



Security

- [aaa accounting dot1x, on page 3](#)
- [aaa accounting identity, on page 5](#)
- [aaa authentication dot1x, on page 7](#)
- [aaa authorization network, on page 8](#)
- [aaa new-model, on page 9](#)
- [authentication host-mode, on page 11](#)
- [authentication logging verbose, on page 13](#)
- [authentication mac-move permit, on page 14](#)
- [authentication priority, on page 15](#)
- [authentication violation, on page 18](#)
- [auto security, on page 20](#)
- [auto security-port, on page 21](#)
- [cisp enable, on page 22](#)
- [clear errdisable interface vlan, on page 23](#)
- [clear mac address-table, on page 24](#)
- [debug ip rip, on page 26](#)
- [deny \(MAC access-list configuration\), on page 28](#)
- [dot1x critical \(global configuration\), on page 32](#)
- [dot1x logging verbose, on page 33](#)
- [dot1x pae, on page 34](#)
- [dot1x supplicant force-multicast, on page 35](#)
- [dot1x test eapol-capable, on page 36](#)
- [dot1x test timeout, on page 37](#)
- [dot1x timeout, on page 38](#)
- [epm access-control open, on page 40](#)
- [ip access-group, on page 41](#)
- [ip admission, on page 42](#)
- [ip admission name, on page 43](#)
- [ip device tracking maximum, on page 45](#)
- [ip device tracking probe, on page 46](#)
- [ip dhcp snooping database, on page 47](#)
- [ip dhcp snooping information option format remote-id, on page 49](#)
- [ip dhcp snooping verify no-relay-agent-address, on page 50](#)

- ip source binding, on page 51
- ip ssh source-interface, on page 52
- ip verify source, on page 53
- ipv6 snooping policy, on page 54
- limit address-count, on page 55
- mab request format attribute 32, on page 56
- match (access-map configuration), on page 58
- mab logging verbose, on page 60
- permit (MAC access-list configuration), on page 61
- radius server, on page 65
- router rip, on page 67
- show aaa clients, on page 68
- show aaa command handler, on page 69
- **show aaa local**, on page 70
- show aaa servers, on page 71
- show aaa sessions, on page 72
- show authentication sessions, on page 73
- show auto security, on page 76
- show cisp, on page 78
- show dot1x, on page 80
- show eap pac peer, on page 82
- show ip dhcp snooping statistics, on page 83
- show ip rip database, on page 86
- show ip ssh, on page 88
- show radius server-group, on page 89
- show vlan group, on page 91
- switchport port-security aging, on page 92
- switchport port-security mac-address, on page 94
- switchport port-security maximum, on page 96
- switchport port-security violation, on page 98
- trusted-port, on page 100
- username name masked-secret, on page 101
- vlan group, on page 102

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 Release 15.2(7)E1	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) accounting 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 Release 15.2(7)E1	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 the switch stack or 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 Release 15.2(7)E1	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 network

To configure the switch to use user-RADIUS authorization for all network-related service requests, such as IEEE 802.1x VLAN assignment, use the **aaa authorization network** command in global configuration mode. To disable RADIUS user authorization, use the **no** form of this command

aaa authorization network default group radius
no aaa authorization network default

Syntax Description	default group radius Use the list of all RADIUS hosts in the server group as the default authorization list.
---------------------------	---

Command Default	Authorization is disabled.
------------------------	----------------------------

Command Modes	Global configuration
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Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines	Use the aaa authorization network default group radius global configuration command to allow the switch to download IEEE 802.1x authorization parameters from the RADIUS servers in the default authorization list. The authorization parameters are used by features such as VLAN assignment to get parameters from the RADIUS servers.
-------------------------	---

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

This example shows how to configure the switch for user RADIUS authorization for all network-related service requests:

```
Device(config)# aaa authorization network default group radius
```


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)

Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	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.

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 Release 15.2(7)E1	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 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 Release 15.2(7)E1	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.

authentication mac-move permit

To enable MAC move on a device, 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 Release 15.2(7)E1	This command was introduced.

Usage Guidelines

The command enables authenticated hosts to move between 802.1x-enabled ports on a device. 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.

MAC move is not supported on port-security enabled 802.1x ports. If MAC move is globally configured on the switch and a port security-enabled host moves to an 802.1x-enabled port, a violation error occurs.

This example shows how to enable MAC move on a device:

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

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 Release 15.2(7)E1	This command was introduced.

Usage Guidelines Ordering sets the order of methods that the switch attempts when trying to authenticate a new device is connected to a port.

When configuring multiple fallback methods on a port, set web authentication (webauth) last.

Assigning priorities to different authentication methods allows a higher-priority method to interrupt an in-progress authentication method with a lower priority.



Note If a client is already authenticated, it might be reauthenticated if an interruption from a higher-priority method occurs.

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.

This example shows how to set 802.1x as the first authentication method and web authentication as the second authentication method:

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

This example shows how to set MAB as the first authentication method and web authentication as the second authentication method:

```
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 interface details	Displays detailed information about the Authentication Manager for a given interface,
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		
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 Release 15.2(7)E1	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
```

auto security

To configure global auto security, use the **auto security** command in global configuration mode. To disable auto security, use the **no** form of this command.

auto security
no auto security

This command has no arguments and keywords.

Command Default Auto security is enabled globally.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	This command was introduced in a release prior to Cisco IOS Release 15.2(5)E.

Usage Guidelines When you configure auto security in global configuration mode, auto security is enabled on all interfaces. When you disable auto security, it is disabled on all interfaces.

To enable auto security on specific interfaces, use the **auto security-port** command in interface configuration mode.



Note In Cisco IOS Release 15.2(5)E, auto security is enabled on interfaces, when the **auto security** command is configured in global configuration mode; however, the **auto security-port {host |uplink}** command is not explicitly saved to the interface configuration. When auto security is configured on an interface, and then the **auto security-port {host |uplink}** command is removed from that interface; the **no auto security-port {host |uplink}** command is saved to interface configuration.

This example shows how to enable auto security globally:

```
Device(config)# auto security
```

Related Commands

Command	Description
auto security-port	Configures auto security on an interface.
show auto security	Displays auto security status.

auto security-port

To configure auto security on an interface, use the **auto security-port** command in interface configuration mode. To disable auto security on an interface, use the **no** form of this command.

```
auto security {host | uplink}
no auto security
```

Syntax Description

host	Configures auto security for a host port.
uplink	Configures auto security for an uplink port.

Command Default

Auto security is disabled on all interfaces.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines

You can enable auto security globally, by using the **auto security** in global configuration mode.



Note In Cisco IOS Release 15.2(5)E, auto security is enabled on interfaces, when the **auto security** command is configured in global configuration mode; however, the **auto security-port {host |uplink}** command is not explicitly saved to the interface configuration. When auto security is configured on an interface, and then the **auto security-port {host |uplink}** command is removed from that interface; the **no auto security-port {host |uplink}** command is saved to interface configuration.

The following example shows how to configure auto security on an interface:

```
Switch(config)# interface gigabitethernet 1/0/2
Switch(config-if)# auto security-port host
```

Related Commands

Command	Description
auto security	Configures global auto security.
show auto security	Displays auto security status.

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 Release 15.2(7)E1	This command was introduced.

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 reenoble 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 Release 15.2(7)E1	This command was introduced.

Usage Guidelines You can reenoble 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 reenoble 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 Release 15.2(7)E1	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.

debug ip rip

To display information on Routing Information Protocol (RIP) routing transactions, use the **debug ip rip** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug ip rip [{database | events | trigger}]
no debug ip rip [{database | events | trigger}]
```

Syntax Description

database	(Optional) Displays information about RIP database events.
events	(Optional) Displays information about RIP protocol-based events.
trigger	(Optional) Displays information about RIP trigger extensions.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS Release 15.2(7)E1	This command was introduced.

Examples

In the following example, the router being debugged has received updates from a router at source address 10.89.80.28. In this scenario, information has been sent to about five destinations in the routing table update. Notice that the fourth destination address in the update, 172.31.0.0, is inaccessible because it is more than 15 hops away from the router from which the update was sent. The router being debugged also sends updates, in both cases to broadcast address 255.255.255.255 as the destination.

```
Device# debug ip rip

RIP: received update from 10.89.80.28 on GigabitEthernet0/0/0
 10.89.95.0 in 1 hops
 10.89.81.0 in 1 hops
 10.89.66.0 in 2 hops
 172.31.0.0 in 16 hops (inaccessible)
 0.0.0.0 in 7 hop
RIP: sending update to 255.255.255.255 via GigabitEthernet0/0/0 (10.89.64.31)
 subnet 10.89.94.0, metric 1
 172.31.0.0 in 16 hops (inaccessible)
RIP: sending update to 255.255.255.255 via Serial1 (10.89.94.31)
 subnet 10.89.64.0, metric 1
 subnet 10.89.66.0, metric 3
 172.31.0.0 in 16 hops (inaccessible)
 default 0.0.0.0, metric 8
```

The second line is an example of a routing table update. It shows the number of hops between a given Internet address and the device.

The entries show that the device is sending updates that are similar, except that the number in parentheses is the source address encapsulated into the IP header.

The following are examples for the **debug ip rip** command of entries that appear at startup, during an interface transition event, or when a user manually clears the routing table:

```
RIP: broadcasting general request on GigabitEthernet0/0/0  
RIP: broadcasting general request on GigabitEthernet1/0/0
```

The following entry is most likely caused by a malformed packet from the sender:

```
RIP: bad version 128 from 160.89.80.43
```

Related Commands

Command	Description
show ip rip database	Displays summary address entries in the RIP routing database entries if relevant are routes being summarized based upon a summary address.

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 Release 15.2(7)E1	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 1: 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.

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 Release 15.2(7)E1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS Release 15.2(7)E1	This command was introduced.
Release	Modification				
Cisco IOS Release 15.2(7)E1	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 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 Release 15.2(7)E1	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.

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 Release 15.2(7)E1	This command was introduced.

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 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 Release 15.2(7)E1	This command was introduced.

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 <i>interface-id</i>	(Optional) Port to be queried.
Command Default	There is no default setting.	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	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 <i>timeout</i>	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 Release 15.2(7)E1	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>	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).	The range is from 1 to 65535. The default is 30.
held-period <i>seconds</i>	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).	The range is from 1 to 65535. The default is 60
quiet-period <i>seconds</i>	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.	The range is from 1 to 65535. The default is 60
ratelimit-period <i>seconds</i>	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). <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>	Configures the interval, in seconds, between two successive EAPOL-Start frames when they are being retransmitted. <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>	Configures the interval, in seconds, between two successive EAPOL-Start frames when they are being retransmitted. <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 Release 15.2(7)E1	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 Release 15.2(7)E1	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.

ip access-group

To apply an IP access group, use the **ip access-group** command in interface configuration mode. To remove an IP access group, use the **no** form of this command.

ip access-group { *access-list-name* | *standard-access-list* | *expanded-access-list* } **in**

no ip access-group { *access-list-name* | *standard-access-list* | *expanded-access-list* } **in**

Syntax Description	<i>access-list-name</i>	Name of the existing IP access list.
	<i>standard-access-list</i>	Standard access list number. <ul style="list-style-type: none"> Valid values are from 1 to 199 for a standard or extended IP access list.
	<i>expanded-access-list</i>	Expanded access list number. <ul style="list-style-type: none"> Valid values are from 1300 to 2699 for a standard or extended IP expanded access list.
	in	Filters inbound packets.
Command Default	Access groups are not applied.	
Command Modes	Interface configuration (config-if)	
Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines If the specified access list is not available, all packets are passed (no warning message is issued).

Applying Access Lists to Interfaces

For standard inbound access lists, after an interface receives a packet, the Cisco IOS software checks the source address of the packet against the access list. For extended access lists, the networking device also checks the destination access list. If the access list permits the address, the software continues to process the packet. If the access list rejects the address, the software discards the packet and returns an Internet Control Management Protocol (ICMP) host unreachable message.

Examples

The following example applies list 101 on packets inbound from Gigabit Ethernet interface 1/0/1:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/0/1
Device(config-if)# ip access-group 101 in
Device(config-if)# end
```

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 Release 15.2(7)E1	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 Release 15.2(7)E1	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 Release 15.2(7)E1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS Release 15.2(7)E1	This command was introduced.
Release	Modification				
Cisco IOS Release 15.2(7)E1	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
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 switch sends the ARP probe. The range is from 1 to 255.
delay <i>seconds</i>	Sets the number of seconds that the switch waits before sending the ARP probe. The range is from 1 to 120.
interval <i>seconds</i>	Sets the number of seconds that the switch 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 Release 15.2(7)E1	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.

no ip dhcp snooping database [**timeout** | **write-delay**]

Syntax Description		
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).
rnp:url		Specifies the database URL for storing entries using remote copy (rnp).
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 <i>seconds</i>		Specifies the timeout interval; valid values are from 0 to 86400 seconds.
write-delay <i>seconds</i>		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 Release 15.2(7)E1	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 Release 15.2(7)E1	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 Release 15.2(7)E1	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 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 Release 15.2(7)E1	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
Device (config)# ip source binding 0100.0230.0002 vlan 11 10.0.0.4 interface
gigabitethernet1/0/1
```

ip ssh source-interface

To specify the IP address of an interface as the source address for a Secure Shell (SSH) client device, use the **ip ssh source-interface** command in global configuration mode. To remove the IP address as the source address, use the **no** form of this command.

```
ip ssh source-interface interface
no ip ssh source-interface interface
```

Syntax Description

<i>interface</i>	The interface whose address is used as the source address for the SSH client.
------------------	---

Command Default

The address of the closest interface to the destination is used as the source address (the closest interface is the output interface through which the SSH packet is sent).

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines

By specifying this command, you can force the SSH client to use the IP address of the source interface as the source address.

Examples

In the following example, the IP address assigned to GigabitEthernet interface 1/0/1 is used as the source address for the SSH client:

```
Device(config)# ip ssh source-interface GigabitEthernet 1/0/1
```

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
no ip verify source

Command Default IP source guard is disabled.

Command Modes Interface configuration

Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines To enable IP source guard with source IP address filtering, use the **ip verify source** 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
```

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

ipv6 snooping policy



Note All existing IPv6 Snooping commands now have corresponding SISF-based device-tracking commands that allow you to apply your configuration to both IPv4 and IPv6 address families.

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 Release 15.2(7)E1	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)#
```

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

maximum 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 Release 15.2(7)E1	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 Release 15.2(7)E1	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.

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 Release 15.2(7)E1	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.

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 Release 15.2(7)E1	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.
lavr-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 Release 15.2(7)E1

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 2: 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.

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 {<i>ipv4</i> <i>ipv6</i>} <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 Release 15.2(7)E1	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
```

router rip

To configure the Routing Information Protocol (RIP) routing process, use the **router rip** command in global configuration mode. To turn off the RIP routing process, use the **no** form of this command.

router rip
no router rip

Syntax Description This command has no arguments or keywords.

Command Default No RIP routing process is defined.

Command Modes Global configuration (config)

Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	This command was introduced.

Examples The following example shows how to begin the RIP routing process:

```
Device(config)# router rip
```

Related Commands	Command	Description
	network (RIP)	Specifies a list of networks for the RIP process.

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	Modification
	Cisco IOS Release 15.2(7)E1	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 Release 15.2(7)E1	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.

Syntax Description

user	Specifies the AAA local locked-out user.
lockout	

Command Modes

User EXEC

Command History

Release

Modification

Cisco IOS Release 15.2(7)E1

This command was introduced.

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 Release 15.2(7)E1	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 Release 15.2(7)E1	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 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

handle <i>handle-id</i>	(Optional) Specifies the particular handle for which Auth Manager information is to be displayed.
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 Release 15.2(7)E1	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 3: 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.
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 4: 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 auto security

To display auto security status, use the **show auto security** command in privileged EXEC mode.

show auto-security

This command has no arguments or keywords.

Command Modes Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines Configuring the **auto security** command in global configuration mode, configures auto security globally; including all interfaces. When you disable auto security, it is disabled on all interfaces.

Use the **auto security-port** command to enable auto security on specific interfaces.

The following is sample output from the **show auto security** command, when auto security is enabled globally:

```
Device# show auto security
Auto Security is Enabled globally

AutoSecurity is Enabled on below interface(s):
-----
GigabitEthernet1/0/2
GigabitEthernet1/0/3
GigabitEthernet1/0/4
GigabitEthernet1/0/5
GigabitEthernet1/0/7
GigabitEthernet1/0/8
GigabitEthernet1/0/10
GigabitEthernet1/0/12
GigabitEthernet1/0/23
```

The following is sample output from the **show auto security** command, when auto security is enabled on a specific interface:

```
Device# show auto security
Auto Security is Disabled globally

AutoSecurity is Enabled on below interface(s):
-----
GigabitEthernet1/0/2
```

Related Commands

Command	Description
auto security	Configures global auto security.
auto security-port	Configures auto security on an interface.

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 Release 15.2(7)E1	This command was introduced.

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 Release 15.2(7)E1	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 Release 15.2(7)E1	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 Release 15.2(7)E1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS Release 15.2(7)E1	This command was introduced.
Release	Modification				
Cisco IOS Release 15.2(7)E1	This command was introduced.				
Usage Guidelines	In a switch stack, all statistics are generated on the primary stack. 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 5: 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 ip rip database

To display summary address entries in the Routing Information Protocol (RIP) routing database entries if relevant are routes being summarized based upon a summary address, use the **show ip rip database** command in privileged EXEC mode.

show ip rip database [*ip-address mask*]

Syntax Description	
<i>ip-address</i>	(Optional) Address about which routing information should be displayed.
<i>mask</i>	(Optional) Argument for the subnet mask. The subnet mask must also be specified if the IP address argument is entered.

Command Default No default behavior or values.

Command Modes Privileged EXEC(#)

Command History	Release	Modification
	Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines Summary address entries will appear in the database only if relevant child routes are being summarized. When the last child route for a summary address becomes invalid, the summary address is also removed from the routing table.

The RIP private database is populated only if triggered extensions to RIP are enabled with the **ip rip triggered** command.

Examples

The following output shows a summary address entry for route 10.11.0.0/16, with three child routes active:

```
Device# show ip rip database
10.0.0.0/8    auto-summary
10.0.0.0/8
    [1] via 172.16.0.10, 00:00:17, GigabitEthernet7/0/10
192.168.0.0/8    auto-summary
192.168.0.0/8
    [2] via 172.16.0.10, 00:00:17, GigabitEthernet7/0/10
172.16.0.0/8    auto-summary
172.16.0.0/24    directly connected, GigabitEthernet7/0/10
```

The table below describes the fields in the display.

Table 6: show ip rip database Field Descriptions

Field	Description
10.0.0.0/8 auto-summary	Summary address entry.

Field	Description
172.16.0.0/24 directly connected, GigabitEthernet7/0/10	Directly connected entry for GigabitEthernet 7/0/10.

Related Commands

Commands	Description
debug ip rip	Displays information on RIP routing transactions.

show ip ssh

To display the version and configuration data for Secure Shell (SSH), use the **show ip ssh** privileged EXEC command.

show ip ssh

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS Release 15.2(7)E1	This command was introduced.

Usage Guidelines

Use the **show ip ssh** to view the status of configured options such as retries and timeouts. This command allows you to see if SSH is enabled or disabled.

Examples

The following is sample output from the **show ip ssh** command when SSH has been enabled:

```
Device# show ip ssh
SSH Enabled - version 1.5
Authentication timeout: 120 secs; Authentication retries: 3
```

The following is sample output from the **show ip ssh** command when SSH has been disabled:

```
Device# show ip ssh
%SSH has not been enabled
```

The following is sample output from the **show ip ssh** command to display the configured RSA key size:

```
Device# show ip ssh
SSH Disabled - version 1.99
%Please create RSA keys to enable SSH (and of atleast 768 bits for SSH v2).
Authentication methods:publickey,keyboard-interactive,password
Authentication Publickey Algorithms:x509v3-ssh-rsa,ssh-rsa
Hostkey Algorithms:x509v3-ssh-rsa,ssh-rsa
Encryption Algorithms:aes128-ctr,aes192-ctr,aes256-ctr
MAC Algorithms:hmac-shal,hmac-shal-96
Authentication timeout: 120 secs; Authentication retries: 3
Minimum expected Diffie Hellman key size : 1024 bits
IOS Keys in SECSH format(ssh-rsa, base64 encoded): NONE
```


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

name 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 Release 15.2(7)E1	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 7: 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 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 <i>vlan-group-name</i> (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	Modification
	Cisco IOS Release 15.2(7)E1	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.	

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 Release 15.2(7)E1	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 Release 15.2(7)E1	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 Release 15.2(7)E1	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:

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- 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 Release 15.2(7)E1	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.
- 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
```

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 Release 15.2(7)E1	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
```

username name masked-secret

To configure a user account with the given name and masked-secret, use the **username name masked-secret** command in the global configuration mode.

To remove all username related configuration, use the **no** form of this command.

username *name* **masked-secret**

no username *name* **masked-secret**

Syntax Description

name User name

masked-secret Specifies a secret for the user. The secret input will be masked on the screen and will be converted to type 9 by default.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3	This command was introduced.

Usage Guidelines

When configuring the username and secret (in plain text), the password text is visible on the terminal as it is and is saved as plaintext in the running-configuration and start-up-configuration. You can use the **username name masked-secret** command to mask the secret input on the screen.

Example

The following example shows a sample output of the **username name masked-secret** command.

```
Device#username cisco masked-secret
Enter secret: *****
Confirm secret: *****
```

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 Release 15.2(7)E1	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
```