Configuring Access Control Lists

This chapter contains the following sections:

Information About ACLs

An access control list (ACL) is an ordered set of rules that you can use to filter traffic. Each rule specifies a set of conditions that a packet must satisfy to match the rule. When the switch determines that an ACL applies to a packet, it tests the packet against the conditions of all rules. The first match determines whether the packet is permitted or denied. If there is no match, the switch applies the applicable default rule. The switch continues processing packets that are permitted and drops packets that are denied.

You can use ACLs to protect networks and specific hosts from unnecessary or unwanted traffic. For example, you could use ACLs to disallow HTTP traffic from a high-security network to the Internet. You could also use ACLs to allow HTTP traffic but only to specific sites, using the IP address of the site to identify it in an IP ACL.

IP ACL Types and Applications

The Cisco Nexus device supports IPv4, IPv6, and MAC ACLs for security traffic filtering. The switch allows you to use IP access control lists (ACLs) as port ACLs, VLAN ACLs, and Router ACLs as shown in the following table.

Table 1: Security ACL Applications

Application	Supported Interfaces	Types of ACLs Supported
Port ACL	An ACL is considered a port ACL when you apply it to one of the following: • Ethernet interface • Ethernet port-channel interface When a port ACL is applied to a trunk port, the ACL filters traffic on all VLANs on the trunk port.	IPv4 ACLs IPv6 ACLs MAC ACLs
Router ACL	• VLAN interfaces **Note** You must enable VLAN interfaces globally before you can configure a VLAN interface. • Physical Layer 3 interfaces • Layer 3 Ethernet subinterfaces • Layer 3 Ethernet port-channel interfaces • Layer 3 Ethernet port-channel subinterfaces • Tunnels • Management interfaces	IPv4 ACLs IPv6 ACLs
VLAN ACL (VACL)	An ACL is a VACL when you use an access map to associate the ACL with an action and then apply the map to a VLAN.	IPv4 ACLs MAC ACLs
VTY ACL	VTYs	IPv4 ACLs IPv6 ACLs

Application Order

When the device processes a packet, it determines the forwarding path of the packet. The path determines which ACLs that the device applies to the traffic. The device applies the ACLs in the following order:

1. Port ACL
2. Ingress VACL
3. Ingress Router ACL
4. Egress Router ACL
5. Egress VACL

Rules

Rules are what you create, modify, and remove when you configure how an ACL filters network traffic. Rules appear in the running configuration. When you apply an ACL to an interface or change a rule within an ACL that is already applied to an interface, the supervisor module creates ACL entries from the rules in the running configuration and sends those ACL entries to the applicable I/O module. Depending upon how you configure the ACL, there may be more ACL entries than rules, especially if you implement policy-based ACLs by using object groups when you configure rules.

You can create rules in access-list configuration mode by using the **permit** or **deny** command. The device allows traffic that matches the criteria in a permit rule and blocks traffic that matches the criteria in a deny rule. You have many options for configuring the criteria that traffic must meet in order to match the rule.

This section describes some of the options that you can use when you configure a rule.

Source and Destination

In each rule, you specify the source and the destination of the traffic that matches the rule. You can specify both the source and destination as a specific host, a network or group of hosts, or any host.

Protocols

IPv4, IPv6, and MAC ACLs allow you to identify traffic by protocol. For your convenience, you can specify some protocols by name. For example, in an IPv4 ACL, you can specify ICMP by name.

You can specify any protocol by the integer that represents the Internet protocol number. For example, you can use 115 to specify Layer 2 Tunneling Protocol (L2TP) traffic.

Implicit Rules

IP and MAC ACLs have implicit rules, which means that although these rules do not appear in the running configuration, the switch applies them to traffic when no other rules in an ACL match.

All IPv4 ACLs include the following implicit rule:

```
deny ip any any
```

This implicit rule ensures that the switch denies unmatched IP traffic.

All IPv6 ACLs include the following implicit rule:

```
deny ipv6 any any
```

Additional Filtering Options

You can identify traffic by using additional options. IPv4 ACLs support the following additional filtering options:

- Layer 4 protocol
- TCP and UDP ports
- ICMP types and codes
- IGMP types
- Precedence level

- Differentiated Services Code Point (DSCP) value
- TCP packets with the ACK, FIN, PSH, RST, SYN, or URG bit set
- Established TCP connections

IPv6 ACLs support the following additional filtering options:

- Layer 4 protocol
- Authentication Header Protocol
- Encapsulating Security Payload
- Payload Compression Protocol
- Stream Control Transmission Protocol (SCTP)
- SCTP, TCP, and UDP ports
- ICMP types and codes
- IGMP types
- Flow label
- DSCP value
- TCP packets with the ACK, FIN, PSH, RST, SYN, or URG bit set
- Established TCP connections
- Packet length

MAC ACLs support the following additional filtering options:

- Layer 3 protocol
- VLAN ID
- Class of Service (CoS)

Sequence Numbers

The Cisco Nexus device supports sequence numbers for rules. Every rule that you enter receives a sequence number, either assigned by you or assigned automatically by the device. Sequence numbers simplify the following ACL tasks:

- Adding new rules between existing rules—By specifying the sequence number, you specify where in the ACL a new rule should be positioned. For example, if you need to insert a rule between rules numbered 100 and 110, you could assign a sequence number of 105 to the new rule.
- Removing a rule—Without using a sequence number, removing a rule requires that you enter the whole rule, as follows:

  ```
  switch(config-acl)# no permit tcp 10.0.0.0/8 any
  ```

  However, if the same rule had a sequence number of 101, removing the rule requires only the following command:

  ```
  switch(config-acl)# no 101
  ```

- Moving a rule—With sequence numbers, if you need to move a rule to a different position within an ACL, you can add a second instance of the rule using the sequence number that positions it correctly, and then you can remove the original instance of the rule. This action allows you to move the rule without disrupting traffic.

If you enter a rule without a sequence number, the device adds the rule to the end of the ACL and assigns a sequence number that is 10 greater than the sequence number of the preceding rule to the rule. For example, if the last rule in an ACL has a sequence number of 225 and you add a rule without a sequence number, the device assigns the sequence number 235 to the new rule.

In addition, the device allows you to reassign sequence numbers to rules in an ACL. Resequencing is useful when an ACL has rules numbered contiguously, such as 100 and 101, and you need to insert one or more rules between those rules.

Logical Operators and Logical Operation Units

IP ACL rules for TCP and UDP traffic can use logical operators to filter traffic based on port numbers.

The Cisco Nexus device stores operator-operand couples in registers called logical operation units (LOUs) to perform operations (greater than, less than, not equal to, and range) on the TCP and UDP ports specified in an IP ACL.

Note The range operator is inclusive of boundary values.

These LOUs minimize the number of ternary content addressable memory (TCAM) entries needed to perform these operations. A maximum of two LOUs are allowed for each feature on an interface. For example an ingress RACL can use two LOUs, and a QoS feature can use two LOUs. If an ACL feature requires more than two arithmetic operations, the first two operations use LOUs, and the remaining access control entries (ACEs) get expanded.

The following guidelines determine when the device stores operator-operand couples in LOUs:

- If the operator or operand differs from other operator-operand couples that are used in other rules, the couple is stored in an LOU.

  For example, the operator-operand couples "gt 10" and "gt 11" would be stored separately in half an LOU each. The couples "gt 10" and "lt 10" would also be stored separately.

- Whether the operator-operand couple is applied to a source port or a destination port in the rule affects LOU usage. Identical couples are stored separately when one of the identical couples is applied to a source port and the other couple is applied to a destination port.

  For example, if a rule applies the operator-operand couple "gt 10" to a source port and another rule applies a "gt 10" couple to a destination port, both couples would also be stored in half an LOU, resulting in the use of one whole LOU. Any additional rules using a "gt 10" couple would not result in further LOU usage.

Statistics and ACLs

The device can maintain global statistics for each rule that you configure in IPv4, IPv6, and MAC ACLs. If an ACL is applied to multiple interfaces, the maintained rule statistics are the sum of packet matches (hits) on all the interfaces on which that ACL is applied.

Note The device does not support interface-level ACL statistics.

For each ACL that you configure, you can specify whether the device maintains statistics for that ACL, which allows you to turn ACL statistics on or off as needed to monitor traffic filtered by an ACL or to help troubleshoot the configuration of an ACL.

The device does not maintain statistics for implicit rules in an ACL. For example, the device does not maintain a count of packets that match the implicit **deny ip any any** rule at the end of all IPv4 ACLs. If you want to maintain statistics for implicit rules, you must explicitly configure the ACL with rules that are identical to the implicit rules.

Licensing Requirements for ACLs

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	No license is required to use ACLs.

Prerequisites for ACLs

IP ACLs have the following prerequisites:

- You must be familiar with IP addressing and protocols to configure IP ACLs.
- You must be familiar with the interface types that you want to configure with ACLs.

VACLs have the following prerequisite:

- Ensure that the IP ACL or MAC ACL that you want to use in the VACL exists and is configured to filter traffic in the manner that you need for this application.

Guidelines and Limitations for ACLs

IP ACLs have the following configuration guidelines and limitations:

- We recommend that you perform ACL configuration using the Session Manager. This feature allows you to verify ACL configuration and confirm that the resources required by the configuration are available prior to committing them to the running configuration. This is especially useful for ACLs that include more than about 1000 rules.
- To apply an IP ACL to a VLAN interface, you must have enabled VLAN interfaces globally.

MAC ACLs have the following configuration guidelines and limitations:

- MAC ACLs apply to ingress traffic only.
- ACL statistics are not supported if the DHCP snooping feature is enabled.

VACLs have the following configuration guidelines and limitations:

- We recommend that you perform ACL configurations using the Session Manager. This feature allows you to verify ACL configuration and confirm that the resources required by the configuration are available prior to committing them to the running configuration.
- ACL statistics are not supported if the DHCP snooping feature is enabled.

Default ACL Settings

The following table lists the default settings for IP ACLs parameters.

Table 2: Default IP ACLs Parameters

Parameters	Default
IP ACLs	No IP ACLs exist by default.
ACL rules	Implicit rules apply to all ACLs .
Object groups	No object groups exist by default.

The following table lists the default settings for MAC ACLs parameters.

Table 3: Default MAC ACLs Parameters

Parameters	Default
MAC ACLs	No MAC ACLs exist by default.
ACL rules	Implicit rules apply to all ACLs .

The following table lists the default settings for VACL parameters.

Table 4: Default VACL Parameters

Parameters	Default
VACLs	No IP ACLs exist by default.
ACL rules	Implicit rules apply to all ACLs.

Configuring IP ACLs

Creating an IP ACL

You can create an IPv4 or IPv6 ACL on the switch and add rules to it.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# {**ip** | **ipv6**} **access-list** *name*
3. switch(config-acl)# [*sequence-number*] {**permit** | **deny**} *protocol source destination*
4. (Optional) switch(config-acl)# **statistics**
5. (Optional) switch# **show** {**ip** | **ipv6**} **access-lists** *name*
6. (Optional) switch# **show ip access-lists** *name*
7. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

Step 1 switch# **configure terminal**

Enters global configuration mode.

Step 2 switch(config)# {**ip** | **ipv6**} **access-list** *name*

Creates the IP ACL and enters IP ACL configuration mode. The *name* argument can be up to 64 characters.

Step 3 switch(config-acl)# [*sequence-number*] {**permit** | **deny**} *protocol source destination*

Creates a rule in the IP ACL. You can create many rules. The *sequence-number* argument can be a whole number between 1 and 4294967295.

The **permit** and **deny** commands support many ways of identifying traffic. For more information, see the *Command Reference* for the specific Cisco Nexus device.

Step 4 (Optional) switch(config-acl)# **statistics**

Specifies that the switch maintains global statistics for packets that match the rules in the ACL.

Step 5 (Optional) switch# **show** {**ip** | **ipv6**} **access-lists** *name*

Displays the IP ACL configuration.

Step 6 (Optional) switch# **show ip access-lists** *name*

Displays the IP ACL configuration.

Step 7 (Optional) switch# **copy running-config startup-config**

Copies the running configuration to the startup configuration.

Example

This example shows how to create an IPv4 ACL:

```
switch# configure terminal
switch(config)# ip access-list acl-01
switch(config-acl)# permit ip 192.168.2.0/24 any
switch(config-acl)# statistics
```

This example shows how to create an IPv6 ACL:

```
switch# configure terminal
switch(config)# ipv6 access-list acl-01-ipv6
switch(config-ipv6-acl)# permit tcp 2001:0db8:85a3::/48 2001:0db8:be03:2112::/64
```

Changing an IP ACL

You can add and remove rules in an existing IPv4 or IPv6 ACL. You cannot change existing rules. Instead, to change a rule, you can remove it and recreate it with the desired changes.

If you need to add more rules between existing rules than the current sequence numbering allows, you can use the **resequence** command to reassign sequence numbers.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# {**ip** | **ipv6**} **access-list** *name*
3. switch(config)# **ip access-list** *name*
4. switch(config-acl)# [*sequence-number*] {**permit** | **deny**} *protocol source destination*
5. (Optional) switch(config-acl)# **no** {*sequence-number* | {**permit** | **deny**} *protocol source destination*}
6. (Optional) switch(config-acl)# [**no**] **statistics**
7. (Optional) switch#**show ip access-lists** *name*
8. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# {**ip** | **ipv6**} **access-list** *name*	Enters IP ACL configuration mode for the ACL that you specify by name.
Step 3	switch(config)# **ip access-list** *name*	Enters IP ACL configuration mode for the ACL that you specify by name.
Step 4	switch(config-acl)# [*sequence-number*] {**permit** | **deny**} *protocol source destination*	Creates a rule in the IP ACL. Using a sequence number allows you to specify a position for the rule in the ACL. Without a sequence number, the rule is added to the end of the rules. The *sequence-number* argument can be a whole number between 1 and 4294967295. The **permit** and **deny** commands support many ways of identifying traffic. For more information, see the *Command Reference* for your Cisco Nexus device.
Step 5	(Optional) switch(config-acl)# **no** {*sequence-number* | {**permit** | **deny**} *protocol source destination*}	Removes the rule that you specified from the IP ACL. The **permit** and **deny** commands support many ways of identifying traffic. For more information, see the *Command Reference* for your Cisco Nexus device.
Step 6	(Optional) switch(config-acl)# [**no**] **statistics**	Specifies that the switch maintains global statistics for packets that match the rules in the ACL.

	Command or Action	Purpose
		The **no** option stops the switch from maintaining global statistics for the ACL.
Step 7	(Optional) switch#**show ip access-lists** *name*	Displays the IP ACL configuration.
Step 8	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Related Topics

Changing Sequence Numbers in an IP ACL, on page 10

Removing an IP ACL

You can remove an IP ACL from the switch.

Before you remove an IP ACL from the switch, be sure that you know whether the ACL is applied to an interface. The switch allows you to remove ACLs that are currently applied. Removing an ACL does not affect the configuration of interfaces where you have applied the ACL. Instead, the switch considers the removed ACL to be empty.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **no** {**ip** | **ipv6**} **access-list** *name*
3. switch(config)# no **ip access-list** *name*
4. (Optional) switch# **show running-config**
5. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **no** {**ip** | **ipv6**} **access-list** *name*	Removes the IP ACL that you specified by name from the running configuration.
Step 3	switch(config)# no **ip access-list** *name*	Removes the IP ACL that you specified by name from the running configuration.
Step 4	(Optional) switch# **show running-config**	Displays the ACL configuration. The removed IP ACL should not appear.
Step 5	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Changing Sequence Numbers in an IP ACL

You can change all the sequence numbers assigned to the rules in an IP ACL.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **resequence** {**ip** | **ipv6**} **access-list** *name starting-sequence-number increment*
3. (Optional) switch# **show** {**ip** | **ipv6**} **access-lists** *name*
4. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **resequence** {**ip** | **ipv6**} **access-list** *name starting-sequence-number increment*	Assigns sequence numbers to the rules contained in the ACL, where the first rule receives the starting sequence number that you specify. Each subsequent rule receives a number larger than the preceding rule. The difference in numbers is determined by the increment that you specify. The *starting-sequence-number* argument and the *increment* argument can be a whole number between 1 and 4294967295.
Step 3	(Optional) switch# **show** {**ip** | **ipv6**} **access-lists** *name*	Displays the IP ACL configuration.
Step 4	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Configuring ACLs with Logging

You can create an access-control list for logging traffic of a specified protocol and address.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# {**ip** | **ipv6**} **access-list** *name*
3. switch(config-acl)# **permit** *protocol source destination* **log**
4. switch(config-acl)# **exit**
5. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# {**ip** | **ipv6**} **access-list** *name*	Creates the IP ACL and enters IP ACL configuration mode. The *name* argument can be up to 64 characters.

	Command or Action	Purpose
Step 3	switch(config-acl)# **permit** *protocol source destination* **log**	Creates a rule to log traffic of the specified protocol in the syslog file. in the IP ACL. Valid values for the *protocol* argument are: • **icmp**—ICMP • **igmp**—IGMP • **ip**—IPv4 • **ipv6**—IPv6 • **tcp**—TCP • **udp**—UDP • **sctp**—SCTP (IPv6 only) The source and destination arguments can be the IP address with a network wildcard (IPv4 only), IP address and variable-length subnet mask, host address, or **any** to designate any address. For more information, see the System Management configuration guide and the Security command reference for your platform.
Step 4	switch(config-acl)# **exit**	Exists the current configuration mode.
Step 5	(Optional) switch(config)# **copy running-config startup-config**	Saves the change persistently through reboots and restarts by copying the running configuration to the startup configuration.

Example

The following example shows how to create an ACL for logging entries that match IPv4 TCP traffic from any source and any destination:

```
switch# configuration terminal
switch(config)# ip access-list tcp_log
switch(config-acl)# permit tcp any any log
switch(config-acl)# exit
switch(config)# copy running-config startup-config
```

Applying an IP ACL to mgmt0

You can apply an IPv4 or IPv6 ACL to the management interface (mgmt0).

Before you begin

Ensure that the ACL that you want to apply exists and that it is configured to filter traffic in the manner that you need for this application.

SUMMARY STEPS

1. **configure terminal**
2. **interface mgmt** *port*
3. **ip access-group** *access-list* {**in** | **out**}
4. (Optional) **show running-config aclmgr**
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface mgmt** *port*
	Example:
	`switch(config)# interface mgmt0`
	`switch(config-if)#`
		Enters configuration mode for the management interface.

Step 3	**ip access-group** *access-list* {**in** | **out**}
	Example:
	`switch(config-if)#ip access-group acl-120 out`
		Applies an IPv4 or IPv6 ACL to the Layer 3 interface for traffic flowing in the direction specified. You can apply one router ACL per direction.

Step 4	(Optional) **show running-config aclmgr** **Example:** `switch(config-if)# show running-config aclmgr`	Displays the ACL configuration.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch(config-if)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Related Topics

- Creating an IP ACL

Applying an IP ACL as a Router ACL

You can apply an IPv4 or IPv6 ACL to any of the following types of interfaces:

- Physical Layer 3 interfaces and subinterfaces
- Layer 3 Ethernet port-channel interfaces and subinterfaces
- VLAN interfaces
- Tunnels

- Management interfaces

ACLs applied to these interface types are considered router ACLs.

Before you begin

Ensure that the ACL you want to apply exists and that it is configured to filter traffic in the manner that you need for this application.

SUMMARY STEPS

1. switch# **configure terminal**
2. Enter one of the following commands:
    - switch(config)# **interface ethernet** *slot*/*port*[**.** *number*]
    - switch(config)# **interface port-channel** *channel-number*[**.** *number*]
    - switch(config)# **interface tunnel** *tunnel-number*
    - switch(config)# **interface vlan** *vlan-ID*
    - switch(config)# **interface mgmt** *port*
3. Enter one of the following commands:
    - switch(config-if)# **ip access-group** *access-list* {**in** | **out**}
    - switch(config-if)# **ipv6 traffic-filter** *access-list* {**in** | **out**}
4. (Optional) switch(config-if)# **show running-config aclmgr**
5. (Optional) switch(config-if)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	Enter one of the following commands: • switch(config)# **interface ethernet** *slot*/*port*[**.** *number*] • switch(config)# **interface port-channel** *channel-number*[**.** *number*] • switch(config)# **interface tunnel** *tunnel-number* • switch(config)# **interface vlan** *vlan-ID* • switch(config)# **interface mgmt** *port*	Enters configuration mode for the interface type that you specified.
Step 3	Enter one of the following commands: • switch(config-if)# **ip access-group** *access-list* {**in** | **out**} • switch(config-if)# **ipv6 traffic-filter** *access-list* {**in** | **out**}	Applies an IPv4 or IPv6 ACL to the Layer 3 interface for traffic flowing in the direction specified. You can apply one router ACL per direction.
Step 4	(Optional) switch(config-if)# **show running-config aclmgr**	Displays the ACL configuration.
Step 5	(Optional) switch(config-if)# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Applying an IP ACL as a Port ACL

You can apply an IPv4 or IPv6 ACL to a physical Ethernet interface or a PortChannel. ACLs applied to these interface types are considered port ACLs.

Note Some configuration parameters when applied to an PortChannel are not reflected on the configuration of the member ports.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **interface** {**ethernet** [*chassis/*]*slot*/*port* | **port-channel** *channel-number*}
3. switch(config-if)# {**ip port access-group** | **ipv6 port traffic-filter**} *access-list* **in**
4. (Optional) switch# **show running-config**
5. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **interface** {**ethernet** [*chassis/*]*slot*/*port* | **port-channel** *channel-number*}	Enters interface configuration mode for the specified interface.
Step 3	switch(config-if)# {**ip port access-group** | **ipv6 port traffic-filter**} *access-list* **in**	Applies an IPv4 or IPv6 ACL to the interface or PortChannel. Only inbound filtering is supported with port ACLs. You can apply one port ACL to an interface.
Step 4	(Optional) switch# **show running-config**	Displays the ACL configuration.
Step 5	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Verifying IP ACL Configurations

To display IP ACL configuration information, perform one of the following tasks:

Procedure

- switch# **show running-config**

  Displays ACL configuration, including IP ACL configuration and interfaces that IP ACLs are applied to.

- switch# **show running-config interface**

  Displays the configuration of an interface to which you have applied an ACL.

Example

For detailed information about the fields in the output from these commands, refer to the *Command Reference* for your Cisco Nexus device.

Monitoring and Clearing IP ACL Statistics

Use the **show ip access-lists** or **show ipv6 access-list** command to display statistics about an IP ACL, including the number of packets that have matched each rule. For detailed information about the fields in the output from this command, see the *Command Reference* for your Cisco Nexus device.

Note The mac access-list is applicable to non-IPv4 and non-IPv6 traffic only.

Procedure

- switch# **show** {**ip** | **ipv6**} **access-lists** *name*

  Displays IP ACL configuration. If the IP ACL includes the **statistics** command, then the **show ip access-lists** and **show ipv6 access-list** command output includes the number of packets that have matched each rule.

- switch#**show ip access-lists** *name*

  Displays IP ACL configuration. If the IP ACL includes the **statistics** command, then the **show ip access-lists** command output includes the number of packets that have matched each rule.

- switch# **clear** {**ip** | **ipv6**} **access-list counters** [*access-list-name*]

  Clears statistics for all IP ACLs or for a specific IP ACL.

- switch# **clear ip access-list counters** [*access-list-name*]

  Clears statistics for all IP ACLs or for a specific IP ACL.

Configuring MAC ACLs

Creating a MAC ACL

SUMMARY STEPS

1. switch# **configure terminal**
2. switch# **mac access-list** *name*
3. switch(config-mac-acl)# [*sequence-number*] {**permit** | **deny**} *source destination protocol*
4. (Optional) switch(config-mac-acl)# **statistics**
5. (Optional) switch# **show mac access-lists** *name*
6. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch# **mac access-list** *name*	Creates the MAC ACL and enters ACL configuration mode.
Step 3	switch(config-mac-acl)# [*sequence-number*] {**permit** | **deny**} *source destination protocol*	Creates a rule in the MAC ACL. The **permit** and **deny** options support many ways of identifying traffic. For more information, see the Security command reference for your platform.
Step 4	(Optional) switch(config-mac-acl)# **statistics**	Specifies that the switch maintains global statistics for packets matching the rules in the ACL.
Step 5	(Optional) switch# **show mac access-lists** *name*	Displays the MAC ACL configuration.
Step 6	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Example

The following example shows how to create a MAC ACL and add rules to it:

```
switch# configure terminal
switch(config)# mac access-list acl-mac-01
switch(config-mac-acl)# permit 00c0.4f00.0000 0000.00ff.ffff any
switch(config-mac-acl)# statistics
```

Changing a MAC ACL

In an existing MAC ACL, you can add and remove rules. You cannot change existing rules. Instead, to change a rule, you can remove it and recreate it with the desired changes.

If you need to add more rules between existing rules than the current sequence numbering allows, you can use the **resequence** command to reassign sequence numbers.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **mac access-list** *name*
3. switch(config-mac-acl)# [*sequence-number*] {**permit** | **deny**} *source destination protocol*
4. (Optional) switch(config-mac-acl)# **no** {*sequence-number* | {**permit**|**deny**} *source destination protocol*}
5. (Optional) switch(config-mac-acl)# [**no**] **statistics**
6. (Optional) switch# **show mac access-lists** *name*
7. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **mac access-list** *name*	Enters ACL configuration mode for the ACL that you specify by name.
Step 3	switch(config-mac-acl)# [*sequence-number*] {**permit** | **deny**} *source destination protocol*	Creates a rule in the MAC ACL. Using a sequence number allows you to specify a position for the rule in the ACL. Without a sequence number, the rule is added to the end of the rules. The **permit** and **deny** commands support many ways of identifying traffic.
Step 4	(Optional) switch(config-mac-acl)# **no** {*sequence-number* | {**permit**|**deny**} *source destination protocol*}	Removes the rule that you specify from the MAC ACL. The **permit** and **deny** commands support many ways of identifying traffic.
Step 5	(Optional) switch(config-mac-acl)# [**no**] **statistics**	Specifies that the switch maintains global statistics for packets matching the rules in the ACL. The **no** option stops the switch from maintaining global statistics for the ACL.
Step 6	(Optional) switch# **show mac access-lists** *name*	Displays the MAC ACL configuration.
Step 7	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Example

The following example shows how to change a MAC ACL:

```
switch# configure terminal

switch(config)# mac access-list acl-mac-01

switch(config-mac-acl)# 100 permit mac 00c0.4f00.00 0000.00ff.ffff any

switch(config-mac-acl)# statistics
```

Removing a MAC ACL

You can remove a MAC ACL from the switch.

Be sure that you know whether the ACL is applied to an interface. The switch allows you to remove ACLs that are current applied. Removing an ACL does not affect the configuration of interfaces where you have applied the ACL. Instead, the switch considers the removed ACL to be empty.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **no mac access-list** *name*
3. (Optional) switch# **show mac access-lists**
4. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **no mac access-list** *name*	Removes the MAC ACL that you specify by name from the running configuration.
Step 3	(Optional) switch# **show mac access-lists**	Displays the MAC ACL configuration.
Step 4	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Changing Sequence Numbers in a MAC ACL

You can change all the sequence numbers assigned to rules in a MAC ACL. Resequencing is useful when you need to insert rules into an ACL and there are not enough available sequence numbers.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **resequence mac access-list** *name starting-sequence-number increment*
3. (Optional) switch# **show mac access-lists** *name*
4. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **resequence mac access-list** *name starting-sequence-number increment*	Assigns sequence numbers to the rules contained in the ACL, where the first rule receives the number specified by the starting-sequence number that you specify. Each subsequent rule receives a number larger than the preceding rule. The difference in numbers is determined by the increment number that you specify.
Step 3	(Optional) switch# **show mac access-lists** *name*	Displays the MAC ACL configuration.
Step 4	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Related Topics

Rules, on page 3

Applying a MAC ACL as a Port ACL

You can apply a MAC ACL as a port ACL to any of the following interface types:

- Ethernet interfaces
- EtherChannel interfaces

Be sure that the ACL that you want to apply exists and is configured to filter traffic as necessary for this application.

Note Some configuration parameters when applied to an EtherChannel are not reflected on the configuration of the member ports.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **interface** {**ethernet** [*chassis/*]*slot*/*port* | **port-channel** *channel-number*}
3. switch(config-if)# **mac port access-group** *access-list*
4. (Optional) switch# **show running-config**
5. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **interface** {**ethernet** [*chassis/*]*slot*/*port* | **port-channel** *channel-number*}	Enters interface configuration mode for the Ethernet specified interface.
Step 3	switch(config-if)# **mac port access-group** *access-list*	Applies a MAC ACL to the interface.
Step 4	(Optional) switch# **show running-config**	Displays ACL configuration.
Step 5	(Optional) switch# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Related Topics

Creating an IP ACL, on page 7

Verifying MAC ACL Configurations

To display MAC ACL configuration information, perform one of the following tasks:

Procedure

- switch# **show mac access-lists**

  Displays the MAC ACL configuration

- switch# **show running-config**

  Displays ACL configuration, including MAC ACLs and the interfaces that ACLs are applied to.

- switch# **show running-config interface**

  Displays the configuration of the interface to which you applied the ACL.

Displaying and Clearing MAC ACL Statistics

Use the **show mac access-lists** command to display statistics about a MAC ACL, including the number of packets that have matched each rule.

Procedure

- switch# **show mac access-lists**

  Displays MAC ACL configuration. If the MAC ACL includes the **statistics** command, the **show mac access-lists** command output includes the number of packets that have matched each rule.

- switch# **clear mac access-list counters**

  Clears statistics for all MAC ACLs or for a specific MAC ACL.

Example Configuration for MAC ACLs

This example shows how to create a MAC ACL named acl-mac-01 and apply it to Ethernet interface 1/1:

```
switch# configure terminal

switch(config)# mac access-list acl-mac-01

switch(config-mac-acl)# permit 00c0.4f00.0000 0000.00ff.ffff any

switch(config-mac-acl)# exit

switch(config)# interface ethernet 1/1

switch(config-if)# mac access-group acl-mac-01
```

Information About VLAN ACLs

A VLAN ACL (VACL) is one application ofa MAC ACL or an IP ACL. You can configure VACLs to apply to all packets that are bridged within a VLAN. VACLs are used strictly for security packet filtering. VACLs are not defined by direction (ingress or egress).

VACLs and Access Maps

VACLs use access maps to link an IP ACL or a MAC ACL to an action. The switch takes the configured action on packets that are permitted by the VACL.

VACLs and Actions

In access map configuration mode, you use the **action** command to specify one of the following actions:

- Forward—Sends the traffic to the destination determined by normal operation of the switch.
- Drop—Drops the traffic.

Statistics

The Cisco Nexus device can maintain global statistics for each rule in a VACL. If a VACL is applied to multiple VLANs, the maintained rule statistics are the sum of packet matches (hits) on all the interfaces on which that VACL is applied.

Note The Cisco Nexus device does not support interface-level VACL statistics.

For each VLAN access map that you configure, you can specify whether the switch maintains statistics for that VACL. This allows you to turn VACL statistics on or off as needed to monitor traffic filtered by a VACL or to help troubleshoot VLAN access-map configuration.

Configuring VACLs

Creating or Changing a VACL

You can create or change a VACL. Creating a VACL includes creating an access map that associates an IP ACL or MAC ACL with an action to be applied to the matching traffic.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **vlan access-map** *map-name*
3. switch(config-access-map)# **match ip address** *ip-access-list*
4. switch(config-access-map)# **match mac address** *mac-access-list*
5. switch(config-access-map)# **action** {**drop** | **forward**}
6. (Optional) switch(config-access-map)# [**no**] **statistics**
7. (Optional) switch(config-access-map)# **show running-config**
8. (Optional) switch(config-access-map)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **vlan access-map** *map-name*	Enters access map configuration mode for the access map specified.
Step 3	switch(config-access-map)# **match ip address** *ip-access-list*	Specifies an IPv4 and IPv6 ACL for the map.
Step 4	switch(config-access-map)# **match mac address** *mac-access-list*	Specifies a MAC ACL for the map.
Step 5	switch(config-access-map)# **action** {**drop** | **forward**}	Specifies the action that the switch applies to traffic that matches the ACL.
Step 6	(Optional) switch(config-access-map)# [**no**] **statistics**	Specifies that the switch maintains global statistics for packets matching the rules in the VACL. The **no** option stops the switch from maintaining global statistics for the VACL.
Step 7	(Optional) switch(config-access-map)# **show running-config**	Displays the ACL configuration.
Step 8	(Optional) switch(config-access-map)# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Removing a VACL

You can remove a VACL, which means that you will delete the VLAN access map.

Be sure that you know whether the VACL is applied to a VLAN. The switch allows you to remove VACLs that are current applied. Removing a VACL does not affect the configuration of VLANs where you have applied the VACL. Instead, the switch considers the removed VACL to be empty.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **no vlan access-map** *map-name*
3. (Optional) switch(config)# **show running-config**
4. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **no vlan access-map** *map-name*	Removes the VLAN access map configuration for the specified access map.
Step 3	(Optional) switch(config)# **show running-config**	Displays ACL configuration.

	Command or Action	Purpose
Step 4	(Optional) switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Applying a VACL to a VLAN

You can apply a VACL to a VLAN.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# [**no**] **vlan filter** *map-name* **vlan-list** *list*
3. (Optional) switch(config)# **show running-config**
4. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# [**no**] **vlan filter** *map-name* **vlan-list** *list*	Applies the VACL to the VLANs by the list that you specified. The **no** option unapplies the VACL. The **vlan-list** command can specify a list of up to 32 VLANs, but multiple **vlan-list** commands can be configured to cover more than 32 VLANs.
Step 3	(Optional) switch(config)# **show running-config**	Displays ACL configuration.
Step 4	(Optional) switch(config)# **copy running-config startup-config**	Copies the running configuration to the startup configuration.

Verifying VACL Configuration

To display VACL configuration information, perform one of the following tasks:

Procedure

- switch# **show running-config aclmgr**

  Displays ACL configuration, including VACL-related configuration.

- switch# **show vlan filter**

  Displays information about VACLs that are applied to a VLAN.

- switch# **show vlan access-map**

  Displays information about VLAN access maps.

Displaying and Clearing VACL Statistics

To display or clear VACL statistics, perform one of the following tasks:

Procedure

- switch# **show vlan access-list**

  Displays VACL configuration. If the VLAN access-map includes the **statistics** command, then the **show vlan access-list** command output includes the number of packets that have matched each rule.

- switch# **clear vlan access-list counters**

  Clears statistics for all VACLs or for a specific VACL.

Configuration Examples for VACL

The following example shows how to configure a VACL to forward traffic permitted by an IP ACL named acl-ip-01 and how to apply the VACL to VLANs 50 through 82:

```
switch# configure terminal

switch(config)# vlan access-map acl-ip-map

switch(config-access-map)# match ip address acl-ip-01

switch(config-access-map)# action forward

switch(config-access-map)# exit

 switch(config)# vlan filter acl-ip-map vlan-list 50-82
```

Configuring ACLs on Virtual Terminal Lines

To restrict incoming and outgoing connections for IPv4 or IPv6 between a Virtual Terminal (VTY) line and the addresses in an access list, use the **access-class** command in line configuration mode. To remove access restrictions, use the **no** form of this command.

Follow these guidelines when configuring ACLs on VTY lines:

- Set identical restrictions on all VTY lines because a user can connect to any of them.
- Statistics per entry is not supported for ACLs on VTY lines.

Before you begin

Be sure that the ACL that you want to apply exists and is configured to filter traffic for this application.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **line vty**
3. switch(config-line)# **access-class access-list-number {in | out}**
4. (Optional) switch(config-line)# **no access-class access-list-number {in | out}**

5. switch(config-line)# **exit**
6. (Optional) switch# **show running-config aclmgr**
7. (Optional) switch# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.

Step 2	switch(config)# **line vty**
	Example:
	`switch(config)# line vty`
	`switch(config-line)#`
		Enters line configuration mode.

Step 3	switch(config-line)# **access-class access-list-number {in | out}**
	Example:
	`switch(config-line)# access-class ozi2 in`
	`switch(config-line)#access-class ozi3 out`
	`switch(config)#`
		Specifies inbound or outbound access restrictions.

Step 4	(Optional) switch(config-line)# **no access-class access-list-number {in | out}**
	Example:
	`switch(config-line)# no access-class ozi2 in`
	`switch(config-line)# no access-class ozi3 out`
	`switch(config)#`
		Removes inbound or outbound access restrictions.

Step 5	switch(config-line)# **exit**
	Example:
	`switch(config-line)# exit`
	`switch#`
		Exits line configuration mode.

Step 6	(Optional) switch# **show running-config aclmgr** **Example:** `switch# show running-config aclmgr`	Displays the running configuration of the ACLs on the switch.
Step 7	(Optional) switch# **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Example

The following example shows how to apply the access-class ozi2 command to the in-direction of the vty line.

```
switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config)# line vty
switch(config-line)# access-class ozi2 in
switch(config-line)# exit
switch#
```

Verifying ACLs on VTY Lines

To display the ACL configurations on VTY lines, perform one of the following tasks:

Command	Purpose
show running-config aclmgr	Displays the running configuration of the ACLs configured on the switch.
show users	Displays the users that are connected.
show access-lists *access-list-name*	Display the statistics per entry.

Configuration Examples for ACLs on VTY Lines

The following example shows the connected users on the console line (ttyS0) and the VTY lines (pts/0 and pts/1).

```
switch# show users
NAME     LINE         TIME         IDLE          PID COMMENT
admin    ttyS0        Aug 27 20:45   .         14425 *
admin    pts/0        Aug 27 20:06 00:46       14176 (172.18.217.82) session=ssh
admin    pts/1        Aug 27 20:52   .         14584 (10.55.144.118)
```

The following example shows how to allow vty connections to all IPv4 hosts except 172.18.217.82 and how to deny vty connections to any IPv4 host except 10.55.144.118, 172.18.217.79, 172.18.217.82, 172.18.217.92:

- Applying the ipv6 access-list ozi7 command to the in direction of the VTY line, denies VTY connections to all IPv6 hosts.
- Applying the ipv6 access-list ozip6 command to the out direction of the VTY line, allows VTY connections to all IPv6 hosts.

```
switch# show running-config aclmgr
!Time: Fri Aug 27 22:01:09 2010
version 5.0(2)N1(1)
ip access-list ozi
  10 deny ip 172.18.217.82/32 any
  20 permit ip any any
ip access-list ozi2
  10 permit ip 10.55.144.118/32 any
  20 permit ip 172.18.217.79/32 any
  30 permit ip 172.18.217.82/32 any
  40 permit ip 172.18.217.92/32 any
ipv6 access-list ozi7
  10 deny tcp any any
ipv6 access-list ozip6
  10 permit tcp any any

line vty
  access-class ozi in
  access-class ozi2 out
  ipv6 access-class ozi7 in
  ipv6 access-class ozip6 out
```

The following example shows how to configure the IP access list by enabling per-entry statistics for the ACL:

```
switch# configure terminal
Enter configuration commands, one per line.
End with CNTL/Z.
switch(config)# ip access-list ozi2
switch(config-acl)# statistics per-entry
switch(config-acl)# deny tcp 172.18.217.83/32 any
switch(config-acl)# exit

switch(config)# ip access-list ozi
switch(config-acl)# statistics per-entry
switch(config-acl)# permit ip 172.18.217.20/24 any
switch(config-acl)# exit
switch#
```

The following example shows how to apply the ACLs on VTY in and out directions:

```
switch(config)# line vty
switch(config-line)# ip access-class ozi in
switch(config-line)# access-class ozi2 out
switch(config-line)# exit
switch#
```

The following example shows how to remove the access restrictions on the VTY line:

```
switch# configure terminal
Enter configuration commands, one per line. End
with CNTL/Z.
switch(config)# line vty
switch(config-line)# no access-class ozi2 in
switch(config-line)# no ip access-class ozi2 in
switch(config-line)# exit
switch#
```