session. This feature is based on support of the RADIUS Disconnect Message defined in RFC 3576.
- VoIP VLAN—Supports IP telephones. The implementation of a voice VLAN on an IP telephone is vendor-specific. If the phone is 802.1X-enabled, it is authenticated as any other supplicant is. If the phone is not 802.1X-enabled, but has another 802.1X-compatible device connected to its data port, that device is authenticated, and then VoIP traffic can flow to and from the phone (provided that the interface is configured in single supplicant mode and not in single-secure supplicant mode).



NOTE: Configuring a VoIP VLAN on private VLAN (PVLAN) interfaces is not supported.

- **RADIUS accounting**—Sends accounting information to the RADIUS accounting server. Accounting information is sent to the server whenever a subscriber logs in or logs out and whenever a subscriber activates or deactivates a subscription.
- **RADIUS server attributes for 802.1X**—The **Juniper-Switching-Filter** is a vendor-specific attribute (VSA) that can be configured on the RADIUS server to further define a supplicant's access during the 802.1X authentication process. Centrally configuring attributes on the authentication server obviates the need to configure these same attributes in the form of firewall filters on every switch in the LAN to which the supplicant might connect to the LAN. This feature is based on RLI 4583, AAA RADIUS BRAS VSA Support.

The following features are supported to authenticate devices that are not 802.1X-enabled:

- **Static MAC bypass**—Provides a bypass mechanism to authenticate devices that are not 802.1X-enabled (such as printers). Static MAC bypass connects these devices to 802.1X-enabled ports, bypassing 802.1X authentication.
- **MAC RADIUS authentication**—Provides a means to permit hosts that are not 802.1X-enabled to access the LAN. MAC-RADIUS simulates the supplicant functionality of the client device, using the MAC address of the client as username and password.

Related Documentation

- [Understanding Authentication on EX Series Switches on page 10](#)
- [Understanding 802.1X and VoIP on EX Series Switches on page 20](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)
- [Understanding 802.1X and RADIUS Accounting on EX Series Switches on page 16](#)
- [Understanding Guest VLANs for 802.1X on EX Series Switches on page 16](#)
- [Understanding 802.1X and VSAs on EX Series Switches on page 23](#)
- [Understanding Server Fail Fallback and Authentication on EX Series Switches on page 24](#)

Understanding Authentication on EX Series Switches

You can control access to your network through a Juniper Networks EX Series Ethernet Switch by using several different authentication methods—802.1X, MAC RADIUS, or captive portal. Authentication prevents unauthorized devices and users from gaining access to your LAN. For 802.1X and MAC RADIUS authentication, end devices must be authenticated before they receive an IP address from a DHCP server. For captive portal authentication, the switch allows the end devices to acquire an IP address and allows forwarding of DHCP, DNS, and ARP packets.

You can allow an end device to access the network without authentication by configuring a static MAC bypass list and including the MAC address of the end device in the list.

You can configure 802.1X, MAC RADIUS, and captive portal on the same interface and in any combination, except that you cannot configure MAC RADIUS and captive portal on an interface without also configuring 802.1X. If you configure multiple authentication methods on a single interface, the switch falls back to another method if the first method is unsuccessful. For a description of the process flow when multiple authentication methods are configured on an interface, see [“Authentication Process Flow for EX Series Switches” on page 25](#).

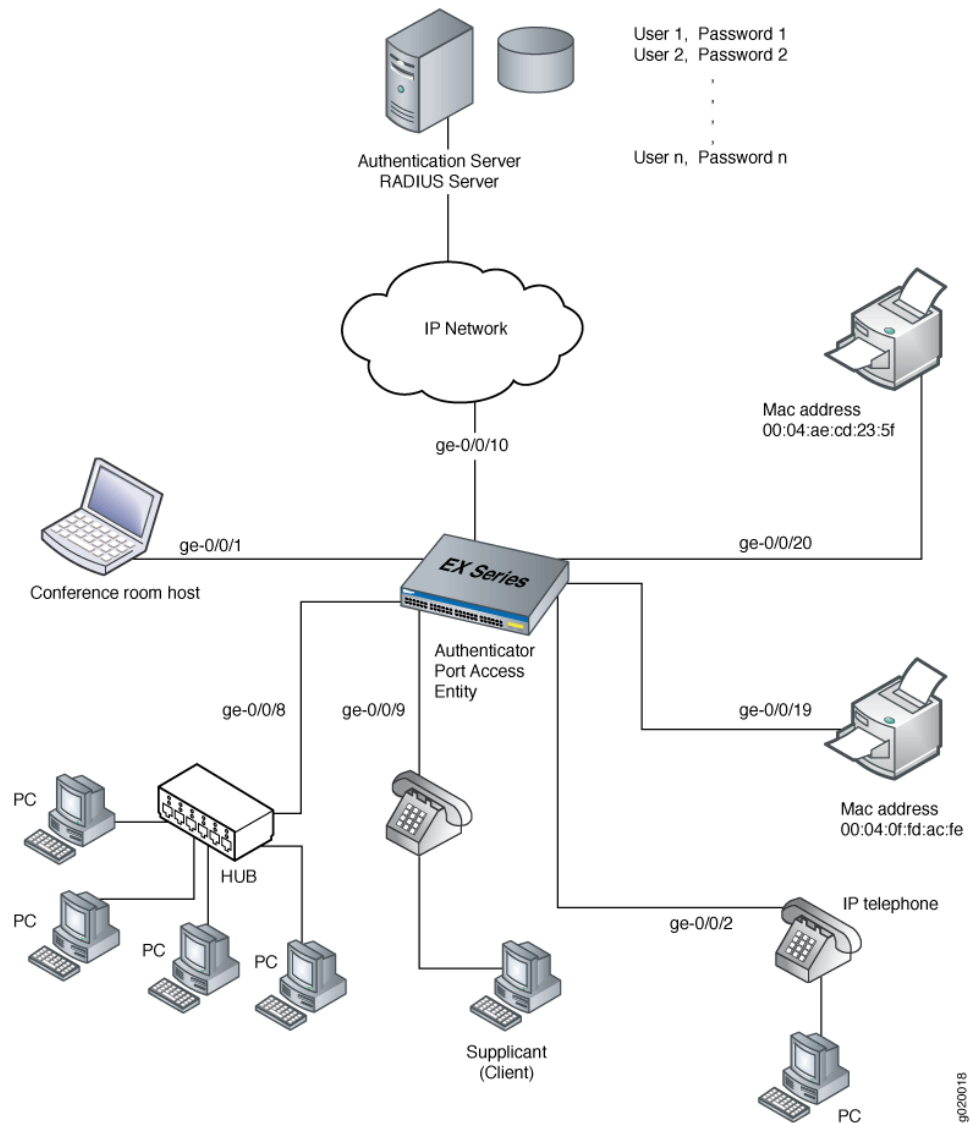
This topic covers:

- [Sample Basic Authentication Topology on page 10](#)
- [802.1X Authentication on page 11](#)
- [MAC RADIUS Authentication on page 13](#)
- [Captive Portal Authentication on page 13](#)
- [Static MAC Bypass of Authentication on page 14](#)
- [Fallback of Authentication Methods on page 15](#)

Sample Basic Authentication Topology

[Figure 1 on page 11](#) illustrates a basic deployment topology for authentication on an EX Series switch:

Figure 1: Example Authentication Topology



The topology contains an EX Series access switch connected to the authentication server on port ge-0/0/10. Interface ge-0/0/1 connects to the conference room host. Interface ge-0/0/8 is connected to four desktop PCs through a hub. Interfaces ge-0/0/9 and ge-0/0/2 are connected to IP phones with integrated hub, to connect the phone and desktop PC to a single port. Interfaces ge-0/0/19 and ge-0/0/20 are connected to printers.

802.1X Authentication

802.1X is an IEEE standard for port-based network access control. It provides an authentication mechanism to allow devices to access a LAN. The 802.1X authentication feature on an EX Series switch is based upon the IEEE 802.1X standard *Port-Based Network Access Control*.

The communication protocol between the end device and the switch is Extensible Authentication Protocol over LAN (EAPoL). EAPoL is a version of EAP designed to work with Ethernet networks. The communication protocol between the authentication server and the switch is RADIUS.

During the authentication process, the switch completes multiple message exchanges between the end device and the authentication server. While 802.1X authentication is in process, only 802.1X and control traffic is allowed. Other traffic, such as DHCP and HTTP, is blocked at the data link layer.



NOTE: You can configure both the maximum number of times an EAPoL request packet is retransmitted and the timeout period between attempts. For information, see [“Configuring 802.1X Interface Settings \(CLI Procedure\)” on page 120](#).

An 802.1X authentication configuration for a LAN contains three basic components:

- *Supplicant* (also called end device)—Supplicant is the IEEE term for an end device that requests to join the network. The end device can be responsive or nonresponsive. A responsive end device is 802.1X-enabled and provides authentication credentials—specifically, a username and password for EAP MD5 or a username and client certificates for EAP-Transport Layer Security (EAP-TLS), EAP-Tunneled Transport Layer Security (EAP-TTLS), and Protected EAP (PEAP).

You can configure a server-reject VLAN to provide limited LAN access for responsive end devices that are 802.1X-enabled but that have sent the wrong credentials. A server-reject VLAN can provide a remedial connection, typically only to the Internet, for these devices. See [“Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients” on page 101](#) for additional information.



NOTE: If the end device that is authenticated using the server-reject VLAN is an IP phone, voice traffic is not allowed.

A nonresponsive end device is not 802.1X-enabled, but it can be authenticated through MAC RADIUS authentication.

- *Authenticator port access entity*—The IEEE term for the authenticator. The EX Series switch is the authenticator, and it controls access by blocking all traffic to and from end devices until they are authenticated.
- *Authentication server*—The authentication server contains the backend database that makes authentication decisions. It contains credential information for each end device that is allowed to connect to the network. The authenticator forwards credentials supplied by the end device to the authentication server. If the credentials forwarded by the authenticator match the credentials in the authentication server database, access is granted. If the credentials forwarded do not match, access is denied. The EX Series switches support RADIUS authentication servers.



NOTE: You cannot configure 802.1X authentication on redundant trunk groups (RTGs). For more information about RTGs, see *Understanding Redundant Trunk Links*.

MAC RADIUS Authentication

You can configure MAC RADIUS authentication on interfaces that are connected to end devices that are not 802.1X-enabled but that you want to allow to access the LAN.

The EAP method supported for MAC RADIUS authentication on EX Series switches is EAP-MD5.

If both 802.1X-enabled end devices and end devices that are not 802.1X-enabled connect to an interface, you can configure both 802.1X and MAC RADIUS authentication methods on the interface. In this case, the switch first attempts to authenticate using 802.1X, and if that method fails, it attempts to authenticate the end device using MAC RADIUS authentication.

If you know that only end devices that are not 802.1X-enabled connect on that interface, you can eliminate the delay that occurs while the switch determines that the end device is not 802.1X-enabled by configuring the **mac-radius restrict** option. When this option is configured, the switch does not attempt to authenticate the end device through 802.1X authentication but instead immediately sends a request to the RADIUS server for authentication of the MAC address of the end device. If the MAC address of that end device is configured as permitted on the RADIUS server, the switch opens LAN access to the end device on the interface to which it is connected.

This option is useful when no other 802.1X authentication methods, such as guest VLAN, are needed on the interface. When you configure **mac-radius restrict** on an interface to eliminate the delay caused when the switch attempts to authenticate the end device through 802.1X, the switch drops all 802.1X packets.

Captive Portal Authentication

Captive portal authentication (hereafter referred to as captive portal) enables you to authenticate users on EX Series switches by redirecting Web browser requests to a login page that requires users to input a username and password before they are allowed access to the network. Captive portal controls network access by requiring users to provide information that is authenticated against a RADIUS server database by using EAP-MD5. You can also use captive portal to display an acceptable-use policy to users before they access your network.

Juniper Networks Junos operating system (Junos OS) for EX Series switches provides a template that enables you to easily design and modify the look of the captive portal login page. You enable specific interfaces for captive portal. The first time an end device connected to a captive portal interface attempts to access a web page, the switch presents the captive portal login page. After the device is successfully authenticated, it is allowed access to the network and to continue to the original page requested.



NOTE: If HTTPS is enabled, HTTP requests are redirected to an HTTPS connection for the captive portal authentication process. After authentication, the end device is returned to the HTTP connection.

If there are end devices that are not HTTP-enabled connected to the captive portal interface, you can allow them to bypass captive portal authentication by adding their MAC addresses to an authentication whitelist.

When the user is authenticated by the RADIUS server, any per-user policies (attributes) associated with that user are also sent to the switch.

Captive portal on EX Series switches has the following limitations:

- Captive portal does not support dynamic assignment of VLANs downloaded from the RADIUS server.
- If the user is idle for more than about 5 minutes and there is no traffic passed, the user must log back in to the captive portal.

Static MAC Bypass of Authentication

You can allow end devices to access the LAN without authentication on a RADIUS server by including their MAC addresses in the static MAC bypass list (also known as the exclusion list).

You might choose to include a device in the bypass list to:

- Allow non-802.1X-enabled devices access to the LAN.
- Eliminate the delay that occurs while the switch determines that a connected device is a non-802.1X-enabled host.

When you configure static MAC on the switch, the MAC address of the end device is first checked in a local database (a user-configured list of MAC addresses). If a match is found, the end device is successfully authenticated and the interface is opened up for it. No further authentication is done for that end device. If a match is not found and 802.1X authentication is enabled on the switch, the switch attempts to authenticate the end device through the RADIUS server.

For each MAC address, you can also configure the VLAN to which the end device is moved or the interfaces on which the host connects.



CAUTION: When you clear the learned MAC addresses from an interface, using the `clear dot1x interface` command, all MAC addresses are cleared, including those in the static MAC bypass list.

Fallback of Authentication Methods

You can configure multiple authentication methods on a single interface to enable fallback to another method if one method fails.

If an interface is configured in multiple supplicant mode, all end devices connecting through the interface must use either captive portal or a combination of 802.1X authentication and MAC RADIUS authentication, captive portal cannot be mixed with 802.1X authentication or MAC RADIUS authentication. Therefore, if there is already an end device on the interface that was authenticated through 802.1X or MAC RADIUS authentication, then additional end devices authenticating do not fall back to captive portal. If only 802.1X authentication or MAC RADIUS authentication is configured, some end devices can be authenticated using 802.1X authentication and others can still be authenticated using MAC RADIUS authentication.

Fallback of authentication methods occurs in the following order:

1. 802.1X authentication—If 802.1X is configured on the interface, the switch sends EAPoL requests to the end device and attempts to authenticate the end device through 802.1X authentication. If the end device does not respond to the EAP requests, the switch checks whether MAC RADIUS authentication is configured on the interface.
2. MAC RADIUS authentication—If MAC RADIUS authentication is configured on the interface, the switch sends the MAC RADIUS address of the end device to the authentication server. If MAC RADIUS authentication is not configured, the switch checks whether captive portal is configured on the interface.
3. Captive portal authentication—If captive portal is configured on the interface, the switch attempts to authenticate the end device by using this method after attempting any other configured authentication methods. If an end device is authenticated on the interface by using captive portal, captive portal becomes the active authentication method on the interface. When captive portal is the active authentication method, the switch falls back to 802.1X authentication if there are no sessions in the authenticated state and if the interface receives an EAP packet.

Related Documentation

- [802.1X for EX Series Switches Overview on page 7](#)
- [Authentication Process Flow for EX Series Switches on page 25](#)
- [Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Configuring MAC RADIUS Authentication \(CLI Procedure\) on page 139](#)
- [Configuring Captive Portal Authentication \(CLI Procedure\) on page 142](#)
- [Configuring Static MAC Bypass of Authentication \(CLI Procedure\) on page 140](#)
- [Controlling Authentication Session Timeouts \(CLI Procedure\) on page 146](#)

Understanding Guest VLANs for 802.1X on EX Series Switches

Guest VLANs can be configured on switches that are using 802.1X authentication to provide limited access—typically only to the Internet—for:

- Corporate guests
- End devices that are not 802.1X-enabled
- Nonresponsive end devices when MAC RADIUS authentication has not been configured on the switch interfaces to which the hosts are connected

A guest VLAN is not used for supplicants that send incorrect credentials. Those supplicants are directed to the server-reject VLAN instead.

For end devices that are not 802.1X-enabled, a guest VLAN can allow limited access to a server from which the non-802.1X-enabled end device can download the supplicant software and attempt authentication again.

A guest VLAN is not used when MAC RADIUS authentication has been configured on the switch interfaces to which the hosts are connected.

Related Documentation

- [Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39](#)
- [Understanding Dynamic VLANs for 802.1X on EX Series Switches on page 23](#)
- [Understanding Authentication on EX Series Switches on page 10](#)

Understanding 802.1X and RADIUS Accounting on EX Series Switches

Juniper Networks EX Series Ethernet Switches support IETF RFC 2866, *RADIUS Accounting*. By configuring RADIUS accounting on an EX Series switch, you can collect statistical data about users logging on to or out of a LAN to be collected and send that data to a RADIUS accounting server. The statistical data gathered can be used to perform general network monitoring, to analyze and track usage patterns, or to bill a user based on the amount of time or type of services accessed.

To configure RADIUS accounting, specify one or more RADIUS accounting servers to receive the statistical data from the switch, and select the type of accounting data to be collected.

The RADIUS accounting server you specify can be the same server used for RADIUS authentication, or it can be a separate RADIUS server. You can specify a list of RADIUS accounting servers. If the primary server (the first one configured) is unavailable, then each RADIUS server in the list is tried in the order in which the servers are configured in Junos OS.

The RADIUS accounting process between a switch and a RADIUS server works like this:

1. A RADIUS accounting server listens for User Datagram Protocol (UDP) packets on a specific port. For example, on FreeRADIUS, the default port is 1813.
2. The switch forwards an *accounting-request* packet containing an event record to the accounting server. For example, a supplicant is authenticated through 802.1X authentication and then connected to the LAN. The event record associated with this supplicant contains an *Acct-Status-Type* attribute whose value indicates the beginning of user service for this supplicant. When the supplicant's session ends, the accounting request will contain an *Acct-Status-Type* attribute value that indicates the end of user service. The RADIUS accounting server records this as a stop-accounting record that contains session information and the length of the session.
3. The RADIUS accounting server logs these events as start-accounting or stop-accounting records. The records are stored in a file. On FreeRADIUS, the file name is the server's address; for example, 122.69.1.250.
4. The accounting server sends an *accounting-response* packet back to the switch confirming that it has received the accounting request.
5. If the switch does not receive a response from the server, it continues to send accounting requests until an accounting response is returned from the accounting server.

The statistics collected through this process can be displayed from the RADIUS server; to see those statistics, the user needs to access the log file configured to receive them.

**Related
Documentation**

- [802.1X for EX Series Switches Overview on page 7](#)
- [Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35](#)
- [Configuring 802.1X RADIUS Accounting \(CLI Procedure\) on page 124](#)

Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches

EX Series Ethernet Switches use Link Layer Discovery Protocol (LLDP) and Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) to learn and distribute device information on network links. The information enables the switch to quickly identify a variety of devices, resulting in a LAN that interoperates smoothly and efficiently.

LLDP-capable devices transmit information in type, length, and value (TLV) messages to neighbor devices. Device information can include information such as chassis and port identification and system name and system capabilities. The TLVs leverage this information from parameters that have already been configured in the Junos operating system (Junos OS).

LLDP-MED goes one step further than LLDP, exchanging IP-telephony messages between the switch and the IP telephone.



NOTE: If your IP telephone is configured for VoIP (VoIP), the switch automatically detects the configuration and assigns the telephone to the voice VLAN. The implementation of a voice VLAN on an IP telephone is vendor-specific. Consult the documentation that came with your IP telephone for instructions on configuring a voice VLAN. For example, on an Avaya phone, you can ensure that the phone gets the correct VoIP VLAN ID even in the absence of LLDP-MED by enabling DHCP option 176.

LLDP and LLDP-MED also provide PoE power management capabilities. LLDP power negotiation allows the switch to manage PoE power by negotiating with LLDP-enabled powered devices to dynamically allocate PoE power as needed. LLDP power priority allows an LLDP-enabled powered device to set the PoE power priority on the switch interface to which it connects.

The switch also uses these protocols to ensure that voice traffic gets tagged and prioritized with the correct values at the source itself. For example, 802.1p CoS and 802.1Q tag information can be sent to the IP telephone.

TLVs fall into the following categories: basic management TLVs, organizationally defined TLVs, and LLDP-MED related TLVs.

EX Series switches support the following basic management TLVs:

- Chassis ID—The MAC address associated with the local system.



NOTE: The Chassis ID TLV has a subtype for the network address family. LLDP frames are validated only if this subtype has a value of 1 (IPv4) or 2 (IPv6). For any other value, the transmitting device is detected by LLDP as a neighbor and displayed in the output of the `show lldp neighbors` command, but is not assigned to the VLAN.

- Port ID—The port identification for the specified port in the local system.
- Port Description—Textual description of the interface or the logical unit. The description for the logical unit is used, if available; otherwise, the Port Description TLV contains the description configured on the physical interface. For example, LAG member interfaces do not contain a logical unit; therefore, only the description configured on the physical interface can be used.
- System Name—The user-configured name of the local system. The system name can be a maximum of 256 characters.
- System Description—The system description that contains information about the software and current image running on the system. This information is not configurable, but taken from the software.

- **System Capabilities**—The primary function performed by the system. The capabilities that the system supports—for example, bridge or router. This information is not configurable, but based on the model of the product.
- **Management Address**—The IPv4 or IPv6 management address of the local system.

EX Series switches support the following organizationally defined TLVs:

- **Power via MDI**—A TLV that advertises MDI (media dependent interface) power support, PSE (power sourcing equipment) power pair, and power class information.
- **MAC/PHY Configuration Status**—A TLV that advertises information about the physical interface, such as autonegotiation status and support and MAU (medium attachment unit) type. The information is not configurable, but based on the physical interface structure.



NOTE: The MAC/PHY Configuration Status TLV has a subtype for the PMD Auto-Negotiation Advertised Capability field. This field contains a value of **other or unknown** if the LLDP packet is transmitted from a 10-gigabit SFP+ port.

- **Link Aggregation**—A TLV that advertises whether the port is aggregated and its aggregated port ID.
- **Maximum Frame Size**—A TLV that advertises the maximum transmission unit (MTU) of the interface sending LLDP frames.
- **Port Vlan**—A TLV that advertises the VLAN name configured on the interface.

EX Series switches support the following LLDP-MED TLVs:

- **LLDP MED Capabilities**—A TLV that advertises the primary function of the port. The values of capabilities range from 0 through 15:
 - 0—Capabilities
 - 1—Network Policy
 - 2—Location Identification
 - 3—Extended Power via MDI-PSE
 - 4—Inventory
 - 5-15—Reserved
- **LLDP-MED Device Class Values**—Categorizes media endpoint devices into classes:
 - 0—Class not defined
 - 1—Class 1 (generic endpoints). This class definition is applicable to all endpoints that require the base LLDP discovery services.
 - 2—Class 2 (media endpoints). This class includes endpoints that have IP media capabilities.

- 3—Class 3 (communication endpoints). Devices acting as end user communication appliances
- 4—Network Connectivity Device
- 5-255—Reserved
- Network Policy—A TLV that advertises the port VLAN configuration and associated Layer 2 and Layer 3 attributes. Attributes include the policy identifier, application types, such as voice or streaming video, 802.1Q VLAN tagging, and 802.1p priority bits and Diffserv code points.
- Endpoint Location— A TLV that advertises the physical location of the endpoint.
- Extended Power via MDI— A TLV that advertises the power type, power source, power priority, and power value of the port. It is the responsibility of the PSE device (network connectivity device) to advertise the power priority on a port.

Related Documentation

- *Understanding Layer 2 Protocol Tunneling on EX Series Switches*
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Configuring LLDP \(CLI Procedure\) on page 128](#)
- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)
- *Understanding PoE on EX Series Switches*

Understanding 802.1X and VoIP on EX Series Switches

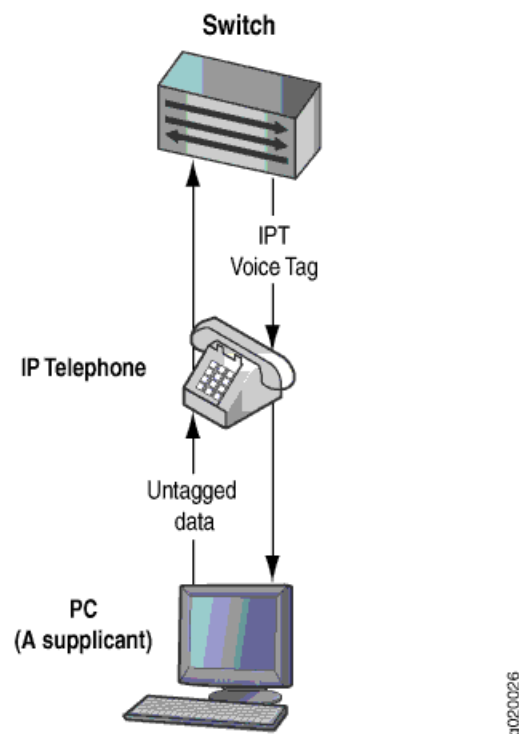
When you use VoIP, you can connect IP telephones to the switch and configure IEEE 802.1X authentication for 802.1X-compatible IP telephones. The 802.1X authentication provides network edge security, protecting Ethernet LANs from unauthorized user access.

VoIP is a protocol used for the transmission of voice through packet-switched networks. VoIP transmits voice calls by using a network connection instead of an analog phone line.

When VoIP is used with 802.1X, the RADIUS server authenticates the phone, and Link Layer Discovery Protocol—Media Endpoint Discovery (LLDP-MED) provides the class-of-service (CoS) parameters to the phone.

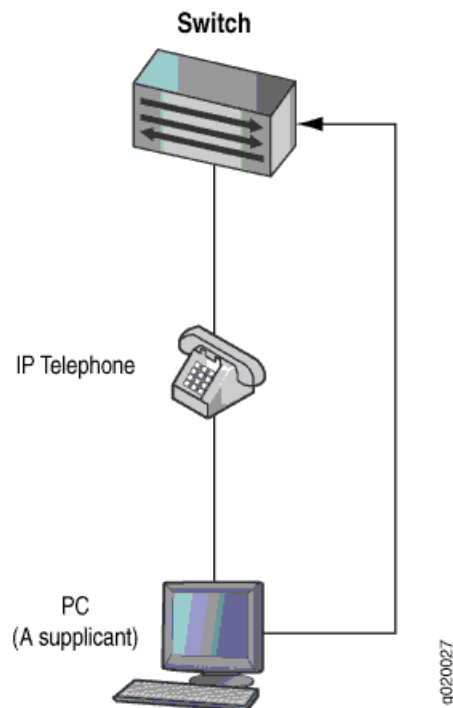
You can configure 802.1X authentication to work with VoIP in multiple supplicant or single supplicant mode. In *multiple supplicant* mode, the 802.1X process allows multiple supplicants to connect to the interface. Each supplicant is authenticated individually. For an example of a VoIP multiple supplicant topology, see [Figure 2 on page 21](#).

Figure 2: VoIP Multiple Supplicant Topology



If an 802.1X-compatible IP telephone does not have an 802.1X host but has another 802.1X-compatible device connected to its data port, you can connect the phone to an interface in single supplicant mode. In *single supplicant* mode, the 802.1X process authenticates only the first supplicant. All other supplicants who connect later to the interface are allowed full access without any further authentication. They effectively “piggyback” on the first supplicant’s authentication. For an example of a VoIP single supplicant topology, see [Figure 3 on page 22](#).

Figure 3: VoIP Single Supplicant Topology



If an IP telephone does not support 802.1X, you can configure VoIP to bypass 802.1X and LLDP-MED and have the packets forwarded to a VoIP VLAN.

Related Documentation

- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Example: Configuring VoIP on an EX Series Switch Without Including 802.1X Authentication on page 62](#)
- [Example: Configuring VoIP on an EX Series Switch Without Including LLDP-MED Support on page 58](#)

Understanding 802.1X and VSAs on EX Series Switches

EX Series Ethernet Switches support the configuration of RADIUS server attributes specific to Juniper Networks. These attributes are known as vendor-specific attributes (VSAs) and are described in RFC 2138, *Remote Authentication Dial In User Service* (RADIUS). Through VSAs, you can configure port-filtering attributes on the RADIUS server. VSAs are clear-text fields sent from the RADIUS server to the switch as a result of the 802.1X authentication success or failure. The 802.1X authentication prevents unauthorized user access by blocking a supplicant at the port until the supplicant is authenticated by the RADIUS server. The VSA attributes are interpreted by the switch during authentication, and the switch takes appropriate actions. Implementing port-filtering attributes with 802.1X authentication on the RADIUS server provides a central location for controlling LAN access for supplicants.

These port-filtering attributes specific to Juniper Networks are encapsulated in a RADIUS server VSA with the vendor ID set to the Juniper Networks ID number, 2636.

Besides configuring port-filtering attributes through VSAs, you can apply a port firewall filter that has already been configured on the switch directly to the RADIUS server. Like port-filtering attributes, the filter is applied during the 802.1X authentication process, and its actions are applied at the switch port. Adding a port firewall filter to a RADIUS server eliminates the need to add the filter to multiple ports and switches. For more information, see [“Example: Applying a Firewall Filter to 802.1X-Authenticated Supplicants by Using RADIUS Server Attributes on an EX Series Switch” on page 85](#).

VSAs are supported only for 802.1X single supplicant configurations and multiple supplicant configurations.

Related Documentation

- [Understanding Authentication on EX Series Switches on page 10](#)
- [Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44](#)
- [Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125](#)
- [Configuring Firewall Filters \(CLI Procedure\)](#)
- [Juniper-Switching-Filter VSA Match Conditions and Actions on page 135](#)

Understanding Dynamic VLANs for 802.1X on EX Series Switches

Dynamic VLANs, in conjunction with the 802.1X authentication process, provide secure access to the LAN on a single port for end devices belonging to different VLANs.

When this feature is configured on the RADIUS server, an end device or user authenticating on the RADIUS server is assigned to the VLAN configured for it. The end device or user becomes a member of a VLAN dynamically after successful 802.1X authentication. For information about configuring dynamic VLANs on your RADIUS server, see the documentation for your RADIUS server.

Successful authentication requires that the VLAN ID or VLAN name exist on the switch and match the VLAN ID or VLAN name sent by the RADIUS server during authentication. If neither exists, the end device is unauthenticated. If a guest VLAN is established, the unauthenticated end device is automatically moved to the guest VLAN.

**Related
Documentation**

- [Understanding Guest VLANs for 802.1X on EX Series Switches on page 16](#)
- [Example: Configuring MAC RADIUS Authentication on an EX Series Switch on page 79](#)
- [Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39](#)

Understanding Server Fail Fallback and Authentication on EX Series Switches

Server fail fallback enables you to specify how end devices connected to the switch are supported if the RADIUS authentication server becomes unavailable or sends a RADIUS access-reject message.

Juniper Networks EX Series Ethernet Switches use authentication to implement access control in an enterprise network. If 802.1X, MAC RADIUS, or captive portal authentication is configured on the switch, end devices are evaluated at the initial connection by an authentication (RADIUS) server. If the end device is configured on the authentication server, the device is granted access to the LAN and the EX Series switch opens the interface to permit access.

A RADIUS server timeout occurs if no RADIUS authentication servers are reachable when an end device logs in and attempts to access the LAN. Server fail fallback enables you to specify one of four actions to be taken for end devices awaiting authentication when the server is timed out:

- *Permit* authentication, allowing traffic to flow from the end device through the interface as if the end device were successfully authenticated by the RADIUS server.
- *Deny* authentication, preventing traffic from flowing from the end device through the interface. This is the default.
- *Move* the end device to a specified VLAN if the switch receives a RADIUS access-reject message. The configured VLAN name overrides any attributes sent by the server. (The VLAN must already exist on the switch.)
- *Sustain* authenticated end devices that already have LAN access and *deny* unauthenticated end devices. If the RADIUS servers time out during reauthentication, previously authenticated end devices are reauthenticated and new users are denied LAN access.

Server fail fallback is triggered most often during reauthentication when the already configured and in-use RADIUS server becomes inaccessible. However, server fail fallback can also be triggered by an end device's first attempt at authentication through the RADIUS server.

Server fail fallback enables you to specify that an end device be moved to a specified VLAN if the switch receives a RADIUS access-reject message. The configured VLAN name overrides any attributes sent by the server.

**Related
Documentation**

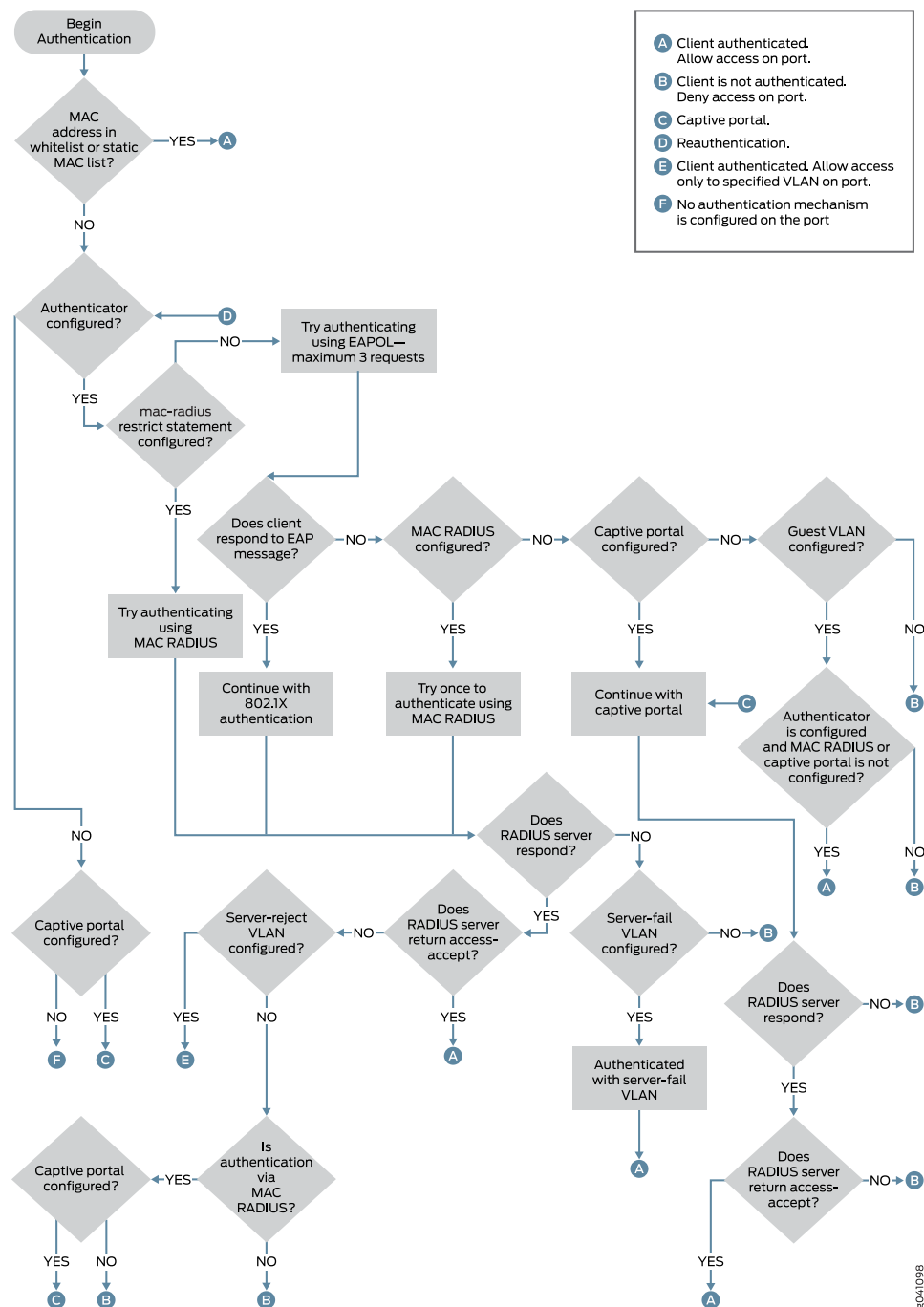
- [802.1X for EX Series Switches Overview on page 7](#)
- [Example: Configuring 802.1X Authentication Options When the RADIUS Server Is Unavailable to an EX Series Switch on page 73](#)
- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
- [Configuring Server Fail Fallback \(CLI Procedure\) on page 137](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)

Authentication Process Flow for EX Series Switches

You can control access to your network through an EX Series switch by using several different authentication methods—including 802.1X, MAC RADIUS, or captive portal.

[Figure 4 on page 26](#) illustrates the authentication process:

Figure 4: Authentication Process Flow for an EX Series Switch

**Related Documentation**

- [Understanding Authentication on EX Series Switches on page 10](#)
- [Understanding Server Fail Fallback and Authentication on EX Series Switches on page 24](#)

- [Understanding Guest VLANs for 802.1X on EX Series Switches on page 16](#)
- [Understanding Dynamic VLANs for 802.1X on EX Series Switches on page 23](#)
- [Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96](#)

Understanding Authentication Session Timeout

You can specify authentication session timeout values for captive portal authentication sessions and 802.1X and MAC RADIUS authentication sessions.

For captive portal authentication, the duration of the session depends on the value configured for the **session-expiry** statement. The remainder of this topic pertains only to 802.1X and MAC RADIUS authentication sessions.

For 802.1X and MAC RADIUS authentication sessions, the duration of the session before timeout depends on the interval value of the **reauthentication** statement. The authentication session might also end when the MAC table aging time expires because, unless you configure it not to, the session is removed from the authentication session table when the MAC address is removed from the Ethernet switching table.

Information about each 802.1X and MAC RADIUS authentication session—including the associated interfaces and VLANs for each MAC address that is authenticated by 802.1X authentication or MAC RADIUS authentication—is stored in the authentication session table. The authentication session table is tied to the Ethernet switching table (also called the MAC table). Each time the switch detects traffic from a MAC address, it updates the timestamp for that network node in the Ethernet switching table. A timer on the switch periodically checks the timestamp and if its value exceeds the user-configured **mac-table-aging-time** value, the switch removes the MAC address from the Ethernet switching table. When a MAC address ages out of the Ethernet switching table, the entry for that MAC address is also removed from the authentication database, with the result that the session ends.

You can control variables affecting timeout of authentication sessions in the following ways:

- Set the authentication session timeout on all interfaces or on selected interfaces using the **reauthentication** statement.
- Disassociate the authentication session table from the Ethernet switching table by using the **no-mac-table-binding** statement. This setting prevents the termination of the authentication session when the associated MAC address ages out of the Ethernet switching table.

Related Documentation

- [Understanding Authentication on EX Series Switches on page 10](#)
- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
- [Controlling Authentication Session Timeouts \(CLI Procedure\) on page 146](#)
- [Configuring MAC Table Aging \(CLI Procedure\)](#)

Understanding NetBIOS Snooping

NetBIOS snooping allows Juniper Networks EX Series Ethernet Switches to discover NetBIOS hosts that are connected to the switch.

- [What Is a NetBIOS Name? on page 28](#)
- [How NetBIOS Snooping Works on page 28](#)

What Is a NetBIOS Name?

A NetBIOS name is a key element in communications between NetBIOS resources. A NetBIOS name identifies a NetBIOS resource on the network. A NetBIOS name is either a unique (exclusive) name or a group (nonexclusive) name. When a NetBIOS resource communicates with one other NetBIOS resource, a unique name is used in that communication. When a NetBIOS resource communicates with multiple resources, a group name is used.

The NetBIOS name of each NetBIOS resource is stored on the NetBIOS Name Server (NBNS). The NetBIOS name of a NetBIOS resource is mapped to its IP address.

A NetBIOS name is a 16-byte address. The first 15 bytes contain the name and the last byte contains the name type.

The NetBIOS name service is supported over UDP port 137.

How NetBIOS Snooping Works

You can enable NetBIOS snooping on the switch so that the switch can identify NetBIOS resources that are connected to it.

When a host connected to the switch initializes itself, it attempts to register its NetBIOS name by sending a NetBIOS name registration request message. The host can opt for either a unique or a group NetBIOS name. For a unique NetBIOS name, the host either broadcasts a NetBIOS name query message on the local network or unicasts it to the NBNS to check whether the requested name is already being used by another host. If so, the host that previously registered the name or the NBNS responds with a negative name registration response. If the host receives no negative response, it broadcasts the NetBIOS name registration packet to confirm the name. For a NetBIOS group name, the host sends a NetBIOS name registration packet, which generates no responses from other hosts because multiple hosts can use the same group name at the same time.

The NetBIOS snooping-enabled switch extracts the host details from the NetBIOS name registration packet and stores the details in the LLDP neighbor database.

Related Documentation

- [Configuring NetBIOS Snooping \(CLI Procedure\) on page 147](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

Understanding Centralized Network Access Control and EX Series Switches

Network access control (NAC) allows you to control who is admitted to the network and what resources—servers, applications, and stored data—those users are allowed to access. These controls include:

- Authentication—Pre-admission controls
- Authorization—Post-admission controls

You can use different methods to implement NAC on Juniper Networks EX Series Ethernet Switches.

This topic describes:

- [NAC Using Any RADIUS Server and Access Polices Defined on the Local Switch on page 29](#)
- [Centralized NAC Using Junos Pulse Access Control Service on page 29](#)
- [Captive Portal Authentication on page 30](#)

NAC Using Any RADIUS Server and Access Polices Defined on the Local Switch

For pre-admission controls, you can use the switch in combination with any RADIUS server as the *authentication server*. For additional information, see [“Understanding Authentication on EX Series Switches” on page 10](#).

For post-admission controls, you can configure firewall filters to limit access to specific resources. For additional information, see [Firewall Filters for EX Series Switches Overview](#).

Centralized NAC Using Junos Pulse Access Control Service

You can use Junos Pulse Access Control Service and the switches for a centralized end-to-end NAC system, including both pre-admission *authentication* and post-admission *authorization*.

When you configure such a system, the Juniper Networks MAG Series Junos Pulse Gateways or the Juniper Networks IC Series Unified Access Control Appliances NAC device functions as the authentication server. For messages relating to IEEE 802.1X and MAC RADIUS authentication, the NAC device communicates with the switch using the RADIUS protocol.

The Access Control Service also performs additional functions. It eliminates the need to configure firewall filters on each switch. Instead, you define resource access policies centrally on the NAC device. This centralized method is particularly helpful when you have multiple switches in your network.

The resource access policy on the Access Control Service defines which network resources are allowed and denied for a user, based upon the user's role. The NAC device distributes these policies to all connected switches. The NAC device thus functions as a centralized policy management server. For messages relating to access policies, the NAC device communicates with the switch using the Junos UAC Enforcer Protocol (JUEP). The switch

converts the resource access policies into filter definitions and applies these to the appropriate port.



NOTE: With this solution, the EX Series switch serves as an *Infranet Enforcer*, that is, a policy enforcement point for the Access Control Service. The Access Control Service sends auth table entries and resource access policies when an endpoint successfully completes 802.1X authentication or MAC authentication (unmanaged devices). Access for any endpoint is governed by the resource access policies that you configure on the Access Control Service. Because resource access policies are employed, firewall filters are not required for the switch configuration.

This integrated solution of Access Control Service and EX Series switches is easier to implement and much more efficient than previous versions of Access Control Service and the switches. As soon the switch connects to the MAG Series or IC Series NAC device, the Access Control Service pushes the role-based policies to the switch via JUEP. This enables the user to access the network more quickly than previous implementations, because the policy is already available on the switch and does not need to be pushed from the centralized device at the time of user authentication. Moreover, the policy push happens only once, which utilizes network bandwidth efficiently and makes this implementation suitable for scaled environments.

If you change policies, the Access Control Service automatically pushes the updated policies to the connected switch. The switch applies the policies dynamically without taking users through another authentication transaction.



NOTE: Do not configure firewall filters on the switch and do not use RADIUS server attributes for firewall filters if you are configuring the switch to use the Access Control Service. Instead, specify or deny access to resources by using the Access Control Service resource access policies. See *Configuring Resource Access Policies*.

You create policies on the NAC device's administrative interface to control access to resources and services. Access is based on successful authentication, the user's assigned role, and the security compliance of the endpoint device. For example, you can provide full access to protected resources employee role and limited access for a contractor role.

See *About Resource Access Policies* for additional information.

Captive Portal Authentication

Captive portal authentication allows you to authenticate users on the switches by redirecting Web browser requests to a login page that requires users to input a username and password before they are allowed access to the network. The details of configuring captive portal authentication differ depending on whether you are using the Access Control Service:

- If you have connected the switch to the Access Control Service, use the Access Control Service NAC device as an external captive portal server for redirecting Web browser requests. When users try to access a protected network resource that is connected to the switch, the user must first sign in to the Access Control Service for authentication and endpoint security checking. The captive portal redirects the user to a login page located on the Access Control Service. When the sign-in page for the Access Control Service is displayed, the user signs in and the Access Control Service examines the endpoint for compliance with security policies. If the endpoint passes the security check, access is granted to the protected resource.

See [“Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service \(CLI Procedure\)” on page 150](#). You can use the same Access Control Service as the external captive portal server for more than one switch. See *About Sign-In Policies*.

- If you are not using the Access Control Service, you can use captive portal to redirect users to a login page that you configure on the local switch. See [“Designing a Captive Portal Authentication Login Page on an EX Series Switch” on page 144](#) for information about designing a login page on your switch.

**Related
Documentation**

- *Junos Pulse Access Control Service and Using the EX Series Switch as an Infranet Enforcer*

PART 2

Configuration

- [Configuration Examples on page 35](#)
- [Configuration Tasks on page 119](#)
- [Configuration Statements on page 153](#)

CHAPTER 3

Configuration Examples

- [Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35](#)
- [Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39](#)
- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Example: Configuring VoIP on an EX Series Switch Without Including LLDP-MED Support on page 58](#)
- [Example: Configuring VoIP on an EX Series Switch Without Including 802.1X Authentication on page 62](#)
- [Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69](#)
- [Example: Configuring 802.1X Authentication Options When the RADIUS Server Is Unavailable to an EX Series Switch on page 73](#)
- [Example: Configuring MAC RADIUS Authentication on an EX Series Switch on page 79](#)
- [Example: Applying a Firewall Filter to 802.1X-Authenticated Supplicants by Using RADIUS Server Attributes on an EX Series Switch on page 85](#)
- [Example: Applying Firewall Filters to Multiple Supplicants on Interfaces Enabled for 802.1X or MAC RADIUS Authentication on page 91](#)
- [Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96](#)
- [Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients on page 101](#)
- [Example: Configuring Centralized Access Control to Network Resources, with an EX Series Switch Connected to Junos Pulse Access Control Service on page 105](#)

Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch

802.1X is the IEEE standard for port-based network access control (PNAC). You use 802.1X to control network access. Only users and devices providing credentials that have been verified against a user database are allowed access to the network. You can use a RADIUS server as the user database for 802.1X authentication, as well as for MAC RADIUS authentication.

This example describes how to connect a RADIUS server to an EX Series switch, and configure it for 802.1X:

- [Requirements on page 36](#)
- [Overview and Topology on page 36](#)
- [Configuration on page 38](#)
- [Verification on page 39](#)

Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.0 or later for EX Series switches
- One EX Series switch acting as an authenticator port access entity (PAE). The ports on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- One RADIUS authentication server that supports 802.1X. The authentication server acts as the backend database and contains credential information for hosts (supplicants) that have permission to connect to the network.

Before you connect the server to the switch, be sure you have:

- Performed basic bridging and VLAN configuration on the switch. See the documentation that describes setting up basic bridging and a VLAN for your switch. If you are using a switch that supports the Enhanced Layer 2 Software (ELS) configuration style, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*. For all other switches, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.



NOTE: For more about ELS, see *Getting Started with Enhanced Layer 2 Software*.

- Configured users on the RADIUS authentication server.

Overview and Topology

The EX Series switch acts as an authenticator PAE. It blocks all traffic and acts as a control gate until the supplicant (client) is authenticated by the server. All other users and devices are denied access.

[Figure 5 on page 37](#) shows one EX4200 switch that is connected to the devices listed in [Table 3 on page 37](#).

Figure 5: Topology for Configuration

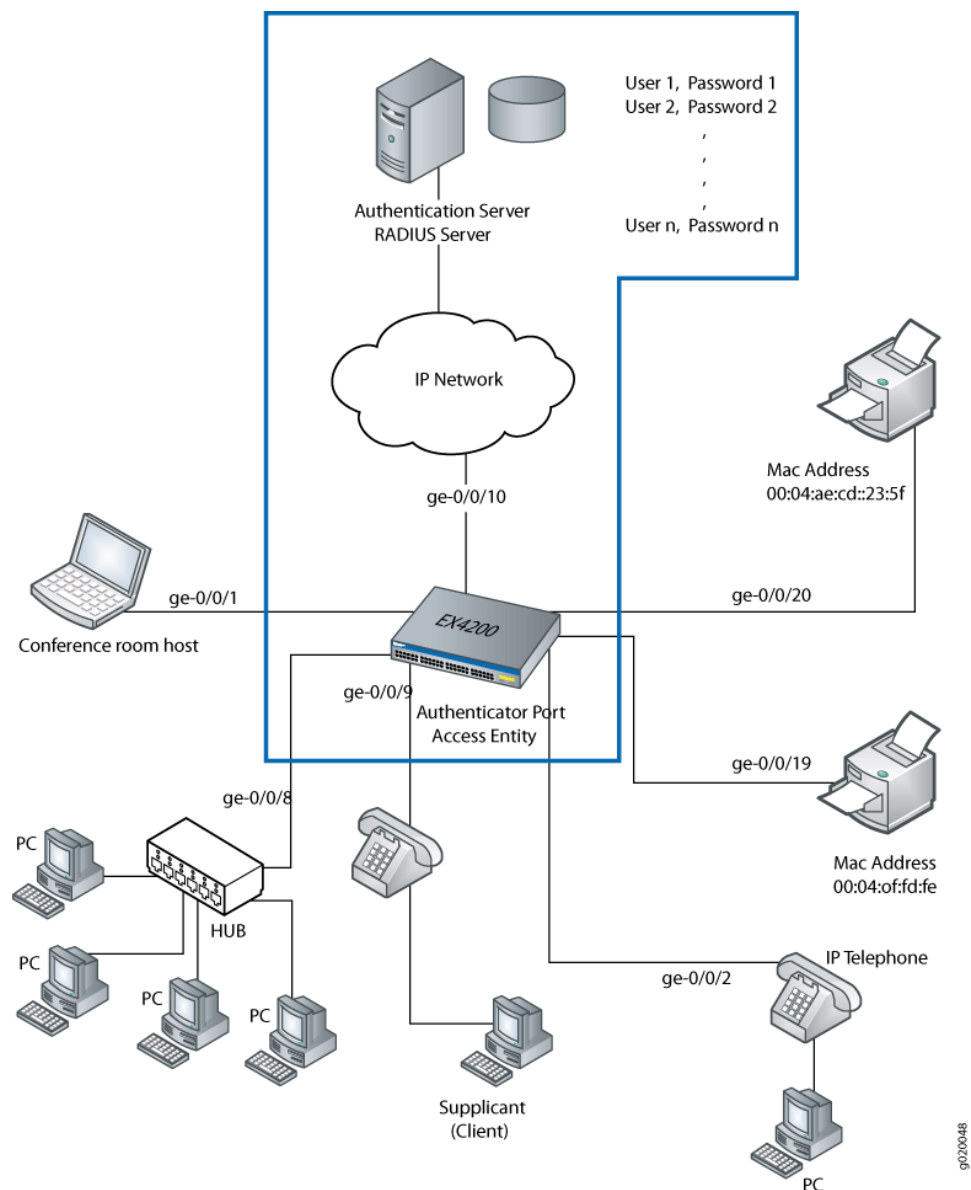


Table 3: Components of the Topology

Property	Settings
Switch hardware	EX4200 access switch, 24 Gigabit Ethernet ports: 8 PoE ports (ge-0/0/0 through ge-0/0/7) and 16 non-PoE ports (ge-0/0/8 through ge-0/0/23)
VLAN name	default
One RADIUS server	Backend database with an address 10.0.0.100 connected to the switch at port ge-0/0/10

In this example, connect the RADIUS server to access port ge-0/0/10 on the EX4200 switch. The switch acts as the authenticator and forwards credentials from the supplicant to the user database on the RADIUS server. You must configure connectivity between the EX4200 and the RADIUS server by specifying the address of the server and configuring the secret password. This information is configured in an access profile on the switch.



NOTE: For more information about authentication, authorization, and accounting (AAA) services, see the [Junos OS System Basics Configuration Guide](#).

Configuration

CLI Quick Configuration

To quickly connect the RADIUS server to the switch, copy the following commands and paste them into the switch terminal window:

```
[edit]
set access radius-server 10.0.0.100 secret juniper
set access radius-server 10.0.0.200 secret juniper
set access profile profile1 authentication-order radius
set access profile profile1 radius authentication-server [10.0.0.100 10.0.0.200]
```

Step-by-Step Procedure

To connect the RADIUS server to the switch:

1. Define the address of the servers, and configure the secret password. The secret password on the switch must match the secret password on the server:


```
[edit]
user@switch# set access radius-server 10.0.0.100 secret juniper
user@switch# set access radius-server 10.0.0.200 secret juniper
```
2. Configure the authentication order, making **radius** the first method of authentication:


```
[edit]
user@switch# set access profile profile1 authentication-order radius
```
3. Configure a list of server IP addresses to be tried in sequential order to authenticate the supplicant:


```
[edit]
user@switch# set access profile profile1 radius authentication-server [10.0.0.100 10.0.0.200]
```

Results Display the results of the configuration:

```
user@switch> show configuration access
radius-server {
  10.0.0.100
  port 1812;
  secret "$9$qPT3ApBSrv69rvWLVb.P5"; ## SECRET-DATA
}
profile profile1{
  authentication-order radius;
  radius {
    authentication-server 10.0.0.100 10.0.0.200;
  }
}
```

Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verify That the Switch and RADIUS Server Are Properly Connected on page 39](#)

Verify That the Switch and RADIUS Server Are Properly Connected

Purpose	Verify that the RADIUS server is connected to the switch on the specified port.
Action	<p>Ping the RADIUS server to verify the connection between the switch and the server:</p> <pre>user@switch> ping 10.0.0.100 PING 10.0.0.100 (10.0.0.100): 56 data bytes 64 bytes from 10.93.15.218: icmp_seq=0 ttl=64 time=9.734 ms 64 bytes from 10.93.15.218: icmp_seq=1 ttl=64 time=0.228 ms</pre>
Meaning	ICMP echo request packets are sent from the switch to the target server at 10.0.0.100 to test whether the server is reachable across the IP network. ICMP echo responses are being returned from the server, verifying that the switch and the server are connected.
Related Documentation	<ul style="list-style-type: none"> • Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44 • Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124 • Filtering 802.1X Suplicants By Using RADIUS Server Attributes on page 125

Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch

802.1X on EX Series switches provides LAN access to users who do not have credentials in the RADIUS database. These users, referred to as *guests*, are authenticated and typically provided with access to the Internet.

This example describes how to create a guest VLAN and configure 802.1X authentication for it.

- [Requirements on page 40](#)
- [Overview and Topology on page 40](#)
- [Configuration of a Guest VLAN That Includes 802.1X Authentication on page 42](#)
- [Verification on page 42](#)

Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.0 or later for EX Series switches
- One EX Series switch acting as a port access entity (PAE). The interfaces on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- One RADIUS authentication server that supports 802.1X. The authentication server acts as the backend database and contains credential information for hosts (supplicants) that have permission to connect to the network.

Before you configure guest VLAN authentication, be sure you have:

- Performed the initial switch configuration. See *Connecting and Configuring an EX Series Switch (CLI Procedure)*.
- Performed basic bridging and VLAN configuration on the switch. See the documentation that describes setting up basic bridging and a VLAN for your switch. If you are using a switch that supports the Enhanced Layer 2 Software (ELS) configuration style, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*. For all other switches, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.



NOTE: For more about ELS, see: *Getting Started with Enhanced Layer 2 Software*

Overview and Topology

As part of IEEE 802.1X port-based network access control (PNAC), you can provide limited network access to supplicants who do not belong to a VLAN authentication group by configuring authentication for a guest VLAN. Typically, guest VLAN access is used to provide Internet access to visitors to a corporate site. However, you can also use the guest VLAN feature to provide access to a VLAN with limited resources to supplicants that fail 802.1X authentication on a corporate LAN.

[Figure 6 on page 41](#) shows the conference room connected to the switch at interface ge-0/0/1.

Figure 6: Topology for Guest VLAN Example

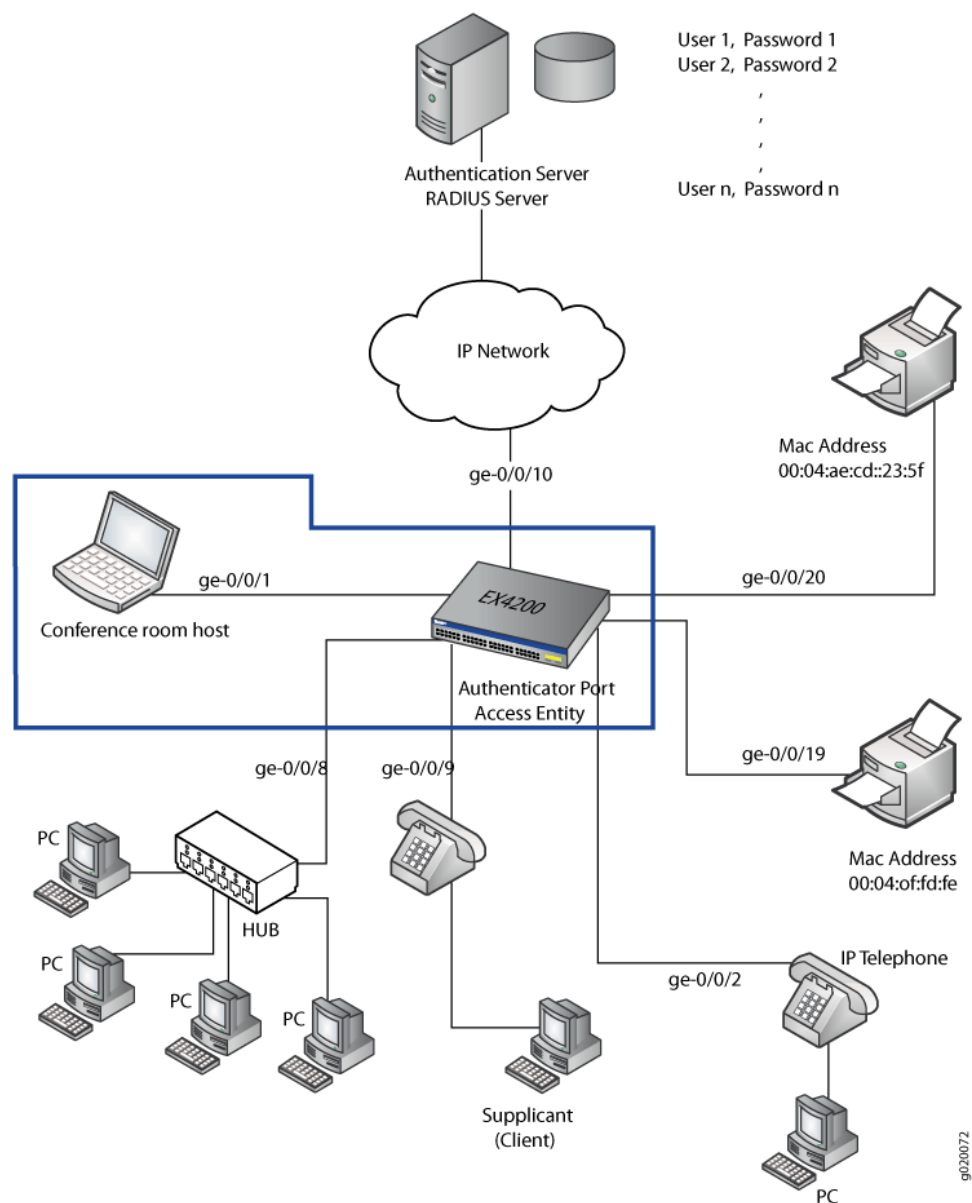


Table 4: Components of the Guest VLAN Topology

Property	Settings
Switch hardware	EX4200 switch, 24 Gigabit Ethernet interfaces: 8 PoE interfaces (ge-0/0/0 through ge-0/0/7) and 16 non-PoE interfaces (ge-0/0/8 through ge-0/0/23)
VLAN names and tag IDs	sales , tag 100 support , tag 200 guest-vlan , tag 300
One RADIUS server	Backend database connected to the switch through interface ge-0/0/10

In this example, access interface **ge-0/0/1** provides LAN connectivity in the conference room. Configure this access interface to provide LAN connectivity to visitors in the conference room who are not authenticated by the corporate VLAN.

Configuration of a Guest VLAN That Includes 802.1X Authentication

CLI Quick Configuration To quickly configure a guest VLAN, with 802.1X authentication, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans guest-vlan vlan-id 300
set protocols dot1x authenticator interface all guest-vlan guest-vlan
```

Step-by-Step Procedure To configure a guest VLAN that includes 802.1X authentication on an EX Series switch:

1. Configure the VLAN ID for the guest VLAN:

```
[edit]
user@switch# set vlans guest-vlan vlan-id 300
```

2. Configure the guest VLAN under **dot1x** protocol:

```
[edit]
user@switch# set protocols dot1x authenticator interface all guest-vlan guest-vlan
```

Results Check the results of the configuration:

```
user@switch> show configuration
protocols {
  dot1x {
    authenticator {
      interface {
        all {
          guest-vlan {
            guest-vlan;
          }
        }
      }
    }
  }
}
vlands {
  guest-vlan {
    vlan-id 300;
  }
}
```

Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verifying That the Guest VLAN Is Configured on page 42](#)

Verifying That the Guest VLAN Is Configured

Purpose Verify that the guest VLAN is created and that an interface has failed authentication and been moved to the guest VLAN.



NOTE: On switches running Junos OS for EX Series with support for ELS, the output for the `show vlans` command will contain additional information. If your switch runs software that supports ELS, see `show vlans`. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

Action Issue the operational mode commands:

```
user@switch> show vlans
```

Name	Tag	Interfaces
default		ge-0/0/3.0*
dynamic	40	None
guest	30	None
guest-vlan	300	ge-0/0/1.0*
vlan_dyn		None

```
user@switch> show dot1x interface ge-0/0/1.0 detail
ge-0/0/1.0
```

```
  Role: Authenticator
  Administrative state: Auto
  Supplicant mode: Single
  Number of retries: 3
  Quiet period: 60 seconds
  Transmit period: 30 seconds
  Mac Radius: Enabled
  Mac Radius Restrict: Disabled
  Reauthentication: Enabled
  Configured Reauthentication interval: 3600 seconds
  Supplicant timeout: 30 seconds
  Server timeout: 30 seconds
  Maximum EAPOL requests: 2
  Guest VLAN member: guest-vlan
  Number of connected supplicants: 1
    Supplicant: user1, 00:00:00:00:13:23
      Operational state: Authenticated
      Authentication method: Radius
      Authenticated VLAN: vo11
      Dynamic Filter: match source-dot1q-tag 10 action deny
      Session Reauth interval: 60 seconds
      Reauthentication due in 50 seconds
```

Meaning The output of the `show vlans` command shows **guest-vlan** as the the name of the VLAN and the VLAN ID as **300**.

The output of the `show dot1x interface ge-0/0/1.0 detail` command displays the **Guest VLAN membership** field, indicating that a supplicant at this interface failed 802.1X authentication and was passed through to the **guest-vlan**.

Related Documentation

- [Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35](#)
- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)

Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch

802.1x port-based network access control (PNAC) authentication on EX Series switches provides three types of authentication to meet the access needs of your enterprise LAN:

- Authenticate the first end device (suppliant) on an authenticator port, and allow all other end devices also connecting to have access to the LAN.
- Authenticate only one end device on an authenticator port at one time.
- Authenticate multiple end devices on an authenticator port. Multiple suppliant mode is used in VoIP configurations.

This example configures an EX Series switch to use IEEE 802.1X to authenticate end devices that use three different administrative modes.

- [Requirements on page 44](#)
- [Overview and Topology on page 45](#)
- [Configuration of 802.1X to Support Multiple Suppliant Modes on page 47](#)
- [Verification on page 48](#)

Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.0 or later for EX Series switches
- One EX Series switch acting as an authenticator port access entity (PAE). The ports on the authenticator PAE form a control gate that blocks all traffic to and from end devices until they are authenticated.
- One RADIUS authentication server that supports 802.1X. The authentication server acts as the backend database and contains credential information for end devices (suplicants) that have permission to connect to the network.

Before you configure the ports for 802.1X authentication, be sure you have:

- Performed the initial switch configuration. See *Connecting and Configuring an EX Series Switch (CLI Procedure)*.
- Performed basic bridging and VLAN configuration on the switch. See the documentation that describes setting up basic bridging and a VLAN for your switch. If you are using a

switch that supports the Enhanced Layer 2 Software (ELS) configuration style, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*. For all other switches, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.



NOTE: For more about ELS, see *Getting Started with Enhanced Layer 2 Software*.

- Configured users on the authentication server.

Overview and Topology

As shown in [Figure 7 on page 46](#), the topology contains an EX4200 access switch connected to the authentication server on port ge-0/0/10. Interfaces ge-0/0/8, ge-0/0/9, and ge-0/0/11 will be configured for three different administrative modes.

Figure 7: Topology for Configuring Supplicant Modes

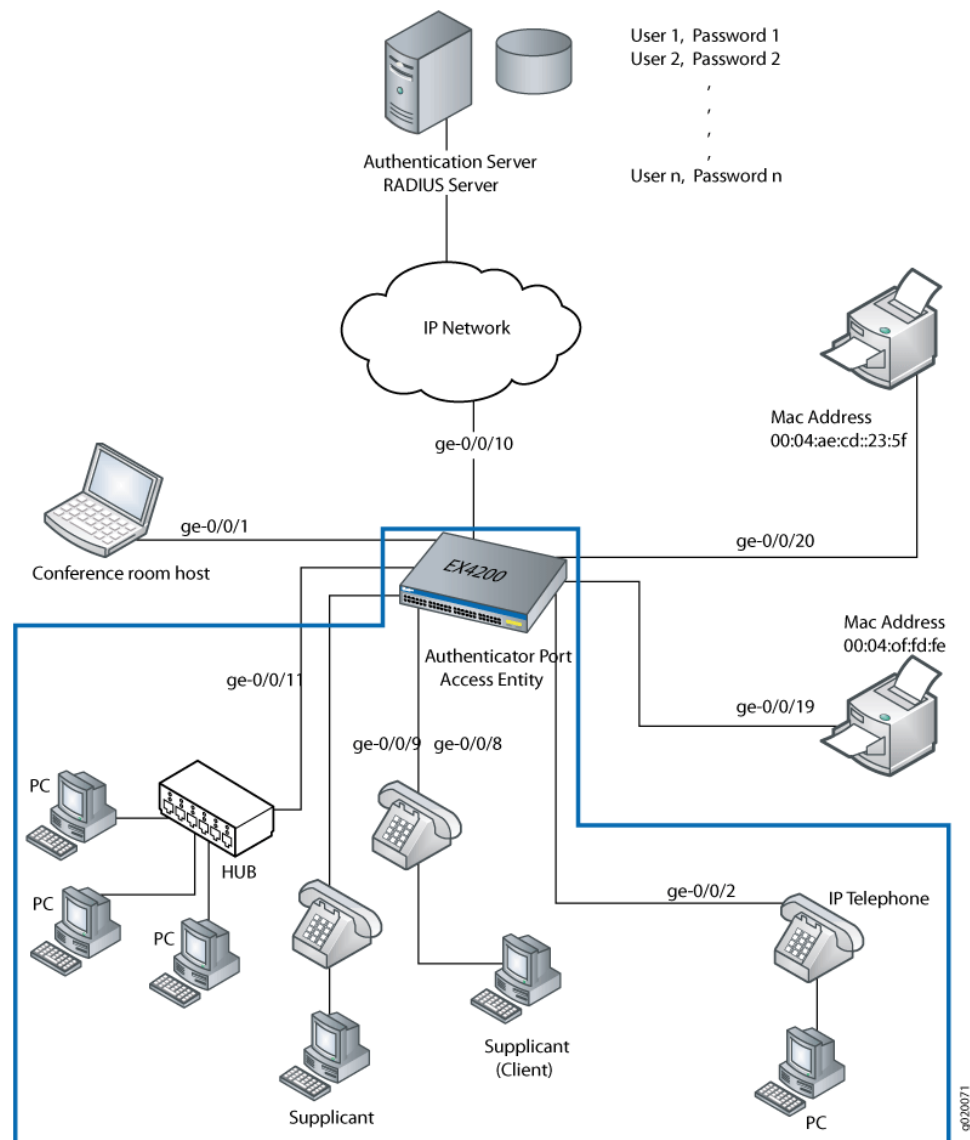


Table 5: Components of the Supplicant Mode Configuration Topology

Property	Settings
Switch hardware	EX4200 switch, 24 Gigabit Ethernet ports: 8 PoE ports (ge-0/0/0 through ge-0/0/7) and 16 non-PoE ports (ge-0/0/8 through ge-0/0/23)
Connections to Avaya phones—with integrated hub, to connect phone and desktop PC to a single port; (requires PoE)	ge-0/0/8, ge-0/0/9, and ge-0/0/11

To configure the administrative modes to support supplicants in different areas of the Enterprise network:

- Configure access port ge-0/0/8 for single supplicant mode authentication.
- Configure access port ge-0/0/9 for single secure supplicant mode authentication.
- Configure access port ge-0/0/11 for multiple supplicant mode authentication.

Single supplicant mode authenticates only the first end device that connects to an authenticator port. All other end devices connecting to the authenticator port after the first has connected successfully, whether they are 802.1X-enabled or not, are permitted access to the port without further authentication. If the first authenticated end device logs out, all other end devices are locked out until an end device authenticates.

Single-secure supplicant mode authenticates only one end device to connect to an authenticator port. No other end device can connect to the authenticator port until the first logs out.

Multiple supplicant mode authenticates multiple end devices individually on one authenticator port. If you configure a maximum number of devices that can be connected to a port through port security, the lesser of the configured values is used to determine the maximum number of end devices allowed per port.

Configuration of 802.1X to Support Multiple Supplicant Modes

CLI Quick Configuration To quickly configure the ports with different 802.1X authentication modes, copy the following commands and paste them into the switch terminal window:

```
[edit]
set protocols dot1x authenticator interface ge-0/0/8 supplicant single
set protocols dot1x authenticator interface ge-0/0/9 supplicant single-secure
set protocols dot1x authenticator interface ge-0/0/11 supplicant multiple
```

Step-by-Step Procedure Configure the administrative mode on the interfaces:

1. Configure the supplicant mode as single on interface ge-0/0/8:


```
[edit protocols]
user@switch# set dot1x authenticator interface ge-0/0/8 supplicant single
```
2. Configure the supplicant mode as single secure on interface ge-0/0/9:


```
[edit protocols]
user@switch# set dot1x authenticator interface ge-0/0/9 supplicant single-secure
```
3. Configure multiple supplicant mode on interface ge-0/0/11:


```
[edit protocols]
user@switch# set dot1x authenticator interface ge-0/0/11 supplicant multiple
```

Results

Check the results of the configuration:

```
[edit]
user@access-switch> show configuration
protocols {
  dot1x {
    authenticator {
      interface {
        ge-0/0/8.0 {
```

```
        supplicant single;
    )
    ge-0/0/9.0 {
        supplicant single-secure;
    }
    ge-0/0/11.0 {
        supplicant multiple;
    }
}
}
```

Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verifying the 802.1X Configuration on page 48](#)

Verifying the 802.1X Configuration

Purpose Verify the 802.1X configuration on interfaces ge-0/0/8, ge-0/0/9, and ge-0/0/5.

Action Verify the 802.1X configuration by issuing the operational mode command **show dot1x interface**:

```

user@switch> show dot1x interface ge-0/0/8.0 detail
ge-0/0/8.0
  Role: Authenticator
  Administrative state: Auto
  Supplicant mode: Single
  Number of retries: 3
  Quiet period: 60 seconds
  Transmit period: 30 seconds
  Mac Radius: Disabled
  Mac Radius Restrict: Disabled
  Reauthentication: Enabled
  Configured Reauthentication interval: 3600 seconds
  Supplicant timeout: 30 seconds
  Server timeout: 30 seconds
  Maximum EAPOL requests: 2
  Guest VLAN member: <not configured>

user@switch> show dot1x interface ge-0/0/9.0 detail
ge-0/0/9.0
  Role: Authenticator
  Administrative state: Auto
  Supplicant mode: Single-Secure
  Number of retries: 3
  Quiet period: 60 seconds
  Transmit period: 30 seconds
  Mac Radius: Disabled
  Mac Radius Restrict: Disabled
  Reauthentication: Enabled
  Configured Reauthentication interval: 3600 seconds
  Supplicant timeout: 30 seconds
  Server timeout: 30 seconds
  Maximum EAPOL requests: 2
  Guest VLAN member: <not configured>
  Number of connected supplicants: 0

user@switch> show dot1x interface ge-0/0/11.0 detail
ge-0/0/11.0
  Role: Authenticator
  Administrative state: Auto
  Supplicant mode: Multiple
  Number of retries: 3
  Quiet period: 60 seconds
  Transmit period: 30 seconds
  Mac Radius: Disabled
  Mac Radius Restrict: Disabled
  Reauthentication: Enabled
  Configured Reauthentication interval: 3600 seconds
  Supplicant timeout: 30 seconds
  Server timeout: 30 seconds
  Maximum EAPOL requests: 2
  Guest VLAN member: <not configured>
  Number of connected supplicants: 0

```

Meaning The **Supplicant mode** output field displays the configured administrative mode for each interface. Interface **ge-0/0/8.0** displays **Single** supplicant mode. Interface **ge-0/0/9.0**

displays **Single-Secure** supplicant mode. Interface **ge-0/0/11.0** displays **Multiple** supplicant mode.

Related Documentation

- [Controlling Authentication Session Timeouts \(CLI Procedure\) on page 146](#)
- [Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35](#)
- [Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39](#)
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Configuring 802.1X RADIUS Accounting \(CLI Procedure\) on page 124](#)
- [Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125](#)
- [Understanding Authentication on EX Series Switches on page 10](#)

Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch

You can configure voice over IP (VoIP) on an EX Series switch to support IP telephones. The Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) protocol forwards VoIP parameters from the switch to the phone. You also configure 802.1X authentication to allow the telephone access to the LAN. Authentication is done through a backend RADIUS server.

This example describes how to configure VoIP on an EX Series switch to support an Avaya IP phone, as well as the LLDP-MED protocol and 802.1X authentication:

- [Requirements on page 50](#)
- [Overview and Topology on page 51](#)
- [Configuration on page 53](#)
- [Verification on page 55](#)

Requirements

This example uses the following hardware and software components:

- Junos OS Release 9.1 or later for EX Series switches
- One EX Series switch acting as an authenticator port access entity (PAE). The interfaces on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- An Avaya 9620 IP telephone that supports LLDP-MED and 802.1X

Before you configure VoIP, be sure you have:

- Installed your EX Series switch. See *Installing and Connecting an EX3200 Switch*.
- Performed the initial switch configuration. See *Connecting and Configuring an EX Series Switch (J-Web Procedure)*.

- Performed basic bridging and VLAN configuration on the switch. See *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.
- Configured the RADIUS server for 802.1X authentication and set up the access profile. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch” on page 35](#).
- (Optional) Configured interface **ge-0/0/2** for Power over Ethernet (PoE). The PoE configuration is not necessary if the VoIP supplicant is using a power adapter. For information about configuring PoE, see *Configuring PoE on EX Series Switches (CLI Procedure)*.



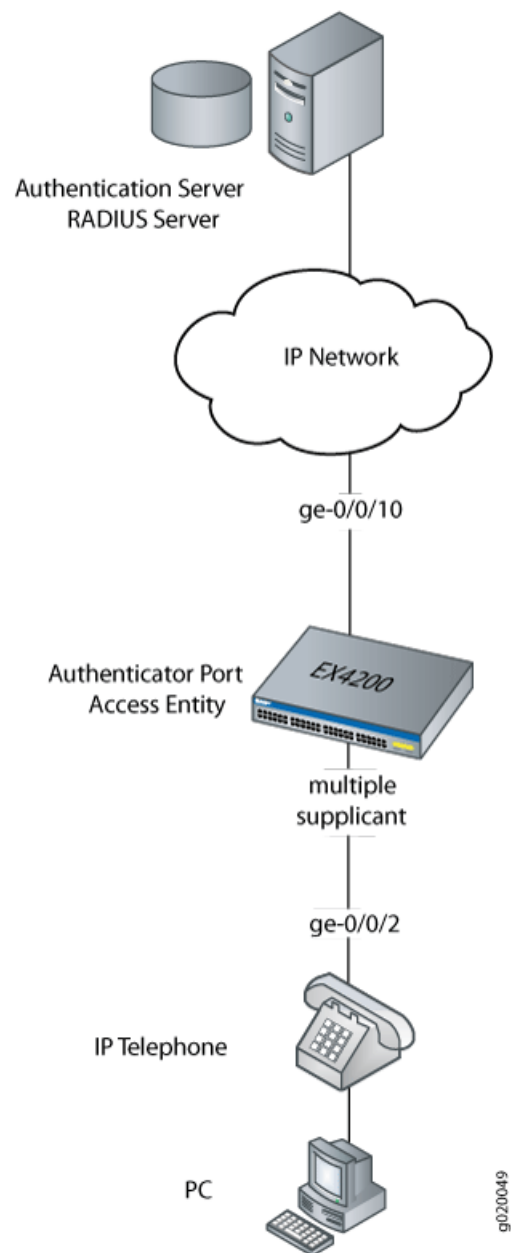
NOTE: If the IP address isn't configured on the Avaya IP phone, the phone exchanges LLDP-MED information to get the VLAN ID for the voice VLAN. You must configure the **voip** statement on the interface to designate the interface as a VoIP interface and allow the switch to forward the VLAN name and VLAN ID for the voice VLAN to the IP telephone. The IP telephone then uses the voice VLAN (that is, it references the voice VLAN's ID) to send a DHCP discover request and exchange information with the DHCP server (voice gateway).

Overview and Topology

Instead of using a regular telephone, you connect an IP telephone directly to the switch. An IP phone has all the hardware and software needed to handle VoIP. You also can power an IP telephone by connecting it to one of the Power over Ethernet (PoE) interfaces on the switch.

In this example, the access interface **ge-0/0/2** on the EX4200 switch is connected to an Avaya 9620 IP telephone. Avaya phones have a built-in bridge that allows you to connect a desktop PC to the phone, so the desktop and phone in a single office require only one interface on the switch. The EX Series switch is connected to a RADIUS server on interface **ge-0/0/10** (see [Figure 8 on page 52](#)).

Figure 8: VoIP Topology



In this example, you configure VoIP parameters and specify the forwarding class **assured-forward** for voice traffic to provide the highest quality of service.

[Table 6 on page 52](#) describes the components used in this VoIP configuration example.

Table 6: Components of the VoIP Configuration Topology

Property	Settings
Switch hardware	EX4200 switch

Table 6: Components of the VoIP Configuration Topology (*continued*)

Property	Settings
VLAN names	data-vlan voice-vlan
Connection to Avaya phone—with integrated hub, to connect phone and desktop PC to a single interface (requires PoE)	ge-0/0/2
One RADIUS server	Provides backend database connected to the switch through interface ge-0/0/10 .

As well as configuring a VoIP for interface **ge-0/0/2**, you configure:

- 802.1X authentication. Authentication is set to **multiple** supplicant to support more than one supplicant's access to the LAN through interface **ge-0/0/2**.
- LLDP-MED protocol information. The switch uses LLDP-MED to forward VoIP parameters to the phone. Using LLDP-MED ensures that voice traffic gets tagged and prioritized with the correct values at the source itself. For example, 802.1p class of service and 802.1Q tag information can be sent to the IP telephone.



NOTE: A PoE configuration is not necessary if an IP telephone is using a power adapter.

Configuration

To configure VoIP, LLDP-MED, and 802.1X authentication:

CLI Quick Configuration

To quickly configure VoIP, LLDP-MED, and 802.1X, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans data-vlan vlan-id 77
set vlans voice-vlan vlan-id 99
set vlans data-vlan interface ge-0/0/2.0
set interfaces ge-0/0/2 unit 0 family ethernet-switching vlan members data-vlan
set interfaces ge-0/0/2 unit 0 family ethernet-switching port-mode access
set ethernet-switching-options voip interface ge-0/0/2.0 vlan voice-vlan
set ethernet-switching-options voip interface ge-0/0/2.0 forwarding-class assured-forwarding
set protocols lldp-med interface ge-0/0/2.0
set protocols dot1x authenticator interface ge-0/0/2.0 supplicant multiple
```

Step-by-Step Procedure

To configure VoIP with LLDP-MED and 802.1X:

1. Configure the VLANs for voice and data:


```
[edit vlans]
user@switch# set data-vlan vlan-id 77
user@switch# set voice-vlan vlan-id 99
```
2. Associate the VLAN **data-vlan** with the interface:


```
[edit vlans]
user@switch# set data-vlan interface ge-0/0/2.0
```

3. Configure the interface as an access interface, configure support for Ethernet switching, and add the **data-vlan** VLAN:


```
[edit interfaces]
user@switch# set ge-0/0/2 unit 0 family ethernet-switching vlan members data-vlan
user@switch# set ge-0/0/2 unit 0 family ethernet-switching port-mode access
```
4. Configure VoIP on the interface and specify the **assured-forwarding** forwarding class to provide the most dependable class of service:


```
[edit ethernet-switching-options]
user@switch# set voip interface ge-0/0/2.0 vlan voice-vlan
user@switch# set voip interface ge-0/0/2.0 forwarding-class assured-forwarding
```
5. Configure LLDP-MED protocol support:


```
[edit protocols]
user@switch# set lldp-med interface ge-0/0/2.0
```
6. To authenticate an IP phone and a PC connected to the IP phone on the interface, configure 802.1X authentication support and specify **multiple** supplicant mode:



NOTE: If you do not want to authenticate any device, skip the 802.1X configuration on this interface.

```
[edit protocols]
user@switch# set dot1x authenticator interface ge-0/0/2.0 supplicant multiple
```

Results Display the results of the configuration:

```
[edit]
user@switch# show configuration
interfaces {
  ge-0/0/2 {
    unit 0 {
      family ethernet-switching {
        port-mode access;
        vlan {
          members data-vlan;
        }
      }
    }
  }
}
protocols {
  lldp-med {
    interface ge-0/0/2.0;
  }
  dot1x {
    authenticator {
      interface {
        ge-0/0/2.0 {
          supplicant multiple;
        }
      }
    }
  }
}
```

```
}
vpls {
  data-vlan {
    vlan-id 77;
    interface {
      ge-0/0/2.0;
    }
  }
  voice-vlan {
    vlan-id 99;
  }
}
ethernet-switching options {
  voip {
    interface ge-0/0/2.0 {
      vlan voice-vlan;
      forwarding-class assured-forwarding;
    }
  }
}
```

Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verifying LLDP-MED Configuration on page 55](#)
- [Verifying 802.1X Authentication for IP Phone and Desktop PC on page 56](#)
- [Verifying the VLAN Association with the Interface on page 57](#)

Verifying LLDP-MED Configuration

Purpose Verify that LLDP-MED is enabled on the interface.

Action user@switch> `show lldp detail`

```
LLDP : Enabled
Advertisement interval : 30 Second(s)
Transmit delay : 2 Second(s)
Hold timer : 2 Second(s)
Config Trap Interval : 300 Second(s)
Connection Hold timer : 60 Second(s)

LLDP MED : Enabled
MED fast start count : 3 Packet(s)
```

Interface	LLDP	LLDP-MED	Neighbor count
all	Enabled	-	0
ge-0/0/2.0	-	Enabled	0

Interface	VLAN-id	VLAN-name
ge-0/0/0.0	0	default
ge-0/0/1.0	0	employee-vlan
ge-0/0/2.0	0	data-vlan
ge-0/0/2.0	99	voice-vlan
ge-0/0/3.0	0	employee-vlan
ge-0/0/8.0	0	employee-vlan
ge-0/0/10.0	0	default
ge-0/0/11.0	20	employee-vlan
ge-0/0/23.0	0	default

LLDP basic TLVs supported:

Chassis identifier, Port identifier, Port description, System name, System description, System capabilities, Management address.

LLDP 802 TLVs supported:

Power via MDI, Link aggregation, Maximum frame size, Port VLAN tag, Port VLAN name.

LLDP MED TLVs supported:

LLDP MED capabilities, Network policy, Endpoint location, Extended power Via MDI.

Meaning The `show lldp detail` output shows that both LLDP and LLDP-MED are configured on the `ge-0/0/2.0` interface. The end of the output shows the list of supported LLDP basic TLVs, 802.3 TLVs, and LLDP-MED TLVs that are supported.

Verifying 802.1X Authentication for IP Phone and Desktop PC

Purpose Display the 802.1X configuration to confirm that the VoIP interface has access to the LAN.

Action user@switch> `show dot1x interface ge-0/0/2.0 detail`
ge-0/0/2.0
Role: Authenticator
Administrative state: Auto
Supplicant mode: Multiple
Number of retries: 3
Quiet period: 60 seconds
Transmit period: 30 seconds
Mac Radius: Disabled
Mac Radius Restrict: Disabled
Reauthentication: Enabled
Configured Reauthentication interval: 3600 seconds
Supplicant timeout: 30 seconds
Server timeout: 30 seconds
Maximum EAPOL requests: 2
Guest VLAN member: <not configured>
Number of connected supplicants: 1
Supplicant: user101, 00:04:0f:fd:ac:fe
Operational state: Authenticated
Authentication method: Radius
Authenticated VLAN: vo11
Dynamic Filter: match source-dot1q-tag 10 action deny
Session Reauth interval: 60 seconds
Reauthentication due in 50 seconds

Meaning The field **Role** shows that the **ge-0/0/2.0** interface is in the authenticator state. The **Supplicant** field shows that the interface is configured in multiple supplicant mode, permitting multiple supplicants to be authenticated on this interface. The MAC addresses of the supplicants currently connected are displayed at the bottom of the output.

Verifying the VLAN Association with the Interface

Purpose Display the interface state and VLAN membership.

Action user@switch> `show ethernet-switching interfaces`
Ethernet-switching table: 0 entries, 0 learned

```

user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Blocking
ge-0/0/0.0  down  default       unblocked
ge-0/0/1.0  down  employee-vlan unblocked
ge-0/0/5.0  down  employee-vlan unblocked
ge-0/0/3.0  down  employee-vlan unblocked
ge-0/0/8.0  down  employee-vlan unblocked
ge-0/0/10.0 down  default       unblocked
ge-0/0/11.0 down  employee-vlan unblocked
ge-0/0/23.0 down  default       unblocked
ge-0/0/2.0  up    voice-vlan    unblocked
           data-vlan    unblocked

```

Meaning The field **VLAN members** shows that the **ge-0/0/2.0** interface supports both the **data-vlan** VLAN and **voice-vlan** VLAN. The **State** field shows that the interface is up.

Related Documentation • [Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35](#)

- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
- [Defining CoS Forwarding Classes \(CLI Procedure\)](#)
- [Defining CoS Forwarding Classes \(J-Web Procedure\)](#)
- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)

Example: Configuring VoIP on an EX Series Switch Without Including LLDP-MED Support

You can configure voice over IP (VoIP) on an EX Series switch to support IP telephones. The Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) protocol is sometimes used with IP phones to forward VoIP parameters from the switch to the phone. However, not all IP phones support LLDP-MED.

This example describes how to configure VoIP on an EX Series switch without using LLDP-MED:

- [Requirements on page 58](#)
- [Overview on page 59](#)
- [Configuring VoIP Without LLDP-MED by Using a Voice VLAN on an Access Port on page 59](#)
- [Configuring VoIP Without LLDP-MED by Using a Trunk Port with Native VLAN Option on page 61](#)
- [Verification on page 62](#)

Requirements

This example uses the following hardware and software components:

- One EX4200 switch acting as an authenticator port access entity (PAE). The interfaces on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- An IP phone that does not support LLDP-MED.
- Junos OS Release 9.1 or later for EX Series switches.

Before you configure VoIP, be sure you have:

- Performed basic bridging and VLAN configuration on the switch. See *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.
- Configured the IP phone as a member of the voice VLAN.
- (Optional) Configured interface ge-0/0/2 for Power over Ethernet (PoE). The PoE configuration is not necessary if the VoIP supplicant is using a power adapter. See *Configuring PoE on EX Series Switches (CLI Procedure)*.

Overview

Instead of using a regular telephone, you connect an IP telephone directly to the switch. An IP phone has all the hardware and software needed to handle VoIP. You can also power an IP telephone by connecting it to one of the Power over Ethernet (PoE) interfaces on the switch.

EX Series switches can accommodate an IP telephone and end host connected to a single switch port. In such a scenario, voice and data traffic must be separated into different broadcast domains, or VLANs. One method for accomplishing this is by configuring a voice VLAN, which enables access ports to accept untagged data traffic as well as tagged voice traffic from IP phones, and associate each type of traffic with separate and distinct VLANs. Voice traffic (tagged) can then be treated differently, generally with a higher priority than data traffic (untagged).

The voice VLAN delivers the greatest benefit when used with IP phones that support LLDP-MED, but it is flexible enough that IP phones that do not support LLDP-MED can also use it effectively. However, in the absence of LLDP-MED, the voice VLAN ID must be set manually on the IP phone because LLDP-MED is not available to accomplish this dynamically. For information about setting up a voice VLAN for IP phones that support LLDP-MED, see [“Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch” on page 50](#).

Another method to separate voice (tagged) and data (untagged) traffic into different VLANs is to use a trunk port with the native VLAN ID option. The trunk port is added as a member of the voice VLAN, and processes only tagged voice traffic from that VLAN. The trunk port must also be configured with the native VLAN ID for the data VLAN so that it can process untagged data traffic from the data VLAN. This configuration also requires that the voice VLAN ID be set manually on the IP phone.

This example illustrates both methods. In this example, the interface ge-0/0/2 on the EX4200 switch is connected to a non-LLDP-MED IP phone.



NOTE: The implementation of a voice VLAN on an IP telephone is vendor-specific. Consult the documentation that came with your IP telephone for instructions on configuring a voice VLAN. For example, on an Avaya phone, you can ensure that the phone gets the correct VoIP VLAN ID even in the absence of LLDP-MED by enabling DHCP option 176.

Configuring VoIP Without LLDP-MED by Using a Voice VLAN on an Access Port

CLI Quick Configuration	<p>To quickly configure VoIP, copy the following commands and paste them into the switch terminal window:</p> <pre>[edit] set vlans data-vlan vlan-id 77 set vlans voice-vlan vlan-id 99 set vlans data-vlan interface ge-0/0/2.0 set interfaces ge-0/0/2 unit 0 family ethernet-switching port-mode access set interfaces ge-0/0/2 unit 0 family ethernet-switching vlan members data-vlan</pre>
--------------------------------	---

```
set ethernet-switching-options voip interface ge-0/0/2.0 vlan voice-vlan
set ethernet-switching-options voip interface ge-0/0/2.0 forwarding-class assured-forwarding
```

Step-by-Step Procedure

1. Configure two VLANs: one for data traffic and one for voice traffic:

```
[edit vlans]
user@switch# set data-vlan vlan-id 77
user@switch# set voice-vlan vlan-id 99
```



NOTE: The voice VLAN ID must be set manually on the IP phone.

2. Configure the VLAN **data-vlan** on the interface ge-0/0/2:

```
[edit vlans]
user@switch# set data-vlan interface ge-0/0/2.0
```

3. Configure the interface ge-0/0/2 as an access port belonging to the data VLAN:

```
[edit interfaces]
user@switch# set ge-0/0/2 unit 0 family ethernet-switching port-mode access
user@switch# set ge-0/0/2 unit 0 family ethernet-switching vlan member data-vlan
```

4. Configure VoIP on the interface ge-0/0/2 and add this interface to the voice VLAN:

```
[edit ethernet-switching-options]
user@switch# set voip interface ge-0/0/2.0 vlan voice-vlan
```

5. Specify the assured-forwarding forwarding class to provide the most dependable class of service:

```
[edit ethernet-switching-options]
user@switch# set voip interface ge-0/0/2.0 forwarding-class assured-forwarding
```

Results Display the results of the configuration:

```
[edit]
user@switch> show configuration
interfaces {
  ge-0/0/2 {
    unit 0 {
      family ethernet-switching {
        port-mode access;
        vlan {
          members data-vlan;
        }
      }
    }
  }
}
vlans {
  data-vlan {
    vlan-id 77;
    interface {
      ge-0/0/2.0;
    }
  }
  voice-vlan {
    vlan-id 99;
  }
}
```



```

}
ethernet-switching options {
  voip {
    interface ge-0/0/2.0 {
      vlan voice-vlan;
      forwarding-class assured-forwarding;
    }
  }
}

```

Configuring VoIP Without LLDP-MED by Using a Trunk Port with Native VLAN Option

CLI Quick Configuration To quickly configure VoIP, copy the following commands and paste them into the switch terminal window:

```

[edit]
set vlans data-vlan vlan-id 77
set vlans voice-vlan vlan-id 99
set interfaces ge-0/0/2 unit 0 family ethernet-switching port-mode trunk
set interfaces ge-0/0/2 unit 0 family ethernet-switching vlan members voice-vlan
set interfaces ge-0/0/2 unit 0 family ethernet-switching native-vlan-id data-vlan

```

Step-by-Step Procedure 1. Configure two VLANs: one for data traffic and one for voice traffic:

```

[edit vlans]
user@switch# set data-vlan vlan-id 77
user@switch# set voice-vlan vlan-id 99

```



NOTE: The voice VLAN ID must be set manually on the IP phone.

2. Configure interface ge-0/0/2 as a trunk port that includes only the voice VLAN:

```

[edit interfaces]
user@switch# set ge-0/0/2 unit 0 family ethernet-switching port-mode trunk
user@switch# set ge-0/0/2 unit 0 family ethernet-switching vlan member voice-vlan

```

3. Configure the native VLAN ID for the data VLAN on the trunk port:

```

[edit interfaces]
user@switch# set ge-0/0/2 unit 0 family ethernet-switching native-vlan-id data-vlan

```

Results Display the results of the configuration:

```

[edit]
user@switch> show configuration
interfaces {
  ge-0/0/2 {
    unit 0 {
      family ethernet-switching {
        port-mode trunk;
        vlan {
          members voice-vlan;
        }
        native-vlan-id data-vlan;
      }
    }
  }
}

```

```

}
vlans {
  data-vlan {
    vlan-id 77;
  }
  voice-vlan {
    vlan-id 99;
  }
}

```

Verification

To confirm that the configuration is working properly, perform the following task:

- [Verifying the VLAN Association With the Interface on page 62](#)

Verifying the VLAN Association With the Interface

Purpose Display the interface state and VLAN membership.

Action user@switch> [show ethernet-switching interfaces](#)
Ethernet-switching table: 0 entries, 0 learned

```

user@switch> show ethernet-switching interfaces
Interface  State  VLAN members  Blocking
ge-0/0/0.0 down  default       unblocked
ge-0/0/1.0 down  employee-vlan unblocked
ge-0/0/5.0 down  employee-vlan unblocked
ge-0/0/3.0 down  employee-vlan unblocked
ge-0/0/8.0 down  employee-vlan unblocked
ge-0/0/10.0 down default       unblocked
ge-0/0/11.0 down employee-vlan unblocked
ge-0/0/23.0 down default       unblocked
ge-0/0/2.0 up    voice-vlan    unblocked
                data-vlan     unblocked

```

Meaning The field **VLAN members** shows that the ge-0/0/2.0 interface supports both the data VLAN, data-vlan, and the voice VLAN, voice-vlan. The **State** field shows that the interface is up.

- Related Documentation**
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
 - [Example: Configuring VoIP on an EX Series Switch Without Including 802.1X Authentication on page 62](#)
 - [Understanding 802.1X and VoIP on EX Series Switches on page 20](#)
 - [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

Example: Configuring VoIP on an EX Series Switch Without Including 802.1X Authentication

You can configure voice over IP (VoIP) on an EX Series switch to support IP telephones.

To configure VoIP on an EX Series switch to support an IP phone that does not support 802.1X authentication, you must either add the MAC address of the phone to the static MAC bypass list or enable MAC RADIUS authentication on the switch.

This example describes how to configure VoIP on an EX Series switch without 802.1X authentication using static MAC bypass of authentication:

- [Requirements on page 63](#)
- [Overview on page 64](#)
- [Configuration on page 64](#)
- [Verification on page 66](#)

Requirements

This example uses the following hardware and software components:

- Junos OS Release 9.1 or later for EX Series switches
- An IP telephone

Before you configure VoIP, be sure you have:

- Installed your EX Series switch. See the installation information for your switch.
- Performed the initial switch configuration. See *Connecting and Configuring an EX Series Switch (CLI Procedure)*.
- Performed basic bridging and VLAN configuration on the switch. See *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.
- Configured the RADIUS server for 802.1X authentication and set up the access profile. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch” on page 35](#).
- (Optional) Configured interface **ge-0/0/2** for Power over Ethernet (PoE). The PoE configuration is not necessary if the VoIP supplicant is using a power adapter. For information about configuring PoE, see *Configuring PoE on EX Series Switches (CLI Procedure)*.



NOTE: If the IP address isn't configured on the Avaya IP phone, the phone exchanges LLDP-MED information to get the VLAN ID for the voice VLAN. You must configure the `voip` statement on the interface to designate the interface as a VoIP interface and allow the switch to forward the VLAN name and VLAN ID for the voice VLAN to the IP telephone. The IP telephone then uses the voice VLAN (that is, it references the voice VLAN's ID) to send a DHCP discover request and exchange information with the DHCP server (voice gateway).

Overview

Instead of using a regular telephone, you connect an IP telephone directly to the switch. An IP phone has all the hardware and software needed to handle VoIP. You also can power an IP telephone by connecting it to one of the Power over Ethernet (PoE) interfaces on the switch.

In this example, the access interface **ge-0/0/2** on the EX4200 switch is connected to a non-802.1X IP phone.

To configure VoIP on an EX Series switch to support an IP phone that does not support 802.1X authentication, add the MAC address of the phone as a static entry in the authenticator database and set the supplicant mode to multiple.

Configuration

To configure VoIP without 802.1X authentication:

CLI Quick Configuration

To quickly configure VoIP, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans data-vlan vlan-id 77
set vlans voice-vlan vlan-id 99
set vlans data-vlan interface ge-0/0/2.0
set interfaces ge-0/0/2 unit 0 family ethernet-switching vlan members data-vlan
set interfaces ge-0/0/2 unit 0 family ethernet-switching port-mode access
set ethernet-switching-options voip interface ge-0/0/2.0 vlan voice-vlan
set ethernet-switching-options voip interface ge-0/0/2.0 forwarding-class assured-forwarding
set protocols lldp-med interface ge-0/0/2.0
set protocols dot1x authenticator authentication-profile-name auth-profile
set protocols dot1x authenticator static 00:04:f2:11:aa:a7
set protocols dot1x authenticator interface ge-0/0/2.0 supplicant multiple
```

Step-by-Step Procedure

To configure VoIP without 802.1X:

1. Configure the VLANs for voice and data:

```
[edit vlans]
user@switch# set data-vlan vlan-id 77
user@switch# set voice-vlan vlan-id 99
```
2. Associate the VLAN **data-vlan** with the interface:

```
[edit vlans]
user@switch# set data-vlan interface ge-0/0/2.0
```
3. Configure the interface as an access interface, configure support for Ethernet switching, and add the **data-vlan** VLAN:

```
[edit interfaces]
user@switch# set ge-0/0/2 unit 0 family ethernet-switching vlan members data-vlan
user@switch# set ge-0/0/2 unit 0 family ethernet-switching port-mode access
```
4. Configure VoIP on the interface and specify the **assured-forwarding** forwarding class to provide the most dependable class of service:

```
[edit ethernet-switching-options]
user@switch# set voip interface ge-0/0/2.0 vlan voice-vlan
user@switch# set voip interface ge-0/0/2.0 forwarding-class assured-forwarding
```
5. Configure LLDP-MED protocol support:

- ```
[edit protocols]
user@switch# set lldp-med interface ge-0/0/2.0
```
6. Set the authentication profile (see [“Configuring 802.1X Interface Settings \(CLI Procedure\)” on page 120](#) and [“Configuring 802.1X RADIUS Accounting \(CLI Procedure\)” on page 124](#)):
 

```
[edit protocols]
set dot1x authenticator authentication-profile-name auth-profile
```
  7. Add the MAC address of the phone to the static MAC bypass list:
 

```
[edit protocols]
set dot1x authenticator static 00:04:f2:11:aa:a7
```
  8. Set the supplicant mode to multiple:
 

```
[edit protocols]
set dot1x authenticator interface ge-0/0/2.0 supplicant multiple
```

**Results** Display the results of the configuration:

```
[edit]
user@switch# show configuration
interfaces {
 ge-0/0/2 {
 unit 0 {
 family ethernet-switching {
 port-mode access;
 vlan {
 members data-vlan;
 }
 }
 }
 }
}
protocols {
 lldp-med {
 interface ge-0/0/2.0;
 }
 dot1x {
 authenticator {
 authentication-profile-name auth-profile;
 static {
 00:04:f2:11:aa:a7;
 }
 }
 interface {
 ge-0/0/2.0 {
 supplicant multiple;
 }
 }
 }
}
vllans {
 data-vlan {
 vlan-id 77;
 interface {
 ge-0/0/2.0;
 }
 }
}
```

```
}
voice-vlan {
 vlan-id 99;
}
}
ethernet-switching options {
 voip {
 interface ge-0/0/2.0 {
 vlan voice-vlan;
 forwarding-class assured-forwarding;
 }
 }
}
```

## Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verifying LLDP-MED Configuration on page 66](#)
- [Verifying Authentication for the Desktop PC on page 67](#)
- [Verifying the VLAN Association with the Interface on page 68](#)

### Verifying LLDP-MED Configuration

---

**Purpose** Verify that LLDP-MED is enabled on the interface.

**Action** user@switch> `show lldp detail`

```

LLDP : Enabled
Advertisement interval : 30 Second(s)
Transmit delay : 2 Second(s)
Hold timer : 2 Second(s)
Config Trap Interval : 300 Second(s)
Connection Hold timer : 60 Second(s)

LLDP MED : Enabled
MED fast start count : 3 Packet(s)

```

| Interface  | LLDP    | LLDP-MED | Neighbor count |
|------------|---------|----------|----------------|
| all        | Enabled | -        | 0              |
| ge-0/0/2.0 | -       | Enabled  | 0              |

| Interface   | VLAN-id | VLAN-name     |
|-------------|---------|---------------|
| ge-0/0/0.0  | 0       | default       |
| ge-0/0/1.0  | 0       | employee-vlan |
| ge-0/0/2.0  | 0       | data-vlan     |
| ge-0/0/2.0  | 99      | voice-vlan    |
| ge-0/0/3.0  | 0       | employee-vlan |
| ge-0/0/8.0  | 0       | employee-vlan |
| ge-0/0/10.0 | 0       | default       |
| ge-0/0/11.0 | 20      | employee-vlan |
| ge-0/0/23.0 | 0       | default       |

LLDP basic TLVs supported:

Chassis identifier, Port identifier, Port description, System name, System description, System capabilities, Management address.

LLDP 802 TLVs supported:

Power via MDI, Link aggregation, Maximum frame size, Port VLAN tag, Port VLAN name.

LLDP MED TLVs supported:

LLDP MED capabilities, Network policy, Endpoint location, Extended power Via MDI.

**Meaning** The `show lldp detail` output shows that both LLDP and LLDP-MED are configured on the `ge-0/0/2.0` interface. The end of the output shows the list of supported LLDP basic TLVs, 802.3 TLVs, and LLDP-MED TLVs that are supported.

### Verifying Authentication for the Desktop PC

**Purpose** Display the 802.1X configuration for the desktop PC connected to the VoIP interface through the IP phone.

**Action** user@switch> `show dot1x interface ge-0/0/2.0 detail`  
ge-0/0/2.0  
Role: Authenticator  
Administrative state: Auto  
Supplicant mode: Multiple  
Number of retries: 3  
Quiet period: 60 seconds  
Transmit period: 30 seconds  
Mac Radius: Disabled  
Mac Radius Restrict: Disabled  
Reauthentication: Enabled  
Configured Reauthentication interval: 3600 seconds  
Supplicant timeout: 30 seconds  
Server timeout: 30 seconds  
Maximum EAPOL requests: 2  
Guest VLAN member: <not configured>  
Number of connected supplicants: 1  
Supplicant: user101, 00:04:0f:fd:ac:fe  
Operational state: Authenticated  
Authentication method: Radius  
Authenticated VLAN: vo11  
Dynamic Filter: match source-dot1q-tag 10 action deny  
Session Reauth interval: 60 seconds  
Reauthentication due in 50 seconds

**Meaning** The field **Role** shows that the **ge-0/0/2.0** interface is in the authenticator state. The **Supplicant** field shows that the interface is configured in multiple supplicant mode, permitting multiple supplicants to be authenticated on this interface. The MAC addresses of the supplicants currently connected are displayed at the bottom of the output.

---

### Verifying the VLAN Association with the Interface

---

**Purpose** Display the interface state and VLAN membership.

**Action** user@switch> `show ethernet-switching interfaces`  
Ethernet-switching table: 0 entries, 0 learned

user@switch> `show ethernet-switching interfaces`

| Interface   | State | VLAN members  | Blocking  |
|-------------|-------|---------------|-----------|
| ge-0/0/0.0  | down  | default       | unblocked |
| ge-0/0/1.0  | down  | employee-vlan | unblocked |
| ge-0/0/5.0  | down  | employee-vlan | unblocked |
| ge-0/0/3.0  | down  | employee-vlan | unblocked |
| ge-0/0/8.0  | down  | employee-vlan | unblocked |
| ge-0/0/10.0 | down  | default       | unblocked |
| ge-0/0/11.0 | down  | employee-vlan | unblocked |
| ge-0/0/23.0 | down  | default       | unblocked |
| ge-0/0/2.0  | up    | voice-vlan    | unblocked |
|             |       | data-vlan     | unblocked |

**Meaning** The field **VLAN members** shows that the **ge-0/0/2.0** interface supports both the **data-vlan** VLAN and **voice-vlan** VLAN. The **State** field shows that the interface is up.

**Related Documentation**

- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)



- [Example: Configuring VoIP on an EX Series Switch Without Including LLDP-MED Support on page 58](#)
- [Understanding 802.1X and VoIP on EX Series Switches on page 20](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

## Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch

To allow devices to access your LAN through 802.1X-configured interfaces without authentication, you can configure a static MAC bypass list on the EX Series switch. The static MAC bypass list, also known as the *exclusion list*, specifies MAC addresses that are allowed on the switch without sending a request to an authentication server.

You can use static MAC bypass of authentication to allow connection for devices that are not 802.1X-enabled, such as printers. If a host's MAC address is compared and matched against the static MAC address list, the nonresponsive host is authenticated and an interface opened for it.

This example describes how to configure static MAC bypass of authentication for two printers:

- [Requirements on page 69](#)
- [Overview and Topology on page 70](#)
- [Configuration on page 71](#)
- [Verification on page 72](#)

### Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.0 or later for EX Series switches
- One EX Series switch acting as an authenticator port access entity (PAE). The ports on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.

Before you configure static MAC bypass of authentication, be sure you have:

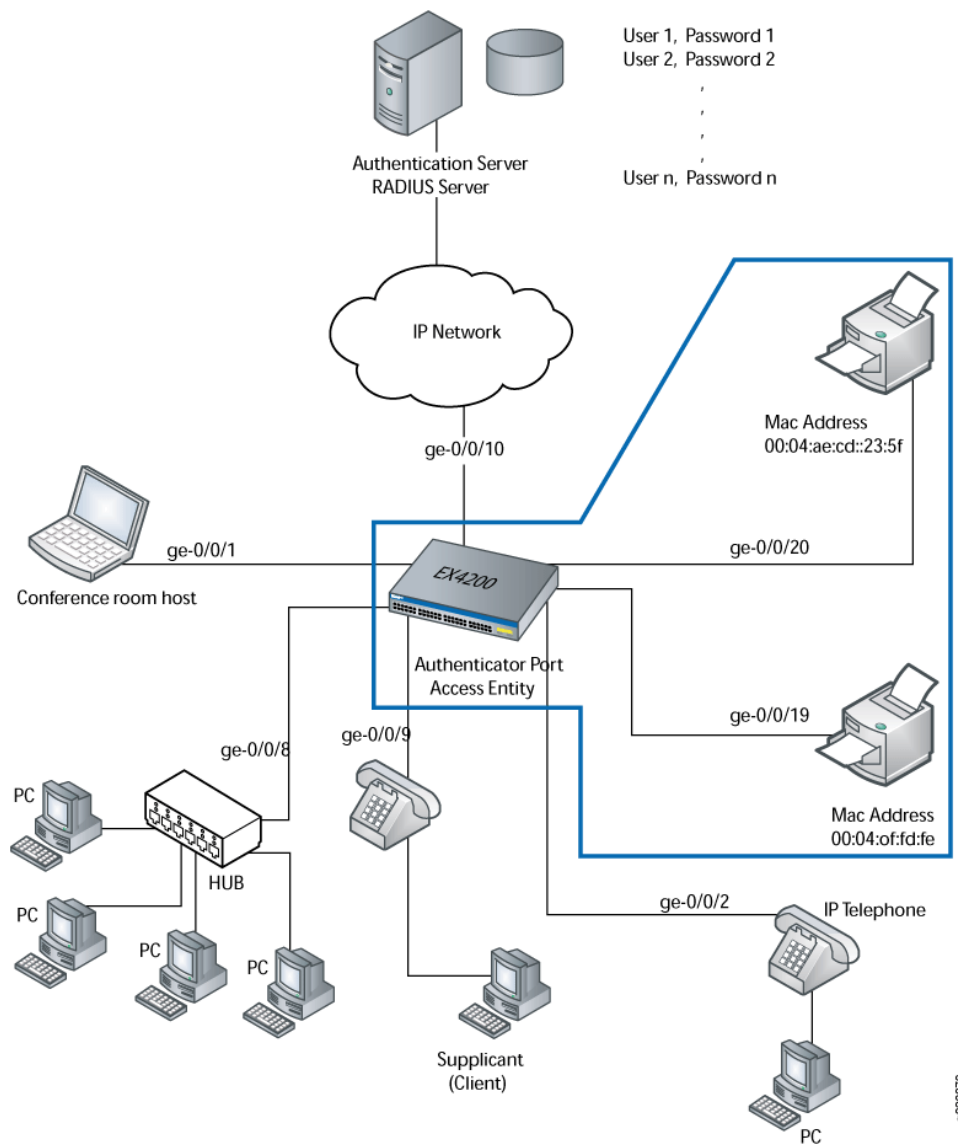
- Performed basic bridging and VLAN configuration on the switch. See the documentation that describes setting up basic bridging and a VLAN for your switch. If you are using a switch that supports the Enhanced Layer 2 Software (ELS) configuration style, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*. For all other switches, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*. For more about ELS, see: *Getting Started with Enhanced Layer 2 Software*.
- Specified the RADIUS server connections and configured an access profile on the switch. See "[Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch](#)" on page 35.

## Overview and Topology

To permit printers access to the LAN, add them to the static MAC bypass list. The MAC addresses on this list are permitted access without authentication from the RADIUS server.

Figure 9 on page 70 shows the two printers connected to the EX4200.

**Figure 9: Topology for Static MAC Bypass of Authentication Configuration**



The interfaces shown in Table 7 on page 71 will be configured for static MAC bypass of authentication.

Table 7: Components of the Static MAC Bypass of Authentication Configuration Topology

| Property                                                                | Settings                                                                                         |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Switch hardware                                                         | EX4200, 24 Gigabit Ethernet ports: 16 non-PoE ports and 8 PoE ports (ge-0/0/0 through ge-0/0/23) |
| VLAN name                                                               | default                                                                                          |
| Connections to integrated printer/fax/copier machines (no PoE required) | ge-0/0/19, MAC address 00:04:0f:fd:ac:fe<br>ge-0/0/20, MAC address 00:04:ae:cd:23:5f             |

The printer with the MAC address 00:04:0f:fd:ac:fe is connected to access interface **ge-0/0/19**. A second printer with the MAC address 00:04:ae:cd:23:5f is connected to access interface **ge-0/0/20**. Both printers will be added to the static list and bypass 802.1X authentication.

## Configuration

**CLI Quick Configuration** To quickly configure the static MAC bypass list, copy the following commands and paste them into the switch terminal window:

```
[edit]
set protocols dot1x authenticator static [00:04:0f:fd:ac:fe 00:04:ae:cd:23:5f]
set protocols dot1x authenticator interface all supplicant multiple
set protocols dot1x authenticator authentication-profile-name profile1
```

**Step-by-Step Procedure** Configure the static MAC bypass list:

1. Configure MAC addresses **00:04:0f:fd:ac:fe** and **00:04:ae:cd:23:5f** as static MAC addresses:

```
[edit protocols]
user@switch# set dot1x authenticator static [00:04:0f:fd:ac:fe 00:04:ae:cd:23:5f]
```

2. Configure the 802.1X authentication method:

```
[edit protocols]
user@switch# set dot1x authenticator interface all supplicant multiple
```

3. Configure the authentication profile name (access profile name) to use for authentication:

```
[edit protocols]
user@switch# set dot1x authenticator authentication-profile-name profile1
```



**NOTE:** Access profile configuration is required only for 802.1X clients, not for static MAC clients.

**Results** Display the results of the configuration:

```
user@switch> show
interfaces {
 ge-0/0/19 {
 unit 0 {
 family ethernet-switching {
```

```

 vlan members default;
 }
}
ge-0/0/20 {
 unit 0 {
 family ethernet-switching {
 vlan members default;
 }
 }
}
}
protocols {
 dot1x {
 authenticator {
 authentication-profile-name profile1
 static [00:04:0f:fd:ac:fe 00:04:ae:cd:23:5f];
 interface {
 all {
 supplicant multiple;
 }
 }
 }
 }
}
}

```

## Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verifying Static MAC Bypass of Authentication on page 72](#)

### Verifying Static MAC Bypass of Authentication

**Purpose** Verify that the MAC addresses of both printers are configured and associated with the correct interfaces.

**Action** Issue the operational mode command:

```
user@switch> show dot1x static-mac-address
```

| MAC address       | VLAN-Assignment | Interface   |
|-------------------|-----------------|-------------|
| 00:04:0f:fd:ac:fe | default         | ge-0/0/19.0 |
| 00:04:ae:cd:23:5f | default         | ge-0/0/20.0 |

**Meaning** The output field **MAC address** shows the MAC addresses of the two printers.

The output field **Interface** shows that the MAC address **00:04:0f:fd:ac:fe** can connect to the LAN through interface **ge-0/0/19.0** and that the MAC address **00:04:ae:cd:23:5f** can connect to the LAN through interface **ge-0/0/20.0**.

**Related Documentation**

- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Configuring Static MAC Bypass of Authentication \(CLI Procedure\) on page 140](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Understanding Authentication on EX Series Switches on page 10](#)

## Example: Configuring 802.1X Authentication Options When the RADIUS Server Is Unavailable to an EX Series Switch

Server fail fallback enables you to specify how 802.1X supplicants connected to the switch are supported if the RADIUS authentication server becomes unavailable or sends a RADIUS access-reject message.

You use 802.1X to control network access. Only users and devices (supplicants) providing credentials that have been verified against a user database are allowed access to the network. You use a RADIUS server as the user database.

This example describes how to configure an interface to move a supplicant to a VLAN in the event of a RADIUS server timeout:

- [Requirements on page 73](#)
- [Overview and Topology on page 74](#)
- [Configuration on page 76](#)
- [Verification on page 76](#)

### Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.3 or later for EX Series switches
- One EX Series switch acting as an authenticator port access entity (PAE). The ports on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- One RADIUS authentication server that supports 802.1X. The authentication server acts as the backend database and contains credential information for hosts (supplicants) that have permission to connect to the network.

Before you connect the server to the switch, be sure you have:

- Performed basic bridging and VLAN configuration on the switch. See the documentation that describes setting up basic bridging and a VLAN for your switch. If you are using a switch that supports the Enhanced Layer 2 Software (ELS) configuration style, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*. For all other switches, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.



**NOTE:** For more about ELS, see *Getting Started with Enhanced Layer 2 Software*.

- Set up a connection between the switch and the RADIUS server. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch”](#) on page 35.
- Configured users on the authentication server.

## Overview and Topology

A RADIUS server timeout occurs if no authentication RADIUS servers are reachable when a supplicant logs in and attempts to access the LAN. Using server fail fallback, you configure alternative options for supplicants attempting LAN access. You can configure the switch to accept or deny access to supplicants or to maintain the access already granted to supplicants before the RADIUS server timeout. Additionally, you can configure the switch to move supplicants to a specific VLAN if a RADIUS timeout occurs or if the RADIUS server sends an EAP Access-Reject message.

[Figure 10 on page 75](#) shows the topology used for this example. The RADIUS server is connected to the EX4200 switch on access port **ge-0/0/10**. The switch acts as the authenticator port access entity (PAE) and forwards credentials from the supplicant to the user database on the RADIUS server. The switch blocks all traffic and acts as a control gate until the supplicant is authenticated by the authentication server. A supplicant is connected to the switch through interface **ge-0/0/1**.

Figure 10: Topology for Configuring 802.1X Options

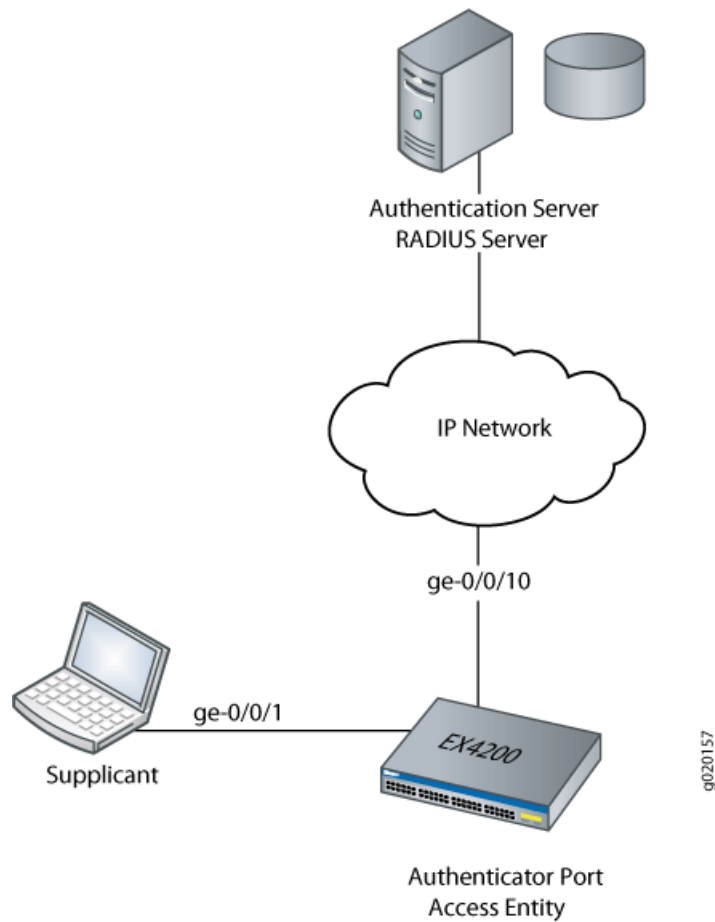


Table 8 on page 75 describes the components in this topology.

Table 8: Components of the Topology

| Property          | Settings                                                                                               |
|-------------------|--------------------------------------------------------------------------------------------------------|
| Switch hardware   | EX4200 access switch, 24 Gigabit Ethernet ports: 16 non-PoE ports and 8 PoE ports.                     |
| VLAN names        | <b>default</b> VLAN<br><b>vlan-sf</b> VLAN                                                             |
| Supplicant        | Supplicant attempting access on interface <b>ge-0/0/1</b>                                              |
| One RADIUS server | Backend database with an address of <b>10.0.0.100</b> connected to the switch at port <b>ge-0/0/10</b> |

In this example, configure interface ge-0/0/1 to move a supplicant attempting access to the LAN during a RADIUS timeout to another VLAN. A RADIUS timeout prevents the normal exchange of EAP messages that carry information from the RADIUS server to the

switch and permit the authentication of a supplicant. The default VLAN is configured on interface ge-0/0/1. When a RADIUS timeout occurs, supplicants on the interface will be moved from the default VLAN to the VLAN named vlan-sf.

## Configuration

**CLI Quick Configuration** To quickly configure server fail fallback on the switch, copy the following commands and paste them into the switch terminal window:

```
[edit protocols dot1x authenticator]
set interface ge-0/0/1 server-fail vlan-name vlan-sf
```

**Step-by-Step Procedure** To configure an interface to divert supplicants to a specific VLAN when a RADIUS timeout occurs (here, the VLAN is `vlan-sf`):

1. Define the VLAN to which supplicants are diverted:

```
[edit protocols dot1x authenticator]
user@switch# set interface ge-0/0/1 server-fail vlan-name vlan-sf
```

**Results** Display the results of the configuration:

```
user@switch> show configuration
interfaces {
 ge-0/0/1 {
 unit 0 {
 family ethernet-switching {
 vlan {
 members default;
 }
 }
 }
 }
}
protocols {
 dot1x {
 authenticator {
 interface {
 ge-0/0/1.0 {
 server-fail vlan-name vlan-sf;
 }
 }
 }
 }
}
```

## Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verifying That the Supplicants Are Moved to an Alternative VLAN During a RADIUS Timeout on page 77](#)



### Verifying That the Supplicants Are Moved to an Alternative VLAN During a RADIUS Timeout

---

**Purpose** Verify that the interface moves supplicants to an alternative VLAN during a RADIUS timeout.



.....

**NOTE:** On switches running Junos OS for EX Series with support for ELS, the output for the `show vlans` command will contain additional information. If your switch runs software that supports ELS, see *show vlans*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*

.....

**Action** Display the VLANs configured on the switch; the interface **ge-0/0/1.0** is a member of the **default** VLAN:

```
user@switch> show vlans
Name Tag Interfaces
default
 ge-0/0/0.0, ge-0/0/1.0*, ge-0/0/5.0*, ge-0/0/10.0,
 ge-0/0/12.0*, ge-0/0/14.0*, ge-0/0/15.0, ge-0/0/20.0
v2 77
 None
vlan-sf 50
 None
mgmt
 me0.0*
```

Display 802.1X protocol information on the switch to view supplicants that are authenticated on interface **ge-0/0/1.0**:

```
user@switch> show dot1x interface brief
802.1X Information:
Interface Role State MAC address User
ge-0/0/1.0 Authenticator Authenticated 00:00:00:00:00:01 abc
ge-0/0/10.0 Authenticator Initialize
ge-0/0/14.0 Authenticator Connecting
ge-0/0/15.0 Authenticator Initialize
ge-0/0/20.0 Authenticator Initialize
```

A RADIUS server timeout occurs. Display the Ethernet switching table to show that the supplicant with the MAC address **00:00:00:00:00:01** previously accessing the LAN through the **default** VLAN is now being learned on the VLAN named **vlan-sf**:

```
user@switch> show ethernet-switching table
Ethernet-switching table: 3 entries, 1 learned
VLAN MAC address Type Age Interfaces
v1 * Flood - All-members
vlan-sf 00:00:00:00:00:01 Learn 1:07 ge-0/0/1.0
default * Flood - All-members
```

Display 802.1X protocol information to show that interface **ge-0/0/1.0** is connecting and will open LAN access to supplicants:

```
user@switch> show dot1x interface brief
802.1X Information:
Interface Role State MAC address User
ge-0/0/1.0 Authenticator Connecting
ge-0/0/10.0 Authenticator Initialize
ge-0/0/14.0 Authenticator Connecting
ge-0/0/15.0 Authenticator Initialize
ge-0/0/20.0 Authenticator Initialize
```

**Meaning** The **show vlans** command displays interface **ge-0/0/1.0** as a member of the **default** VLAN. The **show dot1x interface brief** command shows that a supplicant (**abc**) is authenticated on interface **ge-0/0/1.0** and has the MAC address **00:00:00:00:00:01**. A RADIUS server timeout occurs, and the authentication server cannot be reached by the

switch. The **show-ethernet-switching table** command shows that MAC address **00:00:00:00:00:01** is learned on VLAN **vlan-sf**. The supplicant has been moved from the **default** VLAN to the **vlan-sf** VLAN. The supplicant is then connected to the LAN through the VLAN named **vlan-sf**.

#### Related Documentation

- [Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44](#)
- [Configuring Server Fail Fallback \(CLI Procedure\) on page 137](#)
- [Configuring 802.1X RADIUS Accounting \(CLI Procedure\) on page 124](#)
- [Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125](#)
- [Understanding Server Fail Fallback and Authentication on EX Series Switches on page 24](#)

## Example: Configuring MAC RADIUS Authentication on an EX Series Switch

To permit hosts that are not 802.1X-enabled to access a LAN, you can configure MAC RADIUS authentication on the switch interfaces to which the non-802.1X-enabled hosts are connected. When MAC RADIUS authentication is configured, the switch will attempt to authenticate the host with the RADIUS server by using the host's MAC address.

This example describes how to configure MAC RADIUS authentication for two non-802.1X-enabled hosts:

- [Requirements on page 79](#)
- [Overview and Topology on page 80](#)
- [Configuration on page 82](#)
- [Verification on page 83](#)

### Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.3 or later for EX Series switches.
- An EX Series switch acting as an authenticator port access entity (PAE). The ports on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- A RADIUS authentication server. The authentication server acts as the backend database and contains credential information for hosts (supplicants) that have permission to connect to the network.

Before you configure MAC RADIUS authentication, be sure you have:

- Configured basic access between the EX Series switch and the RADIUS server. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch” on page 35](#).

- Performed basic bridging and VLAN configuration on the switch. See the documentation that describes setting up basic bridging and a VLAN for your switch. If you are using a switch that supports the Enhanced Layer 2 Software (ELS) configuration style, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*. For all other switches, see *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.



**NOTE:** For more about ELS, see: *Getting Started with Enhanced Layer 2 Software*

- Performed basic 802.1X configuration. See “[Configuring 802.1X Interface Settings \(CLI Procedure\)](#)” on page 120.

## Overview and Topology

IEEE 802.1X port-based network access control (PNAC) authenticates and permits devices access to a LAN if the devices can communicate with the switch by using the 802.1X protocol (that is, the devices are 802.1X-enabled). To permit non-802.1X-enabled end devices to access the LAN, you can configure MAC RADIUS authentication on the interfaces to which the end devices are connected. When the MAC address of the end device appears on the interface, the switch consults the RADIUS server to check whether it is a permitted MAC address. If the MAC address of the end device is configured as permitted on the RADIUS server, the switch opens LAN access to the end device.

You can configure both MAC RADIUS authentication and 802.1X authentication methods on an interface configured for multiple supplicants. Additionally, if an interface is connected only to a non-802.1X-enabled host, you can enable MAC RADIUS and not enable 802.1X authentication by using the **mac-radius restrict** option, and thus avoid the delay that occurs while the switch determines that the device does not respond to EAP messages.

[Figure 11 on page 81](#) shows the two printers connected to the switch.

Figure 11: Topology for MAC RADIUS Authentication Configuration

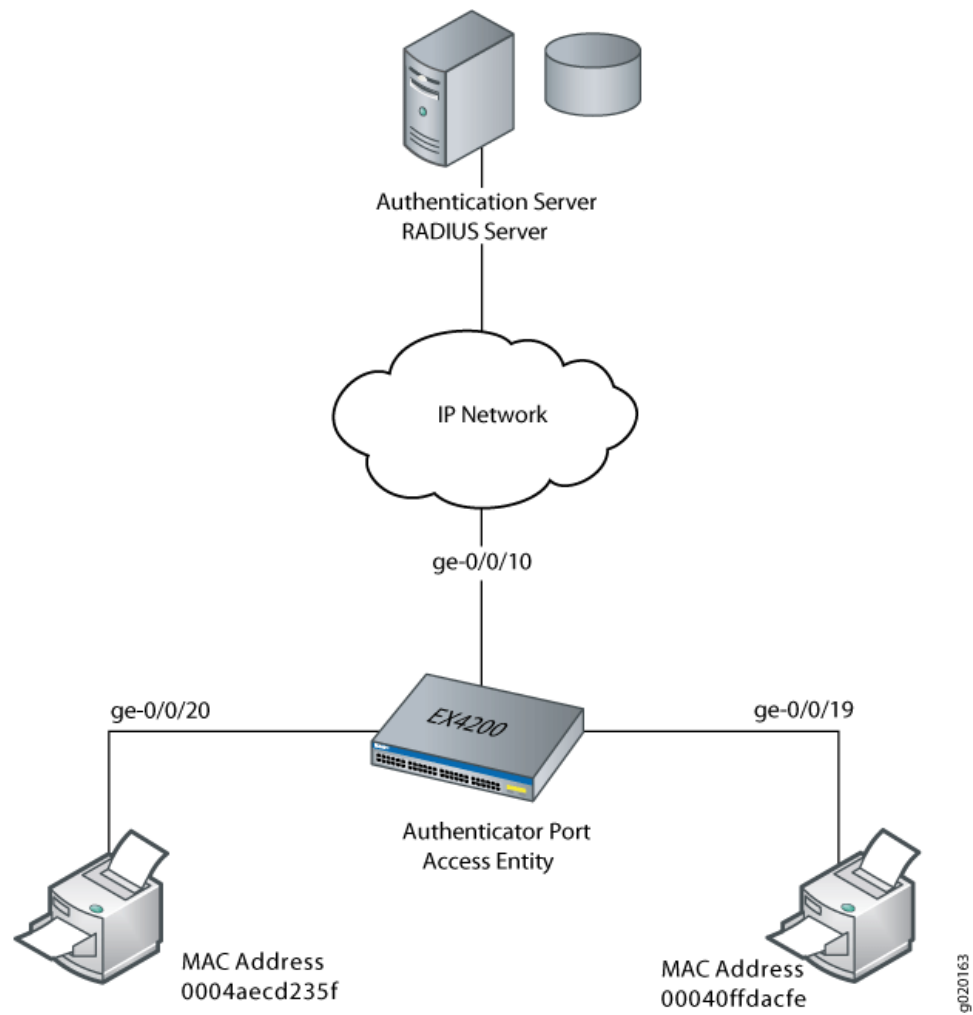


Table 9 on page 81 shows the components in the example for MAC RADIUS authentication.

Table 9: Components of the MAC RADIUS Authentication Configuration Topology

| Property                                  | Settings                                                                   |
|-------------------------------------------|----------------------------------------------------------------------------|
| Switch hardware                           | EX4200 ports (ge-0/0/0 through ge-0/0/23)                                  |
| VLAN name                                 | sales                                                                      |
| Connections to printers (no PoE required) | ge-0/0/19, MAC address 00040ffdacfe<br>ge-0/0/20, MAC address 0004aecd235f |
| RADIUS server                             | Connected to the switch on interface <b>ge-0/0/10</b>                      |

The printer with the MAC address 00040ffdacfe is connected to access interface ge-0/0/19. A second printer with the MAC address 0004aec235f is connected to access interface ge-0/0/20. In this example, both interfaces are configured for MAC RADIUS authentication on the switch, and the MAC addresses (without colons) of both printers are configured on the RADIUS server. Interface ge-0/0/20 is configured to eliminate the normal delay while the switch attempts 802.1X authentication; MAC RADIUS authentication is enabled and 802.1X authentication is disabled using the **mac radius restrict** option.

## Configuration

**CLI Quick Configuration** To quickly configure MAC RADIUS authentication, copy the following commands and paste them into the switch terminal window:

```
[edit]
set protocols dot1x authenticator interface ge-0/0/19 mac-radius
set protocols dot1x authenticator interface ge-0/0/20 mac-radius restrict
```



**NOTE:** You must also configure the two MAC addresses as usernames and passwords on the RADIUS server, as is done in step 2 of the Step-by-Step Procedure.

**Step-by-Step Procedure** Configure MAC RADIUS authentication on the switch and on the RADIUS server:

1. On the switch, configure the interfaces to which the printers are attached for MAC RADIUS authentication, and configure the restrict option on interface ge-0/0/20, so that only MAC RADIUS authentication is used:

```
[edit]
user@switch# set protocols dot1x authenticator interface ge-0/0/19 mac-radius
user@switch# set protocols dot1x authenticator interface ge-0/0/20 mac-radius restrict
```

2. On the RADIUS server, configure the MAC addresses 00040ffdacfe and 0004aec235f as usernames and passwords:

```
[root@freeradius]#
edit /etc/raddb
vi users
00040ffdacfe Auth-type:=EAP, User-Password = "00040ffdacfe"
0004aec235f Auth-type:=EAP, User-Password = "0004aec235f"
```

**Results** Display the results of the configuration on the switch:

```
user@switch> show configuration
protocols {
 dot1x {
 authenticator {
 authentication-profile-name profile52;
 interface {
 ge-0/0/19.0 {
 mac-radius;
 }
 ge-0/0/20.0 {
 mac-radius {
```

```
restrict;
}
}
}
}
}
```

## Verification

Verify that the supplicants are authenticated:

- [Verifying That the Supplicants Are Authenticated on page 83](#)

### Verifying That the Supplicants Are Authenticated

**Purpose** After supplicants are configured for MAC RADIUS authentication on the switch and on the RADIUS server, verify that they are authenticated and display the method of authentication.

**Action** Display information about the 802.1X-configured interfaces ge-0/0/19 and ge-0/0/20:

```
user@switch> show dot1x interface ge-0/0/19.0 detail
ge-0/0/19.0
 Role: Authenticator
 Administrative state: Auto
 Supplicant mode: Single
 Number of retries: 3
 Quiet period: 60 seconds
 Transmit period: 30 seconds
 Mac Radius: Enabled
 Mac Radius Restrict: Disabled
 Reauthentication: Enabled
 Configured Reauthentication interval: 3600 seconds
 Supplicant timeout: 30 seconds
 Server timeout: 30 seconds
 Maximum EAPOL requests: 2
 Guest VLAN member: <not configured>
 Number of connected supplicants: 1
 Supplicant: user101, 00:04:0f:fd:ac:fe
 Operational state: Authenticated
 Authentication method: Radius
 Authenticated VLAN: vo11
 Dynamic Filter: match source-dot1q-tag 10 action deny
 Session Reauth interval: 60 seconds
 Reauthentication due in 50 seconds

user@switch> show dot1x interface ge-0/0/20.0 detail
ge-0/0/20.0
 Role: Authenticator
 Administrative state: Auto
 Supplicant mode: Single
 Number of retries: 3
 Quiet period: 60 seconds
 Transmit period: 30 seconds
 Mac Radius: Enabled
 Mac Radius Restrict: Enabled
 Reauthentication: Enabled
 Configured Reauthentication interval: 3600 seconds
 Supplicant timeout: 30 seconds
 Server timeout: 30 seconds
 Maximum EAPOL requests: 2
 Guest VLAN member: <not configured>
 Number of connected supplicants: 1
 Supplicant: user102, 00:04:ae:cd:23:5f
 Operational state: Authenticated
 Authentication method: Radius
 Authenticated VLAN: vo11
 Dynamic Filter: match source-dot1q-tag 10 action deny
 Session Reauth interval: 60 seconds
 Reauthentication due in 50 seconds
```

**Meaning** The sample output from the **show dot1x interface detail** command displays the MAC address of the connected end device in the **Supplicant** field. On interface ge-0/0/19, the MAC address is **00:04:0f:fd:ac:fe**, which is the MAC address of the first printer configured for MAC RADIUS authentication. The **Authentication method** field displays the authentication method as **Radius**. On interface ge-0/0/20, the MAC address is **00:04:ae:cd:23:5f**, which is the MAC address of the second printer configured for MAC



RADIUS authentication. The **Authentication method** field displays the authentication method as **Radius**.

**Related  
Documentation**

- [Configuring MAC RADIUS Authentication \(CLI Procedure\) on page 139](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Understanding Authentication on EX Series Switches on page 10](#)

## Example: Applying a Firewall Filter to 802.1X-Authenticated Supplicants by Using RADIUS Server Attributes on an EX Series Switch

You can use RADIUS server attributes and a port firewall filter to centrally apply terms to multiple supplicants (end devices) connected to an EX Series switch in your enterprise. Terms are applied after a device is successfully authenticated through 802.1X. If the firewall filter configuration is modified after end devices are authenticated using the 802.1X authentication, then the established 802.1X authentication session must be terminated and re-established for the firewall filter changes to take effect.

EX Series switches support port firewall filters. Port firewall filters are configured on a single EX Series switch, but in order for them to operate throughout an enterprise, they must be configured on multiple switches. To reduce the need to configure the same port firewall filter on multiple switches, you can instead apply the filter centrally on the RADIUS server by using RADIUS server attributes.

The following example uses FreeRADIUS to apply a port firewall filter on a RADIUS server. For information about configuring your server, consult the documentation that was included with your RADIUS server.

This example describes how to configure a port firewall filter with terms, create counters to count packets for the supplicants, apply the filter to user profiles on the RADIUS server, and display the counters to verify the configuration:

- [Requirements on page 85](#)
- [Overview and Topology on page 86](#)
- [Configuring the Port Firewall Filter and Counters on page 88](#)
- [Applying the Port Firewall Filter to the Supplicant User Profiles on the RADIUS Server on page 89](#)
- [Verification on page 90](#)

## Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.3 or later for EX Series switches

- One EX Series switch acting as an authenticator port access entity (PAE). The ports on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- One RADIUS authentication server. The authentication server acts as the backend database and contains credential information for hosts (supplicants) that have permission to connect to the network.

Before you connect the server to the switch, be sure you have:

- Set up a connection between the switch and the RADIUS server. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch”](#) on page 35.
- Configured 802.1X authentication on the switch, with the supplicant mode for interface ge-0/0/2 set to **multiple**. See [“Configuring 802.1X Interface Settings \(CLI Procedure\)”](#) on page 120 and [“Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch”](#) on page 44.
- Configured users on the RADIUS authentication server (in this example, the user profiles for Supplicant 1 and Supplicant 2 in the topology are modified on the RADIUS server).

## Overview and Topology

When the 802.1X configuration on an interface is set to **multiple** supplicant mode, you can apply a single port firewall filter configured through the Junos OS CLI on the EX Series switch to any number of end devices (supplicants) by adding the filter centrally to the RADIUS server. Only a single filter can be applied to an interface; however, the filter can contain multiple terms for separate end devices.

For more information about firewall filters, see *Firewall Filters for EX Series Switches Overview*.

RADIUS server attributes are applied to the port where the end device is connected after the device is successfully authenticated using 802.1X. To authenticate an end device, the switch forwards the end device's credentials to the RADIUS server. The RADIUS server matches the credentials against preconfigured information about the supplicant located in the supplicant's user profile on the RADIUS server. If a match is found, the RADIUS server instructs the switch to open an interface to the end device. Traffic then flows from and to the end device on the LAN. Further instructions configured in the port firewall filter and added to the end device's user profile using a RADIUS server attribute further define the access that the end device is granted. Filtering terms configured in the port firewall filter are applied to the port where the end device is connected after 802.1X authentication is complete.



**NOTE:** If you modify the port firewall filter after an end device is successfully authenticated using 802.1X, you must terminate and re-establish the 802.1X authentication session for the firewall filter configuration changes to be effective.

Figure 12 on page 87 shows the topology used for this example. The RADIUS server is connected to an EX4200 switch on access port ge-0/0/10. Two end devices (supplicants) are accessing the LAN on interface ge-0/0/2. Supplicant 1 has the MAC address 00:50:8b:6f:60:3a. Supplicant 2 has the MAC address 00:50:8b:6f:60:3b.

**Figure 12: Topology for Firewall Filter and RADIUS Server Attributes Configuration**

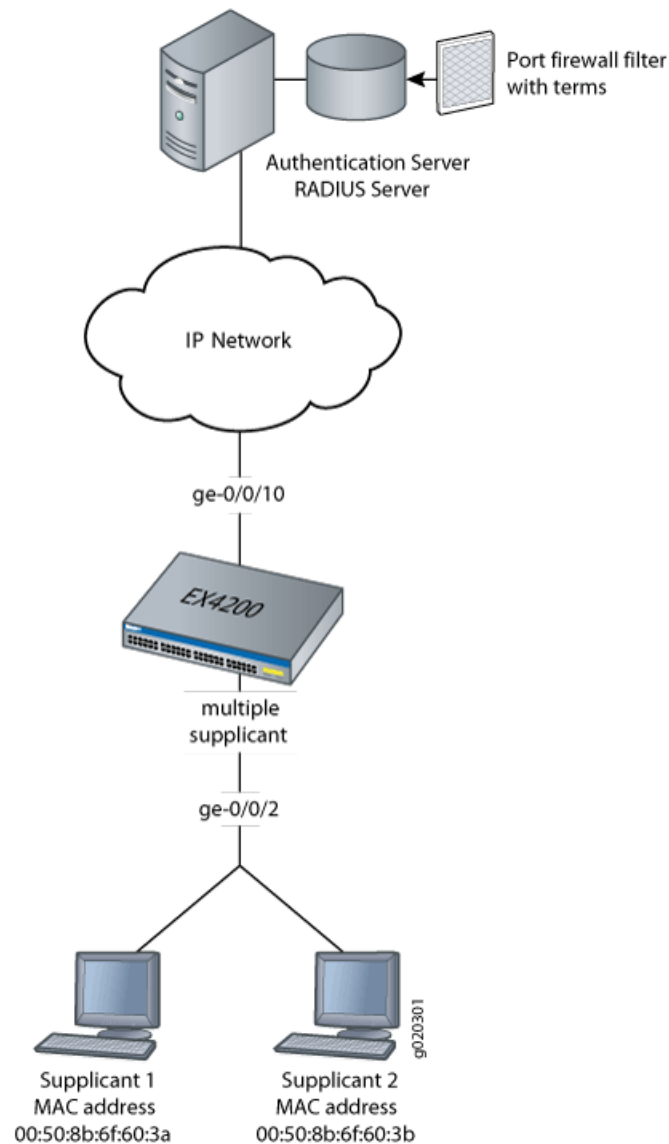


Table 10 on page 87 describes the components in this topology.

**Table 10: Components of the Firewall Filter and RADIUS Server Attributes Topology**

| Property        | Settings                                                                           |
|-----------------|------------------------------------------------------------------------------------|
| Switch hardware | EX4200 access switch, 24 Gigabit Ethernet ports: 16 non-PoE ports and 8 PoE ports. |

Table 10: Components of the Firewall Filter and RADIUS Server Attributes Topology (*continued*)

| Property                                                                | Settings                                                                                                                                                                                   |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| One RADIUS server                                                       | Backend database with the address 10.0.0.100 connected to the switch at port <b>ge-0/0/10</b> .                                                                                            |
| 802.1X supplicants connected to the switch on interface <b>ge-0/0/2</b> | <ul style="list-style-type: none"> <li>• <b>Supplicant 1</b> has MAC address <b>00:50:8b:6f:60:3a</b>.</li> <li>• <b>Supplicant 2</b> has MAC address <b>00:50:8b:6f:60:3b</b>.</li> </ul> |
| Port firewall filter to be applied on the RADIUS server                 | <b>filter1</b>                                                                                                                                                                             |
| Counters                                                                | <b>counter1</b> counts packets from Supplicant 1, and <b>counter2</b> counts packets from Supplicant 2.                                                                                    |
| Policer                                                                 | <b>policer p1</b>                                                                                                                                                                          |
| User profiles on the RADIUS server                                      | <ul style="list-style-type: none"> <li>• Supplicant 1 has the user profile <b>supplicant1</b>.</li> <li>• Supplicant 2 has the user profile <b>supplicant2</b>.</li> </ul>                 |

In this example, you configure a port firewall filter named **filter1**. The filter contains terms that will be applied to the end devices based on the MAC addresses of the end devices. When you configure the filter, you also configure the counters **counter1** and **counter2**. Packets from each end device are counted, which helps you verify that the configuration is working. Policer **p1** limits the traffic rate based on the values for **exceeding** and **discard** parameters. Then, you check to see that the RADIUS server attribute is available on the RADIUS server and apply the filter to the user profiles of each end device on the RADIUS server. Finally, you verify the configuration by displaying output for the two counters.

## Configuring the Port Firewall Filter and Counters

### CLI Quick Configuration

To quickly configure a port firewall filter with terms for Supplicant 1 and Supplicant 2 and create parallel counters for each supplicant, copy the following commands and paste them into the switch terminal window:

```
[edit]
set firewall family ethernet-switching filter filter1 term supplicant1 from source-mac-address 00:50:8b:6f:60:3a
set firewall family ethernet-switching filter filter1 term supplicant2 from source-mac-address 00:50:8b:6f:60:3b
set firewall policer p1 if-exceeding bandwidth-limit 1m
set firewall policer p1 if-exceeding burst-size-limit 1k
set firewall policer p1 then discard
set firewall family ethernet-switching filter filter1 term supplicant1 then count counter1
set firewall family ethernet-switching filter filter1 term supplicant1 then policer p1
set firewall family ethernet-switching filter filter1 term supplicant2 then count counter2
```

### Step-by-Step Procedure

To configure a port firewall filter and counters on the switch:

1. Configure a port firewall filter (here, **filter1**) with terms for each end device based on the MAC address of each end device:

```
[edit firewall family ethernet-switching]
user@switch# set filter filter1 term supplicant1 from source-mac-address 00:50:8b:6f:60:3a
user@switch# set filter filter1 term supplicant2 from source-mac-address 00:50:8b:6f:60:3b
```

2. Set policer definition:

```
[edit]
user@switch# set firewall policer p1 if-exceeding bandwidth-limit 1m
user@switch# set firewall policer p1 if-exceeding burst-size-limit 1k
user@switch# set firewall policer p1 then discard
```

3. Create two counters that will count packets for each end device and a policer that limits the traffic rate:

```
[edit firewall family ethernet-switching]
user@switch# set filter filter1 term supplicant1 then count counter1
user@switch# set filter filter1 term supplicant1 then policer p1
user@switch# set filter filter1 term supplicant2 then count counter2
```

**Results** Display the results of the configuration:

```
user@switch> show configuration
firewall {
 family ethernet-switching {
 filter filter1 {
 term supplicant1 {
 from {
 source-mac-address {
 00:50:8b:6f:60:3a;
 }
 }
 then count counter1;
 then policer p1;
 }
 term supplicant2 {
 from {
 source-mac-address {
 00:50:8b:6f:60:3b;
 }
 }
 then count counter2;
 }
 }
 }
}
policer p1 {
 if-exceeding {
 bandwidth-limit 1m;
 burst-size-limit 1k;
 }
 then discard;
}
```

## Applying the Port Firewall Filter to the Supplicant User Profiles on the RADIUS Server

**Step-by-Step Procedure** To verify that the RADIUS server attribute **Filter-ID** is on the RADIUS server and to apply the filter to the user profiles:

1. Display the dictionary **dictionary.rfc2865** on the RADIUS server, and verify that the attribute **Filter-ID** is in the dictionary:

```
[root@freeradius]# cd usr/share/freeradius/dictionary.rfc2865
```

2. Close the dictionary file.
3. Display the local user profiles of the end devices to which you want to apply the filter (here, the user profiles are called **supplicant1** and **supplicant2**):

```
[root@freeradius]# cat /usr/local/etc/raddb/users
```

The output shows:

```
supplicant1 Auth-Type := EAP, User-Password == "supplicant1"
 Tunnel-Type = VLAN,
 Tunnel-Medium-Type = IEEE-802,
 Tunnel-Private-Group-Id = "1005"
```

```
supplicant2 Auth-Type := EAP, User-Password == "supplicant2"
 Tunnel-Type = VLAN,
 Tunnel-Medium-Type = IEEE-802,
 Tunnel-Private-Group-Id = "1005"
```

4. Apply the filter to both user profiles by adding the line **Filter-Id = "filter1"** to each profile, and then close the file:

```
[root@freeradius]# cat /usr/local/etc/raddb/users
```

After you paste the line into the files, the files look like this:

```
supplicant1 Auth-Type := EAP, User-Password == "supplicant1"
 Tunnel-Type = VLAN,
 Tunnel-Medium-Type = IEEE-802,
 Tunnel-Private-Group-Id = "1005",
 Filter-Id = "filter1"
```

```
supplicant2 Auth-Type := EAP, User-Password == "supplicant2"
 Tunnel-Type = VLAN,
 Tunnel-Medium-Type = IEEE-802,
 Tunnel-Private-Group-Id = "1005",
 Filter-Id = "filter1"
```

## Verification

### Verifying That the Filter Has Been Applied to the Supplicants

---

**Purpose** After the end devices are authenticated, verify that the filter has been configured on the switch and added to each end device's user profile on the RADIUS server:

**Action** Display information about firewall filter **filter1**:

```
user@switch> show firewall filter filter1
Filter: filter1
Counters:
Name Bytes Packets
counter1 128 2
counter2 64 1
```

**Meaning** The output of the **show firewall filter filter1** command displays **counter1** and **counter2**. Packets from Supplicant 1 are counted using **counter1**, and packets from Supplicant 2 are counted using **counter2**. The output displays packets incrementing for both counters. The filter has been applied to both end devices.

- Related Documentation**
- [Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44](#)
  - [Example: Configuring Firewall Filters for Port, VLAN, and Router Traffic on EX Series Switches](#)
  - [Configuring 802.1X RADIUS Accounting \(CLI Procedure\) on page 124](#)
  - [Understanding Authentication on EX Series Switches on page 10](#)
  - [Understanding 802.1X and VSAs on EX Series Switches on page 23](#)

## Example: Applying Firewall Filters to Multiple Supplicants on Interfaces Enabled for 802.1X or MAC RADIUS Authentication

On EX Series switches, firewall filters that you apply to interfaces enabled for 802.1X or MAC RADIUS authentication are dynamically combined with the per-user policies sent to the switch from the RADIUS server. The switch uses internal logic to dynamically combine the interface firewall filter with the user policies from the RADIUS server and create an individualized policy for each of the multiple users or nonresponsive hosts that are authenticated on the interface.

This example describes how dynamic firewall filters are created for multiple supplicants on an 802.1X-enabled interface (the same principles shown in this example apply to interfaces enabled for MAC RADIUS authentication):

- [Requirements on page 92](#)
- [Overview and Topology on page 92](#)
- [Configuration on page 94](#)
- [Verification on page 96](#)

## Requirements

This example uses the following hardware and software components:

- Junos OS Release 9.5 or later for EX Series switches
- One EX Series switch
- One RADIUS authentication server. The authentication server acts as the backend database and contains credential information for hosts (supplicants) that have permission to connect to the network.

Before you apply firewall filters to an interface for use with multiple supplicants, be sure you have:

- Set up a connection between the switch and the RADIUS server. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch”](#) on page 35.
- Configured 802.1X authentication on the switch, with the authentication mode for interface **ge-0/0/2** set to **multiple**. See [“Configuring 802.1X Interface Settings \(CLI Procedure\)”](#) on page 120 and [“Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch”](#) on page 44.
- Configured users on the RADIUS authentication server.

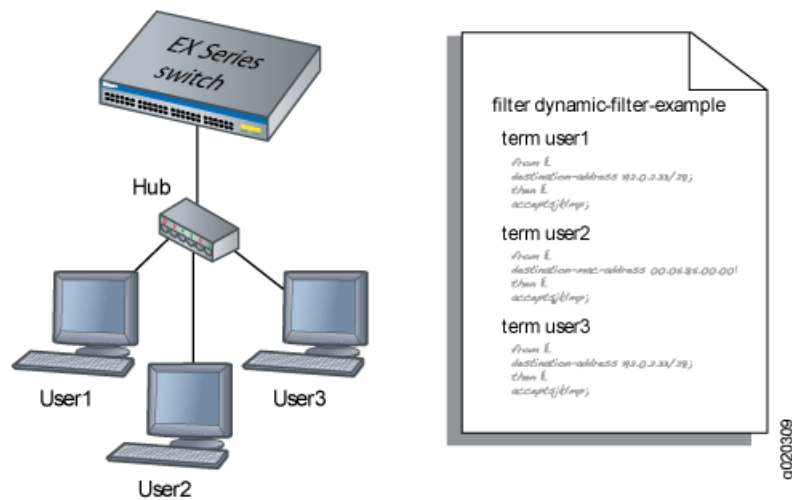
## Overview and Topology

When the 802.1X configuration on an interface is set to multiple supplicant mode, the system dynamically combines interface firewall filter with the user policies sent to the switch from the RADIUS server during authentication and creates separate terms for each user. Because there are separate terms for each user authenticated on the interface, you can, as shown in this example, use counters to view the activities of individual users that are authenticated on the same interface.

When a new user (or a nonresponsive host) is authenticated on an interface, the system adds a term to the firewall filter associated with the interface, and the term (policy) for each user is associated with the MAC address of the user. The term for each user is based on the user-specific filters set on the RADIUS server and the filters configured on the interface. For example, as shown in [Figure 13 on page 93](#), when User1 is authenticated by the EX Series switch, the system creates the firewall filter **dynamic-filter-example**. When User2 is authenticated, another term is added to the firewall filter, and so on.



Figure 13: Conceptual Model: Dynamic Filter Updated for Each New User



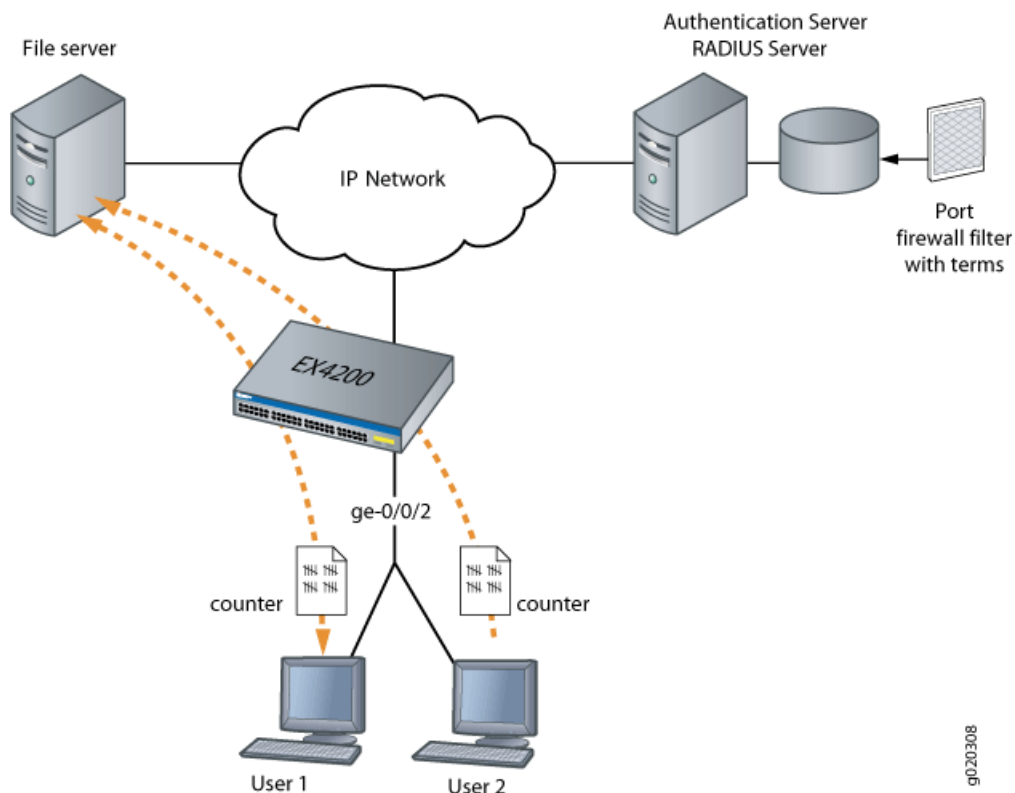
This is a conceptual model of the internal process—you cannot access or view the dynamic filter.



**NOTE:** If the firewall filter on the interface is modified after the user (or nonresponsive host) is authenticated, the modifications are not reflected in the dynamic filter unless the user is reauthenticated.

In this example, you configure a firewall filter to count the requests made by each endpoint authenticated on interface **ge-0/0/2** to the file server, which is located on subnet **192.0.2.16/28**, and set policer definitions to rate limit the traffic. [Figure 14 on page 94](#) shows the network topology for this example.

Figure 14: Multiple Supplicants on an 802.1X-Enabled Interface Connecting to a File Server



## Configuration

To configure firewall filters for multiple supplicants on 802.1X-enabled interfaces:

- [Configuring Firewall Filters on Interfaces with Multiple Supplicants on page 94](#)

### Configuring Firewall Filters on Interfaces with Multiple Supplicants

#### CLI Quick Configuration

To quickly configure firewall filters for multiple supplicants on an 802.1X-enabled interface copy the following commands and paste them into the switch terminal window:

```
[edit]
set protocols dot1x authenticator interface ge-0/0/2 supplicant multiple
set firewall family ethernet-switching filter filter1 term term1 from destination-address 192.0.2.16/28
set firewall policer p1 if-exceeding bandwidth-limit 1m
set firewall policer p1 if-exceeding burst-size-limit 1k
set firewall family ethernet-switching filter filter1 term term1 then count counter1
set firewall family ethernet-switching filter filter1 term term2 then policer p1
```

#### Step-by-Step Procedure

To configure firewall filters on an interface enabled for multiple supplicants:

1. Configure interface **ge-0/0/2** for multiple supplicant mode authentication:
 

```
[edit protocols dot1x]
user@switch# set authenticator interface ge-0/0/2 supplicant multiple
```
2. Set policer definition:

```

user@switch# show policer p1 |display set
set firewall policer p1 if-exceeding bandwidth-limit 1m
set firewall policer p1 if-exceeding burst-size-limit 1k
set firewall policer p1 then discard

```

3. Configure a firewall filter to count packets from each user and a policer that limits the traffic rate. As each new user is authenticated on the multiple supplicant interface, this filter term will be included in the dynamically created term for the user:

```

[edit firewall family ethernet-switching]
user@switch# set filter filter1 term term1 from destination-address 192.0.2.16/28
user@switch# set filter filter1 term term1 then count counter1
user@switch# set filter filter1 term term2 then policer p1

```

**Results** Check the results of the configuration:

```
user@switch> show configuration
```

```

firewall {
 family ethernet-switching {
 filter filter1 {
 term term1 {
 from {
 destination-address {
 192.0.2.16/28;
 }
 }
 then count counter1;
 }
 term term2 {
 from {
 destination-address {
 192.0.2.16/28;
 }
 }
 then policer p1;
 }
 }
 }
}
policer p1 {
 if-exceeding {
 bandwidth-limit 1m;
 burst-size-limit 1k;
 }
 then discard;
}
}
protocols {
 dot1x {
 authenticator
 interface ge-0/0/2 {
 supplicant multiple;
 }
 }
}
}

```

## Verification

To confirm that the configuration is working properly, perform these tasks:

- [Verifying Firewall Filters on Interfaces with Multiple Supplicants on page 96](#)

---

### Verifying Firewall Filters on Interfaces with Multiple Supplicants

---

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>               | Verify that firewall filters are functioning on the interface with multiple supplicants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Action</b>                | <ol style="list-style-type: none"><li>1. Check the results with one user authenticated on the interface. In this case, the user is authenticated on <b>ge-0/0/2</b>:<br/><br/>user@switch&gt; <b>show dot1x firewall</b><br/>Filter: dot1x_ge-0/0/2<br/>Counters<br/>counter1_dot1x_ge-0/0/2_user1 100</li><li>2. When a second user, User2, is authenticated on the same interface, <b>ge-0/0/2</b>, you can verify that the filter includes the results for both of the users authenticated on the interface:<br/><br/>user@switch&gt; <b>show dot1x firewall</b><br/>Filter: dot1x-filter-ge-0/0/0<br/>Counters<br/>counter1_dot1x_ge-0/0/2_user1 100<br/>counter1_dot1x_ge-0/0/2_user2 400</li></ol> |
| <b>Meaning</b>               | The results displayed by the <b>show dot1x firewall</b> command output reflect the dynamic filter created with the authentication of each new user. User1 accessed the file server located at the specified destination address 100 times, while User2 accessed the same file server 400 times.                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Related Documentation</b> | <ul style="list-style-type: none"><li>• <a href="#">Example: Applying a Firewall Filter to 802.1X-Authenticated Supplicants by Using RADIUS Server Attributes on an EX Series Switch on page 85</a></li><li>• <a href="#">Example: Configuring Firewall Filters for Port, VLAN, and Router Traffic on EX Series Switches</a></li><li>• <a href="#">Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125</a></li></ul>                                                                                                                                                                                                                                                              |

---

## Example: Setting Up Captive Portal Authentication on an EX Series Switch

---

You can set up captive portal authentication (hereafter referred to as captive portal) on a switch to redirect Web browser requests to a login page that requires the user to input a username and password. Upon successful authentication, the user is allowed to continue with the original page request and subsequent access to the network.

This example describes how to set up captive portal on an EX Series switch:

- [Requirements on page 97](#)
- [Overview and Topology on page 97](#)

- [Configuration on page 97](#)
- [Verification on page 99](#)
- [Troubleshooting on page 100](#)

## Requirements

This example uses the following hardware and software components:

- An EX Series switch that supports captive portal
- Junos OS Release 10.1 or later for EX Series switches

Before you begin, be sure you have:

- Performed basic bridging and VLAN configuration on the switch. See *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.
- Generated an SSL certificate and installed it on the switch. See *Generating SSL Certificates to Be Used for Secure Web Access*.
- Configured basic access between the EX Series switch and the RADIUS server. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch” on page 35](#).
- Designed your captive portal login page. See [“Designing a Captive Portal Authentication Login Page on an EX Series Switch” on page 144](#).

## Overview and Topology

This example shows the configuration required on the switch to enable captive portal on an interface. To permit a printer connected to the captive portal interface to access the LAN without going through captive portal, add its MAC address to the authentication whitelist. The MAC addresses in this list are permitted access on the interface without captive portal.

The topology for this example consists of one EX Series switch connected to a RADIUS authentication server. One interface on the switch is configured for captive portal. In this example, the interface is configured in multiple supplicant mode.

## Configuration

To configure captive portal on your switch:

### CLI Quick Configuration

To quickly configure captive portal on the switch after completing the tasks in the Requirements section, copy the following commands and paste them into the switch terminal window:

```
[edit]
set system services web-management http
set system services web-management https local-certificate my-signed-cert
set services captive-portal secure-authentication https
set services captive-portal interface ge-0/0/10.0 supplicant multiple
set ethernet-switching-options authentication-whitelist 00:10:12:e0:28:22
set custom-options post-authentication-url http://www.my-home-page.com
```

**Step-by-Step  
Procedure**

To configure captive portal on the switch:

1. Enable HTTP access on the switch:

```
[edit]
user@switch# set system services web-management http
```

2. To create a secure channel for Web access to the switch, configure captive portal for HTTPS:



**NOTE:** You can enable HTTP without enabling HTTPS, but we recommend HTTPS for security purposes.

- a. Associate the security certificate with the Web server and enable HTTPS access on the switch:

```
[edit]
user@switch# set system services web-management https local-certificate
my-signed-cert
```

- b. Configure captive portal to use HTTPS:

```
[edit]
user@switch# set services captive-portal secure-authentication https
```

3. Enable an interface for captive portal:

```
[edit]
user@switch# set services captive-portal interface ge-0/0/10 supplicant multiple
```

4. (Optional) Allow specific clients to bypass captive portal:



**NOTE:** If the client is already attached to the switch, you must clear its MAC address from the captive portal authentication by using the `clear captive-portal mac-address mac-address` command after adding its MAC address to the whitelist. Otherwise the new entry for the MAC address will not be added to the Ethernet switching table and authentication bypass will not be allowed.

```
[edit]
user@switch# set ethernet-switching-options authentication-whitelist 00:10:12:e0:28:22
```



**NOTE:** Optionally, you can use `set ethernet-switching-options authentication-whitelist 00:10:12:e0:28:22 interface ge-0/0/10.0` to limit the scope to the interface.

5. (Optional) To redirect clients to a specified page rather than the page they originally requested, configure the post-authentication URL:

```
[edit services captive-portal]
user@switch# set custom-options post-authentication-url http://www.my-home-page.com
```

**Results** Display the results of the configuration:

```
[edit]
user@switch> show
system {
 services {
 web-management {
 http;
 https {
 local-certificate my-signed-cert;
 }
 }
 }
}
security {
 certificates {
 local {
 my-signed-cert {
 "-----BEGIN RSA PRIVATE KEY-----\nMIICXwIBAAKBgQDk8sUggnXdDUmr7T
 vLv63yJq/LRpDASfIDZlX3z9ZDe1Kfk5C9\nr/kyvzv
 ...
 Pt5YmvWDoGo0mSjoE/liH0BqYdh9YGqv3T2IEUfflSTQQHEOShS0ogWDHF\
 nnyOb1O/vQtjk20X9NVQg JHBwidssY9eRp\n-----END CERTIFICATE-----\n";
 ## SECRET-DATA
 }
 }
 }
}
services {
 captive-portal {
 interface {
 ge-0/0/10.0 {
 supplicant multiple;
 }
 }
 secure-authentication https;
 }
}
ethernet-switching-options {
 authentication-whitelist {
 00:10:12:e0:28:22/48;
 }
}
```

## Verification

To confirm that captive portal is configured and working properly, perform these tasks:

- [Verifying That Captive Portal Is Enabled on the Interface on page 99](#)
- [Verify That Captive Portal Is Working Correctly on page 100](#)

### Verifying That Captive Portal Is Enabled on the Interface

**Purpose** Verify that captive portal is configured on interface ge-0/0/10.

**Action** Use the operational mode command **show captive-portal interface** *interface-name* detail:

```
user@switch> show captive-portal interface ge-0/0/10.0 detail
ge-0/0/10.0
 Supplicant mode: Multiple
 Number of retries: 3
 Quiet period: 60 seconds
 Configured CP session timeout: 3600 seconds
 Server timeout: 15 seconds
```

**Meaning** The output confirms that captive portal is configured on interface ge-0/0/10 with the default settings for number of retries, quiet period, CP session timeout, and server timeout.

---

### Verify That Captive Portal Is Working Correctly

**Purpose** Verify that captive portal is working on the switch.

**Action** Connect a client to interface ge-0/0/10. From the client, open a Web browser and request a webpage. The captive portal login page that you designed should be displayed. After you enter your login information and are authenticated against the RADIUS server, the Web browser should display either the page you requested or the post-authentication URL that you configured.

## Troubleshooting

To troubleshoot captive portal, perform these tasks:

- [Troubleshooting Captive Portal on page 100](#)

---

### Troubleshooting Captive Portal

**Problem** The switch does not return the captive portal login page when a user connected to a captive portal interface on the switch requests a Web page.

**Solution** You can examine the ARP, DHCP, HTTPS, and DNS counters—if one or more of these counters are not incrementing, this provides an indication of where the problem lies. For example, if the client cannot get an IP address, check the switch interface to determine whether the DHCP counter is incrementing—if the counter increments, the DHCP packet was received by the switch.

```
user@switch> show captive-portal firewall ge-0/0/10.0
ge-0/0/10.0
 Filter name: dot1x_ge-0/0/10
 Counters:
 Name Bytes Packets
 dot1x_ge-0/0/10_CP_arp 7616 119
 dot1x_ge-0/0/10_CP_dhcp 0 0
 dot1x_ge-0/0/10_CP_http 0 0
 dot1x_ge-0/0/10_CP_https 0 0
 dot1x_ge-0/0/10_CP_t_dns 0 0
 dot1x_ge-0/0/10_CP_u_dns 0 0
```



- Related Documentation**
- [Configuring Captive Portal Authentication \(CLI Procedure\) on page 142](#)
  - [Designing a Captive Portal Authentication Login Page on an EX Series Switch on page 144](#)

## Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients

For 802.1X user authentication, EX Series switches support RADIUS authentication servers that are using Extensible Authentication Protocol–Tunneled TLS (EAP-TTLS) to authenticate Odyssey Access Client (OAC) supplicants. OAC networking software runs on endpoint computers (desktop, laptop, or notepad computers and supported wireless devices) and provides secure access to both wired and wireless networks.

This example describes how to configure an 802.1X-enabled interface on the switch to provide fallback support for OAC users who have entered incorrect login credentials:

- [Requirements on page 101](#)
- [Overview and Topology on page 101](#)
- [Configuration on page 103](#)
- [Verification on page 105](#)

### Requirements

This example uses the following software and hardware components:

- Junos OS Release 11.2 or later for EX Series switches
- One EX Series switch acting as an authenticator port access entity (PAE). The ports on the authenticator PAE form a control gate that blocks all traffic to and from supplicants until they are authenticated.
- One RADIUS authentication server that supports 802.1X. The authentication server acts as the backend database and contains credential information for hosts (supplicants) that have permission to connect to the network.
- One OAC end device acting as a supplicant.

Before you begin configuring the fallback option, ensure that you have:

- Set up a connection between the switch and the RADIUS server. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch” on page 35](#).
- Configured EAP-TTLS on the server. See your RADIUS server documentation.
- Configured users on the RADIUS server. See your RADIUS server documentation.

### Overview and Topology

OAC is networking software that runs on endpoint computers (desktop, laptop, or notepad) and supported wireless devices. OAC provides full support for EAP, which is required for secure wireless LAN access.

In this topology, OAC is deployed with an 802.1X-enabled switch and a RADIUS server. The switch functions as an enforcement point in the network security architecture. This topology:

- Ensures that only authorized users can connect.
- Maintains privacy of login credentials.
- Maintains data privacy over the wireless link.

This example includes the configuration of a server-reject VLAN on the switch, which can be used to prevent accidental lockout for users who have entered incorrect login credentials. These users can be given limited LAN access.

However, this fallback configuration is complicated by the fact that the OAC supplicant and RADIUS server are using EAP-TTLS. EAP-TTLS creates a secure encrypted tunnel between the server and the end device to complete the authentication process. When the user enters incorrect login credentials, the RADIUS server sends EAP failure messages directly to the client through this tunnel. The EAP failure message causes the client to restart the authentication procedure, so that the switch's 802.1X authentication process tears down the session that was established with the switch using the server-reject VLAN. You can enable the remedial connection to continue by configuring:

- **eapol-block**—Enable the EAPoL block timer on the 802.1X interface that is configured to belong to the server-reject VLAN. The block timer causes the authentication port access entity to ignore EAP start messages from the client, attempting to restart the authentication procedure.



**NOTE:** The EAPoL block timer is triggered only after the configured number of allowed reattempts (using the `retries` option) on the 802.1X interface have been exhausted. You can configure `retries` to specify the number of times the switch attempts to authenticate the port after an initial failure. The default is three retries.

- **block-interval**—Configure the amount of time that you want the EAPoL block timer to continue to ignore EAP start messages. If you do not configure the block interval, the EAPoL block timer defaults to 120 seconds.

When the 802.1X interface ignores the EAP start messages from the client, the switch allows the existing remedial session that was established through the server-reject VLAN to remain open.

These configuration options apply to single, single-secure, and multiple supplicant authentication modes. In this example, the 802.1X interface is configured in single supplicant mode.

[Figure 15 on page 103](#) shows an EX Series switch connecting an OAC end device to a RADIUS server, and indicates the protocols being used to connect the network entities.

Figure 15: EX Series Switch Connecting OAC to RADIUS Server Using EAP-TTLS Authentication

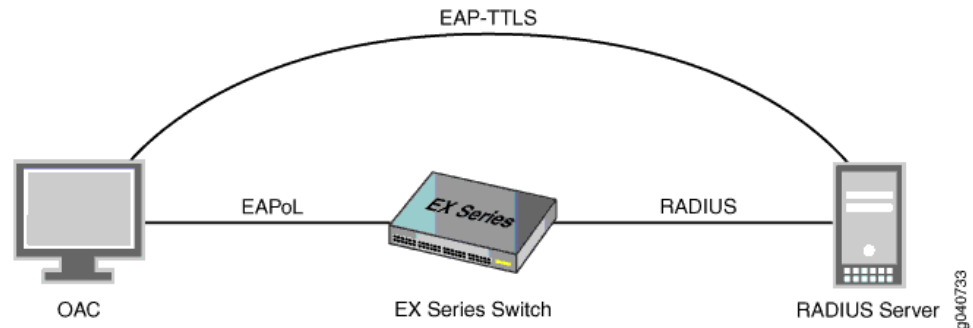


Table 11 on page 103 describes the components in this OAC deployment:

Table 11: Components of the OAC Deployment

| Property                         | Settings                                                                                            |
|----------------------------------|-----------------------------------------------------------------------------------------------------|
| Switch hardware                  | EX Series switch                                                                                    |
| VLANS                            | <b>default</b><br><b>server-reject-vlan:</b> VLAN name is <b>remedial</b> and VLAN ID is <b>700</b> |
| 802.1X interface                 | <b>ge-0/0/8</b>                                                                                     |
| OAC supplicant                   | EAP-TTLS                                                                                            |
| One RADIUS authentication server | EAP-TTLS                                                                                            |

## Configuration

**CLI Quick Configuration** To quickly configure the fallback options for EAP-TTLS and OAC supplicants, copy the following commands and paste them into the switch terminal window:

```
[edit]
set vlans remedial vlan-id 700
set protocols dot1x authenticator interface ge-0/0/8 retries 4
set protocols dot1x authenticator interface ge-0/0/8 server-reject-vlan remedial
set protocols dot1x authenticator interface ge-0/0/8 server-reject-vlan eapol-block
set protocols dot1x authenticator interface ge-0/0/8 server-reject-vlan block-interval 130
```

**Step-by-Step  
Procedure**

To configure the fallback options for EAP-TTLS and OAC supplicants:



**TIP:** In this example, the switch has only one server-reject VLAN. Therefore, the configuration specifies `eapol-block` and `block-interval` directly after `server-reject-vlan`. However, if you have configured multiple VLANs on the switch, you must include the VLAN name or VLAN ID directly after `server-reject-vlan` to indicate which VLAN is being modified.

1. Configure a VLAN that will function as the server-reject VLAN to provide limited LAN access for users who have entered incorrect login credentials:  

```
[edit]
user@switch# set vlans remedial vlan-id 700
```
2. Configure the number of times for the client to be prompted for username and password before an incorrect login is directed to the server-reject VLAN:  

```
[edit protocols dot1x authenticator interface ge-0/0/8]
user@switch# set retries 4
```
3. Configure the 802.1X authenticator interface to use the server-reject VLAN as a fallback for incorrect logins:  

```
[edit protocols dot1x authenticator interface ge-0/0/8]
user@switch# set server-reject-vlan remedial
```
4. Enable the EAPoL block timer on the 802.1X interface that is configured to belong to the server-reject VLAN.  

```
[edit protocols dot1x authenticator interface ge-0/0/8]
user@switch# set server-reject-vlan eapol-block
```
5. Configure the amount of time for the EAPoL block to remain in effect:  

```
[edit protocols dot1x authenticator interface ge-0/0/8]
user@switch# set server-reject-vlan block-interval 130
```

---

**Results**

Check the results of the configuration:

```
user@switch> show configuration
protocols {
 dot1x {
 authenticator {
 interface {
 ge-0/0/8.0 {
 supplicant single;
 retries 4;
 server-reject-vlan remedial block-interval 130 eapol-block;
 }
 }
 }
 }
}
```

## Verification

To confirm that the configuration and the fallback options are working correctly, perform this task:

- [Verifying the Configuration of the 802.1X Interface on page 105](#)

### Verifying the Configuration of the 802.1X Interface

**Purpose** Verify that the 802.1X interface is configured with the desired options.

**Action** user@switch> `show dot1x interface ge-0/0/8.0 detail`  
 ge-0/0/8.0  
 Role: Authenticator  
 Administrative state: Auto  
 Supplicant mode: Single  
 Number of retries: 4  
 Quiet period: 60 seconds  
 Transmit period: 30 seconds  
 Mac Radius: Disabled  
 Mac Radius Restrict: Disabled  
 Reauthentication: Enabled  
 Configured Reauthentication interval: 120 seconds  
 Supplicant timeout: 30 seconds  
 Server timeout: 30 seconds  
 Maximum EAPoL requests: 2  
 Guest VLAN member: guest  
 Number of connected supplicants: 1  
 Supplicant: tem, 2A:92:E6:F2:00:00  
 Operational state: Authenticated  
 Backend Authentication state: Idle  
 Authentication method: Radius  
 Authenticated VLAN: remedial  
 Session Reauth interval: 120 seconds  
 Reauthentication due in 68 seconds

**Meaning** The `show dot1x ge-0/0/8 detail` command output shows that the `ge-0/0/8` interface is in the **Authenticated** state and that it is using the **remedial** VLAN.

**Related Documentation** • [Understanding Authentication on EX Series Switches on page 10](#)

## Example: Configuring Centralized Access Control to Network Resources, with an EX Series Switch Connected to Junos Pulse Access Control Service

You can deploy an EX Series switch and Junos Pulse Access Control Service to control who is admitted to your network and what resources—servers, applications, stored data, and other devices—the user can access after being admitted to the network. Access Control Service provides both authentication and authorization:

With this combination of products, the switch serves as an *Infranet Enforcer*, that is, a policy enforcement point for Access Control Service. Access Control Service sends authentication entries and resource access policies when an endpoint successfully completes

802.1X or MAC authentication (unmanaged devices). Access for any endpoint is governed by the resource access policies that you configure on Access Control Service. The switch converts the resource access policies into filter definitions and applies these to the appropriate port. Because resource access policies are employed, firewall filters are not required for the switch configuration.

This example describes how to configure the switch to use Access Control Service for authentication and authorization and how to configure Access Control Service to use the switch as an Infranet Enforcer.



**NOTE:** This example configures the switch prior to configuring the Access Control Service. However, you can configure the Access Control Service first, if you prefer. The sequence does not matter.

The example also describes the requisite configuration procedures on Access Control Service for configuring user roles, user realms, and resource access policies:

- [Requirements on page 106](#)
- [Overview and Topology on page 107](#)
- [Configuring the EX Series Switch to Connect to the Junos Pulse Access Control Device on page 109](#)
- [Creating an Authentication Server Instance on the UAC NAC Device on page 111](#)
- [Configuring User Roles on the UAC NAC Device on page 112](#)
- [Configuring a User Realm on page 113](#)
- [Mapping User Roles to the User Realm on page 113](#)
- [Configuring Sign-In Policies on page 114](#)
- [Configuring a Location Group on page 114](#)
- [Configuring an EX Series Switch Infranet Enforcer Instance on the UAC NAC Device on page 114](#)
- [Configuring Resource Access Policies on the UAC NAC Device on page 115](#)
- [Verification on page 116](#)

## Requirements

This example uses the following hardware and software components:

- Junos OS Release 12.2 or later for EX Series switches
- One EX Series switch acting as an Infranet Enforcer and an authenticator port access entity (PAE)
- Junos Pulse Access Control Service Release 4.2 or later
- Access Control Service IC Series device or MAG Series device

Before you configure the switch to use Access Control Service, be sure you have:

- Installed and set up the IC Series device or the MAG Series device.

- For information on the IC Series, see [http://www.juniper.net/techpubs/en\\_US/release-independent/uac/information-products/pathway-pages/unified-access-control/product/](http://www.juniper.net/techpubs/en_US/release-independent/uac/information-products/pathway-pages/unified-access-control/product/).
- For information on the MAG Series, see [http://www.juniper.net/techpubs/en\\_US/release-independent/mag/information-products/pathway-pages/mag-series/product/](http://www.juniper.net/techpubs/en_US/release-independent/mag/information-products/pathway-pages/mag-series/product/).
- The IP address and password of the IC Series or MAG Series device.



**NOTE:** Within the example, the IC Series or MAG Series device is referred to as a Network Access Control (NAC) device.

## Overview and Topology

You use 802.1X to control network access. Only users and devices providing credentials that have been verified against a user database are allowed access to the network. You can use Access Control Service as the user database for 802.1X authentication, as well as for MAC RADIUS authentication.

In addition, Access Control Service functions as a centralized policy management server. It eliminates the need to configure firewall filters on the individual switch. Instead, you define resource access policies centrally on Access Control Service. The resource access policy defines which network resources are allowed and denied for a user, based upon the user's role. Access Control Service NAC device distributes these policies to all connected switches. For messages relating to access policies, the NAC device communicates with the switch using the Junos UAC Enforcer Protocol (JUEP).

The Access Control Service IC Series device or MAG Series device acts as your centralized NAC device. Specific resources are allocated through resource access policies from the Access Control Service device. The ports on the switch form a control gate that blocks all traffic to and from supplicants until they are authenticated.

Limit access to protected resources by defining *user roles* and *user realms* with accompanying *resource access policies* in the UAC admin console.

In this example, we are configuring access control for a medical facility. Because we are using Access Control Service for centralized access control, we specify the permissions and limitations on the UAC NAC device.

To ensure patient privacy, the patient medical history files are accessible only to the medical staff (**med-staf**). The patient insurance information and payment records are available only to the accounts personnel (**accounts**). Other information pertaining to the patients is available to anyone of the general staff (**other**).

The switch acts as an Infranet Enforcer and an authenticator port access entity (PAE). It blocks all traffic and acts as a control gate until the supplicant (client) is authenticated by the server. All other users and devices are denied access.

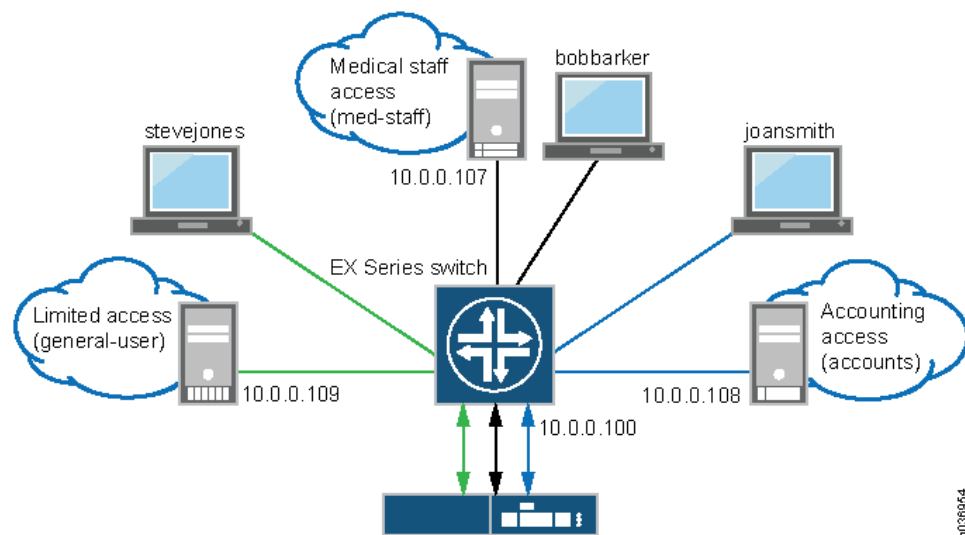
Table 12 on page 108 shows the configuration components used for the switch and the Access Control Service NAC device in this example.

**Table 12: Components of the Topology for Access Control Service and the EX Series Switch**

| Property                                                                          | Settings                                                              |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Access Control Service NAC device properties that must be specified on the switch | IP address—10.204.88.148<br>hostname—my_nac<br>password—MyUACPassword |
| Password to use for connecting the switch with the RADIUS server                  | <b>MySecret</b>                                                       |
| Access profile, specified on the switch, to define the connection to the UAC      | <b>myuac_profile</b>                                                  |
| Switch hostname                                                                   | <b>myswitch</b>                                                       |
| User <b>roles</b> on the NAC device                                               | <b>med-staff</b><br><b>accounts</b><br><b>general-user</b>            |
| User <b>realm</b> on the NAC device                                               | <b>hospital-staff</b>                                                 |
| Location <b>group</b> on the NAC device                                           | <b>medical-group</b>                                                  |

Figure 16 on page 108 shows the topology used in this example.

**Figure 16: Centralized Access Control to Network Resources with an EX Series Switch Connected to Junos Pulse Access Control Service**





## Configuring the EX Series Switch to Connect to the Junos Pulse Access Control Device

**CLI Quick Configuration** To quickly connect the switch to Access Control Service, copy the following commands and paste them into the switch terminal window:



**NOTE:** This example uses the default values for **timeout**, **interval**, and **timeout-action**.

```
[edit]
set ethernet-switching-options uac-policy
set access profile myuac_profile authentication-order radius
set access profile myuac radius authentication-server 10.204.88.148
set access radius-server 10.204.88.148
set access radius-server secret MySecret
set services unified-access-control infranet-controller my_nacaddress 10.204.88.148
set services unified-access-control infranet-controller myswitch interface me0.0
set services unified-access-control infranet-controller myswitch password MyUACPassword
set protocols dot1x authenticator authentication-profile-name myuac_profile
set protocols dot1x authenticator interface ge-0/0/10.0
```

### Step-by-Step Procedure

To connect the switch to your UAC NAC device:

1. Configure the switch to use Access Control Service for authentication and authorization:
 

```
[edit ethernet-switching-options]
user@switch# set uac-policy
```
2. Configure the access profile to specify Access Control Service. The access profile contains the authentication and authorization configuration that aids in handling authentication and authorization requests, including the authentication method and sequence, and Access Control Service address:
  - a. Configure **radius** as the authentication method to be used when attempting to authenticate a user. For each login attempt, the software tries the authentication methods in order, starting with the first one, until the password matches:
 

```
[edit access profile]
user@switch# set myuac_profile authentication-order radius
```
  - b. Define the access profile for connecting to the UAC by specifying the IP address of the authentication server:



**NOTE:** Specify the same IP address that you use for the RADIUS server and the NAC device.

- ```
[edit access profile]
user@switch# set myuac_profile radius authentication-server 10.204.88.148
```
3. Configure the RADIUS server to use the same IP address that you specified for the authentication server:


```
[edit access]
```

```
user@switch# set radius-server 10.204.88.148
```

4. Configure the password to use for connecting the switch with the RADIUS server:



NOTE: The password specified here is used for RADIUS communications between the switch and Access Control Service. It does not need to match the password that is specified on Access Control Service through the administrative interface on Access Control Service.

```
[edit access]
```

```
user@switch# set radius-server secret MySecret
```

5. Configure the address of Access Control Service NAC device:



NOTE: Specify the hostname and IP address of the NAC device. This is the same IP address that you used for specifying the authentication server.

```
[edit services united-access-control infranet-controller my_nac ]
```

```
user@switch# set address 10.204.88.148
```

6. Configure the switch's management Ethernet interface for the NAC device:

```
[edit services united-access-control infranet-controller myswitch]
```

```
user@switch# set interface me0.0
```

7. Configure the password for connecting the switch to the Access Control Service NAC device:



NOTE: This password must match the password specified on Access Control Service through its administrative interface. It is used for Junos UAC Enforcer Protocol (JUEP) communications between the switch and Access Control Service.

```
[edit services united-access-control infranet-controller myswitch]
```

```
user@switch# set password MyUACPassword
```

8. Specify the name of the access profile to use for 802.1X, MAC RADIUS, or captive portal authentication:



NOTE: Use the same access profile that you configured previously (step 2).

```
[edit protocols dot1x]
```

```
user@switch# set authenticator authentication-profile-name myuac_profile
```

9. Configure the 802.1X interface that the switch will use for communicating with Access Control Service:

```
[edit protocols dot1x]
```

```
user@switch# set authenticator interface ge-0/0/10.0
```

Results Display the results of the configuration:

```
user@switch> show configuration

services {
  unified-access-control {
    infranet-controller myuac {
      address 10.204.88.148;
      interface me0.0;
      password "$9$uOdBBRSvWxwYoreYoJGq.0BI"; ## SECRET-DATA
    }
  }
}
ethernet-switching-options {
  uac-policy;
}
protocols {
  dot1x {
    authenticator {
      authentication-profile-name myuac_profile;
      interface {
        ge-0/0/10.0;
      }
    }
  }
}
access {
  radius-server {
    10.204.88.148
    port 1812;
    secret "$9$38aJ6A0yIMXNb0BEyeK7Ns24oDkqm5Qz6k.ORSrLXJGDHPQ6/t"; ##
    SECRET-DATA
  }
}
profile myuac_profile {
  authentication-order radius;
  radius {
    authentication-server 10.204.88.148;
  }
}
```

Creating an Authentication Server Instance on the UAC NAC Device

Step-by-Step Procedure Access Control Service supports a variety of user authentication and authorization servers. To quickly set up user authentication, you can use local authentication on the Access Control Service NAC device. This example uses the preconfigured local authentication server, System Local.

To set up local user authentication on the NAC device:

1. In the NAC device admin console, select **Authentication > Auth. Servers**.
2. Click **System Local**.
3. Select the **Users** tab.
4. Click **New**.

5. In the dialog box for **New Local User**, enter information into the text boxes of the following fields:

- **Username**
- **Full Name**
- **Password**



NOTE: All other fields are optional.

6. Click **Save Changes**.
7. Repeat this procedure for each user that you want to include in the device database. For example, we created three users: **bobbarker**, **joansmith**, and **stevejones**

Results The users **bobbarker**, **joansmith**, and **stevejones** are available in the NAC device database and can be associated with a role.

Configuring User Roles on the UAC NAC Device

Step-by-Step Procedure To set up the user roles:



NOTE: In this example, either Odyssey Access Client or the Junos Pulse client is installed on the client.

1. In the NAC device admin console, select **Users > User Roles**.
2. Click **New Role** and then enter the **Name** of the role that allows users with compliant endpoints to access the protected resources. You can also enter additional information about this role into the **Description** text box.
3. Click **Save Changes**.
4. Repeat these steps to create the additional user roles. For example, we created three roles: **med-staff**, **accounts**, and **general-user**

Results The roles, **med-staff**, **accounts**, and **general-user**, are available in the NAC database.

Configuring a User Realm

Step-by-Step Procedure To configure a user realm within the authentication server instance.



NOTE: Only one user realm is required.

1. In the NAC device admin console, select **Users > User Realms**.
2. In the dialog box **User Authentication Realms**, click **New**.
3. In **New Authentication Realm**, :
 - Enter information into the text boxes:
 - **Name**—Name of the realm. For this example, we are using **hospital-staff**.
 - **Description**—(Optional) Any additional information that you wish to provide.
 - Under **Servers**:
 - **Authentication**—Select **System Local**.
 - **Directory/Attribute**—Select **None**.
 - **Accounting**—Select **None**.
4. Click **Save Changes**.

Results The new user realm can be associated with the roles you have created.

Mapping User Roles to the User Realm

Step-by-Step Procedure To map each user role to a rule within the user authentication realm.

1. In the NAC device admin console, select **Users > User Realms > Role Mapping hospital-staff**.
2. Click **New Rule**.
3. In the Role Mapping Rule dialog box, for a rule based on username, enter the information for the appropriate fields:
 - Under **Rule: If username**, is———**bobbarker**.
 - Under **then assign these roles**, select **med-staff** role and then click **Add**.
4. Create additional role mapping rules for additional users. For example, create a role mapping rule to associate user joansmith with accounts, and a role mapping rule to associate user stevejones with medical-staff.
5. Click **Save Changes**.

Results Each user is associated with a role.

Configuring Sign-In Policies

- Step-by-Step Procedure** To create a user sign-in policy:
1. In the admin console, select **Authentication > Signing in > Sign-in Policies**.
 2. To create a new sign-in policy, click **New URL** and select **Users**.
 3. In the **Sign-in URL** field, enter the URL that you want to associate with the policy. Use the format *<host>/<path>* where *<host>* is the hostname of the NAC device, and *<path>* is any string users must enter. For example **/testsite/*.
 4. (Optional) Enter a **Description** for the policy.
 5. In the **Sign-in Page** list, select **Default Sign-in Page**.
 6. Under **Available realms**, select the hospital-staff that you created.
 7. Under **Authentication protocol set**, select **802.1X**.
 8. Click **Save Changes**.
- Results** A sign-in URL is available for users.

Configuring a Location Group

- Step-by-Step Procedure** You must create a location group to associate with an Infranet Enforcer instance.
1. In the admin console, select **Network Access > Location Group**.
 2. Select **New Location Group**.
 3. For **Name**, type **medical-group**.
 4. Add an optional description.
 5. Leave the default sign-in policy.
 6. Click **Save Changes**.

Results A location group that can be assigned to the EX Series switch is created.

Configuring an EX Series Switch Infranet Enforcer Instance on the UAC NAC Device

- Step-by-Step Procedure** To configure Junos Pulse Access Control Service to accept a connection from the switch:
1. On the left navigation bar in the NAC device admin console, select **UAC > Infranet Enforcer > Connection**.
 2. Click **New Enforcer**. The New Infranet Enforcer dialog box appears. By default, the new ScreenOS Enforcer page is displayed.
 3. Select the **Junos EX** option button. The New Infranet Enforcer page is displayed.
 4. Enter the name of the switch in the **Name** box.

5. Enter the password for the switch. This password is a shared secret that administrators of both the switch and Junos Pulse Access Control Service can use for connectivity between the two devices.
6. Enter the serial number of the switch.
7. For **Location Group**, select **medical-group**.
8. Click **Save Changes**.

Results Junos Pulse Access Control Service and the EX switch can be connected.

Configuring Resource Access Policies on the UAC NAC Device

Step-by-Step Procedure

To create a resource access policy:

1. In the Infranet Enforcer admin console, select **UAC > Infranet Enforcer > Resource Access**.
2. Click **New Policy**.
3. On the **New Policy** page:
 - a. For **Name** and **Description**, enter any name and description for this policy, such as **MedicalServer**.
 - b. For **Resources**, specify the protocol, IP address, network mask, and port of each resource (or range of addresses) for which this Infranet Enforcer resource access policy applies, one per line. You cannot specify a hostname in an Infranet Enforcer resource access policy. You can specify only an IP address. You can use TCP, UDP, or ICMP.

For example, type:10.204.91.20 to specify the med-staff protected resources on the switch.
 - c. In the **Infranet Enforcer** box, add the switch you created to selected Enforcers.
 - d. In the **Roles** box, select **Policy applies to SELECTED roles**, select **med-staff**, and click **Add** to apply this resource access policy to users who are mapped to the med-staff role.
 - e. In the **Action** box, select **Allow** access.
4. Click **Save Changes**.
5. Complete two additional resource access policies:
 - Allow role accounts with the IP address 10.204.91.21.
 - Allow role general-access with the IP address 10.204.91.22.

Results Individual users, through their assigned roles, are provided access to the proper protected assets.

Verification

The following procedures verify the connections between the switch and the NAC device.

- [Verifying That the Switch Is Connected to Access Control Service on page 116](#)
- [Verifying the Configuration of Resource Access Policies on page 116](#)
- [Verifying the Mapping of Roles to Resources on page 117](#)

Verifying That the Switch Is Connected to Access Control Service

Purpose Verify that the switch is connected to Access Control Service.

Action Confirm the status of the connection to Access Control Service.

```
user@switch> show services unified-access-control status
```

Host	Address	Port	Interface	State
ic	10.204.88.148	11123	vlan.60	connected

Meaning Confirm that the **State** indicates that the Access Control Service is connected.

Verifying the Configuration of Resource Access Policies

Purpose After you have configured the access resource policies on the UAC device admin console, verify that they have been deployed to the switch.

Action Confirm that resource access policies for the switch have been configured on Access Control Service .

```

user@switch> show services unified-access-control policies detail
Identifier: 1
  Resource: 10.204.91.20:*
  Action: allow
  Apply: selected
  Role identifier      Role name
    0000000001.000005.0 med-staff
Identifier: 2
  Resource: 10.204.91.21:*
  Action: allow
  Apply: selected
  Role identifier      Role name
    1331203933.456038.0 accounts
Identifier: 3
  Resource: 10.204.91.23:*
  Action: allow
  Apply: selected
  Role identifier      Role name
    1318918961.643263.0 general-user
Identifier: 4
  Resource: 10.204.88.148:*
  Resource: udp://*:53,67
  Action: allow
  Apply: all
Total: 4

```



NOTE: There must always be a resource access policy to allow traffic to the Access Control Service.

Meaning The results show the resource access policies that were configured in this example. The policy with identifier 4 is the policy that allows traffic to the Access Control Service. It lists the IP address of the Access Control Service and an additional resource for **udp** indicating that it allows dhcp/dns traffic, too.

Verifying the Mapping of Roles to Resources

Purpose Display the content of the authentication table in a user role firewall implementation. The table, pushed from a supporting Access Control Service device, provides the user roles associated with incoming traffic.

Action Display the contents of the authentication table to show the mapping of roles to resources.

```
user@switch> show services unified-access-control authentication-table detail
Identifier: 6
Source: 00-50-56-a4-5a-4c/10.204.90.61
Username: bobbarker
Age: 0
Role identifier      Role name
0000000001.000005.0 med-staff
Total: 1
```

Meaning This output shows the mapping for username **bobbarker**. The output shows only one user, because only this user is connected at the time that the command is issued. If additional users were connected, the other users would also be displayed.

Related Documentation

- [Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service \(CLI Procedure\) on page 150](#)
- [Understanding Centralized Network Access Control and EX Series Switches on page 29](#)

CHAPTER 4

Configuration Tasks

- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Configuring 802.1X RADIUS Accounting \(CLI Procedure\) on page 124](#)
- [Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125](#)
- [Configuring LLDP \(CLI Procedure\) on page 128](#)
- [Configuring LLDP \(J-Web Procedure\) on page 132](#)
- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)
- [Juniper-Switching-Filter VSA Match Conditions and Actions on page 135](#)
- [Configuring Server Fail Fallback \(CLI Procedure\) on page 137](#)
- [Configuring MAC RADIUS Authentication \(CLI Procedure\) on page 139](#)
- [Configuring Static MAC Bypass of Authentication \(CLI Procedure\) on page 140](#)
- [Specifying RADIUS Server Connections on an EX Series Switch \(CLI Procedure\) on page 141](#)
- [Configuring Captive Portal Authentication \(CLI Procedure\) on page 142](#)
- [Designing a Captive Portal Authentication Login Page on an EX Series Switch on page 144](#)
- [Controlling Authentication Session Timeouts \(CLI Procedure\) on page 146](#)
- [Configuring NetBIOS Snooping \(CLI Procedure\) on page 147](#)
- [Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control \(CLI Procedure\) on page 148](#)
- [Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service \(CLI Procedure\) on page 150](#)

Configuring 802.1X Interface Settings (CLI Procedure)

IEEE 802.1X authentication provides network edge security, protecting Ethernet LANs from unauthorized user access by blocking all traffic to and from a supplicant (client) at the interface until the supplicant's credentials are presented and matched on the *authentication server* (a RADIUS server). When the supplicant is authenticated, the switch stops blocking access and opens the interface to the supplicant.



NOTE:

- You can also specify an 802.1X exclusion list to specify supplicants that can bypass authentication and be automatically connected to the LAN. See [“Configuring Static MAC Bypass of Authentication \(CLI Procedure\)”](#) on page 140.
- You cannot configure 802.1X user authentication on interfaces that have been enabled for Q-in-Q tunneling.
- You cannot configure 802.1X user authentication on trunk ports.

Before you begin, specify the RADIUS server or servers to be used as the authentication server. See [“Specifying RADIUS Server Connections on an EX Series Switch \(CLI Procedure\)”](#) on page 141.

To configure 802.1X on an interface:

1. Configure the supplicant mode as **single** (authenticates the first supplicant), **single-secure** (authenticates only one supplicant), or **multiple** (authenticates multiple supplicants):

```
[edit protocols dot1x]
user@switch# set authenticator interface interface-name supplicant multiple
```

2. Enable reauthentication and specify the reauthentication interval:

```
[edit protocols dot1x]
user@switch# set authenticator interface interface-name reauthentication interval seconds
```

3. Configure the interface timeout value for the response from the supplicant:

```
[edit protocols dot1x]
user@switch# set authenticator interface interface-name supplicant-timeout seconds
```

4. Configure the timeout for the interface before it resends an authentication request to the RADIUS server:

```
[edit protocols dot1x]
user@switch# set authenticator interface interface-name server-timeout seconds
```

5. Configure how long, in seconds, the interface waits before retransmitting the initial EAPOL PDUs to the supplicant:

```
[edit protocols dot1x]
user@switch# set authenticator interface interface-name transmit-period seconds
```

6. Configure the maximum number of times an EAPOL request packet is retransmitted to the supplicant before the authentication session times out:

```
[edit protocols dot1x]
```

```
user@switch# set authenticator interface interface-name maximum-requests number
```

7. Configure the number of times the switch attempts to authenticate the port after an initial failure. The port remains in a wait state during the quiet period after the authentication attempt.

```
[edit protocols dot1x]
```

```
user@switch# set authenticator interface interface-name retries number
```



NOTE: This setting specifies the number of attempts before the switch puts the interface in a *HELD* state.

Related Documentation

- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Monitoring 802.1X Authentication on page 295](#)
- [Verifying 802.1X Authentication on page 296](#)
- [Configuring LLDP \(CLI Procedure\) on page 128](#)
- [Understanding Authentication on EX Series Switches on page 10](#)

Configuring 802.1X Authentication (J-Web Procedure)



NOTE: This topic applies only to the J-Web Application package.

To configure 802.1X settings on an EX Series switch using the J-Web interface:

1. Select **Configure > Security > 802.1X**.

The 802.1X screen displays a list of interfaces, whether 802.1X security has been enabled, and the assigned port role.

When you select an interface, the **Details of 802.1x configuration on port** section displays 802.1X details for that interface.



NOTE: After you make changes to the configuration on this page, you must commit the changes for them to take effect. To commit all changes to the active configuration, select **Commit Options > Commit**. See [Using the Commit Options to Commit Configuration Changes](#) for details about all commit options.

2. Click one of the following options:

- **RADIUS Servers**—Specifies the RADIUS server to be used for authentication. Select the check box to specify a server. Click **Add** or **Edit** to add or modify the RADIUS server settings. Enter information as specified in [Table 13 on page 122](#).
- **Exclusion List**—Excludes hosts from the 802.1X authentication list by specifying the MAC address. Click **Add** or **Edit** in the Exclusion list screen to include or modify the MAC addresses. Enter information as specified in [Table 14 on page 122](#).
- **Edit**—Specifies 802.1X settings for the selected interface
 - **Apply 802.1X Profile**—Applies an 802.1X profile based on the port role. If a message appears asking whether you want to configure a RADIUS server, click **Yes**.
 - **802.1X Configuration**—Configures custom 802.1X settings for the selected interface. If a message appears asking if you want to configure a RADIUS server, click **Yes**. Enter information as specified in [Table 13 on page 122](#). To configure 802.1X settings, enter information as specified in [Table 15 on page 123](#).
- **Delete**—Deletes 802.1X authentication configuration on the selected interface.

Table 13: RADIUS Server Settings

Field	Function	Your Action
IP Address	Specifies the IP address of the server.	Enter the IP address in dotted decimal notation.
Password	Specifies the login password.	Enter the password.
Confirm Password	Verifies the login password for the server.	Reenter the password.
Server Port Number	Specifies the port with which the server is associated.	Type the port number.
Source Address	Specifies the source address of the switch using which the switch can communicate with the server.	Type the IP address in dotted decimal notation.
Retry Attempts	Specifies the number of login retries allowed after a login failure.	Type the number.
Timeout	Specifies the time interval to wait before the connection to the server is closed.	Type the interval in seconds.

Table 14: 802.1X Exclusion List

Field	Function	Your Action
MAC Address	Specifies the MAC address to be excluded from 802.1X authentication.	Enter the MAC address.
Exclude if connected through the port	Specifies that the host can bypass authentication if it is connected through a particular interface.	Select to enable the option. Select the port through which the host is connected.
Move the host to the VLAN	Specifies moving the host to a specific VLAN once the host is authenticated.	Select to enable the option. Select the VLAN from the list.

Table 15: 802.1X Port Settings

Field	Function	Your Action
Supplicant Mode		
Supplicant Mode	Specifies the mode to be adopted for supplicants: <ul style="list-style-type: none"> • Single—allows only one host for authentication. • Multiple—allows multiple hosts for authentication. Each host is checked before being admitted to the network. • Single authentication for multiple hosts—Allows multiple hosts but only the first is authenticated. 	Select a mode.
Authentication		
Enable re-authentication	Specifies enabling reauthentication on the selected interface.	1. Select to enable reauthentication. 2. Enter the timeout for reauthentication in seconds.
Action on authentication failure	Specifies the action to be taken in case the host does not respond, leading to an authentication failure.	Select one: <ul style="list-style-type: none"> • Move to the Guest VLAN—Select the VLAN to move the interface to. • Deny—The host is not permitted access.
Timeouts	Specifies timeout values for each action.	Enter the value in seconds for: <ul style="list-style-type: none"> • Port waiting time after an authentication failure • EAPOL retransmitting interval • Max. EAPOL requests • Maximum number of retries • Port timeout value for the response from the supplicant • Port timeout value for the response from the RADIUS server

- Related Documentation**
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
 - [Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44](#)
 - [Understanding Authentication on EX Series Switches on page 10](#)

Configuring 802.1X RADIUS Accounting (CLI Procedure)

RADIUS accounting permits statistical data about users logging onto or off a LAN to be collected and sent to a RADIUS accounting server. The statistical data gathered can be used for general network monitoring, to analyze and track usage patterns, or to bill a user based upon the amount of time or type of services accessed.

To configure basic RADIUS accounting by using the CLI:

1. Specify the accounting servers to which the switch will forward accounting statistics:

```
[edit access]
user@switch# set profile profile1 radius accounting-server [server-addresses]
```

2. Define the RADIUS accounting servers:

```
[edit access]
user@switch# set radius-server server-address secret password
user@switch# set radius-server server-address secret password
```

3. Enable accounting for an access profile:

```
[edit access]
user@switch# set profile profile-name accounting (Access Profile)
```

4. Configure the RADIUS servers to use while sending accounting messages and updates:

```
[edit access]
user@switch# set profile profile-name accounting order radius
```

5. Configure the statistics to be collected on the switch and forwarded to the accounting server:

```
[edit access]
user@switch# set profile profile-name accounting accounting-stop-on-access-deny
user@switch# set profile profile-name accounting accounting-stop-on-failure
```

6. Display accounting statistics collected on the switch:

```
user@switch> show network-access aaa statistics accounting
Accounting module statistics
  Requests received: 1
  Accounting Response failures: 0
  Accounting Response Success: 1
  Requests timedout: 0
```

7. Open an accounting log on the RADIUS accounting server by using the server's address, and view accounting statistics:

```
[root@freeradius]# cd /usr/local/var/log/radius/radacct/122.69.1.250
[root@freeradius 122.69.1.250]# ls
```

```
detail-20071214
```

```
[root@freeradius 122.69.1.250]# vi details-20071214
```

```
User-Name = "000347e1bab9"
NAS-Port = 67
Acct-Status-Type = Stop
Acct-Session-Id = "802.1x811912"
Acct-Input-Octets = 17454
Acct-Output-Octets = 4245
Acct-Session-Time = 1221041249
```



```

Acct-Input-Packets = 72
Acct-Output-Packets = 53
Acct-Terminate-Cause = Lost-Carrier
Acct-Input-Gigawords = 0
Acct-Output-Gigawords = 0
Called-Station-Id = "00-19-e2-50-52-60"
Calling-Station-Id = "00-03-47-e1-ba-b9"
Event-Timestamp = "Sep 10 2008 16:52:39 PDT"
NAS-Identifier = "esp48t-1b-01"
NAS-Port-Type = Virtual

User-Name = "000347e1bab9"
NAS-Port = 67
Acct-Status-Type = Start
Acct-Session-Id = "802.1x811219"
Called-Station-Id = "00-19-e2-50-52-60"
Calling-Station-Id = "00-03-47-e1-ba-b9"
Event-Timestamp = "Sep 10 2008 18:58:52 PDT"
NAS-Identifier = "esp48t-1b-01"
NAS-Port-Type = Virtual

```

- Related Documentation**
- [Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35](#)
 - [Understanding 802.1X and RADIUS Accounting on EX Series Switches on page 16](#)

Filtering 802.1X Supplicants By Using RADIUS Server Attributes

There are two ways to configure the RADIUS server with port firewall filters:

- Include a match statement and corresponding action in the **Juniper-Switching-Filter** attribute. The **Juniper-Switching-Filter** attribute is a vendor-specific attribute (VSA) listed under attribute ID number 48 in the Juniper dictionary on the RADIUS server. Use this attribute to configure simple filter conditions for authenticated users. Nothing needs to be configured on the switch; all of the configuration is on the RADIUS server.
- Apply a local firewall filter to users authenticated through the RADIUS server. Use this method for more complex filters. The firewall filter must be configured on each switch.



NOTE: If the firewall filter configuration is modified after users are authenticated using the 802.1X authentication, then the established 802.1X authentication session must be terminated and re-established for the firewall filter configuration changes to take effect.

This topic describes using FreeRADIUS software to configure VSAs. For specifics on configuring your server, consult the AAA documentation that was included with your server.

This topic includes the following tasks:

1. [Configuring Match Statements on the RADIUS Server on page 126](#)
2. [Applying a Port Firewall Filter from the RADIUS Server on page 128](#)

Configuring Match Statements on the RADIUS Server

You can configure simple filter conditions by using the **Juniper-Switching-Filter** attribute in the Juniper dictionary on the RADIUS server. These filters are then sent to a switch whenever a new user is authenticated successfully. The filters are created and applied on all EX Series switches that authenticate users through that RADIUS server without the need to configure anything on each individual switch.

To configure the **Juniper-Switching-Filter** attribute, enter one or more match conditions and a resulting action using the CLI for the RADIUS server. Enter the match statement plus an action statement enclosed within quotation marks (") using the following syntax:

```
match <destination-mac mac-address> <source-vlan vlan-name> <source-dot1q-tag
tag> <destination-ip ip-address> <ip-protocol protocol-id> <source-port port>
<destination-port port>
}
action [allow | deny] <forwarding-class class-of-service> <loss-priority (low | medium |
high)>
}
```

See [“Juniper-Switching-Filter VSA Match Conditions and Actions”](#) on page 135 for definitions of match statement options.

To configure match conditions on the RADIUS server:

1. Verify that the Juniper dictionary is loaded on your RADIUS server and includes the filtering attribute **Juniper-Switching-Filter**, attribute ID 48:

```
[root@freeradius]# cat /usr/local/share/freeradius/dictionary.juniper

# dictionary.juniper
#
# Version:      $Id: dictionary.juniper,v 1.2.6.1 2005/11/30 22:17:25 a1and
Exp
$
#  VENDOR      Juniper      2636
BEGIN-VENDOR   Juniper
ATTRIBUTE      Juniper-Local-User-Name      1      string
ATTRIBUTE      Juniper-Allow-Commands       2      string
ATTRIBUTE      Juniper-Deny-Commands        3      string
ATTRIBUTE      Juniper-Allow-Configuration  4      string
ATTRIBUTE      Juniper-Deny-Configuration   5      string
ATTRIBUTE      Juniper-Switching-Filter      48     string
<-
```

2. Enter the match conditions and actions. For example:

- To deny authentication based on the 802.1Q tag (here, the 802.1Q tag is 10):

```
[root@freeradius]#
cd /usr/local/etc/raddb
vi users
```

For each relevant user, add the **Juniper-Switching-Filter** attribute:

```
Juniper-Switching-Filter = "Match Source-dot1q-tag 10 Action deny"
```

- To deny access based on a destination IP address:

```
[root@freeradius]# cd /usr/local/etc/raddb
```

```
vi users
```

For each relevant user, add the **Juniper-Switching-Filter** attribute:

```
Juniper-Switching-Filter = "Match Destination-ip 192.168.1.0/31 Action deny"
```

- To set the packet loss priority (PLP) to **high** based on a destination MAC address and the IP protocol:

```
[root@freeradius]# cd /usr/local/etc/raddb
```

```
vi users
```

For each relevant user, add the **Juniper-Switching-Filter** attribute:

```
Juniper-Switching-Filter = "Match Destination-mac 00:04:0f:fd:ac:fe, ip-protocol 2, forwarding-class high, Action loss-priority high"
```



NOTE: For the **forwarding-class** option to be applied, the forwarding class must be configured on the switch. If it is not configured on the switch, this option is ignored. You must specify both the forwarding class and the packet loss priority.

3. Stop and restart the RADIUS process to activate the configuration.

Applying a Port Firewall Filter from the RADIUS Server

You can apply a firewall filter to user policies on the RADIUS server. The RADIUS server can then specify the firewall filters that are to be applied to each user that requests to authenticate. Use this method when the firewall filter has more extensive conditions or you want to use different conditions for the same filter on different switches. The firewall filters must be configured on each switch.

For more information about firewall filters, see *Firewall Filters for EX Series Switches Overview*.

To apply a port firewall filter centrally from the RADIUS server:



NOTE: If port firewall filters are also configured locally for the interface, then VSAs take precedence if they conflict with the filters. If the VSAs and the local port firewall filters do not conflict, they are merged.

1. Create the firewall filter on the local switch. In this example, the filter is called **filter1**.
2. Open the **users** file on the RADIUS server:

```
[root@freeradius]#  
cd /usr/local/pool/raddb  
vi users
```

3. For each relevant user, add the filter (here, the filter ID is **filter1**):

```
Filter-Id = "filter1"
```



NOTE: Multiple filters are not supported on a single interface. However, you can support multiple filters for multiple users that are connected to the switch on the same interface by configuring a single filter with policies for each of those users.

4. Stop and restart the RADIUS process to activate the configuration.

Related Documentation

- [Example: Applying a Firewall Filter to 802.1X-Authenticated Supplicants by Using RADIUS Server Attributes on an EX Series Switch on page 85](#)
- [Example: Configuring Firewall Filters for Port, VLAN, and Router Traffic on EX Series Switches](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Understanding 802.1X and VSAs on EX Series Switches on page 23](#)

Configuring LLDP (CLI Procedure)

Devices use Link Layer Discovery Protocol (LLDP) and Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) to learn and distribute device

information on network links. The information enables the device to quickly identify a variety of other devices, resulting in a LAN that interoperates smoothly and efficiently.

This topic describes:

- [Enabling LLDP on Interfaces on page 129](#)
- [Adjusting LLDP Advertisement Settings on page 129](#)
- [Adjusting SNMP Notification Settings of LLDP Changes on page 130](#)
- [Specifying a Management Address for the LLDP Management TLV on page 131](#)
- [Configuring LLDP Power Negotiation on page 131](#)

Enabling LLDP on Interfaces

LLDP is enabled on all interfaces by default. If it is disabled, you can enable LLDP by configuring it on all interfaces or on specific interfaces.

- To configure LLDP on all interfaces:

```
[edit protocols lldp]
user@switch# set interface all
```

- To configure LLDP on a specific interface:

```
[edit protocols lldp]
user@switch# set interface interface-name
```



NOTE: On EX4300 switches, LLDP cannot be configured on the me0 or vme interface. Issuing the `set protocols lldp interface me0` command generates the following error message:

```
error: name: 'me0': Invalid interface
error: statement creation failed: interface
```

Issuing the `set protocols lldp interface vme` command generates the following error message:

```
error: name: 'vme': Invalid interface
error: statement creation failed: interface
```

Adjusting LLDP Advertisement Settings

You can adjust the following settings for LLDP advertisements for troubleshooting or verification purposes. The default values are applied when LLDP is enabled. For normal operations, we recommend that you do not change the default values.

- To specify the frequency at which LLDP advertisements are sent (in seconds):

```
[edit protocols lldp]
user@switch# set advertisement-interval seconds
```

For example, using the default value:

```
[edit protocols lldp]
user@switch# set advertisement-interval 45
```

- To specify the number of seconds that LLDP information is held before it is discarded (the multiplier value is used in combination with the **advertisement-interval** value):

```
[edit protocols lldp]
user@switch# set hold-multiplier seconds
```

For example, using the default value:

```
[edit protocols lldp]
user@switch# set hold-multiplier 5
```

- To specify the number of seconds the device waits before sending advertisements to neighbors after a change is made in a TLV (type, length, or value) element in LLDP or in the state of the local system, such as a change in hostname or management address, set the transmit delay. The transmit delay is enabled by default on switches to reduce the delay in notifying neighbors of a change in the local system. The default value is 2 seconds (if the **advertisement-interval** value is set to 8 seconds or more) or 1 second (if the **advertisement-interval** value is set to less than 8 seconds).

```
[edit protocols lldp]
user@switch# set transmit-delay seconds
```

For example:

```
[edit protocols lldp]
user@switch# set transmit-delay 2
```



NOTE: The advertisement-interval value must be greater than or equal to four times the transmit-delay value; otherwise, an error is returned when you attempt to commit the configuration.

Adjusting SNMP Notification Settings of LLDP Changes

You can adjust the following settings for SNMP notifications of LLDP changes. If the values are not specified or if the interval values are set to 0, the notifications are disabled.

- To specify the frequency at which LLDP database changes are sent (in seconds):

```
[edit protocols lldp]
user@switch# set lldp-configuration-notification-interval seconds
```

For example:

```
[edit protocols lldp]
user@switch# set lldp-configuration-notification-interval 600
```

- To configure the time interval for SNMP trap notifications to wait for topology changes (in seconds):

```
[edit protocols lldp]
user@switch# set ptopo-configuration-trap-interval seconds
```

For example:

```
[edit protocols lldp]
user@switch# set ptopo-configuration-trap-interval 600
```

- To specify the holding time (used in combination with the **ptopo-configuration-trap-interval** value) to maintain dynamic topology entries (in seconds):

```
[edit protocols lldp]
user@switch# set ptopo-configuration-maximum-hold-time seconds
```

For example:

```
[edit protocols lldp]
user@switch# set ptopo-configuration-maximum-hold-time 2147483647
```

Specifying a Management Address for the LLDP Management TLV

You can configure an IPv4 or IPv6 management address to be used in the LLDP Management Address type, length, and value (TLV) messages. Only an out-of-band management address must be used as the value for the **management-address** statement.

To configure the management address:

```
[edit protocols lldp]
user@switch# set management-address ip-address
```



NOTE: Ensure that the interface with the configured management address has LLDP enabled using the **set protocols lldp interface** command. If you configure a customized management address for LLDP on an interface that has LLDP disabled, the **show lldp local-information** command output does not display the correct interface information.

Configuring LLDP Power Negotiation

LLDP power negotiation enables the switch's Power over Ethernet (PoE) controller to dynamically allocate PoE power to PoE interfaces, based on the needs of the powered device, by negotiating with LLDP-enabled powered devices.



NOTE: LLDP power negotiation is not supported on EX3200 and EX4200 (except EX4200-24P and EX4200-48P models) switches.

LLDP power negotiation is supported on switches running PoE controller software version 4.04 or later. For information about upgrading the PoE controller software, see *Upgrading the PoE Controller Software*.

LLDP power negotiation is automatically enabled when the PoE management mode is set to **class**:

- [edit poe]
user@switch# **set management class**

To disable LLDP power negotiation:

- On switch interfaces:
[edit protocols lldp interface all power-negotiation]
user@switch# **disable**
- On a specific switch interface:
[edit protocols lldp interface *interface-name* power-negotiation]

```
user@switch# disable
```

Related Documentation

- [Configuring LLDP \(J-Web Procedure\) on page 132](#)
- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

Configuring LLDP (J-Web Procedure)



NOTE: This topic applies only to the J-Web Application package.

Use the LLDP Configuration page to configure LLDP global and port settings for an EX Series switch on the J-Web interface.

To configure LLDP:

1. Select **Configure** > **Switching** > **LLDP**.

The LLDP Configuration page displays LLDP Global Settings and Port Settings.

The second half of the screen displays operational details for the selected port.



NOTE: After you make changes to the configuration on this page, you must commit the changes for them to take effect. To commit all changes to the active configuration, select **Commit Options** > **Commit**. See [Using the Commit Options to Commit Configuration Changes](#) for details about all commit options.

2. For an EX8200 Virtual Chassis configuration, select the member and the slot (FPC) from the list.

3. To modify LLDP Global Settings, click **Global Settings**.

Enter information as described in [Table 16 on page 132](#).

4. To modify Port Settings, click **Edit** in the Port Settings section.

Enter information as described in [Table 17 on page 133](#).

Table 16: Global Settings

Field	Function	Your Action
Advertising interval	Specifies the frequency of outbound LLDP advertisements. You can increase or decrease this interval.	Type the number of seconds.
Hold multiplier	Specifies the multiplier factor to be used by an LLDP-enabled switch to calculate the time-to-live (TTL) value for the LLDP advertisements it generates and transmits to LLDP neighbors.	Type the required number in the field.

Table 16: Global Settings (*continued*)

Field	Function	Your Action
Fast start count	Specifies the number of LLDP advertisements sent in the first second after the device connects. The default is 3. Increasing this number results in the port initially advertising LLDP-MED at a faster rate for a limited time.	Type the Fast start count.

Table 17: Edit Port Settings

Field	Function	Your Action
LLDP Status	Specifies whether LLDP has been enabled on the port.	Select one: Enabled , Disabled , or None .
LLDP-MED Status	Specifies whether LLDP-MED has been enabled on the port.	Select Enable from the list.

Related Documentation

- [Configuring LLDP \(CLI Procedure\) on page 128](#)
- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

Configuring LLDP-MED (CLI Procedure)

Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) is an extension of LLDP. The EX Series switch uses LLDP-MED to support device discovery of VoIP telephones and to create location databases for these telephone locations.

LLDP-MED is enabled by default on EX Series switches.

This topic describes:

- [Enabling LLDP-MED on Interfaces on page 133](#)
- [Configuring Location Information Advertised by the Switch on page 134](#)
- [Configuring a Fast Start for LLDP-MED on page 134](#)

Enabling LLDP-MED on Interfaces

LLDP-MED is enabled on all interfaces by default. If it is disabled, you can enable LLDP-MED by configuring it on all interfaces or on specific interfaces.



NOTE: On switches running Junos OS for EX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style, configure LLDP-MED on the physical interface—for example, on ge-0/0/2. For more about ELS, see *Getting Started with Enhanced Layer 2 Software*.

To configure LLDP-MED on all interfaces or on a specific interface:

```
[edit protocols lldp-med]
user@switch# set interface interface-name
```

Configuring Location Information Advertised by the Switch

You can configure the location information that is advertised from the switch to the LLDP-MED device. You can specify a civic-based location (geographic location) or a location based on an ELIN (Emergency Location Identification Number):

- To specify a location by geography:

```
[edit protocols lldp-med]
user@switch# set interface ge-0/0/2.0 location civic-based country-code country-code
user@switch# set interface ge-0/0/2.0 location civic-based ca-type ca-type ca-value ca-value
```

- To specify a location by using an elin string:

```
[edit protocols lldp-med]
user@switch# set interface ge-0/0/2.0 location elin 4085551212
```

Configuring a Fast Start for LLDP-MED

When the switch detects an LLDP-MED capable device, it begins to send LLDP advertisements from the port connected to the device. The fast start count indicates how many advertisements will be sent in the first second after the switch detects the LLDP-MED device. The default is 3; to set it to another value:

```
[edit protocols lldp-med]
user@switch# set fast-start seconds
```

For example:

```
[edit protocols lldp-med]
user@switch# set fast-start 6
```



NOTE: If an interface is configured as a VoIP interface, then the switch does not wait for an attached phone to identify itself as an LLDP-MED device before it performs an LLDP-MED fast start after a graceful Routing Engine switchover (GRES) or a reboot. Instead, it immediately performs an LLDP-MED fast start after a GRES or reboot. This behavior prevents certain models of IP phones from resetting after a GRES.

Related Documentation

- [Configuring LLDP \(J-Web Procedure\) on page 132](#)
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch](#)
- [Configuring LLDP \(CLI Procedure\) on page 128](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

Juniper-Switching-Filter VSA Match Conditions and Actions

Switching devices support the configuration of RADIUS server attributes specific to Juniper Networks, known as vendor-specific attributes (VSAs). The **Juniper-Switching-Filter** VSA works in conjunction with 802.1X authentication to define a supplicant's access to the network. You can use this VSA to apply a port firewall filter to 802.1X authenticated users. The filter is configured on the RADIUS server as a set of match conditions and actions.

Each term in a VSA consists of *match conditions* and an *action*. Match conditions are the values or fields that the packet must contain. You can define single, multiple, or no match conditions. If no match conditions are specified for the term, the packet is accepted by default. The action is the action that the switch takes if a packet matches the match conditions for the specific term. Allowed actions are to accept a packet or to discard a packet.

The following guidelines apply when you specify match conditions and actions for VSAs:

- Both **match** and **action** statements are mandatory.
- Any or all options (separated by commas) can be included in each **match** and **action** statement.
- The AND operation is performed on fields separated by commas if the fields are of a different type. The same types cannot be repeated.
- For OR cases (for example, match **10.1.1.0/24 OR 11.1.1.0/24**), apply multiple VSAs to the 802.1X supplicant.
- In order for the **forwarding-class** option to be applied, the forwarding class must be configured on the switch. If it is not configured on the switch, this option is ignored.

[Table 18 on page 135](#) describes the match conditions that you can specify when configuring a VSA by using the **match** command on the RADIUS server. The string that defines a match condition is called a *match statement*.

Table 18: Match Conditions

Option	Description
destination-mac <i>mac-address</i>	Destination media access control (MAC) address of the packet.
source-vlan <i>source-vlan</i>	Name of the source VLAN.
source-dot1q-tag <i>tag</i>	Tag value in the 802.1Q header, in the range 0 through 4095.
destination-ip <i>ip-address</i>	Address of the final destination node.
ip-protocol <i>protocol-id</i>	IPv4 protocol value. In place of the numeric value, you can specify one of the following text synonyms: ah , egp (8), esp (50), gre (47), icmp (1), igmp (2), ipip (4), ipv6 (41), ospf (89), pim (103), rsvp (46), tcp (6), or udp (17)

Table 18: Match Conditions (*continued*)

Option	Description
source-port <i>port</i>	TCP or User Datagram Protocol (UDP) source port field. Normally, you specify this match statement in conjunction with the ip-protocol match statement to determine which protocol is being used on the port. In place of the numeric field, you can specify one of the text options listed under destination-port .
destination-port <i>port</i>	<p>TCP or UDP destination port field. Normally, you specify this match in conjunction with the ip-protocol match statement to determine which protocol is being used on the port. In place of the numeric value, you can specify one of the following text synonyms (the port numbers are also listed):</p> <p>afs (1483), bgp (179), biff (512), bootpc (68), bootps (67), cvspserver (2401), cmd (514), dhcp (67), domain (53), eklogin (2105), ekshell (2106), exec (512), finger (79), ftp (21), ftp-data (20), http (80), https (443), ident (113), imap (143), kerberos-sec (88), klogin (543), kpasswd (761), krb-prop (754), krbupdate (760), kshell (544), ldap (389), login (513), mobileip-agent (434), mobilip-mn (435), msdp (639), netbios-dgm (138), netbios-ns (137), netbios-ssn (139), nfsd (2049), nntp (119), ntalk (518), ntp (123), pop3 (110), pptp (1723), printer (515), radacct (1813), radius (1812), rip (520), rkinit (2108), smtp (25), snmp (161), snmptrap (162), snpp (444), socks (1080), ssh (22), sunrpc (111), syslog (514), telnet (23), tacacs-ds (65), talk (517), tftp (69), timed (525), who (513), xdmcp (177), zephyr-clt (2103), zephyr-hm (2104)</p>

When you define one or more terms that specify the filtering criteria, you also define the action to take if the packet matches all criteria. [Table 19 on page 136](#) shows the actions that you can specify in a term.

Table 19: Actions for VSAs

Option	Description
(allow deny)	Accept a packet or discard a packet silently without sending an Internet Control Message Protocol (ICMP) message.
forwarding-class <i>class-of-service</i>	<p>(Optional) Classify the packet in one of the following forwarding classes:</p> <ul style="list-style-type: none"> assured-forwarding best-effort expedited-forwarding network-control
loss-priority (low medium high)	(Optional) Set the packet loss priority (PLP) to low , medium , or high . Specify both the forwarding class and loss priority.

- Related Documentation**
- [Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125](#)
 - [Understanding 802.1X and VSAs on EX Series Switches on page 23](#)
 - [Understanding VSAs](#)

Configuring Server Fail Fallback (CLI Procedure)

You can use the server fail fallback feature to specify how end devices connected to the switch are supported if the RADIUS authentication server becomes unavailable or sends a RADIUS access-reject message.

802.1X and MAC RADIUS authentication work by using an *authenticator port access entity* (the EX Series switch) to block all traffic to and from an end device at the interface until the end device's credentials are presented and matched on the *authentication server* (a RADIUS server). When the end device has been authenticated, the switch stops blocking and opens the interface to the end device.

When you set up 802.1X or MAC RADIUS authentication on the switch, you specify a primary authentication server and one or more backup authentication servers. If the primary authentication server cannot be reached by the switch and the secondary authentication servers are also unreachable, a RADIUS server timeout occurs. Because the authentication server grants or denies access to the end devices awaiting authentication, the switch does not receive access instructions for end devices attempting access to the LAN and normal authentication cannot be completed. With server fail fallback, you can configure authentication alternatives that permit the switch to take appropriate actions toward end devices awaiting authentication or reauthentication.



NOTE: The authentication fallback method called *server-reject VLAN* provides limited access to a LAN, typically only to the Internet, for responsive end devices that are 802.1X-enabled but that have sent the wrong credentials. If the end device that is authenticated using the server-reject VLAN is an IP phone, voice traffic is not allowed.

To configure basic server fail fallback options by using the CLI:

- Configure an interface to allow traffic to flow from a supplicant to the LAN if a RADIUS server timeout occurs (as if the end device had been successfully authenticated by a RADIUS server):

```
[edit protocols dot1x authenticator]
user@switch# set interface interface-name server-fail permit
```

- Configure an interface to prevent traffic flow from an end device to the LAN (as if the end device had failed authentication and had been rejected by the RADIUS server):

```
[edit protocols dot1x authenticator]
user@switch# set interface interface-name server-fail deny
```

- Configure an interface to move an end device to a specified VLAN if a RADIUS server timeout occurs:

```
[edit protocols dot1x authenticator]
user@switch# set interface interface-name server-fail vlan-name
```

- Configure an interface to recognize already connected end devices as reauthenticated if there is a RADIUS timeout during reauthentication (new users will be denied access):

```
[edit protocols dot1x authenticator]
user@switch# set interface interface-name server-fail use-cache
```

- Configure an interface that receives a RADIUS access-reject message from the authentication server to move end devices attempting LAN access on the interface to a server-reject VLAN, a specified VLAN already configured on the switch:

```
[edit protocols dot1x authenticator]
user@switch# set interface interface-name server-reject-vlan vlan-sf
```



NOTE: If an IP phone is authenticated in the server-reject VLAN, voice traffic is not allowed.

Related Documentation

- [Example: Configuring 802.1X Authentication Options When the RADIUS Server Is Unavailable to an EX Series Switch on page 73](#)
- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Monitoring 802.1X Authentication on page 295](#)
- [Understanding Server Fail Fallback and Authentication on EX Series Switches on page 24](#)

Configuring MAC RADIUS Authentication (CLI Procedure)

You can permit devices that are not 802.1X-enabled LAN access by configuring MAC RADIUS authentication on the EX Series switch interfaces to which the hosts are connected.



NOTE: You can also allow non-802.1X-enabled devices to access the LAN by configuring their MAC address for static MAC bypass of authentication.

You can configure MAC RADIUS authentication on an interface that also allows 802.1X authentication, or you can configure either authentication method alone.

If both MAC RADIUS and 802.1X authentication are enabled on the interface, the switch first sends the host three EAPoL requests to the host. If there is no response from the host, the switch sends the host's MAC address to the RADIUS server to check whether it is a permitted MAC address. If the MAC address is configured as permitted on the RADIUS server, the RADIUS server sends a message to the switch that the MAC address is a permitted address, and the switch opens LAN access to the nonresponsive host on the interface to which it is connected.

If MAC RADIUS authentication is configured on the interface but 802.1X authentication is not (by using the **mac-radius restrict** option), the switch attempts to authenticate the MAC address with the RADIUS server without delaying by attempting 802.1X authentication first.

Before you configure MAC RADIUS authentication, be sure you have:

- Configured basic access between the EX Series switch and the RADIUS server. See [“Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch” on page 35.](#)

To configure MAC RADIUS authentication by using the CLI:

- On the switch, configure the interfaces to which the nonresponsive hosts are attached for MAC RADIUS authentication, and add the **restrict** qualifier for interface **ge-0/0/20** to have it use only MAC RADIUS authentication:

```
[edit]
user@switch# set protocols dot1x authenticator interface ge-0/0/19 mac-radius
user@switch# set protocols dot1x authenticator interface ge-0/0/20 mac-radius restrict
```

- On a RADIUS authentication server, create user profiles for each nonresponsive host using the MAC address (without colons) of the nonresponsive host as the username and password (here, the MAC addresses are 00:04:0f:fd:ac:fe and 00:04:ae:cd:23:5f):

```
[root@freeradius]#
edit /etc/raddb
vi users
00040ffdacfe Auth-type:=Local, User-Password = "00040ffdacfe"
0004aecdc235f Auth-type:=Local, User-Password = "0004aecdc235f"
```

- Related Documentation**
- [Example: Configuring MAC RADIUS Authentication on an EX Series Switch on page 79](#)
 - [Verifying 802.1X Authentication on page 296](#)
 - [Understanding Authentication on EX Series Switches on page 10](#)

Configuring Static MAC Bypass of Authentication (CLI Procedure)

You can configure a static MAC bypass list (sometimes called the exclusion list) on the switch to specify MAC addresses of devices allowed access to the LAN without 802.1X or MAC RADIUS authentication requests to the RADIUS server.

To configure the static MAC bypass list:

- Specify a MAC address to bypass authentication:

```
[edit protocols dot1x]  
user@switch# set authenticator static 00:04:0f:fd:ac:fe
```
- Configure a supplicant to bypass authentication if it is connected through a particular interface:

```
[edit protocols dot1x]  
user@switch# set authenticator static 00:04:0f:fd:ac:fe interface ge-0/0/5
```
- Configure a supplicant to be moved to a specific VLAN after it is authenticated:

```
[edit protocols dot1x]  
user@switch# set authenticator static 00:04:0f:fd:ac:fe interface ge-0/0/5 vlan-assignment  
default-vlan
```

- Related Documentation**
- [Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69](#)
 - [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
 - [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)

Specifying RADIUS Server Connections on an EX Series Switch (CLI Procedure)

IEEE 802.1X and MAC RADIUS authentication both provide network edge security, protecting Ethernet LANs from unauthorized user access by blocking all traffic to and from devices at the interface until the supplicant's credentials or MAC address are presented and matched on the *authentication server* (a RADIUS server). When the supplicant is authenticated, the switch stops blocking access and opens the interface to the supplicant.

To use 802.1X or MAC RADIUS authentication, you must specify the connections on the switch for each RADIUS server to which you will connect.

To configure a RADIUS server on the switch:

1. Define the IP address of the RADIUS server, the RADIUS server authentication port number, and the secret password. You can define more than one RADIUS server. The secret password on the switch must match the secret password on the server:

```
[edit access]
user@switch# set radius-server server-address port 1812 secret password
```



NOTE: Specifying the authentication port is optional, and port 1812 is the default. However, we recommend that you configure it in order to avoid confusion as some RADIUS servers might refer to an older default.

2. (Optional) Specify the IP address by which the switch is identified by the RADIUS server. If you do not specify the IP address, the RADIUS server uses the address of the interface that sends the RADIUS request. We recommend that you specify this IP address because if the request gets diverted on an alternate route to the RADIUS server, the interface relaying the request might not be an interface on the switch.

```
[edit access]
user@switch# set access radius-server source-address source-address
```

3. Configure the authentication order, making **radius** the first method of authentication:

```
[edit access]
user@switch# set profile profile-name authentication-order radius
```

4. Create a profile and specify the list of RADIUS servers to be associated with the profile. For example, you might choose to group your RADIUS servers geographically by city. This feature enables easy modification whenever you want to change to a different set of authentication servers.

```
[edit access profile profile-name]
user@switch# set radius authentication-server server-address server-address
```

5. Specify the group of servers to be used for 802.1X or MAC RADIUS authentication by identifying the profile name:

```
[edit]
```

```
user@switch# set protocols dot1x authenticator authentication-profile-name  
access-profile-name
```

6. Configure the IP address of the EX Series switch in the list of clients on the RADIUS server. For information about configuring the RADIUS server, consult the documentation for your server.

**Related
Documentation**

- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Configuring MAC RADIUS Authentication \(CLI Procedure\) on page 139](#)
- [Configuring 802.1X RADIUS Accounting \(CLI Procedure\) on page 124](#)

Configuring Captive Portal Authentication (CLI Procedure)

Configure captive portal authentication (hereafter referred to as captive portal) on an EX Series switch so that users connected to the switch are authenticated before being allowed to access the network. When the user requests a webpage, a login page is displayed that requires the user to input a username and password. Upon successful authentication, the user is allowed to continue with the original page request and subsequent access to the network.

Before you begin, be sure you have:

- Performed basic bridging and VLAN configuration on the switch. See *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*.
- Generated an SSL certificate and installed it on the switch. See *Generating SSL Certificates to Be Used for Secure Web Access*.
- Configured basic access between the EX Series switch and the RADIUS server. See “[Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch](#)” on page 35.
- Designed your captive portal login page. See “[Designing a Captive Portal Authentication Login Page on an EX Series Switch](#)” on page 144.

This topic includes the following tasks:

- [Configuring Secure Access for Captive Portal on page 142](#)
- [Enabling an Interface for Captive Portal on page 143](#)
- [Configuring Bypass of Captive Portal Authentication on page 143](#)

Configuring Secure Access for Captive Portal

To configure secure access for captive portal:

1. Enable HTTP access on the switch:

```
[edit]
```

```
user@switch# set system services web-management http
```

2. Associate the security certificate with the Web server and enable HTTPS access on the switch:

```
[edit]
user@switch# set system services web-management https local-certificate my-signed-cert
```



NOTE: You can enable HTTP without HTTPS, but we recommend HTTPS for security purposes.

3. Configure captive portal to use HTTPS:

```
[edit]
user@switch# set services captive-portal secure-authentication https
```

Enabling an Interface for Captive Portal

To enable an interface for captive portal:

```
[edit]
user@switch# set services captive-portal interface interface-name
```

For example, to enable captive portal on the interface ge-0/0/10:

```
[edit]
user@switch# set services captive-portal interface ge-0/0/10
```

Configuring Bypass of Captive Portal Authentication

To allow specific clients to bypass captive portal:

```
[edit]
user@switch# set ethernet-switching-options authentication-whitelist mac-address
```

For example, to allow specific clients to bypass captive portal:

```
[edit]
user@switch# set ethernet-switching-options authentication-whitelist 00:10:12:e0:28:22
```



NOTE: Optionally, you can use `set ethernet-switching-options authentication-whitelist 00:10:12:e0:28:22 interface ge-0/0/10.0` to limit the scope to the interface.



NOTE: If the client is already attached to the switch, you must clear its MAC address from the captive portal authentication by using the `clear captive-portal mac-address mac-address` command after adding its MAC address to the whitelist. Otherwise the new entry for the MAC address will not be added to the Ethernet switching table and authentication bypass will not be allowed.

Related Documentation

- [Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96](#)
- [Understanding Authentication on EX Series Switches on page 10](#)

Designing a Captive Portal Authentication Login Page on an EX Series Switch

You can set up captive portal authentication on your switch to redirect all Web browser requests to a login page that requires users to input a username and password before they are allowed access. Upon successful authentication, users are allowed access to the network and redirected to the original page requested.

Junos OS provides a customizable template for the captive portal window that allows you to easily design and modify the look of the captive portal login page. You can modify the design elements of the template to change the look of your captive portal login page and to add instructions or information to the page. You can also modify any of the design elements of a captive portal login page.

The first screen displayed before the captive login page requires the user to read the terms and conditions of use. By clicking the Agree button, the user can access the captive portal login page.

Figure 17 on page 144 shows an example of a captive portal login page:

Figure 17: Example of a Captive Portal Login Page

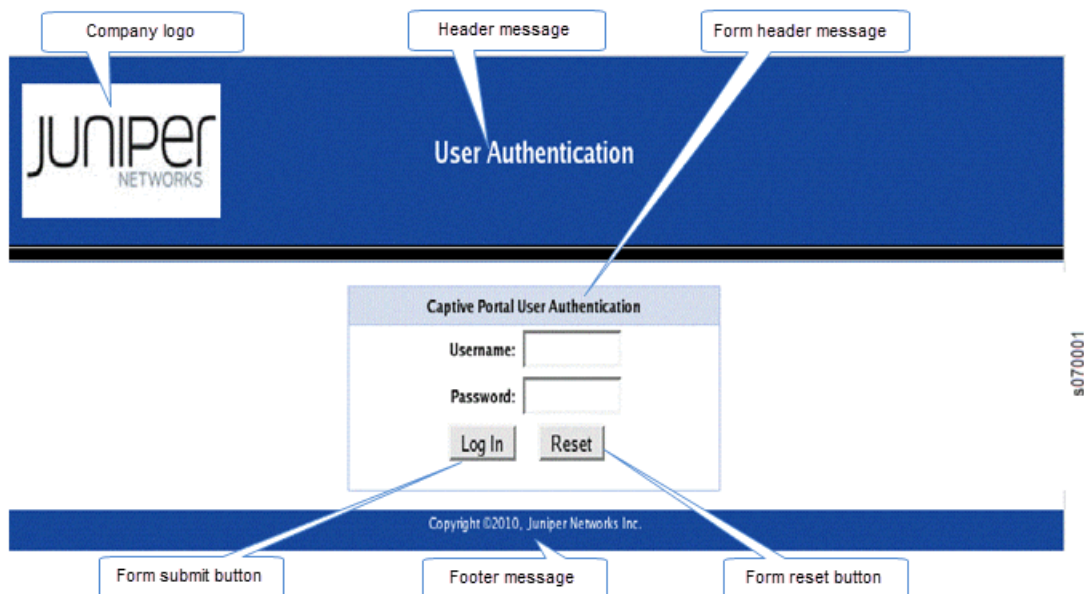


Table 20 on page 144 summarizes the configurable elements of a captive portal login page.

Table 20: Configurable Elements of a Captive Portal Login Page

Element	CLI Statement	Description
Footer background color	footer-bgcolor <i>hex-color</i>	The HTML hexadecimal code for the background color of the captive portal login page footer.

Table 20: Configurable Elements of a Captive Portal Login Page (*continued*)

Element	CLI Statement	Description
Footer message	footer-message <i>text-string</i>	Text displayed in the footer of the captive portal login page. You can include copyright information, links, and additional information such as help instructions, legal notices, or a privacy policy The default text shown in the footer is Copyright ©2010, Juniper Networks Inc.
Footer text color	footer- text-color <i>color</i>	Color of the text in the footer. The default color is white.
Form header background color	form-header-bgcolor <i>hex-color</i>	The HTML hexadecimal code for the background color of the header bar across the top of the form area of the captive portal login page.
Form header message	form-header-message <i>text-string</i>	Text displayed in the header of the captive portal login page. The default text is Captive Portal User Authentication .
Form header text color	form-header- text- color <i>color</i>	Color of the text in the form header. The default color is black.
Form reset button label	form-reset-label <i>label-name</i>	Using the Reset button, the user can clear the username and password fields on the form.
Form submit button label	form-submit-label <i>label-name</i>	Using the Login button, the user can submit the login information.
Header background color	header-bgcolor <i>hex-color</i>	The HTML hexadecimal code for the background color of the captive portal login page header.
Header logo	header-logo <i>filename</i>	Filename of the file containing the image of the logo that you want to appear in the header of the captive portal login page. The image file can be in GIF, JPEG, or PNG format. You can upload a logo image file to the switch. Copy the logo to the /var/tmp directory on the switch (during commit, the files are saved to persistent locations). If you do not specify a logo image, the Juniper Networks logo is displayed.
Header message	header-message <i>text-string</i>	Text displayed in the page header. The default text is User Authentication .
Header text color	header-text- color <i>color</i>	Color of the text in the header. The default color is white.
Post-authentication URL	post-authentication-url <i>url</i>	URL to which the users are directed on successful authentication. By default, users are directed to the page they had originally requested.

To design the captive portal login page:

1. (Optional) Upload your logo image file to the switch:

```
user@switch> file copy ftp://username:prompt@ftp.hostname.net/var/tmp/my-logo.jpeg
```
2. Configure the custom options to specify the background colors and text displayed in the captive portal page:

```
[edit system services captive-portal]
user@switch# set custom-options header-bgcolor #006600
set custom-options header-message "Welcome to Our Network"
set custom-options banner-message "Please enter your username and password".The banner
displays the message "XXXXXXX" by default. The user can modify this message.
set custom-options footer-message "Copyright ©2010, Our Network"
```

Now you can commit the configuration.



NOTE: For the custom options that you do not specify, the default value is used.

**Related
Documentation**

- [Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96](#)
- [Understanding Authentication on EX Series Switches on page 10](#)
- [captive-portal on page 190](#)

Controlling Authentication Session Timeouts (CLI Procedure)

For 802.1X and MAC RADIUS authentication sessions, you can specify authentication session timeout values by using the **reauthentication** statement.

The session might also end when the MAC table aging time expires, because the session is removed from the authentication session table when the MAC address is removed from the Ethernet switching table. In order to prevent the session from being removed from the authentication session table, you must disassociate the authentication table from the Ethernet switching table by using the **no-mac-table-binding** statement.

Before you begin:

- Specify the RADIUS server or servers to be used as the authentication server. See [“Specifying RADIUS Server Connections on an EX Series Switch \(CLI Procedure\)” on page 141](#).
- Configure 802.1X authentication on the switch. See [“Configuring 802.1X Interface Settings \(CLI Procedure\)” on page 120](#).

To configure the authentication session time on all interfaces:

```
[edit]
user@switch# set protocols dot1x authenticator interface all reauthentication seconds;
```

To configure the authentication session time on a single interface:

```
[edit]
user@switch# set protocols dot1x authenticator interface interface-name reauthentication
seconds;
```

To disable removal of authentication sessions from the authentication session table when a MAC address ages out of the Ethernet switching table, remove the binding of the authentication table to the Ethernet switching table.

To remove the binding on all interfaces:

```
[edit]
user@switch# set protocols dot1x authenticator no-mac-table-binding interface all;
```

To remove the binding on a single interface:

```
[edit]
user@switch# set protocols dot1x authenticator no-mac-table-binding interface interface-name;
```

Related Documentation

- [Configuring MAC Table Aging \(CLI Procedure\)](#)
- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
- [Understanding Authentication on EX Series Switches on page 10](#)
- [Understanding Authentication Session Timeout on page 27](#)

Configuring NetBIOS Snooping (CLI Procedure)

NetBIOS snooping enables an EX Series switch to learn information about NetBIOS hosts that are connected to the switch.

This topic describes:

- [Enabling NetBIOS Snooping on page 147](#)
- [Disabling NetBIOS Snooping on page 147](#)

Enabling NetBIOS Snooping

To enable NetBIOS snooping:

```
[edit protocols lldp]
user@switch# set netbios-snooping
```

Disabling NetBIOS Snooping

To disable NetBIOS snooping:

```
[edit protocols lldp]
user@switch# delete netbios-snooping
```

Related Documentation

- [show lldp neighbors on page 333](#)

- [Understanding NetBIOS Snooping on page 28](#)

Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure)

You can connect the switch to Junos Pulse Access Control Service to set up a centralized, end-to-end network access control (NAC) system, which allows you to control who is admitted to the network and what resources those users are allowed to access.

The Access Control Service functions both as an *authentication server* (RADIUS server) and as a *centralized policy management server*.

Before you begin configuring the switch to connect to the Access Control Service:

- Configure a resource access policy. See *Configuring Resource Access Policies*.
- Obtain the password of the Access Control Service.
- Obtain the IP address of the Access Control Service.



NOTE: Specify the same IP address for the authentication server, the RADIUS server, and the infranet controller (NAC device). These components refer to the same Access Control Service.

To configure the switch to work with the Access Control Service:

1. Configure the switch to use the Access Control Service for authentication and authorization:

```
[edit ethernet-switching-options]
user@switch# set uac-policy
```
2. Configure the access profile to specify the Access Control Service. The access profile contains the authentication and authorization configuration that aids in handling authentication and authorization requests, including the authentication method and sequence, and the Access Control Service address:
 - a. Configure **radius** as the authentication method to be used when attempting to authenticate a user. For each login attempt, the software tries the authentication methods in order, starting with the first one, until the password matches:

```
[edit access profile]
user@switch# set profile-name authentication-order radius
```
 - b. Specify the IP address of the authentication server:



NOTE: Specify the same IP address that you use for the RADIUS server and the NAC device.

```
[edit access profile]
user@switch# set profile-name radius authentication-server ip-address
```


3. Configure the RADIUS server to use the same IP address that you specified for the authentication server:

```
[edit access]
user@switch# set radius-server ip-address
```

4. Configure the password to use for connecting the switch with the RADIUS server:



NOTE: The password specified here is used for RADIUS communications between the switch and the Access Control Service. It does not need to match the password that is specified on the Access Control Service through the administrative interface on the Access Control Service.

```
[edit access]
user@switch# set radius-server secret password
```

5. Configure the address of the Access Control Service MAG Series or the IC Series NAC device:



NOTE: Specify the hostname and IP address of the NAC device. This is the same IP address that you used for specifying the authentication server.

```
[edit services united-access-control infranet-controller hostname]
user@switch# set address ip-address
```

6. Configure the switch's management Ethernet interface for the NAC device:

```
[edit services united-access-control infranet-controller hostname]
user@switch# set interface me0.0
```

7. Configure the password for connecting the switch to the Access Control Service NAC device:



NOTE: This password must match the password specified on the Access Control Service through its administrative interface. It is used for Junos UAC Enforcer Protocol (JUEP) communications between the switch and the Access Control Service.

```
[edit services united-access-control infranet-controller hostname]
user@switch# set password password
```

8. Configure the amount of time that switch waits to receive a response from the Access Control Service:

```
[edit services united-access-control]
user@switch# set timeout seconds
```

9. Specify the time between continuity-check messages for the switch's connection with the Access Control Service:

```
[edit services united-access-control]
user@switch# set interval seconds
```

10. Specify an action for the switch to take if a timeout occurs for the connection between the switch and the Access Control Service:

```
[edit services united-access-control]
user@switch# set timeout-action action
```

11. Specify the name of the access profile to use for 802.1X, MAC RADIUS, or captive portal authentication:



NOTE: Use the same access profile that you configured previously (step 2).

[edit protocols dot1x]

user@switch# **set authenticator authentication-profile-name** *profile-name*

12. Configure the 802.1X interface that the switch will use for communicating with the Access Control Service:

[edit protocols dot1x]

user@switch# **set authenticator interface** *interface-name*

**Related
Documentation**

- [Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service \(CLI Procedure\) on page 150](#)
- [Understanding Centralized Network Access Control and EX Series Switches on page 29](#)

Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure)

If you have connected the EX Series switch to the Junos Pulse Access Control Service and you want to use the captive portal user authentication feature, configure the Access Control Service network access control (NAC) device as an external captive portal server. The captive portal feature is required only for user authentication. Unmanaged devices, such as printers or phones, can be authenticated through 802.1X and MAC address authentication.

When users try to access a protected network resource that is connected to the switch, the user must first sign in to the Access Control Service for authentication and endpoint security checking. The captive portal redirects the user to a login page located on the Access Control Service.

When the sign-in page for the Access Control Service is displayed, the user signs in and the Access Control Service examines the endpoint for compliance with security policies. If the endpoint passes the security check, access is granted to the protected resource.

Before you begin, be sure you have:

- Configured access between the switch and the Access Control Service. See [“Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control \(CLI Procedure\)” on page 148](#).
- Designed your captive portal login page on the Access Control Service. See [About Sign-In Policies](#).

To configure the switch to use the Access Control Service for captive portal:

1. Configure captive portal to authenticate clients connected to the switch for access to use the authentication profile that directs the client to the Access Control Service:



NOTE: The access profile name specified here must match the access profile name that you specified for the Access Control Service in “Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure)” on page 148.

[edit]

user@switch# **set services captive-portal authentication-profile-name** *access-profile-name*

2. Enable an interface for use with captive portal authentication:

[edit]

user@switch# **set services captive-portal interface** *interface-name* **supplicant** **multiple**

3. (Optional) Specify which clients are to bypass captive portal authentication:

[edit]

user@switch# **set ethernet-switching-options authentication-whitelist** *mac-address*



NOTE: You can use **set ethernet-switching-options authentication-whitelist** *mac-address* **interface** *interface-name* to limit the scope to the interface.



NOTE: If the client is already attached to the switch, you must clear its MAC address from captive portal authentication by using the **clear captive-portal mac-address** *mac-address* command after adding its MAC address to the authentication whitelist. Otherwise the new entry for the MAC address will not be added to the Ethernet switching table and the authentication bypass will not be allowed.

Related Documentation

- [Understanding Centralized Network Access Control and EX Series Switches on page 29](#)
- [Understanding Authentication on EX Series Switches on page 10](#)

CHAPTER 5

Configuration Statements

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- [server-fail on page 265](#)
- [server-reject-vlan on page 266](#)
- [server-timeout on page 267](#)
- [server-timeout \(Captive Portal\) on page 268](#)
- [session-expiry on page 268](#)
- [single-connection on page 269](#)
- [source-address on page 269](#)
- [source-address \(NTP, RADIUS, System Logging, or TACACS+\) on page 270](#)
- [static \(Protocols 802.1X\) on page 271](#)
- [statistics \(Access Profile\) on page 272](#)
- [supplicant on page 273](#)
- [supplicant-timeout on page 274](#)
- [tacplus on page 275](#)
- [timeout \(System\) on page 276](#)
- [timeout \(Access Control Service\) on page 277](#)
- [timeout \(RADIUS\) on page 278](#)
- [timeout-action \(Access Control Service\) on page 279](#)
- [traceoptions \(802.1X\) on page 280](#)
- [traceoptions \(LLDP\) on page 282](#)
- [transmit-delay on page 284](#)
- [transmit-period on page 285](#)
- [uac-policy on page 285](#)
- [uac-service on page 286](#)
- [unified-access-control on page 287](#)
- [update-interval on page 288](#)
- [vlan-assignment on page 289](#)
- [vlan-nas-port-stacked-format on page 290](#)
- [voip on page 290](#)
- [what on page 291](#)

[edit access] Configuration Statement Hierarchy on EX Series Switches

This topic lists supported and unsupported configuration statements in the **[edit access]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see [Feature Explorer](#).

This topic lists:

- [Supported Statements in the \[edit access\] Hierarchy Level on page 157](#)
- [Unsupported Statements in the \[edit access\] Hierarchy Level on page 159](#)

Supported Statements in the [edit access] Hierarchy Level

The following hierarchy shows the **[edit access]** configuration statements supported on EX Series switches:

```
access {
  address-assignment {
    abated-utilization percentage;
    abated-utilization-v6 percentage;
    high-utilization percentage;
    high-utilization-v6 percentage;
    pool pool-name {
      family inet {
        dhcp-attributes {
          boot-file filename;
          boot-server hostname;
          domain-name domain-name;
          grace-period seconds;
          maximum-lease-time (seconds | infinite);
          name-server {
            address;
          }
        }
        netbios-node-type (b-node | h-node | m-node | p-node);
        option option-index (array (byte | flag | integer | ip-address | short | string |
          unsigned-integer | unsigned-short) [ type-values ] | byte 8-bit-value |
          flag (false | off | on | true) | integer signed-32-bit-value | ip-address address |
          short signed-16-bit-value | string text-string | unsigned-integer 32-bit-value |
          unsigned-short 16-bit-value);
        router {
          address;
        }
      }
      server-identifier ipv4-address;
      tftp-server hostname;
      wins-server {
        address;
      }
    }
  }
}
```

```

    }
  }
  host hostname {
    hardware-address mac-address;
    ip-address ip-address;
  }
  network ip-prefix </prefix-length>;
  range name {
    high upper-limit;
    low lower-limit;
  }
}
link pool-name;
}
}
address-pool pool-name {
  address address-or-prefix;
  address-range <low lower-limit> <high upper-limit>;
}
profile profile-name {
  accounting (Access Profile) {
    accounting-stop-on-access-deny;
    accounting-stop-on-failure;
    coa-immediate-update;
    immediate-update;
    order (radius | none);
    statistics (time | volume-time);
  }
}
authentication-order (ldap | password | radius);
client client-name {
  chap-secret chap-secret;
  firewall-user {
    password password;
  }
  no-rfc2486;
  pap-password password;
}
radius {
  accounting-server server-address;
  attributes {
    exclude [exclude-options];
    ignore [ignore-options];
  }
  authentication-server server-address;
}
radius-options {
  revert-interval interval;
}
session-options {
  client-idle-timeout minutes;
  client-session-timeout minutes;
}
radius-options {
  revert-interval interval;
}
}

```

```

radius-server server-address {
  port port-number;
  retry attempts;
  routing-instance instance-name;
  secret password;
  source-address address;
  timeout minutes;
}

```

Unsupported Statements in the [edit access] Hierarchy Level

All statements in the [edit access] hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented with the following exceptions:

Table 21: Unsupported [edit access] Configuration Statements on EX Series Switches

Statement	Hierarchy Level
NOTE: Variables, such as <i>filename</i> , are not shown in the statements or hierarchies.	
aaa	[edit access terminate-code]
administrative-reset	[edit access terminate-code aaa shutdown]
authentication-denied	[edit access terminate-code aaa deny]
client-request	[edit access terminate-code aaa dhcp]
compliance	[edit access ppp-options]
deny	[edit access terminate-code aaa]
dhcp	[edit access terminate-code]
group-profile	[edit access]
ike	[edit access profile client]
initiate-dead-peer-detection	[edit access profile client ike]
lost-carrier	[edit access terminate-code dhcp]
nak	[edit access terminate-code dhcp]
nas-logout	[edit access terminate-code dhcp]
no-offers	[edit access terminate-code dhcp]
no-resources	[edit access terminate-code aaa deny]

Table 21: Unsupported [edit access] Configuration Statements on EX Series Switches (*continued*)

Statement	Hierarchy Level
ppp-options	[edit access]
preference	[edit access profile client ike reverse-route]
remote-reset	[edit access terminate-code aaa shutdown]
rfc	[edit access ppp-options compliance]
reverse-route	[edit access profile client ike]
server-request-timeout	[edit access terminate-code aaa deny]
shutdown	[edit access terminate-code aaa]
terminate-code	[edit access]

**Related
Documentation**

- [Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35](#)
- [Configuring 802.1X RADIUS Accounting \(CLI Procedure\) on page 124](#)
- [Security Features for EX Series Switches Overview on page 3](#)

[edit ethernet-switching-options] Configuration Statement Hierarchy on EX Series Switches

This topic lists supported and unsupported configuration statements in the **[edit ethernet-switching-options]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see [Feature Explorer](#).

This topic lists:

- [Supported Statements in the \[edit ethernet-switching-options\] Hierarchy Level on page 161](#)
- [Unsupported Statements in the \[edit ethernet-switching-options\] Hierarchy Level on page 163](#)

Supported Statements in the [edit ethernet-switching-options] Hierarchy Level

The following hierarchy shows the [edit ethernet-switching-options] configuration statements supported on EX Series switches:

```

ethernet-switching-options {
  analyzer (Port Mirroring) {
    name {
      input {
        egress {
          interface (all | interface-name);
        }
        ingress {
          interface (all | interface-name);
          vlan (vlan-id | vlan-name);
        }
      }
      loss-priority priority;
      output {
        interface interface-name;
        vlan (vlan-id | vlan-name);
      }
      ratio number;
    }
  }
  authentication-whitelist {
    interface;
    vlan-assignment;
  }
  bpdu-block {
    disable-timeout timeout;
    interface (all | [interface-name]) {
      (disable | drop | shutdown);
    }
  }
  dot1q-tunneling {
    ether-type (0x8100 | 0x88a8 | 0x9100);
  }
  interfaces interface-name {
    no-mac-learning;
  }
  mac-lookup-length number-of-entries;
  }
  mac-notification {
    notification-interval seconds;
  }
  mac-table-aging-time seconds;
  port-error-disable {
    disable-timeout timeout;
  }
  redundant-trunk-group {
    group name {
      description;
      interface interface-name {
        primary;

```

```
    }
    preempt-cutover-timer seconds;
  }
}
secure-access-port {
  dhcp-snooping-file {
    location local_pathname | remote_URL;
    timeout seconds;
    write-interval seconds;
  }
  interface (all | interface-name) {
    allowed-mac {
      mac-address-list;
    }
    (dhcp-trusted | no-dhcp-trusted );
    fcoe-trusted;
    mac-limit limit action action;
    no-allowed-mac-log;
    static-ip ip-address {
      mac mac-address;
      vlan vlan-name;
    }
  }
}
uac-policy;
}
vlan (all | vlan-name) {
  (arp-inspection | no-arp-inspection );
  dhcp-option82 {
    disable;
    circuit-id {
      prefix hostname;
      use-interface-description;
      use-vlan-id;
    }
    remote-id {
      prefix (hostname | mac | none);
      use-interface-description;
      use-string string;
    }
    vendor-id [string];
  }
  (examine-dhcp | no-examine-dhcp);
  examine-fip {
    fc-map fc-map-value;
  }
  (ip-source-guard | no-ip-source-guard);
  mac-move-limit limit action action;
}
}
static {
  vlan vlan-id {
    mac mac-address next-hop interface-name;
  }
}
storm-control {
  action-shutdown;
```

```

interface (all | interface-name) {
    bandwidth bandwidth;
    multicast;
    no-broadcast;
    no-multicast;
    no-registered-multicast;
    no-unknown-unicast;
    no-unregistered-multicast;
}
}
traceoptions {
    file filename <files number> <no-stamp> <replace> <size size> <world-readable |
    no-world-readable>;
    flag flag <disable>;
}
unknown-unicast-forwarding {
    vlan (all | vlan-name) {
        interface interface-name;
    }
}
}
voip {
    interface (all | [interface-name | access-ports]) {
        forwarding-class (assured-forwarding | best-effort | expedited-forwarding |
        network-control);
        vlan vlan-name;
    }
}
}
}

```

Unsupported Statements in the [edit ethernet-switching-options] Hierarchy Level

All statements in the [edit ethernet-switching-options] hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented.

Related Documentation

- [Example: Setting Up Q-in-Q Tunneling on EX Series Switches](#)
- [Example: Configuring Redundant Trunk Links for Faster Recovery](#)
- [Configuring MAC Table Aging \(CLI Procedure\)](#)
- [Configuring MAC Notification \(CLI Procedure\)](#)
- [Configuring Q-in-Q Tunneling \(CLI Procedure\)](#)
- [Configuring Redundant Trunk Links for Faster Recovery \(CLI Procedure\)](#)
- [Configuring Nonstop Bridging on EX Series Switches \(CLI Procedure\)](#)

[\[edit protocols\]](#) Configuration Statement Hierarchy on EX Series Switches

Each of the following topics lists the statements at a subhierarchy of the **[edit protocols]** hierarchy:

- [\[edit protocols bfd\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols bgp\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols connections\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols dcbx\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols dot1x\]](#) Configuration Statement Hierarchy on EX Series Switches on page 165
- [\[edit protocols igmp\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols igmp-snooping\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols isis\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols lacp\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols link-management\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols lldp\]](#) Configuration Statement Hierarchy on EX Series Switches on page 167
- [\[edit protocols lldp-med\]](#) Configuration Statement Hierarchy on EX Series Switches on page 168
- [\[edit protocols mld\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols mld-snooping\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols mpls\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols msdp\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols mstp\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols mvrp\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols neighbor-discovery\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols oam\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols ospf\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols ospf3\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols pim\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols rip\]](#) Configuration Statement Hierarchy on EX Series Switches
- [\[edit protocols ripng\]](#) Configuration Statement Hierarchy on EX Series Switches

- [\[edit protocols router-advertisement\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols router-discovery\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols rstp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols rsvp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols sflow\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols stp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols uplink-failure-detection\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols vrrp\] Configuration Statement Hierarchy on EX Series Switches](#)
- [\[edit protocols vstp\] Configuration Statement Hierarchy on EX Series Switches](#)

**Related
Documentation**

- [EX Series Switch Software Features Overview](#)
- [EX Series Virtual Chassis Software Features Overview](#)

[\[edit protocols dot1x\] Configuration Statement Hierarchy on EX Series Switches](#)

This topic lists supported and unsupported configuration statements in the **[edit protocols dot1x]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the switch CLI, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see [EX Series Switch Software Features Overview](#).

This topic lists:

- [Supported Statements in the \[edit protocols dot1x\] Hierarchy Level on page 165](#)
- [Unsupported Statements in the \[edit protocols dot1x\] Hierarchy Level on page 166](#)

Supported Statements in the [edit protocols dot1x] Hierarchy Level

The following hierarchy shows the **[edit protocols dot1x]** configuration statements supported on EX Series switches:

```
protocols {
  dot1x {
    authenticator {
      authentication-profile-name access-profile-name;
      interface (all | [ interface-names ]) {
        disable;
        guest-vlan (vlan-id | vlan-name);
      }
    }
  }
}
```


- [Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69](#)
- [802.1X for EX Series Switches Overview on page 7](#)
- [\[edit protocols\] Configuration Statement Hierarchy on EX Series Switches on page 164](#)

[\[edit protocols lldp\] Configuration Statement Hierarchy on EX Series Switches](#)

This topic lists supported and unsupported configuration statements in the **[edit protocols lldp]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see *EX Series Switch Software Features Overview*.

This topic lists:

- [Supported Statements in the \[edit protocols lldp\] Hierarchy Level on page 167](#)
- [Unsupported Statements in the \[edit protocols lldp\] Hierarchy Level on page 168](#)

Supported Statements in the **[edit protocols lldp]** Hierarchy Level

The following hierarchy shows the **[edit protocols lldp]** configuration statements supported on EX Series switches:

```
protocols {
  lldp {
    advertisement-interval seconds;
    disable;
    hold-multiplier seconds;
    interface (all | interface-name) {
      disable;
      power-negotiation {
        disable;
      }
    }
  }
  lldp-configuration-notification-interval seconds;
  management-address;
  netbios-snooping;
  ptopo-configuration-maximum-hold-time seconds;
  ptopo-configuration-trap-interval seconds;
  traceoptions {
    file filename <files number> <size maximum-file-size> <world-readable |
      no-world-readable>;
    flag flag <disable>;
  }
}
```

```
        transmit-delay seconds;  
    }  
}
```

Unsupported Statements in the [edit protocols lldp] Hierarchy Level

All statements in the **[edit protocols lldp]** hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented.

Related Documentation

- [\[edit protocols\] Configuration Statement Hierarchy on EX Series Switches on page 164](#)

[edit protocols lldp-med] Configuration Statement Hierarchy on EX Series Switches

This topic lists supported and unsupported configuration statements in the **[edit protocols lldp-med]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific EX Series switch platforms, see *EX Series Switch Software Features Overview*.

This topic lists:

- [Supported Statements in the \[edit protocols lldp-med\] Hierarchy Level on page 168](#)
- [Unsupported Statements in the \[edit protocols lldp-med\] Hierarchy Level on page 169](#)

Supported Statements in the [edit protocols lldp-med] Hierarchy Level

The following hierarchy shows the **[edit protocols lldp-med]** configuration statements supported on EX Series switches:

```
protocols {  
  lldp-med {  
    disable;  
    fast-start number;  
    interface (all | interface-name) {  
      disable;  
      location {  
        civic-based {  
          ca-type {  
            index {  
              ca-value value;  
            }  
          }  
        }  
        country-code code;  
        what value;  
      }  
    }  
  }  
}
```

```
        elin number;  
    }  
}  
}
```

Unsupported Statements in the [edit protocols lldp-med] Hierarchy Level

All statements in the **[edit protocols lldp-med]** hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented.

Related Documentation

- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [show lldp on page 326](#)
- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)
- [\[edit protocols\] Configuration Statement Hierarchy on EX Series Switches on page 164](#)

access

Syntax	<pre> access { address-assignment pool <i>pool-name</i> address-pool <i>pool-name</i> profile <i>profile-name</i> { accounting (Access Profile) { accounting-stop-on-access-deny; accounting-stop-on-failure; (authentication-order (ldap radius none); order (radius none); } radius { accounting-server [<i>server-addresses</i>]; authentication-server [<i>server-addresses</i>]; } } } </pre>
Hierarchy Level	[edit]
Release Information	<p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.1 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.</p>
Description	<p>Configure authentication, authorization, and accounting (AAA) services.</p> <p>The statements are explained separately.</p>
	<div>  <p>NOTE: The [edit access] hierarchy is not available on QFabric systems.</p> </div>
Default	Not enabled
Required Privilege Level	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124

accounting (Access Profile)

Syntax	<pre> accounting { accounting-stop-on-access-deny; accounting-stop-on-failure; address-change-immediate-update; coa-immediate-update; coa-no-override service-class-attribute; duplication; duplication-filter; duplication-vrf { access-profile-name <i>profile-name</i>; vrf-name <i>vrf-name</i>; } immediate-update; order [<i>accounting-method</i>]; send-acct-status-on-config-change statistics (time volume-time); update-interval <i>minutes</i>; wait-for-acct-on-ack; } </pre>
Hierarchy Level	[edit access profile <i>profile-name</i>]
Release Information	<p>Statement introduced in Junos OS Release 9.1.</p> <p>Statement introduced in Junos OS Release 9.1 for EX Series switches.</p>
Description	<p>Configure RADIUS accounting parameters and enable RADIUS accounting for an access profile.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i> • <i>Configuring Per-Subscriber Session Accounting</i> • <i>Understanding RADIUS Accounting Duplicate Reporting</i>

accounting

```
Syntax  accounting {
        events [login change-log interactive-commands];
        destination {
            radius {
                server {
                    server-address {
                        accounting-port port-number;
                        secret password;
                        source-address address;
                        retry number;
                        timeout seconds;
                    }
                }
            }
            tacplus {
                server {
                    server-address {
                        port port-number;
                        secret password;
                        single-connection;
                        timeout seconds;
                    }
                }
            }
        }
        enhanced-avs-max <number>;
    }
```

Hierarchy Level [edit system]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
enhanced-avs-max statement introduced in Junos OS Release 14.1.
Support for the **source-address-inet6** statement introduced in Junos OS Release 14.1X53-D10 for EX Series switches.

Description Configure audit of TACACS+ or RADIUS authentication events, configuration changes, and interactive commands. Auditing these factors helps you track network usage for auditing and billing purposes.

The remaining statements are explained separately.

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation

- *Configuring RADIUS System Accounting*
- *Configuring TACACS+ System Accounting*
- *enhanced-avs-max*

accounting-port (RADIUS Server)

Syntax	accounting-port <i>port-number</i> ;
Hierarchy Level	[edit system accounting destination radius <i>server</i> <i>server-address</i>], [edit system <i>radius-server</i> <i>server-address</i>]
Release Information	Statement introduced in Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Description	Configure the accounting port number on which to contact the RADIUS server.
Options	<i>number</i> —Port number on which to contact the RADIUS server. Default: 1813
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Authentication</i>• <i>Configuring RADIUS System Accounting</i>

accounting-server

Syntax	<code>accounting-server[server-addresses];</code>
Hierarchy Level	[edit access profile <i>profile-name</i> radius]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Description	Configure the Remote Authentication Dial-In User Service (RADIUS) server for authentication. To configure multiple RADIUS servers, include multiple server addresses. The servers are tried in order and in a round-robin fashion until a valid response is received from one of the servers or until all the configured retry limits are reached.
Default	Not enabled
Options	<i>server-addresses</i> —One or more addresses of RADIUS authentication servers.



NOTE: The [edit access] hierarchy is not available on QFabric systems.

Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show network-access aaa statistics authentication on page 344• Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35• Understanding 802.1X and RADIUS Accounting on EX Series Switches on page 16• Understanding RADIUS Accounting

accounting-session-id-format

Syntax	accounting-session-id-format (decimal description);
Hierarchy Level	[edit access profile <i>profile-name</i> radius options]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches.
Description	Configure the format the router or switch uses to identify the accounting session.
Default	decimal
Options	decimal —Use the decimal format. description —Use the generic format, in the form: jnpr <i>interface-specifier:subscriber-session-id</i> .
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Options for Subscriber Access</i>• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>

accounting-stop-on-access-deny

Syntax	accounting-stop-on-access-deny;
Hierarchy Level	[edit access profile <i>profile-name</i> accounting]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Description	Configure the authentication order for authentication, authorization, and accounting (AAA) services to send an Acct-Stop message if the AAA server denies access to a supplicant.



NOTE: The [edit access] hierarchy is not available on QFabric systems.

Default	Not enabled
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35• Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124• show network-access aaa statistics authentication on page 344• Configuring RADIUS Accounting

accounting-stop-on-failure

Syntax	accounting-stop-on-failure;
Hierarchy Level	[edit access profile <i>profile-name</i> accounting]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Description	<p>Configure RADIUS accounting to send an Acct-Stop message when a subscriber session has been successfully authenticated and authorized, but then fails before an Acct-Start message is sent. By default, an Acct-Stop message is sent only if an Acct-Start message has been exchanged with the accounting server.</p> <p>Consider a situation where RADIUS address pools are used to assign IP/IPv6 addresses. After a subscriber session is successfully authenticated, the RADIUS server authorizes the session by assigning an IP address from the RADIUS address pool and conveying that address in the Framed-IP-Address attribute. If a negotiation failure occurs at this point, the session is terminated before activating. The Acct-Start message is never sent because it is initiated by session activation. By default, an Acct-Stop message cannot be sent because the Acct-Start is never sent. However, if the acct-stop-on-failure statement is configured, the negotiation failure causes the Acct-Stop message to be sent, which explicitly notifies the RADIUS server that the session is disconnected and that it can free the allocated IP address back to the pool.</p>
	<p> NOTE: The [edit access] hierarchy is not available on QFabric systems.</p>
Default	Not enabled
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35 • Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124 • Understanding 802.1X and RADIUS Accounting on EX Series Switches on page 16 • Configuring RADIUS Accounting • Understanding RADIUS Accounting

address (Access Address Pool)

Syntax	<code>address <i>address-or-prefix</i>;</code>
Hierarchy Level	[edit access address-pool <i>pool-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the IP address or prefix value for clients.
Options	<i>address-or-prefix</i> —An address or prefix value.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Address Pool for L2TP Network Server IP Address Allocation

address (Access Control Service)

Syntax	<code>address <i>ip-address</i>;</code>
Hierarchy Level	[edit services unified-access-control infranet-controller]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Specify the address through which the switch will connect to the Junos Pulse Access Control Service.
Options	<i>ip-address</i> —Specify the IP address of the NAC device.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148

address-pool

Syntax	<code>address-pool <i>pool-name</i> { address <i>address-or-prefix</i>; address-range <low <i>lower-limit</i>> <high <i>upper-limit</i>>; }</code>
Hierarchy Level	[edit access]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Allocate IP addresses for clients.




NOTE: This statement is not supported for L2TP LNS on MX Series routers.

Options	<i>pool-name</i> —Name assigned to an address pool. The remaining statements are explained separately.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> <i>Configuring the Address Pool for L2TP Network Server IP Address Allocation</i>

address-range

Syntax	<code>address-range <low <i>lower-limit</i>> <high <i>upper-limit</i>>;</code>
Hierarchy Level	[edit access <code>address-pool <i>pool-name</i></code>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the address range.
Options	<ul style="list-style-type: none"> <i>high upper-limit</i>—Upper limit of an address range. <i>low lower-limit</i>—Lower limit of an address range.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> <i>Configuring the Address Pool for L2TP Network Server IP Address Allocation</i>

advertisement-interval

Syntax	<code>advertisement-interval seconds;</code>
Hierarchy Level	[edit protocols lldp], [edit routing-instances <i>routing-instance-name</i> protocols lldp]
Release Information	Statement introduced in Junos OS Release 9.6 for MX Series and T Series routers. Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Description	<p>Configure an interval for LLDP advertisement.</p> <p>For switches configured for Link Layer Discovery Protocol, configure the frequency at which LLDP advertisements are sent.</p> <p>The advertisement-interval value must be greater than or equal to four times the transmit-delay value, or an error will be returned when you attempt to commit the configuration.</p> <div>NOTE: The default value of transmit-delay is 2 seconds. If you configure the advertisement-interval as less than 8 seconds and you do not configure a value for transmit-delay, the default value of transmit-delay is automatically changed to 1 second in order to satisfy the requirement that the advertisement-interval value must be greater than or equal to four times the transmit-delay value.</div>
Default	Disabled.
Options	seconds —Interval between LLDP advertisement. Default: 30 Range: 5 through 32768
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring LLDP</i>• show lldp on page 326• Configuring LLDP (CLI Procedure) on page 128• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17• transmit-delay on page 284• <i>Understanding LLDP</i>

attributes

Syntax	<pre> attributes { exclude { ... } ignore { framed-ip-netmask; input-filter; logical-system-routing-instance; output-filter; } } </pre>
Hierarchy Level	[edit access profile <i>profile-name</i> radius]
Release Information	<p>Statement introduced in Junos OS Release 9.1.</p> <p>Statement introduced in Junos OS Release 9.1 for EX Series switches.</p>
Description	<p>Specify how the router or switch processes RADIUS attributes.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring How RADIUS Attributes Are Used for Subscriber Access</i>

authentication-order

Syntax	authentication-order [(none ldap password radius secureid)];
Hierarchy Level	[edit access profile <i>profile-name</i>]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	(EX and QFX Series only) Configure the order of authentication, authorization, and accounting (AAA) methods to use while sending authentication messages.
Default	Not enabled
Options	none —No authentication for specified subscribers. ldap —Lightweight Directory Access Protocol. password —Locally configured password in access profile. radius —RADIUS authentication. secureid —RSA SecurID authentication.
Required Privilege Level	admin —To view this statement in the configuration. admin-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35• Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124

authentication-profile-name

Syntax	<code>authentication-profile-name <i>access-profile-name</i>;</code>
Hierarchy Level	[edit protocols dot1x authenticator], [edit services captive-portal]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Added to <code>[edit services captive-portal]</code> hierarchy in Junos OS Release 10.1 for EX Series switches.
Description	Specify the name of the access profile to be used for 802.1X, MAC RADIUS, or captive portal authentication.
Default	No access profile is specified.
Options	<i>access-profile-name</i> —Name of the access profile. The access profile is configured at the <code>[edit access profile]</code> hierarchy level and contains the RADIUS server IP address and other information used for authentication.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35 • Example: Configuring MAC RADIUS Authentication on an EX Series Switch on page 79 • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • Configuring 802.1X Authentication (J-Web Procedure) on page 121 • Configuring Captive Portal Authentication (CLI Procedure) on page 142

authentication-server

Syntax	<code>authentication-server [server-addresses];</code>
Hierarchy Level	[edit access profile <i>profile-name</i> radius]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Description	Configure the RADIUS server for authentication. To configure multiple RADIUS servers, include multiple server addresses. The servers are tried in order and in a round-robin fashion until a valid response is received from one of the servers or until all the configured retry limits are reached.
Options	server-addresses —Configure one or more RADIUS server addresses.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35• show network-access aaa statistics authentication on page 344

authentication-whitelist

Syntax	<pre>authentication-whitelist { mac-address { interface <i>interface-name</i>; vlan-assignment (<i>vlan-id</i> <i>vlan-name</i>); } }</pre>
Hierarchy Level	<pre>[edit ethernet-switching-options]; [edit switch-options]</pre>
Release Information	<p>Statement introduced in Junos OS Release 10.1 for EX Series switches.</p> <p>The [edit switch-options] hierarchy level was introduced in Junos OS Release 13.2X50-D10 for EX Series switches (ELS).</p>
Description	<p>Configure MAC addresses for which RADIUS authentication is to be bypassed.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Example: Setting Up Captive Portal Authentication on an EX Series Switch • Configuring Captive Portal Authentication (CLI Procedure) on page 142 • Configuring Captive Portal Authentication (CLI Procedure)

authenticator

```
Syntax  authenticator {
        authentication-profile-name access-profile-name;
        interface (all | [ interface-names ]) {
            disable;
            guest-vlan ( vlan-id | vlan-name );
            lldp-med-bypass;
            mac-radius <restrict>;
            maximum-requests number;
            no-reauthentication;
            quiet-period seconds;
            reauthentication interval;
            retries number;
            server-fail (deny | permit | use-cache | vlan-id | vlan-name);
            server-reject-vlan (vlan-id | vlan-name) {
                eapol-block;
                block-interval block-interval;
            }
            server-timeout seconds;
            supplicant (single | single-secure | multiple);
            supplicant-timeout seconds;
            transmit-period seconds;
        }
        no-mac-table-binding {
            interface interface-names;
            static mac-address;
        }
        radius-options {
            use-vlan-id;
            use-vlan-name;
        }
        static mac-address {
            vlan-assignment vlan-identifier;
        }
    }
```

Hierarchy Level [edit protocols [dot1x](#)]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure an authenticator for 802.1X authentication.

The remaining statements are explained separately.



NOTE: You cannot configure 802.1X user authentication on interfaces on which Q-in-Q tunneling is enabled.

Default 802.1X authentication is disabled.

Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • Specifying RADIUS Server Connections on an EX Series Switch (CLI Procedure) on page 141 • Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69

block-interval

Syntax	<code>block-interval <i>block-interval</i>;</code>
Hierarchy Level	[edit protocols dot1x authenticator interface (all [<i>interface-names</i>]) server-reject-vlan (<i>vlan-id</i> <i>vlan-name</i>)], [edit protocols dot1x authenticator interface (all [<i>interface-names</i>]) server-reject-vlan]
Release Information	Statement introduced in Junos OS Release 11.2 for EX Series switches.
Description	Specify the amount of time that the 802.1X interface ignores Extensible Authentication Protocol (EAP) start messages from the client when an EAPoL block has been enabled on the 802.1X interface.
Options	<i>block-interval</i> —The number of seconds for the interval. Range: 120 through 65,535
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • eapol-block on page 202 • Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients on page 101

ca-type

Syntax	<pre>ca-type { number { ca-value value; } }</pre>
Hierarchy Level	[edit protocols lldp-med interface (all <i>interface-name</i> location civic-based)]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	<p>For Link Layer Discovery Protocol–Media Endpoint Device (LLDP-MED), configure the address elements. These elements are included in the location information to be advertised from the switch to the MED. This information is used during emergency calls to identify the location of the MED.</p> <p>For further information about the values that can be used to comprise the location,, refer to RFC 4776, <i>Dynamic Host Configuration Protocol (DHCPv4 and DHCPv6) Option for Civic Addresses Configuration Information</i>. A subset of those values is provided below.</p> <p>The ca-value statement is explained separately.</p>
Default	Disabled.
Options	<p>value—Civic address elements that represent the civic or postal address. Values are:</p> <ul style="list-style-type: none">• 0—A code that specifies the language used to describe the location.• 16—The leading-street direction, such as “N”.• 17—A trailing street suffix, such as “SW”.• 18—A street suffix or type, such as “Ave” or “Platz”.• 19—A house number, such as “6450”.• 20—A house-number suffix, such as “A” or “1/2”.• 21—A landmark, such as “Stanford University”.• 22—Additional location information, such as “South Wing”.• 23—The name and occupant of a location, such as “Carrillo's Holiday Market”.• 24—A house-number suffix, such as “95684”.• 25—A building structure, such as “East Library”.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326

- [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)

ca-value

Syntax	<code>ca-value <i>value</i>;</code>
Hierarchy Level	[edit protocols <code>lldp-med</code> interface (all <i>interface-name</i>) location civic-based <code>ca-type</code> <i>number</i>]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For Link Layer Discovery Protocol—Media Endpoint Device (LLDP-MED), configure location information, such as street address and city, that is indexed by the <code>ca-type</code> code. This information is advertised from the switch to the MED and is used during emergency calls to identify the location of the MED.
Default	Disabled.
Options	<i>value</i> —Specify a value that correlates to the <code>ca-type</code> . See <code>ca-type</code> for a list of codes and suggested values.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring LLDP-MED (CLI Procedure) on page 133

captive-portal

Syntax	<pre> captive-portal { authentication-profile-name authentication-profile-name custom-options { banner-message string; footer-bgcolor color; footer-message string; footer-text-color color; form-header-bgcolor color; form-header-message string; form-header-text-color color; form-reset-label label name; form-submit-label label name; header-bgcolor color; header-logo filename; header-message string; header-text-color color; post-authentication-url url-string; } interface (all [interface-names]) { quiet-period seconds; retries number-of-retries; server-timeout seconds; session-expiry seconds; supplicant (multiple single single-secure); } secure-authentication (http https); } </pre>
Hierarchy Level	[edit services]
Release Information	Statement introduced in Junos OS Release 10.1 for EX Series switches.
Description	<p>Configure captive portal to authenticate clients connected to the switch for access to the network.</p> <p>The remaining statements are explained separately.</p>
Default	Captive portal is disabled.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Designing a Captive Portal Authentication Login Page on an EX Series Switch on page 144 • Configuring Captive Portal Authentication (CLI Procedure) on page 142 • Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148

- [Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service \(CLI Procedure\) on page 150](#)

certificate-verification

Syntax	certificate-verification (optional required warning);
Hierarchy Level	[edit services unified-access-control]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Specify certificate verification requirement for the connection from the switch to Junos Pulse Access Control service.
Default	warning
Options	<p>optional—The specification of a security certificate is optional.</p> <p>required—The specification of a security certificate is required.</p>



NOTE: Do not specify this option in Junos OS Release 12.2 for EX Series switches, because the specification of a security certificate ([ca-profile](#)) is not supported in this release.

warning—A warning is issue if a security certificate is not specified. Default.

Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148 • Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150 • Understanding Centralized Network Access Control and EX Series Switches on page 29

civic-based

Syntax	<pre>civic-based { what number; country-code code; ca-type { number { ca-value value; } } }</pre>
Hierarchy Level	[edit protocols lldp-med interface (all <i>interface-name</i>) location]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	<p>For Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED), configure the geographic location to be advertised from the switch to the MED. This information is used during emergency calls to identify the location of the MED.</p> <p>The statements are explained separately.</p>
Default	Disabled.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326• Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50• Configuring LLDP-MED (CLI Procedure) on page 133

country-code

Syntax	<code>country-code code;</code>
Hierarchy Level	[edit protocols lldp-med (Ethernet Switching) interface (LLDP-MED) (all <i>interface-name</i>)]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For Link Layer Discovery Protocol—Media Endpoint Device (LLDP-MED), configure the two-letter country code to include in the location information. Location information is advertised from the switch to the MED, and is used during emergency calls to identify the location of the MED. The country code is required when configuring LLDP-MED based on location.
Default	Disabled.
Options	code —Two-letter ISO 3166 country code in capital ASCII letters; for example, US or DE.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring LLDP-MED (CLI Procedure) on page 133

custom-options

Syntax custom-options {
 banner-message *string*;
 footer-bgcolor *color*;
 footer-message *string*;
 footer-text-color *color*;
 form-header-bgcolor *color*;
 form-header-message *string*;
 form-header-text-color *color*;
 form-reset-label *label name*;
 form-submit-label *label name*;
 header-bgcolor *color*;
 header-logo *filename*;
 header-message *string*;
 header-text-color *color*;
 post-authentication-url *url-string*;
}

Hierarchy Level [edit services [captive-portal](#)]

Release Information Statement introduced in Junos OS Release 10.1 for EX Series switches.

Description Specify the design elements of a captive portal login page.

Options **banner-message**—The first screen displayed before the captive portal login page is displayed—for example, a disclaimer message.

Range: 1–2047 characters

footer-bgcolor —The hexadecimal color code for the color of the footer bar across the bottom of the captive portal login page—for example, #2E8B57 (sea green).

Values: # symbol followed by six characters.

footer-message—Text message displayed in the footer bar across the bottom of the captive portal login page.

Range: 1–2047 characters

Default: Copyright ©2010, Juniper Networks Inc.

footer-text-color — Color of the text in the footer.

Default: The default color is white.

form-header-bgcolor —The hexadecimal color code for the background color of the header bar across the top of the form area of the captive portal login page.

Values: # symbol followed by six characters.

form-header-message—Text message displayed in the header bar across the top of the form area of the captive portal login page.

Range: 1–255 characters

Default: Captive Portal User Authentication

form-header-text-color—Color of the text in the form header.

Default: The default color is black.

form-reset-label—Label displayed in the button that the user can select to clear the username and password fields on the form.

Range: 1–255 characters

Default: Reset

form-submit-label —Label displayed in the button that the user selects to submit their login information—for example, **Log In** .

Range: 1–255 characters

Default: Log In

header-bgcolor—The hexadecimal color code for the color of the header bar across the top of the captive portal login page.

Values: # symbol followed by six characters.

header-logo—Filename of the file containing the image of the logo displayed at the top of the captive portal login page. The image file can be in GIF, JPEG, or PNG format.

Default: The Juniper Networks logo

header-message—Text displayed in the header bar across the bottom of the captive portal login page.

Range: 1–2047 characters

Default: User Authentication

header-text-color—Color of the text in the header.

Default: The default color is white.

post-authentication-url—URL to which the users are directed upon successful authentication—for example **www.mycafe.com**.

Range: 1–255 characters

Default: The page originally requested by the user.

Required Privilege Level

routing—To view this statement in the configuration.

routing-control—To add this statement to the configuration.

Related Documentation

- [Designing a Captive Portal Authentication Login Page on an EX Series Switch on page 144](#)
- [Configuring Captive Portal Authentication \(CLI Procedure\) on page 142](#)

destination (Accounting)

```
Syntax destination {
    radius {
        server {
            server-address {
                accounting-port port-number;
                retry number;
                secret password;
                source-address address;
                source-address-inet6 IPv6-source-address;
                timeout seconds;
            }
        }
    }
    tacplus {
        server {
            server-address {
                port port-number;
                secret password;
                single-connection;
                timeout seconds;
            }
        }
    }
}
```

Hierarchy Level [edit system [accounting](#)]

Release Information Statement introduced before Junos OS Release 7.4.
radius statement added in Junos OS Release 7.4.
 Statement introduced in Junos OS Release 9.0 for EX Series switches.
 Statement introduced in Junos OS Release 11.1 for the QFX Series.
 Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Configure the authentication server.

Options **source-address-inet6 IPv6-source-address**—A valid IPv6 address configured on one of the routers or switch interfaces.

The remaining statements are explained separately.

Required Privilege Level system—To view this statement in the configuration.
 system-control—To add this statement to the configuration.

Related Documentation

- *Configuring RADIUS System Accounting*
- *Configuring TACACS+ System Accounting*

disable (802.1X)

Syntax	disable;
Hierarchy Level	[edit protocols dot1x authenticator interface (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Disable 802.1X authentication on a specified interface or all interfaces.
Default	802.1X authentication is disabled on all interfaces.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • show dot1x on page 313 • Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44 • Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69 • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • Configuring 802.1X Authentication (J-Web Procedure) on page 121

disable (LLDP)

Syntax	disable;
Hierarchy Level	[edit protocols lldp], [edit protocols interface lldp]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	Disable the LLDP configuration on the switch or on one or more interfaces.
Default	If you do not configure LLDP, it is disabled on the switch and on specific switch interfaces.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326• Configuring LLDP (CLI Procedure) on page 128• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17• Configuring LLDP• Understanding LLDP

disable (LLDP-MED)

Syntax	disable;
Hierarchy Level	[edit protocols lldp-med], [edit protocols lldp-med interface]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Disable the LLDP-MED configuration on the switch or on one or more interfaces.
Default	If you do not configure LLDP-MED, it is disabled on the switch and on specific switch interfaces.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326• Configuring LLDP (CLI Procedure) on page 128• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17

disable (LLDP Power Negotiation)

Syntax	disable;
Hierarchy Level	[edit protocols lldp interface (all <i>interface-name</i>) power-negotiation]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Disable Link Layer Discovery Protocol (LLDP) power negotiation, which negotiates with Power over Ethernet (PoE)-powered devices to allocate power.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring LLDP (CLI Procedure) on page 128• Configuring PoE on EX Series Switches (CLI Procedure)

dot1x

```
Syntax  dot1x {
        authenticator {
            authentication-profile-name access-profile-name;
            interface (all | [ interface-names ]) {
                disable;
                guest-vlan (vlan-id | vlan-name);
                lldp-med-bypass;
                mac-radius <restrict>;
                maximum-requests number;
                no-reauthentication;
                quiet-period seconds;
                reauthentication {
                    interval seconds;
                }
                retries number;
                server-fail (deny | permit | use-cache | vlan-id | vlan-name);
                server-reject-vlan (vlan-id | vlan-name) {
                    eapol-block;
                    block-interval block-interval;
                }
                server-timeout seconds;
                supplicant (single | single-secure | multiple);
                supplicant-timeout seconds;
                transmit-period seconds;
            }
            no-mac-table-binding {
                interface interface-names
                static mac-address
            }
            static mac-address {
                interface interface-names;
                vlan-assignment (vlan-id | vlan-name);
            }
        }
    }
```

Hierarchy Level [edit protocols]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure 802.1X authentication for Port-Based Network Access Control. 802.1X authentication is supported on interfaces that are members of private VLANs (PVLANS).

The remaining statements are explained separately.

Default 802.1X is disabled.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

- Related Documentation**
- [show dot1x on page 313](#)
 - [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
 - [Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39](#)
 - [Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50](#)
 - [Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69](#)
 - [Example: Configuring MAC RADIUS Authentication on an EX Series Switch on page 79](#)
 - [Configuring Server Fail Fallback \(CLI Procedure\) on page 137](#)


elin

Syntax	<code>elin <i>number</i>;</code>
Hierarchy Level	<code>[edit protocols lldp-med (Ethernet Switching) interface (LLDP-MED) (all <i>interface-name</i> location (LLDP-MED))]</code>
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED), configure the Emergency Line Identification Number (ELIN) as location information. Location information is advertised from the switch to the MED device and is used during emergency calls to identify the location of the MED device.
Default	Disabled.
Options	<i>number</i> —Configure a 10-digit number (area code and telephone number).
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring LLDP-MED (CLI Procedure) on page 133

eapol-block

Syntax	eapol-block;
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all [<i>interface-names</i>]) server-reject-vlan], [edit protocols dot1x authenticator interface (all [<i>interface-names</i>]) server-reject-vlan (<i>vlan-id</i> <i>vlan-name</i>)]
Release Information	Statement introduced in Junos OS Release 11.2 for EX Series switches.
Description	Enable an EAPoL block that causes the 802.1X interface to ignore Extensible Authentication Protocol (EAP) start messages from the client, which are attempts to restart the authentication procedure. When the 802.1X interface ignores the EAP start messages from the client, the switch allows the existing session that was established through the server-reject VLAN to remain open.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• block-interval on page 187• Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients on page 101

ethernet-port-type-virtual

Syntax	ethernet-port-type-virtual;
Hierarchy Level	[edit access profile <i>profile-name</i> radius options]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches.
Description	Specify the physical port type the router or switch uses to authenticate clients. The router or switch passes a port type of ethernet in RADIUS attribute 61 (NAS-Port-Type) by default. This statement specifies a port type of virtual .
<div> NOTE: This statement takes precedence over the <code>nas-port-type</code> statement if you include both statements in the same access profile.</div>	
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RADIUS Server Options for Subscriber Access• Configuring RADIUS Server Parameters for Subscriber Access

ethernet-switching-options

```

Syntax ethernet-switching-options {
    analyzer (Port Mirroring) {
        name {
            loss-priority priority;
            ratio number;
            input {
                ingress {
                    interface (all | interface-name);
                    vlan (vlan-id | vlan-name);
                }
                egress {
                    interface (all | interface-name);
                }
            }
            output {
                interface interface-name;
                vlan (vlan-id | vlan-name) {
                    no-tag;
                }
            }
        }
    }
    bpdu-block {
        disable-timeout timeout;
        interface (all | [interface-name]) {
            (disable | drop | shutdown);
        }
    }
    dot1q-tunneling {
        ether-type (0x8100 | 0x88a8 | 0x9100);
    }
    interfaces interface-name {
        no-mac-learning;
    }
    mac-lookup-length number-of-entries;
}
    mac-notification {
        notification-interval seconds;
    }
    mac-table-aging-time seconds;
    nonstop-bridging;
    port-error-disable {
        disable-timeout timeout;
    }
    redundant-trunk-group {
        group name {
            interface interface-name <primary>;
            interface interface-name;
        }
    }
    secure-access-port {
        dhcp-snooping-file {

```

```

    location local_pathname | remote_URL;
    timeout seconds;
    write-interval seconds;
}
dhcpv6-snooping-file {
    location local_pathname | remote_URL;
    timeout seconds;
    write-interval seconds;
}
interface (all | interface-name) {
    allowed-mac {
        mac-address-list;
    }
    (dhcp-trusted | no-dhcp-trusted);
    fcoe-trusted;
    mac-limit limit action (drop | log | none | shutdown);
    no-allowed-mac-log;
    persistent-learning;
    static-ip ip-address {
        vlan vlan-name;
        mac mac-address;
    }
    static-ipv6 ip-address {
        vlan vlan-name;
        mac mac-address;
    }
}
vlan (all | vlan-name) {
    (arp-inspection | no-arp-inspection) [
        forwarding-class class-name;
    ]
    dhcp-option82 {
        circuit-id {
            prefix hostname;
            use-interface-description;
            use-vlan-id;
        }
        remote-id {
            prefix hostname | mac | none;
            use-interface-description;
            use-string string;
        }
        vendor-id [string];
    }
    (examine-dhcp | no-examine-dhcp) {
        forwarding-class class-name;
    }
    (examine-dhcpv6 | no-examine-dhcpv6) {
        forwarding-class class-name;
    }
    examine-fip {
        fc-map fc-map-value;
    }
    (ip-source-guard | no-ip-source-guard);
    (ipv6-source-guard | no-ipv6-source-guard);
    mac-move-limit limit action (drop | log | none | shutdown);

```



```

    }
    (neighbor-discovery-inspection | no-neighbor-discovery-inspection);
no-option-37;
static {
    vlan name {
        mac mac-address {
            next-hop interface-name;
        }
    }
}
storm-control {
    action-shutdown;
    interface (all | interface-name) {
        bandwidth bandwidth;
        level level;
        multicast;
        no-broadcast;
        no-multicast;
        no-registered-multicast;
        no-unknown-unicast;
        no-unregistered-multicast;
    }
}
traceoptions {
    file filename <files number> <no-stamp> <replace> <size size> <world-readable |
        no-world-readable>;
    flag flag <disable>;
}
unknown-unicast-forwarding {
    vlan (all | vlan-name) {
        interface interface-name;
    }
}
}
voip {
    interface (all | [interface-name | access-ports]) {
        vlan vlan-name;
        forwarding-class (assured-forwarding | best-effort | expedited-forwarding |
            network-control);
    }
}
}
}

```

Hierarchy Level [edit]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure Ethernet switching options.

The remaining statements are explained separately.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation	<ul style="list-style-type: none">• <i>Understanding Port Mirroring on EX Series Switches</i>• <i>Understanding Port Security</i>• <i>Understanding BPDU Protection for STP, RSTP, and MSTP on EX Series Switches</i>• <i>Understanding Redundant Trunk Links</i>• <i>Understanding Storm Control on EX Series Switches</i>• Understanding 802.1X and VoIP on EX Series Switches on page 20• <i>Understanding Q-in-Q Tunneling on EX Series Switches</i>• <i>Understanding Unknown Unicast Forwarding</i>• <i>Understanding MAC Notification on EX Series Switches</i>• <i>Understanding FIP Snooping</i>• <i>Understanding Nonstop Bridging on EX Series Switches</i>
------------------------------	--

events

Syntax	<code>events [<i>events</i>];</code>
Hierarchy Level	[edit system accounting]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the types of events to track and log.
Options	<i>events</i> —Event types; can be one or more of the following: <ul style="list-style-type: none">• change-log—Audit configuration changes.• interactive-commands—Audit interactive commands (any command-line input).• login—Audit logins.
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring TACACS+ System Accounting</i>

exclude (RADIUS)

```
Syntax  exclude {
    acc-aggr-cir-id-asc [ access-request | accounting-start | accounting-stop ];
    acc-aggr-cir-id-bin [ access-request | accounting-start | accounting-stop ];
    acc-loop-cir-id [ access-request | accounting-start | accounting-stop ];
    accounting-authentic [ accounting-on | accounting-off ];
    accounting-delay-time [ accounting-on | accounting-off ];
    accounting-session-id [ access-request | accounting-on | accounting-off | accounting-stop
    ];
    accounting-terminate-cause [ accounting-off ];
    acct-tunnel-connection [ accounting-start | accounting-stop ];
    act-data-rate-dn [ access-request | accounting-start | accounting-stop ];
    act-data-rate-up [ access-request | accounting-start | accounting-stop ];
    act-interlv-delay-dn [ access-request | accounting-start | accounting-stop ];
    act-interlv-delay-up [ access-request | accounting-start | accounting-stop ];
    att-data-rate-dn [ access-request | accounting-start | accounting-stop ];
    att-data-rate-up [ access-request | accounting-start | accounting-stop ];
    called-station-id [ access-request | accounting-start | accounting-stop ];
    calling-station-id [ access-request | accounting-start | accounting-stop ];
    chap-challenge [ access-request ];
    chargeable-user-identity [ access-request ];
    class [ accounting-start | accounting-stop ];
    cos-shaping-rate [ accounting-start | accounting-stop ];
    dhcp-gi-address [ access-request | accounting-start | accounting-stop ];
    dhcp-mac-address [ access-request | accounting-start | accounting-stop ];
    dhcp-options [ access-request | accounting-start | accounting-stop ];
    downstream-calculated-qos-rate [ access-request | accounting-start | accounting-stop
    ];
    dsl-forum-attributes [ access-request | accounting-start | accounting-stop ];
    dsl-line-state [ access-request | accounting-start | accounting-stop ];
    dsl-type [ access-request | accounting-start | accounting-stop ];
    event-timestamp [ accounting-on | accounting-off | accounting-start | accounting-stop
    ];
    filter-id [ accounting-start | accounting-stop ];
    framed-ip-address [ accounting-start | accounting-stop ];
    framed-ip-netmask [ accounting-start | accounting-stop ];
    input-filter [ accounting-start | accounting-stop ];
    input-gigapackets [ accounting-stop ];
    input-gigawords [ accounting-stop ];
    interface-description [ access-request | accounting-start | accounting-stop ];
    l2tp-rx-connect-speed [ access-request | accounting-start | accounting-stop ];
    l2tp-tx-connect-speed [ access-request | accounting-start | accounting-stop ];
    max-data-rate-dn [ access-request | accounting-start | accounting-stop ];
    max-data-rate-up [ access-request | accounting-start | accounting-stop ];
    max-interlv-delay-dn [ access-request | accounting-start | accounting-stop ];
    max-interlv-delay-up [ access-request | accounting-start | accounting-stop ];
    min-data-rate-dn [ access-request | accounting-start | accounting-stop ];
    min-data-rate-up [ access-request | accounting-start | accounting-stop ];
    min-lp-data-rate-dn [ access-request | accounting-start | accounting-stop ];
    min-lp-data-rate-up [ access-request | accounting-start | accounting-stop ];
    nas-identifier [ access-request | accounting-on | accounting-off | accounting-start |
    accounting-stop ];
    nas-port [ access-request | accounting-start | accounting-stop ];
```

```
nas-port-id [ access-request | accounting-start | accounting-stop ];
nas-port-type [ access-request | accounting-start | accounting-stop ];
output-filter [ accounting-start | accounting-stop ];
output-gigapackets [ accounting-stop ];
output-gigawords [ accounting-stop ];
pppoe-description [ access-request | accounting-start | accounting-stop ];
tunnel-assignment-id [ accounting-start | accounting-stop ];
tunnel-client-auth-id [ accounting-start | accounting-stop ];
tunnel-client-endpoint [ accounting-start | accounting-stop ];
tunnel-medium-type [ accounting-start | accounting-stop ];
tunnel-server-auth-id [ accounting-start | accounting-stop ];
tunnel-server-endpoint [ accounting-start | accounting-stop ];
tunnel-type [ accounting-start | accounting-stop ];
upstream-calculated-qos-rate [ access-request | accounting-start | accounting-stop ];
virtual-router [ access-request | accounting-start | accounting-stop ];
}
```

Hierarchy Level [edit access profile *profile-name* radius [attributes](#)]

Release Information Statement introduced in Junos OS Release 9.1.
Statement introduced in Junos OS Release 9.1 for EX Series switches.
downstream-calculated-qos-rate, **dsl-forum-attributes**, and **upstream-calculated-qos-rate**
Options introduced in Junos OS Release 11.4.
cos-shaping-rate and **filter-id** Options introduced in Junos OS Release 13.2.
virtual-router Option introduced in Junos OS Release 14.1X51.
pppoe-description Option introduced in Junos OS Release 14.2.

Description Configure the router or switch to exclude the specified attributes from the specified type of RADIUS message.

Not all attributes are available in all types of RADIUS messages. By default, the router or switch includes the specified attributes in RADIUS Access-Request, Acct-On, Acct-Off, Acct-Start, and Acct-Stop messages.

Options RADIUS attribute type—RADIUS attribute, Juniper Networks (vendor ID 4874) VSA number and name, or DSL Forum (vendor ID 3561) VSA number and name.

- **acc-aggr-cir-id-asc**—Juniper Networks VSA 26-112, Acc-Aggr-Cir-Id-Asc.
- **acc-aggr-cir-id-bin**—Juniper Networks VSA 26-111, Acc-Aggr-Cir-Id-Bin.
- **acc-loop-cir-id**—Juniper Networks VSA 26-110, Acc-Loop-Cir-Id.
- **accounting-authentic**—RADIUS attribute 45, Acct-Authentic.
- **accounting-delay-time**—RADIUS attribute 41, Acct-Delay-Time.
- **accounting-session-id**—RADIUS attribute 44, Acct-Session-Id.
- **accounting-terminate-cause**—RADIUS attribute 49, Acct-Terminate-Cause.
- **acct-tunnel-connection**—RADIUS attribute 68, Acct-Tunnel-Connection.
- **act-data-rate-dn**—Juniper Networks VSA 26-114, Act-Data-Rate-Dn
- **act-data-rate-up**—Juniper Networks VSA 26-113, Act-Data-Rate-Up
- **act-interlv-delay-dn**—Juniper Networks VSA 26-126, Act-Interlv-Delay-Dn
- **act-interlv-delay-up**—Juniper Networks VSA 26-124, Act-Interlv-Delay-Up
- **att-data-rate-dn**—Juniper Networks VSA 26-118, Att-Data-Rate-Dn
- **att-data-rate-up**—Juniper Networks VSA 26-117, Att-Data-Rate-Up
- **called-station-id**—RADIUS attribute 30, Called-Station-Id.
- **calling-station-id**—RADIUS attribute 31, Calling-Station-Id.
- **chap-challenge**—RADIUS attribute 60, CHAP-Challenge.
- **chargeable-user-identity**—RADIUS attribute 89, Chargeable-User-Identity.
- **class**—RADIUS attribute 25, Class.
- **cos-shaping-rate**—Juniper Networks VSA 26-177, Cos-Shaping-Rate.
- **dhcp-gi-address**—Juniper Networks VSA 26-57, DHCP-GI-Address.
- **dhcp-mac-address**—Juniper Networks VSA 26-56, DHCP-MAC-Address.
- **dhcp-options**—Juniper Networks VSA 26-55, DHCP-Options.
- **downstream-calculated-qos-rate**—Juniper Networks VSA 26-141
- **dsl-forum-attributes**—DSL Forum VSA (vendor ID 3561) as described in RFC 4679, *DSL Forum Vendor-Specific RADIUS Attributes*
- **dsl-line-state**—Juniper Networks VSA 26-127, DSL-Line-State
- **dsl-type**—Juniper Networks VSA 26-128, DSL-Type
- **event-timestamp**—RADIUS attribute 55, Event-Timestamp.
- **filter-id**—RADIUS attribute 11, Filter-Id.
- **framed-ip-address**—RADIUS attribute 8, Framed-IP-Address.

- **framed-ip-netmask**—RADIUS attribute 9, Framed-IP-Netmask.
- **input-filter**—Juniper Networks VSA 26-10, Ingress-Policy-Name.
- **input-gigapackets**—Juniper Networks VSA 26-42, Acct-Input-Gigapackets.
- **input-gigawords**—RADIUS attribute 52, Acct-Input-Gigawords.
- **interface-description**—Juniper Networks VSA 26-53, Interface-Desc.
- **l2tp-rx-connect-speed**—Juniper Networks VSA 26-163, Rx-Connect-Speed
- **l2tp-tx-connect-speed**—Juniper Networks VSA 26-162, Tx-Connect-Speed
- **max-data-rate-dn**—Juniper Networks VSA 26-120, Max-Data-Rate-Dn
- **max-data-rate-up**—Juniper Networks VSA 26-119, Max-Data-Rate-Up
- **max-interlv-delay-dn**—Juniper Networks VSA 26-125, Max-Interlv-Delay-Dn
- **max-interlv-delay-up**—Juniper Networks VSA 26-123, Max-Interlv-Delay-Up
- **min-data-rate-dn**—Juniper Networks VSA 26-116, Min-Data-Rate-Dn
- **min-data-rate-up**—Juniper Networks VSA 26-115, Min-Data-Rate-Up
- **min-lp-data-rate-dn**—Juniper Networks VSA 26-122, Min-Lp-Data-Rate-Dn
- **min-lp-data-rate-up**—Juniper Networks VSA 26-121, Min-Lp-Data-Rate-Up
- **nas-identifier**—RADIUS attribute 32, NAS-Identifier.
- **nas-port**—RADIUS attribute 5, NAS-Port.
- **nas-port-id**—RADIUS attribute 87, NAS-Port-Id.
- **nas-port-type**—RADIUS attribute 61, NAS-Port-Type.
- **output-filter**—Juniper Networks VSA 26-11, Egress-Policy-Name.
- **output-gigapackets**—Juniper Networks VSA 26-43, Acct-Output-Gigapackets.
- **output-gigawords**—RADIUS attribute 53, Acct-Output-Gigawords.
- **pppoe-description**—Juniper Networks VSA 26-24, PPPoE-Description.
- **tunnel-assignment-id**—RADIUS attribute 82, Tunnel-Assignment-ID.
- **tunnel-client-auth-id**—RADIUS attribute 90, Tunnel-Client-Auth-ID.
- **tunnel-client-endpoint**—RADIUS attribute 66, Tunnel-Client-Endpoint.
- **tunnel-medium-type**—RADIUS attribute 65, Tunnel-Medium-Type.
- **tunnel-server-auth-id**—RADIUS attribute 91, Tunnel-Server-Auth-ID.
- **tunnel-server-endpoint**—RADIUS attribute 67, Tunnel-Server-Endpoint.
- **tunnel-type**—RADIUS attribute 64, Tunnel-Type.
- **upstream-calculated-qos-rate**—Juniper Networks VSA 26-142

RADIUS message type

- **access-request**—RADIUS Access-Request messages.
- **accounting-off**—RADIUS Accounting-Off messages.
- **accounting-on**—RADIUS Accounting-On messages.
- **accounting-start**—RADIUS Accounting-Start messages.
- **accounting-stop**—RADIUS Accounting-Stop messages.

Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring How RADIUS Attributes Are Used for Subscriber Access</i> • <i>Configuring RADIUS Server Parameters for Subscriber Access</i>

fast-start (LLDP-MED)

Syntax	fast-start <i>count</i> ;
Hierarchy Level	[edit protocols lldp-med (Ethernet Switching)]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the number of Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) advertisements sent from the switch in the first second after it has detected an LLDP-MED device (such as an IP telephone).
Options	count —Number of advertisements. Range: 1 through 10 Default: 3
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Configuring LLDP-MED (CLI Procedure) on page 133 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17

forwarding-class (VoIP)

Syntax	forwarding-class < assured-forwarding best-effort expedited-forwarding network-control >;
Hierarchy Level	[edit ethernet-switching-options voip interface <all <i>interface-name</i> access-ports>] [edit switch-options voip interface <all <i>interface-name</i> access-ports>]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For EX Series switches, configure the forwarding class used to handle packets on the VoIP interface.
Default	Disabled.
Options	<i>class</i> —Forwarding class: <ul style="list-style-type: none">• assured-forwarding—Assured forwarding (AF)—Provides a group of values you can define and includes four subclasses: AF1, AF2, AF3, and AF4, each with three drop probabilities: low, medium, and high.• best-effort—Provides no service profile. For the best effort forwarding class, loss priority is typically not carried in a class-of-service (CoS) value, and random early detection (RED) drop profiles are more aggressive.• expedited-forwarding—Provides a low loss, low latency, low jitter, assured bandwidth, end-to-end service.• network-control—Provides a typically high priority because it supports protocol control.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50• Example: Configuring VoIP on an EX Series Switch Without Including 802.1X Authentication on page 62• Example: Configuring VoIP on an EX Series Switch Without Including LLDP-MED Support on page 58

guest-vlan

Syntax	<code>guest-vlan (vlan-id vlan-name);</code>
Hierarchy Level	[edit protocols dot1x authenticator interface (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Specify the VLAN to which an interface is moved when no 802.1X supplicants are connected on the interface. The VLAN specified must already exist on the switch.
Default	None
Options	<p><i>vlan-id</i>—VLAN tag identifier of the guest VLAN.</p> <p><i>vlan-name</i>—Name of the guest VLAN.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39 • Understanding Guest VLANs for 802.1X on EX Series Switches on page 16

hold-multiplier

Syntax	hold-multiplier <i>number</i> ;
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for QFX Series.
Description	Specify the multiplier used in combination with the advertisement-interval value to determine the length of time LLDP information is held before it is discarded. The default value is 4 (or 120 seconds).
Default	Disabled.
Options	<i>number</i> —A number used as a multiplier. Range: 2 through 10 Default: 4 (or 120 seconds)
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326• Configuring LLDP (CLI Procedure) on page 128• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17• Configuring LLDP• Understanding LLDP

ignore

Syntax	<pre>ignore { dynamic-iflset-name; framed-ip-netmask; input-filter; logical-system-routing-instance; output-filter; }</pre>
Hierarchy Level	[edit access profile <i>profile-name</i> radius attributes]
Release Information	<p>Statement introduced in Junos OS Release 9.1.</p> <p>Statement introduced in Junos OS Release 9.1 for EX Series switches.</p>
Description	Configure the router or switch to ignore the specified attributes in RADIUS Access-Accept messages. By default, the router or switch processes the attributes it receives from the external server.
Options	<p>dynamic-iflset-name—Ignore Interface-Set/Dynamic-Ifset-Name (VSA 26-130).</p> <p>framed-ip-netmask—Ignore Framed-IP-Netmask (RADIUS attribute 9).</p> <p>input-filter—Ignore Ingress-Policy-Name (VSA 26-10).</p> <p>logical-system-routing-instance—Ignore Virtual-Router (VSA 26-1).</p> <p>output-filter—Ignore Egress-Policy-Name (VSA 26-11).</p>
Required Privilege Level	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring How RADIUS Attributes Are Used for Subscriber Access</i> • <i>Configuring RADIUS Server Parameters for Subscriber Access</i>

immediate-update

Syntax	immediate-update;
Hierarchy Level	[edit access profile <i>profile-name</i> accounting]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches.
Description	Configure the router or switch to send an Acct-Update message to the RADIUS accounting server on receipt of a response (for example, an ACK or timeout) to the Acct-Start message.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RADIUS Server Parameters for Subscriber Access• Configuring Per-Subscriber Session Accounting

infranet-controller

Syntax	infranet-controller <i>hostname</i> { address <i>ip-address</i> ; interface <i>interface-name</i> ; password <i>password</i> ; port <i>port-number</i> ; }
Hierarchy Level	[edit services unified-access-control]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure the switch's connection to the Junos Pulse Access Control Service network access control (NAC) device. The remaining statements are explained separately.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148• Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

interface (802.1X)

Syntax	<pre> interface (all [<i>interface-names</i>]) { disable; guest-vlan (<i>vlan-name</i> <i>vlan-id</i>); lldp-med-bypass; mac-radius <restrict>; maximum-requests <i>number</i>; no-reauthentication; quiet-period <i>seconds</i>; reauthentication { interval <i>seconds</i>; } retries <i>number</i>; server-fail (deny permit use-cache <i>vlan-id</i> <i>vlan-name</i>); server-reject-vlan (<i>vlan-id</i> <i>vlan-name</i>) { eapol-block; block-interval <i>block-interval</i>; } server-timeout <i>seconds</i>; supplicant (single single-secure multiple); supplicant-timeout <i>seconds</i>; transmit-period <i>seconds</i>; } </pre>
Hierarchy Level	[edit protocols dot1x authenticator]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure 802.1X authentication for Port-Based Network Access Control for all interfaces or for specific interfaces.
Options	<p>all—Configure all interfaces for 802.1X authentication.</p> <p>[<i>interface-names</i>]— List of names of interfaces to configure for 802.1X authentication.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show dot1x on page 313 • Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44 • Example: Setting Up 802.1X in Conference Rooms to Provide Internet Access to Corporate Visitors on an EX Series Switch on page 39 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Example: Configuring MAC RADIUS Authentication on an EX Series Switch on page 79

- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)


interface (Access Control Service)

Syntax	<code>interface <i>interface-name</i>;</code>
Hierarchy Level	[edit services unified-access-control infranet-controller]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Specify the interface through which the switch will connect to the Junos Pulse Access Control Service.
Options	<i>interface-name</i> —Name of the interface that will connect the switch to the Access Control Service.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148• Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

interface (Captive Portal)

Syntax	<pre>interface (all [<i>interface-names</i>]) { quiet-period <i>seconds</i>; retries <i>number-of-retries</i>; server-timeout <i>seconds</i>; session-expiry <i>seconds</i>; supplicant (multiple single single-secure); }</pre>
Hierarchy Level	[edit services captive-portal]
Release Information	Statement introduced in Junos OS Release 10.1 for EX Series switches.
Description	Configure captive portal authentication for all interfaces or for specific interfaces.
Options	<p>all—All interfaces to be configured for captive portal authentication.</p> <p>[<i>interface-names</i>]—List of names of interfaces to be configured for captive portal authentication.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing—control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Configuring Captive Portal Authentication (CLI Procedure) on page 142

interface (LLDP)

Syntax	<pre>interface (all <i>interface-name</i>) { disable; power-negotiation { disable; } }</pre>
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	Configure Link Layer Discovery Protocol (LLDP) on all interfaces or on a specific interface. <div> NOTE: On EX4300 switches, LLDP cannot be configured on the me0 or vme interface. Issuing the command <code>set protocols lldp interface me0</code> generates the following error message: error: name: 'me0': Invalid interface error: statement creation failed: interface Issuing the command <code>set protocols lldp interface vme</code> generates the following error message: error: name: 'vme': Invalid interface error: statement creation failed: interface</div>
Default	None
Options	all —All interfaces on the switch. <i>interface-name</i> —Name of a specific interface. The remaining statements are explained separately.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring LLDP (CLI Procedure) on page 128• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17• Configuring LLDP• Understanding LLDP

interface (LLDP-MED)

Syntax	<pre> interface (all <i>interface-name</i>) { disable; location (LLDP-MED) { elin <i>number</i>; civic-based { what <i>number</i>; country-code <i>code</i>; ca-type { number { ca-value <i>value</i>; } } } } } </pre>
Hierarchy Level	[edit protocols lldp-med (Ethernet Switching)]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) on all interfaces or on a specific interface.
Default	Not enabled
Options	<p>all—All interfaces on the switch.</p> <p><i>interface-name</i>—Name of a specific interface.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring LLDP-MED (CLI Procedure) on page 133 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17

interface (Static MAC Bypass)

Syntax	<code>interface [<i>interface-names</i>];</code>
Hierarchy Level	[edit protocols dot1x authenticator authentication-profile-name static mac-address], [edit ethernet-switching-options authentication-whitelist mac-address], [edit switch-options authentication-whitelist mac-address]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement added to the [edit ethernet-switching-options authentication-whitelist] hierarchy in Junos OS Release 10.1 for EX Series switches. Statement added to the [edit switch-options authentication-whitelist] hierarchy in Junos OS Release 13.2X50-D10 for EX Series switches (ELS).
Description	Configure interfaces on which the specified MAC addresses are allowed to bypass RADIUS authentication and allowed to connect to the LAN without authentication.
Options	<i>interface-names</i> —List of interfaces.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show dot1x static-mac-address on page 320• Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Configuring Captive Portal Authentication (CLI Procedure) on page 142

interface (VoIP)

Syntax	<pre>interface (all [<i>interface-name</i>] access-ports) { vlan <i>vlan-name</i> ; forwarding-class <assured-forwarding best-effort expedited-forwarding network-control>; }</pre>
Hierarchy Level	<ul style="list-style-type: none"> For platforms with ELS: [edit switch-options voip] For platforms without ELS: [edit ethernet-switching-options voip],
Release Information	<p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Hierarchy level [edit switch-options] introduced in Junos OS Release 13.2X50-D10. (See <i>Getting Started with Enhanced Layer 2 Software</i> for information about ELS.)</p>
Description	Enable voice over IP (VoIP) for all interfaces or specific interfaces.
Options	all <i>interface-name</i> access-ports—Enable VoIP on all interfaces, on a specific interface, or on all access ports.
Required Privilege Level	<p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 Example: Configuring VoIP on an EX Series Switch Without Including 802.1X Authentication on page 62 Example: Configuring VoIP on an EX Series Switch Without Including LLDP-MED Support on page 58

interface-description-format

Syntax	<pre>interface-description-format { exclude-adapter; exclude-sub-interface; }</pre>
Hierarchy Level	[edit access profile <i>profile-name</i> radius options]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches. Options exclude-adapter and exclude-sub-interface introduced in Junos OS Release 10.4.
Description	Specify the information that is excluded from the interface description that the device passes to RADIUS for inclusion in the RADIUS attribute 87 (NAS-Port-Id). By default, the device includes both the subinterface and the adapter in the interface description.
Options	exclude-adapter —Exclude the adapter from the interface description. exclude-sub-interface —Exclude the subinterface from the interface description.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Options for Subscriber Access</i>• <i>RADIUS Server Options for Subscriber Access</i>

interval (Access Control Service)

Syntax	<code>interval seconds;</code>
Hierarchy Level	[edit services unified-access-control]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure the time between continuity check messages for the switch's connection with the Junos Pulse Access Control Service. The specified value must be less than the value specified for timeout .
Options	seconds —Time between continuity check messages, in seconds. Range: 1 through 9999 seconds Default: 30 seconds
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148• Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

lldp

```
Syntax  lldp {
    advertisement-interval seconds;
    disable;
    hold-multiplier number;
    interface (all | [interface-name]) {
        disable;
        power-negotiation {
            disable;
        }
    }
    lldp-configuration-notification-interval seconds;
    management-address ip-management-address;
    netbios-snooping;
    no-tagging;
    ptopo-configuration-maximum-hold-time seconds;
    ptopo-configuration-trap-interval seconds;
    traceoptions {
        file filename <files number> <size size> <world-readable | no-world-readable>
        <no-stamp> <replace>;
        flag flag <disable>;
    }
    transmit-delay seconds;
}
```

Hierarchy Level [edit protocols]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Statement introduced in Junos OS Release 11.1 for QFX Series.

Description Configure Link Layer Discovery Protocol (LLDP). The switch uses LLDP to advertise its identity and capabilities on a LAN, as well as to receive information about other network devices. LLDP is defined in the IEEE standard 802.1AB-2005.

The remaining statements are explained separately.



NOTE: The `transmit-delay` and `netbios-snooping` options are not available on QFabric systems.



NOTE: On EX4300 switches, LLDP cannot be configured on the `me0` or `vme` interface. Issuing the command `set protocols lldp interface me0` generates the following error message:

```
error: name: 'me0': Invalid interface
error: statement creation failed: interface
```

Issuing the command `set protocols lldp interface vme` generates the following error message:

```
error: name: 'vme': Invalid interface
error: statement creation failed: interface
```

.....

Default LLDP is enabled.

The following statements have default values:

- **advertisement-interval**—The default value is 30 seconds. The allowable range is from 5 through 32768 seconds.
- **hold-multiplier**—The default values is 4. The allowable range is from 2 through 10.
- **ptopo-configuration-maximum-hold-time**—The default value is 300 seconds. The allowable range is from 1 through 2147483647 seconds.
- **transmit-delay**—The default values is 2 seconds. The allowable range is from 1 through 8192 seconds.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- [show lldp on page 326](#)
- [Configuring LLDP \(CLI Procedure\) on page 128](#)
- [Configuring LLDP](#)
- [Understanding LLDP](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

lldp-configuration-notification-interval

Syntax	lldp-configuration-notification-interval <i>seconds</i> ;
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 9.6 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	Specify how often SNMP trap notifications are generated as a result of LLDP database changes. If the interval value is 0, trap notifications of database changes are disabled.
Default	SNMP trap notifications of LLDP database changes are disabled.
Options	seconds —Interval between trap notifications about LLDP database changes. Range: 0 through 3600
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326

lldp-med (Ethernet Switching)

Syntax	<pre> lldp-med { disable; fast-start <i>number</i>; interface (all <i>interface-name</i>) { disable; location { elin <i>number</i>; civic-based { what <i>number</i>; country-code <i>code</i>; ca-type { number { ca-value <i>value</i>; } } } } } } </pre>
Hierarchy Level	[edit protocols]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	<p>Configure Link Layer Discovery Protocol–Media Endpoint Discovery. LLDP-MED is an extension of LLDP. The switch uses LLDP-MED to support device discovery of VoIP telephones and to create location databases for these telephone locations for emergency services. LLDP-MED is defined in the standard ANSI/TIA-1057 by the Telecommunications Industry Association (TIA).</p> <p>The statements are explained separately.</p>
Default	Disabled.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring LLDP-MED (CLI Procedure) on page 133

lldp-med-bypass

Syntax	lldp-med-bypass;
Hierarchy Level	[edit protocols dot1x authenticator interface (all <i>interface-name</i>)]
Release Information	Statement introduced in Junos OS Release 12.3 for EX Series switches.
Description	Bypass the 802.1X authentication procedure for connecting multiple LLDP-MED end devices. Automatically add the learned MAC addresses of the end devices to the switch's static MAC bypass list, and allow the devices to access the network. You can enable lldp-med-bypass only when the interface is also configured for 802.1X authentication of <i>multiple</i> supplicants.
Default	Disabled
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• supplicant on page 273• Understanding Authentication on EX Series Switches on page 10

lldp-priority

Syntax	lldp-priority;
Hierarchy Level	[edit poe], [edit poe fpc (all <i>slot-number</i>)]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure the switch to assign interfaces the power priority provided by the powered device by using Link Layer Discovery Protocol (LLDP) power negotiation rather than the power priority configured on the switch interface.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring PoE on EX Series Switches (CLI Procedure)


location (LLDP-MED)

Syntax	<pre> location { elin number; civic-based { what number; country-code code; ca-type{ number { ca-value value; } } } } </pre>
Hierarchy Level	[edit protocols lldp-med interface (all <i>interface-name</i>)]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	<p>For Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED), configure the location information. Location information is advertised from the switch to the MED. This information is used during emergency calls to identify the location of the MED.</p> <p>The statements are explained separately.</p>
Default	Disabled.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring LLDP-MED (CLI Procedure) on page 133

mac-radius

Syntax	<code>mac-radius <flap-on-disconnect> <restrict>;</code>
Hierarchy Level	[edit protocols dot1x authenticator interface <i>interface-name</i>]
Release Information	Statement introduced in Junos OS Release 9.3 for EX Series switches. Option flap-on-disconnect introduced in Junos OS Release 9.4 for EX Series switches.
Description	<p>Configure MAC RADIUS authentication for specific interfaces. MAC RADIUS authentication allows LAN access to permitted MAC addresses. When a new MAC address appears on an interface, the switch consults the RADIUS server to check whether the MAC address is a permitted address. If the MAC address is configured on the RADIUS server, the device is allowed access to the LAN.</p> <p>If MAC RADIUS is configured, the switch first tries to get a response from the host for 802.1X authentication. If the host is unresponsive, the switch attempts to authenticate using MAC RADIUS.</p> <p>To restrict authentication to MAC RADIUS only, use the restrict option. In restrictive mode, all 802.1X packets are eliminated and the attached device on the interface is considered a nonresponsive host.</p>
Options	<p>flap-on-disconnect—(Optional) When the RADIUS server sends a disconnect message to a supplicant, the switch resets the interface on which the supplicant is authenticated. If the interface is configured for multiple supplicant mode, the switch resets all the supplicants on the specified interface. This option takes effect only when the restrict option is also set.</p> <p>restrict—(Optional) Restricts authentication to MAC RADIUS only. When mac-radius restrict is configured the switch drops all 802.1X packets. This option is useful when no other 802.1X authentication methods, such as guest VLAN, are needed on the interface, and eliminates the delay that occurs while the switch determines that a connected device is a non-802.1X-enabled host.</p>
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show dot1x on page 313• Example: Configuring MAC RADIUS Authentication on an EX Series Switch on page 79• Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44• Configuring MAC RADIUS Authentication (CLI Procedure) on page 139• Configuring 802.1X Interface Settings (CLI Procedure) on page 120• Understanding Authentication on EX Series Switches on page 10

management-address

Syntax	<code>management-address <i>ip-management-address</i>;</code>
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 9.5 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	Specify the management address of the switch to be used in the LLDP Management type, length, and value (TLV). The Management Address TLV typically contains the IPv4 or IPv6 management address of the local system. Only out-of-band management addresses must be used for the management-address. Other remote managers can use this address to obtain information related to the local device.
<div>  <p>NOTE: Ensure that the interface with the configured management address has LLDP enabled using the <code>set protocols lldp interface</code> command. If you configure a customized management address for LLDP on an interface that has LLDP disabled, the <code>show lldp local-information</code> command output will not display the correct interface information.</p> </div>	
Default	The LLDP Management Address TLV uses the IP address of the switch's management Ethernet interface (me0), or the IP address of the virtual management Ethernet (VME) interface if the switch is a Virtual Chassis member.
Options	<i>ip-management-address</i> —You can specify either an IPv4 or an IPv6 management address for the switch.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17 • EX Series Switches Interfaces Overview • Understanding LLDP

maximum-requests

Syntax	maximum-requests <i>number</i> ;
Hierarchy Level	[edit protocols dot1x authenticator interface (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, configure the maximum number of times an EAPOL request packet is retransmitted to the supplicant before the authentication session times out.
Default	Two retransmission attempts
Options	<i>number</i> —Number of retransmission attempts. Range: 1 through 10 Default: 2
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring 802.1X Interface Settings (CLI Procedure) on page 120• Configuring 802.1X Authentication (J-Web Procedure) on page 121

nas-identifier

Syntax	nas-identifier <i>identifier-value</i> ;
Hierarchy Level	[edit access profile <i>profile-name</i> radius options]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches.
Description	Configure the value for the client RADIUS attribute 32 (NAS-Identifier). This attribute is used for authentication and accounting requests.
Options	<i>identifier-value</i> —String to use for authentication and accounting requests. Range: 1 through 64 characters
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RADIUS Server Options for Subscriber Access• Configuring RADIUS Server Parameters for Subscriber Access

nas-port-extended-format (Access Profile)

Syntax

```
nas-port-extended-format {
  adapter-width width;
  ae-width width;
  port-width width;
  pw-width width;
  slot-width width;
  stacked-vlan-width width;
  vlan-width width;
  atm {
    adapter-width width;
    port-width width;
    slot-width width;
    vci-width width;
    vpi-width width;
  }
}
```

Hierarchy Level [edit access profile *profile-name* radius [options](#)]

Release Information Statement introduced in Junos OS Release 9.1.
 Statement introduced in Junos OS Release 9.1 for EX Series switches.
ae-width option added in Junos OS Release 12.1.
atm option added in Junos OS Release 12.3R3 and supported in later 12.3Rx releases.
atm option supported in Junos OS Release 13.2 and later releases. (Not supported in Junos OS Release 13.1.)
pw-width option added in Junos OS Release 15.1.

Description In an access profile, configure the RADIUS client to use the extended format for RADIUS attribute 5 (NAS-Port) and specify the width of the fields in the NAS-Port attribute. You can use the same access profile to configure the NAS-Port extended format for Ethernet subscribers and ATM subscribers.

Options

- adapter-width *width***—Number of bits in the adapter field.
- ae-width *width***—Number of bits in the aggregated Ethernet identifier field.
- port-width *width***—Number of bits in the port field.
- pw-width *width***—Number of bits in the pseudowire field. Appears in the Cisco NAS-Port-Info AVP (100).
- slot-width *width***—Number of bits in the slot field.
- stacked-vlan-width *width***—Number of bits in the SVLAN ID field.
- vlan-width *width***—Number of bits in the VLAN ID field.
- atm**—Configure the NAS-Port extended format for ATM subscribers; options include:
 - **adapter-width *width***—Number of bits in the adapter field.

- **port-width *width***—Number of bits in the port field.
- **slot-width *width***—Number of bits in the slot field.
- **vci-width *width***—Number of bits in the ATM virtual circuit identifier (VCI) field.
- **vpi-width *width***—Number of bits in the ATM virtual path identifier (VPI) field.



NOTE: Each field can be 0 through 32 bits wide; however, the total of the widths of all fields must not exceed 32 bits, or the configuration fails.

The router may truncate the values of individual fields depending on the bit width you specify.

Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Options for Subscriber Access</i>• <i>Configuring RADIUS Server Parameters for Subscriber Access</i>

netbios-snooping

Syntax	netbios-snooping;
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 11.1 for EX Series switches.
Description	Enable NetBIOS snooping on the switch.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring NetBIOS Snooping (CLI Procedure) on page 147

no-mac-table-binding (802.1X)

Syntax	no-mac-table-binding;
Hierarchy Level	[edit protocols dot1x authenticator]
Release Information	Statement introduced in Junos OS Release 11.1 for EX Series switches.
Description	For 802.1X authentication, disable the removal of the session from the authentication session table when the MAC address ages out of the Ethernet switching table.
Default	Not enabled
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Controlling Authentication Session Timeouts (CLI Procedure) on page 146

no-reauthentication

Syntax	no-reauthentication;
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, disables reauthentication.
Default	Not disabled
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • Configuring 802.1X Authentication (J-Web Procedure) on page 121 • Understanding Authentication on EX Series Switches on page 10

no-tagging

Syntax	no-tagging;
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 14.1X53-D10 for EX Series switches.
Description	Configure the switch to send LLDPDUs without including VLAN tags on interfaces for which VLAN tagging is enabled (tagged interfaces).
Default	Interfaces for which VLAN tagging is enabled include a VLAN tag (tag 0) in LLDPDUs if the no-tagging option is not configured.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17

options (Access Profile)

```
Syntax  options {
    accounting-session-id-format (decimal | description);
    calling-station-id-delimiter delimiter-character;
    calling-station-id-format {
        agent-circuit-id;
        agent-remote-id;
        interface-description;
        nas-identifier;
    }
    chap-challenge-in-request-authenticator;
    client-accounting-algorithm (direct | round-robin);
    client-authentication-algorithm (direct | round-robin);
    coa-dynamic-variable-validation;
    ethernet-port-type-virtual;
    access-loop-id-local;
    interface-description-format {
        exclude-adapter;
        exclude-sub-interface;
    }
    ip-address-change-notify message;
    juniper-dsl-attributes;
    nas-identifier identifier-value;
    nas-port-extended-format {
        adapter-width width;
        ae-width width;
        port-width width;
        slot-width width;
        stacked-vlan-width width;
        vlan-width width;
        atm {
            adapter-width width;
            port-width width;
            pw-width width;
            slot-width width;
            vci-width width;
            vpi-width width;
        }
    }
    nas-port-id-delimiter delimiter-character;
    nas-port-id-format {
        agent-circuit-id;
        agent-remote-id;
        interface-description;
        interface-text-description;
        nas-identifier;
        order {
            agent-circuit-id;
            agent-remote-id;
            interface-description;
            interface-text-description;
            nas-identifier;
            postpend-vlan-tags;
        }
    }
}
```

```
    }
    postpend-vlan-tags;
  }
  nas-port-type {
    ethernet {
      port-type;
    }
  }
  revert-interval interval;
  vlan-nas-port-stacked-format;
}
```

Hierarchy Level [edit access profile *profile-name* **radius**]

Release Information Statement introduced in Junos OS Release 9.1.
Statement introduced in Junos OS Release 9.1 for EX Series switches.

Description Configure the options used by RADIUS authentication and accounting servers.


The remaining statements are explained separately.

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation

- *Configuring RADIUS Server Options for Subscriber Access*
- *RADIUS Server Options for Subscriber Access*

order

Syntax	<code>order (radius [<i>accounting-order-data-list</i>]);</code>
Hierarchy Level	[edit access profile <i>profile-name</i> accounting]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	Configure the order of authentication, authorization, and accounting (AAA) servers to use while sending accounting messages and updates.
Default	No order specified
Options	<p>radius—RADIUS accounting for specified subscribers.</p> <p>[<i>accounting-order-data-list</i>]— Set of data listing the authentication order to be used, enclosed by brackets. This can be any combination of the authentication methods, up to and including a full list of the entire authentication order.</p>
<div>  <p>NOTE: The [edit access] hierarchy is not available on QFabric systems.</p> </div>	
Required Privilege Level	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35 • Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124 • Configuring RADIUS Accounting


password (Access Control Service)

Syntax	<code>password password;</code>
Hierarchy Level	[edit services unified-access-control infranet-controller <i>hostname</i>]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure the password to connect the switch to the Junos Pulse Access Control Service network access control (NAC) device. This password must match the password specified on the Access Control Service through its administrative interface.
Options	password —A string of up to 200 alphanumeric characters bounded by quotation marks. Spaces are allowed, but special characters, such as <code>?</code> , are not allowed.
Required Privilege Level	<code>routing</code> —To view this statement in the configuration. <code>routing-control</code> —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148• Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

port

Syntax	<code>port port-number;</code>
Hierarchy Level	[edit access radius-server <i>server-address</i>], [edit access profile <i>profile-name</i> radius-server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the port number on which to contact the RADIUS server.
Options	port-number —Port number on which to contact the RADIUS server. Default: 1812 (as specified in RFC 2865)
Required Privilege Level	<code>system</code> —To view this statement in the configuration. <code>system-control</code> —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Router or Switch Interaction with RADIUS Servers• Configuring Authentication and Accounting Parameters for Subscriber Access

port (Access Control Service)

Syntax	<code>port <i>port-number</i>;</code>
Hierarchy Level	[edit services unified-access-control infranet-controller]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure the switch's connection to the security port on the Junos Pulse Access Control Service network access control (NAC) device.
<div>  NOTE: Do not change this port setting. </div>	
Options	<code><i>port-number</i></code> —11123
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148 • Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

port (RADIUS Server)

Syntax	<code>port <i>port-number</i>;</code>
Hierarchy Level	[edit system radius-server <i>address</i>], [edit system accounting destination radius server <i>address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Description	Configure the port number on which to contact the RADIUS server.
Options	<i>number</i> —Port number on which to contact the RADIUS server. Default: 1812 (as specified in RFC 2865)



NOTE: The [edit system accounting] hierarchy is not available on QFabric systems.

Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Authentication</i>


port (TACACS+ Server)

Syntax	<code>port <i>port-number</i>;</code>
Hierarchy Level	[edit system accounting destination tacplus server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the port number on which to contact the TACACS+ server.
Options	<i>number</i> —Port number on which to contact the TACACS+ server. Default: 49
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring TACACS+ System Accounting</i>

power-negotiation

Syntax	power-negotiation { disable; }
Hierarchy Level	[edit protocols lldp interface (all <i>interface-name</i>)]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	<p>Configure Link Layer Discovery Protocol (LLDP) power negotiation, which negotiates with Power over Ethernet (PoE) powered devices to allocate power.</p> <p>LLDP power negotiation requires the PoE management option to be set to class.</p> <p>The remaining statement is explained separately.</p>
Default	LLDP power negotiation is enabled by default when the PoE management option is set to class .
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring LLDP (CLI Procedure) on page 128 • <i>Configuring PoE on EX Series Switches (CLI Procedure)</i>

profile

Syntax	<pre> profile <i>profile-name</i> { accounting (Access Profile) { <i>accounting-stop-on-access-deny</i>; <i>accounting-stop-on-failure</i>; order (radius [<i>accounting-order-data-list</i>]); } <i>authentication-order</i> [<i>authentication-method</i>]; radius { <i>accounting-server</i> [<i>server-addresses</i>]; <i>authentication-server</i> [<i>server-addresses</i>]; } } </pre>
Hierarchy Level	[edit access]
Release Information	<p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.</p> <p>Statement introduced in Junos OS Release 11.1 for the QFX Series.</p>
Description	Configure an access profile. The access profile contains the entire authentication, authorization, and accounting (AAA) configuration that aids in handling AAA requests, including the authentication method and order, AAA server addresses, and AAA accounting.
Default	Not enabled
Options	<p><i>profile-name</i>—Profile name of up to 32 characters.</p> <p>The remaining statements are explained separately.</p>
<div style="display: flex; align-items: center;">  <div> <p>NOTE: The [edit access] hierarchy is not available on QFabric systems.</p> </div> </div>	
Required Privilege Level	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35 • Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124 • Configuring RADIUS Accounting

ptopo-configuration-maximum-hold-time

Syntax	<code>ptopo-configuration-maximum-hold-time <i>seconds</i>;</code>
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 9.6 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	Configure how long to maintain the physical topology database entries. The physical topology identifies the devices on the network and their physical interconnections.
Options	<i>seconds</i> —Time to maintain physical topology database entries. Default: 300 Range: 1 through 2147483647
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17 • Understanding LLDP

ptopo-configuration-trap-interval

Syntax	<code>ptopo-configuration-trap-interval <i>seconds</i>;</code>
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 9.6 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	Specify how often SNMP trap notifications are sent regarding changes in physical topology global statistics.
Default	SNMP trap notifications of changes in physical topology global statistics are disabled.
Options	<i>seconds</i> —Interval between SNMP trap notifications about physical topology global statistics. Range: 0 through 3600
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

quiet-period

Syntax	<code>quiet-period seconds;</code>
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all <i>[interface-names]</i>)]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, configure the number of seconds the interface remains in the wait state following a failed authentication attempt by a supplicant before reattempting authentication.
Default	60 seconds
Options	seconds —Number of seconds the interface remains in the wait state. Range: 0 through 65,535 seconds Default: 60 seconds
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show network-access aaa statistics authentication on page 344• Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35

quiet-period (Captive Portal)

Syntax	<code>quiet-period seconds;</code>
Hierarchy Level	[edit services captive-portal interface (all <i>interface-names</i>)]
Release Information	Statement introduced in Junos OS Release 10.1 for EX Series switches.
Description	Configure time, in seconds, after a user exceeds the maximum number of retries before they can attempt to authenticate.
Options	seconds —Number of seconds. Range: 1–65535 Default: 60
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Configuring Captive Portal Authentication (CLI Procedure) on page 142

radius (Access Profile)

```
Syntax  radius {
    accounting-server [ ip-address ];
    attributes {
        exclude
        ...
    }
    ignore {
        framed-ip-netmask;
        input-filter;
        logical-system-routing-instance;
        output-filter;
    }
}
authentication-server [ ip-address ];
options {
    accounting-session-id-format (decimal | description);
    calling-station-id-delimiter delimiter-character;
    calling-station-id-format {
        agent-circuit-id;
        agent-remote-id;
        interface-description;
        nas-identifier;
    }
    chap-challenge-in-request-authenticator;
    client-accounting-algorithm (direct | round-robin);
    client-authentication-algorithm (direct | round-robin);
    coa-dynamic-variable-validation;
    ethernet-port-type-virtual;
    interface-description-format {
        exclude-adapter;
        exclude-sub-interface;
    }
    ip-address-change-notify message;
    juniper-dsl-attributes;
    nas-identifier identifier-value;
    nas-port-extended-format {
        adapter-width width;
        ae-width width;
        port-width width;
        slot-width width;
        stacked-vlan-width width;
        vlan-width width;
        atm {
            adapter-width width;
            port-width width;
            slot-width width;
            vci-width width;
            vpi-width width;
        }
    }
    nas-port-id-delimiter delimiter-character;
    nas-port-id-format {
```

```
agent-circuit-id;
agent-remote-id;
interface-description;
interface-text-description;
nas-identifier;
order {
    agent-circuit-id;
    agent-remote-id;
    interface-description;
    interface-text-description;
    nas-identifier;
    postpend-vlan-tags;
}
postpend-vlan-tags;
}
nas-port-type {
    ethernet {
        port-type;
    }
}
revert-interval interval;
vlan-nas-port-stacked-format;
}
preauthentication-server ip-address;
}
```

Hierarchy Level [edit access profile *profile-name*]

Release Information Statement introduced in Junos OS Release 9.1.
Statement introduced in Junos OS Release 9.1 for EX Series switches.

Description Configure the RADIUS parameters that the router uses for AAA authentication and accounting for subscribers.

The remaining statements are explained separately.

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.


Related Documentation

- *Configuring RADIUS Server Parameters for Subscriber Access*
- *RADIUS Server Options for Subscriber Access*

radius (System)

Syntax	<pre>radius { server { server-address { accounting-port port-number; secret password; source-address address; retry number; timeout seconds; } } }</pre>
Hierarchy Level	[edit system accounting destination]
Release Information	<p>Statement introduced in Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.1 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
Description	Configure the RADIUS accounting server.
Options	<p>server-address—Address of the RADIUS accounting server.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> <i>Configuring RADIUS System Accounting</i>

radius

Syntax	<pre>radius { accounting-server [server-addresses]; authentication-server [server-addresses]; }</pre>
Hierarchy Level	[edit access profile <i>profile-name</i>]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Statement introduced in Junos OS Release 11.1 for the QFX Series.
Description	<p>Configure the RADIUS servers for authentication and for accounting. To configure multiple RADIUS servers, include multiple radius statements. The servers are tried in order and in a round-robin fashion until a valid response is received from one of the servers or until all the configured retry limits are reached.</p> <p>The statements are explained separately.</p>
<div> NOTE: The [edit access] hierarchy is not available on QFabric systems.</div>	
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35• Configuring 802.1X RADIUS Accounting (CLI Procedure) on page 124• Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125• Configuring RADIUS Accounting

radius-options (Protocols 802.1X)

Syntax	radius-options { use-vlan-id; use-vlan-name; }
Hierarchy Level	[edit protocols dot1x authenticator]
Release Information	Statement introduced in Junos OS Release 12.1 for EX Series switches.
Description	Configure 802.1X authenticator so that the VLAN ID or VLAN name is included in the packet sent to the RADIUS server to request authentication.
Options	<p>use-vlan-id—Include the VLAN ID in the packet sent to the RADIUS server to request authentication.</p> <p>use-vlan-name—Include the VLAN name in the packet sent to the RADIUS server to request authentication. The VLAN name is sent even if the 802.1X interface is configured with the VLAN ID.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • Specifying RADIUS Server Connections on an EX Series Switch (CLI Procedure) on page 141 • authenticator on page 186

radius-server

Syntax	<pre>radius-server server-address { accounting-port <i>port-number</i>; accounting-retry <i>number</i>; accounting-timeout <i>seconds</i>; dynamic-request-port <i>port</i> <i>port-number</i>; preauthentication-port <i>port-number</i>; preauthentication-secret <i>password</i>; <i>retry</i> <i>attempts</i>; <i>routing-instance</i> <i>routing-instance-name</i>; <i>secret</i> <i>password</i>; max-outstanding-requests <i>value</i>; <i>source-address</i> <i>source-address</i>; <i>timeout</i> <i>seconds</i>; }</pre>
Hierarchy Level	[edit access], [edit access profile <i>profile-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches. dynamic-request-port option added in Junos OS Release 14.2R1 for MX Series routers. preauthentication-port and preauthentication-secret options added in Junos OS Release 14.1X51 for MX Series routers.
Description	<p>Configure RADIUS for subscriber access management, L2TP, or PPP.</p> <p>To configure multiple RADIUS servers, include multiple radius-server statements. The servers are tried in order and in a round-robin fashion until a valid response is received from one of the servers or until all the configured retry limits are reached.</p>
Options	<p>server-address—Address of the RADIUS authentication server.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Authentication for L2TP</i>• <i>Configuring the PPP Authentication Protocol</i>• <i>Configuring RADIUS Server Authentication</i>• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>• <i>show network-access aaa statistics</i>• <i>clear network-access aaa statistics</i>

radius-server (System)

Syntax	<pre>radius-server { server-address { accounting-port port-number; port number; retry number; secret password; source-address source-address; timeout seconds; } }</pre>
Hierarchy Level	[edit system]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>Configure a RADIUS server for Point-to-Point Protocol (PPP).</p> <p>To configure multiple RADIUS servers, include multiple radius-server statements. The servers are tried in order and in a round-robin fashion until a valid response is received from one of the servers or until all the configured retry limits are reached.</p>
Options	<p>server-address—Address of the RADIUS authentication server.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> <i>Configuring RADIUS Server Authentication</i>

reauthentication

Syntax	<code>reauthentication <i>interval</i>;</code>
Hierarchy Level	[edit protocols <code>dot1x authenticator interface (802.1X)</code> (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, specify the number of seconds before an authentication session times out.
Options	<i>interval</i> —Sets the periodic reauthentication time interval in seconds. Range: 1 through 4,294,967,296 seconds Default: 3600 seconds
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring 802.1X Interface Settings (CLI Procedure) on page 120

retries

Syntax	<code>retries <i>number</i>;</code>
Hierarchy Level	[edit protocols <code>dot1x authenticator interface (802.1X)</code> (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, configure the number of times the switch attempts to authenticate the port after an initial failure. The port remains in a wait state during the quiet period after the authentication attempt.
Options	<i>number</i> —Number of retries. Default: 3 retries Range: 1 through 10
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring 802.1X Interface Settings (CLI Procedure) on page 120• Configuring 802.1X Authentication (J-Web Procedure) on page 121• Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients on page 101

retries (Captive Portal)

Syntax	<code>retries <i>number-of-tries</i>;</code>
Hierarchy Level	[edit services captive-portal interface (all <i>interface-names</i>)]]
Release Information	Statement introduced in Junos OS Release 10.1 for EX Series switches.
Description	Configure the number of times the user can attempt to submit authentication information.
Options	<i>number-of-tries</i> —Number of authentication attempts by user. Range: 1–65535 Default: 3
Required Privilege Level	routing—To view this statement in the configuration. routing—control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Configuring Captive Portal Authentication (CLI Procedure) on page 142

retry

Syntax	<code>retry <i>attempts</i>;</code>
Hierarchy Level	[edit access radius-server <i>server-address</i>]; [edit access profile <i>profile-name</i> radius-server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Specify the number of times that the router or switch is allowed to attempt to contact a RADIUS authentication or accounting server.
Options	<i>attempts</i> —Number of times that the router is allowed to attempt to contact a RADIUS server. Range: 1 through 30 Default: 3
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>• <i>Configuring Router or Switch Interaction with RADIUS Servers</i>• <i>Example: Configuring CHAP Authentication with RADIUS</i>• <i>Configuring RADIUS Authentication for L2TP</i>• timeout on page 278

retry (RADIUS)

Syntax	<code>retry number;</code>
Hierarchy Level	[edit system radius-server <i>server-address</i>], [edit system accounting destination radius server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Number of times the router or switch is allowed to try to contact a RADIUS authentication or accounting server.
Options	<i>number</i> —Number of retries allowed for contacting a RADIUS server. Range: 1 through 10 Default: 3
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Authentication</i>• <i>Configuring RADIUS System Accounting</i>• timeout on page 276

revert-interval

Syntax	<code>revert-interval <i>interval</i>;</code>
Hierarchy Level	[edit access profile <i>profile-name</i> radius options]; [edit access radius-options]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches.
Description	Configure the amount of time the router or switch waits after a server has become unreachable. The router or switch rechecks the connection to the server when the specified interval expires. If the server is then reachable, it is used in accordance with the order of the server list.
Options	<i>interval</i> —Amount of time to wait. Range: 0 through 604,800 seconds Default: 60 seconds
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Options for Subscriber Access</i>• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>

routing-instance

Syntax	<code>routing-instance <i>routing-instance-name</i>;</code>
Hierarchy Level	[edit access radius-server <i>server-address</i>], [edit access profile <i>profile-name</i> radius-server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the routing instance used to send RADIUS packets to the RADIUS server.
Options	<i>routing-instance-name</i> —Routing instance name.
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring the PPP Authentication Protocol</i>• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>

secret

Syntax	<code>secret password;</code>
Hierarchy Level	[edit access profile <i>profile-name</i> radius-server <i>server-address</i>], [edit access radius-disconnect <i>client-address</i>], [edit access radius-server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the password to use with the RADIUS server. The secret password used by the local router or switch must match that used by the server.
Options	password —Password to use; it can include spaces if the character string is enclosed in quotation marks.
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i> • <i>Configuring Router or Switch Interaction with RADIUS Servers</i> • <i>Example: Configuring CHAP Authentication with RADIUS</i> • <i>Configuring RADIUS Authentication for L2TP</i> • <i>Configuring the RADIUS Disconnect Server for L2TP</i>

secret

Syntax	<code>secret password;</code>
Hierarchy Level	[edit system accounting destination radius server <i>server-address</i>], [edit system accounting destination tacplus server <i>server-address</i>], [edit system radius-server <i>server-address</i>], [edit system tacplus-server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the password to use with the RADIUS or TACACS+ server. The secret password used by the local router or switch must match that used by the server.
Options	<i>password</i> —Password to use; can include spaces included in quotation marks.
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RADIUS Server Authentication• Configuring TACACS+ Authentication• Configuring TACACS+ System Accounting• Configuring RADIUS System Accounting

secure-authentication

Syntax	<code>secure-authentication (http https);</code>
Hierarchy Level	[edit services captive-portal]
Release Information	Statement introduced in Junos OS Release 10.1 for EX Series switches.
Description	Enable HTTP or HTTPS access on the captive portal interface.
Default	<code>http</code>
Options	<code>http</code> —Enables HTTP access on the captive portal interface. <code>https</code> —Enables HTTPS access on the captive portal interface. HTTPS is recommended.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Configuring Captive Portal Authentication (CLI Procedure) on page 142

server (RADIUS Accounting)

Syntax	<pre> server { server-address { accounting-port port-number; retry number secret password; source-address address; timeout seconds; } } </pre>
Hierarchy Level	[edit system accounting destination radius]
Release Information	<p>Statement introduced in Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the source-address-inet6 statement introduced in Junos OS Release 14.1X53-D10 for EX Series switches.</p>
Description	<p>Configure RADIUS logging.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> <i>Configuring RADIUS System Accounting</i>

server (TACACS+ Accounting)

Syntax server {
 server-address {
 port port-number;
 secret password;
 single-connection;
 timeout seconds;
 }
 }

Hierarchy Level [edit system accounting destination tacplus]

Release Information Statement introduced before Junos OS Release 7.4.
 Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure TACACS+ logging.

 The remaining statements are explained separately.

Required Privilege Level system—To view this statement in the configuration.
 system-control—To add this statement to the configuration.

Related Documentation • *Configuring TACACS+ System Accounting*

server-fail

Syntax	<code>server-fail (deny permit use-cache <i>vlan-id</i> <i>vlan-name</i>);</code>
Hierarchy Level	[edit protocols <code>dot1x authenticator interface (802.1X)</code> (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.3 for EX Series switches.
Description	<p>For EX Series switches configured for 802.1X authentication, specify the server fail fallback action the switch takes when all RADIUS authentication servers are unreachable.</p> <p>When you specify the action <i>vlan-name</i> or <i>vlan-id</i>, the VLAN must already be configured on the switch.</p>
Default	Authentication is denied.
Options	<p>deny—Force fail the supplicant authentication. No traffic will flow through the interface.</p> <p>permit—Force succeed the supplicant authentication. Traffic will flow through the interface as if it were successfully authenticated by the RADIUS server.</p> <p>use-cache—Force succeed the supplicant authentication only if it was previously authenticated successfully. This action ensures that already authenticated supplicants are not affected.</p> <p>vlan-id—Move supplicant on the interface to the VLAN specified by this numeric identifier. This action is allowed only if it is the first supplicant connecting to the interface. If an authenticated supplicant is already connected, then the supplicant is not moved to the VLAN and is not authenticated.</p> <p>vlan-name—Move supplicant on the interface to the VLAN specified by this name. This action is allowed only if it is the first supplicant connecting to an interface. If an authenticated supplicant is already connected, then the supplicant is not moved to the VLAN and is not authenticated.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show dot1x on page 313 • Example: Configuring 802.1X Authentication Options When the RADIUS Server Is Unavailable to an EX Series Switch on page 73 • Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35 • Configuring Server Fail Fallback (CLI Procedure) on page 137 • Understanding Server Fail Fallback and Authentication on EX Series Switches on page 24

server-reject-vlan

Syntax	<code>server-reject-vlan (vlan-id vlan-name) { eapol-block; block-interval block-interval; }</code>
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.3 for EX Series switches.
Description	<p>For EX Series switches configured for 802.1X authentication, specify that when the switch receives an Extensible Authentication Protocol Over LAN (EAPoL) Access-Reject message during the authentication process between the switch and the RADIUS authentication server, supplicants attempting access to the LAN are granted access and moved to a specific VLAN. Any VLAN name or VLAN ID sent by a RADIUS server as part of the EAPoL Access-Reject message is ignored.</p> <p>When you specify the VLAN ID or VLAN name, the VLAN must already be configured on the switch.</p> <p>The remaining statements are explained separately.</p>
Default	None
Options	<p><i>vlan-id</i>—Numeric identifier of the VLAN to which the supplicant is moved.</p> <p><i>vlan-name</i>—Name of the VLAN to which the supplicant is moved.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• show dot1x on page 313• Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35• Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients• Configuring Server Fail Fallback (CLI Procedure) on page 137• Understanding Server Fail Fallback and Authentication on EX Series Switches on page 24

server-timeout

Syntax	<code>server-timeout <i>seconds</i>;</code>
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all [<i>interface-name</i>])
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, configure the amount of time a port will wait for a reply when relaying a response from the supplicant to the authentication server before timing out and invoking the server-fail action.
Default	30 seconds
Options	<p><i>seconds</i> —Number of seconds.</p> <p>Range: 1 through 60 seconds</p> <p>Default: 30 seconds</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show dot1x on page 313 • clear dot1x on page 302 • Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35 • 802.1X for EX Series Switches Overview on page 7

server-timeout (Captive Portal)

Syntax	<code>server-timeout <i>seconds</i>;</code>
Hierarchy Level	[edit services captive-portal interface (all <i>interface-names</i>)]]
Release Information	Statement introduced in Junos OS Release 10.1 for EX Series switches.
Description	Configure the time in seconds an interface will wait for a reply when relaying a response from the client to the authentication server before timing out and invoking the server-fail action.
Options	<i>seconds</i> —Number of seconds. Range: 1–65535 Default: 20
Required Privilege Level	routing—To view this statement in the configuration. routing—control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Configuring Captive Portal Authentication (CLI Procedure) on page 142

session-expiry

Syntax	<code>session-expiry <i>seconds</i>;</code>
Hierarchy Level	[edit services captive-portal interface (all <i>interface-names</i>)]]
Release Information	Statement introduced in Junos OS Release 10.1 for EX Series switches.
Description	Configure the maximum duration in seconds of a session.
Options	<i>seconds</i> —Duration of session. Range: 1 through 65535 Default: 3600
Required Privilege Level	routing—To view this statement in the configuration. routing—control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Configuring Captive Portal Authentication (CLI Procedure) on page 142

single-connection

Syntax	single-connection;
Hierarchy Level	[edit system accounting destination tacplus-server <i>server-address</i>] [edit system tacplus-server <i>server-address</i>],
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Optimize attempts to connect to a TACACS+ server. The software maintains one open TCP connection to the server for multiple requests rather than opening a connection for each connection attempt.
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring TACACS+ Authentication</i> • <i>Configuring TACACS+ System Accounting</i>

source-address

Syntax	source-address <i>source-address</i> ;
Hierarchy Level	[edit access <i>radius-server</i> <i>server-address</i>]; [edit access profile <i>profile-name</i> <i>radius-server</i> <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure a source address for each configured RADIUS server. Each RADIUS request sent to a RADIUS server uses the specified source address.
Options	source-address —Valid IPv4 address configured on one of the router or switch interfaces. On M Series routers only, the source address can be an IPv6 address and the UDP source port is 514.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • <i>Configuring Router or Switch Interaction with RADIUS Servers</i> • <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i> • <i>Example: Configuring CHAP Authentication with RADIUS</i> • <i>Configuring RADIUS Authentication for L2TP</i>

source-address (NTP, RADIUS, System Logging, or TACACS+)

Syntax	<code>source-address <i>source-address</i> <routing-instance <i>routing-instance-name</i>>;</code>
Hierarchy Level	<code>[edit system accounting destination radius <i>server</i> <i>server-address</i>],</code> <code>[edit system accounting destination tacplus <i>server</i> <i>server-address</i>],</code> <code>[edit system ntp],</code> <code>[edit system <i>radius-server</i> <i>server-address</i>],</code> <code>[edit system syslog],</code> <code>[edit system tacplus-server <i>server-address</i>]</code>
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches. routing-instance option added in Junos OS Release 14.1
Description	Specify a source address for each configured IPv4 or IPv6 TACACS+ server, RADIUS server, NTP server, or the source address to record in system log messages that are directed to a remote machine.
Options	<i>source-address</i> —A valid IP address configured on one of the router or switch interfaces. For system logging, the address is recorded as the message source in messages sent to the remote machines specified in all host <i>hostname</i> statements at the [edit system syslog] hierarchy level, but not for messages directed to the other Routing Engine or to the TX Matrix router or TX Matrix Plus router in a routing matrix based on a TX Matrix router or TX Matrix Plus router. routing-instance <i>routing-instance-name</i> —(Optional) The routing instance name in which the source address is defined. Default: The primary address of the interface
Required Privilege Level	system —To view this statement in the configuration. system-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Authentication</i>• <i>Synchronizing and Coordinating Time Distribution Using NTP</i>• <i>Specifying an Alternative Source Address for System Log Messages</i>

static (Protocols 802.1X)

Syntax	<pre>static mac-address { interface interface-names; vlan-assignment (vlan-id vlan-name); }</pre>
Hierarchy Level	[edit protocols dot1x authenticator]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	<p>Configure MAC addresses to exclude from 802.1X authentication. The static MAC list provides an authentication bypass mechanism for supplicants connecting to a port, permitting devices such as printers that are not 802.1X-enabled to be connected to the network on 802.1X-enabled ports.</p> <p>Using this 802.1X authentication-bypass mechanism, the supplicant connected to the MAC address is assumed to be successfully authenticated and the port is opened for it. No further authentication is done for the supplicant.</p> <p>You can optionally configure the VLAN that the supplicant is moved to or the interfaces on which the MAC address can gain access from.</p>
Options	<p>mac-address —The MAC address of the device for which 802.1X authentication should be bypassed and the device permitted access to the port.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show dot1x static-mac-address on page 320 • Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69 • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • Configuring 802.1X Authentication (J-Web Procedure) on page 121 • Understanding Authentication on EX Series Switches on page 10

statistics (Access Profile)

Syntax	statistics (time volume-time);
Hierarchy Level	[edit access profile <i>profile-name</i> accounting]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches. volume-time option added in Junos OS Release 9.4.
Description	Configure the router or switch to collect time statistics, or both volume and time statistics, for the sessions being managed by AAA.
Options	time —Collect uptime statistics only. volume-time —Collect both volume and uptime statistics.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>

supplicant

Syntax	supplicant (multiple single single-secure);
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all [<i>interface-names</i>])], [edit services captive-portal interface (all [<i>interface-names</i>])]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement added to the [edit services captive-portal interface] hierarchy in Junos OS Release 10.1 for EX Series switches
Description	Configure the MAC-based method used to authenticate clients for 802.1X or captive portal authentication.
Default	single
Options	<p>single—Authenticates only the first client that connects to an authenticator port. All other clients connecting to the authenticator port after the first are permitted free access to the port without further authentication. If the first authenticated client logs out, all other supplicants are locked out until a client authenticates again.</p> <p>single-secure—Authenticates only one client to connect to an authenticator port. The host must be directly connected to the switch.</p> <p>multiple—Authenticates multiple clients individually on one authenticator port. You can configure the number of clients per port. If you also configure a maximum number of devices that can be connected to a port through port security settings, the lower of the configured values is used to determine the maximum number of clients allowed per port.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44 • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Understanding Authentication on EX Series Switches on page 10 • Configuring Captive Portal Authentication (CLI Procedure) on page 142

supplicant-timeout

Syntax	supplicant-timeout <i>seconds</i> ;
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all [<i>interface-name</i>])
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, configure how long the port waits for a response when relaying a request from the authentication server to the supplicant before resending the request.
Default	30 seconds
Options	<i>seconds</i> —Number of seconds. Range: 1 through 60 seconds Default: 30 seconds
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• supplicant on page 273• Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44• Understanding Authentication on EX Series Switches on page 10

tacplus

Syntax	<pre> tacplus { server { server-address { port port-number; secret password; single-connection; timeout seconds; } } } </pre>
Hierarchy Level	[edit system accounting destination]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the Terminal Access Controller Access Control System Plus (TACACS+).
Options	<p>server-address—Address of the TACACS+ authentication server.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> <i>Configuring TACACS+ System Accounting</i>

timeout (System)

Syntax	timeout <i>seconds</i> ;
Hierarchy Level	[edit system radius-server <i>server-address</i>], [edit system tacplus-server <i>server-address</i>], [edit system accounting destination radius server <i>server-address</i>], [edit system accounting destination tacplus server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the amount of time that the local router or switch waits to receive a response from a RADIUS or TACACS+ server.
Options	<i>seconds</i> —Amount of time to wait. Range: 1 through 90 seconds Default: 3 seconds
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring RADIUS Server Authentication</i>• <i>Configuring TACACS+ Authentication</i>• retry on page 259

timeout (Access Control Service)

Syntax	timeout <i>seconds</i> ;
Hierarchy Level	[edit services unified-access-control]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure the amount of time that the switch waits to receive a response from the Junos Pulse Access Control Service.
Options	<p><i>seconds</i>—Amount of time to wait.</p> <p>Range: 2 through 1000 seconds</p> <p>Default: 300 seconds</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148• Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

timeout (RADIUS)

Syntax	<code>timeout seconds;</code>
Hierarchy Level	[edit access radius-server <i>server-address</i>], [edit access profile <i>profile-name</i> radius-server <i>server-address</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure the amount of time that the local router or switch waits to receive a response from a RADIUS server.
Options	seconds —Amount of time to wait. Range: 1 through 90 seconds Default: 3 seconds
Required Privilege Level	system —To view this statement in the configuration. system-control —To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring Router or Switch Interaction with RADIUS Servers</i>• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>• <i>Example: Configuring CHAP Authentication with RADIUS</i>• <i>Configuring RADIUS Authentication for L2TP</i>

timeout-action (Access Control Service)

Syntax	timeout-action (close no-change);
Hierarchy Level	[edit services unified-access-control]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Specify the action to be taken when the timeout is reached for the switch's connection with the Junos Pulse Access Control Service.
Options	<p>close—Remove existing sessions and block further traffic.</p> <p>no-change—Preserve existing connections, but block new sessions.</p> <p>Default: close</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• timeout (Access Control Service) on page 277• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148• Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

traceoptions (802.1X)

Syntax	<pre>traceoptions { file <i>filename</i> <files <i>number</i>> <size <i>size</i>> <world-readable no-world-readable> <match <i>regex</i>>; flag <i>flag</i>; }</pre>
Hierarchy Level	[edit protocols dot1x]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Support for the dot1x-event and dot1x-ipc options introduced in Junos OS Release 13.2X50 for EX Series switches.
Description	Define tracing operations for the 802.1X protocol.
Default	Tracing operations are disabled.
Options	<p>file <i>filename</i>—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory /var/log.</p> <p>files <i>number</i>—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size by using the size option.</p> <p>Range: 2 through 1000</p> <p>Default: 3 files</p> <p>flag <i>flag</i>—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. You can include the following flags:</p> <ul style="list-style-type: none">• all—All tracing operations.• config-internal—Trace internal configuration operations.• dot1x-event—(Switches with ELS only) Trace 802.1x events.• dot1x-debug—(Switches without ELS) Trace 802.1x events.• dot1x-ipc—(Switches with ELS only) Trace IPC interactions.• eapol—Trace EAPOL packets transmitted and received.• esw-if—(Switches without ELS) Trace ESW interactions.• general—Trace general operations.• normal—Trace normal operations.• parse—Trace reading of the configuration.• regex-parse—Trace regular-expression parsing operations.• state—Trace protocol state changes.

- **task**—Trace protocol task operations.
- **timer**—Trace protocol timer operations.
- **vlan**—Trace VLAN transactions.

match *regex*—(Optional) Refine the output to include lines that contain the regular expression.

no-world-readable—(Optional) Restrict file access to the user who created the file.

size *size*—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named **trace-file** reaches its maximum size, it is renamed **trace-file.0**, then **trace-file.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files with the **files** option, you also must specify a maximum file size.

Syntax: *xk* to specify KB, *xm* to specify MB, or *xg* to specify GB

Range: 10 KB through 1 GB

Default: 128 KB

world-readable—(Optional) Enable unrestricted file access.

Required Privilege Level	routing—To view this statement in the configuration.
	routing-control—To add this statement to the configuration.

Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • 802.1X for EX Series Switches Overview on page 7
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traceoptions (LLDP)

Syntax	<pre>traceoptions { file <i>filename</i> <files <i>number</i>> <size <i>size</i>> <world-readable no-world-readable> <no-stamp> <replace>; flag <i>flag</i> <disable>; }</pre>
Hierarchy Level	[edit protocols lldp]
Release Information	<p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.</p> <p>Statement introduced in Junos OS Release 11.1 for the QFX Series.</p>
Description	Define tracing operations for the Link Layer Discovery Protocol (LLDP). You can trace messages under LLDP for LLDP and PTOPO MIBs.



NOTE: The traceoptions statement is not supported on the QFX3000 QFabric system.

Default	Tracing operations are disabled.
Options	<p>file <i>filename</i>—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory <code>/var/log</code>.</p> <p>files <i>number</i>—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum xk to specify KB, xm to specify MB, or xg to specify GB number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size with the size option.</p> <p>Range: 2 through 1000</p> <p>Default: 3 files</p> <p>flag <i>flag</i>—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. You can include the following flags:</p> <ul style="list-style-type: none"> • all—All tracing operations. • configuration—Trace configuration operations. • interface—Trace interface update events. • netbios—Trace NetBIOS events. • packet—Trace packet events. • rtsock—Trace routing socket operations. • snmp—Trace SNMP configuration operations.

- **vlan**—Trace VLAN update events.

no-stamp—(Optional) Do not timestamp the trace file.

Default: If you omit this option, timestamp information is placed at the beginning of each line of the tracing output.

no-world-readable—(Optional) Restrict file access to the user who created the file.

replace—(Optional) Replace an existing trace file if there is one rather than appending output to it.

size size—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named **trace-file** reaches its maximum size, it is renamed **trace-file.0**, then **trace-file.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size with the **files** option.

Syntax: **xk** to specify KB, **xm** to specify MB, or **xg** to specify GB

Range: 10 KB through 1 GB

Default: 128 KB

Default: If you do not include this option, tracing output is appended to an existing trace file.

world-readable—(Optional) Enable unrestricted file access.



NOTE: The **traceoptions** statement is not supported on the QFX3000 QFabric system.

Required Privilege Level

routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- [Configuring LLDP-MED \(CLI Procedure\) on page 133](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)
- [Configuring LLDP](#)
- [Understanding LLDP](#)

transmit-delay

Syntax	<code>transmit-delay <i>seconds</i>;</code>
Hierarchy Level	[edit protocols lldp]
Release Information	Statement introduced in Junos OS Release 11.1 for EX Series switches.
Description	<p>Specify the number of seconds the device delays before sending advertisements to neighbors after a change is made in a TLV (type, length, or value) element in the Link Layer Discovery Protocol (LLDP) or in the state of the local system, such as a change in hostname or management address. You can set this value to reduce the delay in notifying neighbors of a change in the local system.</p> <p>The advertisement-interval value must be greater than or equal to four times the transmit-delay value, or an error will be returned when you attempt to commit the configuration.</p>
Default	Enabled
Options	<p><i>seconds</i>—Delay after a change to the local TLVs or system state before LLDP advertisements are sent.</p> <p>Range: 1 through 8192 seconds</p> <p>Default:</p> <ul style="list-style-type: none">• 2 seconds if the advertisement-interval value is set to 8 seconds or more• 1 second if the advertisement-interval value is set to less than 8 seconds
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326• Configuring LLDP (CLI Procedure) on page 128• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17

transmit-period

Syntax	transmit-period <i>seconds</i> ;
Hierarchy Level	[edit protocols dot1x authenticator interface (802.1X) (all [<i>interface-name</i>])
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	For 802.1X authentication, how long the port waits before retransmitting the initial EAPOL PDUs to the supplicant.
Default	30 seconds
Options	<i>seconds</i> —Number of seconds the port waits before retransmitting the initial EAPOL PDUs to the supplicant. Range: 1 through 65,535 seconds Default: 30 seconds
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • 802.1X for EX Series Switches Overview on page 7

uac-policy

Syntax	uac-policy;
Hierarchy Level	[edit ethernet-switching-options]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure Junos Pulse Access Control Service as the access policy to authenticate and authorize users connected to the switch for admission to the network and for access to protected network resources.
Default	The Access Control Service access policy is disabled.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148 • Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

uac-service

Syntax	uac-service { timeout { timeout-action {
Hierarchy Level	[edit system processes]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	Configure Junos Pulse Access Control Service as one of the system processes.
Default	Junos Pulse Access Control Service process is disabled.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148• Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150• Understanding Centralized Network Access Control and EX Series Switches on page 29

unified-access-control

Syntax	<pre> unified-access-control { infranet-controller <i>hostname</i> { address <i>ip-address</i>; interface <i>interface-name</i>; password <i>password</i>; port <i>port-number</i>; } </pre>
Hierarchy Level	[edit services]
Release Information	Statement introduced in Junos OS Release 12.2 for EX Series switches.
Description	<p>Configure Junos Pulse Access Control Service to authenticate and authorize users connected to the switch for admission to the network and for access to protected network resources.</p> <p>The remaining statements are explained separately.</p>
Default	Junos Pulse Access Control Service is disabled.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148 • Configuring the EX Series Switch for Captive Portal Authentication with Junos Pulse Access Control Service (CLI Procedure) on page 150

update-interval

Syntax	update-interval <i>minutes</i> ;
Hierarchy Level	[edit access profile <i>profile-name</i> accounting]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches.
Description	Enable interim accounting updates and configure the amount of time that the router or switch waits before sending a new accounting update.
Default	No updates
Options	minutes —Amount of time between updates, in minutes. All values are rounded up to the next higher multiple of 10. For example, the values 811 through 819 are all accepted by the CLI, but are all rounded up to 820. Range: 10 through 1440 minutes
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• <i>Configuring Authentication and Accounting Parameters for Subscriber Access</i>• <i>Configuring Immediate Interim Accounting Updates to RADIUS in Response to ANCP Notifications</i>

vlan-assignment

Syntax	<code>vlan-assignment (vlan-id vlan-name);</code>
Hierarchy Level	<p>[edit protocols dot1x authenticator authentication-profile-name static (Protocols 802.1X) mac-address];</p> <p>[edit ethernet-switching-options authentication-whitelist];</p> <p>[edit switch-options authentication-whitelist]</p>
Release Information	<p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Statement added to the [edit ethernet-switching-options authentication-whitelist] hierarchy in Junos OS Release 10.1 for EX Series switches.</p> <p>Statement added to the [edit switch-options authentication-whitelist] hierarchy in Junos OS Release 13.2X50-D10 for EX Series switches.</p>
Description	Configure the VLAN that is associated with the list of MAC addresses that are excluded from RADIUS authentication.
Options	<code>vlan-id vlan-name</code> —The name of the VLAN or the VLAN tag identifier to associate with the device. The VLAN already exists on the switch.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show dot1x static-mac-address on page 320 • Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69 • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Understanding Authentication on EX Series Switches on page 10 • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Configuring Captive Portal Authentication (CLI Procedure) on page 142

vlan-nas-port-stacked-format

Syntax	<code>vlan-nas-port-stacked-format;</code>
Hierarchy Level	[edit access profile <i>profile-name</i> radius options]
Release Information	Statement introduced in Junos OS Release 9.1. Statement introduced in Junos OS Release 9.1 for EX Series switches.
Description	Configure RADIUS attribute 5 (NAS-Port) to include the S-VLAN ID, in addition to the VLAN ID, for subscribers on Ethernet interfaces.
Required Privilege Level	admin—To view this statement in the configuration. admin-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring RADIUS Server Options for Subscriber Access• Configuring Authentication and Accounting Parameters for Subscriber Access

voip

Syntax	<pre>voip { interface (all [<i>interface-name</i> access-ports]) { vlan <i>vlan-name</i> ; forwarding-class <assured-forwarding best-effort expedited-forwarding network-control>; } }</pre>
Hierarchy Level	[edit ethernet-switching-options]; [edit switch-options]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches.
Description	Configure VoIP interfaces. The remaining statements are explained separately.
Required Privilege Level	system—To view this statement in the configuration. system-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50• Example: Configuring VoIP on an EX Series Switch Without Including 802.1X Authentication on page 62• Example: Configuring VoIP on an EX Series Switch Without Including LLDP-MED Support on page 58

what

Syntax	<code>what <i>number</i>;</code>
Hierarchy Level	[edit protocols lldp-med (Ethernet Switching) interface (LLDP-MED) (all <i>interface-name</i>) location (LLDP-MED) civic-based]
Release Information	Statement introduced in Junos OS Release 9.0 for EX Series switches. Modified in Junos OS Release 9.2 for EX Series switches to display new default.
Description	<p>For Link Layer Discovery Protocol—Media Endpoint Device (LLDP-MED), configure the location to which the DHCP entry refers. This information is advertised, along with other location information, from the switch to the MED. It is used during emergency calls to identify the location of the MED.</p> <p>Options 0 and 1 should not be used unless it is known that the DHCP client is in close physical proximity to the server or network element.</p>
Default	1
Options	<p><i>number</i>—Location:</p> <ul style="list-style-type: none"> • 0—Location of the DHCP server. • 1—Location of a network element believed to be closest to the client. • 2—Location of the client.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • show lldp on page 326 • Example: Setting Up VoIP with 802.1X and LLDP-MED on an EX Series Switch on page 50 • Configuring LLDP-MED (CLI Procedure) on page 133

PART 3

Administration

- [Routine Monitoring on page 295](#)
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CHAPTER 6

Routine Monitoring

- [Monitoring 802.1X Authentication on page 295](#)
- [Verifying 802.1X Authentication on page 296](#)

Monitoring 802.1X Authentication

Purpose



NOTE: This topic applies only to the J-Web Application package.

Use the monitoring feature to display details of authenticated users and users who have failed authentication.

Action

To display authentication details in the J-Web interface, select **Monitoring > Security > 802.1X**.

To display authentication details in the CLI, enter the following commands:

- `show dot1x interface detail | display xml`
- `show dot1x interface detail <interface> | display xml`
- `show dot1x auth-failed-users`

Meaning

The details displayed include:

- A list of authenticated users.
- The total number of users connected.
- A list of users who have failed authentication.

You can also specify an interface for which the details must be displayed.

Related Documentation

- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)

Verifying 802.1X Authentication

Purpose Verify that supplicants are being authenticated on an interface on an EX Series switch with the interface configured for 802.1X authentication, and display the method of authentication being used.

Action Display detailed information about an interface configured for 802.1X (here, the interface is ge-0/0/16):

```
user@switch> show dot1x interface ge-0/0/16.0 detail
ge-0/0/16.0
  Role: Authenticator
  Administrative state: Auto
  Supplicant mode: Single
  Number of retries: 3
  Quiet period: 60 seconds
  Transmit period: 30 seconds
  Mac Radius: Enabled
  Mac Radius Strict: Disabled
  Reauthentication: Enabled Reauthentication interval: 40 seconds
  Supplicant timeout: 30 seconds
  Server timeout: 30 seconds
  Maximum EAPOL requests: 1
  Guest VLAN member: <not configured>
  Number of connected supplicants: 1
    Supplicant: user5, 00:30:48:8C:66:BD
      Operational state: Authenticated
      Authentication method: Radius
      Authenticated VLAN: v200
      Reauthentication due in 17 seconds
```

Meaning The sample output from the **show dot1x interface detail** command shows that the **Number of connected supplicants** is 1. The supplicant that was authenticated and is now connected to the LAN is known as **user5** on the RADIUS server and has the MAC address **00:30:48:8C:66:BD**. The supplicant was authenticated by means of the 802.1X authentication method called RADIUS authentication, as indicated by **Radius** in the output. When RADIUS authentication is used, the supplicant is configured on the RADIUS server, the RADIUS server communicates this to the switch, and the switch opens LAN access on the interface to which the supplicant is connected. The sample output also shows that the supplicant is connected to VLAN **v200**.

Other 802.1X authentication methods supported on EX Series switches in addition to RADIUS authentication are:

- Guest VLAN—A nonresponsive host is granted Guest-VLAN access.
- MAC Radius—A nonresponsive host is authenticated based on its MAC address. The MAC address is configured as permitted on the RADIUS server, the RADIUS server notifies the switch that the MAC address is a permitted address, and the switch grants LAN access to the nonresponsive host on the interface to which it is connected.
- Server-fail deny—If the RADIUS servers time out, all supplicants are denied access to the LAN, preventing traffic from the supplicant from traversing through the interface. This is the default.

- Server-fail permit—When the RADIUS server is unavailable, a supplicant is still permitted access to the LAN as if the supplicant were successfully authenticated by the RADIUS server.
- Server-fail use-cache—If the RADIUS servers time out during reauthentication, previously authenticated supplicants are granted LAN access, but new supplicants are denied LAN access.
- Server-fail VLAN—A supplicant is configured to be moved to a specified VLAN if the RADIUS server is unavailable to reauthenticate the supplicant. (The VLAN must already exist on the switch.)

**Related
Documentation**

- [Configuring 802.1X Interface Settings \(CLI Procedure\) on page 120](#)
- [Configuring 802.1X Authentication \(J-Web Procedure\) on page 121](#)
- [Configuring MAC RADIUS Authentication \(CLI Procedure\) on page 139](#)
- [Configuring Server Fail Fallback \(CLI Procedure\) on page 137](#)

CHAPTER 7

Operational Commands

- clear captive-portal
- clear dot1x
- clear lldp neighbors
- clear lldp statistics
- show captive-portal authentication-failed-users
- show captive-portal firewall
- show captive-portal interface
- show dot1x
- show dot1x authentication-failed-users
- show dot1x firewall
- show dot1x static-mac-address
- show ethernet-switching interfaces
- show lldp
- show lldp local-information
- show lldp neighbors
- show lldp remote-global-statistics
- show lldp statistics
- show network-access aaa statistics accounting
- show network-access aaa statistics authentication
- show network-access aaa statistics dynamic-requests
- show services unified-access-control authentication-table
- show services unified-access-control policies
- show services unified-access-control status

clear captive-portal

Syntax	<code>clear captive-portal (firewall [<i>interface-names</i>] interface (802.1X) (all [<i>interface-names</i>]) mac-address [<i>mac-addresses</i>])</code>
Release Information	Command introduced in Junos OS Release 10.1 for EX Series switches. Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.
Description	Reset the authentication state of a captive portal interface or captive portal firewall statistics on one or more interfaces.
Options	<p>firewall [<i>interface-names</i>] —Resets captive portal statistics on all interfaces or on the specified interface.</p> <p>interface (all <i>interface-names</i>) —Resets the authentication state of users connected to all interfaces or the specified interfaces.</p> <p>mac-address <i>mac-addresses</i> —Resets the authentication state for the specified MAC addresses.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • show captive-portal authentication-failed-users on page 306 • show captive-portal interface on page 310 • show captive-portal firewall on page 308 • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Configuring Captive Portal Authentication (CLI Procedure) on page 142
List of Sample Output	clear captive-portal interface on page 301 clear captive-portal interface on page 301 clear captive-portal mac-address on page 301 clear captive-portal firewall on page 301
Output Fields	Table 22 on page 300 lists the output fields for the clear captive-portal interface command. (The clear captive-portal firewall and clear captive-portal mac-address commands have no output). Output fields are listed in the approximate order in which they appear.

Table 22: clear captive-portal interface Output Fields

Field Name	Field Description
Interface	Interface on which captive portal has been configured.

Table 22: clear captive-portal interface Output Fields (*continued*)

Field Name	Field Description
State	<p>The state of the port:</p> <ul style="list-style-type: none"> • Authenticated—The client has been authenticated through the RADIUS server or has been permitted access through server fail fallback. • Authenticating—The client is authenticating through the RADIUS server. • Connecting—Switch is attempting to contact the RADIUS server. • Initialize—The interface link is down. • Held—An action has been triggered through server fail fallback during a RADIUS server timeout. A supplicant is denied access, permitted access through a specified VLAN, or maintains the authenticated state granted to it before the RADIUS server timeout occurred.
MAC address	The MAC address of the connected client on the interface.
User	Users connected to the captive portal interface.

Sample Output

clear captive-portal interface

```
user@switch> clear captive-portal interface
ge-0/0/3.0
```

clear captive-portal interface

```
user@switch> clear captive-portal interface
Captive Portal Information:
Interface      State      MAC address      User
ge-0/0/3.0     Authenticated  00:03:47:e1:ba:b9  ac1allow
ge-0/0/5.0     Connecting
ge-0/0/7.0     Connecting
ge-0/0/9.0     Connecting
```

clear captive-portal mac-address

```
user@switch> clear captive-portal mac-address 00:03:47:e1:ba:b9
This command has no output.
```

clear captive-portal firewall

```
user@switch> clear captive-portal firewall
This command has no output.
```

clear dot1x

Syntax `clear dot1x (firewall <counter-name> | interface <[interface-name]> | mac-address [mac-addresses] | statistics <interface interface-name>)`

Release Information Command introduced in Junos OS Release 9.0 for EX Series switches.
firewall option added in Junos OS Release 9.5 for EX Series switches.
 Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.

Description Reset the authentication state of an interface or delete 802.1X statistics from the switch. When you reset an interface using the **interface** or **mac-address** options, reauthentication on the interface is also triggered. The switch sends out a multicast message on the interface to restart the authentication of all connected supplicants. If a MAC address is reset, then the switch sends out a unicast message to that specific MAC address to restart authentication.

If a supplicant is sending traffic when the **clear dot1x interface** command is issued, the authenticator immediately initiates reauthentication. This process happens quickly, and it might seem that reauthentication did not occur. To verify that reauthentication has happened, issue the **show dot1x interface detail** command. The values for **Reauthentication due** and **Reauthentication interval** will be about the same.



CAUTION: When you clear the learned MAC addresses from an interface using the **clear dot1x interface** command, all MAC addresses are cleared, including those in static MAC bypass list.

If you have enabled Media Access Control Security (MACsec) using static secure association key (SAK) security mode on an EX Series switch, the SAKs are rotated when the **clear dot1x** command is entered. The **clear dot1x** command has no impact on MACsec when MACsec is enabled using static connectivity association keys (CAK) or any other security mode.

Options **firewall <counter-name>**—Clear 802.1X firewall counter statistics. If the *counter-name* option is specified, clear 802.1X firewall statistics for that counter.

interface <[interface-name]>—Reset the authentication state of all the supplicants (also, clears all the authentication bypassed clients) connected to the specified interface (when the interface is an authenticator) or reset the authentication state for the interface itself (when the interface is a supplicant).

mac-address [mac-addresses]—Reset the authentication state of the specified MAC addresses.

statistics <interface interface-name>—Clear 802.1X statistics on all 802.1X-enabled interfaces. If the **interface** option is specified, clear 802.1X firewall statistics for that interface or interfaces.

Required Privilege Level view

Related Documentation

- [show dot1x on page 313](#)
- [Example: Setting Up 802.1X for Single-Suppliant or Multiple-Suppliant Configurations on an EX Series Switch on page 44](#)
- [Filtering 802.1X Suplicants By Using RADIUS Server Attributes on page 125](#)

List of Sample Output

- [clear dot1x firewall on page 303](#)
- [clear dot1x interface \(Specific Interfaces\) on page 303](#)
- [clear dot1x mac-address \(Specific MAC Address\) on page 303](#)
- [clear dot1x statistics interface \(Specific Interface\) on page 303](#)

Sample Output

clear dot1x firewall

```
user@switch> clear dot1x firewall c1
```

clear dot1x interface (Specific Interfaces)

```
user@switch> clear dot1x interface ge-1/0/0 ge-2/0/0 ge-2/0/0 ge5/0/0
```

clear dot1x mac-address (Specific MAC Address)

```
user@switch> clear dot1x mac-address 00:04:ae:cd:23:5f
```

clear dot1x statistics interface (Specific Interface)

```
user@switch> clear dot1x statistics interface ge-1/0/1
```

clear lldp neighbors

Syntax	<code>clear lldp neighbors</code> <code><interface <i>interface</i>></code>
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches.
Description	Clear the learned remote neighbor information on all or selected interfaces.
Options	none —Clear the remote neighbor information on all interfaces. interface <i>interface</i> —(Optional) Clear the remote neighbor information from one or more selected interfaces.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none">• show lldp on page 326• Configuring LLDP (CLI Procedure) on page 128• Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17
List of Sample Output	clear lldp neighbors on page 304 clear lldp neighbors interface ge-0/1/1.0 on page 304

Sample Output

clear lldp neighbors

```
user@switch> clear lldp neighbors
```

clear lldp neighbors interface ge-0/1/1.0

```
user@switch> clear lldp neighbors interface ge-0/1/1.0
```

clear lldp statistics

Syntax	clear lldp statistics <interface <i>interface</i> >
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches.
Description	Clear LLDP statistics on one or more interfaces.
Options	<p>none—Clears LLDP statistics on all interfaces.</p> <p>interface <i>interface-names</i>—(Optional) Clear LLDP statistics on one or more interfaces.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • Configuring LLDP (CLI Procedure) on page 128 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17
List of Sample Output	clear lldp statistics on page 305 clear lldp statistics interface ge-0/1/1.0 on page 305

Sample Output

clear lldp statistics

```
user@switch> clear lldp statistics
```

clear lldp statistics interface ge-0/1/1.0

```
user@switch> clear lldp statistics interface ge-0/1/1.0
```

show captive-portal authentication-failed-users

Syntax	show captive-portal authentication-failed-users
Release Information	Command introduced in Junos OS Release 10.1 for EX Series switches. Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.
Description	Display the users that have failed captive portal authentication.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • show captive-portal interface on page 310 • show captive-portal firewall on page 308 • clear captive-portal on page 300 • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Configuring Captive Portal Authentication (CLI Procedure) on page 142
List of Sample Output	show captive-portal authentication-failed-users on page 306
Output Fields	Table 23 on page 306 lists the output fields for the show captive-portal authentication-failed-users command. Output fields are listed in the approximate order in which they appear.

Table 23: show captive-portal authentication-failed-users Output Fields

Field Name	Field Description	Level of Output
Interface	The MAC address configured to bypass captive portal authentication.	all
MAC address	The MAC address configured statically on the interface.	all
User	Name of the user that has failed captive portal authentication.	all
Failure Count	The number of times that 802.1X authentication has failed on the interface.	all

Sample Output

**show captive-portal
authentication-failed-users**

```
user@host> show captive-portal authentication-failed-users
```

Interface	MAC address	User	Failure Count
ge-0/0/17.0	00:37:00:00:00:00	003700000000	28
ge-0/0/20.0	00:04:10:00:00:00	000410000000	32
ge-0/0/18.0	00:00:03:00:0a:00	000003000a00	4
ge-0/0/19.0	00:00:03:00:0b:00	000003000b00	18

show captive-portal firewall

Syntax	<code>show captive-portal firewall</code> <code><brief detail></code> <code><interface-name></code> <code><interface-name detail></code>
Release Information	Command introduced in Junos OS Release 10.1 for EX Series switches. Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.
Description	Display information about the firewall filters for each user that is authenticated on each captive portal interface.
Options	none —Display all the firewall filters on all captive portal interfaces. brief detail —(Optional) Display the specified level of output. interface-name —(Optional) Display all the terms of the firewall filters for the specified interface. interface-name detail —(Optional) Display all of the terms of the firewall filters for the specified interface.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none">• show captive-portal authentication-failed-users on page 306• show captive-portal interface on page 310• clear captive-portal on page 300• Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96• Configuring Captive Portal Authentication (CLI Procedure) on page 142
List of Sample Output	show captive-portal firewall brief on page 308 show captive-portal firewall (Specific Interface) on page 309 show captive-portal firewall on page 309
Output Fields	Output fields for the show captive-portal firewall command include any action modifier specified in firewall filters except policers. Policers are not supported in the terms of the internally generated dynamic firewall filters that are created when multiple supplicants authenticate on 802.1X-enabled interfaces.

Sample Output

show captive-portal firewall brief

```
user@switch> show captive-portal firewall brief
Captive Portal Information:
Interface      State      MAC address      User
```



```

ge-0/0/1.0    Connecting
ge-0/0/10.0   Connecting    00:30:48:8c:66:bd    No User

```

show captive-portal firewall (Specific Interface)

```

user@switch> show captive-portal firewall ge-0/0/10.0
Filter name: dot1x_ge-0/0/10
Counters:
Name                               Bytes      Packets
dot1x_ge-0/0/10_CP_arp             7616       119
dot1x_ge-0/0/10_CP_dhcp              0           0
dot1x_ge-0/0/10_CP_http              0           0
dot1x_ge-0/0/10_CP_https             0           0
dot1x_ge-0/0/10_CP_t_dns             0           0
dot1x_ge-0/0/10_CP_u_dns             0           0

```

show captive-portal firewall

```

user@switch> show captive-portal firewall
Filter name: dot1x_ge-0/0/0
Counters:
Name                               Bytes      Packets
dot1x_ge-0/0/0_CP_arp              0           0
dot1x_ge-0/0/0_CP_dhcp              0           0
dot1x_ge-0/0/0_CP_http              0           0
dot1x_ge-0/0/0_CP_https             0           0
dot1x_ge-0/0/0_CP_t_dns             0           0
dot1x_ge-0/0/0_CP_u_dns             0           0
Filter name: dot1x_ge-0/0/1
Counters:
Name                               Bytes      Packets
dot1x_ge-0/0/1_CP_arp              0           0
dot1x_ge-0/0/1_CP_dhcp              0           0
dot1x_ge-0/0/1_CP_http              0           0
dot1x_ge-0/0/1_CP_https             0           0
dot1x_ge-0/0/1_CP_t_dns             0           0
dot1x_ge-0/0/1_CP_u_dns             0           0
Filter name: dot1x_ge-0/0/10
Counters:
Name                               Bytes      Packets
dot1x_ge-0/0/10_CP_arp             7616       119
dot1x_ge-0/0/10_CP_dhcp              0           0
dot1x_ge-0/0/10_CP_http              0           0
dot1x_ge-0/0/10_CP_https             0           0
dot1x_ge-0/0/10_CP_t_dns             0           0
dot1x_ge-0/0/10_CP_u_dns             0           0
Filter name: dot1x_ge-0/0/11

```

show captive-portal interface

Syntax	show captive-portal interface <interface-name> detail	
Release Information	Command introduced in Junos OS Release 10.1 for EX Series switches. Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.	
Description	Display the current operational state of all captive portal interfaces with the list of connected users and the configured values of captive portal attributes on the interfaces.	
Options	<p>none—Display all captive portal interfaces.</p> <p>interface-name—(Optional) Display the state for the specified captive portal interface and lists the MAC address and user names of any clients authenticated on the interface.</p> <p>interface-name detail—(Optional) Display the configured values of captive portal attributes on the specified captive portal interface.</p>	
Required Privilege Level	view	
Related Documentation	<ul style="list-style-type: none"> • show captive-portal authentication-failed-users on page 306 • show captive-portal firewall on page 308 • captive-portal on page 190 • clear captive-portal on page 300 • Example: Setting Up Captive Portal Authentication on an EX Series Switch on page 96 • Configuring Captive Portal Authentication (CLI Procedure) on page 142 	
List of Sample Output	show captive-portal interface (Only Captive Portal Enabled) on page 312 show captive-portal interface (802.1X Authentication and Captive Portal Enabled) on page 312 show captive-portal interface detail (Only Captive Portal Enabled) on page 312 show captive-portal interface detail (802.1X Authentication and Captive Portal Enabled) on page 312	
Output Fields	Table 24 on page 310 lists the output fields for the show captive-portal interface command. Output fields are listed in the approximate order in which they appear.	

Table 24: show captive-portal interface Output Fields

Field Name	Field Description	Level of Output
Interface	Interface on which captive portal has been configured.	All levels

Table 24: show captive-portal interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
State	<p>The state of the interface:</p> <ul style="list-style-type: none"> • Authenticated—The client has been authenticated through the RADIUS server or has been permitted access through server fail fallback. • Authenticating—The client is authenticating through the RADIUS server. • Connecting—Switch is attempting to contact the RADIUS server. • Initialize—The interface link is down. • Held—An action has been triggered through server fail fallback during a RADIUS server timeout. A supplicant is denied access, permitted access through a specified VLAN, or maintains the authenticated state granted to it before the RADIUS server timeout occurred. 	All levels
MAC address	The MAC address of the connected client on the interface..	brief
User	Users connected to the captive portal interface.	brief
Fallen back	<p>Indicates when 802.1X authentication and captive portal are both enabled on an interface:</p> <ul style="list-style-type: none"> • If 802.1X authentication and captive portal are both enabled, CP fallen back status is Yes. • If 802.1X authentication and captive portal are not both enabled, CP fallen back status is No. 	
Supplicant mode	Mode used to authenticate clients—multiple, single, or single-supplicant.	detail
Number of retries	Number of times the user can attempt to submit authentication information.	detail
Quiet period	Time, in seconds, after a user exceeds the maximum number of retries before they can attempt to authenticate.	detail
Configured CP session timeout	Time, in seconds, that a client can be idle before the session expires.	detail
Server timeout	Time, in seconds, that an interface will wait for a reply when relaying a response from the client to the authentication server before timing out and invoking the server-fail action.	detail
Number of connected supplicants	<p>Number of users connecting through the captive portal interface. Information for each user includes:</p> <ul style="list-style-type: none"> • Supplicant—User name and MAC address. • Operational state—See State (above). • Dynamic CP session timeout—Timeout value dynamically downloaded from the RADIUS server for this user, if any. • CP Session expiration due in—Time remaining in session. 	detail

Sample Output

show captive-portal interface (Only Captive Portal Enabled)

```
user@switch> show captive-portal interface
Captive Portal Information:
Interface      State           MAC address      User             Fallen back
ge-0/0/1.0     Connecting
ge-0/0/10.0    Connecting      00:30:48:8c:66:bd No User
ge-6/0/5.0     Authenticated   00:30:48:8d:7a:9b abcdeX           No
```

show captive-portal interface (802.1X Authentication and Captive Portal Enabled)

```
user@switch> show captive-portal interface
Captive Portal Information:
Interface      State           MAC address      User             Fallen back
ge-0/0/1.0     Connecting
ge-0/0/10.0    Connecting      00:30:48:8c:66:bd No User
ge-6/0/5.0     Authenticated   00:30:48:8d:7a:9b abcdeX           Yes
```

show captive-portal interface detail (Only Captive Portal Enabled)

```
user@switch> show captive-portal interface detail ge-6/0/5.0
Supplicant mode: Multiple
Number of retries: 3
Quiet period: 60 seconds
Configured CP session timeout: 3600 seconds
Server timeout: 15 seconds
CP fallen back: No
Number of connected supplicants: 1
  Supplicant: abcdeX, 00:30:48:8d:7a:9b
    Operational state: Authenticated
    Dynamic CP Session Timeout: 3600 seconds
    CP Session Expiration due in: 3583 seconds
```

show captive-portal interface detail (802.1X Authentication and Captive Portal Enabled)

```
user@switch> show captive-portal interface detail ge-6/0/5.0
Supplicant mode: Multiple
Number of retries: 3
Quiet period: 60 seconds
Configured CP session timeout: 3600 seconds
Server timeout: 15 seconds
CP fallen back: Yes
Number of connected supplicants: 1
  Supplicant: abcdeX, 00:30:48:8d:7a:9b
    Operational state: Authenticated
    Dynamic CP Session Timeout: 3600 seconds
    CP Session Expiration due in: 3583 seconds
```

show dot1x

Syntax	show dot1x <brief detail> <interface <i>interface-name</i>>
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.
Description	Display the current operational state of all ports with the list of connected users. This command displays the list of connected supplicants received from the RADIUS authentication server regardless of the session state—that is, for both authenticated supplicants and for supplicants that attempted authentication.
Options	none —Display information for all authenticator ports. brief detail —(Optional) Display the specified level of output. interface <i>interface-name</i> —Display information for the specified port with a list of connected supplicants.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • clear dot1x on page 302 • Example: Setting Up 802.1X for Single-Supplicant or Multiple-Supplicant Configurations on an EX Series Switch on page 44 • Example: Configuring 802.1X Authentication Options When the RADIUS Server Is Unavailable to an EX Series Switch on page 73 • Example: Configuring Fallback Options on EX Series Switches for EAP-TTLS Authentication and Odyssey Access Clients on page 101 • Filtering 802.1X Supplicants By Using RADIUS Server Attributes on page 125 • Verifying 802.1X Authentication on page 296
List of Sample Output	show dot1x interface brief on page 316 show dot1x interface detail on page 316
Output Fields	Table 25 on page 313 lists the output fields for the show dot1x command. Output fields are listed in the approximate order in which they appear.

Table 25: show dot1x Output Fields

Field Name	Field Description	Level of Output
Interface	Name of a port.	All levels

Table 25: show dot1x Output Fields (*continued*)

Field Name	Field Description	Level of Output
MAC address	The MAC address of the connected supplicant on the port.	All levels
Role	The 802.1X authentication role of the interface. When 802.1X is enabled on an interface, the role is Authenticator . As Authenticator , the interface blocks LAN access until a supplicant is authenticated through 802.1X or MAC RADIUS authentication.	brief, detail
State	<p>The state of the port:</p> <ul style="list-style-type: none"> • Authenticated—The supplicant has been authenticated through the RADIUS server or has been permitted access through server fail fallback. • Authenticating—The supplicant is authenticating through the RADIUS server. • Held—An action has been triggered through server fail fallback during a RADIUS server timeout. A supplicant is denied access, permitted access through a specified VLAN, or maintains the authenticated state granted to it before the RADIUS server timeout occurred. 	brief
User	The user name of the connected supplicant	brief
Administrative state	<p>The administrative state of the port:</p> <ul style="list-style-type: none"> • auto—Traffic is allowed through the port based on the authentication result. (Default) • force-authorize—All traffic flows through the port irrespective of the authentication result. This state is not allowed on an interface whose VLAN membership has been set to dynamic. • force-unauthorize—All traffic drops on the port irrespective of the authentication result. This state is not allowed on an interface whose VLAN membership has been set to dynamic. 	detail
Supplicant	<p>The mode for the supplicant:</p> <ul style="list-style-type: none"> • single—Authenticates only the first supplicant. All other supplicants who connect later to the port are allowed full access without any further authentication. They effectively “piggyback” on the first supplicant’s authentication. • single-secure—Allows only one supplicant to connect to the port. No other supplicant is allowed to connect until the first supplicant logs out. • multiple—Allows multiple supplicants to connect to the port. Each supplicant is authenticated individually. 	detail
Quiet period	The number of seconds the port waits following a failed authentication exchange with the supplicant before reattempting the authentication. The default value is 60 seconds. The range is 0 through 65,535 seconds.	detail
Transmit period	The number of seconds the port waits before retransmitting the initial EAPOL PDUs to the supplicant. The default value is 30 seconds. The range is 1 through 65,535 seconds.	detail

Table 25: show dot1x Output Fields (*continued*)

Field Name	Field Description	Level of Output
MAC radius	MAC RADIUS authentication: <ul style="list-style-type: none"> • enabled—The switch sends an EAPOL request to the connecting host to attempt 802.1X authentication and if the connecting host is unresponsive, the switch tries to authenticate using the MAC address. • disabled—The default. The switch will not attempt to authenticate the MAC address of the connecting host. 	detail
MAC radius restrict	The authentication method is restricted to MAC RADIUS only. 802.1X authentication is not enabled.	detail
Reauthentication	The reauthentication state: <ul style="list-style-type: none"> • disable—Periodic reauthentication of the client is disabled. • interval—Sets the periodic reauthentication time interval. The default value is 3600 seconds. The range is 1 through 65,535 seconds. 	detail
Supplicant timeout	The number of seconds the port waits for a response when relaying a request from the authentication server to the supplicant before resending the request. The default value is 30 seconds. The range is 1 through 60 seconds.	detail
Server timeout	The number of seconds the port waits for a reply when relaying a response from the supplicant to the authentication server before timing out. The default value is 30 seconds. The range is 1 through 60 seconds.	detail
Maximum EAPOL requests	The maximum number of retransmission times of an EAPOL request packet to the supplicant before the authentication session times out. The default value is 2. The range is 1 through 10.	detail
Number of clients bypassed because of authentication	The number of non-802.1X clients granted access to the LAN by means of static MAC bypass. The following fields are displayed: <ul style="list-style-type: none"> • Client—MAC address of the client. • vlan —The name of the VLAN to which the client is connected. 	detail
Guest VLAN member	The VLAN to which a supplicant is connected when the supplicant is authenticated using a guest VLAN. If a guest VLAN is not configured on the interface, this field displays <not configured> .	detail
Number of connected supplicants	The number of supplicants connected to a port.	detail
Supplicant	The user name and MAC address of the connected supplicant.	detail

Table 25: show dot1x Output Fields (*continued*)

Field Name	Field Description	Level of Output
Authentication method	<p>The 802.1X authentication method used for a supplicant:</p> <ul style="list-style-type: none"> • Guest VLAN—A supplicant is connected to the LAN through the guest VLAN. • MAC Radius—A nonresponsive host is authenticated based on its MAC address. The MAC address is configured as permitted on the RADIUS server, the RADIUS server lets the switch know that the MAC address is a permitted address, and the switch opens LAN access to the nonresponsive host on the interface to which it is connected. • Radius—A supplicant is configured on the RADIUS server, the RADIUS server communicates this to the switch, and the switch opens LAN access on the interface to which the supplicant is connected. • Server-fail deny—If the RADIUS servers time out, all supplicants are denied access to the LAN, preventing traffic from flowing from the supplicant through the interface. This is the default. • Server-fail permit—When the RADIUS server is unavailable, a supplicant is still permitted access to the LAN as if the supplicant had been successfully authenticated by the RADIUS server. • Server-fail use-cache—If the RADIUS servers time out during reauthentication, previously authenticated supplicants are reauthenticated, but new supplicants are denied LAN access. • Server-fail VLAN—A supplicant is configured to be moved to a specified VLAN if the RADIUS server is unavailable to reauthenticate the supplicant. (The VLAN must already exist on the switch.) 	detail
Authenticated VLAN	The VLAN to which the supplicant is connected.	detail
Dynamic filter	User policy filter sent by the RADIUS server.	detail
Session Reauth interval	The configured reauthentication interval.	detail
Reauthentication due in	The number of seconds in which reauthentication will occur again for the connected supplicant.	detail

Sample Output

show dot1x interface brief

```

user@switch> show dot1x interface brief
802.1X Information:
Interface    Role           State           MAC address     User
ge-0/0/1     Authenticator  Authenticated   00:a0:d2:18:1a:c8  user1
ge-0/0/2     Authenticator  Connecting      00:a6:55:f2:94:ae  user3
ge-0/0/3     Authenticator  Held

```

show dot1x interface detail

```

user@switch> show dot1x interface ge-0/0/16.0 detail

ge-0/0/16.0
Role: Authenticator
Administrative state: Auto

```


Supplicant mode: Single
Number of retries: 3
Quiet period: 60 seconds
Transmit period: 30 seconds
Mac Radius: Enabled
Mac Radius Strict: Disabled
Reauthentication: Enabled
Configured Reauthentication interval: 40 seconds
Supplicant timeout: 30 seconds
Server timeout: 30 seconds
Maximum EAPOL requests: 1
Guest VLAN member: <not configured>
Number of connected supplicants: 1
 Supplicant: abc, 00:30:48:8C:66:BD
 Operational state: Authenticated
 Authentication method: Radius
 Authenticated VLAN: v200
 Reauthentication due in 17 seconds

show dot1x authentication-failed-users

Syntax	show dot1x authentication-failed-users
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches.
Description	Display the supplicants (users) that have failed 802.1X authentication.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • clear dot1x on page 302 • Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69 • Configuring 802.1X Interface Settings (CLI Procedure) on page 120
List of Sample Output	show dot1x authentication-failed-users on page 318
Output Fields	Table 26 on page 318 lists the output fields for the show dot1x authentication-failed-users command. Output fields are listed in the approximate order in which they appear.

Table 26: show dot1x authentication-failed-users Output Fields

Field Name	Field Description	Level of Output
Interface	The MAC address configured to bypass 802.1X authentication.	all
MAC address	The MAC address configured statically on the interface.	all
User	The user that is configured on the RADIUS server and that has failed 802.1X authentication.	all
Failure Count	The number of times that 802.1X authentication has failed on the interface.	all

Sample Output

show dot1x authentication-failed-users

```
user@switch> show dot1x authentication-failed-users
```

Interface	MAC address	User	Failure Count
ge-0/0/17.0	00:37:00:00:00:00	003700000000	28
ge-0/0/20.0	00:04:10:00:00:00	000410000000	32
ge-0/0/18.0	00:00:03:00:0a:00	000003000a00	4
ge-0/0/19.0	00:00:03:00:0b:00	000003000b00	18

show dot1x firewall

Syntax	<code>show dot1x firewall <interface <i>interface-name</i>></code>
Release Information	Command introduced in Junos OS Release 9.5 for EX Series switches. Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.
Description	Display information about the firewall filters for each user or nonresponsive host that is authenticated on each 802.1X-enabled interface that is configured for multiple supplicants. For example, if the firewall filter is configured with a term for counters, the command shows the count for each user.
Options	none —Display information for all interfaces. interface <i>interface-names</i> —(Optional) Display information for the specified interface.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • clear dot1x on page 302 • Example: Applying Firewall Filters to Multiple Supplicants on Interfaces Enabled for 802.1X or MAC RADIUS Authentication on page 91
List of Sample Output	show dot1x firewall on page 319 show dot1x firewall on page 319
Output Fields	Output fields include any action modifier that is specified in firewall filters.

Sample Output

show dot1x firewall

(Showing counter action)

```
user@switch> show dot1x firewall
Filter: dot1x-filter-ge-0/0/3
Counters
  counter1_dot1x_ge-0/0/3_user1    342
  counter1_dot1x_ge-0/0/3_user2    857
```

show dot1x firewall

(Showing policer action)

```
user@switch> show dot1x firewall
Filter: dot1x_ge-0/0/0
Counters
  p1-t1    494946
```

show dot1x static-mac-address

Syntax	<code>show dot1x static-mac-address <(interface <i>[interface-name]</i>)></code>
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.
Description	Display all the static MAC addresses that are configured to bypass 802.1X authentication on the switch.
Options	none —Display static MAC addresses for all interfaces. interface <i>interface-name</i> —(Optional) Display static MAC addresses for a specific interface.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • clear dot1x on page 302 • Example: Configuring Static MAC Bypass of Authentication on an EX Series Switch on page 69 • Adding a Static MAC Address Entry to the Ethernet Switching Table (CLI Procedure) • Configuring 802.1X Interface Settings (CLI Procedure) on page 120 • Understanding Authentication on EX Series Switches on page 10
List of Sample Output	show dot1x static-mac-address on page 320 show dot1x static-mac-address interface (Specific Interface) on page 321
Output Fields	Table 27 on page 320 lists the output fields for the show dot1x static-mac-address command. Output fields are listed in the approximate order in which they appear.

Table 27: show dot1x static-mac-address Output Fields

Field Name	Field Description	Level of Output
MAC address	The MAC address of the device that is configured to bypass 802.1X authentication.	all
VLAN-Assignment	The name of the VLAN to which the device is assigned.	all
Interface	The name of the interface on which authentication is bypassed for a given MAC address.	all

Sample Output

show dot1x static-mac-address

```
user@switch> show dot1x static-mac-address
```

MAC address	VLAN-Assignment	Interface
00:00:00:11:22:33		
00:00:00:00:12:12		ge-0/0/3.0
00:00:00:02:34:56	facilities	ge-0/0/1.0

show dot1x static-mac-address interface (Specific Interface)

```
user@switch> show dot1x static-mac-address interface ge-0/0/0.1
```

MAC address	VLAN-Assignment	Interface
00:00:00:12:24:12	support	ge-0/0/1.0
00:00:00:72:30:58	support	ge-0/0/1.0

show ethernet-switching interfaces

Syntax	<code>show ethernet-switching interfaces</code> <code><brief detail summary></code> <code><interface <i>interface-name</i>></code>
Release Information	<p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>In Junos OS Release 9.6 for EX Series switches, the following updates were made:</p> <ul style="list-style-type: none">• Blocking field output was updated.• The default view was updated to include information about 802.1Q tags.• The detail view was updated to include information on VLAN mapping. <p>In Junos OS Release 11.1 for EX Series switches, the detail view was updated to include reflective relay information.</p>
Description	Display information about Ethernet switching interfaces.
Options	<p>none—Display brief information for Ethernet switching interfaces.</p> <p>brief detail summary—(Optional) Display the specified level of output.</p> <p>interface <i>interface-name</i>—(Optional) Display Ethernet switching information for a specific interface.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none">• <i>show ethernet-switching mac-learning-log</i>• <i>show ethernet-switching table</i>• <i>Configuring Autorecovery From the Disabled State on Secure or Storm Control Interfaces (CLI Procedure)</i>
List of Sample Output	<p>show ethernet-switching interfaces on page 324</p> <p>show ethernet-switching interfaces ge-0/0/15 brief on page 324</p> <p>show ethernet-switching interfaces ge-0/0/2 detail (Blocked by RTG rtggroup) on page 324</p> <p>show ethernet-switching interfaces ge-0/0/15 detail (Blocked by STP) on page 325</p> <p>show ethernet-switching interfaces ge-0/0/17 detail (Disabled by bpdu-control) on page 325</p> <p>show ethernet-switching interfaces detail (C-VLAN to S-VLAN Mapping) on page 325</p> <p>show ethernet-switching interfaces detail (Reflective Relay Is Configured) on page 325</p>
Output Fields	<p>Table 28 on page 323 lists the output fields for the show ethernet-switching interfaces command. Output fields are listed in the approximate order in which they appear.</p>

Table 28: show ethernet-switching interfaces Output Fields

Field Name	Field Description	Level of Output
Interface	Name of a switching interface.	none, brief , detail , summary
Index	VLAN index internal to Junos OS.	detail
State	Interface state. Values are up and down .	none, brief , detail
Port mode	The access mode is the port mode default and works with a single VLAN. Port mode can also be trunk , which accepts tagged packets from multiple VLANs on other switches. The third port mode value is tagged-access , which accepts tagged packets from access devices.	detail
Reflective Relay Status	Reflective relay allows packets to use the same interface for both upstream and downstream traffic. When reflective relay has been configured, the status displayed is always enabled . When reflective relay is not configured, this entry does not appear in the command output.	detail
Ether type for the interface	Ether type is a two-octet field in an Ethernet frame used to indicate which protocol is encapsulated in the payload of an incoming Ethernet packet. Both 802.1Q packets and Q-in-Q packets use this field. The output displayed for this particular field indicates the interface's Ether type, which is used to match the Ether type of incoming 802.1Q packets and Q-in-Q packets. The indicated Ether type field is also added to the interface's outgoing 802.1Q and Q-in-Q packets.	detail
VLAN membership	Names of VLANs that belong to this interface.	none, brief , detail ,
Tag	Number of the 802.1Q tag.	none, brief , detail ,
Tagging	Specifies whether the interface forwards 802.1Q tagged or untagged traffic.	none, brief , detail ,
Blocking	<p>The forwarding state of the interface:</p> <ul style="list-style-type: none"> • unblocked—Traffic is forwarded on the interface. • blocked—Traffic is not being forwarded on the interface. • Disabled by bpdu control—The interface is disabled due to receiving BPDUs on a protected interface. If the disable-timeout statement has been included in the BPDU configuration, the interface automatically returns to service after the timer expires. • blocked by RTG—The specified redundant trunk group is disabled. • blocked by STP—The interface is disabled due to a spanning-tree protocol error. • MAC limit exceeded—The interface is temporarily disabled due to a MAC limit error. The disabled interface is automatically restored to service when the disable timeout expires. • MAC move limit exceeded—The interface is temporarily disabled due to a MAC move limit error. The disabled interface is automatically restored to service when the disable timeout expires. • Storm control in effect—The interface is temporarily disabled due to a storm control error. The disabled interface is automatically restored to service when the disable timeout expires. 	none, brief , detail ,

Table 28: show ethernet-switching interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Number of MACs learned on IFL	Number of MAC addresses learned by this interface.	detail
mapping	<p>When mapping is configured, the status is one of the following C-VLAN to S-VLAN mapping types:</p> <ul style="list-style-type: none"> • dot1q-tunneled—The interface maps all traffic to the S-VLAN (all-in-one bundling). • native—The interface maps untagged and priority tagged packets to the S-VLAN. • push—The interface maps packets to a firewall filter to an S-VLAN. • policy-mapped—The interface maps packets to a specifically defined S-VLAN. • integer—The interface maps packets to the specified S-VLAN. <p>When mapping is not configured, this entry does not appear in the command output.</p>	detail

Sample Output

show ethernet-switching interfaces

```
user@switch> show ethernet-switching interfaces
```

Interface	State	VLAN members	Tag	Tagging	Blocking
ae0.0	up	default		untagged	unblocked
ge-0/0/2.0	up	vlan300	300	untagged	blocked by RTG (rtggroup)
ge-0/0/3.0	up	default			blocked by STP
ge-0/0/4.0	down	default			MAC limit exceeded
ge-0/0/5.0	down	default			MAC move limit exceeded
ge-0/0/6.0	down	default			Storm control in effect
ge-0/0/7.0	down	default			unblocked
ge-0/0/13.0	up	default		untagged	unblocked
ge-0/0/14.0	up	vlan100	100	tagged	unblocked
		vlan200	200	tagged	unblocked
ge-0/0/15.0	up	vlan100	100	tagged	blocked by STP
		vlan200	200	tagged	blocked by STP
ge-0/0/16.0	down	default		untagged	unblocked
ge-0/0/17.0	down	vlan100	100	tagged	Disabled by bpdu-control
		vlan200	200	tagged	Disabled by bpdu-control

show ethernet-switching interfaces ge-0/0/15 brief

```
user@switch> show ethernet-switching interfaces ge-0/0/15 brief
```

Interface	State	VLAN members	Tag	Tagging	Blocking
ge-0/0/15.0	up	vlan100	100	tagged	blocked by STP
		vlan200	200	tagged	blocked by STP

show ethernet-switching interfaces ge-0/0/2 detail (Blocked by RTG rtggroup)

```
user@switch> show ethernet-switching interfaces ge-0/0/2 detail
```



```

Interface: ge-0/0/2.0, Index: 65, State: up, Port mode: Access
Ether type for the interface: 0X8100
VLAN membership:
    vlan300, 802.1Q Tag: 300, untagged, msti-id: 0, blocked by RTG(rtggroup)
Number of MACs learned on IFL: 0

```

show ethernet-switching interfaces ge-0/0/15 detail (Blocked by STP)

```

user@switch> show ethernet-switching interfaces ge-0/0/15 detail

Interface: ge-0/0/15.0, Index: 70, State: up, Port mode: Trunk
Ether type for the interface: 0X8100
VLAN membership:
    vlan100, 802.1Q Tag: 100, tagged, msti-id: 0, blocked by STP
    vlan200, 802.1Q Tag: 200, tagged, msti-id: 0, blocked by STP

Number of MACs learned on IFL: 0

```

show ethernet-switching interfaces ge-0/0/17 detail (Disabled by bpdu-control)

```

user@switch> show ethernet-switching interfaces ge-0/0/17 detail

Interface: ge-0/0/17.0, Index: 71, State: down, Port mode: Trunk
Ether type for the interface: 0X8100
VLAN membership:
    vlan100, 802.1Q Tag: 100, tagged, msti-id: 1, Disabled by bpdu-control
    vlan200, 802.1Q Tag: 200, tagged, msti-id: 2, Disabled by bpdu-control
Number of MACs learned on IFL: 0

```

show ethernet-switching interfaces detail (C-VLAN to S-VLAN Mapping)

```

user@switch> show ethernet-switching interfaces ge-0/0/6.0 detail
Interface: ge-0/0/6.0, Index: 73, State: up, Port mode: Access
Ether type for the interface: 0X8100
VLAN membership:
    map, 802.1Q Tag: 134, Mapped Tag: native, push, dot1q-tunneled, unblocked
    map, 802.1Q Tag: 134, Mapped Tag: 20, push, dot1q-tunneled, unblocked

```

show ethernet-switching interfaces detail (Reflective Relay Is Configured)

```

user@switch1> show ethernet-switching interfaces ge-7/0/2 detail
Interface: ge-7/0/2, Index: 66, State: down, Port mode: Tagged-access
Ether type for the interface: 0X8100
Reflective Relay Status: Enabled
Ether type for the interface: 0x8100
VLAN membership:
    VLAN_Purple VLAN_Orange VLAN_Blue, 802.1Q Tag: 450, tagged, unblocked
Number of MACs learned on IFL: 0

```

show lldp


Syntax	<code>show lldp</code> <code><detail></code>
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Command introduced in Junos OS Release 11.1 for the QFX Series.
Description	Display information about Link Layer Discovery Protocol (LLDP) and Link Level Discovery Protocol—Media Endpoint Discovery (LLDP-MED) configuration and capabilities on the switch. LLDP and LLDP-MED are used to learn about and to distribute device information on network links.
<div>  NOTE: LLDP-MED is not available on the QFX Series. </div>	
Options	none —Display LLDP information for all interfaces. detail —(Optional) Display detailed LLDP information for all interfaces.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • Configuring LLDP (CLI Procedure) on page 128 • Configuring LLDP-MED (CLI Procedure) on page 133 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17 • Configuring LLDP • Understanding LLDP
List of Sample Output	show lldp (EX3200 switches) on page 329 show lldp (EX4300 switches) on page 329 show lldp detail (EX4300 switches) on page 330
Output Fields	Table 29 on page 326 lists the output fields for the show lldp command. Output fields are listed in the approximate order in which they appear.

Table 29: show lldp Output Fields

Field Name	Field Description	Level of Output
LLDP	LLDP operating state. The state can be enabled or disabled . NOTE: If a VLAN that has been configured for untagged packets on an interface also has Layer 2 protocol tunneling (L2PT) enabled for LLDP, the LLDP operating state for that interface is displayed as disabled .	All levels

Table 29: show lldp Output Fields (*continued*)

Field Name	Field Description	Level of Output
Advertisement interval	Frequency, in seconds, at which LLDP advertisements are sent. This value is set by the advertisement-interval configuration statement.	All levels
Transmit delay	Seconds of delay before advertisements are sent to neighbors following a change to a TLV (type, length, or value) element in the LLDP protocol or to the state of the local system, such as a change in hostname or management address. You can set this value to reduce the delay in notifying neighbors of a change in the local system. This value is set by the transmit-delay configuration statement.	All levels
Hold timer	On EX4300 switches, the hold timer shows the length of time LLDP information is held before it is discarded. The hold timer value is equal to the advertisement interval multiplied by the hold multiplier. On all other switches, the hold timer shows the value of the hold multiplier. The hold multiplier value is set by the hold-multiplier configuration statement.	All levels
Notification interval	How often LLDP trap notifications are generated as a result of LLDP database changes. If the interval value is 0, LLDP trap notifications on database changes are disabled. This value is set by the lldp-configuration-notification-interval configuration statement.	All levels
Config Trap Interval	How often LLDP trap notifications are generated as a result of changes in topology—for example, when an endpoint connects or disconnects. If the interval value is 0, LLDP trap notifications on topology changes are disabled. This value is set by the ptopo-configuration-trap-interval configuration statement.	All levels
Connection Hold timer	Amount of time the system maintains dynamic topology entries. This value is set by the ptopo-configuration-maximum-hold-time configuration statement.	All levels
LLDP-MED	LLDP-MED operating state. The state can be Enabled or Disabled .	All levels
MED fast start count	Number of advertisements sent from a switch to a device, such as a VoIP telephone, when the device is first detected by the switch. These increased advertisements are temporary. After a device and a switch exchange information and can communicate, advertisements are reduced to one per second. This value is set by using the fast-start configuration statement. NOTE: fast-start is not available on the QFX Series.	All levels
Interface	Name of the interface for which LLDP configuration information is being reported.	All levels
Parent Interface	Name of the aggregated Ethernet interface, if any, to which the interface belongs.	All levels

Table 29: show lldp Output Fields (*continued*)

Field Name	Field Description	Level of Output
LLDP	LLDP operating state. The state can be Enabled or Disabled .	All levels
Power Negotiation	LLDP power negotiation operating state. The state can be Enabled or Disabled .	All levels
Neighbor count	Total number of new LLDP neighbors detected since the last switch reboot.	detail
Interface	Name of the interface that is advertising VLAN information.	All levels
Vlan-id	VLAN tag associated with the interface sending LLDP frames. If the interface is not a member of a VLAN, the VLAN ID is advertised as 0.	detail
Vlan-name	VLAN name associated with the VLAN ID.	detail
LLDP basic TLVs supported	<p>Basic TLVs supported on the switch:</p> <ul style="list-style-type: none"> • Chassis identifier—TLV that advertises the MAC address associated with the local system. • Port identifier—TLV that advertises the port identification for the specified port in the local system. • Port description—Interface name for the port. • System name—TLV that advertises the user-configured name of the local system. • System description—TLV that advertises the system description containing information about the software and current image running on the system. This information is taken from the software and is not configurable. • System capabilities—TLV that advertises the primary functions performed by the system—for example, bridge or router. • Management address—TLV that advertises the IP management address of the local system. 	detail
Supported LLDP 802 TLVs	<p>802.3 TLVs supported on the switch:</p> <ul style="list-style-type: none"> • MAC/PHY configuration status—TLV that advertises information about the physical interface, such as autonegotiation status and support and MAU type. The information is based on the physical interface structure and is not configurable. • Power via MDI—TLV that advertises MDI power support, PSE power pair, and power class information. • Link aggregation—TLV that advertises if the interface is aggregated and its aggregated interface ID. • Maximum frame size—TLV that advertises the maximum transmission unit (MTU) of the interface sending LLDP frames. • Port VLAN tag—TLV that advertises the VLAN tag configured on the interface. • Port VLAN name—TLV that advertises the VLAN name configured on the interface. 	detail

Table 29: show lldp Output Fields (*continued*)

Field Name	Field Description	Level of Output
Supported LLDP MED TLVs	<p>LLDP-MED TLVs supported on the switch:</p> <ul style="list-style-type: none"> • LLDP MED capabilities—TLV that advertises the primary function of the port. The capabilities values range from 0 through 15: <ul style="list-style-type: none"> • 0—Capabilities • 1—Network Policy • 2—Location Identification • 3—Extended Power via MDI-PSE • 4—Inventory • 5–15—Reserved • Network policy—TLV that advertises the port VLAN configuration and associated Layer 2 and Layer 3 attributes. Attributes include the policy identifier, application types—such as voice or streaming video—802.1Q VLAN tagging, and 802.1p priority bits and DiffServ code points. • Endpoint location—TLV that advertises the physical location of the endpoint. • Extended power Via MDI—TLV that advertises the power type, power source, power priority, and power value of the port. It is the responsibility of the PSE device (network connectivity device) to advertise the power priority on a port. 	detail

Sample Output

show lldp (EX3200 switches)

```

user@switch> show lldp
LLDP                               : Enabled
Advertisement interval             : 30 seconds
Transmit delay                     : 2 seconds
Hold timer                         : 4 seconds
Notification interval             : 0 Second(s)
Config Trap Interval              : 0 seconds
Connection Hold timer             : 300 seconds

LLDP MED                           : Disabled
MED fast start count              : 3 Packets

```

```

Interface      Parent Interface  LLDP      LLDP-MED  Power Negotiation
all            -                 Enabled    Enabled    Enabled

```

show lldp (EX4300 switches)

```

user@switch> show lldp
LLDP                               : Enabled
Advertisement interval             : 30 seconds
Transmit delay                     : 2 seconds
Hold timer                         : 120 seconds
Notification interval             : 0 Second(s)
Config Trap Interval              : 0 seconds
Connection Hold timer             : 300 seconds

LLDP MED                           : Disabled
MED fast start count              : 3 Packets

```

Interface	Parent Interface	LLDP	LLDP-MED	Power Negotiation
all	-	Enabled	Enabled	Enabled

show lldp detail (EX4300 switches)

```

user@switch> show lldp detail
LLDP : Enabled
Advertisement interval : 30 seconds
Transmit delay : 2 seconds
Hold timer : 120 seconds
Notification interval : 0 Second(s)
Config Trap Interval : 0 seconds
Connection Hold timer : 300 seconds

LLDP MED : Disabled
MED fast start count : 3 Packets

```

Interface	Parent Interface	LLDP	LLDP-MED	Power Negotiation
Neighbor count				
all	-	Enabled	Enabled	Enabled
8				

Interface	Parent Interface	Vlan-id	Vlan-name
xe-3/0/0.0	ae31.0	100	v100
xe-3/0/0.0	ae31.0	101	v101
xe-3/0/0.0	ae31.0	4000	v4000
xe-3/0/1.0	ae31.0	100	v100
xe-3/0/1.0	ae31.0	101	v101
xe-3/0/1.0	ae31.0	4000	v4000
xe-3/0/2.0	ae31.0	100	v100
xe-3/0/2.0	ae31.0	101	v101
xe-3/0/2.0	ae31.0	4000	v4000

LLDP basic TLVs supported:

Chassis identifier, Port identifier, Port description, System name, System description, System capabilities, Management address.

Supported LLDP 802 TLVs:

MAC/PHY configuration/status, Power via MDI, Link aggregation, Maximum frame size, Port VLAN tag, Port VLAN name.

Supported LLDP MED TLVs:

LLDP MED capabilities, Network policy, Endpoint location, Extended power Via MDI.

show lldp local-information

Syntax	show lldp local-information
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 14.1X53-D20 for OCX Series switches. Command introduced in Junos OS Release 11.1 for the QFX Series.
Description	Display the information that the switch provides in Link Layer Discovery Protocol (LLDP) advertisements to its neighbors.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • Configuring LLDP (CLI Procedure) on page 128 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17 • management-address on page 233 • <i>Configuring LLDP</i> • <i>Understanding LLDP</i>
List of Sample Output	show lldp local-information (EX Series Switch) on page 332
Output Fields	Table 30 on page 331 lists the output fields for the show lldp local-information command. Output fields are listed in the approximate order in which they appear.

Table 30: show lldp local-information Output Fields

Field Name	Field Description
LLDP Local Information details	Information about the local system (the switch): <ul style="list-style-type: none"> • Chassis ID—MAC address associated with the switch. • System name—User-configured name of the switch. • System descr—System description containing information about the switch model and the current software image running on the switch. This information is taken from the software and is not configurable.
System Capabilities	Capabilities (such as bridge or router) that are supported or enabled on the system.
Management Information	Details of the management information: Port Name , Port Address (such as 10.204.34.35), Address Type (such as ipv4 or ipv6), Port ID (SNMP interface index), Port ID Subtype , and Port Subtype . The Port Subtype displays: <ul style="list-style-type: none"> • ifindex(2)—IP address of the switch's management Ethernet interface (me0) or virtual management Ethernet (VME) interface address (for a virtual chassis) is used to manage the switch. • unknown(1)—IP management address has been configured with set protocols lldp management-address.

Table 30: show lldp local-information Output Fields (*continued*)

Field Name	Field Description
Interface name	Name of the local interface which is configured for either LLDP or LLDP-MED.
Parent Interface	Name of the aggregated Ethernet interface, if any, to which the local interface belongs.
SNMP Index	SNMP interface index.
Interface description	User-configured port description.
Status	Administrative status of the interface: either up or down .
Tunneling	Status of tunneling on the interface: either enabled or disabled .

Sample Output

show lldp local-information (EX Series Switch)

```
user@switch> show lldp local-information
```

LLDP Local Information details

```
Chassis ID   : 00:1d:b5:aa:b9:f0
System name  : switch
System descr : Juniper Networks, Inc. ex8208 , version 10.4I0 [builder] Build
               date: 2010-11-17 12:38:30 UTC
```

System Capabilities

```
Supported   : Bridge Router
Enabled     : Bridge Router
```

Management Information

```
Port Name    : -
Port Address : 10.93.54.6
Address Type  : IPv4
Port ID       : 34
Port ID Subtype : local(7)
Port Subtype  : ifIndex(2)
```

Interface name	Parent Interface	SNMP Index	Interface description	Status	Tunneling
me0.0	-	34	-	Down	Disabled
xe-3/0/0.0	ae31.0	769	xe-3/0/0.0	Up	Disabled
xe-3/0/1.0	ae31.0	770	xe-3/0/1.0	Up	Disabled
xe-3/0/2.0	ae31.0	771	xe-3/0/2.0	Up	Disabled
xe-3/0/3.0	ae31.0	772	xe-3/0/3.0	Up	Disabled
xe-3/0/4.0	ae31.0	577	xe-3/0/4.0	Up	Disabled
xe-3/0/5.0	ae31.0	578	xe-3/0/5.0	Up	Disabled
xe-3/0/6.0	ae31.0	579	xe-3/0/6.0	Up	Disabled
xe-3/0/7.0	ae31.0	581	xe-3/0/7.0	Up	Disabled

show lldp neighbors

Syntax `show lldp neighbors`
`<interface interface>`

Release Information Command introduced in Junos OS Release 9.0 for EX Series switches.

Description Display the information about neighboring devices learned by the switch by using the Link Layer Discovery Protocol (LLDP).



NOTE: The Chassis ID TLV has a subtype for Network Address Family. The supported network address families are IPv4 and IPv6. LLDP frames are validated only if the Network Address subtype of the Chassis ID TLV has a value of 1 (IPv4) or 2 (IPv6). For any other value, the transmitting device is detected by LLDP as a neighbor and displayed in the output of the `show lldp neighbors` command, but is not assigned to the VLAN.

Options `interface interface`—(Optional) Display LLDP neighbor information for a selected interface.

Required Privilege Level view

Related Documentation

- [Configuring LLDP \(CLI Procedure\) on page 128](#)
- [Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17](#)

List of Sample Output

- [show lldp neighbors on page 335](#)
- [show lldp neighbors interface ge-0/0/2 on page 336](#)
- [show lldp neighbors interface ge-0/0/0.0 \(for a VoIP Avaya Telephone with LLDP-MED Support\) on page 337](#)
- [show lldp neighbors interface ge-0/0/5.0 \(with NetBIOS Snooping Enabled on the Switch\) on page 338](#)

Output Fields [Table 31 on page 333](#) lists the output fields for the `show lldp neighbors` command. Output fields are listed in the approximate order in which they appear.

Table 31: show lldp neighbors Output Fields

Field Name	Field Description
Local Interface	List of local interfaces for which neighbor information is available.
Parent Interface	List of aggregated Ethernet interfaces, if any, to which the local interfaces belong.
Chassis ID	List of chassis identifiers for neighbors.
Port info	This field displays the port information received from neighbors.

Table 31: show lldp neighbors Output Fields (*continued*)

Field Name	Field Description
System name	List of system names gathered from neighbors.
LLDP Neighbor Information	Information about both the local system (the switch) and a neighbor system on the interface (appears when the interface option is used).
Local Information	Information about the local system (appears when the interface option is used).
Index	Local interface index (appears when the interface option is used).
Time to live	Number of seconds for which this information is valid (appears when the interface option is used).
Time mark	Date and timestamp of information (appears when the interface option is used).
Local Interface	Name of the local physical interface (appears when the interface option is used).
Parent Interface	Name of the aggregated Ethernet interface, if any, to which the interface belongs (appears when the interface option is used).
Local Port ID	Local interface SNMP index (appears when the interface option is used).
Ageout Count	Number of times the complete set of information advertised by the neighbor has been deleted from LLDP neighbor information maintained by the local system because the information timeliness interval expired (appears when the interface option is used).
Neighbor Information	Information about a neighbor system on the interface (appears when the interface option is used).
Chassis type	Type of chassis identifier supplied, such as Mac address (appears when the interface option is used).
Chassis ID	Chassis identifier of the chassis type listed (appears when the interface option is used).
Port type	Type of port identifier supplied, such as Locally assigned (appears when the interface option is used).
Port ID	Port identifier of the port type listed (appears when the interface option is used).
Port description	The port description field uses the configured port description, the port name or the SNMP ifIndex (appears when the interface option is used).
System name	Name supplied by the system on the interface (appears when the interface option is used).

Table 31: show lldp neighbors Output Fields (*continued*)

Field Name	Field Description
System Description	Description supplied by the system on the interface (appears when the interface option is used).
System capabilities	Capabilities (such as Bridge , Bridge Router , and Bridge Telephone) that are supported or enabled by the system on the interface (appears when the interface option is used).
Management Info	<p>Details of management information: Type (such as IPv4 or IPv6), Address (such as 10.204.34.35), Port ID, Subtype, Interface Subtype, and organization identifier (OID) (appears when the interface option is used).</p> <p>The Interface Subtype displays:</p> <ul style="list-style-type: none"> ifIndex(2)—IP address of the neighbor's management Ethernet interface (me0) or virtual management Ethernet (VME) interface address (for a Virtual Chassis) is used to manage the switch. unknown(1)—Neighbor's IP management address has been configured with set protocols lldp management-address.
Media Info	Additional details about the endpoint device appear when a device that supports LLDP-MED is attached to the interface. The specific details depend upon the capabilities of the device. Details might include: Media endpoint class (such as Class 3 for communication devices such as IP phones), MED Hardware revision , MED Firmware revision , MED Software revision , MED Serial number , MED Manufacturer name , MED Model name .
Organization Info	One or more entries listing remote information by organizationally unique identifier (OUI), Subtype , Index , and Info (appears when the interface option is used).
Age	How long the neighbor has been identified (appears when the interface option is used and NetBIOS snooping is enabled on the switch).
Local Interface	Name of the local physical interface (appears when the interface option is used and NetBIOS snooping is enabled on the switch).
Parent Interface	Name of the aggregated Ethernet interface, if any, to which the interface belongs (appears when the interface option is used and NetBIOS snooping is enabled on the switch).
Chassis ID	Chassis identifier of the chassis type listed (appears when the interface option is used and NetBIOS snooping is enabled on the switch).
System name	NetBIOS name of the host (appears when the interface option is used and NetBIOS snooping is enabled on the switch).

Sample Output

show lldp neighbors

```
user@switch> show lldp neighbors
```

Local Interface	Parent Interface	Chassis Id	Port info	System Name
xe-3/0/4.0	ae31.0	b0:c6:9a:63:80:40	xe-0/0/0.0	newyork31
xe-3/0/5.0	ae31.0	b0:c6:9a:63:80:40	xe-0/0/1.0	newyork31
xe-3/0/6.0	ae31.0	b0:c6:9a:63:80:40	xe-0/0/2.0	newyork31
xe-3/0/7.0	ae31.0	b0:c6:9a:63:80:40	xe-0/0/3.0	newyork31
xe-3/0/0.0	ae31.0	b0:c6:9a:63:80:40	xe-0/1/0.0	newyork31
xe-3/0/1.0	ae31.0	b0:c6:9a:63:80:40	xe-0/1/1.0	newyork31
xe-3/0/2.0	ae31.0	b0:c6:9a:63:80:40	xe-0/1/2.0	newyork31
xe-3/0/3.0	ae31.0	b0:c6:9a:63:80:40	xe-0/1/3.0	newyork31

show lldp neighbors interface ge-0/0/2

```
user@switch> show lldp neighbors interface ge-0/0/2
```

LLDP Neighbor Information:

Local Information:

```
Index: 1 Time to live: 240 Time mark: Wed Dec 1 10:23:24 2010 Age: 29 secs
Local Interface   : ge-0/0/2.0
Parent Interface  : -
Local Port ID     : 507
Ageout Count      : 0
```

Neighbour Information:

```
Chassis type      : Mac address
Chassis ID        : 00:1f:12:38:7f:c0
Port type         : Locally assigned
Port ID           : 507
Port description  : ge-0/0/2.0
System name       : bng-148p5-dev
```

```
System Description : Juniper Networks, Inc. ex4200-48p , version 10.4IO Build
date: 2010-11-30 09:32:17 UTC
```

System capabilities

```
Supported : Bridge Router
Enabled   : Bridge Router
```

Management Info

```
Type           : IPv4
Address         : 10.204.96.235
Port ID        : 34
Subtype        : 1
Interface Subtype : ifIndex(2)
OID            : 1.3.6.1.2.1.31.1.1.1.1.34
```

```
Media endpoint class: Network Connectivity
```

Organization Info

```
OUI       : IEEE 802.3 Private (0x00120f)
Subtype    : MAC/PHY Configuration/Status (1)
Info       : Autonegotiation [supported, enabled (0x3)], PMD Autonegotiation
Capability (0x1d00), MAU Type (0x0)
Index      : 1
```

Organization Info

```
OUI       : IEEE 802.3 Private (0x00120f)
Subtype    : MDI Power (2)
Info       : MDI Power Support [PSE supported ], MDI Power Pair (signal),
MDI Power Class (class0)
Index      : 2
```

show lldp neighbors interface ge-0/0/0.0 (for a VoIP AvayaTelephone with LLDP-MED Support)

```
user@switch>show lldp neighbors interface ge-0/0/0.0
```

LLDP Neighbor Information:**Local Information:**

```
Index: 20 Time to live: 120 Time mark: Thu Apr 15 22:26:22 2010 Age: 16 secs
Local Interface   : ge-0/0/0.0
Parent Interface  : -
Local Port ID     : 517
Ageout Count      : 0
```

Neighbour Information:

```
Chassis type      : Network address
Chassis ID        : 0.0.0.0
Port type         : Mac address
Port ID           : 00:04:0d:fc:55:48
System name       : AVAFC5548
```

System capabilities

```
Supported : Bridge Telephone
Enabled   : Bridge
```

Management Info

```
Type           : IPv4
Address         : 0.0.0.0
Port ID         : 1
Subtype         : 1
Interface Subtype : ifIndex(2)
OID             : 1.3.6.1.2.1.31.1.1.1.1.1
```

```
Media endpoint class: Class III Device
```

```
MED Hardware revision : 4610D01A
MED Firmware revision : b10d01b2_9.bin
MED Software revision : a10d01b2_9.bin
MED Serial number     : 07N510103424
MED Manufacturer name : Avaya
MED Model name        : 4610
```

Organization Info

```
OUI       : IEEE 802.3 Private (0x00120f)
Subtype    : MAC/PHY Configuration/Status (1)
Info       : Autonegotiation [supported, enabled (0x3)], PMD Autonegotiation
Capability (0x1d00), MAU Type (0x0)
Index      : 1
```

Organization Info

```
OUI       : IEEE 802.3 Private (0x00120f)
Subtype    : MDI Power (2)
Info       : MDI Power Support [PSE supported ], MDI Power Pair (signal),
MDI Power Class (class0)
Index      : 2
```

Organization Info

```
OUI       : IEEE 802.3 Private (0x00120f)
Subtype    : Link Aggregation (3)
Info       : Aggregation Status (supported ), Aggregation Port ID (0)
Index      : 3
```

Organization Info

```
OUI       : IEEE 802.3 Private (0x00120f)
```

```
Subtype : Maximum Frame Size (4)
Info    : MTU Size (1514)
Index   : 4
```

Organization Info

```
OUI      : Ethernet Bridged (0x0080c2)
Subtype  : Port Vid (1)
Info     : VLAN ID (10),
Index    : 5
```

Organization Info

```
OUI      : Juniper Specific (0x009069)
Subtype  : Chassis Serial Type (1)
Info     : Juniper Slot Serial [BQ0208211462]
Index    : 6
```

Organization Info

```
OUI      : Ethernet Bridged (0x0080c2)
Subtype  : VLAN Name (3)
Info     : VLAN ID (10), VLAN Name (vtest)
Index    : 7
```

show lldp neighbors interface ge-0/0/5.0 (with NetBIOS Snooping Enabled on the Switch)

```
user@switch> show lldp neighbors interface ge-0/0/5
```

```
Age: 299999 secs
Local Interface   : ge-0/0/5.0
Parent Interface  : -
Chassis ID        : 00:10:94:00:00:02
Port description  : 169.254.58.17
System name       : JNPRU\
```

show lldp remote-global-statistics

Syntax	show lldp remote-global-statistics
Release Information	Command introduced in Junos OS Release 10.0 for EX Series switches.
Description	Display remote Link Layer Discovery Protocol (LLDP) global statistics.
Options	This command has no options.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • Configuring LLDP (CLI Procedure) on page 128 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17
List of Sample Output	show lldp remote-global-statistics on page 340
Output Fields	Table 32 on page 339 describes the output fields for the show lldp remote-global-statistics command. Output fields are listed in the approximate order in which they appear.

Table 32: show lldp remote-global-statistics Output Fields

Field Name	Field Description
LLDP Remote Database Table Counters	Information about remote database table counters.
LastchangeTime	Time elapsed between LLDP agent startup and the last change to the remote database table information.
Inserts	Number of insertions made in the remote database table.
Deletes	Number of deletions made in the remote database table.
Drops	Number of LLDP frames dropped from the remote database table because of errors.
Ageouts	Number of remote database table entries that have aged out of the table.

Sample Output

show lldp remote-global-statistics

```
user@host> show lldp remote-global-statistics
user@host> show lldp remote-global-statistics
LLDP Remote Database Table Counters
LastchangeTime      Inserts    Deletes    Drops    Ageouts
00:00:76 (76 sec)   192        0           0         0
```


show lldp statistics

Syntax	show lldp statistics <interface <i>interface</i>>
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches.
Description	Display LLDP statistics for all interfaces or for the specified interface.
Options	none —Display LLDP statistics for all interfaces. interface <i>interface</i> —(Optional) Display LLDP statistics for the specified interface.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • Configuring LLDP (CLI Procedure) on page 128 • Understanding 802.1X and LLDP and LLDP-MED on EX Series Switches on page 17
List of Sample Output	show lldp statistics on page 342 show lldp statistics interface xe-3/0/0.0 on page 342
Output Fields	Table 33 on page 341 lists the output fields for the show lldp statistics command. Output fields are listed in the approximate order in which they appear.

Table 33: show lldp statistics Output Fields

Field Name	Field Description
Interface	Name of the interface.
Parent Interface	Name of the aggregated Ethernet interface, if any, to which the interface belongs. NOTE: Because LLDP packets are transmitted and received on member interfaces only, statistics are available only for the member interfaces, not for the aggregated interface.
Received	Total number of LLDP frames received on an interface.
Unknown TLVs	Number of unrecognized LLDP TLVs received on an interface.
With Errors	Number of invalid LLDP TLVs received on an interface.
Discarded	Number of LLDP TLVs received and then discarded on an interface.
Transmitted	Total number of LLDP frames that were transmitted on an interface.
Untransmitted	Total number of LLDP frames that were untransmitted on an interface.

Sample Output

show lldp statistics

```
user@switch> show lldp statistics
```

Interface	Parent Interface	Received	Unknown TLVs	With Errors
xe-3/0/0.0	ae31.0	1564	0	0
xe-3/0/1.0	ae31.0	1564	0	0
xe-3/0/2.0	ae31.0	1565	0	0
xe-3/0/3.0	ae31.0	1566	0	0
xe-3/0/4.0	ae31.0	1598	0	0
xe-3/0/5.0	ae31.0	1598	0	0
xe-3/0/6.0	ae31.0	1596	0	0
xe-3/0/7.0	ae31.0	1597	0	0
xe-5/0/6.0	-	0	0	0
xe-5/0/7.0	-	0	0	0

Discarded TLVs	Transmitted	Untransmitted
0	3044	1
0	3044	1
0	3044	1
0	3044	1
0	3075	1
0	3075	1
0	3075	1
0	3075	1
0	17312	0
0	17312	0

show lldp statistics interface xe-3/0/0.0

```
user@switch> show lldp statistics interface xe-3/0/0.0
```

Interface	Parent Interface	Received	Unknown TLVs	With Errors
xe-3/0/0.0	ae31.0	1566	0	0

Discarded TLVs	Transmitted	Untransmitted
0	3046	1

show network-access aaa statistics accounting

Syntax	show network-access aaa statistics accounting
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for QFX Series switches.
Description	Display authentication, authorization, and accounting (AAA) accounting statistics.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • accounting-server on page 174 • accounting-stop-on-access-deny on page 176 • <i>Configuring RADIUS Accounting</i>
List of Sample Output	show network-access aaa statistics accounting on page 343
Output Fields	Table 34 on page 343 lists the output fields for the show network-access aaa statistics accounting command. Output fields are listed in the approximate order in which they appear.

Table 34: show network-access aaa statistics accounting Output Fields

Field Name	Field Description
Requests received	The number of accounting-request packets sent from a switch to a RADIUS accounting server.
Accounting Response failures	The number of accounting-response failure packets sent from the RADIUS accounting server to the switch.
Accounting Response Success	The number of accounting-response success packets sent from the RADIUS accounting server to the switch.
Requests timedout	The number of requests-timedout packets sent from the RADIUS accounting server to the switch.

Sample Output

show network-access aaa statistics accounting

```

user@switch> show network-access aaa statistics accounting
Accounting module statistics
  Requests received: 1
  Accounting Response failures: 0
  Accounting Response Success: 1
  Requests timedout: 0

```

show network-access aaa statistics authentication

Syntax	show network-access aaa statistics authentication
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for QFX Series switches.
Description	Display authentication, authorization, and accounting (AAA) authentication statistics.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> authentication-server on page 184 Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35
List of Sample Output	show network-access aaa statistics authentication on page 344 show network-access aaa statistics authentication (in QFX Series Switches) on page 344
Output Fields	Table 35 on page 344 lists the output fields for the show network-access aaa statistics authentication command. Output fields are listed in the approximate order in which they appear.

Table 35: show network-access aaa statistics authentication Output Fields

Field Name	Field Description
Requests received	The number of authentication requests received by the switch.
Accepts	The number of authentication accepts received by the RADIUS server.
Rejects	The number authentication rejects sent by the RADIUS server.
Challenges	The number of authentication challenges sent by the RADIUS server.

Sample Output

show network-access aaa statistics authentication

```

user@switch> show network-access aaa statistics authentication
Authentication module statistics
  Requests received: 2
  Accepts: 1
  Rejects: 0
  Challenges: 1

```

show network-access aaa statistics authentication (in QFX Series Switches)

```

user@switch> show network-access aaa statistics authentication
Authentication module statistics
  Requests received: 2
  Accepts: 1

```

Rejects: 0
Challenges: 1

show network-access aaa statistics dynamic-requests

Syntax	show network-access aaa statistics dynamic-requests;
Release Information	Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for QFX Series switches.
Description	Display authentication, authorization, and accounting (AAA) authentication statistics for disconnects.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • authentication-server on page 184 • Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch on page 35
List of Sample Output	show network-access aaa statistics authentication on page 346
Output Fields	Table 36 on page 346 lists the output fields for the show network-access aaa statistics dynamic-requests command. Output fields are listed in the approximate order in which they appear.

Table 36: show network-access aaa statistics dynamic-requests Output Fields

Field Name	Field Description
Requests received	The number of dynamic requests received by the RADIUS server.
Processed successfully	The number of dynamic requests successfully processed by the RADIUS server.
Errors during processing	The number of errors that occurred while the RADIUS server was processing the dynamic request.
Silently dropped	The number of silently dropped requests.

Sample Output

show network-access aaa statistics authentication

```

user@switch> show network-access aaa statistics dynamic-requests
Dynamic-requests module statistics
  Requests received: 0
  Processed successfully: 0
  Errors during processing: 0
  Silently dropped: 0

```

show services unified-access-control authentication-table

Syntax	<pre>show services unified-access-control authentication-table <detail> <extended> <identifier <i>id</i>> <ipsource <i>ipaddress</i>> <role <i>role-name</i>> <user <i>user-name</i>></pre>
Release Information	<p>Command introduced in Junos OS Release 9.4.</p> <p>Command introduced in Junos OS Release 12.2 for EX Series switches.</p>
Description	<p>Display a summary of the authentication table entries configured for the Juniper Networks MAG Series Junos Pulse Gateways or the Juniper Networks IC Series Unified Access Control Appliances. Authentication tables store mappings between traffic sessions and Unified Access Control (UAC) roles. The Access Control Service appliance uses the roles specified in the mappings to help determine which Access Control Service policies to apply to a session.</p> <p>Use this command when you have configured the SRX Series device or EX Series switch to act as a Junos OS Enforcer in an Access Control Service deployment. When deployed as a Junos OS Enforcer, the SRX Series device or EX Series switch enforces the policies that are defined on the Access Control Service appliance.</p> <p>You can also use this command to display the content of the authentication table in a user role firewall implementation. The table, pushed from a supporting Access Control Service device, provides the user roles associated with incoming traffic.</p>
Options	<p>none—Display a view of all authentication table entries.</p> <p>detail—(Optional) Display a detailed view of all authentication table entries.</p> <p>extended—(Optional) Display a view of all authentication table entries with the user roles listed.</p> <p>identifier <i>id</i>—(Optional) Display all authentication table entries with the specified identifier number.</p> <p>ipsource <i>ip-address</i>—(Optional) Display any authentication table entry for the specified IP address.</p> <p>role <i>role-name</i>—(Optional) Display all authentication table entries for the specified role name.</p> <p>user <i>username</i>—(Optional) Display all authentication table entries for the specified user.</p>
Required Privilege Level	view

- Related Documentation**
- [Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control \(CLI Procedure\) on page 148](#)

List of Sample Output

[show services unified-access-control authentication-table \(SRX Series device\) on page 348](#)
[show services unified-access-control authentication-table detail \(SRX Series device\) on page 349](#)
[show services unified-access-control authentication-table \(EX Series switch\) on page 349](#)
[show services unified-access-control authentication-table detail \(EX Series switch\) on page 349](#)

Output Fields [Table 37 on page 348](#) lists the output fields for the **show services unified-access-control authentication-table** command. Output fields are listed in the approximate order in which they appear.

Table 37: show services unified-access-control authentication-table Output Fields

Field Name	Field Description	Level of Output
Identifier	The identification number of this authentication table.	All
Source	The IP address of the end device.	All
Username	The username logged in by the end device.	All
Age	Refers to the Access Control Service authentication table timeout. The authentication table timeout is a configurable parameter on the Access Control Service. It indicates how long a session with no activity can remain table before the table entry is cleared. For EX Series switches, the authentication table timeout is always 0, which means that the session does not time out until the 802.1X connection is made. For additional information, see the <i>Junos Pulse Access Control Service Administration Guide</i> .	All
Role identifier	A value generated and used by the Access Control Service to uniquely identify a given role.	All
Role name	Role name specified in Access Control Service.	detail
Total	Total number of entries in the authentication table.	All

Sample Output

[show services unified-access-control authentication-table \(SRX Series device\)](#)

```
user@host>show services unified-access-control authentication-table
```


Id	Source IP	Username	Age	Role identifier
1	172.24.72.79	atsang	0	0000000001.000005.0

Total: 1

show services unified-access-control authentication-table detail (SRX Series device)

```

user@host>show services unified-access-control authentication-table detail
Identifier: 1
  Source IP: 172.24.72.79
  Username: atsang
  Age: 0
  Role identifier      Role name
    0000000001.000005.0 Users
    1113249951.100616.0 PersonalFirewall
    1183670148.427197.0 UAC
Total: 1

```

show services unified-access-control authentication-table (EX Series switch)

```

user@switch> show services unified-access-control authentication-table
Id      Source                               Username  Age    Role identifier
1       00-50-56-a4-5a-4c/10.25.0.223      t         0      0000000001.000005.0

Total: 1

```

show services unified-access-control authentication-table detail (EX Series switch)

```

user@switch> show services unified-access-control authentication-table detail
Identifier: 1
  Source: 00-50-56-a4-5a-4c/10.25.0.223
  Username: t
  Age: 0
  Role identifier      Role name
    0000000001.000005.0 Users
Total: 1

```

show services unified-access-control policies

Syntax	show services unified-access-control policies <detail> <identifier <i>id</i>>
Release Information	Command introduced in Junos OS Release 9.4. Command introduced in Junos OS Release 12.2 for EX Series switches.
Description	Display a summary of resource access policies configured from the Junos Pulse Access Control Service MAG Series or IC Series Appliance. Use this command when you have configured the SRX Series device or EX Series switch to act as a Junos OS Enforcer in an Access Control Service deployment. When deployed as a Junos OS Enforcer, the SRX Series device or EX Series switch enforces the policies that are defined on the Access Control Service appliance.
Options	none —Display a view of all resource access policies. detail —(Optional) Display a detailed view of all resource access policies. identifier <i>id</i> —(Optional) Display all resource access policies with the specified identifier number.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148
List of Sample Output	show services unified-access-control policies (SRX Series device) on page 351 show services unified-access-control policies (EX Series switch) on page 351 show services unified-access-control policies detail (SRX Series device) on page 351 show services unified-access-control policies detail (EX Series switch) on page 351 show services unified-access-control policies identifier 1 (SRX Series device) on page 352 show services unified-access-control policies identifier 1 (EX Series switch) on page 352
Output Fields	Table 38 on page 350 lists the output fields for the show services unified-access-control policies command. Output fields are listed in the approximate order in which they appear.

Table 38: show services unified-access-control policies Output Fields

Field Name	Field Description	Level of Output
Identifier	The identification number of this authentication table.	All
Resource	<ul style="list-style-type: none"> <i>ip-address</i>—The IP address of the resource. <i>*:*</i>—Any IP address. 	All
Resource	The MAC address of the resource.	detail

Table 38: show services unified-access-control policies Output Fields (*continued*)

Field Name	Field Description	Level of Output
Action	<ul style="list-style-type: none"> allow—Allow the supplicant to access the specified resource. deny—Do not allow the supplicant to access the specified resource. 	All
Apply	<ul style="list-style-type: none"> all—Allow the supplicant to access all the resources. selected—Allow the supplicant to access the selected resource. 	All
Role identifier	A value generated and used by the Access Control Service to uniquely identify a given role.	All
Total	Total number of resource access policies.	All

Sample Output

show services unified-access-control policies (SRX Series device)

```

user@host> services unified-access-control policies
Id      Resource          Action Apply  Role identifier
1       10.100.15.0/24:*   allow  selected 1113249951.100616.0
2       10.100.17.0/24:*   deny   all

```

show services unified-access-control policies (EX Series switch)

```

user@switch> services unified-access-control policies
Id      Resource          Action Apply  Role identifier
1       10.204.88.192:*   deny   all
2       *:*               allow   all
Total: 2

```

show services unified-access-control policies detail (SRX Series device)

```

user@host> services unified-access-control policies detail
Identifier: 1
Resource: 10.100.15.0/24:*
Resource: 10.100.16.23-10.100.16.60:*
Action: allow
Apply: selected
Role identifier      Role name
1113249951.100616.0 Personal Firewall
1112927873.881659.0 Antivirus
1183670148.427197.0 UAC
Identifier: 2
Resource: 10.100.17.0/24:*
Resource: 10.100.16.23-10.100.16.60:*
Resource: 10.100.18.0/24:*
Action: deny
Apply: all

```

show services unified-access-control policies detail (EX Series switch)

```

user@switch> services unified-access-control policies detail
Identifier: 1
Resource: 10.204.88.192:*

```

```
Resource: 00:1b:c0:58:9b:00
Action: deny
Apply: all
Identifier: 2
Resource: *:*
Action: allow
Apply: all
Total: 2
```

show services unified-access-control policies identifier 1 (SRX Series device)

```
user@host> show services unified-access-control policies identifier 1
Identifier: 1
Resource: 10.100.15.0/24:*
Resource: 10.100.16.23-10.100.16.60:*
Action: allow
Apply: selected
Role identifier      Role name
1113249951.100616.0 Personal Firewall
1112927873.881659.0 Antivirus
1183670148.427197.0 UAC
```

show services unified-access-control policies identifier 1 (EX Series switch)

```
user@switch> show services unified-access-control policies identifier 1
Identifier: 1
Resource: 10.204.88.192:*
Action: deny
Apply: all
```

show services unified-access-control status

Syntax	show services unified-access-control status
Release Information	Command introduced in Junos OS Release 9.4. Command introduced in Junos OS Release 12.2 for EX Series switches.
Description	<p>Display the status of the connection between the SRX Series device or the EX Series switch and the Junos Pulse Access Control Service MAG Series or IC Series Appliance, as well as statistics to help debug connections to the Access Control Service appliance.</p> <p>Use this command when you have configured the SRX Series device or EX Series switch to act as a Junos OS Enforcer in an Access Control Service deployment. When deployed as a Junos OS Enforcer, the SRX Series device or EX Series switch enforces the policies that are defined on the Access Control Service device.</p>
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none"> • Configuring an EX Series Switch to Use Junos Pulse Access Control Service for Network Access Control (CLI Procedure) on page 148
List of Sample Output	show services unified-access-control status (SRX Series device) on page 354 show services unified-access-control status (EX Series switch) on page 354
Output Fields	Table 39 on page 353 lists the output fields for the show services unified-access-control status command. Output fields are listed in the approximate order in which they appear.

Table 39: show services unified-access-control status Output Fields

Field Name	Field Description
Host	The hostname of Access Control Service NAC device.
Address	The address of the Access Control Service NAC device.
Port	The security port on the Access Control Service NAC device. The default setting is 11123.
Interface	The switch interface used to connect to the Access Control Service.
State	<p>The options are:</p> <ul style="list-style-type: none"> • connected—The connection between the Access Control Service and the SRX Sseries device or EX Series switch is open. • closed—The connection between the Access Control Service and the SRX Sseries device or EX Series switch is closed.

Sample Output

show services unified-access-control status (SRX Series device)

```
user@host> show services unified-access-control status
Host      Address      Port  Interface  State
dev106vm26 10.64.11.106 11123 ge-0/0/0.0 connected
dev107vm26 10.64.11.106 11123 ge-0/0/0.0 closed
```

show services unified-access-control status (EX Series switch)

```
user@switch> show services unified-access-control status
Host      Address      Port  Interface  State
ic        10.204.88.148 11123 vlan.60    connected
```

PART 4

Troubleshooting

- [Troubleshooting Procedures on page 357](#)

CHAPTER 8

Troubleshooting Procedures

- [Troubleshooting Authentication of End Devices on EX Series Switches on page 357](#)

Troubleshooting Authentication of End Devices on EX Series Switches

Problem **Description:** End devices configured using static MAC addresses lose connection to the switch after the clear dot1x interface command is run to clear all learned MAC addresses. Before clearing MAC addresses:

```
user@switch# run show ethernet-switching table
Ethernet-switching table: 3 entries, 1 learned, 0 persistent entries
VLAN      MAC address      Type      Age Interfaces
vlan100   *                Flood     - All-members
default   *                Flood     - All-members
default   00:a0:d4:00:03:00 Learn       0 ge-3/0/16.0

user@switch> show dot1x authentication-bypassed-users
MAC address      Interface      VLAN
00:a0:d4:00:03:00 ge-3/0/16.0    configured/default
```

To clear MAC addresses:

```
user@switch> clear dot1x interface
```

After clearing MAC addresses:

```
user@switch> show ethernet-switching table
Ethernet-switching table: 2 entries, 0 learned, 0 persistent entries
VLAN      MAC address      Type      Age Interfaces
vlan100   *                Flood     - All-members
default   *                Flood     - All-members

user@switch> show dot1x authentication-bypassed-users
```

Note that there are no end devices on the authentication bypass list.

Cause Static MAC addresses are treated the same as other learned MAC addresses on an interface. When the clear dot1x interface command is run, it clears all learned MAC addresses from the interface, including the static MAC bypass list (also known as the exclusion list).

Solution If you run the `clear dot1x interfaces` command for an interface that has static MAC addresses configured for authentication bypass, re-add the static MAC addresses to the static MAC bypass list.

Related Documentation

- [clear dot1x on page 302](#)
- [Understanding Authentication on EX Series Switches on page 10](#)