



Security

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aaa accounting

To enable authentication, authorization, and accounting (AAA) accounting of requested services for billing or security purposes when you use RADIUS or TACACS+, use the **aaa accounting** command in global configuration mode. To disable AAA accounting, use the **no** form of this command.

```
aaa accounting {auth-proxy | system | network | exec | connections | commands level}
{default | list-name} {start-stop | stop-only | none} [broadcast] group group-name
no aaa accounting {auth-proxy | system | network | exec | connections | commands level}
{default | list-name} {start-stop | stop-only | none} [broadcast] group group-name
```

Syntax Description

auth-proxy	Provides information about all authenticated-proxy user events.
system	Performs accounting for all system-level events not associated with users, such as reloads.
network	Runs accounting for all network-related service requests.
exec	Runs accounting for EXEC shell session. This keyword might return user profile information such as what is generated by the autocommand command.
connection	Provides information about all outbound connections made from the network access server.
commands level	Runs accounting for all commands at the specified privilege level. Valid privilege level entries are integers from 0 through 15.
default	Uses the listed accounting methods that follow this argument as the default list of methods for accounting services.
<i>list-name</i>	Character string used to name the list of at least one of the accounting methods described in
start-stop	Sends a "start" accounting notice at the beginning of a process and a "stop" accounting notice at the end of a process. The "start" accounting record is sent in the background. The requested user process begins regardless of whether the "start" accounting notice was received by the accounting server.
stop-only	Sends a "stop" accounting notice at the end of the requested user process.
none	Disables accounting services on this line or interface.
broadcast	(Optional) Enables sending accounting records to multiple AAA servers. Simultaneously sends accounting records to the first server in each group. If the first server is unavailable, fail over occurs using the backup servers defined within that group.
<i>group</i> <i>groupname</i>	At least one of the keywords described in Table 1: AAA accounting Methods, on page 5

Command Default

AAA accounting is disabled.

Command Modes

Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Use the **aaa accounting** command to enable accounting and to create named method lists defining specific accounting methods on a per-line or per-interface basis.

Table 1: AAA accounting Methods

Keyword	Description
group radius	Uses the list of all RADIUS servers for authentication as defined by the aaa group server radius command.
group tacacs+	Uses the list of all TACACS+ servers for authentication as defined by the aaa group server tacacs+ command.
group <i>group-name</i>	Uses a subset of RADIUS or TACACS+ servers for accounting as defined by the server group <i>group-name</i> .

In [Table 1: AAA accounting Methods, on page 5](#), the **group radius** and **group tacacs+** methods refer to a set of previously defined RADIUS or TACACS+ servers. Use the **radius server** and **tacacs server** commands to configure the host servers. Use the **aaa group server radius** and **aaa group server tacacs+** commands to create a named group of servers.

Cisco IOS software supports the following two methods of accounting:

- **RADIUS**—The network access server reports user activity to the RADIUS security server in the form of accounting records. Each accounting record contains accounting attribute-value (AV) pairs and is stored on the security server.
- **TACACS+**—The network access server reports user activity to the TACACS+ security server in the form of accounting records. Each accounting record contains accounting attribute-value (AV) pairs and is stored on the security server.

Method lists for accounting define the way accounting will be performed. Named accounting method lists enable you to designate a particular security protocol to be used on specific lines or interfaces for particular types of accounting services. Create a list by entering the *list-name* and the *method*, where *list-name* is any character string used to name this list (excluding the names of methods, such as radius or tacacs+) and *method* identifies the methods to be tried in sequence as given.

If the **aaa accounting** command for a particular accounting type is issued without a named method list specified, the default method list is automatically applied to all interfaces or lines (where this accounting type applies) except those that have a named method list explicitly defined. (A defined method list overrides the default method list.) If no default method list is defined, then no accounting takes place.



Note System accounting does not use named accounting lists; you can only define the default list for system accounting.

For minimal accounting, include the **stop-only** keyword to send a stop record accounting notice at the end of the requested user process. For more accounting, you can include the **start-stop** keyword, so that RADIUS

or TACACS+ sends a start accounting notice at the beginning of the requested process and a stop accounting notice at the end of the process. Accounting is stored only on the RADIUS or TACACS+ server. The none keyword disables accounting services for the specified line or interface.

When AAA accounting is activated, the network access server monitors either RADIUS accounting attributes or TACACS+ AV pairs pertinent to the connection, depending on the security method you have implemented. The network access server reports these attributes as accounting records, which are then stored in an accounting log on the security server. For a list of supported RADIUS accounting attributes, refer to the appendix RADIUS Attributes in the *Cisco IOS Security Configuration Guide*. For a list of supported TACACS+ accounting AV pairs, refer to the appendix TACACS+ Attribute-Value Pairs in the *Cisco IOS Security Configuration Guide*.



Note This command cannot be used with TACACS or extended TACACS.

This example defines a default commands accounting method list, where accounting services are provided by a TACACS+ security server, set for privilege level 15 commands with a stop-only restriction:

```
Device(config)# aaa accounting commands 15 default stop-only group TACACS+
```

This example defines a default auth-proxy accounting method list, where accounting services are provided by a TACACS+ security server with a stop-only restriction. The aaa accounting commands activates authentication proxy accounting.

```
Device(config)# aaa new model
Device(config)# aaa authentication login default group TACACS+
Device(config)# aaa authorization auth-proxy default group TACACS+
Device(config)# aaa accounting auth-proxy default start-stop group TACACS+
```

aaa accounting dot1x

To enable authentication, authorization, and accounting (AAA) accounting and to create method lists defining specific accounting methods on a per-line or per-interface basis for IEEE 802.1x sessions, use the **aaa accounting dot1x** command in global configuration mode. To disable IEEE 802.1x accounting, use the **no** form of this command.

```
aaa accounting dot1x {name | default} start-stop {broadcast group {name | radius | tacacs+}
[group {name | radius | tacacs+} ... ] | group {name | radius | tacacs+} [group
{name | radius | tacacs+} ... ]}
no aaa accounting dot1x {name | default}
```

Syntax Description

name	Name of a server group. This is optional when you enter it after the broadcast group and group keywords.
default	Specifies the accounting methods that follow as the default list for accounting services.
start-stop	Sends a start accounting notice at the beginning of a process and a stop accounting notice at the end of a process. The start accounting record is sent in the background. The requested user process begins regardless of whether or not the start accounting notice was received by the accounting server.
broadcast	Enables accounting records to be sent to multiple AAA servers and sends accounting records to the first server in each group. If the first server is unavailable, the switch uses the list of backup servers to identify the first server.
group	Specifies the server group to be used for accounting services. These are valid server group names: <ul style="list-style-type: none"> • name — Name of a server group. • radius — Lists of all RADIUS hosts. • tacacs+ — Lists of all TACACS+ hosts. <p>The group keyword is optional when you enter it after the broadcast group and group keywords. You can enter more than optional group keyword.</p>
radius	(Optional) Enables RADIUS accounting.
tacacs+	(Optional) Enables TACACS+ accounting.

Command Default

AAA accounting is disabled.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

This command requires access to a RADIUS server.

We recommend that you enter the **dot1x reauthentication** interface configuration command before configuring IEEE 802.1x RADIUS accounting on an interface.

This example shows how to configure IEEE 802.1x accounting:

```
Device(config)# aaa new-model  
Device(config)# aaa accounting dot1x default start-stop group radius
```


aaa accounting identity

To enable authentication, authorization, and accounting (AAA) for IEEE 802.1x, MAC authentication bypass (MAB), and web authentication sessions, use the **aaa accounting identity** command in global configuration mode. To disable IEEE 802.1x accounting, use the **no** form of this command.

```
aaa accounting identity {name | default} start-stop {broadcast group {name | radius | tacacs+}
[group {name | radius | tacacs+} ... ] | group {name | radius | tacacs+} [group
{name | radius | tacacs+} ... ]}
no aaa accounting identity {name | default}
```

Syntax Description

name Name of a server group. This is optional when you enter it after the **broadcast group** and **group** keywords.

default Uses the accounting methods that follow as the default list for accounting services.

start-stop Sends a start accounting notice at the beginning of a process and a stop accounting notice at the end of a process. The start accounting record is sent in the background. The requested-user process begins regardless of whether or not the start accounting notice was received by the accounting server.

broadcast Enables accounting records to be sent to multiple AAA servers and send accounting records to the first server in each group. If the first server is unavailable, the switch uses the list of backup servers to identify the first server.

group Specifies the server group to be used for accounting services. These are valid server group names:

- **name** — Name of a server group.
- **radius** — Lists of all RADIUS hosts.
- **tacacs+** — Lists of all TACACS+ hosts.

The **group** keyword is optional when you enter it after the **broadcast group** and **group** keywords. You can enter more than optional **group** keyword.

radius (Optional) Enables RADIUS authorization.

tacacs+ (Optional) Enables TACACS+ accounting.

Command Default

AAA accounting is disabled.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

To enable AAA accounting identity, you need to enable policy mode. To enable policy mode, enter the **authentication display new-style** command in privileged EXEC mode.

This example shows how to configure IEEE 802.1x accounting identity:

```
Device# authentication display new-style
```

Please note that while you can revert to legacy style configuration at any time unless you have explicitly entered new-style configuration, the following caveats should be carefully read and understood.

- (1) If you save the config in this mode, it will be written to NVRAM in NEW-style config, and if you subsequently reload the router without reverting to legacy config and saving that, you will no longer be able to revert.
- (2) In this and legacy mode, Webauth is not IPv6-capable. It will only become IPv6-capable once you have entered new-style config manually, or have reloaded with config saved in 'authentication display new' mode.

```
Device# configure terminal
```

```
Device(config)# aaa accounting identity default start-stop group radius
```

aaa authentication dot1x

To specify the authentication, authorization, and accounting (AAA) method to use on ports complying with the IEEE 802.1x authentication, use the **aaa authentication dot1x** command in global configuration mode on a standalone switch. To disable authentication, use the **no** form of this command.

```
aaa authentication dot1x {default} method1
no aaa authentication dot1x {default} method1
```

Syntax Description	default	The default method when a user logs in. Use the listed authentication method that follows this argument.
	<i>method1</i>	Specifies the server authentication. Enter the group radius keywords to use the list of all RADIUS servers for authentication.
	Note	Though other keywords are visible in the command-line help strings, only the default and group radius keywords are supported.

Command Default No authentication is performed.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines The **method** argument identifies the method that the authentication algorithm tries in the specified sequence to validate the password provided by the client. The only method that is IEEE 802.1x-compliant is the **group radius** method, in which the client data is validated against a RADIUS authentication server.

If you specify **group radius**, you must configure the RADIUS server by entering the **radius-server host** global configuration command.

Use the **show running-config** privileged EXEC command to display the configured lists of authentication methods.

This example shows how to enable AAA and how to create an IEEE 802.1x-compliant authentication list. This authentication first tries to contact a RADIUS server. If this action returns an error, the user is not allowed access to the network.

```
Device(config)# aaa new-model
Device(config)# aaa authentication dot1x default group radius
```

aaa authorization

To set the parameters that restrict user access to a network, use the **aaa authorization** command in global configuration mode. To remove the parameters, use the **no** form of this command.

```
aaa authorization { auth-proxy | cache | commands level | config-commands | configuration
| console | credential-download | exec | multicast | network | onep | policy-if | prepaid
| radius-proxy | reverse-access | subscriber-service | template } { default | list_name }
[method1 [ method2 . . . ]]
aaa authorization { auth-proxy | cache | commands level | config-commands | configuration
| console | credential-download | exec | multicast | network | reverse-access | template }
{ default | list_name } [method1 [ method2 . . . ]]
no aaa authorization { auth-proxy | cache | commands level | config-commands | configuration
| console | credential-download | exec | multicast | network | reverse-access | template }
{ default | list_name } [method1 [ method2 . . . ]]
```

Syntax Description

auth-proxy	Runs authorization for authentication proxy services.
cache	Configures the authentication, authorization, and accounting (AAA) server.
commands	Runs authorization for all commands at the specified privilege level.
<i>level</i>	Specific command level that should be authorized. Valid entries are 0 through 15.
config-commands	Runs authorization to determine whether commands entered in configuration mode are authorized.
configuration	Downloads the configuration from the AAA server.
console	Enables the console authorization for the AAA server.
credential-download	Downloads EAP credential from Local/RADIUS/LDAP.
exec	Enables the console authorization for the AAA server.
multicast	Downloads the multicast configuration from the AAA server.
network	Runs authorization for all network-related service requests, including Serial Line Internet Protocol (SLIP), PPP, PPP Network Control Programs (NCPs), and AppleTalk Remote Access (ARA).
onep	Runs authorization for the ONEP service.
reverse-access	Runs authorization for reverse access connections, such as reverse Telnet.
template	Enables template authorization for the AAA server.
default	Uses the listed authorization methods that follow this keyword as the default list of methods for authorization.
<i>list_name</i>	Character string used to name the list of authorization methods.

method1 [*method2...*] (Optional) An authorization method or multiple authorization methods to be used for authorization. A method may be any one of the keywords listed in the table below.

Command Default Authorization is disabled for all actions (equivalent to the method keyword **none**).

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Use the **aaa authorization** command to enable authorization and to create named methods lists, which define authorization methods that can be used when a user accesses the specified function. Method lists for authorization define the ways in which authorization will be performed and the sequence in which these methods will be performed. A method list is a named list that describes the authorization methods (such as RADIUS or TACACS+) that must be used in sequence. Method lists enable you to designate one or more security protocols to be used for authorization, which ensures a backup system in case the initial method fails. Cisco IOS software uses the first method listed to authorize users for specific network services; if that method fails to respond, the Cisco IOS software selects the next method listed in the method list. This process continues until there is successful communication with a listed authorization method, or until all the defined methods are exhausted.



Note The Cisco IOS software attempts authorization with the next listed method only when there is no response from the previous method. If authorization fails at any point in this cycle--meaning that the security server or the local username database responds by denying the user services--the authorization process stops and no other authorization methods are attempted.

If the **aaa authorization** command for a particular authorization type is issued without a specified named method list, the default method list is automatically applied to all interfaces or lines (where this authorization type applies) except those that have a named method list explicitly defined. (A defined method list overrides the default method list.) If no default method list is defined, then no authorization takes place. The default authorization method list must be used to perform outbound authorization, such as authorizing the download of IP pools from the RADIUS server.

Use the **aaa authorization** command to create a list by entering the values for the *list-name* and the *method* arguments, where *list-name* is any character string used to name this list (excluding all method names) and *method* identifies the list of authorization methods tried in the given sequence.



Note In the table that follows, the **group***group-name*, **group ldap**, **group radius**, and **group tacacs+** methods refer to a set of previously defined RADIUS or TACACS+ servers. Use the **radius server** and **tacacs server** commands to configure the host servers. Use the **aaa group server radius**, **aaa group server ldap**, and **aaa group server tacacs+** commands to create a named group of servers.

This table describes the method keywords.

Table 2: aaa authorization Methods

Keyword	Description
cache <i>group-name</i>	Uses a cache server group for authorization.
group <i>group-name</i>	Uses a subset of RADIUS or TACACS+ servers for accounting as defined by the server group group-name command.
group ldap	Uses the list of all Lightweight Directory Access Protocol (LDAP) servers for authentication.
group radius	Uses the list of all RADIUS servers for authentication as defined by the aaa group server radius command.
grouptacacs+	Uses the list of all TACACS+ servers for authentication as defined by the aaa group server tacacs+ command.
if-authenticated	Allows the user to access the requested function if the user is authenticated. Note The if-authenticated method is a terminating method. Therefore, if it is listed as a method, any methods listed after it will never be evaluated.
local	Uses the local database for authorization.
none	Indicates that no authorization is performed.

Cisco IOS software supports the following methods for authorization:

- Cache Server Groups—The router consults its cache server groups to authorize specific rights for users.
- If-Authenticated—The user is allowed to access the requested function provided the user has been authenticated successfully.
- Local—The router or access server consults its local database, as defined by the **username** command, to authorize specific rights for users. Only a limited set of functions can be controlled through the local database.
- None—The network access server does not request authorization information; authorization is not performed over this line or interface.
- RADIUS—The network access server requests authorization information from the RADIUS security server group. RADIUS authorization defines specific rights for users by associating attributes, which are stored in a database on the RADIUS server, with the appropriate user.
- TACACS+—The network access server exchanges authorization information with the TACACS+ security daemon. TACACS+ authorization defines specific rights for users by associating attribute-value (AV) pairs, which are stored in a database on the TACACS+ security server, with the appropriate user.

Method lists are specific to the type of authorization being requested. AAA supports five different types of authorization:

- **Commands**—Applies to the EXEC mode commands a user issues. Command authorization attempts authorization for all EXEC mode commands, including global configuration commands, associated with a specific privilege level.
- **EXEC**—Applies to the attributes associated with a user EXEC terminal session.
- **Network**—Applies to network connections. The network connections can include a PPP, SLIP, or ARA connection.



Note You must configure the **aaa authorization config-commands** command to authorize global configuration commands, including EXEC commands prepended by the **do** command.

- **Reverse Access**—Applies to reverse Telnet sessions.
- **Configuration**—Applies to the configuration downloaded from the AAA server.

When you create a named method list, you are defining a particular list of authorization methods for the indicated authorization type.

Once defined, the method lists must be applied to specific lines or interfaces before any of the defined methods are performed.

The authorization command causes a request packet containing a series of AV pairs to be sent to the RADIUS or TACACS daemon as part of the authorization process. The daemon can do one of the following:

- Accept the request as is.
- Make changes to the request.
- Refuse the request and authorization.

For a list of supported RADIUS attributes, see the module RADIUS Attributes. For a list of supported TACACS+ AV pairs, see the module TACACS+ Attribute-Value Pairs.



Note Five commands are associated with privilege level 0: **disable**, **enable**, **exit**, **help**, and **logout**. If you configure AAA authorization for a privilege level greater than 0, these five commands will not be included in the privilege level command set.

The following example shows how to define the network authorization method list named `mygroup`, which specifies that RADIUS authorization will be used on serial lines using PPP. If the RADIUS server fails to respond, local network authorization will be performed.

```
Device(config)# aaa authorization network mygroup group radius local
```

aaa new-model

To enable the authentication, authorization, and accounting (AAA) access control model, issue the **aaa new-model** command in global configuration mode. To disable the AAA access control model, use the **no** form of this command.

aaa new-model
no aaa new-model

Syntax Description This command has no arguments or keywords.

Command Default AAA is not enabled.

Command Modes Global configuration (config)

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines This command enables the AAA access control system.

If the **login local** command is configured for a virtual terminal line (VTY), and the **aaa new-model** command is removed, you must reload the switch to get the default configuration or the **login** command. If the switch is not reloaded, the switch defaults to the **login local** command under the VTY.



Note We do not recommend removing the **aaa new-model** command.

The following example shows this restriction:

```
Device(config)# aaa new-model
Device(config)# line vty 0 15
Device(config-line)# login local
Device(config-line)# exit
Device(config)# no aaa new-model
Device(config)# exit
Device# show running-config | b line vty

line vty 0 4
 login local !<=== Login local instead of "login"
line vty 5 15
 login local
!
```

Examples

The following example initializes AAA:

```
Device(config)# aaa new-model
Device(config)#
```


Related Commands	Command	Description
	aaa accounting	Enables AAA accounting of requested services for billing or security purposes.
	aaa authentication arap	Enables an AAA authentication method for ARAP using TACACS+.
	aaa authentication enable default	Enables AAA authentication to determine if a user can access the privileged command level.
	aaa authentication login	Sets AAA authentication at login.
	aaa authentication ppp	Specifies one or more AAA authentication method for use on serial interfaces running PPP.
	aaa authorization	Sets parameters that restrict user access to a network.

access-session mac-move deny

To disable MAC move on a , use the **access-session mac-move deny** global configuration command. To return to the default setting, use the **no** form of this command.

```
access-session mac-move deny
no access-session mac-move deny
```

Syntax Description This command has no arguments or keywords.

Command Default MAC move is enabled.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines The **no** form of this command enables authenticated hosts to move between any authentication-enabled ports (MAC authentication bypass [MAB], 802.1x, or Web-auth) on a . For example, if there is a device between an authenticated host and port, and that host moves to another port, the authentication session is deleted from the first port, and the host is reauthenticated on the new port.

If MAC move is disabled, and an authenticated host moves to another port, it is not reauthenticated, and a violation error occurs.

This example shows how to enable MAC move on a :

```
Device(config)# no access-session mac-move deny
```

Related Commands

Command	Description
authentication event	Sets the action for specific authentication events.
authentication fallback	Configures a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
authentication host-mode	Sets the authorization manager mode on a port.
authentication open	Enables or disables open access on a port.
authentication order	Sets the order of authentication methods used on a port.
authentication periodic	Enables or disables reauthentication on a port.
authentication port-control	Enables manual control of the port authorization state.

Command	Description
authentication priority	Adds an authentication method to the port-priority list.
authentication timer	Configures the timeout and reauthentication parameters for an 802.1x-enabled port.
authentication violation	Configures the violation modes that occur when a new device connects to a port or when a new device connects to a port with the maximum number of devices already connected to that port.
show authentication	Displays information about authentication manager events on the switch.

access-session template monitor

To set the access session template to monitor ports, use the **access-session template monitor** command in global configuration mode. To return to the default setting, use the **no** form of this command.

access-session template monitor

no access-session template monitor

Syntax Description This command has no arguments or keywords.

Command Default This command is not configured.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines The **access-session template monitor** command enables session monitoring to create sessions on all ports where authentication configurations are not present, and MAC addresses are known. These sessions have open access ports for traffic, multi-auth host mode to control the number of hosts on a port, and port-control set to auto for sessions to undergo authentication and authorization. The **access-session template monitor** command is enabled by default if the **device classifier** or **autoconf** command is enabled. Session monitoring can be disabled on a per port basis.

This command is available on devices that has Identity-Based Networking Services (IBNS). The equivalent command for **access-session template monitor** command in IBNS **new-style** mode is **access-session monitor**. To switch from IBNS legacy mode to new style mode, use the **authentication convert-to new-style** command.

Examples

The following example shows how to set the access session template to monitor ports:

```
Device(config)# access-session template monitor
```

Related Commands	Command	Description
	device classifier	Creates a monitor session for all the MAC addresses learned in the system.
	authentication convert-to new-style	Converts all the relevant authentication commands to their CPL control policy-equivalents.

action

To set the action for the VLAN access map entry, use the **action** command in access-map configuration mode. To return to the default setting, use the **no** form of this command.

actiondrop | forward
no action

Syntax Description	drop	Drops the packet when the specified conditions are matched.
	forward	Forwards the packet when the specified conditions are matched.
Command Default	The default action is to forward packets.	
Command Modes	Access-map configuration	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You enter access-map configuration mode by using the **vlan access-map** global configuration command.

If the action is **drop**, you should define the access map, including configuring any access control list (ACL) names in match clauses, before applying the map to a VLAN, or all packets could be dropped.

In access-map configuration mode, use the **match access-map** configuration command to define the match conditions for a VLAN map. Use the **action** command to set the action that occurs when a packet matches the conditions.

The drop and forward parameters are not used in the **no** form of the command.

You can verify your settings by entering the **show vlan access-map** privileged EXEC command.

This example shows how to identify and apply a VLAN access map (vmap4) to VLANs 5 and 6 that causes the VLAN to forward an IP packet if the packet matches the conditions defined in access list a12:

```
Device(config)# vlan access-map vmap4
Device(config-access-map)# match ip address a12
Device(config-access-map)# action forward
Device(config-access-map)# exit
Device(config)# vlan filter vmap4 vlan-list 5-6
```

authentication host-mode

To set the authorization manager mode on a port, use the **authentication host-mode** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

authentication host-mode { **multi-auth** | **multi-domain** | **multi-host** | **single-host** }
no authentication host-mode

Syntax Description		
multi-auth	Enables multiple-authorization mode (multi-auth mode) on the port.	
multi-domain	Enables multiple-domain mode on the port.	
multi-host	Enables multiple-host mode on the port.	
single-host	Enables single-host mode on the port.	

Command Default Single host mode is enabled.

Command Modes Interface configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Single-host mode should be configured if only one data host is connected. Do not connect a voice device to authenticate on a single-host port. Voice device authorization fails if no voice VLAN is configured on the port.

Multi-domain mode should be configured if data host is connected through an IP phone to the port. Multi-domain mode should be configured if the voice device needs to be authenticated.

Multi-auth mode should be configured to allow devices behind a hub to obtain secured port access through individual authentication. Only one voice device can be authenticated in this mode if a voice VLAN is configured.

Multi-host mode also offers port access for multiple hosts behind a hub, but multi-host mode gives unrestricted port access to the devices after the first user gets authenticated.

This example shows how to enable multi-auth mode on a port:

```
Device(config-if)# authentication host-mode multi-auth
```

This example shows how to enable multi-domain mode on a port:

```
Device(config-if)# authentication host-mode multi-domain
```

This example shows how to enable multi-host mode on a port:

```
Device(config-if) # authentication host-mode multi-host
```

This example shows how to enable single-host mode on a port:

```
Device(config-if) # authentication host-mode single-host
```

You can verify your settings by entering the **show authentication sessions interface** *interface* **details** privileged EXEC command.

authentication mac-move permit

To enable MAC move on a , use the **authentication mac-move permit** command in global configuration mode. To disable MAC move, use the **no** form of this command.

authentication mac-move permit
no authentication mac-move permit

Syntax Description This command has no arguments or keywords.

Command Default MAC move is disabled.

Command Modes Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

This is a legacy command. The new command is **access-session mac-move deny**.

The command enables authenticated hosts to move between any authentication-enabled ports (MAC authentication bypass [MAB], 802.1x, or Web-auth) on a . For example, if there is a device between an authenticated host and port, and that host moves to another port, the authentication session is deleted from the first port, and the host is reauthenticated on the new port.

If MAC move is disabled, and an authenticated host moves to another port, it is not reauthenticated, and a violation error occurs.

This example shows how to enable MAC move on a :

```
Device(config)# authentication mac-move permit
```

Related Commands


Command	Description
access-session mac-move deny	Disables MAC move on a .
authentication event	Sets the action for specific authentication events.
authentication fallback	Configures a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
authentication host-mode	Sets the authorization manager mode on a port.
authentication open	Enables or disables open access on a port.
authentication order	Sets the order of authentication methods used on a port.
authentication periodic	Enable or disables reauthentication on a port.

Command	Description
authentication port-control	Enables manual control of the port authorization state.
authentication priority	Adds an authentication method to the port-priority list.
authentication timer	Configures the timeout and reauthentication parameters for an 802.1x-enabled port.
authentication violation	Configures the violation modes that occur when a new device connects to a port or when a new device connects to a port with the maximum number of devices already connected to that port.
show authentication	Displays information about authentication manager events on the switch.

authentication priority

To add an authentication method to the port-priority list, use the **authentication priority** command in interface configuration mode. To return to the default, use the **no** form of this command.

```
authentication priority [dot1x | mab] {webauth}
no authentication priority [dot1x | mab] {webauth}
```

Syntax Description	dot1x	(Optional) Adds 802.1x to the order of authentication methods.
	mab	(Optional) Adds MAC authentication bypass (MAB) to the order of authentication methods.
	webauth	Adds web authentication to the order of authentication methods.
Command Default	The default priority is 802.1x authentication, followed by MAC authentication bypass and web authentication.	
Command Modes	Interface configuration	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Usage Guidelines	<p>Ordering sets the order of methods that the switch attempts when trying to authenticate a new device is connected to a port.</p> <p>When configuring multiple fallback methods on a port, set web authentication (webauth) last.</p> <p>Assigning priorities to different authentication methods allows a higher-priority method to interrupt an in-progress authentication method with a lower priority.</p>	
 Note	<p>If a client is already authenticated, it might be reauthenticated if an interruption from a higher-priority method occurs.</p> <p>The default priority of an authentication method is equivalent to its position in execution-list order: 802.1x authentication, MAC authentication bypass (MAB), and web authentication. Use the dot1x, mab, and webauth keywords to change this default order.</p> <p>This example shows how to set 802.1x as the first authentication method and web authentication as the second authentication method:</p> <pre>Device(config-if)# authentication priority dotx webauth</pre> <p>This example shows how to set MAB as the first authentication method and web authentication as the second authentication method:</p>	

```
Device(config-if) # authentication priority mab webauth
```

Related Commands	Command	Description
	authentication control-direction	Configures the port mode as unidirectional or bidirectional.
	authentication event fail	Specifies how the Auth Manager handles authentication failures as a result of unrecognized user credentials.
	authentication event no-response action	Specifies how the Auth Manager handles authentication failures as a result of a nonresponsive host.
	authentication event server alive action reinitialize	Reinitializes an authorized Auth Manager session when a previously unreachable authentication, authorization, and accounting server becomes available.
	authentication event server dead action authorize	Authorizes Auth Manager sessions when the authentication, authorization, and accounting server becomes unreachable.
	authentication fallback	Enables a web authentication fallback method.
	authentication host-mode	Allows hosts to gain access to a controlled port.
	authentication open	Enables open access on a port.
	authentication order	Specifies the order in which the Auth Manager attempts to authenticate a client on a port.
	authentication periodic	Enables automatic reauthentication on a port.
	authentication port-control	Configures the authorization state of a controlled port.
	authentication timer inactivity	Configures the time after which an inactive Auth Manager session is terminated.
	authentication timer reauthenticate	Specifies the period of time between which the Auth Manager attempts to reauthenticate authorized ports.
	authentication timer restart	Specifies the period of time after which the Auth Manager attempts to authenticate an unauthorized port.
	authentication violation	Specifies the action to be taken when a security violation occurs on a port.
	mab	Enables MAC authentication bypass on a port.

Command	Description
show authentication registrations	Displays information about the authentication methods that are registered with the Auth Manager.
show authentication sessions	Displays information about current Auth Manager sessions.
show authentication sessions interface	Displays information about the Auth Manager for a given interface.

authentication violation

To configure the violation modes that occur when a new device connects to a port or when a new device connects to a port after the maximum number of devices are connected to that port, use the **authentication violation** command in interface configuration mode.

```
authentication violation { protect | replace | restrict | shutdown }
no authentication violation { protect | replace | restrict | shutdown }
```

Syntax Description	Mode	Description
	protect	Drops unexpected incoming MAC addresses. No syslog errors are generated.
	replace	Removes the current session and initiates authentication with the new host.
	restrict	Generates a syslog error when a violation error occurs.
	shutdown	Error-disables the port or the virtual port on which an unexpected MAC address occurs.

Command Default Authentication violation shutdown mode is enabled.

Command Modes Interface configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Use the **authentication violation** command to specify the action to be taken when a security violation occurs on a port.

This example shows how to configure an IEEE 802.1x-enabled port as error-disabled and to shut down when a new device connects it:

```
Device(config-if) # authentication violation shutdown
```

This example shows how to configure an 802.1x-enabled port to generate a system error message and to change the port to restricted mode when a new device connects to it:

```
Device(config-if) # authentication violation restrict
```

This example shows how to configure an 802.1x-enabled port to ignore a new device when it connects to the port:

```
Device(config-if) # authentication violation protect
```

This example shows how to configure an 802.1x-enabled port to remove the current session and initiate authentication with a new device when it connects to the port:

```
Device(config-if)# authentication violation replace
```

You can verify your settings by entering the **show authentication** privileged EXEC command.

cisp enable

To enable Client Information Signaling Protocol (CISP) on a switch so that it acts as an authenticator to a supplicant switch and a supplicant to an authenticator switch, use the **cisp enable** global configuration command.

cisp enable
no cisp enable

Syntax Description This command has no arguments or keywords.

Command Default No default behavior or values.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.
		This command was reintroduced. This command was not supported in and

Usage Guidelines The link between the authenticator and supplicant switch is a trunk. When you enable VTP on both switches, the VTP domain name must be the same, and the VTP mode must be server.

To avoid the MD5 checksum mismatch error when you configure VTP mode, verify that:

- VLANs are not configured on two different switches, which can be caused by two VTP servers in the same domain.
- Both switches have different configuration revision numbers.

This example shows how to enable CISP:

```
Device(config)# cisp enable
```

Related Commands	Command	Description
	dot1x credentials <i>profile</i>	Configures a profile on a supplicant switch.
	dot1x supplicant force-multicast	Forces 802.1X supplicant to send multicast packets.
	dot1x supplicant controlled transient	Configures controlled access by 802.1X supplicant.
	show cisp	Displays CISP information for a specified interface.

clear errdisable interface vlan

To reenable a VLAN that was error-disabled, use the **clear errdisable interface** command in privileged EXEC mode.

clear errdisable interface *interface-id* **vlan** [*vlan-list*]

Syntax Description	<i>interface-id</i>	Specifies an interface.
	<i>vlan list</i>	(Optional) Specifies a list of VLANs to be reenabled. If a VLAN list is not specified, then all VLANs are reenabled.
Command Default	No default behavior or values.	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines You can reenable a port by using the **shutdown** and **no shutdown** interface configuration commands, or you can clear error-disable for VLANs by using the **clear errdisable** interface command.

This example shows how to reenable all VLANs that were error-disabled on Gigabit Ethernet port 4/0/2:

```
Device# clear errdisable interface gigabitethernet4/0/2 vlan
```

Related Commands	Command	Description
	errdisable detect cause	Enables error-disabled detection for a specific cause or all causes.
	errdisable recovery	Configures the recovery mechanism variables.
	show errdisable detect	Displays error-disabled detection status.
	show errdisable recovery	Displays error-disabled recovery timer information.
	show interfaces status err-disabled	Displays interface status of a list of interfaces in error-disabled state.

clear mac address-table

To delete from the MAC address table a specific dynamic address, all dynamic addresses on a particular interface, all dynamic addresses on stack members, or all dynamic addresses on a particular VLAN, use the **clear mac address-table** command in privileged EXEC mode. This command also clears the MAC address notification global counters.

```
clear mac address-table {dynamic [address mac-addr | interface interface-id | vlan vlan-id]
| move update | notification}
```

Syntax Description		
dynamic		Deletes all dynamic MAC addresses.
address <i>mac-addr</i>		(Optional) Deletes the specified dynamic MAC address.
interface <i>interface-id</i>		(Optional) Deletes all dynamic MAC addresses on the specified physical port or port channel.
vlan <i>vlan-id</i>		(Optional) Deletes all dynamic MAC addresses for the specified VLAN. The range is 1 to 4094.
move update		Clears the MAC address table move-update counters.
notification		Clears the notifications in the history table and reset the counters.

Command Default No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines You can verify that the information was deleted by entering the **show mac address-table** privileged EXEC command.

This example shows how to remove a specific MAC address from the dynamic address table:

```
Device# clear mac address-table dynamic address 0008.0070.0007
```

Related Commands	Command	Description
	mac address-table notification	Enables the MAC address notification feature.
	mac address-table move update { receive transmit }	Configures MAC address-table move update on the switch.

Command	Description
show mac address-table	Displays the MAC address table static and dynamic entries.
show mac address-table move update	Displays the MAC address-table move update information on the switch.
show mac address-table notification	Displays the MAC address notification settings for all interfaces or on the specified interface when the interface keyword is appended.
snmp trap mac-notification change	Enables the SNMP MAC address notification trap on a specific interface.

confidentiality-offset

To enable MACsec Key Agreement protocol (MKA) to set the confidentiality offset for MACsec operations, use the **confidentiality-offset** command in MKA-policy configuration mode. To disable confidentiality offset, use the **no** form of this command.

confidentiality-offset
no confidentiality-offset

Syntax Description This command has no arguments or keywords.

Command Default Confidentiality offset is disabled.

Command Modes MKA-policy configuration (config-mka-policy)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Examples

The following example shows how to enable the confidentiality offset:

```
Device> enable
Device# configure terminal
Device(config)# mka policy 2
Device(config-mka-policy)# confidentiality-offset
```

Related Commands	Command	Description
	mka policy	Configures an MKA policy.
	delay-protection	Configures MKA to use delay protection in sending MKPDU.
	include-icv-indicator	Includes ICV indicator in MKPDU.
	key-server	Configures MKA key-server options.
	macsec-cipher-suite	Configures cipher suite for deriving SAK.
	sak-rekey	Configures the SAK rekey interval.
	send-secure-announcements	Configures MKA to send secure announcements in sending MKPDUs.
	ssci-based-on-sci	Computes SSCI based on the SCI.
	use-updated-eth-header	Uses the updated Ethernet header for ICV calculation.

cts manual

To manually enable an interface for Cisco TrustSec Security, use the **cts manual** command in interface configuration mode.

cts manual

Syntax Description This command has no arguments or keywords.

Command Default Disabled

Command Modes Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was modified with additional options.
	Cisco IOS XE 3.7E	This command was introduced.

Usage Guidelines Use the **cts manual** command to enter the TrustSec manual interface configuration in which policies and the Security Association Protocol (SAP) are configured on the link.

When **cts manual** command is configured, 802.1X authentication is not performed on the link. Use the **policy** subcommand to define and apply policies on the link. By default no policy is applied. To configure MACsec link-to-link encryption, the SAP negotiation parameters must be defined. By default SAP is not enabled. The same SAP PMK should be configured on both sides of the link (that is, a shared secret)

Examples

The following example shows how to enter the Cisco TrustSec manual mode:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet 0
Switch(config-if)# cts manual
Switch(config-if-cts-manual)#
```

The following example shows how to remove the Cisco TrustSec manual configuration from an interface:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet 0
Switch(config-if)# no cts manual
```

Related Commands

Command	Description
propagate sgt (cts manual)	Enables SGT propagation at Layer 2 on Cisco TrustSec Security interfaces.
sap mode-list (cts manual)	Manually specifies the PMK and the SAP authentication and encryption modes to negotiate MACsec link encryption between two interfaces.
show cts interface	Displays Cisco TrustSec interface configuration statistics.

cts role-based enforcement

To enable Cisco TrustSec role-based (security group) access control enforcement, use the **cts role-based enforcement** command in global configuration mode. To disable the configuration, use the **no** form of this command.

```
cts role-based enforcement [logging-interval interval | vlan-list all | vlan-ID [,] [-]]
no cts role-based enforcement [logging-interval interval | vlan-list all | vlan-ID [,] [-]]
```

Syntax Description	
logging-interval <i>interval</i>	(Optional) Configures a logging interval for a security group access control list (SGACL). Valid values for the <i>interval</i> argument are from 5 to 86400 seconds. The default is 300 seconds
vlan-list	(Optional) Configures VLANs on which role-based ACLs are enforced.
all	(Optional) Specifies all VLANs.
<i>vlan-ID</i>	(Optional) VLAN ID. Valid values are from 1 to 4094.
,	(Optional) Specifies another VLAN separated by a comma.
-	(Optional) Specifies a range of VLANs separated by a hyphen.

Command Default Role-based access control is not enforced.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines



Note RBACL and SGACL are used interchangeably.

Use the **cts role-based enforcement** command to globally enable or disable SGACL enforcement for Cisco TrustSec-enabled interfaces in the system.

The default interval after which log for a given flow is printed is 300 seconds. Use the **logging-interval** keyword to change the default interval. Logging is only triggered when the Cisco ACE Application Control Engine has the **logging** keyword.

SGACL enforcement is not enabled by default on VLANs. Use the **cts role-based enforcement vlan-list** command to enable or disable SGACL enforcement for Layer 2 switched packets and for Layer 3 switched packets on an switched virtual interface (SVI).

The *vlan-ID* argument can be a single VLAN ID, a list of VLAN IDs, or VLAN ID ranges.

When a VLAN in which a SGACL is enforced has an active SVI, the SGACL is enforced for both Layer 2 and Layer 3 switched packets within that VLAN. Without an SVI, the SGACL is enforced only for Layer 2 switched packets, because no Layer 3 switching is possible within a VLAN without an SVI.

The following example shows configure an SGACL logging interval:

```
Switch(config)# cts role-based enforcement logging-interval 90
Switch(config)# logging rate-limit

May 27 10:19:21.509: %RBM-6-SGACLHIT:
ingress_interface='GigabitEthernet1/0/2' sgacl_name='sgacl2' action='Deny'
protocol='icmp' src-ip='16.16.1.3' src-port='8' dest-ip='17.17.1.2' dest-port='0'
sgt='101' dgt='202' logging_interval_hits='5'
```

Related Commands

Command	Description
logging rate-limit	Limits the rate of messages logged per second.
show cts role-based permissions	Displays the SGACL permission list.

cts role-based l2-vrf

To select a virtual routing and forwarding (VRF) instance for Layer 2 VLANs, use the **cts role-based l2-vrf** command in global configuration mode. To remove the configuration, use the **no** form of this command.

```
cts role-based l2-vrf vrf-name vlan-list all vlan-ID [,] [-]
no cts role-based l2-vrf vrf-name vlan-list all vlan-ID [,] [-]
```

Syntax Description

<i>vrf-name</i>	Name of the VRF instance.
vlan-list	Specifies the list of VLANs to be assigned to a VRF instance.
all	Specifies all VLANs.
<i>vlan-ID</i>	VLAN ID. Valid values are from 1 to 4094.
,	(Optional) Specifies another VLAN separated by a comma.
-	(Optional) Specifies a range of VLANs separated by a hyphen.

Command Default

VRF instances are not selected.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

The *vlan-list* argument can be a single VLAN ID, a list of comma-separated VLAN IDs, or hyphen-separated VLAN ID ranges.

The **all** keyword is equivalent to the full range of VLANs supported by the network device. The **all** keyword is not preserved in the nonvolatile generation (NVGEN) process.

If the **cts role-based l2-vrf** command is issued more than once for the same VRF, each successive command entered adds the VLAN IDs to the specified VRF.

The VRF assignments configured by the **cts role-based l2-vrf** command are active as long as a VLAN remains a Layer 2 VLAN. The IP-SGT bindings learned while a VRF assignment is active are also added to the Forwarding Information Base (FIB) table associated with the VRF and the IP protocol version. If an Switched Virtual Interface (SVI) becomes active for a VLAN, the VRF-to-VLAN assignment becomes inactive and all bindings learned on the VLAN are moved to the FIB table associated with the VRF of the SVI.

Use the **interface vlan** command to configure an SVI interface, and the **vrf forwarding** command to associate a VRF instance to the interface.

The VRF-to-VLAN assignment is retained even when the assignment becomes inactive. It is reactivated when the SVI is removed or when the SVI IP address is changed. When reactivated, the IP-SGT bindings are moved back from the FIB table associated with the VRF of the SVI to the FIB table associated with the VRF assigned by the **cts role-based l2-vrf** command.

The following example shows how to select a list of VLANs to be assigned to a VRF instance:

```
Switch(config)# cts role-based l2-vrf vrf1 vlan-list 20
```

The following example shows how to configure an SVI interface and associate a VRF instance:

```
Switch(config)# interface vlan 101  
Switch(config-if)# vrf forwarding vrf1
```

Related Commands

Command	Description
interface vlan	Configures a VLAN interface.
vrf forwarding	Associates a VRF instance or a virtual network with an interface or subinterface.
show cts role-based permissions	Displays the SGACL permission list.

cts role-based monitor

To enable role-based (security-group) access list monitoring, use the **cts role-based monitor** command in global configuration mode. To remove role-based access list monitoring, use the **no** form of this command.

```
cts role-based monitor all | permissions | default | from sgt | unknown to sgt | unknown [ipv4]
no cts role-based monitor all | permissions | default | from sgt | unknown to sgt | unknown [ipv4]
```

Syntax Description

all	Monitors permissions for all source tags to all destination tags.
permissions	Monitors permissions from a source tags to a destination tags.
default	Monitors the default permission list.
from	Specifies the source group tag for filtered traffic.
<i>sgt</i>	Security Group Tag (SGT). Valid values are from 2 to 65519.
unknown	Specifies an unknown source or destination group tag (DST).
ipv4	(Optional) Specifies the IPv4 protocol.

Command Default

Role-based access control monitoring is not enabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

Use the **cts role-based monitor all** command to enable the global monitor mode. If the **cts role-based monitor all** command is configured, the output of the **show cts role-based permissions** command displays monitor mode for all configured policies as true.

The following examples shows how to configure SGACL monitor from a source tag to a destination tag:

```
Switch(config)# cts role-based monitor permissions from 10 to 11
```

Related Commands

Command	Description
show cts role-based permissions	Displays the SGACL permission list.

cts role-based permissions

To enable permissions from a source group to a destination group, use the **cts role-based permissions** command in global configuration mode. To remove the permissions, use the **no** form of this command.

```
cts role-based permissions default ipv4 | from sgt | unknown to sgt | unknown ipv4 rbacl-name
[rbacl-name....]
no cts role-based permissions default [ipv4] | from sgt | unknown to sgt | unknown
[ipv4]
```

Syntax Description

default	Specifies the default permissions list. Every cell (an SGT pair) for which, security group access control list (SGACL) permission is not configured statically or dynamically falls under the default category.
ipv4	Specifies the IPv4 protocol.
from	Specifies the source group tag of the filtered traffic.
<i>sgt</i>	Security Group Tag (SGT). Valid values are from 2 to 65519.
unknown	Specifies an unknown source or destination group tag.
<i>rbacl-name</i>	Role-based access control list (RBACL) or SGACL name. Up to 16 SGACLs can be specified in the configuration.

Command Default

Permissions from a source group to a destination group is not enabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

Use the **cts role-based permissions** command to define, replace, or delete the list of SGACLs for a given source group tag (SGT), destination group tag (DGT) pair. This policy is in effect as long as there is no dynamic policy for the same DGT or SGT.

The **cts role-based permissions default** command defines, replaces, or deletes the list of SGACLs of the default policy as long as there is no dynamic policy for the same DGT.

The following example shows how to enable permissions for a destination group:

```
Switch(config)# cts role-based permissions from 6 to 6 mon_2
```

Related Commands

Command	Description
show cts role-based permissions	Displays the SGACL permission list.

delay-protection

To configure MKA to use delay protection in sending MACsec Key Agreement Protocol Data Units (MKPDUs), use the **delay-protection** command in MKA-policy configuration mode. To disable delay protection, use the **no** form of this command.

delay-protection
no delay-protection

Syntax Description This command has no arguments or keywords.

Command Default Delay protection for sending MKPDUs is disabled.

Command Modes MKA-policy configuration (config-mka-policy)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Examples

The following example shows how to configure MKA to use delay protection in sending MKPDUs:

```
Device> enable
Device# configure terminal
Device(config)# mka policy 2
Device(config-mka-policy)# delay-protection
```

Related Commands	Command	Description
	mka policy	Configures an MKA policy.
	confidentiality-offset	Sets the confidentiality offset for MACsec operations.
	include-icv-indicator	Includes ICV indicator in MKPDU.
	key-server	Configures MKA key-server options.
	macsec-cipher-suite	Configures cipher suite for deriving SAK.
	sak-rekey	Configures the SAK rekey interval.
	send-secure-announcements	Configures MKA to send secure announcements in sending MKPDUs.
	ssci-based-on-sci	Computes SSCI based on the SCI.
	use-updated-eth-header	Uses the updated Ethernet header for ICV calculation.

deny (MAC access-list configuration)

To prevent non-IP traffic from being forwarded if the conditions are matched, use the **deny** MAC access-list configuration command on the switch stack or on a standalone switch. To remove a deny condition from the named MAC access list, use the **no** form of this command.

```
deny {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr |
dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv |
diagnostic | dsm | etype-6000 | etype-8042 | lat | larc-sca | lsap lsap mask | mop-console
| mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [cos cos]
no deny {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr |
dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv |
diagnostic | dsm | etype-6000 | etype-8042 | lat | larc-sca | lsap lsap mask | mop-console
| mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [cos cos]
```

Syntax Description

any	Denies any source or destination MAC address.
host <i>src-MAC-addr</i> <i>src-MAC-addr mask</i>	Defines a host MAC address and optional subnet mask. If the source address for a packet matches the defined address, non-IP traffic from that address is denied.
host <i>dst-MAC-addr</i> <i>dst-MAC-addr mask</i>	Defines a destination MAC address and optional subnet mask. If the destination address for a packet matches the defined address, non-IP traffic to that address is denied.
<i>type mask</i>	(Optional) Specifies the EtherType number of a packet with Ethernet II or SNAP encapsulation to identify the protocol of the packet. The type is 0 to 65535, specified in hexadecimal. The mask is a mask of don't care bits applied to the EtherType before testing for a match.
aarp	(Optional) Specifies EtherType AppleTalk Address Resolution Protocol that maps a data-link address to a network address.
amber	(Optional) Specifies EtherType DEC-Amber.
appletalk	(Optional) Specifies EtherType AppleTalk/EtherTalk.
dec-spanning	(Optional) Specifies EtherType Digital Equipment Corporation (DEC) spanning tree.
decnet-iv	(Optional) Specifies EtherType DECnet Phase IV protocol.
diagnostic	(Optional) Specifies EtherType DEC-Diagnostic.

dsm	(Optional) Specifies EtherType DEC-DSM.
etype-6000	(Optional) Specifies EtherType 0x6000.
etype-8042	(Optional) Specifies EtherType 0x8042.
lat	(Optional) Specifies EtherType DEC-LAT.
lavc-sca	(Optional) Specifies EtherType DEC-LAVC-SCA.
lsap <i>lsap-number mask</i>	(Optional) Specifies the LSAP number (0 to 65535) of a packet with 802.2 encapsulation to identify the protocol of the packet. <i>mask</i> is a mask of don't care bits applied to the LSAP number before testing for a match.
mop-console	(Optional) Specifies EtherType DEC-MOP Remote Console.
mop-dump	(Optional) Specifies EtherType DEC-MOP Dump.
msdos	(Optional) Specifies EtherType DEC-MSDOS.
mumps	(Optional) Specifies EtherType DEC-MUMPS.
netbios	(Optional) Specifies EtherType DEC- Network Basic Input/Output System (NetBIOS).
vines-echo	(Optional) Specifies EtherType Virtual Integrated Network Service (VINES) Echo from Banyan Systems.
vines-ip	(Optional) Specifies EtherType VINES IP.
xns-idp	(Optional) Specifies EtherType Xerox Network Systems (XNS) protocol suite (0 to 65535), an arbitrary EtherType in decimal, hexadecimal, or octal.
cos <i>cos</i>	(Optional) Specifies a class of service (CoS) number from 0 to 7 to set priority. Filtering on CoS can be performed only in hardware. A warning message reminds the user if the cos option is configured.

Command Default

This command has no defaults. However, the default action for a MAC-named ACL is to deny.

Command Modes

Mac-access list configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You enter MAC-access list configuration mode by using the **mac access-list extended** global configuration command.

If you use the **host** keyword, you cannot enter an address mask; if you do not use the **host** keyword, you must enter an address mask.

When an access control entry (ACE) is added to an access control list, an implied **deny-any-any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

To filter IPX traffic, you use the *type mask* or **lsap lsap mask** keywords, depending on the type of IPX encapsulation being used. Filter criteria for IPX encapsulation types as specified in Novell terminology and Cisco IOS terminology are listed in the table.

Table 3: IPX Filtering Criteria

IPX Encapsulation Type		Filter Criterion
Cisco IOS Name	Novel Name	
arpa	Ethernet II	EtherType 0x8137
snap	Ethernet-snap	EtherType 0x8137
sap	Ethernet 802.2	LSAP 0xE0E0
novell-ether	Ethernet 802.3	LSAP 0xFFFF

This example shows how to define the named MAC extended access list to deny NETBIOS traffic from any source to MAC address 00c0.00a0.03fa. Traffic matching this list is denied.

```
Device(config-ext-macl)# deny any host 00c0.00a0.03fa netbios.
```

This example shows how to remove the deny condition from the named MAC extended access list:

```
Device(config-ext-macl)# no deny any 00c0.00a0.03fa 0000.0000.0000 netbios.
```

This example denies all packets with EtherType 0x4321:

```
Device(config-ext-macl)# deny any any 0x4321 0
```

You can verify your settings by entering the **show access-lists** privileged EXEC command.

Related Commands

Command	Description
mac access-list extended	Creates an access list based on MAC addresses for non-IP traffic.
permit	Permits from the MAC access-list configuration. Permits non-IP traffic to be forwarded if conditions are matched.

Command	Description
show access-lists	Displays access control lists configured on a switch.

device-role (IPv6 snooping)

To specify the role of the device attached to the port, use the **device-role** command in IPv6 snooping configuration mode.

```
device-role { node | switch }
```

Syntax Description	
node	Sets the role of the attached device to node.
switch	Sets the role of the attached device to switch.

Command Default	
	The device role is node.

Command Modes	
	IPv6 snooping configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines	
	The device-role command specifies the role of the device attached to the port. By default, the device role is node.

The **switch** keyword indicates that the remote device is a switch and that the local switch is now operating in multiswitch mode; binding entries learned from the port will be marked with trunk_port preference level. If the port is configured as a trust-port, binding entries will be marked with trunk_trusted_port preference level.

This example shows how to define an IPv6 snooping policy name as policy1, place the device in IPv6 snooping configuration mode, and configure the device as the node:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# device-role node
```


device-role (IPv6 nd inspection)

To specify the role of the device attached to the port, use the **device-role** command in neighbor discovery (ND) inspection policy configuration mode.

device-role {**host** | **switch**}

Syntax Description	host	Sets the role of the attached device to host.
	switch	Sets the role of the attached device to switch.

Command Default The device role is host.

Command Modes ND inspection policy configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines The **device-role** command specifies the role of the device attached to the port. By default, the device role is host, and therefore all the inbound router advertisement and redirect messages are blocked.

The **switch** keyword indicates that the remote device is a switch and that the local switch is now operating in multiswitch mode; binding entries learned from the port will be marked with trunk_port preference level. If the port is configured as a trust-port, binding entries will be marked with trunk_trusted_port preference level.

The following example defines a Neighbor Discovery Protocol (NDP) policy name as policy1, places the device in ND inspection policy configuration mode, and configures the device as the host:

```
Device(config)# ipv6 nd inspection policy policy1
Device(config-nd-inspection)# device-role host
```

device-tracking policy

To configure a Switch Integrated Security Features (SISF)-based IP device tracking policy, use the **device-tracking** command in global configuration mode. To delete a device tracking policy, use the **no** form of this command.

device -tracking policy *policy-name*
no device-tracking policy *policy-name*

Syntax Description	<i>policy-name</i> User-defined name of the device tracking policy. The policy name can be a symbolic string (such as Engineering) or an integer (such as 0).				
Command Default	A device tracking policy is not configured.				
Command Modes	Global configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td></td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification		This command was introduced.
Release	Modification				
	This command was introduced.				

Usage Guidelines Use the SISF-based **device-tracking policy** command to create a device tracking policy. When the **device-tracking policy** command is enabled, the configuration mode changes to device-tracking configuration mode. In this mode, the administrator can configure the following first-hop security commands:

- (Optional) **device-role** {**node** | **switch**}—Specifies the role of the device attached to the port. Default is **node**.
- (Optional) **limit address-count** *value*—Limits the number of addresses allowed per target.
- (Optional) **no**—Negates a command or sets it to defaults.
- (Optional) **destination-glean** {**recovery** | **log-only**} [**dhcp**]}—Enables binding table recovery by data traffic source address gleaning.
- (Optional) **data-glean** {**recovery** | **log-only**} [**dhcp** | **ndp**]}—Enables binding table recovery using source or data address gleaning.
- (Optional) **security-level** {**glean** | **guard** | **inspect**}—Specifies the level of security enforced by the feature. Default is **guard**.
 - glean**—Gleans addresses from messages and populates the binding table without any verification.
 - guard**—Gleans addresses and inspects messages. In addition, it rejects RA and DHCP server messages. This is the default option.
 - inspect**—Gleans addresses, validates messages for consistency and conformance, and enforces address ownership.
- (Optional) **tracking** {**disable** | **enable**}—Specifies a tracking option.
- (Optional) **trusted-port**—Sets up a trusted port. It disables the guard on applicable targets. Bindings learned through a trusted port have preference over bindings learned through any other port. A trusted port is given preference in case of a collision while making an entry in the table.

This example shows how to configure an a device-tracking policy:

```
Device(config)# device-tracking policy policy1  
Device(config-device-tracking)# trusted-port
```

dot1x critical (global configuration)

To configure the IEEE 802.1X critical authentication parameters, use the **dot1x critical** command in global configuration mode.

dot1x critical eapol

Syntax Description	eapol Specifies that the switch send an EAPOL-Success message when the switch successfully authenticates the critical port.				
Command Default	eapol is disabled				
Command Modes	Global configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

This example shows how to specify that the switch sends an EAPOL-Success message when the switch successfully authenticates the critical port:

```
Device(config)# dot1x critical eapol
```

dot1x max-start

To set the maximum number of Extensible Authentication Protocol over LAN (EAPOL) start frames that a supplicant sends (assuming that no response is received) to the client before concluding that the other end is 802.1X unaware, use the **dot1x max-start** command in interface configuration mode. To remove the maximum number-of-times setting, use the **no** form of this command.

```
dot1x max-start number
no dot1x max-start
```

Syntax Description

number Maximum number of times that the router sends an EAPOL start frame. The value is from 1 to 10. The default is 3.

Command Default

The default maximum number setting is 3.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You must enter the **switchport mode access** interface configuration command on a switch port before entering this command.

The following example shows that the maximum number of EAPOL Start requests has been set to 5:

```
Device(config)# interface g1/0/3
Device(config-if)# dot1x max-start 5
```

dot1x pae

To set the Port Access Entity (PAE) type, use the **dot1x pae** command in interface configuration mode. To disable the PAE type that was set, use the **no** form of this command.

```
dot1x pae {supplicant | authenticator}
no dot1x pae {supplicant | authenticator}
```

Syntax Description

supplicant	The interface acts only as a supplicant and will not respond to messages that are meant for an authenticator.
authenticator	The interface acts only as an authenticator and will not respond to any messages meant for a supplicant.

Command Default

PAE type is not set.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.
	This command was reintroduced. This command was not supported in and

Usage Guidelines

Use the **no dot1x pae** interface configuration command to disable IEEE 802.1x authentication on the port.

When you configure IEEE 802.1x authentication on a port, such as by entering the **dot1x port-control** interface configuration command, the switch automatically configures the port as an IEEE 802.1x authenticator. After the **no dot1x pae** interface configuration command is entered, the Authenticator PAE operation is disabled.

The following example shows that the interface has been set to act as a supplicant:

```
Device(config)# interface g1/0/3
Device(config-if)# dot1x pae supplicant
```

dot1x supplicant controlled transient

To control access to an 802.1x supplicant port during authentication, use the **dot1x supplicant controlled transient** command in global configuration mode. To open the supplicant port during authentication, use the **no** form of this command

dot1x supplicant controlled transient
no dot1x supplicant controlled transient

Syntax Description

This command has no arguments or keywords.

Command Default

Access is allowed to 802.1x supplicant ports during authentication.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.
	This command was reintroduced. This command was not supported in and

Usage Guidelines

In the default state, when you connect a supplicant switch to an authenticator switch that has BPCU guard enabled, the authenticator port could be error-disabled if it receives a Spanning Tree Protocol (STP) bridge protocol data unit (BPDU) packets before the supplicant switch has authenticated. Beginning with Cisco IOS Release 15.0(1)SE, you can control traffic exiting the supplicant port during the authentication period. Entering the **dot1x supplicant controlled transient** global configuration command temporarily blocks the supplicant port during authentication to ensure that the authenticator port does not shut down before authentication completes. If authentication fails, the supplicant port opens. Entering the **no dot1x supplicant controlled transient** global configuration command opens the supplicant port during the authentication period. This is the default behavior.

We strongly recommend using the **dot1x supplicant controlled transient** command on a supplicant switch when BPDU guard is enabled on the authenticator switch port with the **spanning-tree bpduguard enable** interface configuration command.

This example shows how to control access to 802.1x supplicant ports on a switch during authentication:

```
Device(config)# dot1x supplicant controlled transient
```

dot1x supplicant force-multicast

To force a supplicant switch to send only multicast Extensible Authentication Protocol over LAN (EAPOL) packets whenever it receives multicast or unicast EAPOL packets, use the **dot1x supplicant force-multicast** command in global configuration mode. To return to the default setting, use the **no** form of this command.

dot1x supplicant force-multicast
no dot1x supplicant force-multicast

Syntax Description This command has no arguments or keywords.

Command Default The supplicant switch sends unicast EAPOL packets when it receives unicast EAPOL packets. Similarly, it sends multicast EAPOL packets when it receives multicast EAPOL packets.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.
		This command was reintroduced. This command was not supported in and

Usage Guidelines Enable this command on the supplicant switch for Network Edge Access Topology (NEAT) to work in all host modes.

This example shows how force a supplicant switch to send multicast EAPOL packets to the authenticator switch:

```
Device(config)# dot1x supplicant force-multicast
```

Related Commands	Command	Description
	cisp enable	Enable Client Information Signalling Protocol (CISP) on a switch so that it acts as an authenticator to a supplicant switch.
	dot1x credentials	Configure the 802.1x supplicant credentials on the port.
	dot1x pae supplicant	Configure an interface to act only as a supplicant.

dot1x test eapol-capable

To monitor IEEE 802.1x activity on all the switch ports and to display information about the devices that are connected to the ports that support IEEE 802.1x, use the **dot1x test eapol-capable** command in privileged EXEC mode on the switch stack or on a standalone switch.

```
dot1x test eapol-capable [interface interface-id]
```

Syntax Description	interface interface-id (Optional) Port to be queried.				
Command Default	There is no default setting.				
Command Modes	Privileged EXEC				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

Usage Guidelines Use this command to test the IEEE 802.1x capability of the devices connected to all ports or to specific ports on a switch.

There is not a no form of this command.

This example shows how to enable the IEEE 802.1x readiness check on a switch to query a port. It also shows the response received from the queried port verifying that the device connected to it is IEEE 802.1x-capable:

```
Device# dot1x test eapol-capable interface gigabitethernet1/0/13
```

```
DOT1X_PORT_EAPOL_CAPABLE:DOT1X: MAC 00-01-02-4b-f1-a3 on gigabitethernet1/0/13 is EAPOL capable
```

Related Commands	Command	Description
	dot1x test timeout timeout	Configures the timeout used to wait for EAPOL response to an IEEE 802.1x readiness query.

dot1x test timeout

To configure the timeout used to wait for EAPOL response from a port being queried for IEEE 802.1x readiness, use the **dot1x test timeout** command in global configuration mode on the switch stack or on a standalone switch.

dot1x test timeout *timeout*

Syntax Description	<i>timeout</i>	Time in seconds to wait for an EAPOL response. The range is from 1 to 65535 seconds.
---------------------------	----------------	--

Command Default The default setting is 10 seconds.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Use this command to configure the timeout used to wait for EAPOL response.

There is not a no form of this command.

This example shows how to configure the switch to wait 27 seconds for an EAPOL response:

```
Device# dot1x test timeout 27
```

You can verify the timeout configuration status by entering the **show run** privileged EXEC command.

Related Commands	Command	Description
	dot1x test eapol-capable [<i>interface interface-id</i>]	Checks for IEEE 802.1x readiness on devices connected to all or to specified IEEE 802.1x-capable ports.

dot1x timeout

To configure the value for retry timeouts, use the **dot1x timeout** command in global configuration or interface configuration mode. To return to the default value for retry timeouts, use the **no** form of this command.

dot1x timeout { **auth-period** *seconds* | **held-period** *seconds* | **quiet-period** *seconds* | **ratelimit-period** *seconds* | **server-timeout** *seconds* | **start-period** *seconds* | **supp-timeout** *seconds* | **tx-period** *seconds* }

Syntax Description	
auth-period <i>seconds</i>	<p>Configures the time, in seconds for which a supplicant will stay in the HELD state (that is, the length of time it will wait before trying to send the credentials again after a failed attempt).</p> <p>The range is from 1 to 65535. The default is 30.</p>
held-period <i>seconds</i>	<p>Configures the time, in seconds for which a supplicant will stay in the HELD state (that is, the length of time it will wait before trying to send the credentials again after a failed attempt).</p> <p>The range is from 1 to 65535. The default is 60</p>
quiet-period <i>seconds</i>	<p>Configures the time, in seconds, that the authenticator (server) remains quiet (in the HELD state) following a failed authentication exchange before trying to reauthenticate the client.</p> <p>The range is from 1 to 65535. The default is 60</p>
ratelimit-period <i>seconds</i>	<p>Throttles the EAP-START packets that are sent from misbehaving client PCs (for example, PCs that send EAP-START packets that result in the wasting of switch processing power).</p> <ul style="list-style-type: none"> The authenticator ignores EAPOL-Start packets from clients that have successfully authenticated for the rate-limit period duration. The range is from 1 to 65535. By default, rate limiting is disabled.
server-timeout <i>seconds</i>	<p>Configures the interval, in seconds, between two successive EAPOL-Start frames when they are being retransmitted.</p> <ul style="list-style-type: none"> The range is from 1 to 65535. The default is 30. <p>If the server does not send a response to an 802.1X packet within the specified period, the packet is sent again.</p>
start-period <i>seconds</i>	<p>Configures the interval, in seconds, between two successive EAPOL-Start frames when they are being retransmitted.</p> <p>The range is from 1 to 65535. The default is 30.</p> <p>In Cisco IOS Release 15.2(5)E, this command is only available in the supplicant mode. If the command is applied in any other mode, the command misses from the configuration.</p>

supp-timeout *seconds* Sets the authenticator-to-supplicant retransmission time for all EAP messages other than EAP Request ID.
The range is from 1 to 65535. The default is 30.

tx-period *seconds* Configures the number of seconds between retransmission of EAP request ID packets (assuming that no response is received) to the client.

- The range is from 1 to 65535. The default is 30.
- If an 802.1X packet is sent to the supplicant and the supplicant does not send a response after the retry period, the packet will be sent again.

Command Default Periodic reauthentication and periodic rate-limiting are done.

Command Modes Interface configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You should change the default value of this command only to adjust for unusual circumstances such as unreliable links or specific behavioral problems with certain clients and authentication servers.

The **dot1x timeout reauth-period** interface configuration command affects the behavior of the switch only if you have enabled periodic re-authentication by using the **dot1x reauthentication** interface configuration command.

During the quiet period, the switch does not accept or initiate any authentication requests. If you want to provide a faster response time to the user, enter a number smaller than the default.

When the **ratelimit-period** is set to 0 (the default), the switch does not ignore EAPOL packets from clients that have been successfully authenticated and forwards them to the RADIUS server.

The following example shows that various 802.1X retransmission and timeout periods have been set:

```
Device(config)# configure terminal
Device(config)# interface g1/0/3
Device(config-if)# dot1x port-control auto
Device(config-if)# dot1x timeout auth-period 2000
Device(config-if)# dot1x timeout held-period 2400
Device(config-if)# dot1x timeout quiet-period 600
Device(config-if)# dot1x timeout start-period 90
Device(config-if)# dot1x timeout supp-timeout 300
Device(config-if)# dot1x timeout tx-period 60
Device(config-if)# dot1x timeout server-timeout 60
```

epm access-control open

To configure an open directive for ports that do not have an access control list (ACL) configured, use the **epm access-control open** command in global configuration mode. To disable the open directive, use the **no** form of this command.

epm access-control open
no epm access-control open

Syntax Description This command has no arguments or keywords.

Command Default The default directive applies.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Use this command to configure an open directive that allows hosts without an authorization policy to access ports configured with a static ACL. If you do not configure this command, the port applies the policies of the configured ACL to the traffic. If no static ACL is configured on a port, both the default and open directives allow access to the port.

You can verify your settings by entering the **show running-config** privileged EXEC command.

This example shows how to configure an open directive.

```
Device(config)# epm access-control open
```

Related Commands	Command	Description
	show running-config	Displays the contents of the current running configuration file.

include-icv-indicator

To include the integrity check value (ICV) indicator in MKPDU, use the **include-icv-indicator** command in MKA-policy configuration mode. To disable the ICV indicator, use the **no** form of this command.

include-icv-indicator
no include-icv-indicator

Syntax Description This command has no arguments or keywords.

Command Default ICV indicator is included.

Command Modes MKA-policy configuration (config-mka-policy)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Examples

The following example shows how to include the ICV indicator in MKPDU:

```
Device> enable
Device# configure terminal
Device(config)# mka policy 2
Device(config-mka-policy)# include-icv-indicator
```

Related Commands

Command	Description
mka policy	Configures an MKA policy.
confidentiality-offset	Sets the confidentiality offset for MACsec operations.
delay-protection	Configures MKA to use delay protection in sending MKPDU.
key-server	Configures MKA key-server options.
macsec-cipher-suite	Configures cipher suite for deriving SAK.
sak-rekey	Configures the SAK rekey interval.
send-secure-announcements	Configures MKA to send secure announcements in sending MKPDUs.
ssci-based-on-sci	Computes SSCI based on the SCI.
use-updated-eth-header	Uses the updated Ethernet header for ICV calculation.

ip access-list role-based

To create a role-based (security group) access control list (RBACL) and enter role-based ACL configuration mode, use the **ip access-list role-based** command in global configuration mode. To remove the configuration, use the **no** form of this command.

```
ip access-list role-based access-list-name
no ip access-list role-based access-list-name
```

Syntax Description

access-list-name Name of the security group access control list (SGACL).

Command Default

Role-based ACLs are not configured.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

For SGACL logging, you must configure the **permit ip log** command. Also, this command must be configured in Cisco Identity Services Engine (ISE) to enable logging for dynamic SGACLs.

The following example shows how to define an SGACL that can be applied to IPv4 traffic and enter role-based access list configuration mode:

```
Switch(config)# ip access-list role-based rbacl1
Switch(config-rb-acl)# permit ip log
```

Related Commands

Command	Description
permit ip log	Permits logging that matches the configured entry.
show ip access-list	Displays contents of all current IP access lists.

ip admission

To enable web authentication, use the **ip admission** command in interface configuration mode. You can also use this command in fallback-profile configuration mode. To disable web authentication, use the **no** form of this command.

ip admission *rule*
no ip admission *rule*

Syntax Description *rule* IP admission rule name.

Command Default Web authentication is disabled.

Command Modes Interface configuration
 Fallback-profile configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines The **ip admission** command applies a web authentication rule to a switch port.

This example shows how to apply a web authentication rule to a switchport:

```
Device# configure terminal
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip admission rule1
```

This example shows how to apply a web authentication rule to a fallback profile for use on an IEEE 802.1x enabled switch port.

```
Device# configure terminal
Device(config)# fallback profile profile1
Device(config-fallback-profile)# ip admission rule1
```


ip admission name

To enable web authentication, use the **ip admission name** command in global configuration mode. To disable web authentication, use the **no** form of this command.

```
ip admission name name {consent | proxy http} [absolute timer minutes | inactivity-time
minutes | list {acl | acl-name} | service-policy type tag service-policy-name]
no ip admission name name {consent | proxy http} [absolute timer minutes | inactivity-time
minutes | list {acl | acl-name} | service-policy type tag service-policy-name]
```

Syntax Description	
<i>name</i>	Name of network admission control rule.
consent	Associates an authentication proxy consent web page with the IP admission rule specified using the <i>admission-name</i> argument.
proxy http	Configures web authentication custom page.
absolute-timer <i>minutes</i>	(Optional) Elapsed time, in minutes, before the external server times out.
inactivity-time <i>minutes</i>	(Optional) Elapsed time, in minutes, before the external file server is deemed unreachable.
list	(Optional) Associates the named rule with an access control list (ACL).
<i>acl</i>	Applies a standard, extended list to a named admission control rule. The value ranges from 1 through 199, or from 1300 through 2699 for expanded range.
<i>acl-name</i>	Applies a named access list to a named admission control rule.
service-policy type tag	(Optional) A control plane service policy is to be configured.
<i>service-policy-name</i>	Control plane tag service policy that is configured using the policy-map type control tag <i>polycyname</i> command, keyword, and argument. This policy map is used to apply the actions on the host when a tag is received.

Command Default Web authentication is disabled.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The **ip admission name** command globally enables web authentication on a switch.

After you enable web authentication on a switch, use the **ip access-group in** and **ip admission web-rule** interface configuration commands to enable web authentication on a specific interface.

Examples

This example shows how to configure only web authentication on a switch port:

```
Device# configure terminal
Device(config) ip admission name http-rule proxy http
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip access-group 101 in
Device(config-if)# ip admission rule
Device(config-if)# end
```

This example shows how to configure IEEE 802.1x authentication with web authentication as a fallback mechanism on a switch port:

```
Device# configure terminal
Device(config)# ip admission name rule2 proxy http
Device(config)# fallback profile profile1
Device(config)# ip access group 101 in
Device(config)# ip admission name rule2
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# dot1x port-control auto
Device(config-if)# dot1x fallback profile1
Device(config-if)# end
```

Related Commands

Command	Description
dot1x fallback	Configures a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
fallback profile	Creates a web authentication fallback profile.
ip admission	Enables web authentication on a port.
show authentication sessions interface <i>interface</i> detail	Displays information about the web authentication session status.
show ip admission	Displays information about NAC cached entries or the NAC configuration.

ip device tracking maximum

To configure IP device tracking parameters on a Layer 2 access port, use the **ip device tracking maximum** command in interface configuration mode. To remove the maximum value, use the **no** form of the command.

ip device tracking maximum *number*
no ip device tracking maximum

Syntax Description	<i>number</i> Number of bindings created in the IP device tracking table for a port. The range is 0 (disabled) to 65535.				
Command Default	None				
Command Modes	Interface configuration mode				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

Usage Guidelines

To remove the maximum value, use the **no ip device tracking maximum** command.

To disable IP device tracking, use the **ip device tracking maximum 0** command.



Note This command enables IPDT wherever its configured

Examples

This example shows how to configure IP device tracking parameters on a Layer 2 access port:

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# ip device tracking
Device(config)# interface gigabitethernet1/0/3
Device(config-if)# switchport mode access
Device(config-if)# switchport access vlan 1
Device(config-if)# ip device tracking maximum 5
Device(config-if)# switchport port-security
Device(config-if)# switchport port-security maximum 5
Device(config-if)# end
```

ip device tracking probe

To configure the IP device tracking table for Address Resolution Protocol (ARP) probes, use the **ip device tracking probe** command in global configuration mode. To disable ARP probes, use the **no** form of this command.

ip device tracking probe count *number* | **delay** *seconds* | **interval** *seconds* | **use-svi** *address*
no ip device tracking probe count *number* | **delay** *seconds* | **interval** *seconds* | **use-svi** *address*

Syntax Description	
count <i>number</i>	Sets the number of times that the sends the ARP probe. The range is from 1 to 255.
delay <i>seconds</i>	Sets the number of seconds that the waits before sending the ARP probe. The range is from 1 to 120.
interval <i>seconds</i>	Sets the number of seconds that the waits for a response before resending the ARP probe. The range is from 30 to 1814400 seconds.
use-svi	Uses the switch virtual interface (SVI) IP address as source of ARP probes.

Command Default	
	The count number is 3.
	There is no delay.
	The interval is 30 seconds.
	The ARP probe default source IP address is the Layer 3 interface and 0.0.0.0 for switchports.

Command Modes	
	Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines	
	Use the use-svi keyword to configure the IP device tracking table to use the SVI IP address for ARP probes in cases when the default source IP address 0.0.0.0 for switch ports is used and the ARP probes drop.

Examples	
	This example shows how to set SVI as the source for ARP probes:

```
Device(config)# ip device tracking probe use-svi
```

ip dhcp snooping database

To configure the Dynamic Host Configuration Protocol (DHCP)-snooping database, use the **ip dhcp snooping database** command in global configuration mode. To disable the DHCP-snooping database, use the **no** form of this command.

```
ip dhcp snooping database {crashinfo:url | flash:url | ftp:url | http:url | https:url | rcp:url
| scp:url | tftp:url | timeout seconds | usbflash0:url | write-delay seconds}
no ip dhcp snooping database [ timeout | write-delay ]
```

Syntax	Description
crashinfo:url	Specifies the database URL for storing entries using crashinfo.
flash:url	Specifies the database URL for storing entries using flash.
ftp:url	Specifies the database URL for storing entries using FTP.
http:url	Specifies the database URL for storing entries using HTTP.
https:url	Specifies the database URL for storing entries using secure HTTP (https).
rcp:url	Specifies the database URL for storing entries using remote copy (rcp).
scp:url	Specifies the database URL for storing entries using Secure Copy (SCP).
tftp:url	Specifies the database URL for storing entries using TFTP.
timeout seconds	Specifies the timeout interval; valid values are from 0 to 86400 seconds.
usbflash0:url	Specifies the database URL for storing entries using USB flash.
write-delay seconds	Specifies the amount of time before writing the DHCP-snooping entries to an external server after a change is seen in the local DHCP-snooping database; valid values are from 15 to 86400 seconds.

Command Default The DHCP-snooping database is not configured.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines You must enable DHCP snooping on the interface before entering this command. Use the **ip dhcp snooping** command to enable DHCP snooping.

This example shows how to specify the database URL using TFTP:

```
Device(config)# ip dhcp snooping database tftp://10.90.90.90/snooping-rp2
```

This example shows how to specify the amount of time before writing DHCP snooping entries to an external server:

```
Device(config)# ip dhcp snooping database write-delay 15
```

ip dhcp snooping information option format remote-id

To configure the option-82 remote-ID suboption, use the **ip dhcp snooping information option format remote-id** command in global configuration mode on the switch to configure the option-82 remote-ID suboption. To configure the default remote-ID suboption, use the **no** form of this command.

```
ip dhcp snooping information option format remote-id {hostname | string string}
no ip dhcp snooping information option format remote-id {hostname | string string}
```

Syntax Description

hostname	Specify the switch hostname as the remote ID.
string string	Specify a remote ID, using from 1 to 63 ASCII characters (no spaces).

Command Default

The switch MAC address is the remote ID.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You must globally enable DHCP snooping by using the **ip dhcp snooping** global configuration command for any DHCP snooping configuration to take effect.

When the option-82 feature is enabled, the default remote-ID suboption is the switch MAC address. This command allows you to configure either the switch hostname or a string of up to 63 ASCII characters (but no spaces) to be the remote ID.



Note If the hostname exceeds 63 characters, it will be truncated to 63 characters in the remote-ID configuration.

This example shows how to configure the option- 82 remote-ID suboption:

```
Device(config)# ip dhcp snooping information option format remote-id hostname
```

ip dhcp snooping verify no-relay-agent-address

To disable the DHCP snooping feature from verifying that the relay agent address (giaddr) in a DHCP client message matches the client hardware address on an untrusted port, use the **ip dhcp snooping verify no-relay-agent-address** command in global configuration mode. To enable verification, use the **no** form of this command.

ip dhcp snooping verify no-relay-agent-address
no ip dhcp snooping verify no-relay-agent-address

Syntax Description

This command has no arguments or keywords.

Command Default

The DHCP snooping feature verifies that the relay-agent IP address (giaddr) field in DHCP client message on an untrusted port is 0.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

By default, the DHCP snooping feature verifies that the relay-agent IP address (giaddr) field in DHCP client message on an untrusted port is 0; the message is dropped if the giaddr field is not 0. Use the **ip dhcp snooping verify no-relay-agent-address** command to disable the verification. Use the **no ip dhcp snooping verify no-relay-agent-address** to reenable verification.

This example shows how to enable verification of the giaddr in a DHCP client message:

```
Device(config)# no ip dhcp snooping verify no-relay-agent-address
```


ip http access-class

To specify the access list that should be used to restrict access to the HTTP server, use the **ip http access-class** command in global configuration mode. To remove a previously configured access list association, use the **no** form of this command.



Note The existing **ip http access-class** *access-list-number* command is currently supported, but is going to be deprecated. Use the **ip http access-class** **ipv4** { *access-list-number* | *access-list-name* } and **ip http access-class** **ipv6** *access-list-name* instead.

```
ip http access-class { access-list-number | ipv4 { access-list-number | access-list-name } |
ipv6 access-list-name }
no ip http access-class { access-list-number | ipv4 { access-list-number | access-list-name }
| ipv6 access-list-name }
```

Syntax Description

ipv4	Specifies the IPv4 access list to restrict access to the secure HTTP server.
ipv6	Specifies the IPv6 access list to restrict access to the secure HTTP server.
<i>access-list-number</i>	Standard IP access list number in the range 0 to 99, as configured by the access-list global configuration command.
<i>access-list-name</i>	Name of a standard IPv4 access list, as configured by the ip access-list command.

Command Default

No access list is applied to the HTTP server.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was modified. The ipv4 and ipv6 keyword were added.
Cisco IOS XE Release 3.3SE	This command was introduced.

Usage Guidelines

If this command is configured, the specified access list is assigned to the HTTP server. Before the HTTP server accepts a connection, it checks the access list. If the check fails, the HTTP server does not accept the request for a connection.

Examples

The following example shows how to define an access list as 20 and assign it to the HTTP server:

```
Device(config)# ip access-list standard 20
Device(config-std-nacl)# permit 209.165.202.130 0.0.0.255
Device(config-std-nacl)# permit 209.165.201.1 0.0.255.255
```

```
Device(config-std-nacl)# permit 209.165.200.225 0.255.255.255
```

```
Device(config-std-nacl)# exit
```

```
Device(config)# ip http access-class 20
```

The following example shows how to define an IPv4 named access list as and assign it to the HTTP server.

```
Device(config)# ip access-list standard Internet_filter
```

```
Device(config-std-nacl)# permit 1.2.3.4
```

```
Device(config-std-nacl)# exit
```

```
Device(config)# ip http access-class ipv4 Internet_filter
```

Related Commands

Command	Description
ip access-list	Assigns an ID to an access list and enters access list configuration mode.
ip http server	Enables the HTTP 1.1 server, including the Cisco web browser user interface.

ip radius source-interface

To force RADIUS to use the IP address of a specified interface for all outgoing RADIUS packets, use the **ip radius source-interface** command in global configuration mode. To prevent RADIUS from using the IP address of a specified interface for all outgoing RADIUS packets, use the no form of this command.

ip radius source-interface *interface-name* [**vrf** *vrf-name*]
no ip radius source-interface

Syntax Description	
<i>interface-name</i>	Name of the interface that RADIUS uses for all of its outgoing packets.
vrf <i>vrf-name</i>	(Optional) Per virtual route forwarding (VRF) configuration.

Command Default No default behavior or values.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Use this command to set the IP address of an interface to be used as the source address for all outgoing RADIUS packets. The IP address is used as long as the interface is in the *up* state. The RADIUS server can use one IP address entry for every network access client instead of maintaining a list of IP addresses. Radius uses the IP address of the interface that it is associated to, regardless of whether the interface is in the *up* or *down* state.

The **ip radius source-interface** command is especially useful in cases where the router has many interfaces and you want to ensure that all RADIUS packets from a particular router have the same IP address.

The specified interface should have a valid IP address and should be in the *up* state for a valid configuration. If the specified interface does not have a valid IP address or is in the *down* state, RADIUS selects a local IP that corresponds to the best possible route to the AAA server. To avoid this, add a valid IP address to the interface or bring the interface to the *up* state.

Use the **vrf** *vrf-name* keyword and argument to configure this command per VRF, which allows multiple disjointed routing or forwarding tables, where the routes of one user have no correlation with the routes of another user.

Examples

The following example shows how to configure RADIUS to use the IP address of interface s2 for all outgoing RADIUS packets:

```
ip radius source-interface s2
```

The following example shows how to configure RADIUS to use the IP address of interface Ethernet0 for VRF definition:

```
ip radius source-interface Ethernet0 vrf vrfl
```

ip source binding

To add a static IP source binding entry, use the **ip source binding** command. Use the **no** form of this command to delete a static IP source binding entry

```
ip source binding mac-address vlan vlan-id ip-address interface interface-id
no ip source binding mac-address vlan vlan-id ip-address interface interface-id
```

Syntax Description	<i>mac-address</i>	Binding MAC address.
	vlan <i>vlan-id</i>	Specifies the Layer 2 VLAN identification; valid values are from 1 to 4094.
	<i>ip-address</i>	Binding IP address.
	interface <i>interface-id</i>	ID of the physical interface.
Command Default	No IP source bindings are configured.	
Command Modes	Global configuration.	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You can use this command to add a static IP source binding entry only.

The **no** format deletes the corresponding IP source binding entry. It requires the exact match of all required parameter in order for the deletion to be successful. Note that each static IP binding entry is keyed by a MAC address and a VLAN number. If the command contains the existing MAC address and VLAN number, the existing binding entry is updated with the new parameters instead of creating a separate binding entry.

This example shows how to add a static IP source binding entry:

```
Device# configure terminal
Deviceconfig) ip source binding 0100.0230.0002 vlan 11 10.0.0.4 interface gigabitethernet1/0/1
```

ip verify source

To enable IP source guard on an interface, use the **ip verify source** command in interface configuration mode. To disable IP source guard, use the **no** form of this command.

ip verify source [**mac-check**] [**tracking**]
no ip verify source

mac-check	(Optional) Enables IP source guard with MAC address verification.
tracking	(Optional) Enables IP port security to learn static IP address learning on a port.

Command Default IP source guard is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines To enable IP source guard with source IP address filtering, use the **ip verify source** interface configuration command.

To enable IP source guard with source IP address filtering and MAC address verification, use the **ip verify source mac-check** interface configuration command.

Examples

This example shows how to enable IP source guard with source IP address filtering on an interface:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip verify source
```

This example shows how to enable IP source guard with MAC address verification:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip verify source mac-check
```

You can verify your settings by entering the **show ip verify source** privileged EXEC command.

ipv6 access-list

To define an IPv6 access list and to place the device in IPv6 access list configuration mode, use the **ipv6 access-list** command in global configuration mode. To remove the access list, use the **no** form of this command.

ipv6 access-list *access-list-name* | **match-local-traffic** | **log-update threshold** *threshold-in-msgs* | **role-based** *list-name*
noipv6 access-list *access-list-name* | **client** *permit-control-packets* | **log-update** *threshold* | **role-based** *list-name*

Syntax Description

ipv6 <i>access-list-name</i>	Creates a named IPv6 ACL (up to 64 characters in length) and enters IPv6 ACL configuration mode. <i>access-list-name</i> - Name of the IPv6 access list. Names cannot contain a space or quotation mark, or begin with a numeric.
match-local-traffic	Enables matching for locally-generated traffic.
log-update threshold <i>threshold-in-msgs</i>	Determines how syslog messages are generated after the initial packet match. <i>threshold-in-msgs</i> - Number of packets generated.
role-based <i>list-name</i>	Creates a role-based IPv6 ACL.

Command Default

No IPv6 access list is defined.

Command Modes

Global configuration

Command History

Release	Modification
	This command was reintroduced. This command was not supported in and

Usage Guidelines

IPv6 ACLs are defined by using the **ipv6 access-list** command in global configuration mode and their permit and deny conditions are set by using the **deny** and **permit** commands in IPv6 access list configuration mode. Configuring the **ipv6 access-list** command places the device in IPv6 access list configuration mode--the device prompt changes to Device(config-ipv6-acl)#. From IPv6 access list configuration mode, permit and deny conditions can be set for the defined IPv6 ACL.



Note

IPv6 ACLs are defined by a unique name (IPv6 does not support numbered ACLs). An IPv4 ACL and an IPv6 ACL cannot share the same name.

IPv6 is automatically configured as the protocol type in **permit any any** and **deny any any** statements that are translated from global configuration mode to IPv6 access list configuration mode.

Every IPv6 ACL has implicit **permit icmp any any nd-na**, **permit icmp any any nd-ns**, and **deny ipv6 any any** statements as its last match conditions. (The former two match conditions allow for ICMPv6 neighbor

discovery.) An IPv6 ACL must contain at least one entry for the implicit **deny ipv6 any any** statement to take effect. The IPv6 neighbor discovery process makes use of the IPv6 network layer service; therefore, by default, IPv6 ACLs implicitly allow IPv6 neighbor discovery packets to be sent and received on an interface. In IPv4, the Address Resolution Protocol (ARP), which is equivalent to the IPv6 neighbor discovery process, makes use of a separate data link layer protocol; therefore, by default, IPv4 ACLs implicitly allow ARP packets to be sent and received on an interface.

Use the **ipv6 traffic-filter** interface configuration command with the *access-list-name* argument to apply an IPv6 ACL to an IPv6 interface. Use the **ipv6 access-class** line configuration command with the *access-list-name* argument to apply an IPv6 ACL to incoming and outgoing IPv6 virtual terminal connections to and from the device.

An IPv6 ACL applied to an interface with the **ipv6 traffic-filter** command filters traffic that is forwarded, not originated, by the device.

Examples

The example configures the IPv6 ACL list named list1 and places the device in IPv6 access list configuration mode.

```
Device(config)# ipv6 access-list list1
Device(config-ipv6-acl)#
```

The following example configures the IPv6 ACL named list2 and applies the ACL to outbound traffic on Ethernet interface 0. Specifically, the first ACL entry keeps all packets from the network FEC0:0:0:2::/64 (packets that have the site-local prefix FEC0:0:0:2 as the first 64 bits of their source IPv6 address) from exiting out of Ethernet interface 0. The second entry in the ACL permits all other traffic to exit out of Ethernet interface 0. The second entry is necessary because an implicit deny all condition is at the end of each IPv6 ACL.

```
Device(config)# ipv6 access-list list2 deny FEC0:0:0:2::/64 any
Device(config)# ipv6 access-list list2 permit any any
Device(config)# interface ethernet 0
Device(config-if)# ipv6 traffic-filter list2 out
```


ipv6 snooping policy



Note All existing IPv6 Snooping commands (prior to) now have corresponding SISF-based device-tracking commands that allow you to apply your configuration to both IPv4 and IPv6 address families. For more information, see [device-tracking policy](#)

To configure an IPv6 snooping policy and enter IPv6 snooping configuration mode, use the **ipv6 snooping policy** command in global configuration mode. To delete an IPv6 snooping policy, use the **no** form of this command.

ipv6 snooping policy *snooping-policy*
no ipv6 snooping policy *snooping-policy*

Syntax Description	<i>snooping-policy</i> User-defined name of the snooping policy. The policy name can be a symbolic string (such as Engineering) or an integer (such as 0).
---------------------------	--

Command Default	An IPv6 snooping policy is not configured.
------------------------	--

Command Modes	Global configuration
----------------------	----------------------

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Use the **ipv6 snooping policy** command to create an IPv6 snooping policy. When the **ipv6 snooping policy** command is enabled, the configuration mode changes to IPv6 snooping configuration mode. In this mode, the administrator can configure the following IPv6 first-hop security commands:

- The **device-role** command specifies the role of the device attached to the port.
- The **limit address-count** *maximum* command limits the number of IPv6 addresses allowed to be used on the port.
- The **protocol** command specifies that addresses should be gleaned with Dynamic Host Configuration Protocol (DHCP) or Neighbor Discovery Protocol (NDP).
- The **security-level** command specifies the level of security enforced.
- The **tracking** command overrides the default tracking policy on a port.
- The **trusted-port** command configures a port to become a trusted port; that is, limited or no verification is performed when messages are received.

This example shows how to configure an IPv6 snooping policy:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)#
```

key chain macsec

To configure a MACsec key chain name on a device interface to fetch a Pre Shared Key (PSK), use the **key chain macsec** command in global configuration mode. To disable it, use the **no** form of this command.

key chain *name* **macsec** { **description** | **key** | **exit** }

Syntax Description	
name	Name of a key chain to be used to get keys.
description	Provides description of the MACsec key chain.
key	Configure a MACsec key.
exit	Exits from the MACsec key-chain configuration mode.
no	Negates the command or sets the default values.

Command Default key chain macsec is disabled.

Command Modes Global configuration

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

This example shows how to configure MACsec key chain to fetch a 128-bit Pre Shared Key (PSK):

```
Switch#configure terminal
Switch(config)#key chain kc1 macsec
Switch(config-keychain-macsec)#key 1000
Switch(config-keychain-macsec)#cryptographic-algorithm aes-128-cmac
Switch(config-keychain-macsec-key)# key-string fb63e0269e2768c49bab8ee9a5c2258f
Switch(config-keychain-macsec-key)#end
Switch#
```

This example shows how to configure MACsec key chain to fetch a 256-bit Pre Shared Key (PSK):

```
Switch#configure terminal
Switch(config)#key chain kc1 macsec
Switch(config-keychain-macsec)#key 2000
Switch(config-keychain-macsec)#cryptographic-algorithm aes-256-cmac
Switch(config-keychain-macsec-key)# key-string
c865632acb269022447c417504a1bf5db1c296449b52627ba01f2ba2574c2878
Switch(config-keychain-macsec-key)#end
Switch#
```

key-server

To configure MKA key-server options, use the **key-server** command in MKA-policy configuration mode. To disable MKA key-server options, use the **no** form of this command.

key-server priority *value*
no key-server priority

Syntax Description	priority <i>value</i>	Specifies the priority value of the MKA key-server.
---------------------------	------------------------------	---

Command Default	MKA key-server is disabled.
------------------------	-----------------------------

Command Modes	MKA-policy configuration (config-mka-policy)
----------------------	--

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Examples

The following example shows how to configure the MKA key-server:

```
Device> enable
Device# configure terminal
Device(config)# mka policy 2
Device(config-mka-policy)# key-server priority 33
```

Related Commands	Command	Description
	mka policy	Configures an MKA policy.
	confidentiality-offset	Sets the confidentiality offset for MACsec operations.
	delay-protection	Configures MKA to use delay protection in sending MKPDU.
	include-icv-indicator	Includes ICV indicator in MKPDU.
	macsec-cipher-suite	Configures cipher suite for deriving SAK)
	sak-rekey	Configures the SAK rekey interval.
	send-secure-announcements	Configures MKA to send secure announcements in sending MKPDUs.
	ssci-based-on-sci	Computes SSCI based on the SCI.
use-updated-eth-header	Uses the updated Ethernet header for ICV calculation.	

limit address-count

To limit the number of IPv6 addresses allowed to be used on the port, use the **limit address-count** command in Neighbor Discovery Protocol (NDP) inspection policy configuration mode or IPv6 snooping configuration mode. To return to the default, use the **no** form of this command.

limit address-count *maximum*
no limit address-count

Syntax Description	<i>maximum</i> The number of addresses allowed on the port. The range is from 1 to 10000.
---------------------------	---

Command Default	The default is no limit.
------------------------	--------------------------

Command Modes	ND inspection policy configuration IPv6 snooping configuration
----------------------	---

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines	The limit address-count command limits the number of IPv6 addresses allowed to be used on the port on which the policy is applied. Limiting the number of IPv6 addresses on a port helps limit the binding table size. The range is from 1 to 10000.
-------------------------	---

This example shows how to define an NDP policy name as policy1, place the switch in NDP inspection policy configuration mode, and limit the number of IPv6 addresses allowed on the port to 25:

```
Device(config)# ipv6 nd inspection policy policy1
Device(config-nd-inspection)# limit address-count 25
```

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and limit the number of IPv6 addresses allowed on the port to 25:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# limit address-count 25
```

mab request format attribute 32

To enable VLAN ID-based MAC authentication on a switch, use the **mab request format attribute 32 vlan access-vlan** command in global configuration mode. To return to the default setting, use the **no** form of this command.

mab request format attribute 32 vlan access-vlan
no mab request format attribute 32 vlan access-vlan

Syntax Description

This command has no arguments or keywords.

Command Default

VLAN-ID based MAC authentication is disabled.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

Use this command to allow a RADIUS server to authenticate a new user based on the host MAC address and VLAN.

Use this feature on networks with the Microsoft IAS RADIUS server. The Cisco ACS ignores this command.

This example shows how to enable VLAN-ID based MAC authentication on a switch:

```
Device(config)# mab request format attribute 32 vlan access-vlan
```

Related Commands

Command	Description
authentication event	Sets the action for specific authentication events.
authentication fallback	Configures a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
authentication host-mode	Sets the authorization manager mode on a port.
authentication open	Enables or disables open access on a port.
authentication order	Sets the order of authentication methods used on a port.
authentication periodic	Enables or disables reauthentication on a port.
authentication port-control	Enables manual control of the port authorization state.
authentication priority	Adds an authentication method to the port-priority list.

Command	Description
authentication timer	Configures the timeout and reauthentication parameters for an 802.1x-enabled port.
authentication violation	Configures the violation modes that occur when a new device connects to a port or when a new device connects to a port with the maximum number of devices already connected to that port.
mab	Enables MAC-based authentication on a port.
mab eap	Configures a port to use the Extensible Authentication Protocol (EAP).
show authentication	Displays information about authentication manager events on the switch.

macsec-cipher-suite

To configure cipher suite for deriving Security Association Key (SAK), use the **macsec-cipher-suite** command in MKA-policy configuration mode. To disable cipher suite for SAK, use the **no** form of this command.

macsec-cipher-suite gcm-aes-128 | gcm-aes-256 | gcm-aes-xpn-128 | gcm-aes-xpn-256
no macsec-cipher-suite gcm-aes-128 | gcm-aes-256 | gcm-aes-xpn-128 | gcm-aes-xpn-256

Syntax Description

gcm-aes-128	Configures cipher suite for deriving SAK with 128-bit encryption.
gcm-aes-256	Configures cipher suite for deriving SAK with 256-bit encryption.
gcm-aes-xpn-128	Configures cipher suite for deriving SAK with 128-bit encryption for Extended Packet Numbering (XPN).
gcm-aes-xpn-256	Configures cipher suite for deriving SAK with 256-bit encryption for XPN.

Command Default

GCM-AES-128 encryption is enabled.

Command Modes

MKA-policy configuration (config-mka-policy)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

If the device supports both GCM-AES-128 and GCM-AES-256 ciphers, it is highly recommended to define and use a user-defined MKA policy to include both or only 256 bits cipher, based on your requirements..

Examples

The following example shows how to configure MACsec cipher suite for deriving SAK with 256-bit encryption:

```
Device> enable
Device# configure terminal
Device(config)# mka policy 2
Device(config-mka-policy)# macsec-cipher-suite gcm-aes-256
```

Related Commands

Command	Description
mka policy	Configures an MKA policy.
confidentiality-offset	Sets the confidentiality offset for MACsec operations.
delay-protection	Configures MKA to use delay protection in sending MKPDU.
include-icv-indicator	Includes ICV indicator in MKPDU.
key-server	Configures MKA key-server options.
sak-rekey	Configures the SAK rekey interval.

Command	Description
send-secure-announcements	Configures MKA to send secure announcements in sending MKPDUs.
ssci-based-on-sci	Computes SSCI based on the SCI.
use-updated-eth-header	Uses the updated Ethernet header for ICV calculation.

macsec network-link

To enable MKA MACsec configuration on the uplink interfaces, use the **macsec network-link** command on the interface. To disable it, use the **no** form of this command.

macsec network-link

Syntax Description	macsec network-link Enables MKA MACsec configuration on device interfaces using EAP-TLS authentication protocol.				
Command Default	macsec network-link is disabled.				
Command Modes	Interface configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.3.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.3.1	This command was introduced.				

This example shows how to configure MACsec MKA on an interface using the EAP-TLS authentication protocol:

```
Switch#configure terminal
Switch(config)# int G1/0/20
Switch(config-if)# macsec network-link
Switch(config-if)# end
Switch#
```

match (access-map configuration)

To set the VLAN map to match packets against one or more access lists, use the **match** command in access-map configuration mode on the switch stack or on a standalone switch. To remove the match parameters, use the **no** form of this command.

```
match ip address namenumber [namenumber] [namenumber]. . . | ipv6 address namenumber
[namenumber] [namenumber]. . . | mac address name [name] [name]. . .
no match ip address namenumber [namenumber] [namenumber]. . . | ipv6 address namenumber
[namenumber] [namenumber]. . . | mac address name [name] [name]. . .
```

Syntax Description

ip address	Sets the access map to match packets against an IP address access list.
ipv6 address	Sets the access map to match packets against an IPv6 address access list.
mac address	Sets the access map to match packets against a MAC address access list.
<i>name</i>	Name of the access list to match packets against.
<i>number</i>	Number of the access list to match packets against. This option is not valid for MAC access lists.

Command Default

The default action is to have no match parameters applied to a VLAN map.

Command Modes

Access-map configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

You enter access-map configuration mode by using the **vlan access-map** global configuration command.

You must enter one access list name or number; others are optional. You can match packets against one or more access lists. Matching any of the lists counts as a match of the entry.

In access-map configuration mode, use the **match** command to define the match conditions for a VLAN map applied to a VLAN. Use the **action** command to set the action that occurs when the packet matches the conditions.

Packets are matched only against access lists of the same protocol type; IP packets are matched against IP access lists, IPv6 packets are matched against IPv6 access lists, and all other packets are matched against MAC access lists.

IP, IPv6, and MAC addresses can be specified for the same map entry.

This example shows how to define and apply a VLAN access map vmap4 to VLANs 5 and 6 that will cause the interface to drop an IP packet if the packet matches the conditions defined in access list al2:

```
Device(config)# vlan access-map vmap4
Device(config-access-map)# match ip address al2
Device(config-access-map)# action drop
```

```
Device(config-access-map)# exit  
Device(config)# vlan filter vmap4 vlan-list 5-6
```

You can verify your settings by entering the **show vlan access-map** privileged EXEC command.

mka pre-shared-key

To configure MKA MACsec on a device interface using a Pre Shared Key (PSK), use the **mka pre-shared-key key-chain** *key-chain name* command in global configuration mode. To disable it, use the **no** form of this command.

mka pre-shared-key key-chain *key-chain-name*

Syntax Description	mka pre-shared-key key-chain Enables MACsec MKA configuration on device interfaces using a PSK.	
Command Default	mka pre-shared-key is disabled.	
Command Modes	Interface configuration	
Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

This example shows how to configure MKA MACsec on an interface using a PSK:

```
Switch#
Switch(config)# int G1/0/20
Switch(config-if)# mka pre-shared-key key-chain kcl
Switch(config-if)# end
Switch#
```

authentication logging verbose

To filter detailed information from authentication system messages, use the **authentication logging verbose** command in global configuration mode on the switch stack or on a standalone switch.

authentication logging verbose
no authentication logging verbose

Syntax Description This command has no arguments or keywords.

Command Default Detailed logging of system messages is not enabled.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines This command filters details, such as anticipated success, from authentication system messages. Failure messages are not filtered.

To filter verbose authentication system messages:

```
Device(config)# authentication logging verbose
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

Related Commands	Command	Description
	authentication logging verbose	Filters details from authentication system messages.
	dot1x logging verbose	Filters details from 802.1x system messages.
	mab logging verbose	Filters details from MAC authentication bypass (MAB) system messages.

dot1x logging verbose

To filter detailed information from 802.1x system messages, use the **dot1x logging verbose** command in global configuration mode on the switch stack or on a standalone switch.

dot1x logging verbose
no dot1x logging verbose

Syntax Description This command has no arguments or keywords.

Command Default Detailed logging of system messages is not enabled.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines This command filters details, such as anticipated success, from 802.1x system messages. Failure messages are not filtered.

To filter verbose 802.1x system messages:

```
Device(config)# dot1x logging verbose
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

Related Commands	Command	Description
	authentication logging verbose	Filters details from authentication system messages.
	dot1x logging verbose	Filters details from 802.1x system messages.
	mab logging verbose	Filters details from MAC authentication bypass (MAB) system messages.

mab logging verbose

To filter detailed information from MAC authentication bypass (MAB) system messages, use the **mab logging verbose** command in global configuration mode on the switch stack or on a standalone switch.

mab logging verbose
no mab logging verbose

Syntax Description This command has no arguments or keywords.

Command Default Detailed logging of system messages is not enabled.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines This command filters details, such as anticipated success, from MAC authentication bypass (MAB) system messages. Failure messages are not filtered.

To filter verbose MAB system messages:

```
Device(config)# mab logging verbose
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

Related Commands	Command	Description
	authentication logging verbose	Filters details from authentication system messages.
	dot1x logging verbose	Filters details from 802.1x system messages.
	mab logging verbose	Filters details from MAC authentication bypass (MAB) system messages.

permit (MAC access-list configuration)

To allow non-IP traffic to be forwarded if the conditions are matched, use the **permit** MAC access-list configuration command on the switch stack or on a standalone switch. To remove a permit condition from the extended MAC access list, use the **no** form of this command.

```
{permit {any | hostsrc-MAC-addr | src-MAC-addr mask} {any | hostdst-MAC-addr |
dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv |
diagnostic | dsm | etype-6000 | etype-8042 | lat | larc-sca | lsaplsap mask | mop-console
| mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [coscos]
nopermit {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr |
dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv |
diagnostic | dsm | etype-6000 | etype-8042 | lat | larc-sca | lsap lsap mask | mop-console
| mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [coscos]
```

Syntax Description

any	Denies any source or destination MAC address.
host <i>src-MAC-addr</i> <i>src-MAC-addr mask</i>	Specifies a host MAC address and optional subnet mask. If the source address for a packet matches the defined address, non-IP traffic from that address is denied.
host <i>dst-MAC-addr</i> <i>dst-MAC-addr mask</i>	Specifies a destination MAC address and optional subnet mask. If the destination address for a packet matches the defined address, non-IP traffic to that address is denied.
<i>type mask</i>	(Optional) Specifies the EtherType number of a packet with Ethernet II or SNAP encapsulation to identify the protocol of the packet. <ul style="list-style-type: none"> • <i>type</i> is 0 to 65535, specified in hexadecimal. • <i>mask</i> is a mask of don't care bits applied to the EtherType before testing for a match.
aarp	(Optional) Specifies EtherType AppleTalk Address Resolution Protocol that maps a data-link address to a network address.
amber	(Optional) Specifies EtherType DEC-Amber.
appletalk	(Optional) Specifies EtherType AppleTalk/EtherTalk.
dec-spanning	(Optional) Specifies EtherType Digital Equipment Corporation (DEC) spanning tree.
decnet-iv	(Optional) Specifies EtherType DECnet Phase IV protocol.
diagnostic	(Optional) Specifies EtherType DEC-Diagnostic.

dsm	(Optional) Specifies EtherType DEC-DSM.
etype-6000	(Optional) Specifies EtherType 0x6000.
etype-8042	(Optional) Specifies EtherType 0x8042.
lat	(Optional) Specifies EtherType DEC-LAT.
lavl-sca	(Optional) Specifies EtherType DEC-LAVC-SCA.
lsap <i>lsap-number mask</i>	(Optional) Specifies the LSAP number (0 to 65535) of a packet with 802.2 encapsulation to identify the protocol of the packet. The <i>mask</i> is a mask of don't care bits applied to the LSAP number before testing for a match.
mop-console	(Optional) Specifies EtherType DEC-MOP Remote Console.
mop-dump	(Optional) Specifies EtherType DEC-MOP Dump.
msdos	(Optional) Specifies EtherType DEC-MSDOS.
mumps	(Optional) Specifies EtherType DEC-MUMPS.
netbios	(Optional) Specifies EtherType DEC- Network Basic Input/Output System (NetBIOS).
vines-echo	(Optional) Specifies EtherType Virtual Integrated Network Service (VINES) Echo from Banyan Systems.
vines-ip	(Optional) Specifies EtherType VINES IP.
xns-idp	(Optional) Specifies EtherType Xerox Network Systems (XNS) protocol suite.
cos <i>cos</i>	(Optional) Specifies an arbitrary class of service (CoS) number from 0 to 7 to set priority. Filtering on CoS can be performed only in hardware. A warning message appears if the cos option is configured.

Command Default This command has no defaults. However, the default action for a MAC-named ACL is to deny.

Command Modes Mac-access list configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Though visible in the command-line help strings, **appletalk** is not supported as a matching condition.

You enter MAC access-list configuration mode by using the **mac access-list extended** global configuration command.

If you use the **host** keyword, you cannot enter an address mask; if you do not use the **any** or **host** keywords, you must enter an address mask.

After an access control entry (ACE) is added to an access control list, an implied **deny-any-any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

To filter IPX traffic, you use the *type mask* or **lsap lsap mask** keywords, depending on the type of IPX encapsulation being used. Filter criteria for IPX encapsulation types as specified in Novell terminology and Cisco IOS terminology are listed in the following table.

Table 4: IPX Filtering Criteria

IPX Encapsulation Type		Filter Criterion
Cisco IOS Name	Novell Name	
arpa	Ethernet II	EtherType 0x8137
snap	Ethernet-snap	EtherType 0x8137
sap	Ethernet 802.2	LSAP 0xE0E0
novell-ether	Ethernet 802.3	LSAP 0xFFFF

This example shows how to define the MAC-named extended access list to allow NetBIOS traffic from any source to MAC address 00c0.00a0.03fa. Traffic matching this list is allowed.

```
Device(config-ext-macl)# permit any host 00c0.00a0.03fa netbios
```

This example shows how to remove the permit condition from the MAC-named extended access list:

```
Device(config-ext-macl)# no permit any 00c0.00a0.03fa 0000.0000.0000 netbios
```

This example permits all packets with EtherType 0x4321:

```
Device(config-ext-macl)# permit any any 0x4321 0
```

You can verify your settings by entering the **show access-lists** privileged EXEC command.

Related Commands

Command	Description
deny	Denies from the MAC access-list configuration. Denies non-IP traffic to be forwarded if conditions are matched.
mac access-list extended	Creates an access list based on MAC addresses for non-IP traffic.

Command	Description
show access-lists	Displays access control lists configured on a switch.

propagate sgt (cts manual)

To enable Security Group Tag (SGT) propagation at Layer 2 on Cisco TrustSec Security (CTS) interfaces, use the **propagate sgt** command in interface configuration mode. To disable SGT propagation, use the **no** form of this command.

propagate sgt

Syntax Description	This command has no arguments or keywords.
Command Default	SGT processing propagation is enabled.
Command Modes	CTS manual interface configuration mode (config-if-cts-manual)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines SGT processing propagation allows a CTS-capable interface to accept and transmit a CTS Meta Data (CMD) based L2 SGT tag. The **no propagate sgt** command can be used to disable SGT propagation on an interface in situations where a peer device is not capable of receiving an SGT, and as a result, the SGT tag cannot be put in the L2 header.

Examples

The following example shows how to disable SGT propagation on a manually-configured TrustSec-capable interface:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet 0
Switch(config-if)# cts manual
Switch(config-if-cts-manual)# no propagate sgt
```

The following example shows that SGT propagation is disabled on Gigabit Ethernet interface 0:

```
Switch#show cts interface brief
Global Dot1x feature is Disabled
Interface GigabitEthernet0:
  CTS is enabled, mode:      MANUAL
  IFC state:                 OPEN
  Authentication Status:    NOT APPLICABLE
  Peer identity:             "unknown"
  Peer's advertised capabilities: ""
  Authorization Status:     NOT APPLICABLE
  SAP Status:                NOT APPLICABLE
  Propagate SGT:             Disabled
  Cache Info:
    Cache applied to link : NONE
```

Related Commands

Command	Description
cts manual	Enables an interface for CTS.

Command	Description
show cts interface	Displays Cisco TrustSec states and statistics per interface.

protocol (IPv6 snooping)

To specify that addresses should be gleaned with Dynamic Host Configuration Protocol (DHCP) or Neighbor Discovery Protocol (NDP), or to associate the protocol with an IPv6 prefix list, use the **protocol** command. To disable address gleaning with DHCP or NDP, use the **no** form of the command.

```
protocol { dhcp | ndp }
no protocol { dhcp | ndp }
```

Syntax Description	dhcp Specifies that addresses should be gleaned in Dynamic Host Configuration Protocol (DHCP) packets.				
	ndp Specifies that addresses should be gleaned in Neighbor Discovery Protocol (NDP) packets.				
Command Default	Snooping and recovery are attempted using both DHCP and NDP.				
Command Modes	IPv6 snooping configuration mode				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

Usage Guidelines	<p>If an address does not match the prefix list associated with DHCP or NDP, then control packets will be dropped and recovery of the binding table entry will not be attempted with that protocol.</p> <ul style="list-style-type: none"> • Using the no protocol { dhcp ndp } command indicates that a protocol will not be used for snooping or gleaning. • If the no protocol dhcp command is used, DHCP can still be used for binding table recovery. • Data glean can recover with DHCP and NDP, though destination guard will only recovery through DHCP.
-------------------------	---

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and configure the port to use DHCP to glean addresses:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# protocol dhcp
```

radius server



Note Starting from Cisco IOS 15.2(5)E release, the **radius server** command replaces the **radius-server host** command, being used in releases prior to Cisco IOS Release 15.2(5)E. The old command has been deprecated.

Use the **radius server** configuration sub-mode command on the switch stack or on a standalone switch to configure the RADIUS server parameters, including the RADIUS accounting and authentication. Use the **no** form of this command to return to the default settings.

```
radius server name
address {ipv4 | ipv6} ip{address / hostname} auth-port udp-port acct-port udp-port
key string
automate tester name | retransmit value | timeout seconds
no radius server name
```

Syntax Description

address {ipv4 ipv6} <i>ip{address / hostname}</i>	Specify the IP address of the RADIUS server.
auth-port <i>udp-port</i>	(Optional) Specify the UDP port for the RADIUS authentication server. The range is from 0 to 65536.
acct-port <i>udp-port</i>	(Optional) Specify the UDP port for the RADIUS accounting server. The range is from 0 to 65536.
key <i>string</i>	(Optional) Specify the authentication and encryption key for all RADIUS communication between the switch and the RADIUS daemon. Note The key is a text string that must match the encryption key used on the RADIUS server. Always configure the key as the last item in this command. Leading spaces are ignored, but spaces within and at the end of the key are used. If there are spaces in your key, do not enclose the key in quotation marks unless the quotation marks are part of the key.
automate tester <i>name</i>	(Optional) Enable automatic server testing of the RADIUS server status, and specify the username to be used.
retransmit <i>value</i>	(Optional) Specifies the number of times a RADIUS request is resent when the server is not responding or responding slowly. The range is 1 to 100. This setting overrides the radius-server retransmit global configuration command setting.
timeout <i>seconds</i>	(Optional) Specifies the time interval that the Switch waits for the RADIUS server to reply before sending a request again. The range is 1 to 1000. This setting overrides the radius-server timeout global configuration command setting.
no radius server <i>name</i>	Returns to the default settings

Command Default

- The UDP port for the RADIUS accounting server is 1646.
- The UDP port for the RADIUS authentication server is 1645.
- Automatic server testing is disabled.
- The timeout is 60 minutes (1 hour).
- When the automatic testing is enabled, testing occurs on the accounting and authentication UDP ports.
- The authentication and encryption key (string) is not configured.

Command Modes

Radius server sub-mode configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced to replace the radius-server host command.

Usage Guidelines

- We recommend that you configure the UDP port for the RADIUS accounting server and the UDP port for the RADIUS authentication server to non-default values.
- You can configure the authentication and encryption key by using the **key string** sub-mode configuration command. Always configure the key as the last item in this command.
- Use the **automate-tester name** keywords to enable automatic server testing of the RADIUS server status and to specify the username to be used.

This example shows how to configure 1645 as the UDP port for the authentication server and 1646 as the UDP port for the accounting server, and configure a key string:

```
Device(config)# radius server ISE
Device(config-radius-server)# address ipv4 10.1.1.1 auth-port 1645 acct-port 1646
Device(config-radius-server)# key cisco123
```


sak-rekey

To configure the Security Association Key (SAK) rekey time interval for a defined MKA policy, use the **sak-rekey** command in MKA-policy configuration mode. To stop the SAK rekey timer, use the **no** form of this command.

sak-rekey interval *time-interval* | **on-live-peer-loss**
no sak-rekey interval | **on-live-peer-loss**

Syntax Description	interval	SAK rekey interval in seconds.
	<i>time-interval</i>	The range is from 30 to 65535, and the default is 0.
	on-live-peer-loss	Peer loss from the live membership.

Command Default The SAK rekey timer is disabled. The default is 0.

Command Modes MKA-policy configuration (config-mka-policy)

Command History	Release	Modification
	Cisco IOS XE Fuji 16.8.1a	This command was introduced.

Examples

The following example shows how to configure the SAK rekey interval:

```
Device> enable
Device# configure terminal
Device(config)# mka policy 2
Device(config-mka-policy)# sak-rekey interval 300
```

Related Commands	Command	Description
	mka policy	Configures an MKA policy.
	confidentiality-offset	Sets the confidentiality offset for MACsec operations.
	delay-protection	Configures MKA to use delay protection in sending MKPDU.
	include-icv-indicator	Includes ICV indicator in MKPDU.
	key-server	Configures MKA key-server options.
	macsec-cipher-suite	Configures cipher suite for deriving SAK.
	send-secure-announcements	Configures MKA to send secure announcements in sending MKPDUs.
	ssci-based-on-sci	Computes SSCI based on the SCI.
	use-updated-eth-header	Uses the updated Ethernet header for ICV calculation.

sap mode-list (cts manual)

To select the Security Association Protocol (SAP) authentication and encryption modes (prioritized from highest to lowest) used to negotiate link encryption between two interfaces, use the **sap mode-list** command in Cisco TrustSec dot1x interface configuration mode. To remove a mode-list and revert to the default, use the **no** form of this command.

Use the **sap mode-list** command to manually specify the PMK and the Security Association Protocol (SAP) authentication and encryption modes to negotiate MACsec link encryption between two interfaces. Use the **no** form of the command to disable the configuration.

sap pmk mode-list gcm-encrypt | gmac | no-encap | null [gcm-encrypt | gmac | no-encap | null]
no sap pmk mode-list gcm-encrypt | gmac | no-encap | null [gcm-encrypt | gmac | no-encap | null]

Syntax Description

pmk <i>hex_value</i>	Specifies the Hex-data PMK (without leading 0x; enter even number of hex characters, or else the last character is prefixed with 0.).
mode-list	Specifies the list of advertised modes (prioritized from highest to lowest).
gcm-encrypt	Specifies GMAC authentication, GCM encryption.
gmac	Specifies GMAC authentication only, no encryption.
no-encap	Specifies no encapsulation.
null	Specifies encapsulation present, no authentication, no encryption.

Command Default

The default encryption is **sap pmk mode-list gcm-encrypt null**. When the peer interface does not support 802.1AE MACsec or 802.REV layer-2 link encryption, the default encryption is **null**.

Command Modes

CTS manual interface configuration (config-if-cts-manual)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

Use the **sap pmk mode-list** command to specify the authentication and encryption method.

The Security Association Protocol (SAP) is an encryption key derivation and exchange protocol based on a draft version of the 802.11i IEEE protocol. SAP is used to establish and maintain the 802.1AE link-to-link encryption (MACsec) between interfaces that support MACsec.

SAP and PMK can be manually configured between two interfaces with the **sap pmk mode-list** command. When using 802.1X authentication, both sides (supplicant and authenticator) receive the PMK and the MAC address of the peer's port from the Cisco Secure Access Control Server.

If a device is running Cisco TrustSec-aware software but the hardware is not Cisco TrustSec-capable, disallow encapsulation with the **sap mode-list no-encap** command.

Examples

The following example shows how to configure SAP on a Gigabit Ethernet interface:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet 2/1
Switch(config-if)# cts manual
Switch(config-if-cts-manual)# sap pmk FFEED mode-list gcm-encrypt
```

Related Commands

Command	Description
cts manual	Enables an interface for Cisco TrustSec.
propagate sgt (cts manual)	Enables SGT propagation at Layer 2 on Cisco TrustSec Security interfaces.
show cts interface	Displays Cisco TrustSec interface configuration statistics.

security level (IPv6 snooping)

To specify the level of security enforced, use the **security-level** command in IPv6 snooping policy configuration mode.

security level { **glean** | **guard** | **inspect** }

Syntax Description		
glean	Extracts addresses from the messages and installs them into the binding table without performing any verification.	
guard	Performs both glean and inspect. Additionally, RA and DHCP server messages are rejected unless they are received on a trusted port or another policy authorizes them.	
inspect	Validates messages for consistency and conformance; in particular, address ownership is enforced. Invalid messages are dropped.	
Command Default	The default security level is guard.	
Command Modes	IPv6 snooping configuration	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

This example shows how to define an IPv6 snooping policy name as policy1, place the device in IPv6 snooping configuration mode, and configure the security level as inspect:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# security-level inspect
```

security passthru

To modify the IPsec pass-through, use the **security passthru** command. To disable, use the no form of the command.

```
security passthru ip-address
no security passthru
```

Syntax Description	<i>ip-address</i> IP address of the IPsec gateway (router) that is terminating the VPN tunnel.				
Command Default	None.				
Command Modes	wlan				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				
Usage Guidelines	None.				

This example shows how to modify IPsec pass-through.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#security passthrough 10.1.1.1
```

server-private (RADIUS)

To configure the IP address of the private RADIUS server for the group server, use the **server-private** command in RADIUS server-group configuration mode. To remove the associated private server from the authentication, authorization, and accounting (AAA) group server, use the **no** form of this command.

server-private *ip-address* [**auth-port** *port-number* | **acct-port** *port-number*] [**non-standard**] [**timeout** *seconds*] [**retransmit** *retries*] [**key** *string*]

no server-private *ip-address* [**auth-port** *port-number* | **acct-port** *port-number*] [**non-standard**] [**timeout** *seconds*] [**retransmit** *retries*] [**key** *string*]

Syntax Description

<i>ip-address</i>	IP address of the private RADIUS server host.
auth-port <i>port-number</i>	(Optional) User Datagram Protocol (UDP) destination port for authentication requests. The default value is 1645.
acct-port <i>port-number</i>	(Optional) UDP destination port for accounting requests. The default value is 1646.
non-standard	(Optional) RADIUS server is using vendor-proprietary RADIUS attributes.
timeout <i>seconds</i>	(Optional) Time interval (in seconds) that the device waits for the RADIUS server to reply before retransmitting. This setting overrides the global value of the radius-server timeout command. If no timeout value is specified, the global value is used.
retransmit <i>retries</i>	(Optional) Number of times a RADIUS request is resent to a server, if that server is not responding or responding slowly. This setting overrides the global setting of the radius-server retransmit command.
key <i>string</i>	(Optional) Authentication and encryption key used between the device and the RADIUS daemon running on the RADIUS server. This key overrides the global setting of the radius-server key command. If no key string is specified, the global value is used. The <i>string</i> can be 0 (specifies that an unencrypted key follows), 6 (specifies that an advanced encryption scheme [AES] encrypted key follows), 7 (specifies that a hidden key follows), or a line specifying the unencrypted (clear-text) server key.

Command Default

If server-private parameters are not specified, global configurations will be used; if global configurations are not specified, default values will be used.

Command Modes

RADIUS server-group configuration (config-sg-radius)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

Use the **server-private** command to associate a particular private server with a defined server group. To prevent possible overlapping of private addresses between virtual route forwarding (VRF) instances, private

servers (servers with private addresses) can be defined within the server group and remain hidden from other groups, while the servers in the global pool (default "radius" server group) can still be referred to by IP addresses and port numbers. Thus, the list of servers in server groups includes references to the hosts in the global configuration and the definitions of private servers.

**Note**

- If the **radius-server directed-request** command is configured, then a private RADIUS server cannot be used as the group server by configuring the **server-private (RADIUS)** command.
- Creating or updating AAA server statistics record for private RADIUS servers are not supported. If private RADIUS servers are used, then error messages and tracebacks will be encountered, but these error messages or tracebacks do not have any impact on the AAA RADIUS functionality. To avoid these error messages and tracebacks, configure public RADIUS server instead of private RADIUS server.

Use the **password encryption aes** command to configure type 6 AES encrypted keys.

Examples

The following example shows how to define the sg_water RADIUS group server and associate private servers with it:

```
Device> enable
Device# configure terminal
Device(config)# aaa new-model
Device(config)# aaa group server radius sg_water
Device(config-sg-radius)# server-private 10.1.1.1 timeout 5 retransmit 3 key xyz
Device(config-sg-radius)# server-private 10.2.2.2 timeout 5 retransmit 3 key xyz
Device(config-sg-radius)# end
```

Related Commands

Command	Description
aaa group server	Groups different server hosts into distinct lists and distinct methods.
aaa new-model	Enables the AAA access control model.
password encryption aes	Enables a type 6 encrypted preshared key.
radius-server host	Specifies a RADIUS server host.
radius-server directed-request	Allows users to log in to a Cisco NAS and select a RADIUS server for authentication.

server-private (TACACS+)

To configure the IPv4 or IPv6 address of the private TACACS+ server for the group server, use the **server-private** command in server-group configuration mode. To remove the associated private server from the authentication, authorization, and accounting (AAA) group server, use the **no** form of this command.

```
server-private  ipv4-address | ipv6-address | fqdn [ nat ] [ single-connection ] [ port port-number ]
[ timeout seconds ] key [ 0 | 7 ] string
no server-private
```

Syntax Description

ipv4-address	IPv4 address of the private TACACS+ server host.
ipv6-address	IPv6 address of the private TACACS+ server host.
fqdn	Fully qualified domain name (fqdn) of the private TACACS+ server host for address resolution from the Domain Name Server (DNS)
nat	(Optional) Specifies the port Network Address Translation (NAT) address of the remote device. This address is sent to the TACACS+ server.
single-connection	(Optional) Maintains a single TCP connection between the router and the TACACS+ server.
timeout seconds	(Optional) Specifies a timeout value for the server response. This value overrides the global timeout value set with the tacacs-server timeout command for this server only.
port port-number	(Optional) Specifies a server port number. This option overrides the default, which is port 49.
key [0 7] string	(Optional) Specifies an authentication and encryption key. This key must match the key used by the TACACS+ daemon. Specifying this key overrides the key set by the global tacacs-server key command for this server only. If no number or 0 is entered, the <i>string</i> that is entered is considered to be plain text. If 7 is entered, the <i>string</i> that is entered is considered to be encrypted text.

Command Default

If server-private parameters are not specified, global configurations will be used; if global configurations are not specified, default values will be used.

Command Modes

TACACS+ server-group configuration (config-sg-tacacs+)

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

Use the **server-private** command to associate a particular private server with a defined server group. To prevent possible overlapping of private addresses between virtual route forwardings (VRFs), private servers (servers with private addresses) can be defined within the server group and remain hidden from other groups, while the servers in the global pool (default "TACACS+" server group) can still be referred to by IP addresses

and port numbers. Thus, the list of servers in server groups includes references to the hosts in the global configuration and the definitions of private servers.

The following example shows how to define the tacacs1 TACACS+ group server and associate private servers with it:

```
Device> enable
Device# configure terminal
Device(config)# aaa group server tacacs+ tacacs1
Device(config-sg-tacacs+)# server-private 10.1.1.1 port 19 key cisco
Device(config-sg-tacacs+)# exit
Device(config)#ip vrf cisco
Device(config-vrf)# rd 100:1
Device(config-vrf)# exit
Device(config)# interface Loopback0
Device(config-if)#ip address 10.0.0.2 255.0.0.0
Device(config-if)#ip vrf forwarding cisco
```

Related Commands

Command	Description
aaa group server	Groups different server hosts into distinct lists and distinct methods.
aaa new-model	Enables the AAA access control model.
ip tacacs source-interface	Uses the IP address of a specified interface for all outgoing TACACS+ packets.
ip vrf forwarding (server-group)	Configures the VRF reference of an AAA TACACS+ server group.

show aaa clients

To show AAA client statistics, use the **show aaa clients** command.

show aaa clients [**detailed**]

Syntax Description

detailed (Optional) Shows detailed AAA client statistics.

Command Modes

User EXEC

Command History

Release

Cisco IOS XE Everest 16.5.1a

Modification

This command was introduced.

This is an example of output from the **show aaa clients** command:

```
Device# show aaa clients
```

```
Dropped request packets: 0
```

show aaa command handler

To show AAA command handler statistics, use the **show aaa command handler** command.

show aaa command handler

Syntax Description	This command has no arguments or keywords.
---------------------------	--

Command Modes	User EXEC
----------------------	-----------

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show aaa command handler** command:

```
Device# show aaa command handler

AAA Command Handler Statistics:
  account-logon: 0, account-logoff: 0
  account-query: 0, pod: 0
  service-logon: 0, service-logoff: 0
  user-profile-push: 0, session-state-log: 0
  reauthenticate: 0, bounce-host-port: 0
  disable-host-port: 0, update-rbacl: 0
  update-sgt: 0, update-cts-policies: 0
  invalid commands: 0
  async message not sent: 0
```

show aaa local

To show AAA local method options, use the **show aaa local** command.

show aaa local {**netuser** {*name* | **all**} | **statistics** | **user lockout**}

Syntax Description

netuser	Specifies the AAA local network or guest user database.
<i>name</i>	Network user name.
all	Specifies the network and guest user information.
statistics	Displays statistics for local authentication.
user lockout	Specifies the AAA local locked-out user.

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show aaa local statistics** command:

```
Device# show aaa local statistics

Local EAP statistics

EAP Method          Success      Fail
-----
Unknown              0            0
EAP-MD5              0            0
EAP-GTC              0            0
LEAP                 0            0
PEAP                 0            0
EAP-TLS              0            0
EAP-MSCHAPV2        0            0
EAP-FAST             0            0

Requests received from AAA:          0
Responses returned from EAP:        0
Requests dropped (no EAP AVP):      0
Requests dropped (other reasons):    0
Authentication timeouts from EAP:    0

Credential request statistics
Requests sent to backend:            0
Requests failed (unable to send):    0
Authorization results received

    Success:                          0
    Fail:                              0
```

show aaa servers

To shows all AAA servers as seen by the AAA server MIB, use the **show aaa servers** command.

show aaa servers [**private** | **public** | [**detailed**]]

Syntax Description		
	detailed	(Optional) Displays private AAA servers as seen by the AAA Server MIB.
	public	(Optional) Displays public AAA servers as seen by the AAA Server MIB.
	detailed	(Optional) Displays detailed AAA server statistics.
Command Modes	User EXEC	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show aaa servers** command:

```
Device# show aaa servers
RADIUS: id 1, priority 1, host 172.20.128.2, auth-port 1645, acct-port 1646
State: current UP, duration 9s, previous duration 0s
Dead: total time 0s, count 0
Quarantined: No
Authen: request 0, timeouts 0, failover 0, retransmission 0
Response: accept 0, reject 0, challenge 0
Response: unexpected 0, server error 0, incorrect 0, time 0ms
Transaction: success 0, failure 0
Throttled: transaction 0, timeout 0, failure 0
Author: request 0, timeouts 0, failover 0, retransmission 0
Response: accept 0, reject 0, challenge 0
Response: unexpected 0, server error 0, incorrect 0, time 0ms
Transaction: success 0, failure 0
Throttled: transaction 0, timeout 0, failure 0
Account: request 0, timeouts 0, failover 0, retransmission 0
Request: start 0, interim 0, stop 0
Response: start 0, interim 0, stop 0
Response: unexpected 0, server error 0, incorrect 0, time 0ms
Transaction: success 0, failure 0
Throttled: transaction 0, timeout 0, failure 0
Elapsed time since counters last cleared: 0m
Estimated Outstanding Access Transactions: 0
Estimated Outstanding Accounting Transactions: 0
Estimated Throttled Access Transactions: 0
Estimated Throttled Accounting Transactions: 0
Maximum Throttled Transactions: access 0, accounting 0
```

show aaa sessions

To show AAA sessions as seen by the AAA Session MIB, use the **show aaa sessions** command.

show aaa sessions

Syntax Description This command has no arguments or keywords.

Command Modes User EXEC

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show aaa sessions** command:

```
Device# show aaa sessions
Total sessions since last reload: 7
Session Id: 4007
  Unique Id: 4025
  User Name: *not available*
  IP Address: 0.0.0.0
  Idle Time: 0
  CT Call Handle: 0
```

show authentication brief

To display brief information about authentication sessions for a given interface, use the **show authentication brief** command in either user EXEC or privileged EXEC mode.

```
show authentication brief[switch{switch-number|active|standby}{R0}]
```

Syntax Description		
	<i>switch-number</i>	Valid values for the <i>switch-number</i> variable are from 1 to 9.
	R0	Displays information about the Route Processor (RP) slot 0.
	active	Specifies the active instance.
	standby	Specifies the standby instance.

Command Modes	
	Privileged EXEC (#)
	User EXEC (>)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

The following is a sample output from the **show authentication brief** command:

```
Device# show authentication brief
```

Interface	MAC Address	AuthC	AuthZ	Eg	Uptime
Gi2/0/14	0002.0002.0001	m:NA d:OK	AZ: SA-	X	281s
Gi2/0/14	0002.0002.0002	m:NA d:OK	AZ: SA-	X	280s
Gi2/0/14	0002.0002.0003	m:NA d:OK	AZ: SA-	X	279s
Gi2/0/14	0002.0002.0004	m:NA d:OK	AZ: SA-	X	278s
Gi2/0/14	0002.0002.0005	m:NA d:OK	AZ: SA-	X	278s
Gi2/0/14	0002.0002.0006	m:NA d:OK	AZ: SA-	X	277s
Gi2/0/14	0002.0002.0007	m:NA d:OK	AZ: SA-	X	276s
Gi2/0/14	0002.0002.0008	m:NA d:OK	AZ: SA-	X	276s
Gi2/0/14	0002.0002.0009	m:NA d:OK	AZ: SA-	X	275s
Gi2/0/14	0002.0002.000a	m:NA d:OK	AZ: SA-	X	275s
Gi2/0/14	0002.0002.000b	m:NA d:OK	AZ: SA-	X	274s
Gi2/0/14	0002.0002.000c	m:NA d:OK	AZ: SA-	X	274s
Gi2/0/14	0002.0002.000d	m:NA d:OK	AZ: SA-	X	273s
Gi2/0/14	0002.0002.000e	m:NA d:OK	AZ: SA-	X	273s
Gi2/0/14	0002.0002.000f	m:NA d:OK	AZ: SA-	X	272s
Gi2/0/14	0002.0002.0010	m:NA d:OK	AZ: SA-	X	272s
Gi2/0/14	0002.0002.0011	m:NA d:OK	AZ: SA-	X	271s
Gi2/0/14	0002.0002.0012	m:NA d:OK	AZ: SA-	X	271s
Gi2/0/14	0002.0002.0013	m:NA d:OK	AZ: SA-	X	270s
Gi2/0/14	0002.0002.0014	m:NA d:OK	AZ: SA-	X	270s
Gi2/0/14	0002.0002.0015	m:NA d:OK	AZ: SA-	X	269s

The following is a sample output from the **show authentication brief** command for active instances:

```
Device# show authentication brief switch active R0
```

Interface	MAC Address	AuthC	AuthZ	Fg	Uptime
Gi2/0/14	0002.0002.0001	m:NA d:OK	AZ: SA-	X	1s
Gi2/0/14	0002.0002.0002	m:NA d:OK	AZ: SA-	X	0s
Gi2/0/14	0002.0002.0003	m:NA d:OK	AZ: SA-	X	299s
Gi2/0/14	0002.0002.0004	m:NA d:OK	AZ: SA-	X	298s
Gi2/0/14	0002.0002.0005	m:NA d:OK	AZ: SA-	X	298s
Gi2/0/14	0002.0002.0006	m:NA d:OK	AZ: SA-	X	297s
Gi2/0/14	0002.0002.0007	m:NA d:OK	AZ: SA-	X	296s
Gi2/0/14	0002.0002.0008	m:NA d:OK	AZ: SA-	X	296s
Gi2/0/14	0002.0002.0009	m:NA d:OK	AZ: SA-	X	295s
Gi2/0/14	0002.0002.000a	m:NA d:OK	AZ: SA-	X	295s
Gi2/0/14	0002.0002.000b	m:NA d:OK	AZ: SA-	X	294s
Gi2/0/14	0002.0002.000c	m:NA d:OK	AZ: SA-	X	294s
Gi2/0/14	0002.0002.000d	m:NA d:OK	AZ: SA-	X	293s
Gi2/0/14	0002.0002.000e	m:NA d:OK	AZ: SA-	X	293s
Gi2/0/14	0002.0002.000f	m:NA d:OK	AZ: SA-	X	292s
Gi2/0/14	0002.0002.0010	m:NA d:OK	AZ: SA-	X	292s
Gi2/0/14	0002.0002.0011	m:NA d:OK	AZ: SA-	X	291s
Gi2/0/14	0002.0002.0012	m:NA d:OK	AZ: SA-	X	291s
Gi2/0/14	0002.0002.0013	m:NA d:OK	AZ: SA-	X	290s
Gi2/0/14	0002.0002.0014	m:NA d:OK	AZ: SA-	X	290s
Gi2/0/14	0002.0002.0015	m:NA d:OK	AZ: SA-	X	289s
Gi2/0/14	0002.0002.0016	m:NA d:OK	AZ: SA-	X	289s

The following is a sample output from the **show authentication brief** command for standby instances:

```
Device# show authentication brief switch standby R0
```

```
No sessions currently exist
```

The table below describes the significant fields shown in the displays.

Table 5: show authentication brief Field Descriptions

Field	Description
Interface	The type and number of the authentication interface.
MAC Address	The MAC address of the client.
AuthC	Indicates authentication status.
AuthZ	Indicates authorization status.

Field	Description
Fg	Flag indicates the current status. The valid values are: <ul style="list-style-type: none">• A—Applying policy (multi-line status for details)• D—Awaiting removal• F—Final removal in progress• I—Awaiting IIF ID allocation• P—Pushed session• R—Removing user profile (multi-line status for details)• U—Applying user profile (multi-line status for details)• X—Unknown blocker
Uptime	Indicates the duration since which the session came up

show authentication history

To display the authenticated sessions alive on the device, use the **show authentication history** command.

show authentication history [**min-uptime** *seconds*]

Syntax Description

min-uptime *seconds* (Optional) Displays sessions within the minimum uptime. The range is from 1 through 4294967295 seconds.

Command Modes

User EXEC

Command History

Release

Cisco IOS XE Everest 16.5.1a

Modification

This command was introduced.

Usage Guidelines

Use the **show authentication history** command to display the authenticated sessions alive on the device.

This is an example of output from the **show authentication history** command:

```
Device# show authentication history
Interface  MAC Address      Method  Domain  Status  Uptime
Gi3/0/2   0021.d864.07c0  dot1x   DATA   Auth    38s

Session count = 1
```

show authentication sessions

To display information about current Auth Manager sessions, use the **show authentication sessions** command.

```
show authentication sessions [database] [handle handle-id [details]] [interface type number
[details] [mac mac-address [interface type number] [method method-name [interface type number
[details] [session-id session-id [details]]]
```

Syntax Description

database	(Optional) Shows only data stored in session database.
handle <i>handle-id</i>	(Optional) Specifies the particular handle for which Auth Manager information is to be displayed.
details	(Optional) Shows detailed information.
interface <i>type number</i>	(Optional) Specifies a particular interface type and number for which Auth Manager information is to be displayed.
mac <i>mac-address</i>	(Optional) Specifies the particular MAC address for which you want to display information.
method <i>method-name</i>	(Optional) Specifies the particular authentication method for which Auth Manager information is to be displayed. If you specify a method (dot1x , mab , or webauth), you may also specify an interface.
session-id <i>session-id</i>	(Optional) Specifies the particular session for which Auth Manager information is to be displayed.

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

Use the **show authentication sessions** command to display information about all current Auth Manager sessions. To display information about specific Auth Manager sessions, use one or more of the keywords.

This table shows the possible operating states for the reported authentication sessions.

Table 6: Authentication Method States

State	Description
Not run	The method has not run for this session.
Running	The method is running for this session.
Failed over	The method has failed and the next method is expected to provide a result.

State	Description
Success	The method has provided a successful authentication result for the session.
Authc Failed	The method has provided a failed authentication result for the session.

This table shows the possible authentication methods.

Table 7: Authentication Method States

State	Description
dot1x	802.1X
mab	MAC authentication bypass
webauth	web authentication

The following example shows how to display all authentication sessions on the switch:

```
Device# show authentication sessions
Interface  MAC Address  Method  Domain  Status  Session ID
Gi1/0/48   0015.63b0.f676  dot1x   DATA   Authz Success  0A3462B1000000102983C05C
Gi1/0/5    000f.23c4.a401  mab     DATA   Authz Success  0A3462B10000000D24F80B58
Gi1/0/5    0014.bf5d.d26d  dot1x   DATA   Authz Success  0A3462B10000000E29811B94
```

The following example shows how to display all authentication sessions on an interface:

```
Device# show authentication sessions interface gigabitethernet2/0/47
      Interface: GigabitEthernet2/0/47
      MAC Address: Unknown
      IP Address: Unknown
      Status: Authz Success
      Domain: DATA
      Oper host mode: multi-host
      Oper control dir: both
      Authorized By: Guest Vlan
      Vlan Policy: 20
      Session timeout: N/A
      Idle timeout: N/A
      Common Session ID: 0A3462C8000000000002763C
      Acct Session ID: 0x00000002
      Handle: 0x25000000
Runnable methods list:
      Method  State
      mab     Failed over
      dot1x   Failed over
-----
      Interface: GigabitEthernet2/0/47
      MAC Address: 0005.5e7c.da05
      IP Address: Unknown
      User-Name: 00055e7cda05
      Status: Authz Success
      Domain: VOICE
      Oper host mode: multi-domain
```

```
Oper control dir: both
  Authorized By: Authentication Server
  Session timeout: N/A
  Idle timeout: N/A
Common Session ID: 0A3462C8000000010002A238
  Acct Session ID: 0x00000003
  Handle: 0x91000001
Runnable methods list:
  Method      State
  mab         Authc Success
  dot1x       Not run
```

show cts interface

To display Cisco TrustSec (CTS) configuration statistics for an interface, use the **show cts interface** command in EXEC or privileged EXEC mode.

show cts interface [*type slot/port* | **brief** | **summary**]

Syntax Description

type <i>slot/port</i>	(Optional) Specifies an interface type and slot or port number. A verbose output for this interface is returned.
brief	(Optional) Displays abbreviated status for all CTS interfaces.
summary	(Optional) Displays a tabular summary of all CTS interfaces with 4 or 5 key status fields for each interface.

Command Default

None

Command Modes

EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was modified with additional options.
Cisco IOS XE Denali 16.2.1	This command was introduced.

Usage Guidelines

Use the **show cts interface** command without keywords to display verbose status for all CTS interfaces.

Examples

The following example displays output without using a keyword (verbose status for all CTS interfaces):

```
Switch# show cts interface

Global Dot1x feature is Disabled
Interface GigabitEthernet0/1/0:
  CTS is enabled, mode:    MANUAL
  IFC state:              OPEN
  Interface Active for 00:00:18.232
  Authentication Status:  NOT APPLICABLE
  Peer identity:          "unknown"
  Peer's advertised capabilities: ""
  Authorization Status:   NOT APPLICABLE
  SAP Status:             NOT APPLICABLE
  Configured pairwise ciphers:
    gcm-encrypt
    null

  Replay protection:      enabled
  Replay protection mode: STRICT

  Selected cipher:
```

```

Propagate SGT:          Enabled
Cache Info:
  Cache applied to link : NONE

Statistics:
  authc success:        0
  authc reject:         0
  authc failure:        0
  authc no response:    0
  authc logoff:         0
  sap success:          0
  sap fail:             0
  authz success:        0
  authz fail:           0
  port auth fail:      0
Ingress:
  control frame bypassed: 0
  sap frame bypassed:    0
  esp packets:           0
  unknown sa:           0
  invalid sa:           0
  inverse binding failed: 0
  auth failed:          0
  replay error:         0
Egress:
  control frame bypassed: 0
  esp packets:           0
  sgt filtered:         0
  sap frame bypassed:    0
  unknown sa dropped:    0
  unknown sa bypassed:   0

```

The following example displays output using the **brief** keyword:

```

Device# show cts interface brief

Global Dot1x feature is Disabled
Interface GigabitEthernet0/1/0:
  CTS is enabled, mode:    MANUAL
  IFC state:              OPEN
  Interface Active for 00:00:40.386
  Authentication Status:  NOT APPLICABLE
  Peer identity:          "unknown"
  Peer's advertised capabilities: ""
  Authorization Status:   NOT APPLICABLE
  SAP Status:             NOT APPLICABLE
  Propagate SGT:          Enabled
  Cache Info:
    Cache applied to link : NONE

```

Related Commands	Command	Description
	cts manual	Enables an interface for CTS.
	propagate sgt (cts manual)	Enables Security Group Tag (SGT) propagation at Layer 2 on Cisco TrustSec Security (CTS) interfaces.
	sap mode-list (cts manual)	Manually specifies the PMK and the SAP authentication and encryption modes to negotiate MACsec link encryption between two interfaces.

show cts role-based permissions

To display the role-based (security group) access control permission list, use the **show cts role-based permissions** command in privileged EXEC mode.

```
show cts role-based permissions [default [details | ipv4 [details]] | from [sgt [ipv4 | to [sgt | unknown]
[details | ipv4 [details]]] | unknown] | ipv4 | to [sgt | unknown] [ipv4]]
```

Syntax Description

default	(Optional) Displays information about the default permission list.
details	(Optional) Displays attached access control list (ACL) details.
ipv4	(Optional) Displays information about the IPv4 protocol.
from	(Optional) Displays information about the source group.
<i>sgt</i>	(Optional) Security Group Tag. Valid values are from 2 to 65519.
to	(Optional) Displays information about the destination group.
unknown	(Optional) Displays information about unknown source and destination groups.

Command Modes

Privileged EXE (#)

Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

Usage Guidelines

This command displays the content of the SGACL permission matrix. You can specify the source security group tag (SGT) by using the **from** keyword and the destination SGT by using the **to** keyword. When both these keywords are specified RBACLs of a single cell are displayed. An entire column is displayed when only the **to** keyword is used. An entire row is displayed when the **from** keyword is used. The entire permission matrix is displayed when both the **from** and **to** keywords are omitted.

The command output is sorted by destination SGT as a primary key and the source SGT as a secondary key. SGACLs for each cell is displayed in the same order they are defined in the configuration or acquired from Cisco Identity Services Engine (ISE).

The **details** keyword is provided when a single cell is selected by specifying both **from** and **to** keywords. When the **details** keyword is specified the access control entries of SGACLs of a single cell are displayed.

The following is sample output from the **show role-based permissions** command:

```
Switch# show cts role-based permissions

IPv4 Role-based permissions default (monitored):
default_sgacl-02
Permit IP-00
IPv4 Role-based permissions from group 305:sgt to group 306:dgt (monitored):
test_reg_tcp_permit-02
RBACL Monitor All for Dynamic Policies : TRUE
RBACL Monitor All for Configured Policies : FALSE
```



```
IPv4 Role-based permissions from group 6:SGT_6 to group 6:SGT_6 (configured):  
  mon_1  
IPv4 Role-based permissions from group 10 to group 11 (configured):  
  mon_2  
RBACL Monitor All for Dynamic Policies : FALSE  
RBACL Monitor All for Configured Policies : FALSE
```

Related Commands

Command	Description
cts role-based permissions	Enables permissions from a source group to a destination group.
cts role-based monitor	Enables role-based access list monitoring.

show cisp

To display CISP information for a specified interface, use the **show cisp** command in privileged EXEC mode.

show cisp {[**clients** | **interface** *interface-id*] | **registrations** | **summary**}

Syntax Description		
clients		(Optional) Display CISP client details.
interface <i>interface-id</i>		(Optional) Display CISP information about the specified interface. Valid interfaces include physical ports and port channels.
registrations		Displays CISP registrations.
summary		(Optional) Displays CISP summary.

Command Modes Privileged EXEC

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.
		This command was reintroduced. This command was not supported in and

This example shows output from the **show cisp interface** command:

```
Device# show cisp interface fast 0
CISP not enabled on specified interface
```

This example shows output from the **show cisp registration** command:

```
Device# show cisp registrations
Interface(s) with CISP registered user(s):
-----
Fa1/0/13
Auth Mgr (Authenticator)
Gi2/0/1
Auth Mgr (Authenticator)
Gi2/0/2
Auth Mgr (Authenticator)
Gi2/0/3
Auth Mgr (Authenticator)
Gi2/0/5
Auth Mgr (Authenticator)
Gi2/0/9
Auth Mgr (Authenticator)
Gi2/0/11
Auth Mgr (Authenticator)
Gi2/0/13
```

```
Auth Mgr (Authenticator)
Gi3/0/3
Gi3/0/5
Gi3/0/23
```

Related Commands

Command	Description
cisp enable	Enable Client Information Signalling Protocol (CISP)
dot1x credentials <i>profile</i>	Configure a profile on a supplicant switch

show dot1x

To display IEEE 802.1x statistics, administrative status, and operational status for the switch or for the specified port, use the **show dot1x** command in user EXEC mode.

show dot1x [**all** [**count** | **details** | **statistics** | **summary**]] [**interface type number** [**details** | **statistics**]] [**statistics**]

Syntax Description		
all	(Optional) Displays the IEEE 802.1x information for all interfaces.	
count	(Optional) Displays total number of authorized and unauthorized clients.	
details	(Optional) Displays the IEEE 802.1x interface details.	
statistics	(Optional) Displays the IEEE 802.1x statistics for all interfaces.	
summary	(Optional) Displays the IEEE 802.1x summary for all interfaces.	
interface type number	(Optional) Displays the IEEE 802.1x status for the specified port.	
Command Modes	User EXEC	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show dot1x all** command:

```
Device# show dot1x all
Sysauthcontrol          Enabled
Dot1x Protocol Version      3
```

This is an example of output from the **show dot1x all count** command:

```
Device# show dot1x all count
Number of Dot1x sessions
-----
Authorized Clients      = 0
UnAuthorized Clients    = 0
Total No of Client     = 0
```

This is an example of output from the **show dot1x all statistics** command:

```
Device# show dot1x statistics
Dot1x Global Statistics for
-----
RxStart = 0      RxLogoff = 0      RxResp = 0      RxRespID = 0
RxReq = 0        RxInvalid = 0    RxLenErr = 0
RxTotal = 0
```

```
TxStart = 0      TxLogoff = 0      TxResp = 0
TxReq = 0        ReTxReq = 0        ReTxReqFail = 0
TxReqID = 0      ReTxReqID = 0      ReTxReqIDFail = 0
TxTotal = 0
```

show eap pac peer

To display stored Protected Access Credentials (PAC) for Extensible Authentication Protocol (EAP) Flexible Authentication via Secure Tunneling (FAST) peers, use the **show eap pac peer** command in privileged EXEC mode.

show eap pac peer

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show eap pac peers** privileged EXEC command:

```
Device> show eap pac peers
No PACs stored
```

Related Commands

Command	Description
clear eap sessions	Clears EAP session information for the switch or for the specified port.

show ip dhcp snooping statistics

To display DHCP snooping statistics in summary or detail form, use the **show ip dhcp snooping statistics** command in user EXEC mode.

show ip dhcp snooping statistics [detail]

Syntax Description	detail (Optional) Displays detailed statistics information.				
Command Modes	User EXEC				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				
Usage Guidelines	In a switch stack, all statistics are generated on the stack primary. If a new active switch is elected, the statistics counters reset.				

This is an example of output from the **show ip dhcp snooping statistics** command:

```
Device> show ip dhcp snooping statistics

Packets Forwarded                = 0
Packets Dropped                   = 0
Packets Dropped From untrusted ports = 0
```

This is an example of output from the **show ip dhcp snooping statistics detail** command:

```
Device> show ip dhcp snooping statistics detail

Packets Processed by DHCP Snooping                = 0
Packets Dropped Because
  IDB not known                                    = 0
  Queue full                                       = 0
  Interface is in errdisabled                       = 0
  Rate limit exceeded                              = 0
  Received on untrusted ports                      = 0
  Nonzero giaddr                                    = 0
  Source mac not equal to chaddr                   = 0
  Binding mismatch                                  = 0
  Insertion of opt82 fail                           = 0
  Interface Down                                    = 0
  Unknown output interface                         = 0
  Reply output port equal to input port            = 0
  Packet denied by platform                        = 0
```

This table shows the DHCP snooping statistics and their descriptions:

Table 8: DHCP Snooping Statistics

DHCP Snooping Statistic	Description
Packets Processed by DHCP Snooping	Total number of packets handled by DHCP snooping, including forwarded and dropped packets.
Packets Dropped Because IDB not known	Number of errors when the input interface of the packet cannot be determined.
Queue full	Number of errors when an internal queue used to process the packets is full. This might happen if DHCP packets are received at an excessively high rate and rate limiting is not enabled on the ingress ports.
Interface is in errdisabled	Number of times a packet was received on a port that has been marked as error disabled. This might happen if packets are in the processing queue when a port is put into the error-disabled state and those packets are subsequently processed.
Rate limit exceeded	Number of times the rate limit configured on the port was exceeded and the interface was put into the error-disabled state.
Received on untrusted ports	Number of times a DHCP server packet (OFFER, ACK, NAK, or LEASEQUERY) was received on an untrusted port and was dropped.
Nonzero giaddr	Number of times the relay agent address field (giaddr) in the DHCP packet received on an untrusted port was not zero, or the no ip dhcp snooping information option allow-untrusted global configuration command is not configured and a packet received on an untrusted port contained option-82 data.
Source mac not equal to chaddr	Number of times the client MAC address field of the DHCP packet (chaddr) does not match the packet source MAC address and the ip dhcp snooping verify mac-address global configuration command is configured.
Binding mismatch	Number of times a RELEASE or DECLINE packet was received on a port that is different than the port in the binding for that MAC address-VLAN pair. This indicates someone might be trying to spoof the real client, or it could mean that the client has moved to another port on the switch and issued a RELEASE or DECLINE. The MAC address is taken from the chaddr field of the DHCP packet, not the source MAC address in the Ethernet header.
Insertion of opt82 fail	Number of times the option-82 insertion into a packet failed. The insertion might fail if the packet with the option-82 data exceeds the size of a single physical packet on the internet.

DHCP Snooping Statistic	Description
Interface Down	Number of times the packet is a reply to the DHCP relay agent, but the SVI interface for the relay agent is down. This is an unlikely error that occurs if the SVI goes down between sending the client request to the DHCP server and receiving the response.
Unknown output interface	Number of times the output interface for a DHCP reply packet cannot be determined by either option-82 data or a lookup in the MAC address table. The packet is dropped. This can happen if option 82 is not used and the client MAC address has aged out. If IPSG is enabled with the port-security option and option 82 is not enabled, the MAC address of the client is not learned, and the reply packets will be dropped.
Reply output port equal to input port	Number of times the output port for a DHCP reply packet is the same as the input port, causing a possible loop. Indicates a possible network misconfiguration or misuse of trust settings on ports.
Packet denied by platform	Number of times the packet has been denied by a platform-specific registry.

show radius server-group

To display properties for the RADIUS server group, use the **show radius server-group** command.

show radius server-group { *name* | **all** }

Syntax Description

<i>name</i>	Name of the server group. The character string used to name the group of servers must be defined using the aaa group server radius command.
all	Displays properties for all of the server groups.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

Use the **show radius server-group** command to display the server groups that you defined by using the **aaa group server radius** command.

This is an example of output from the **show radius server-group all** command:

```
Device# show radius server-group all
Server group radius
  Sharecount = 1  sg_unconfigured = FALSE
  Type = standard  Memlocks = 1
```

This table describes the significant fields shown in the display.

Table 9: show radius server-group command Field Descriptions

Field	Description
Server group	Name of the server group.
Sharecount	Number of method lists that are sharing this server group. For example, if one method list uses a particular server group, the sharecount would be 1. If two method lists use the same server group, the sharecount would be 2.
sg_unconfigured	Server group has been unconfigured.
Type	The type can be either standard or nonstandard. The type indicates whether the servers in the group accept nonstandard attributes. If all servers within the group are configured with the nonstandard option, the type will be shown as "nonstandard".

Field	Description
Memlocks	An internal reference count for the server-group structure that is in memory. The number represents how many internal data structure packets or transactions are holding references to this server group. Memlocks is used internally for memory management purposes.

show storm-control

To display broadcast, multicast, or unicast storm control settings on the switch or on the specified interface or to display storm-control history, use the **show storm-control** command in user EXEC mode.

show storm-control [*interface-id*] [**broadcast** | **multicast** | **unicast**]

Syntax Description

interface-id	(Optional) Interface ID for the physical port (including type, stack member for stacking-capable switches, module, and port number).
broadcast	(Optional) Displays broadcast storm threshold setting.
multicast	(Optional) Displays multicast storm threshold setting.
unicast	(Optional) Displays unicast storm threshold setting.

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

When you enter an interface ID, the storm control thresholds appear for the specified interface.

If you do not enter an interface ID, settings appear for one traffic type for all ports on the switch.

If you do not enter a traffic type, settings appear for broadcast storm control.

This is an example of a partial output from the **show storm-control** command when no keywords are entered. Because no traffic-type keyword was entered, the broadcast storm control settings appear.

```
Device> show storm-control
Interface Filter State Upper Lower Current
-----
Gi1/0/1 Forwarding 20 pps 10 pps 5 pps
Gi1/0/2 Forwarding 50.00% 40.00% 0.00%
<output truncated>
```

This is an example of output from the **show storm-control** command for a specified interface. Because no traffic-type keyword was entered, the broadcast storm control settings appear.

```
Device> show storm-control gigabitethernet 1/0/1
Interface Filter State Upper Lower Current
-----
Gi1/0/1 Forwarding 20 pps 10 pps 5 pps
```

The following table describes the fields in the show storm-control display:

Table 10: show storm-control Field Descriptions

Field	Description
Interface	Displays the ID of the interface.

Field	Description
Filter State	Displays the status of the filter: <ul style="list-style-type: none">• Blocking—Storm control is enabled, and a storm has occurred.• Forwarding—Storm control is enabled, and no storms have occurred.• Inactive—Storm control is disabled.
Upper	Displays the rising suppression level as a percentage of total available bandwidth in packets per second or in bits per second.
Lower	Displays the falling suppression level as a percentage of total available bandwidth in packets per second or in bits per second.
Current	Displays the bandwidth usage of broadcast traffic or the specified traffic type (broadcast, multicast, or unicast) as a percentage of total available bandwidth. This field is only valid when storm control is enabled.

show vlan access-map

To display information about a particular VLAN access map or for all VLAN access maps, use the **show vlan access-map** command in privileged EXEC mode.

```
show vlan access-map [map-name]
```

Syntax Description	<i>map-name</i> (Optional) Name of a specific VLAN access map.	
Command Default	None	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show vlan access-map** command:

```
Device# show vlan access-map
Vlan access-map "vmap4" 10
  Match clauses:
    ip address: a12
  Action:
    forward
Vlan access-map "vmap4" 20
  Match clauses:
    ip address: a12
  Action:
    forward
```

show vlan filter

To display information about all VLAN filters or about a particular VLAN or VLAN access map, use the **show vlan filter** command in privileged EXEC mode.

```
show vlan filter access-map name | vlan vlan-id
```

Syntax Description	access-map <i>name</i> (Optional) Displays filtering information for the specified VLAN access map.	
	vlan <i>vlan-id</i> (Optional) Displays filtering information for the specified VLAN. The range is 1 to 4094.	
Command Default	None	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

This is an example of output from the **show vlan filter** command:

```
Device# show vlan filter
VLAN Map map_1 is filtering VLANs:
 20-22
```

show vlan group

To display the VLANs that are mapped to VLAN groups, use the **show vlan group** command in privileged EXEC mode.

```
show vlan group [group-name vlan-group-name [user_count]]
```

Syntax Description

group-name *vlan-group-name* (Optional) Displays the VLANs mapped to the specified VLAN group.

user_count (Optional) Displays the number of users in each VLAN mapped to a specified VLAN group.

Command Default

None

Command Modes

Privileged EXEC

Command History

Release

Cisco IOS XE Everest 16.5.1a

Modification

This command was introduced.

Usage Guidelines

The **show vlan group** command displays the existing VLAN groups and lists the VLANs and VLAN ranges that are members of each VLAN group. If you enter the **group-name** keyword, only the members of the specified VLAN group are displayed.

This example shows how to display the members of a specified VLAN group:

snmp-server enable traps

To enable all Simple Network Management Protocol (SNMP) notification types that are available on your system, use the **snmp-server enable traps** command in global configuration mode. To disable all available SNMP notifications, use the **no** form of this command.

snmp-server enable traps
no snmp-server enable traps

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Fuji 16.8.1a	This command was introduced.

Usage Guidelines

SNMP notifications can be sent as traps or inform requests. This command enables both traps and inform requests for the specified notification types.

Examples

The following example shows how to enable the device to send all traps to the host specified by the name myhost.cisco.com, using the community string defined as public:

```
Device(config)# snmp-server enable traps
```

```
Device(config)# snmp-server host myhost.cisco.com public
```

snmp-server enable traps snmp

To enable the RFC 1157 Simple Network Management Protocol (SNMP) notifications, use the **snmp-server enable traps snmp** command in global configuration mode. To disable RFC 1157 SNMP notifications, use the **no** form of this command.

snmp-server enable traps snmp [**authentication**] [**linkup**] [**linkdown**] [**coldstart**] [**warmstart**]
no snmp-server enable traps snmp [**authentication**] [**linkup**] [**linkdown**] [**coldstart**] [**warmstart**]

Syntax Description	
authentication	(Optional) Controls the sending of SNMP authentication failure notifications.
linkup	(Optional) Controls the sending of SNMP linkUp notifications.
linkdown	(Optional) Controls the sending of SNMP linkDown notifications.
coldstart	(Optional) Controls the sending of SNMP coldStart notifications.
warmstart	(Optional) Controls the sending of SNMP warmStart notifications.

Command Default SNMP notifications are disabled.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Fuji 16.8.1a	This command was introduced.

Usage Guidelines SNMP notifications can be sent as traps or inform requests. This command enables both traps and inform requests for the specified notification types.

If you do not enter an **snmp-server enable traps snmp** command, no notifications controlled by this command are sent. To configure the device to send these SNMP notifications, you must enter at least one **snmp-server enable traps snmp** command. When you enter the command with no keywords, all notification types are enabled. When you enter the command with a keyword, only the types of notifications related to that keyword are enabled.

When you use the optional **authentication** keyword, the authenticationFailure(4) trap signifies that the sending device is the addressee of a protocol message that is not properly authenticated. The authentication method depends on the version of SNMP being used. For SNMPv1 or SNMPv2c, authentication failure occurs for packets with an incorrect community string and the SNMP traps are generated. For SNMPv3, authentication failure occurs for packets with an incorrect SHA/MD5 authentication key or for a packet that is outside the authoritative SNMP engine's window (for example, packets that are configured outside access lists or time ranges) and a report PDU is generated, however authentication failure traps are not generated.

When you use the optional **linkup** keyword, the linkUp(3) trap signifies that the sending device recognizes one of the communication links represented in the agent's configuration coming up.

When you use the optional **linkdown** keyword, the linkDown(2) trap signifies that the sending device recognizes a failure in one of the communication links represented in the agent's configuration.

The **snmp-server enable traps snmp [linkup] [linkdown]** form of this command globally enables or disables SNMP linkUp and linkDown traps. After enabling either of these traps globally, you can disable them on specific interfaces using the **no snmp trap link-status** command in interface configuration mode. On the interface level, linkUp and linkDown traps are enabled by default, which means that these notifications do not have to be enabled on a per-interface basis. However, linkUp and linkDown notifications will not be sent unless you enable them globally using the **snmp-server enable traps snmp** command.

When you use the optional **coldstart** keyword, the coldStart(0) trap signifies that the sending device is reinitializing itself such that the agent's configuration or the protocol entity implementation may be altered.

When you use the optional **warmstart** keyword, the warmStart(1) trap signifies that the sending device is reinitializing itself such that neither the agent configuration nor the protocol entity implementation is altered.

The **snmp-server enable traps snmp** command is used in conjunction with the **snmp-server host** command. Use the **snmp-server host** command to specify which host or hosts receive SNMP notifications. In order to send notifications, you must configure at least one **snmp-server host** command.

For a host to receive a notification controlled by this command, you must enable both the **snmp-server enable traps** command and the **snmp-server host** command for that host. If the notification type is not controlled by this command, you must enable the appropriate **snmp-server host** command only.

Examples

The following example shows how to enable the device to send all traps to the host myhost.cisco.com, using the community string public:

```
Device(config)# snmp-server enable traps snmp
Device(config)# snmp-server host myhost.cisco.com public snmp
```

The following example shows how to enable the device to send all inform notifications to the host myhost.cisco.com using the community string public:

```
Device(config)# snmp-server enable traps snmp
Device(config)# snmp-server host myhost.cisco.com informs version 2c public snmp
```

The following example shows how to enable all SNMP trap types, and then disable only the linkUp and linkDown traps:

```
Device> enable
Device# configure terminal
Device(config)# snmp-server enable traps snmp
Device(config)# end
Device# more system:running-config | include traps snmp
snmp-server enable traps snmp authentication linkup linkdown coldstart warmstart
Device# configure terminal
Device(config)# no snmp-server enable traps snmp linkup linkdown
Device(config)# end
Device# more system:running-config | include traps snmp
snmp-server enable traps snmp authentication coldstart warmstart
```

Related Commands

Command	Description
snmp-server enable traps	Enables all available SNMP notifications on your system.
snmp-server host	Specifies the recipient of an SNMP notification operation.

Command	Description
snmp-server informs	Specifies inform request options.
snmp-server trap authentication vrf	Disables or reenables SNMP authentication notifications specific to VPN context mismatches.
snmp-server trap-source	Specifies the interface that an SNMP trap should originate from.

snmp-server group

To configure a new Simple Network Management Protocol (SNMP) group, use the **snmp-server group** command in global configuration mode. To remove a specified SNMP group, use the **no** form of this command.

```
snmp-server group group-name v1 | v2c | v3 auth | noauth | priv [context context-name] [match exact | prefix] [read read-view] [write write-view] [notify notify-view] [access [ipv6 named-access-list] [acl-number acl-name]]
```

```
no snmp-server group group-name v1 | v2c | v3 auth | noauth | priv [context context-name]
```

Syntax Description

<i>group-name</i>	Name of the group.
v1	Specifies that the group is using the SNMPv1 security model. SNMPv1 is the least secure of the possible SNMP security models.
v2c	Specifies that the group is using the SNMPv2c security model. The SNMPv2c security model allows informs to be transmitted and supports 64-character strings.
v3	Specifies that the group is using the SNMPv3 security model. SNMPv3 is the most secure of the supported security models. It allows you to explicitly configure authentication characteristics.
auth	Specifies authentication of a packet without encrypting it.
noauth	Specifies no authentication of a packet.
priv	Specifies authentication of a packet with encryption.
context	(Optional) Specifies the SNMP context to associate with this SNMP group and its views.
<i>context-name</i>	(Optional) Context name.
match	(Optional) Specifies an exact context match or matches only the context prefix.
<i>exact</i>	(Optional) Matches the exact context.
<i>prefix</i>	(Optional) Matches only the context prefix.
read	(Optional) Specifies a read view for the SNMP group. This view enables you to view only the contents of the agent.
<i>read-view</i>	(Optional) String of a maximum of 64 characters that is the name of the view. The default is that the read-view is assumed to be every object belonging to the Internet object identifier (OID) space (1.3.6.1), unless the read option is used to override this state.
write	(Optional) Specifies a write view for the SNMP group. This view enables you to enter data and configure the contents of the agent.

<i>write-view</i>	(Optional) String of a maximum of 64 characters that is the name of the view. The default is that nothing is defined for the write view (that is, the null OID). You must configure write access.
notify	(Optional) Specifies a notify view for the SNMP group. This view enables you to specify a notify, inform, or trap.
<i>notify-view</i>	(Optional) String of a maximum of 64 characters that is the name of the view. By default, nothing is defined for the notify view (that is, the null OID) until the snmp-server host command is configured. If a view is specified in the snmp-server group command, any notifications in that view that are generated will be sent to all users associated with the group (provided a SNMP server host configuration exists for the user). Cisco recommends that you let the software autogenerate the notify view. See the “Configuring Notify Views” section in this document.
access	(Optional) Specifies a standard access control list (ACL) to associate with the group.
ipv6	(Optional) Specifies an IPv6 named access list. If both IPv6 and IPv4 access lists are indicated, the IPv6 named access list must appear first in the list.
<i>named-access-list</i>	(Optional) Name of the IPv6 access list.
<i>acl-number</i>	(Optional) The <i>acl-number</i> argument is an integer from 1 to 99 that identifies a previously configured standard access list.
<i>acl-name</i>	(Optional) The <i>acl-name</i> argument is a string of a maximum of 64 characters that is the name of a previously configured standard access list.

Command Default

No SNMP server groups are configured.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Fuji 16.8.1a	This command was introduced.

Usage Guidelines

When a community string is configured internally, two groups with the name public are autogenerated, one for the v1 security model and the other for the v2c security model. Similarly, deleting a community string will delete a v1 group with the name public and a v2c group with the name public.

No default values exist for authentication or privacy algorithms when you configure the **snmp-server group** command. Also, no default passwords exist. For information about specifying a Message Digest 5 (MD5) password, see the documentation of the **snmp-server user** command.

Configuring Notify Views

The notify-view option is available for two reasons:

- If a group has a notify view that is set using SNMP, you may need to change the notify view.

- The **snmp-server host** command may have been configured before the **snmp-server group** command. In this case, you must either reconfigure the **snmp-server host** command, or specify the appropriate notify view.

Specifying a notify view when configuring an SNMP group is not recommended, for the following reasons:

- The **snmp-server host** command autogenerates a notify view for the user, and then adds it to the group associated with that user.
- Modifying the group's notify view will affect all users associated with that group.

Instead of specifying the notify view for a group as part of the **snmp-server group** command, use the following commands in the order specified:

1. **snmp-server user**—Configures an SNMP user.
2. **snmp-server group**—Configures an SNMP group, without adding a notify view .
3. **snmp-server host**—Autogenerates the notify view by specifying the recipient of a trap operation.

SNMP Contexts

SNMP contexts provide VPN users with a secure way of accessing MIB data. When a VPN is associated with a context, that VPN's specific MIB data exists in that context. Associating a VPN with a context enables service providers to manage networks with multiple VPNs. Creating and associating a context with a VPN enables a provider to prevent the users of one VPN from accessing information about users of other VPNs on the same networking device.

Use this command with the **context** *context-name* keyword and argument to associate a read, write, or notify SNMP view with an SNMP context.

Create an SNMP Group

The following example shows how to create the SNMP server group “public,” allowing read-only access for all objects to members of the standard named access list “lmnop”:

```
Device(config)# snmp-server group public v2c access lmnop
```

Remove an SNMP Server Group

The following example shows how to remove the SNMP server group “public” from the configuration:

```
Device(config)# no snmp-server group public v2c
```

Associate an SNMP Server Group with Specified Views

The following example shows SNMP context “A” associated with the views in SNMPv2c group “GROUP1”:

```
Device(config)# snmp-server context A
Device(config)# snmp mib community commA
```

```
Device(config)# snmp mib community-map commA context A target-list commAVpn
Device(config)# snmp-server group GROUP1 v2c context A read viewA write viewA notify viewB
```

Related Commands

Command	Description
show snmp group	Displays the names of groups on the device and the security model, the status of the different views, and the storage type of each group.
snmp mib community-map	Associates a SNMP community with an SNMP context, engine ID, security name, or VPN target list.
snmp-server host	Specifies the recipient of a SNMP notification operation.
snmp-server user	Configures a new user to a SNMP group.

snmp-server host

To specify the recipient of a Simple Network Management Protocol (SNMP) notification operation, use the **snmp-server host** command in global configuration mode. To remove the specified host from the configuration, use the **no** form of this command.

```
snmp-server host ip-address [vrf vrf-name | informs | traps | version 1 | 2c | 3 [auth | noauth | priv]]
community-string [udp-port port [notification-type] notification-type]
no snmp-server host hostnameip-address [vrf vrf-name | informs | traps | version 1 | 2c | 3 [auth |
noauth | priv]] community-string [udp-port port [notification-type] notification-type]
```

Syntax Description

<i>ip-address</i>	IPv4 address or IPv6 address of the SNMP notification host.
vrf	(Optional) Specifies that a VPN routing and forwarding (VRF) instance should be used to send SNMP notifications.
<i>vrf-name</i>	(Optional) VPN VRF instance used to send SNMP notifications.
informs	(Optional) Specifies that notifications should be sent as informs.
traps	(Optional) Specifies that notifications should be sent as traps. This is the default.
version	<p>(Optional) Specifies the version of the SNMP that is used to send the traps or informs. The default is 1.</p> <p>If you use the version keyword, one of the following keywords must be specified:</p> <ul style="list-style-type: none"> • 1—SNMPv1. • 2c—SNMPv2C. • 3—SNMPv3. The most secure model because it allows packet encryption with the priv keyword. The default is noauth. <p>One of the following three optional security level keywords can follow the 3 keyword:</p> <ul style="list-style-type: none"> • auth—Enables message digest algorithm 5 (MD5) and Secure Hash Algorithm (SHA) packet authentication. • noauth—Specifies that the noAuthNoPriv security level applies to this host. This is the default security level for SNMPv3. • priv—Enables Data Encryption Standard (DES) packet encryption (also called “privacy”).
<i>community-string</i>	<p>Password-like community string sent with the notification operation.</p> <p>Note You can set this string using the snmp-server host command by itself, but Cisco recommends that you define the string using the snmp-server community command prior to using the snmp-server host command.</p> <p>Note The “at” sign (@) is used for delimiting the context information.</p>

udp-port	(Optional) Specifies that SNMP traps or informs are to be sent to a network management system (NMS) host.
<i>port</i>	(Optional) User Datagram Protocol (UDP) port number of the NMS host. The default is 162.
<i>notification-type</i>	(Optional) Type of notification to be sent to the host. If no type is specified, all available notifications are sent. See the “Usage Guidelines” section for more information about the keywords available.

Command Default

This command behavior is disabled by default. A recipient is not specified to receive notifications.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Fuji 16.8.1a	This command was introduced.

Usage Guidelines

If you enter this command with no optional keywords, the default is to send all notification-type traps to the host. No informs will be sent to the host.

The **no snmp-server host** command with no keywords disables traps, but not informs, to the host. To disable informs, use the **no snmp-server host informs** command.

**Note**

If a community string is not defined using the **snmp-server community** command prior to using this command, the default form of the **snmp-server community** command will automatically be inserted into the configuration. The password (community string) used for this automatic configuration of the **snmp-server community** command will be the same as that specified in the **snmp-server host** command. This automatic command insertion and use of passwords is the default behavior for Cisco IOS Release 12.0(3) and later releases. However, in Cisco IOS Release 12.2(33)SRE and later releases, you must manually configure the **snmp-server community** command. That is, the **snmp-server community** command will not be seen in the configuration.

SNMP notifications can be sent as traps or inform requests. Traps are unreliable because the receiver does not send acknowledgments when it receives traps. The sender cannot determine if the traps were received. However, an SNMP entity that receives an inform request acknowledges the message with an SNMP response protocol data unit (PDU). If the sender never receives the response, the inform request can be sent again. Thus, informs are more likely to reach their intended destination than traps.

Compared to traps, informs consume more resources in the agent and in the network. Unlike a trap, which is discarded as soon as it is sent, an inform request must be held in memory until a response is received or the request times out. Also, traps are sent only once; an inform may be tried several times. The retries increase traffic and contribute to a higher overhead on the network.

If you do not enter an **snmp-server host** command, no notifications are sent. To configure the device to send SNMP notifications, you must enter at least one **snmp-server host** command. If you enter the command with no optional keywords, all trap types are enabled for the host.

To enable multiple hosts, you must issue a separate **snmp-server host** command for each host. You can specify multiple notification types in the command for each host.

When multiple **snmp-server host** commands are given for the same host and kind of notification (trap or inform), each succeeding command overwrites the previous command. Only the last **snmp-server host** command will be in effect. For example, if you enter an **snmp-server host inform** command for a host and then enter another **snmp-server host inform** command for the same host, the second command will replace the first.

The **snmp-server host** command is used in conjunction with the **snmp-server enable** command. Use the **snmp-server enable** command to specify which SNMP notifications are sent globally. For a host to receive most notifications, at least one **snmp-server enable** command and the **snmp-server host** command for that host must be enabled.

Some notification types cannot be controlled with the **snmp-server enable** command. Some notification types are always enabled, and others are enabled by a different command. For example, the **linkUpDown** notifications are controlled by the **snmp trap link-status** command. These notification types do not require an **snmp-server enable** command.

The availability of notification-type options depends on the device type and the Cisco IOS software features supported on the device. For example, the **envmon** notification type is available only if the environmental monitor is part of the system. To see what notification types are available on your system, use the command **help ?** at the end of the **snmp-server host** command.

The **vrf** keyword allows you to specify the notifications being sent to a specified IP address over a specific VRF VPN. The VRF defines a VPN membership of a user so that data is stored using the VPN.

In the case of the NMS sending the query having a correct SNMP community but not having a read or a write view, the SNMP agent returns the following error values:

- For a get or a getnext query, returns **GEN_ERROR** for SNMPv1 and **AUTHORIZATION_ERROR** for SNMPv2C.
- For a set query, returns **NO_ACCESS_ERROR**.

Notification-Type Keywords

The notification type can be one or more of the following keywords.



Note The available notification types differ based on the platform and Cisco IOS release. For a complete list of available notification types, use the question mark (?) online help function.

- **aaa server**—Sends SNMP authentication, authorization, and accounting (AAA) traps.
- **adsl**—Sends Asymmetric Digital Subscriber Line (ADSL) LINE-MIB traps.
- **atm**—Sends ATM notifications.
- **authenticate-fail**—Sends an SNMP 802.11 Authentication Fail trap.
- **auth-framework**—Sends SNMP CISCO-AUTH-FRAMEWORK-MIB notifications.
- **bgp**—Sends Border Gateway Protocol (BGP) state change notifications.
- **bridge**—Sends SNMP STP Bridge MIB notifications.

- **bstun**—Sends Block Serial Tunneling (BSTUN) event notifications.
- **bulkstat**—Sends Data-Collection-MIB notifications.
- **c6kxbar**—Sends SNMP crossbar notifications.
- **callhome**—Sends Call Home MIB notifications.
- **calltracker**—Sends Call Tracker call-start/call-end notifications.
- **casa**—Sends Cisco Appliances Services Architecture (CASA) event notifications.
- **ccme**—Sends SNMP Cisco netManager Event (CCME) traps.
- **cef**—Sends notifications related to Cisco Express Forwarding.
- **chassis**—Sends SNMP chassis notifications.
- **cnpd**—Sends Cisco Network-based Application Recognition (NBAR) Protocol Discovery (CNPD) traps.
- **config**—Sends configuration change notifications.
- **config-copy**—Sends SNMP config-copy notifications.
- **config-ctid**—Sends SNMP config-ctid notifications.
- **cpu**—Sends CPU-related notifications.
- **csg**—Sends SNMP Content Services Gateway (CSG) notifications.
- **deauthenticate**—Sends an SNMP 802.11 Deauthentication trap.
- **dhcp-snooping**—Sends DHCP snooping MIB notifications.
- **director**—Sends notifications related to DistributedDirector.
- **disassociate**—Sends an SNMP 802.11 Disassociation trap.
- **dls**—Sends data-link switching (DLSW) notifications.
- **dnis**—Sends SNMP Dialed Number Identification Service (DNIS) traps.
- **dot1x**—Sends 802.1X notifications.
- **dot11-mibs**—Sends dot11 traps.
- **dot11-qos**—Sends SNMP 802.11 QoS Change trap.
- **ds1**—Sends SNMP digital signaling 1 (DS1) notifications.
- **ds1-loopback**—Sends ds1-loopback traps.
- **dspu**—Sends downstream physical unit (DSPU) notifications.
- **eigrp**—Sends Enhanced Interior Gateway Routing Protocol (EIGRP) stuck-in-active (SIA) and neighbor authentication failure notifications.
- **energywise**—Sends SNMP energywise notifications.
- **entity**—Sends Entity MIB modification notifications.
- **entity-diag**—Sends SNMP entity diagnostic MIB notifications.

- **envmon**—Sends Cisco enterprise-specific environmental monitor notifications when an environmental threshold is exceeded.
- **errdisable**—Sends error disable notifications.
- **ethernet-cfm**—Sends SNMP Ethernet Connectivity Fault Management (CFM) notifications.
- **event-manager**—Sends SNMP Embedded Event Manager notifications.
- **firewall**—Sends SNMP Firewall traps.
- **flash**—Sends flash media insertion and removal notifications.
- **flexlinks**—Sends FLEX links notifications.
- **flowmon**—Sends flow monitoring notifications.
- **frame-relay**—Sends Frame Relay notifications.
- **fru-ctrl**—Sends entity field-replaceable unit (FRU) control notifications.
- **hsrp**—Sends Hot Standby Routing Protocol (HSRP) notifications.
- **icsudsu**—Sends SNMP ICSUDSU traps.
- **iplocalpool**—Sends IP local pool notifications.
- **ipmobile**—Sends Mobile IP notifications.
- **ipmulticast**—Sends IP multicast notifications.
- **ipsec**—Sends IP Security (IPsec) notifications.
- **isakmp**—Sends SNMP ISAKMP notifications.
- **isdn**—Sends ISDN notifications.
- **l2tc**—Sends SNMP L2 tunnel configuration notifications.
- **l2tun-pseudowire-status**—Sends pseudowire state change notifications.
- **l2tun-session**—Sends Layer 2 tunneling session notifications.
- **license**—Sends licensing notifications as traps or informs.
- **llc2**—Sends Logical Link Control, type 2 (LLC2) notifications.
- **mac-notification**—Sends SNMP MAC notifications.
- **memory**—Sends memory pool and memory buffer pool notifications.
- **module**—Sends SNMP module notifications.
- **module-auto-shutdown**—Sends SNMP module autosutdown MIB notifications.
- **mpls-fast-reroute**—Sends SNMP Multiprotocol Label Switching (MPLS) traffic engineering fast reroute notifications.
- **mpls-ldp**—Sends MPLS Label Distribution Protocol (LDP) notifications indicating status changes in LDP sessions.

- **mpls-traffic-eng**—Sends MPLS traffic engineering notifications, indicating changes in the status of MPLS traffic engineering tunnels.
- **mpls-vpn**—Sends MPLS VPN notifications.
- **msdp**—Sends SNMP Multicast Source Discovery Protocol (MSDP) notifications.
- **mvpn**—Sends multicast VPN notifications.
- **nhrp**—Sends Next Hop Resolution Protocol (NHRP) notifications.
- **ospf**—Sends Open Shortest Path First (OSPF) sham-link notifications.
- **pim**—Sends Protocol Independent Multicast (PIM) notifications.
- **port-security**—Sends SNMP port-security notifications.
- **power-ethernet**—Sends SNMP power Ethernet notifications.
- **public storm-control**—Sends SNMP public storm-control notifications.
- **pw-vc**—Sends SNMP pseudowire virtual circuit (VC) notifications.
- **p2mp-traffic-eng**—Sends SNMP MPLS Point to Multi-Point MPLS-TE notifications.
- **repeater**—Sends standard repeater (hub) notifications.
- **resource-policy**—Sends CISCO-ERM-MIB notifications.
- **rf**—Sends SNMP RF MIB notifications.
- **rogue-ap**—Sends an SNMP 802.11 Rogue AP trap.
- **rsrb**—Sends remote source-route bridging (RSRB) notifications.
- **rsvp**—Sends Resource Reservation Protocol (RSVP) notifications.
- **rtr**—Sends Response Time Reporter (RTR) notifications.
- **sdlc**—Sends Synchronous Data Link Control (SDLC) notifications.
- **sdllc**—Sends SDLC Logical Link Control (SDLLC) notifications.
- **slb**—Sends SNMP server load balancer (SLB) notifications.
- **snmp**—Sends any enabled RFC 1157 SNMP linkUp, linkDown, authenticationFailure, warmStart, and coldStart notifications.



Note To enable RFC-2233-compliant link up/down notifications, you should use the **snmp server link trap** command.

- **sonet**—Sends SNMP SONET notifications.
- **srp**—Sends Spatial Reuse Protocol (SRP) notifications.
- **stp**—Sends SNMP STP MIB notifications.
- **srst**—Sends SNMP Survivable Remote Site Telephony (SRST) traps.

- **stun**—Sends serial tunnel (STUN) notifications.
- **switch-over**—Sends an SNMP 802.11 Standby Switchover trap.
- **syslog**—Sends error message notifications (Cisco Syslog MIB). Use the **logging history level** command to specify the level of messages to be sent.
- **syslog**—Sends error message notifications (Cisco Syslog MIB). Use the **logging history level** command to specify the level of messages to be sent.
- **tty**—Sends Cisco enterprise-specific notifications when a TCP connection closes.
- **udp-port**—Sends the notification host's UDP port number.
- **vlan-mac-limit**—Sends SNMP L2 control VLAN MAC limit notifications.
- **vlancreate**—Sends SNMP VLAN created notifications.
- **vlandelete**—Sends SNMP VLAN deleted notifications.
- **voice**—Sends SNMP voice traps.
- **vrrp**—Sends Virtual Router Redundancy Protocol (VRRP) notifications.
- **vsimaster**—Sends Virtual Switch Interface (VSI) Master notifications.
- **vswitch**—Sends SNMP virtual switch notifications.
- **vtp**—Sends SNMP VLAN Trunking Protocol (VTP) notifications.
- **wlan-wep**—Sends an SNMP 802.11 Wireless LAN (WLAN) Wired Equivalent Privacy (WEP) trap.
- **x25**—Sends X.25 event notifications.
- **xgcp**—Sends External Media Gateway Control Protocol (XGCP) traps.

SNMP-Related Notification-Type Keywords

The *notification-type* argument used in the **snmp-server host** command do not always match the keywords used in the corresponding **snmp-server enable traps** command. For example, the *notification-type* argument applicable to Multiprotocol Label Switching Protocol (MPLS) traffic engineering tunnels is specified as **mpls-traffic-eng** (containing two hyphens and no embedded spaces). The corresponding parameter in the **snmp-server enable traps** command is specified as **mpls traffic-eng** (containing an embedded space and a hyphen).

This syntax difference is necessary to ensure that the CLI interprets the *notification-type* keyword of the **snmp-server host** command as a unified, single-word construct, which preserves the capability of the **snmp-server host** command to accept multiple *notification-type* keywords in the command line. The **snmp-server enable traps** commands, however, often use two-word constructs to provide hierarchical configuration options and to maintain consistency with the command syntax of related commands. The table below maps some examples of **snmp-server enable traps** commands to the keywords used in the **snmp-server host** command.

Table 11: snmp-server enable traps Commands and Corresponding Notification Keywords

snmp-server enable traps Command	snmp-server host Command Keyword
snmp-server enable traps l2tun session	l2tun-session

snmp-server enable traps Command	snmp-server host Command Keyword
snmp-server enable traps mpls ldp	mpls-ldp
snmp-server enable traps mpls traffic-eng ¹	mpls-traffic-eng
snmp-server enable traps mpls vpn	mpls-vpn
snmp-server host <i>host-address community-string udp-port port</i> p2mp-traffic-eng	snmp-server enable traps mpls p2mp-traffic-eng [down up]

¹ See the *Cisco IOS Multiprotocol Label Switching Command Reference* for documentation of this command.

Examples

If you want to configure a unique SNMP community string for traps but prevent SNMP polling access with this string, the configuration should include an access list. The following example shows how to name a community string comaccess and number an access list 10:

```
Device(config)# snmp-server community comaccess ro 10
Device(config)# snmp-server host 10.0.0.0 comaccess
Device(config)# access-list 10 deny any
```



Note

The “at” sign (@) is used as a delimiter between the community string and the context in which it is used. For example, specific VLAN information in BRIDGE-MIB may be polled using *community @VLAN-ID* (for example, public@100), where 100 is the VLAN number.

The following example shows how to send RFC 1157 SNMP traps to a specified host named myhost.cisco.com. Other traps are enabled, but only SNMP traps are sent because only **snmp** is specified in the **snmp-server host** command. The community string is defined as comaccess.

```
Device(config)# snmp-server enable traps
Device(config)# snmp-server host myhost.cisco.com comaccess snmp
```

The following example shows how to send the SNMP and Cisco environmental monitor enterprise-specific traps to address 10.0.0.0 using the community string public:

```
Device(config)# snmp-server enable traps snmp
Device(config)# snmp-server enable traps envmon
Device(config)# snmp-server host 10.0.0.0 public snmp envmon
```

The following example shows how to enable the device to send all traps to the host myhost.cisco.com using the community string public:

```
Device(config)# snmp-server enable traps
Device(config)# snmp-server host myhost.cisco.com public
```

The following example will not send traps to any host. The BGP traps are enabled for all hosts, but only the ISDN traps are enabled to be sent to a host. The community string is defined as public.


```
Device(config)# snmp-server enable traps bgp
Device(config)# snmp-server host myhost.cisco.com public isdn
```

The following example shows how to enable the device to send all inform requests to the host myhost.cisco.com using the community string public:

```
Device(config)# snmp-server enable traps
Device(config)# snmp-server host myhost.cisco.com informs version 2c public
```

The following example shows how to send HSRP MIB informs to the host specified by the name myhost.cisco.com. The community string is defined as public.

```
Device(config)# snmp-server enable traps hsrp
Device(config)# snmp-server host myhost.cisco.com informs version 2c public hsrp
```

The following example shows how to send all SNMP notifications to example.com over the VRF named trap-vrf using the community string public:

```
Device(config)# snmp-server host example.com vrf trap-vrf public
```

The following example shows how to configure an IPv6 SNMP notification server with the IPv6 address 2001:0DB8:0000:ABCD:1 using the community string public:

```
Device(config)# snmp-server host 2001:0DB8:0000:ABCD:1 version 2c public udp-port 2012
```

The following example shows how to specify VRRP as the protocol using the community string public:

```
Device(config)# snmp-server enable traps vrrp
Device(config)# snmp-server host myhost.cisco.com traps version 2c public vrrp
```

The following example shows how to send all Cisco Express Forwarding informs to the notification receiver with the IP address 10.0.1.1 using the community string public:

```
Device(config)# snmp-server enable traps cef
Device(config)# snmp-server host 10.0.1.1 informs version 2c public cef
```

The following example shows how to enable all NHRP traps, and how to send all NHRP traps to the notification receiver with the IP address 10.0.0.0 using the community string public:

```
Device(config)# snmp-server enable traps nhrp
Device(config)# snmp-server host 10.0.0.0 traps version 2c public nhrp
```

The following example shows how to enable all P2MP MPLS-TE SNMP traps, and send them to the notification receiver with the IP address 172.20.2.160 using the community string "comp2mppublic":

```
Device(config)# snmp-server enable traps mpls p2mp-traffic-eng
```

```
Device(config)# snmp-server host 172.20.2.160 comp2mppublic udp-port 162 p2mp-traffic-eng
```

Related Commands

Command	Description
show snmp host	Displays recipient details configured for SNMP notifications.
snmp-server enable peer-trap poor qov	Enables poor quality of voice notifications for applicable calls associated with a specific voice dial peer.
snmp-server enable traps	Enables SNMP notifications (traps and informs).
snmp-server enable traps nhrp	Enables SNMP notifications (traps) for NHRP.
snmp-server informs	Specifies inform request options.
snmp-server link trap	Enables linkUp/linkDown SNMP traps that are compliant with RFC 2233.
snmp-server trap-source	Specifies the interface from which an SNMP trap should originate.
snmp-server trap-timeout	Defines how often to try resending trap messages on the retransmission queue.
test snmp trap storm-control event-rev1	Tests SNMP storm-control traps.

snmp-server user

To configure a new user to a Simple Network Management Protocol (SNMP) group, use the **snmp-server user** command in global configuration mode. To remove a user from an SNMP group, use the **no** form of this command.

```
snmp-server user username group-name [remote host [udp-port port] [vrf vrf-name]] v1 | v2c | v3 [encrypted] [auth md5 | sha auth-password] [access [ipv6 nacl] [priv des | 3des | aes 128 | 192 | 256 privpassword] acl-numberacl-name]
```

```
no snmp-server user username group-name [remote host [udp-port port] [vrf vrf-name]] v1 | v2c | v3 [encrypted] [auth md5 | sha auth-password] [access [ipv6 nacl] [priv des | 3des | aes 128 | 192 | 256 privpassword] acl-numberacl-name]
```

Syntax Description

<i>username</i>	Name of the user on the host that connects to the agent.
<i>group-name</i>	Name of the group to which the user belongs.
remote	(Optional) Specifies a remote SNMP entity to which the user belongs, and the hostname or IPv6 address or IPv4 IP address of that entity. If both an IPv6 address and IPv4 IP address are being specified, the IPv6 host must be listed first.
<i>host</i>	(Optional) Name or IP address of the remote SNMP host.
udp-port	(Optional) Specifies the User Datagram Protocol (UDP) port number of the remote host.
<i>port</i>	(Optional) Integer value that identifies the UDP port. The default is 162.
vrf	(Optional) Specifies an instance of a routing table.
<i>vrf-name</i>	(Optional) Name of the Virtual Private Network (VPN) routing and forwarding (VRF) table to use for storing data.
v1	Specifies that SNMPv1 should be used.
v2c	Specifies that SNMPv2c should be used.
v3	Specifies that the SNMPv3 security model should be used. Allows the use of the encrypted keyword or auth keyword or both.
encrypted	(Optional) Specifies whether the password appears in encrypted format.
auth	(Optional) Specifies which authentication level should be used.
md5	(Optional) Specifies the HMAC-MD5-96 authentication level.
sha	(Optional) Specifies the HMAC-SHA-96 authentication level.
<i>auth-password</i>	(Optional) String (not to exceed 64 characters) that enables the agent to receive packets from the host.
access	(Optional) Specifies an Access Control List (ACL) to be associated with this SNMP user.
ipv6	(Optional) Specifies an IPv6 named access list to be associated with this SNMP user.

<i>nacl</i>	(Optional) Name of the ACL. IPv4, IPv6, or both IPv4 and IPv6 access lists may be specified. If both are specified, the IPv6 named access list must appear first in the statement.
priv	(Optional) Specifies the use of the User-based Security Model (USM) for SNMP version 3 for SNMP message level security.
des	(Optional) Specifies the use of the 56-bit Digital Encryption Standard (DES) algorithm for encryption.
3des	(Optional) Specifies the use of the 168-bit 3DES algorithm for encryption.
aes	(Optional) Specifies the use of the Advanced Encryption Standard (AES) algorithm for encryption.
128	(Optional) Specifies the use of a 128-bit AES algorithm for encryption.
192	(Optional) Specifies the use of a 192-bit AES algorithm for encryption.
256	(Optional) Specifies the use of a 256-bit AES algorithm for encryption.
<i>privpassword</i>	(Optional) String (not to exceed 64 characters) that specifies the privacy user password.
<i>acl-number</i>	(Optional) Integer in the range from 1 to 99 that specifies a standard access list of IP addresses.
<i>acl-name</i>	(Optional) String (not to exceed 64 characters) that is the name of a standard access list of IP addresses.

Command Default

See the table in the “Usage Guidelines” section for default behaviors for encryption, passwords, and access lists.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Fuji 16.8.1a	This command was introduced.

Usage Guidelines

To configure a remote user, specify the IP address or port number for the remote SNMP agent of the device where the user resides. Also, before you configure remote users for a particular agent, configure the SNMP engine ID, using the **snmp-server engineID** command with the **remote** keyword. The remote agent’s SNMP engine ID is needed when computing the authentication and privacy digests from the password. If the remote engine ID is not configured first, the configuration command will fail.

For the *privpassword* and *auth-password* arguments, the minimum length is one character; the recommended length is at least eight characters, and should include both letters and numbers. The recommended maximum length is 64 characters.

The table below describes the default user characteristics for encryption, passwords, and access lists.

Table 12: snmp-server user Default Descriptions

Characteristic	Default
Access lists	Access from all IP access lists is permitted.
Encryption	Not present by default. The encrypted keyword is used to specify that the passwords are message digest algorithm 5 (MD5) digests and not text passwords.
Passwords	Assumed to be text strings.
Remote users	All users are assumed to be local to this SNMP engine unless you specify they are remote with the remote keyword.

SNMP passwords are localized using the SNMP engine ID of the authoritative SNMP engine. For informs, the authoritative SNMP agent is the remote agent. You need to configure the remote agent's SNMP engine ID in the SNMP database before you can send proxy requests or informs to it.



Note Changing the engine ID after configuring the SNMP user, does not allow to remove the user. To remove the user, you need to first reconfigure the SNMP user.

Working with Passwords and Digests

No default values exist for authentication or privacy algorithms when you configure the command. Also, no default passwords exist. The minimum length for a password is one character, although Cisco recommends using at least eight characters for security. The recommended maximum length of a password is 64 characters. If you forget a password, you cannot recover it and will need to reconfigure the user. You can specify either a plain-text password or a localized MD5 digest.

If you have the localized MD5 or Secure Hash Algorithm (SHA) digest, you can specify that string instead of the plain-text password. The digest should be formatted as aa:bb:cc:dd where aa, bb, and cc are hexadecimal values. Also, the digest should be exactly 16 octets long.

Examples

The following example shows how to add the user abcd to the SNMP server group named public. In this example, no access list is specified for the user, so the standard named access list applied to the group applies to the user.

```
Device(config)# snmp-server user abcd public v2c
```

The following example shows how to add the user abcd to the SNMP server group named public. In this example, access rules from the standard named access list qrst apply to the user.

```
Device(config)# snmp-server user abcd public v2c access qrst
```

In the following example, the plain-text password cisco123 is configured for the user abcd in the SNMP server group named public:

```
Device(config)# snmp-server user abcd public v3 auth md5 cisco123
```

When you enter a **show running-config** command, a line for this user will be displayed. To learn if this user has been added to the configuration, use the `show snmp user` command.



Note The **show running-config** command does not display any of the active SNMP users created in `authPriv` or `authNoPriv` mode, though it does display the users created in `noAuthNoPriv` mode. To display any active SNMPv3 users created in `authPriv`, `authNoPriv`, or `noAuthNoPriv` mode, use the **show snmp user** command.

If you have the localized MD5 or SHA digest, you can specify that string instead of the plain-text password. The digest should be formatted as `aa:bb:cc:dd` where `aa`, `bb`, and `cc` are hexadecimal values. Also, the digest should be exactly 16 octets long.

In the following example, the MD5 digest string is used instead of the plain-text password:

```
Device(config)# snmp-server user abcd public v3 encrypted auth md5
00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF
```

In the following example, the user `abcd` is removed from the SNMP server group named `public`:

```
Device(config)# no snmp-server user abcd public v2c
```

In the following example, the user `abcd` from the SNMP server group named `public` specifies the use of the 168-bit 3DES algorithm for privacy encryption with `secure3des` as the password.

```
Device(config)# snmp-server user abcd public priv v2c 3des secure3des
```

Related Commands

Command	Description
show running-config	Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information.
show snmp user	Displays information on each SNMP username in the group username table.
snmp-server engineID	Displays the identification of the local SNMP engine and all remote engines that have been configured on the device.

snmp-server view

To create or update a view entry, use the **snmp-server view** command in global configuration mode. To remove the specified Simple Network Management Protocol (SNMP) server view entry, use the **no** form of this command.

snmp-server view *view-name oid-tree* **included** | **excluded**
no snmp-server view *view-name*

Syntax Description

<i>view-name</i>	Label for the view record that you are updating or creating. The name is used to reference the record.
<i>oid-tree</i>	Object identifier of the ASN.1 subtree to be included or excluded from the view. To identify the subtree, specify a text string consisting of numbers, such as 1.3.6.2.4, or a word, such as system. Replace a single subidentifier with the asterisk (*) wildcard to specify a subtree family; for example 1.3.*.4.
included	Configures the OID (and subtree OIDs) specified in <i>oid-tree</i> argument to be included in the SNMP view.
excluded	Configures the OID (and subtree OIDs) specified in <i>oid-tree</i> argument to be explicitly excluded from the SNMP view.

Command Default

No view entry exists.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Fuji 16.8.1a	This command was introduced.

Usage Guidelines

Other SNMP commands require an SMP view as an argument. You use this command to create a view to be used as arguments for other commands.

Two standard predefined views can be used when a view is required, instead of defining a view. One is *everything*, which indicates that the user can see all objects. The other is *restricted*, which indicates that the user can see three groups: system, snmpStats, and snmpParties. The predefined views are described in RFC 1447.

The first **snmp-server** command that you enter enables SNMP on your routing device.

Examples

The following example creates a view that includes all objects in the MIB-II subtree:

```
snmp-server view mib2 mib-2 included
```

The following example creates a view that includes all objects in the MIB-II system group and all objects in the Cisco enterprise MIB:

```
snmp-server view root_view system included
snmp-server view root_view cisco included
```

The following example creates a view that includes all objects in the MIB-II system group except for sysServices (System 7) and all objects for interface 1 in the MIB-II interfaces group:

```
snmp-server view agon system included
snmp-server view agon system.7 excluded
snmp-server view agon ifEntry.*.1 included
```

In the following example, the USM, VACM, and Community MIBs are explicitly included in the view “test” with all other MIBs under the root parent “internet”:

```
! -- include all MIBs under the parent tree "internet"
snmp-server view test internet included
! -- include snmpUsmMIB
snmp-server view test 1.3.6.1.6.3.15 included
! -- include snmpVacmMIB
snmp-server view test 1.3.6.1.6.3.16 included
! -- exclude snmpCommunityMIB
snmp-server view test 1.3.6.1.6.3.18 excluded
```

Related Commands

Command	Description
snmp-server community	Sets up the community access string to permit access to the SNMP protocol.
snmp-server manager	Starts the SNMP manager process.

storm-control

To enable broadcast, multicast, or unicast storm control and to set threshold levels on an interface, use the **storm-control** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
storm-control action shutdown | trap | broadcast | multicast | unicast level level [level-low] | bps bps
[bps-low] | pps pps [pps-low]
no storm-control action shutdown | trap | broadcast | multicast | unicast level
```

Syntax Description

action	Specifies the action taken when a storm occurs on a port. The default action is to filter traffic and to not send an Simple Network Management Protocol (SNMP) trap.
shutdown	Disables the port during a storm.
trap	Sends an SNMP trap when a storm occurs.
broadcast	Enables broadcast storm control on the interface.
multicast	Enables multicast storm control on the interface.
unicast	Enables unicast storm control on the interface.
level	Specifies the rising and falling suppression levels as a percentage of total bandwidth of the port.
<i>level</i>	Rising suppression level, up to two decimal places. The range is 0.00 to 100.00. Block the flooding of storm packets when the value specified for level is reached.
<i>level-low</i>	(Optional) Falling suppression level, up to two decimal places. The range is 0.00 to 100.00. This value must be less than or equal to the rising suppression value. If you do not configure a falling suppression level, it is set to the rising suppression level.
level bps	Specifies the rising and falling suppression levels as a rate in bits per second at which traffic is received on the port.
<i>bps</i>	Rising suppression level, up to 1 decimal place. The range is 0.0 to 10000000000.0. Block the flooding of storm packets when the value specified for bps is reached. You can use metric suffixes such as k, m, and g for large number thresholds.
<i>bps-low</i>	(Optional) Falling suppression level, up to 1 decimal place. The range is 0.0 to 10000000000.0. This value must be equal to or less than the rising suppression value. You can use metric suffixes such as k, m, and g for large number thresholds.
level pps	Specifies the rising and falling suppression levels as a rate in packets per second at which traffic is received on the port.
<i>pps</i>	Rising suppression level, up to 1 decimal place. The range is 0.0 to 10000000000.0. Block the flooding of storm packets when the value specified for pps is reached. You can use metric suffixes such as k, m, and g for large number thresholds.

pps-low (Optional) Falling suppression level, up to 1 decimal place. The range is 0.0 to 1000000000.0. This value must be equal to or less than the rising suppression value.

You can use metric suffixes such as k, m, and g for large number thresholds.

Command Default

Broadcast, multicast, and unicast storm control are disabled.

The default action is to filter traffic and to not send an SNMP trap.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The storm-control suppression level can be entered as a percentage of total bandwidth of the port, as a rate in packets per second at which traffic is received, or as a rate in bits per second at which traffic is received.

When specified as a percentage of total bandwidth, a suppression value of 100 percent means that no limit is placed on the specified traffic type. A value of **level 0 0** means that all broadcast, multicast, or unicast traffic on that port is blocked. Storm control is enabled only when the rising suppression level is less than 100 percent. If no other storm-control configuration is specified, the default action is to filter the traffic causing the storm and to send no SNMP traps.



Note

When the storm control threshold for multicast traffic is reached, all multicast traffic except control traffic, such as bridge protocol data unit (BPDU) and Cisco Discovery Protocol (CDP) frames, are blocked. However, the switch does not differentiate between routing updates, such as Open Shortest Path First (OSPF) and regular multicast data traffic, so both types of traffic are blocked.

The **trap** and **shutdown** options are independent of each other.

If you configure the action to be taken as shutdown (the port is error-disabled during a storm) when a packet storm is detected, you must use the **no shutdown** interface configuration command to bring the interface out of this state. If you do not specify the **shutdown** action, specify the action as **trap** (the switch generates a trap when a storm is detected).

When a storm occurs and the action is to filter traffic, if the falling suppression level is not specified, the switch blocks all traffic until the traffic rate drops below the rising suppression level. If the falling suppression level is specified, the switch blocks traffic until the traffic rate drops below this level.



Note

Storm control is supported on physical interfaces. You can also configure storm control on an EtherChannel. When storm control is configured on an EtherChannel, the storm control settings propagate to the EtherChannel physical interfaces.

When a broadcast storm occurs and the action is to filter traffic, the switch blocks only broadcast traffic.

For more information, see the software configuration guide for this release.

This example shows how to enable broadcast storm control with a 75.5-percent rising suppression level:

```
Device(config-if)# storm-control broadcast level 75.5
```

This example shows how to enable unicast storm control on a port with a 87-percent rising suppression level and a 65-percent falling suppression level:

```
Device(config-if)# storm-control unicast level 87 65
```

This example shows how to enable multicast storm control on a port with a 2000-packets-per-second rising suppression level and a 1000-packets-per-second falling suppression level:

```
Device(config-if)# storm-control multicast level pps 2k 1k
```

This example shows how to enable the **shutdown** action on a port:

```
Device(config-if)# storm-control action shutdown
```

You can verify your settings by entering the **show storm-control** privileged EXEC command.

switchport port-security aging

To set the aging time and type for secure address entries or to change the aging behavior for secure addresses on a particular port, use the **switchport port-security aging** command in interface configuration mode. To disable port security aging or to set the parameters to their default states, use the **no** form of this command.

switchport port-security aging static | time *time* | type absolute | inactivity
no switchport port-security aging static | time | type

Syntax Description	
static	Enables aging for statically configured secure addresses on this port.
time <i>time</i>	Specifies the aging time for this port. The range is 0 to 1440 minutes. If the time is 0, aging is disabled for this port.
type	Sets the aging type.
absolute	Sets absolute aging type. All the secure addresses on this port age out exactly after the time (minutes) specified and are removed from the secure address list.
inactivity	Sets the inactivity aging type. The secure addresses on this port age out only if there is no data traffic from the secure source address for the specified time period.

Command Default

The port security aging feature is disabled. The default time is 0 minutes.

The default aging type is absolute.

The default static aging behavior is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

To enable secure address aging for a particular port, set the aging time to a value other than 0 for that port.

To allow limited time access to particular secure addresses, set the aging type as **absolute**. When the aging time lapses, the secure addresses are deleted.

To allow continuous access to a limited number of secure addresses, set the aging type as **inactivity**. This removes the secure address when it become inactive, and other addresses can become secure.

To allow unlimited access to a secure address, configure it as a secure address, and disable aging for the statically configured secure address by using the **no switchport port-security aging static** interface configuration command.

This example sets the aging time as 2 hours for absolute aging for all the secure addresses on the port:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# switchport port-security aging time 120
```

This example sets the aging time as 2 minutes for inactivity aging type with aging enabled for configured secure addresses on the port:

```
Device(config)# interface gigabitethernet1/0/2  
Device(config-if)# switchport port-security aging time 2  
Device(config-if)# switchport port-security aging type inactivity  
Device(config-if)# switchport port-security aging static
```

This example shows how to disable aging for configured secure addresses:

```
Device(config)# interface gigabitethernet1/0/2  
Device(config-if)# no switchport port-security aging static
```

switchport port-security mac-address

To configure secure MAC addresses or sticky MAC address learning, use the **switchport port-security mac-address** interface configuration command. To return to the default setting, use the **no** form of this command.

```
switchport port-security mac-address mac-address [vlan vlan-id access | voice] | sticky [mac-address
| vlan vlan-id access | voice]
no switchport port-security mac-address mac-address [vlan vlan-id access | voice] | sticky
[mac-address | vlan vlan-id access | voice]
```

Syntax Description

mac-address A secure MAC address for the interface by entering a 48-bit MAC address. You can add additional secure MAC addresses up to the maximum value configured.

vlan vlan-id (Optional) On a trunk port only, specifies the VLAN ID and the MAC address. If no VLAN ID is specified, the native VLAN is used.

vlan access (Optional) On an access port only, specifies the VLAN as an access VLAN.

vlan voice (Optional) On an access port only, specifies the VLAN as a voice VLAN.

Note The **voice** keyword is available only if voice VLAN is configured on a port and if that port is not the access VLAN.

sticky Enables the interface for sticky learning. When sticky learning is enabled, the interface adds all secure MAC addresses that are dynamically learned to the running configuration and converts these addresses to sticky secure MAC addresses.

mac-address (Optional) A MAC address to specify a sticky secure MAC address.

Command Default

No secure MAC addresses are configured.
Sticky learning is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

A secure port has the following limitations:

- A secure port can be an access port or a trunk port; it cannot be a dynamic access port.
- A secure port cannot be a routed port.
- A secure port cannot be a protected port.
- A secure port cannot be a destination port for Switched Port Analyzer (SPAN).
- A secure port cannot belong to a Gigabit or 10-Gigabit EtherChannel port group.

- You cannot configure static secure or sticky secure MAC addresses in the voice VLAN.
- When you enable port security on an interface that is also configured with a voice VLAN, set the maximum allowed secure addresses on the port to two. When the port is connected to a Cisco IP phone, the IP phone requires one MAC address. The Cisco IP phone address is learned on the voice VLAN, but is not learned on the access VLAN. If you connect a single PC to the Cisco IP phone, no additional MAC addresses are required. If you connect more than one PC to the Cisco IP phone, you must configure enough secure addresses to allow one for each PC and one for the Cisco IP phone.
- Voice VLAN is supported only on access ports and not on trunk ports.

Sticky secure MAC addresses have these characteristics:

- When you enable sticky learning on an interface by using the **switchport port-security mac-address sticky** interface configuration command, the interface converts all the dynamic secure MAC addresses, including those that were dynamically learned before sticky learning was enabled, to sticky secure MAC addresses and adds all sticky secure MAC addresses to the running configuration.
- If you disable sticky learning by using the **no switchport port-security mac-address sticky** interface configuration command or the running configuration is removed, the sticky secure MAC addresses remain part of the running configuration but are removed from the address table. The addresses that were removed can be dynamically reconfigured and added to the address table as dynamic addresses.
- When you configure sticky secure MAC addresses by using the **switchport port-security mac-address sticky mac-address** interface configuration command, these addresses are added to the address table and the running configuration. If port security is disabled, the sticky secure MAC addresses remain in the running configuration.
- If you save the sticky secure MAC addresses in the configuration file, when the switch restarts or the interface shuts down, the interface does not need to relearn these addresses. If you do not save the sticky secure addresses, they are lost. If sticky learning is disabled, the sticky secure MAC addresses are converted to dynamic secure addresses and are removed from the running configuration.
- If you disable sticky learning and enter the **switchport port-security mac-address sticky mac-address** interface configuration command, an error message appears, and the sticky secure MAC address is not added to the running configuration.

You can verify your settings by using the **show port-security** privileged EXEC command.

This example shows how to configure a secure MAC address and a VLAN ID on a port:

```
Device(config)# interface gigabitethernet 2/0/2
Device(config-if)# switchport mode trunk
Device(config-if)# switchport port-security
Device(config-if)# switchport port-security mac-address 1000.2000.3000 vlan 3
```

This example shows how to enable sticky learning and to enter two sticky secure MAC addresses on a port:

```
Device(config)# interface gigabitethernet 2/0/2
Device(config-if)# switchport port-security mac-address sticky
Device(config-if)# switchport port-security mac-address sticky 0000.0000.4141
Device(config-if)# switchport port-security mac-address sticky 0000.0000.000f
```

switchport port-security maximum

To configure the maximum number of secure MAC addresses, use the **switchport port-security maximum** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

```
switchport port-security maximum value [vlan [vlan-list | [access | voice]]]
no switchport port-security maximum value [vlan [vlan-list | [access | voice]]]
```

Syntax Description

value	Sets the maximum number of secure MAC addresses for the interface. The default setting is 1.
vlan	(Optional) For trunk ports, sets the maximum number of secure MAC addresses on a VLAN or range of VLANs. If the vlan keyword is not entered, the default value is used.
vlan-list	(Optional) Range of VLANs separated by a hyphen or a series of VLANs separated by commas. For nonspecified VLANs, the per-VLAN maximum value is used.
access	(Optional) On an access port only, specifies the VLAN as an access VLAN.
voice	(Optional) On an access port only, specifies the VLAN as a voice VLAN.
Note	The voice keyword is available only if voice VLAN is configured on a port and if that port is not the access VLAN.

Command Default

When port security is enabled and no keywords are entered, the default maximum number of secure MAC addresses is 1.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

The maximum number of secure MAC addresses that you can configure on a switch or switch stack is set by the maximum number of available MAC addresses allowed in the system. This number is determined by the active Switch Database Management (SDM) template. See the **sdm prefer** command. This number represents the total of available MAC addresses, including those used for other Layer 2 functions and any other secure MAC addresses configured on interfaces.

A secure port has the following limitations:

- A secure port can be an access port or a trunk port; it cannot be a dynamic access port.
- A secure port cannot be a routed port.
- A secure port cannot be a protected port.
- A secure port cannot be a destination port for Switched Port Analyzer (SPAN).
- A secure port cannot belong to a Gigabit or 10-Gigabit EtherChannel port group.

- When you enable port security on an interface that is also configured with a voice VLAN, set the maximum allowed secure addresses on the port to two. When the port is connected to a Cisco IP phone, the IP phone requires one MAC address. The Cisco IP phone address is learned on the voice VLAN, but is not learned on the access VLAN. If you connect a single PC to the Cisco IP phone, no additional MAC addresses are required. If you connect more than one PC to the Cisco IP phone, you must configure enough secure addresses to allow one for each PC and one for the Cisco IP phone.

Voice VLAN is supported only on access ports and not on trunk ports.

- When you enter a maximum secure address value for an interface, if the new value is greater than the previous value, the new value overrides the previously configured value. If the new value is less than the previous value and the number of configured secure addresses on the interface exceeds the new value, the command is rejected.

Setting a maximum number of addresses to one and configuring the MAC address of an attached device ensures that the device has the full bandwidth of the port.

When you enter a maximum secure address value for an interface, this occurs:

- If the new value is greater than the previous value, the new value overrides the previously configured value.
- If the new value is less than the previous value and the number of configured secure addresses on the interface exceeds the new value, the command is rejected.

You can verify your settings by using the **show port-security** privileged EXEC command.

This example shows how to enable port security on a port and to set the maximum number of secure addresses to 5. The violation mode is the default, and no secure MAC addresses are configured.

```
Device(config)# interface gigabitethernet 2/0/2
Device(config-if)# switchport mode access
Device(config-if)# switchport port-security
Device(config-if)# switchport port-security maximum 5
```

switchport port-security violation

To configure secure MAC address violation mode or the action to be taken if port security is violated, use the **switchport port-security violation** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

switchport port-security violation protect | restrict | shutdown | shutdown vlan
no switchport port-security violation protect | restrict | shutdown | shutdown vlan

Syntax Description

protect	Sets the security violation protect mode.
restrict	Sets the security violation restrict mode.
shutdown	Sets the security violation shutdown mode.
shutdown vlan	Sets the security violation mode to per-VLAN shutdown.

Command Default

The default violation mode is **shutdown**.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

In the security violation protect mode, when the number of port secure MAC addresses reaches the maximum limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses to drop below the maximum value or increase the number of maximum allowable addresses. You are not notified that a security violation has occurred.



Note

We do not recommend configuring the protect mode on a trunk port. The protect mode disables learning when any VLAN reaches its maximum limit, even if the port has not reached its maximum limit.

In the security violation restrict mode, when the number of secure MAC addresses reaches the limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses or increase the number of maximum allowable addresses. An SNMP trap is sent, a syslog message is logged, and the violation counter increments.

In the security violation shutdown mode, the interface is error-disabled when a violation occurs and the port LED turns off. An SNMP trap is sent, a syslog message is logged, and the violation counter increments. When a secure port is in the error-disabled state, you can bring it out of this state by entering the **errdisable recovery cause psecure-violation** global configuration command, or you can manually re-enable it by entering the **shutdown** and **no shutdown** interface configuration commands.

When the security violation mode is set to per-VLAN shutdown, only the VLAN on which the violation occurred is error-disabled.

A secure port has the following limitations:

- A secure port can be an access port or a trunk port; it cannot be a dynamic access port.
- A secure port cannot be a routed port.
- A secure port cannot be a protected port.
- A secure port cannot be a destination port for Switched Port Analyzer (SPAN).
- A secure port cannot belong to a Gigabit or 10-Gigabit EtherChannel port group.

A security violation occurs when the maximum number of secure MAC addresses are in the address table and a station whose MAC address is not in the address table attempts to access the interface or when a station whose MAC address is configured as a secure MAC address on another secure port attempts to access the interface.

When a secure port is in the error-disabled state, you can bring it out of this state by entering the **errdisable recovery cause psecure-violation** global configuration command. You can manually re-enable the port by entering the **shutdown** and **no shutdown** interface configuration commands or by using the **clear errdisable interface** privileged EXEC command.

You can verify your settings by using the **show port-security** privileged EXEC command.

This example show how to configure a port to shut down only the VLAN if a MAC security violation occurs:

```
Device(config)# interface gigabitethernet2/0/2
Device(config)# switchport port-security violation shutdown vlan
```

tacacs server

To configure the TACACS+ server for IPv6 or IPv4 and enter TACACS+ server configuration mode, use the **tacacs server** command in global configuration mode. To remove the configuration, use the **no** form of this command.

tacacs server *name*
no tacacs server

Syntax Description	name Name of the private TACACS+ server host.
---------------------------	--

Command Default No TACACS+ server is configured.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines The **tacacs server** command configures the TACACS server using the *name* argument and enters TACACS+ server configuration mode. The configuration is applied once you have finished configuration and exited TACACS+ server configuration mode.

Examples The following example shows how to configure the TACACS server using the name `server1` and enter TACACS+ server configuration mode to perform further configuration:

```
Device(config)# tacacs server server1
Device(config-server-tacacs)#
```

Related Commands	Command	Description
	address ipv6 (TACACS+)	Configures the IPv6 address of the TACACS+ server.
	key (TACACS+)	Configures the per-server encryption key on the TACACS+ server.
	port (TACACS+)	Specifies the TCP port to be used for TACACS+ connections.
	send-nat-address (TACACS+)	Sends a client's post-NAT address to the TACACS+ server.
	single-connection (TACACS+)	Enables all TACACS packets to be sent to the same server using a single TCP connection.
	timeout (TACACS+)	Configures the time to wait for a reply from the specified TACACS server.

tracking (IPv6 snooping)

To override the default tracking policy on a port, use the **tracking** command in IPv6 snooping policy configuration mode.

tracking { **enable** [**reachable-lifetime** { *value* | **infinite** }] | **disable** [**stale-lifetime** { *value* | **infinite** }] }

Syntax Description		
enable		Enables tracking.
reachable-lifetime		(Optional) Specifies the maximum amount of time a reachable entry is considered to be directly or indirectly reachable without proof of reachability. <ul style="list-style-type: none"> The reachable-lifetime keyword can be used only with the enable keyword. Use of the reachable-lifetime keyword overrides the global reachable lifetime configured by the ipv6 neighbor binding reachable-lifetime command.
<i>value</i>		Lifetime value, in seconds. The range is from 1 to 86400, and the default is 300.
infinite		Keeps an entry in a reachable or stale state for an infinite amount of time.
disable		Disables tracking.
stale-lifetime		(Optional) Keeps the time entry in a stale state, which overwrites the global stale-lifetime configuration. <ul style="list-style-type: none"> The stale lifetime is 86,400 seconds. The stale-lifetime keyword can be used only with the disable keyword. Use of the stale-lifetime keyword overrides the global stale lifetime configured by the ipv6 neighbor binding stale-lifetime command.

Command Default The time entry is kept in a reachable state.

Command Modes IPv6 snooping configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines The **tracking** command overrides the default tracking policy set by the **ipv6 neighbor tracking** command on the port on which this policy applies. This function is useful on trusted ports where, for example, you may not want to track entries but want an entry to stay in the binding table to prevent it from being stolen.

The **reachable-lifetime** keyword is the maximum time an entry will be considered reachable without proof of reachability, either directly through tracking or indirectly through IPv6 snooping. After the **reachable-lifetime** value is reached, the entry is moved to stale. Use of the **reachable-lifetime** keyword with the tracking command overrides the global reachable lifetime configured by the **ipv6 neighbor binding reachable-lifetime** command.

The **stale-lifetime** keyword is the maximum time an entry is kept in the table before it is deleted or the entry is proven to be reachable, either directly or indirectly. Use of the **reachable-lifetime** keyword with the **tracking** command overrides the global stale lifetime configured by the **ipv6 neighbor binding stale-lifetime** command.

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and configure an entry to stay in the binding table for an infinite length of time on a trusted port:

```
Device(config)# ipv6 snooping policy policy1  
Device(config-ipv6-snooping)# tracking disable stale-lifetime infinite
```

trusted-port

To configure a port to become a trusted port, use the **trusted-port** command in IPv6 snooping policy mode or ND inspection policy configuration mode. To disable this function, use the **no** form of this command.

trusted-port
no trusted-port

Syntax Description This command has no arguments or keywords.

Command Default No ports are trusted.

Command Modes ND inspection policy configuration
 IPv6 snooping configuration

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines When the **trusted-port** command is enabled, limited or no verification is performed when messages are received on ports that have this policy. However, to protect against address spoofing, messages are analyzed so that the binding information that they carry can be used to maintain the binding table. Bindings discovered from these ports will be considered more trustworthy than bindings received from ports that are not configured to be trusted.

This example shows how to define an NDP policy name as policy1, place the switch in NDP inspection policy configuration mode, and configure the port to be trusted:

```
Device(config)# ipv6 nd inspection policy1
Device(config-nd-inspection)# trusted-port
```

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and configure the port to be trusted:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# trusted-port
```

vlan access-map

To create or modify a VLAN map entry for VLAN packet filtering, and change the mode to the VLAN access-map configuration, use the **vlan access-map** command in global configuration mode on the switch stack or on a standalone switch. To delete a VLAN map entry, use the **no** form of this command.

```
vlan access-map name [number]
no vlan access-map name [number]
```



Note This command is not supported on switches running the LAN Base feature set.

Syntax Description

name Name of the VLAN map.

number (Optional) The sequence number of the map entry that you want to create or modify (0 to 65535). If you are creating a VLAN map and the sequence number is not specified, it is automatically assigned in increments of 10, starting from 10. This number is the sequence to insert to, or delete from, a VLAN access-map entry.

Command Default

There are no VLAN map entries and no VLAN maps applied to a VLAN.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

In global configuration mode, use this command to create or modify a VLAN map. This entry changes the mode to VLAN access-map configuration, where you can use the **match** access-map configuration command to specify the access lists for IP or non-IP traffic to match and use the **action** command to set whether a match causes the packet to be forwarded or dropped.

In VLAN access-map configuration mode, these commands are available:

- **action**—Sets the action to be taken (forward or drop).
- **default**—Sets a command to its defaults.
- **exit**—Exits from VLAN access-map configuration mode.
- **match**—Sets the values to match (IP address or MAC address).
- **no**—Negates a command or set its defaults.

When you do not specify an entry number (sequence number), it is added to the end of the map.

There can be only one VLAN map per VLAN and it is applied as packets are received by a VLAN.

You can use the **no vlan access-map name [number]** command with a sequence number to delete a single entry.

Use the **vlan filter** interface configuration command to apply a VLAN map to one or more VLANs. For more information about VLAN map entries, see the software configuration guide for this release.

This example shows how to create a VLAN map named vac1 and apply matching conditions and actions to it. If no other entries already exist in the map, this will be entry 10.

```
Device(config)# vlan access-map vac1  
Device(config-access-map)# match ip address acl1  
Device(config-access-map)# action forward
```

This example shows how to delete VLAN map vac1:

```
Device(config)# no vlan access-map vac1
```

vlan dot1Q tag native

To enable dot1q (IEEE 802.1Q) tagging for a native VLAN on a trunk port, use the **vlan dot1Q tag native** command in global configuration mode.

To disable this function, use the **no** form of this command.

vlan dot1Q tag native
no vlan dot1Q tag native

Syntax Description This command has no arguments or keywords.

Command Default Disabled

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines Typically, you configure 802.1Q trunks with a native VLAN ID which strips tagging from all packets on that VLAN.

To maintain the tagging on the native VLAN and drop untagged traffic, use the **vlan dot1q tag native** command. The device will tag the traffic received on the native VLAN and admit only 802.1Q-tagged frames, dropping any untagged traffic, including untagged traffic in the native VLAN.

Control traffic continues to be accepted as untagged on the native VLAN on a trunked port, even when the **vlan dot1q tag native** command is enabled.



Note If the **dot1q tag vlan native** command is configured at global level, dot1x reauthentication will fail on trunk ports.

This example shows how to enable dot1q (IEEE 802.1Q) tagging for native VLANs on all trunk ports on a device:

```
Device(config)# vlan dot1q tag native
Device(config)#
```

Related Commands

Command	Description
show vlan dot1q tag native	Displays the status of tagging on the native VLAN.

vlan filter

To apply a VLAN map to one or more VLANs, use the **vlan filter** command in global configuration mode on the switch stack or on a standalone switch. To remove the map, use the **no** form of this command.

```
vlan filter mapname vlan-list list | all
no vlan filter mapname vlan-list list | all
```



Note This command is not supported on switches running the LAN Base feature set.

Syntax Description

<i>mapname</i>	Name of the VLAN map entry.
vlan-list	Specifies which VLANs to apply the map to.
<i>list</i>	The list of one or more VLANs in the form <i>tt, uu-vv, xx, yy-zz</i> , where spaces around commas and dashes are optional. The range is 1 to 4094.
all	Adds the map to all VLANs.

Command Default

There are no VLAN filters.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

To avoid accidentally dropping too many packets and disabling connectivity in the middle of the configuration process, we recommend that you completely define the VLAN access map before applying it to a VLAN.

For more information about VLAN map entries, see the software configuration guide for this release.

This example applies VLAN map entry `map1` to VLANs 20 and 30:

```
Device(config)# vlan filter map1 vlan-list 20, 30
```

This example shows how to delete VLAN map entry `map1` from VLAN 20:

```
Device(config)# no vlan filter map1 vlan-list 20
```

You can verify your settings by entering the **show vlan filter** privileged EXEC command.

vlan group

To create or modify a VLAN group, use the **vlan group** command in global configuration mode. To remove a VLAN list from the VLAN group, use the **no** form of this command.

vlan group *group-name* **vlan-list** *vlan-list*
no vlan group *group-name* **vlan-list** *vlan-list*

Syntax Description

<i>group-name</i>	Name of the VLAN group. The group name may contain up to 32 characters and must begin with a letter.
vlan-list <i>vlan-list</i>	Specifies one or more VLANs to be added to the VLAN group. The <i>vlan-list</i> argument can be a single VLAN ID, a list of VLAN IDs, or VLAN ID range. Multiple entries are separated by a hyphen (-) or a comma (,).

Command Default

None

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced.

Usage Guidelines

If the named VLAN group does not exist, the **vlan group** command creates the group and maps the specified VLAN list to the group. If the named VLAN group exists, the specified VLAN list is mapped to the group.

The **no** form of the **vlan group** command removes the specified VLAN list from the VLAN group. When you remove the last VLAN from the VLAN group, the VLAN group is deleted.

A maximum of 100 VLAN groups can be configured, and a maximum of 4094 VLANs can be mapped to a VLAN group.

This example shows how to map VLANs 7 through 9 and 11 to a VLAN group:

```
Device(config)# vlan group group1 vlan-list 7-9,11
```

This example shows how to remove VLAN 7 from the VLAN group:

```
Device(config)# no vlan group group1 vlan-list 7
```