

EtherChannel Interfaces

This chapter tells how to configure EtherChannels interfaces.

Note For multiple context mode, complete all tasks in this section in the system execution space. If you are not already in the system execution space, in the **Configuration > Device List** pane, double-click **System** under the active device IP address.

For ASA cluster interfaces, which have special requirements, see ASA Cluster for the Secure Firewall 3100/4200/6100.

Note For Firepower 4100/9300 chassis, EtherChannel interfaces are configured in the FXOS operating system. See the configuration or getting started guide for your chassis for more information.

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About EtherChannels

This section describes EtherChannels.

EtherChannels

An 802.3ad EtherChannel is a logical interface, called a port-channel interface) that consists of a bundle of individual Ethernet links, known as a channel group. This approach increases the bandwidth for a single network. A port channel interface is used in the same way as a physical interface when you configure interface-related features.

You can configure up to 48 EtherChannels, depending on how many interfaces your model supports.

Channel group interfaces

Channel group interfaces enable EtherChannel aggregation with specific capacity and configuration requirements. Understanding these interface specifications ensures proper EtherChannel deployment and performance.

Each channel group can have up to 8 active interfaces, except for the ISA 3000, which support 16 active interfaces. On switches that support only 8 active interfaces, you can assign up to 16 interfaces to a channel group. Only 8 interfaces can be active, the remaining interfaces can act as standby links in case of interface failure.

All interfaces in the channel group must be the same type and speed. The first interface added to the channel group determines the correct type and speed.

The EtherChannel aggregates traffic across all the available active interfaces in the channel. A proprietary hash algorithm selects the interface, using criteria such as source or destination MAC addresses, IP addresses, TCP and UDP port numbers, and VLAN numbers.

EtherChannel connection to other devices

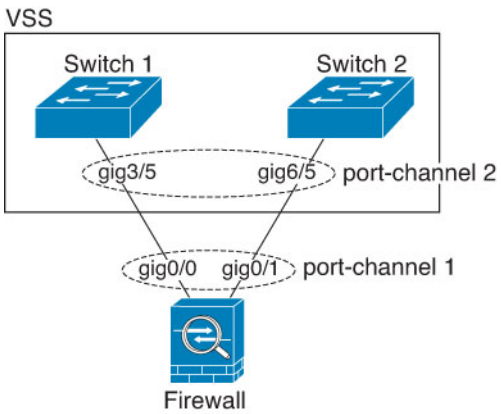
An EtherChannel connection to other devices requires the connected device to support 802.3ad EtherChannels for compatibility.

EtherChannel connection requirements and configurations

The device to which you connect the ASA EtherChannel must also support 802.3ad EtherChannels. For example, you can connect to the Catalyst 6500 switch or the Cisco Nexus 7000.

When the switch is part of a Virtual Switching System (VSS) or Virtual Port Channel (vPC), you can connect ASA interfaces within the same EtherChannel to separate switches in the VSS/vPC. The switch interfaces are members of the same EtherChannel port-channel interface because the separate switches act like a single switch.

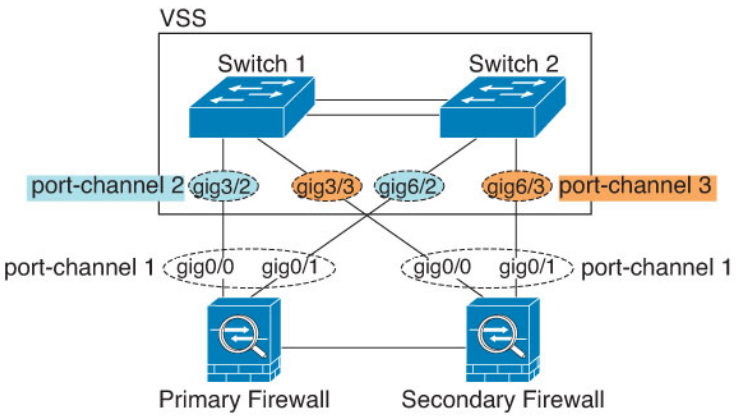
Figure 1: Connecting to a VSS/vPC



Note If the ASA device is in transparent firewall mode, and you place the ASA device between two sets of VSS/vPC switches, then be sure to disable Unidirectional Link Detection (UDLD) on any switch ports connected to the ASA device with an EtherChannel. If you enable UDLD, then a switch port may receive UDLD packets sourced from both switches in the other VSS/vPC pair. The receiving switch will place the receiving interface in a down state with the reason "UDLD Neighbor mismatch".

If you use the ASA device in an Active/Standby failover deployment, you need to create separate EtherChannels on the switches in the VSS/vPC, one for each ASA device. On each ASA device, a single EtherChannel connects to both switches. Even if you could group all switch interfaces into a single EtherChannel connecting to both ASA devices,the EtherChannel would not be established because of the separate ASA system IDs. Also, using a single EtherChannel would not be desirable because you do not want traffic sent to the standby ASA device.

Figure 2: Active/Standby failover and VSS/vPC



Link aggregation control protocol

The Link Aggregation Control Protocol (LACP) is a network protocol that aggregates interfaces by exchanging the Link Aggregation Control Protocol Data Units (LACPDUs) between two network devices.

LACP interface configuration modes

You can configure each physical interface in an EtherChannel to be:

- Active—Sends and receives LACP updates. An active EtherChannel can establish connectivity with either an active or a passive EtherChannel. You should use the active mode unless you need to minimize the amount of LACP traffic.
- Passive—Receives LACP updates. A passive EtherChannel can only establish connectivity with an active EtherChannel. Not supported on hardware models.
- On—The EtherChannel is always on, and LACP is not used. An "on" EtherChannel can only establish a connection with another "on" EtherChannel.

LACP coordinates the automatic addition and deletion of links to the EtherChannel without user intervention. It also handles misconfigurations and checks that both ends of member interfaces are connected to the correct

channel group. "On" mode cannot use standby interfaces in the channel group when an interface goes down, and the connectivity and configurations are not checked.

Load balancing

Load balancing is a distribution mechanism that distributes packets to interfaces in the EtherChannel and ensures transparent failover when active interfaces go down by rebalancing traffic between remaining links.

Load balancing operation details

The ASA device distributes packets to the interfaces in the EtherChannel by hashing the source and destination IP address of the packet (this criteria is configurable). The resulting hash is divided by the number of active links in a modulo operation where the resulting remainder determines which interface owns the flow. All packets with a *hash_value* **mod** *active_links* result of 0 go to the first interface in the EtherChannel, packets with a result of 1 go to the second interface, packets with a result of 2 go to the third interface, and so on. For example, if you have 15 active links, then the modulo operation provides values from 0 to 14. For 6 active links, the values are 0 to 5, and so on.

For a spanned EtherChannel in clustering, load balancing occurs on a per ASA basis. For example, if you have 32 active interfaces in the spanned EtherChannel across 8 ASAs, with 4 interfaces per ASA in the EtherChannel, then load balancing only occurs across the 4 interfaces on the ASA.

If an active interface goes down and is not replaced by a standby interface, then traffic is rebalanced between the remaining links. The failure is masked from both Spanning Tree at Layer 2 and the routing table at Layer 3, so the switchover is transparent to other network devices.

Related Topics

Customize the EtherChannel, on page 9

EtherChannel MAC address

An EtherChannel MAC address is a network identifier that is shared by all interfaces in the EtherChannel group. This makes the EtherChannel transparent to network applications and users by presenting one logical connection.

All interfaces that are part of the channel group share the same MAC address. This feature makes the EtherChannel transparent to network applications and users, because they only see the one logical connection; they have no knowledge of the individual links.

Platform-specific MAC address behavior

MAC address assignment for EtherChannel interface varies by hardware platform.

Firepower and Secure Firewall Hardware

The port-channel interface uses the MAC address of the internal interface Internal-Data 0/1. You can manually configure a MAC address for the port-channel interface if needed. In multiple context mode, you can automatically assign unique MAC addresses to *shared* interfaces, including an EtherChannel port interface. All EtherChannel interfaces on a chassis use the same MAC address, so be aware that if you use SNMP polling, for example, multiple interfaces will have the same MAC address.

Note Member interfaces only use the Internal-Data 0/1 MAC address after a reboot. Prior to rebooting, the member interface uses its own MAC address. If you add a new member interface after a reboot, you will have to perform another reboot to update its MAC address.

Guidelines for EtherChannels and redundant interfaces

Provides essential configuration rules and limitations for implementing EtherChannels and redundant interfaces to maintain network stability and high availability.

Bridge Group

In routed mode, ASA -defined EtherChannels are not supported as bridge group members. EtherChannels on the Firepower 4100/9300 can be bridge group members.

FailoverFailover

- When you use an EtherChannel interface as a Failoverfailover link, it must be pre-configured on both units in the Failoverfailover pair; you cannot configure it on the primary unit and expect it to replicate to the secondary unit because the Failoverfailover link itself is required for replication .
- If you use an EtherChannel interface for the state link, no special configuration is required; the configuration can replicate from the primary unit as normal. For the Firepower 4100/9300 chassis , all interfaces, including EtherChannels, need to be pre-configured on both units.
- You can monitor EtherChannel interfaces for Failoverfailover . When an active member interface fails over to a standby interface, this activity does not cause the EtherChannel interface to appear to be failed when being monitored for device-level Failoverfailover . Only when all physical interfaces fail does the EtherChannel interface appear to be failed (for an EtherChannel interface, the number of member interfaces allowed to fail is configurable) .
- If you use an EtherChannel interface for a Failoverfailover or state link, then to prevent out-of-order packets, only one interface in the EtherChannel is used. If that interface fails, then the next interface in the EtherChannel is used. You cannot alter the EtherChannel configuration while it is in use as a Failoverfailover link. To alter the configuration, you need to temporarily disable Failoverfailover , which prevents Failoverfailover from occurring for the duration.

Model Support

- You cannot add EtherChannels in ASA for the Firepower 4100/9300, ASASM, or the ASA Virtual . The Firepower 4100/9300 supports EtherChannels, but you must perform all hardware configuration of EtherChannels in FXOS on the chassis.
- You cannot use Firepower 1010 or Secure Firewall 1210/1220 switch ports or VLAN interfaces in EtherChannels.

Clustering

- To configure a spanned EtherChannel or an individual cluster interface, see the clustering chapter.

General Redundant Interface Guidelines

- You can configure up to 8 redundant interface pairs.
- All the ASA configuration refers to the logical redundant interface instead of the member physical interfaces.
- You cannot use a redundant interface as part of an EtherChannel, nor can you use an EtherChannel as part of a redundant interface. You cannot use the same physical interfaces in a redundant interface and an EtherChannel interface. You can, however, configure both types on the ASA device if they do not use the same physical interfaces.
- If you shut down the active interface, then the standby interface becomes active.
- Redundant interfaces do not support the Management *slot* / *port* interfaces as members. You can, however, set a redundant interface comprised of non- Management interfaces as management-only.

General EtherChannel Guidelines

- You can configure up to 48 EtherChannels, depending on how many interfaces are available on your model.
- Each channel group can have up to 8 active interfaces, except for ASA models and the ISA 3000, which supports 16 active interfaces. For switches that support only 8 active interfaces, you can assign up to 16 interfaces to a channel group: while only 8 interfaces can be active, the remaining interfaces can act as standby links in case of interface failure.
- When you add the first member interface, it sets the required hardware properties of all member interfaces.
    - The media type of member interfaces can be either RJ-45 or SFP; SFPs of different types (copper and fiber) can be mixed. You cannot mix RJ-45 and SFP interfaces.
    - All interfaces must be set to the same speed and duplex.
    - The first interface sets the speed *capacity* , which cannot be changed later.
- The device to which you connect the ASA EtherChannel must also support 802.3ad EtherChannels.
- The ASA device does not support LACPDUs that are VLAN-tagged. If you enable native VLAN tagging on the neighboring switch using the Cisco IOS **vlan dot1Q tag native** command, then the ASA device will drop the tagged LACPDUs.
- The LACP rate depends on the model. When you set the rate (normal or fast), the device requests that rate from the connecting switch.
- In Cisco IOS software versions earlier than 15.1(1)S2, ASA does not support connecting an EtherChannel to a switch stack. To improve compatibility, set the **stack-mac persistent timer** command to a large enough value to account for reload time.
- Match the speed, duplex, and auto-negotiation settings on every EtherChannel member interface and its corresponding peer port. For a 10/100-Mbps member link, use auto-negotiation at both ends, or use the same fixed speed and duplex settings at both ends. If one end is fixed at full duplex while the other end uses auto-negotiation, the auto-negotiating side defaults to half duplex, resulting in a duplex mismatch.
- All the ASA configuration refers to the logical EtherChannel interface instead of the member physical interfaces.

- You must first remove the breakout ports from the port channel membership before you can delete a port channel with breakout ports.

Default Settings for EtherChannels Interfaces

This section lists default settings for interfaces if you do not have a factory default configuration.

Default State of Interfaces

The default state of an interface depends on the type and the context mode.

In multiple context mode, all allocated interfaces are enabled by default, no matter what the state of the interface is in the system execution space. However, for traffic to pass through the interface, the interface also has to be enabled in the system execution space. If you shut down an interface in the system execution space, then that interface is down in all contexts that share it.

In single mode or in the system execution space, interfaces have the following default states:

- Physical interfaces—Disabled.
- EtherChannel port-channel interfaces—Enabled. However, for traffic to pass through the EtherChannel, the channel group physical interfaces must also be enabled.

Configure an EtherChannel

This section describes how to create an EtherChannel port-channel interface, assign interfaces to the EtherChannel, and customize the EtherChannel.

Add Interfaces to the EtherChannel

This section describes how to create an EtherChannel port-channel interface and assign interfaces to the EtherChannel. By default, port-channel interfaces are enabled.

Before you begin

- When you add the first member interface, it sets the required hardware properties of all member interfaces. See Guidelines for EtherChannels and redundant interfaces, on page 5 for more details about member interface requirements.
- To configure a spanned EtherChannel for clustering, see the clustering chapter instead of this procedure.
- You cannot add a physical interface to the channel group if you configured a name for it. You must first remove the name in the **Configuration > Device Setup > Interface Settings > Interfaces** pane.
- For multiple context mode, complete this procedure in the system execution space. If you are not already in the System configuration mode, in the **Configuration** > **Device List** pane, double-click **System** under the active device IP address.

Caution If you are using a physical interface already in your configuration, removing the name will clear any configuration that refers to the interface.

Procedure

Step 1 (Optional) (Secure Firewall 3100/4200/6100 only) Set the LACP data unit receive rate for a physical interface in the channel group.

lacp rate {**normal** | **fast**}

The default is **normal** (slow, every 30 seconds). The **fast** option receives LACP data units every second. You should match the setting on the connected switch.

Step 2 Depending on your context mode:

- For single mode, choose the **Configuration** > **Device Setup** > **Interface Settings** > **Interfaces** pane.
- For multiple mode in the System execution space, choose the **Configuration** > **Context Management** > **Interfaces** pane.

Step 3 Choose **Add** > **EtherChannel Interface**.

The **Add EtherChannel Interface** dialog box appears.

Note
In single mode, this procedure only covers a subset of the parameters on the Edit EtherChannel Interface dialog box. Note that in multiple context mode, before you complete your interface configuration, you need to allocate interfaces to contexts. See Configure Multiple Contexts.

Step 4 In the **Port Channel ID** field, enter a number between 1 and 48 (1 and 8 for the Firepower 1010 and 1210, and between 1 and 10 for the 1220).

Step 5 In the **Available Physical Interface** area, click an interface and then click **Add** to move it to the **Members in Group** area.

In transparent mode, if you create a channel group with multiple Management interfaces, then you can use this EtherChannel as the management-only interface.

Note
If you want to set the EtherChannel mode to On, then you must include only one interface initially. After you complete this procedure, edit the member interface, and set the mode to **On**. Apply your changes, then edit the EtherChannel to add more member interfaces.

Step 6 Repeat for each interface you want to add to the channel group.

Make sure all interfaces are the same type and speed. The first interface you add determines the type and speed of the EtherChannel. Any non-matching interfaces you add will be put into a suspended state. ASDM does not prevent you from adding non-matching interfaces.

Step 7 Click **OK**.

You return to the **Interfaces** pane. The member interfaces now show a lock to the left of the interface ID showing that only basic parameters can be configured for it. The EtherChannel interface is added to the table.



Step 8 (Optional) (Secure Firewall 3100/4200/6100 only) Set the LACP data unit receive rate for a physical interface in the channel group.

a) Click the physical interface in the **Interfaces** table, and click **Edit**.

The **Edit Interface** dialog box appears.

b) Click the **Advanced** tab.

c) In the **EtherChannel** area, from the **Rate** drop down list, choose **Normal** or **Fast**.

The default is **Normal** (slow, every 30 seconds). The **Fast** option received LACP updates every second. You should match the setting on the connected switch.

Step 9 Click **Apply**. All member interfaces are enabled automatically.

Related Topics

Link aggregation control protocol, on page 3
Customize the EtherChannel, on page 9

Customize the EtherChannel

This section describes how to set the maximum number of interfaces in the EtherChannel, the minimum number of operating interfaces for the EtherChannel to be active, the load balancing algorithm, and other optional parameters.

Procedure

Step 1 Depending on your context mode:

- For single mode, choose the **Configuration** > **Device Setup** > **Interface Settings** > **Interfaces** pane.
- For multiple mode in the System execution space, choose the **Configuration** > **Context Management** > **Interfaces** pane.

Step 2 Click the port-channel interface you want to customize, and click **Edit**.

The **Edit Interface** dialog box appears.

Step 3 To override the media type, duplex, speed, and pause frames for flow control for all member interfaces, click **Configure Hardware Properties**. This method provides a shortcut to set these parameters because these parameters must match for all interfaces in the channel group.

Step 4 (Optional; ISA 3000 only) To customize the EtherChannel, click the **Advanced** tab.

a) In the **EtherChannel** area, from the **Minimum** drop-down list, choose the minimum number of active interfaces required for the EtherChannel to be active, between 1 and 16. The default is 1.

b) From the **Maximum** drop-down list, choose the maximum number of active interfaces allowed in the EtherChannel, between 1 and 16. The default is 16. If your switch does not support 16 active interfaces, be sure to set this command to 8 or fewer.

c) From the **Load Balance** drop-down list, select the criteria used to load balance the packets across the group channel interfaces. By default, the ASA balances the packet load on interfaces according to the source and destination IP address of the packet. If you want to change the properties on which the packet is categorized, choose a different set of criteria. For example, if your traffic is biased heavily towards the same source and destination IP addresses, then the traffic assignment to interfaces in the EtherChannel will be unbalanced. Changing to a different algorithm can result in more evenly distributed traffic. For more information about load balancing, see Load balancing, on page 4.

d) For **Secure Group Tagging** settings, see the firewall configuration guide.

e) For **ASA Cluster** settings, see (Recommended; Required in Multiple Context Mode) Configure Interfaces on the Control Node.

Step 5 Click **OK**.

You return to the **Interfaces** pane.

Step 6 To set the mode and priority for a physical interface in the channel group:

a) Click the physical interface in the **Interfaces** table, and click **Edit**.

The **Edit Interface** dialog box appears.

b) Click the **Advanced** tab.

c) In the **EtherChannel** area, from the **Mode** drop down list, choose **Active**, **Passive**, or **On**. We recommend using Active mode (the default).

d) (Optional; ISA 3000 only) In the **LACP Port Priority** field, set the port priority between 1 and 65535. The default is 32768. The higher the number, the lower the priority. The ASA uses this setting to decide which interfaces are active and which are standby if you assign more interfaces than can be used. If the port priority setting is the same for all interfaces, then the priority is determined by the interface ID (slot/port). The lowest interface ID is the highest priority. For example, GigabitEthernet 0/0 is a higher priority than GigabitEthernet 0/1.

If you want to prioritize an interface to be active even though it has a higher interface ID, then set this command to have a lower value. For example, to make GigabitEthernet 1/3 active before GigabitEthernet 0/7, then make the priority value be 12345 on the 1/3 interface vs. the default 32768 on the 0/7 interface.

If the device at the other end of the EtherChannel has conflicting port priorities, the system priority is used to determine which port priorities to use. See Step 9 to set the system priority.

Step 7 Click **OK**.

You return to the **Interfaces** pane.

Step 8 Click **Apply**.

Step 9 (Optional; ISA 3000 only) To set the LACP system priority, perform the following steps. If the device at the other end of the EtherChannel has conflicting port priorities, the system priority is used to determine which port priorities to use. See Step 6d for more information.

a) Depending on your context mode:

- For single mode, choose the **Configuration** > **Device Setup** > **EtherChannel** pane.
- For multiple mode in the System execution space, choose the **Configuration** > **Context Management** > **EtherChannel** pane.

b) In the **LACP System Priority** field, enter a priority between 1 and 65535.

The default is 32768.

Related Topics

Load balancing, on page 4
Add Interfaces to the EtherChannel, on page 7

Examples for EtherChannels

The following example configures three interfaces as part of an EtherChannel. It also sets the system priority to be a higher priority, and GigabitEthernet 0/2 to be a higher priority than the other interfaces in case more than eight interfaces are assigned to the EtherChannel.

```
lacp system-priority 1234
interface GigabitEthernet0/0
  channel-group 1 mode active
interface GigabitEthernet0/1
  channel-group 1 mode active
interface GigabitEthernet0/2
  lacp port-priority 1234
  channel-group 1 mode passive
interface Port-channel1
  lacp max-bundle 4
  port-channel min-bundle 2
  port-channel load-balance dst-ip
```

History for EtherChannels

Table 1: History for EtherChannels

Feature Name	Releases	Feature Information
EtherChannel support	8.4(1)	You can configure up to 48 802.3ad EtherChannels of eight active interfaces each. We modified or introduced the following screens: Configuration > Device Setup > Interface Settings > Interfaces Configuration > Device Setup > Interface Settings > Interfaces > Add/Edit EtherChannel Interface Configuration > Device Setup > Interface Settings > Interfaces > Add/Edit Interface Configuration > Device Setup > EtherChannel **Note** EtherChannel is not supported on the ASA 5505.

Feature Name	Releases	Feature Information
Support for 16 active links in an EtherChannel	9.2(1)	You can now configure up to 16 active links in an EtherChannel. Previously, you could have 8 active links and 8 standby links. Be sure that your switch can support 16 active links (for example the Cisco Nexus 7000 with F2-Series 10 Gigabit Ethernet Module). **Note** If you upgrade from an earlier ASA version, the maximum active interfaces is set to 8 for compatibility purposes. We modified the following screen: Configuration > Device Setup > Interface Settings > Interfaces > Add/Edit EtherChannel Interface > Advanced.