



Port ACLs (PACLs)

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Note

- For complete syntax and usage information for the commands used in this chapter, see these publications:
http://www.cisco.com/en/US/products/ps11845/prod_command_reference_list.html
- Cisco IOS Release 15.0SY supports only Ethernet interfaces. Cisco IOS Release 15.0SY does not support any WAN features or commands.
- Port ACLs do not support the access-list keywords **log** or **reflexive**. These keywords in the access list are ignored. OAL does not support PACLs.
- PACLs are not supported on private VLANs.



Tip

For additional information about Cisco Catalyst 6500 Series Switches (including configuration examples and troubleshooting information), see the documents listed on this page:

http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html

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Prerequisites for PACLs

None.

Restrictions for PACLs

- There can be at most one IP access list and one MAC access list applied to the same Layer 2 interface per direction.
- PACLs are not applied to MPLS or ARP messages.
- An IP access list filters only IPv4 and IPv6 packets. For IP access lists, you can define a standard, extended, or named access-list.
- A MAC access list filters ingress packets that are of an unsupported type (not IP, ARP, or MPLS packets) based on the fields of the Ethernet datagram. A MAC access list is not applied to IP, MPLS, or ARP messages. You can define only named MAC access lists.
- The number of ACLs and ACEs that can be configured as part of a PACL are bounded by the hardware resources on the switch. Those hardware resources are shared by various ACL features (such as VACLs) that are configured on the system. If there are insufficient hardware resources to program a PACL in hardware, the PACL is not applied.
- PACL does not support the access-list **log** and **reflect/evaluate** keywords. These keywords are ignored if you add them to the access list for a PACL.
- OAL does not support PACLs.
- The access group mode can change the way PACLs interact with other ACLs. To maintain consistent behavior across Cisco platforms, use the default access group mode (merge mode).
- PACLs cannot filter Physical Link Protocols and Logical Link Protocols, such as CDP, VTP, DTP, PAgP, UDLD, and STP, because the protocols are redirected to the RP before the ACL takes effect. You can apply CoPP or QoS to Physical Link Protocol and Logical Link Protocol traffic.

Information About PACLs

- [PACL Overview, page 1-2](#)
- [EtherChannel and PACL Interactions, page 1-3](#)
- [Dynamic ACLs \(Applies to Merge Mode Only\), page 1-4](#)
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PACL Overview

PACLs filter incoming traffic on Layer 2 interfaces, using Layer 3 information, Layer 4 header information, or non-IP Layer 2 information.

The PACL feature uses standard or extended IP ACLs or named MAC-extended ACLs that you want to apply to the port.

Port ACLs perform access control on all traffic entering the specified Layer 2 port.

PACLs and VACLs can provide access control based on the Layer 3 addresses (for IP protocols) or Layer 2 MAC addresses (for non-IP protocols).

The port ACL (PACL) feature provides the ability to perform access control on specific Layer 2 ports. A Layer 2 port is a physical LAN or trunk port that belongs to a VLAN. Port ACLs are applied only on the ingress traffic. The port ACL feature is supported only in hardware (port ACLs are not applied to any packets routed in software).

When you create a port ACL, an entry is created in the ACL TCAM. You can use the **show team counts** command to see how much TCAM space is available.

The PACL feature does not affect Layer 2 control packets received on the port.

You can use the **access-group mode** command to change the way that PACLs interact with other ACLs.

PACLs use the following modes:

- **Prefer port mode**—If a PACL is configured on a Layer 2 interface, the PACL takes effect and overwrites the effect of other ACLs (Cisco IOS ACL and VACL). If no PACL feature is configured on the Layer 2 interface, other features applicable to the interface are merged and are applied on the interface.
- **Merge mode**—In this mode, the PACL, VACL, and Cisco IOS ACLs are merged in the ingress direction following the logical serial model shown in [Figure 1-2](#). This is the default access group mode.

You configure the **access-group mode** command on each interface. The default is merge mode.

**Note**

A PACL can be configured on a trunk port only after prefer port mode has been selected. Trunk ports do not support merge mode.

To illustrate access group mode, assume a physical port belongs to VLAN100, and the following ACLs are configured:

- Cisco IOS ACL R1 is applied on routed interface VLAN100.
- VACL (VLAN filter) V1 is applied on VLAN100.
- PACL P1 is applied on the physical port.

In this situation, the following ACL interactions occur:

- In prefer port mode, Cisco IOS ACL R1 and VACL V1 are ignored.
- In merge mode, Cisco IOS ACL R1, VACL V1 and PACL P1 are merged and applied on the port.

**Note**

The CLI syntax for creating a PACL is identical to the syntax for creating a Cisco IOS ACL. An instance of an ACL that is mapped to a Layer 2 port is called a PACL. An instance of an ACL that is mapped to a Layer 3 interface is called a Cisco IOS ACL. The same ACL can be mapped to both a Layer 2 port and a Layer 3 interface.

The PACL feature supports MAC ACLs, IPv4, and IPv6 ACLs. The PACL feature does not support ACLs for ARP or Multiprotocol Label Switching (MPLS) traffic.

EtherChannel and PACL Interactions

This section describes the guidelines for the EtherChannel and PACL interactions:

- PACLs are supported on the main Layer 2 channel interface but not on the port members. A port that has a PACL configured on it may not be configured as an EtherChannel member port. The EtherChannel configuration commands are unavailable on ports that are configured with a PACL.

- Changing the configuration on the logical port affects all the ports in the channel. When an ACL is mapped to the logical port belonging to a channel, it is mapped to all ports in the channel.

Dynamic ACLs (Applies to Merge Mode Only)

Dynamic ACLs are VLAN-based and are used by two features: CBAC and GWIP. The merge mode *does not* support the merging of the dynamic ACLs with the PACLs. In merge mode, the following configurations are not allowed:

- Attempting to apply a PACL on a port where its corresponding VLAN has a dynamic ACL mapped. In this case, the PACL is not applied to traffic on the port.
- Configuring a dynamic ACL on a VLAN where one of its constituent ports has a PACL installed. In this case, the dynamic ACL is not applied.

Trunk Ports

To configure a PACL on a trunk port, you must first configure port prefer mode. The configuration commands to apply a PACL on a trunk or dynamic port will not be available until you configure the port in port prefer mode by entering the **access-group mode prefer port** interface command. Trunk ports do not support merge mode.

Layer 2 to Layer 3 Port Conversion

If you reconfigure a port from Layer 2 to Layer 3, any PACL configured on the port becomes inactive but remains in the configuration. If you subsequently configure the port as Layer 2, any PACL configured on the port becomes active again.

Port-VLAN Association Changes

You can enter port configuration commands that alter the port-VLAN association, which triggers an ACL remerge.

Unmapping and then mapping a PACL, VACL, or Cisco IOS ACL automatically triggers a remerge.

In merge mode, online insertion or removal of a switching module also triggers a remerge, if ports on the module have PACLs configured.

PACL and VACL Interactions

- [PACL Interaction with VACLs and Cisco IOS ACLs, page 1-5](#)
- [Bridged Packets, page 1-5](#)
- [Routed Packets, page 1-5](#)
- [Multicast Packets, page 1-6](#)

PACL Interaction with VACLs and Cisco IOS ACLs

This section describes the guidelines for the PACL interaction with the VACLs and Cisco IOS ACLs.

For an incoming packet on a physical port, the PACL is applied first. If the packet is permitted by the PACL, the VACL on the ingress VLAN is applied next. If the packet is Layer 3 forwarded and is permitted by the VACL, it is filtered by the Cisco IOS ACL on the same VLAN. The same process happens in reverse in the egress direction. However, there is currently no hardware support for output PACLs.

The PACLs override both the VACLs and Cisco IOS ACLs when the port is configured in prefer port mode. The one exception to this rule is when the packets are forwarded in the software by the route processor (RP). The RP applies the ingress Cisco IOS ACL regardless of the PACL mode. Two examples where the packets are forwarded in the software are as follows:

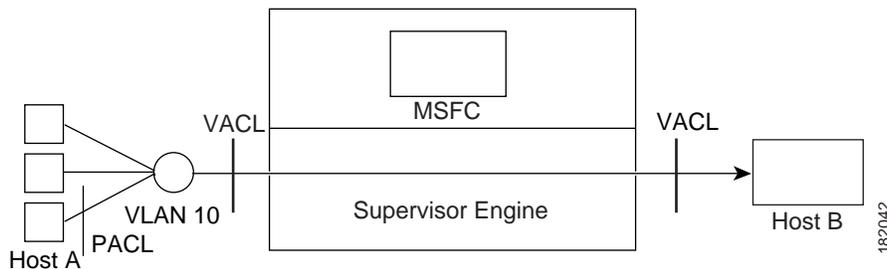
- Packets that are egress bridged (due to logging or features such as NAT)
- Packets with IP options

Bridged Packets

Figure 1-1 shows a PACL and a VACL applied to bridged packets. In merge mode, the ACLs are applied in the following order:

1. PACL for the ingress port
2. VACL for the ingress VLAN
3. VACL for the egress VLAN

Figure 1-1 Applying ACLs on Bridged Packets



In prefer port mode, only the PACL is applied to the ingress packets (the input VACL is not applied).

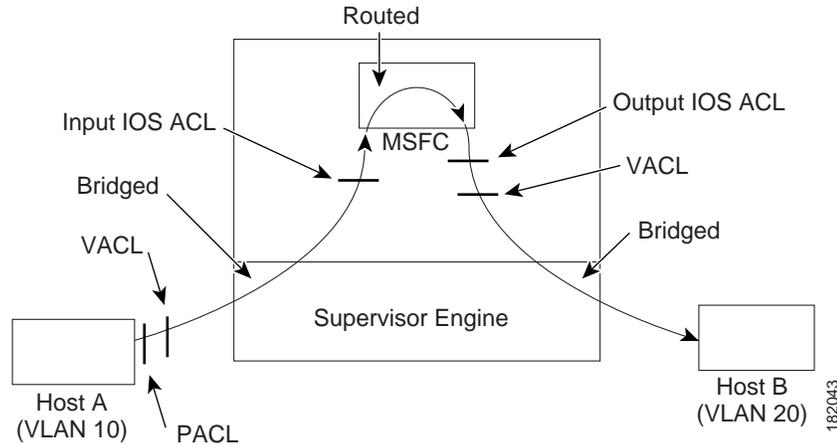
Routed Packets

Figure 1-2 shows how ACLs are applied on routed and Layer 3-switched packets. In merge mode, the ACLs are applied in the following order:

1. PACL for the ingress port
2. VACL for the ingress VLAN
3. Input Cisco IOS ACL
4. Output Cisco IOS ACL
5. VACL for the egress VLAN

In prefer port mode, only the PACL is applied to the ingress packets (the input VACL and Cisco IOS ACL are not applied).

Figure 1-2 Applying ACLs on Routed Packets



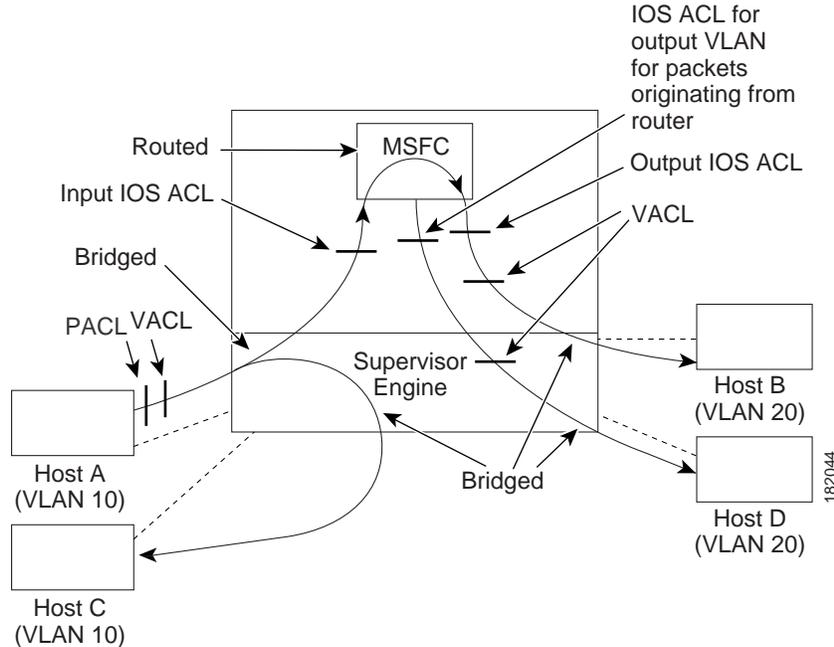
Multicast Packets

Figure 1-3 shows how ACLs are applied on packets that need multicast expansion. For packets that need multicast expansion, the ACLs are applied in the following order:

1. Packets that need multicast expansion:
 - a. PACL for the ingress port
 - b. VACL for the ingress VLAN
 - c. Input Cisco IOS ACL
2. Packets after multicast expansion:
 - a. Output Cisco IOS ACL
 - b. VACL for the egress VLAN
3. Packets originating from router:
 - a. Output Cisco IOS ACL
 - b. VACL for the egress VLAN

In prefer port mode, only the PACL is applied to the ingress packets (the input VACL and Cisco IOS ACL are not applied).

Figure 1-3 Applying ACLs on Multicast Packets



How to Configure PACLs

- [Configuring IP and MAC ACLs on a Layer 2 Interface, page 1-7](#)
- [Configuring Access-group Mode on Layer 2 Interface, page 1-8](#)
- [Applying ACLs to a Layer 2 Interface, page 1-8](#)
- [Applying ACLs to a Port Channel, page 1-9](#)
- [Displaying an ACL Configuration on a Layer 2 Interface, page 1-9](#)

Configuring IP and MAC ACLs on a Layer 2 Interface

IP and MAC ACLs can be applied to Layer 2 physical interfaces. Standard (numbered, named) and Extended (numbered, named) IP ACLs, and Extended Named MAC ACLs are supported.

To apply IP or MAC ACLs on a Layer 2 interface, perform this task:

	Command	Purpose
Step 1	Switch# configure terminal	Enters global configuration mode.
Step 2	Switch(config)# interface interface	Enters interface configuration mode for a Layer 2 port.
Step 3	Switch(config-if)# {ip mac} access-group {name number in out}	Applies a numbered or named ACL to the Layer 2 interface.
Step 4	Switch(config)# show running-config	Displays the access list configuration.

This example shows how to configure the Extended Named IP ACL `simple-ip-acl` to permit all TCP traffic and implicitly deny all other IP traffic:

```
Switch(config)# ip access-list extended simple-ip-acl
Switch(config-ext-nacl)# permit tcp any any
Switch(config-ext-nacl)# end
```

This example shows how to configure the Extended Named MAC ACL `simple-mac-acl` to permit source host 000.000.011 to any destination host:

```
Switch(config)# mac access-list extended simple-mac-acl
Switch(config-ext-macl)# permit host 000.000.011 any
Switch(config-ext-macl)# end
```

Configuring Access-group Mode on Layer 2 Interface

To configure the access mode on a Layer 2 interface, perform this task:

	Command	Purpose
Step 1	Switch# <code>configure terminal</code>	Enters global configuration mode.
Step 2	Switch(config)# <code>interface interface</code>	Enters interface configuration mode for a Layer 2 port.
Step 3	Switch(config-if)# <code>[no] access-group mode {prefer port merge}</code>	Sets the mode for this Layer 2 interface. The no prefix sets the mode to the default value (which is merge).
Step 4	Switch(config)# <code>show running-config</code>	Displays the access list configuration.

This example shows how to configure an interface to use prefer port mode:

```
Switch# configure terminal
Switch(config)# interface gigabitEthernet 6/1
Switch(config-if)# access-group mode prefer port
```

This example shows how to configure an interface to use merge mode:

```
Switch# configure terminal
Switch(config)# interface gigabitEthernet 6/1
Switch(config-if)# access-group mode merge
```

Applying ACLs to a Layer 2 Interface

To apply IP and MAC ACLs to a Layer 2 interface, perform one of these tasks:

Command	Purpose
Switch(config-if)# <code>ip access-group ip-acl in</code>	Applies an IP ACL to the Layer 2 interface.
Switch(config-if)# <code>mac access-group mac-acl in</code>	Applies a MAC ACL to the Layer 2 interface.

This example applies the extended named IP ACL `simple-ip-acl` to interface GigabitEthernet 6/1 ingress traffic:

```
Switch# configure t
Switch(config)# interface gigabitEthernet 6/1
Switch(config-if)# ip access-group simple-ip-acl in
```

This example applies the extended named MAC ACL `simple-mac-acl` to interface GigabitEthernet 6/1 ingress traffic:

```
Switch# configure t
Switch(config)# interface gigabitEthernet 6/1
Switch(config-if)# mac access-group simple-mac-acl in
```

Applying ACLs to a Port Channel

To apply IP and MAC ACLs to a port channel logical interface, perform this task:

Command	Purpose
Switch(config-if)# <code>interface port-channel number</code>	Enters configuration mode for the port channel.
Switch(config-if)# <code>ip access-group ip-acl {in out}</code>	Applies an IP ACL to the port channel interface.
Switch(config-if)# <code>mac access-group mac-acl {in out}</code>	Applies a MAC ACL to the port channel interface.

This example applies the extended named IP ACL `simple-ip-acl` to port channel 3 ingress traffic:

```
Switch# configure t
Switch(config)# interface port-channel 3
Switch(config-if)# ip access-group simple-ip-acl in
```

Displaying an ACL Configuration on a Layer 2 Interface

To display information about an ACL configuration on Layer 2 interfaces, perform one of these tasks:

Command	Purpose
Switch# <code>show ip access-lists [interface interface-name]</code>	Shows the IP access group configuration on the interface.
Switch# <code>show mac access-group [interface interface-name]</code>	Shows the MAC access group configuration on the interface.
Switch# <code>show access-group mode [interface interface-name]</code>	Shows the access group mode configuration on the interface.

This example shows that the IP access group `simple-ip-acl` is configured on the inbound direction of interface fa6/1:

```
Switch# show ip interface gigabitEthernet 6/1
GigabitEthernet6/1 is up, line protocol is up
  Inbound access list is simple-ip-acl
  Outgoing access list is not set
```

This example shows that MAC access group `simple-mac-acl` is configured on the inbound direction of interface Gigabit Ethernet 6/1:

```
Switch# show mac access-group interface gigabitEthernet 6/1
Interface GigabitEthernet6/1:
  Inbound access-list is simple-mac-acl
  Outbound access-list is not set
```

This example shows that access group merge is configured on interface Gigabit Ethernet 6/1:

```
Switch# show access-group mode interface gigabitethernet 6/1
Interface GigabitEthernet6/1:
  Access group mode is: merge
```

**Tip**

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