CHAPTER 5

Configuring Port Channels

This chapter describes how to configure port channels and to apply and configure the Link Aggregation Control Protocol (LACP) for more efficient use of port channels in the Cisco Nexus 7000 Series NX-OS.

This chapter includes the following sections:

Information About Port Channels

A port channel is an aggregation of multiple physical interfaces that creates a logical interface. You can bundle up to eight individual active links into a port channel to provide increased bandwidth and redundancy. Port channeling also load balances traffic across these physical interfaces. The port channel stays operational as long as at least one physical interface within the port channel is operational.

You can create a Layer 2 port channel by bundling compatible Layer 2 interfaces, or you can create Layer 3 port channels by bundling compatible Layer 3 interfaces. After you create a Layer 3 port channel, you can add an IP address to the port-channel interface and create subinterfaces on the Layer 3 port channel. You cannot combine Layer 2 and Layer 3 interfaces in the same port channel.

Beginning in Cisco NX-OS Release 4.2, you can apply port security to port channels. See the *Cisco Nexus 7000 Series NX-OS Security Configuration Guide, Release 4.x* for information on port security.

All ports in the port channel must be in the same virtual device context (VDC); you cannot configure port channels across VDCs You can configure up to 256 port channels per device.

You can also change the port channel from Layer 3 to Layer 2. See Chapter 3, "Configuring Layer 2 Interfaces," for information on creating Layer 2 interfaces.

Any configuration changes that you apply to the port channel are applied to each member interface of that port channel. For example, if you configure Spanning Tree Protocol (STP) parameters on the port channel, the Cisco NX-OS software applies those parameters to each interface in the port channel.

Note After a Layer 2 port becomes part of a port channel, all switchport configurations must be done on the port channel; you can no longer apply switchport configurations to individual port-channel members. You cannon apply Layer 3 configurations to an individual port-channel member either; you must apply the configuration to the entire port channel.

You can create subinterfaces on a Layer 3 port channel, even though a subinterface is part of the logical port-channel interface. See the "Subinterfaces" section on page 4-2 for more information on port-channel subinterfaces.

You can use static port channels, with no associated aggregation protocol, for a simplified configuration.

For more flexibility, you can use the Link Aggregation Control Protocol (LACP), which is defined in IEEE 802.3ad. When you use LACP, the link passes protocol packets.

See the "LACP Overview" section on page 5-8 for information on LACP.

This section includes the following topics:

Port Channels

A port channel bundles physical links into a channel group to create a single logical link that provides the aggregate bandwidth of up to eight physical links. If a member port within a port channel fails, the traffic previously carried over the failed link switches to the remaining member ports within the port channel.

You can bundle up to eight ports into a static port channel without using any aggregation protocol. However, you can enable the LACP to use port channels more flexibly. Configuring port channels with LACP and static port channels require slightly different steps (see the "Configuring Port Channels" section on page 5-13).

Note The device does not support Port Aggregation Protocol (PAgP) for port channels.

Each port can be in only one port channel. All the ports in a port channel must be compatible; they must use the same speed and duplex mode (see the "Compatibility Requirements" section on page 5-4). When you run static port channels with no aggregation protocol, the physical links are all in the **on** channel mode; you cannot change this mode without enabling LACP (see the "Port-Channel Modes" section on page 5-8).

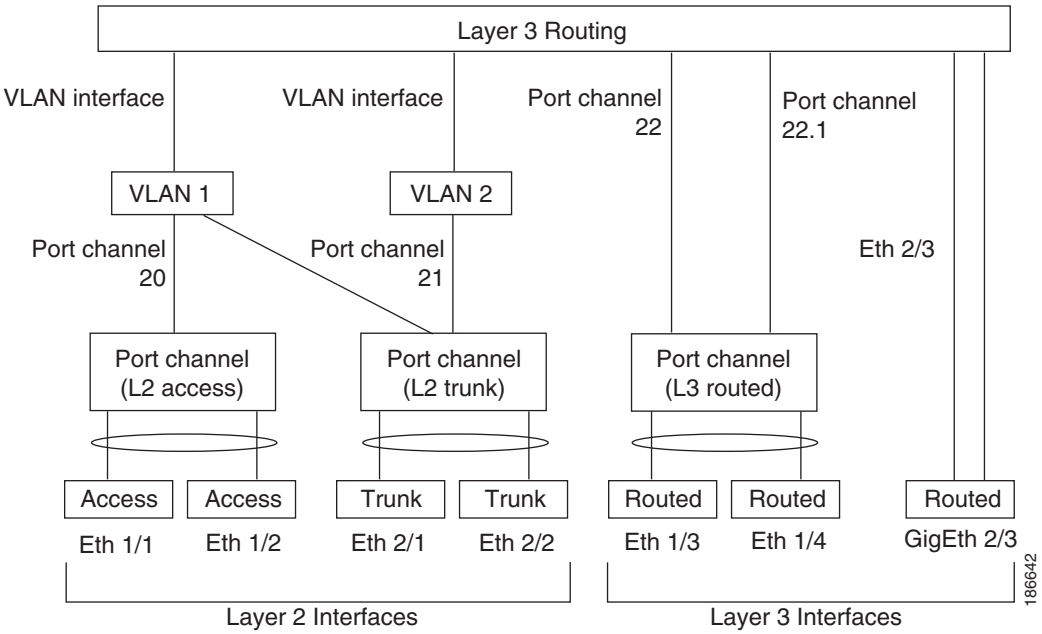
You can create port channels directly by creating the port-channel interface, or you can create a channel group that acts to aggregate individual ports into a bundle. When you associate an interface with a channel group, the software creates a matching port channel automatically if the port channel does not already exist. In this instance, the port channel assumes the Layer 2 or Layer 3 configuration of the first interface. You can also create the port channel first. In this instance, the Cisco NX-OS software creates an empty channel group with the same channel number as the port channel and takes the default Layer 2 or Layer 3 configuration, as well as the compatibility configuration (see the "Compatibility Requirements" section on page 5-4). See Chapter 4, "Configuring Layer 3 Interfaces," for more information on creating and deleting port-channel subinterfaces.

Note The port channel is operationally up when at least one of the member ports is up and that port's status is channeling. The port channel is operationally down when all member ports are operationally down.

Port-Channel Interfaces

Figure 5-1 shows port-channel interfaces.

Figure 5-1 Port-Channel Interfaces



You can classify port-channel interfaces as Layer 2 or Layer 3 interfaces. In addition, you can configure Layer 2 port channels in either access or trunk mode. Layer 3 port-channel interfaces have routed ports as channel members and may have subinterfaces.

Beginning with Cisco NX-OS Release 4.2(1), you can configure a Layer 3 port channel with a static MAC address. If you do not configure this value, the Layer 3 port channel uses the router MAC of the first channel member to come up. See *Cisco Nexus 7000 Series NX-OS Layer 2 Switching Configuration Guide, Release 4.x* information on configuring static MAC addresses on Layer 3 port channels.

See Chapter 3, "Configuring Layer 2 Interfaces," for information on configuring Layer 2 ports in access or trunk mode and Chapter 4, "Configuring Layer 3 Interfaces," for information on configuring Layer 3 interfaces and subinterfaces.

Basic Settings

You can configure the following basic settings for the port-channel interface

- Bandwidth—Use this setting for informational purposes only; this setting is to be used by higher-level protocols.
- Delay—Use this setting for informational purposes only; this setting is to be used by higher-level protocols.
- Description.
- Duplex.
- Flow control.
- IP addresses—Both IPv4 and IPv6.
- Maximum Transmission Unit (MTU). (See Chapter 2, "Configuring Basic Interface Parameters" for information on configuring MTU.)
- Shutdown.
- Speed.

Compatibility Requirements

When you add an interface to a channel group, the software checks certain interface attributes to ensure that the interface is compatible with the channel group. For example, you cannot add a Layer 3 interface to a Layer 2 channel group. The Cisco NX-OS software also checks a number of operational attributes for an interface before allowing that interface to participate in the port-channel aggregation.

The compatibility check includes the following operational attributes:

- Network layer
- (Link) speed capability
- Speed configuration
- Duplex capability
- Duplex configuration
- Port mode
- Access VLAN
- Trunk native VLAN
- Tagged or untagged
- Allowed VLAN list

- MTU size
- SPAN—cannot be a SPAN source or a destination port
- Layer 3 ports—cannot have subinterfaces
- Storm control
- Flow-control capability
- Flow-control configuration

Use the **show port-channel compatibility-parameters** command to see the full list of compatibility checks that the Cisco NX-OS software uses.

You can only add interfaces configured with the channel mode set to **on** to static port channels. And you can only add interfaces configured with the channel mode as **active** or **passive** to port channels that are running LACP. (See the "LACP Marker Responders" section on page 5-10 for information on port-channel modes.) You can configure these attributes on an individual member port. If you configure a member port with an incompatible attribute, the software suspends that port in the port channel.

Alternatively, you can force ports with incompatible parameters to join the port channel if the following parameters are the same:

- (Link) speed capability
- Speed configuration
- Duplex capability
- Duplex configuration
- Flow-control capability
- Flow-control configuration
- Quality of Service (QoS)

When the interface joins a port channel, some of its individual parameters are removed and replaced with the values on the port channel as follows:

- Bandwidth
- Delay
- Extended Authentication Protocol over UDP
- VRF
- IP address (v4 and v6)
- MAC address
- Spanning Tree Protocol
- NAC
- Service policy
- Access control lists (ACLs)

Many interface parameters remain unaffected when the interface joins or leaves a port channel as follows:

- Beacon
- Description
- CDP
- LACP port priority
- Debounce
- UDLD
- MDIX
- Rate mode
- Shutdown
- SNMP trap

If you configure subinterfaces for the port-channel interface and remove a member port from the port channel, the configuration of the port-channel subinterface does not propagate to the member ports.

Note When you delete the port channel, the software sets all member interfaces as if they were removed from the port channel.

Load Balancing Using Port Channels

The Cisco NX-OS software load balances traffic across all operational interfaces in a port channel by hashing the addresses in the frame to a numerical value that selects one of the links in the channel. Port channels provide load balancing by default. Port-channel load-balancing uses MAC addresses, IP addresses. or Layer 4 port numbers to select the link. Port-channel load balancing uses either source or destination addresses or ports, or both source and destination addresses or ports.

You can configure the load-balancing mode to apply to all port channels that are configured on the entire device or on specified modules. The per-module configuration takes precedence over the load- balancing configuration for the entire device. You can configure one load-balancing mode for the entire device, a different mode for specified modules, and another mode for the other specified modules. You cannot configure the load-balancing method per port channel.

You can configure the type of load-balancing algorithm used. You can choose the load-balancing algorithm that determines which member port to select for egress traffic by looking at the fields in the frame.

Note The default load-balancing mode for Layer 3 interfaces is the source and destination IP address, and the default load-balancing mode for non-IP interfaces is the source and destination MAC address.

You can configure the device to use one of the following methods to load balance across the port channel:

- Destination MAC address
- Source MAC address
- Source and destination MAC address
- Destination IP address
- Source IP address
- Source and destination IP address

- Source TCP/UDP port number
- Destination TCP/UDP port number
- Source and destination TCP/UDP port number

Non-IP and Layer 3 port channels both follow the configured load-balancing method, using the source, destination, or source and destination parameters. For example, when you configure load balancing to use the source IP address, all non-IP traffic uses the source MAC address to load balance the traffic while the Layer 3 traffic load balances the traffic using the source IP address. Similarly, when you configure the destination MAC address as the load-balancing method, all Layer 3 traffic uses the destination IP address while the non-IP traffic load balances using the destination MAC address.

Note You cannot configure load balancing using port channels per VDC. You must be in the default VDC to configure this feature; if you attempt to configure this feature from another VDC, the system displays an error.

You can configure load balancing either by the entire system or by specific modules, regardless of the VDC. The port-channel load-balancing is a global setting across all VDCs.

If the ingress traffic is Multiprotocol Label Switching (MPLS) traffic, the software looks under the labels for the IP address on the packet.

The load-balancing algorithms that use port channels do not apply to multicast traffic. Regardless of the load-balancing algorithm you have configured, multicast traffic uses the following methods for load balancing with port channels:

- Multicast traffic with Layer 4 information—Source IP address, source port, destination IP address, destination port
- Multicast traffic without Layer 4 information—Source IP address, destination IP address
- Non-IP multicast traffic—Source MAC address, destination MAC address

Note Devices running Cisco IOS were able to optimize the behavior of the ASICs of member ports upon the failure of a single member by running the **port-channel hash-distribution** command. The Cisco Nexus 7000 performs this optimization by default, and does not require or support this command. Cisco NX-OS does support the customization of the load-balancing criteria on port channels through the **port-channel load-balance ethernet** command, either for the entire device or on a per-module basis

LACP

LACP allows you to configure up to 16 interfaces into a port channel. A maximum of eight interfaces can be active, and a maximum of eight interfaces can be placed in a standby state.

This section includes the following topics:

LACP Overview

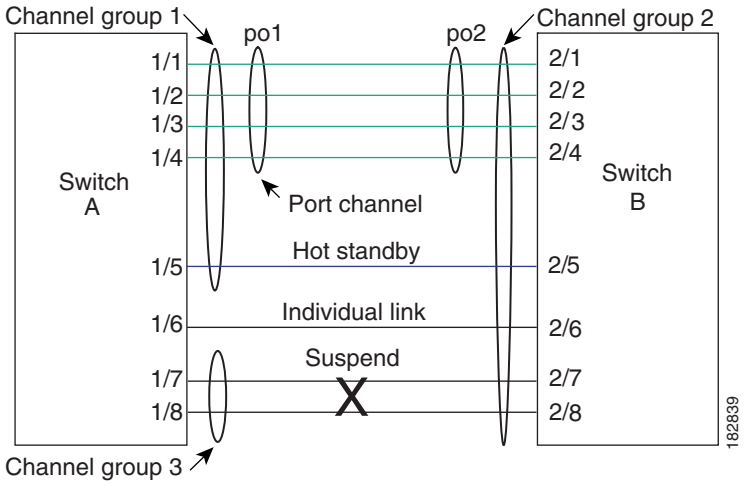
Note You must enable LACP before you can use LACP. By default, LACP is disabled.

See the "Enabling LACP" section on page 5-27 for information on enabling LACP.

Beginning in Cisco NX-OS Release 4.2, the system automatically takes a checkpoint prior to disabling the feature, and you can rollback to this checkpoint. See *Cisco Nexus 7000 Series NX-OS System Management Configuration Guide, Release 4.x* for information on rollbacks and checkpoints.

Figure 5-2 shows how individual links can be combined into LACP port channels and channel groups as well as function as individual links.

Figure 5-2 Individual Links Combined into a Port Channel



With LACP, you can bundle up to 16 interfaces in a channel group. If the channel group has more than eight interfaces, the remaining interfaces are in hot standby for the port channel associated with this channel group.

Note When you delete the port channel, the software automatically deletes the associated channel group. All member interfaces revert to their original configuration.

You cannot disable LACP while any LACP configurations are present.

Port-Channel Modes

Individual interfaces in port channels are configured with channel modes. When you run static port channels with no aggregation protocol, the channel mode is always set to **on**.

After you enable LACP globally on the device, you enable LACP for each channel by setting the channel mode for each interface to **active** or **passive**. You can configure either channel mode for individual links in the LACP channel group when you are adding the links to the channel group.

Note You must enable LACP globally before you can configure an interface in either the **active** or **passive** channel mode.

Table 5-1 describes the channel modes.

Table 5-1 Channel Modes for Individual Links in a Port Channel

Channel Mode	Description
passive	LACP mode that places a port into a passive negotiating state in which the port responds to LACP packets that it receives but does not initiate LACP negotiation.
active	LACP mode that places a port into an active negotiating state in which the port initiates negotiations with other ports by sending LACP packets.
on	All static port channels (that are not running LACP) remain in this mode. If you attempt to change the channel mode to active or passive before enabling LACP, the device displays an error message. You enable LACP on each channel by configuring the interface in that channel for the channel mode as either **active** or **passive**. When an LACP attempts to negotiate with an interface in the **on** state, it does not receive any LACP packets and becomes an individual link with that interface; it does not join the LACP channel group. The default port-channel mode is **on**.

Both the passive and active modes allow LACP to negotiate between ports to determine if they can form a port channel based on criteria such as the port speed and the trunking state.The passive mode is useful when you do not know whether the remote system, or partner, supports LACP.

Ports can form an LACP port channel when they are in different LACP modes if the modes are compatible as in the following examples:

- A port in **active** mode can form a port channel successfully with another port that is in **active** mode.
- A port in **active** mode can form a port channel with another port in **passive** mode.
- A port in **passive** mode cannot form a port channel with another port that is also in **passive** mode, because neither port will initiate negotiation.
- A port in **on** mode is not running LACP and cannot form a port channel with another port that is in **active** or **passive** mode.

LACP ID Parameters

This section describes the LACP parameters in the following topics:

- LACP System Priority, page 5-10
- LACP Port Priority, page 5-10
- LACP Administrative Key, page 5-10

LACP System Priority

Each system that runs LACP has an LACP system priority value. You can accept the default value of 32768 for this parameter, or you can configure a value between 1 and 65535. LACP uses the system priority with the MAC address to form the system ID and also uses the system priority during negotiation with other devices. A higher system priority value means a lower priority.

The system ID is different for each VDC.

Note The LACP system ID is the combination of the LACP system priority value and the MAC address.

LACP Port Priority

Each port that is configured to use LACP has an LACP port priority. You can accept the default value of 32768 for the LACP port priority, or you can configure a value between 1 and 65535. LACP uses the port priority with the port number to form the port identifier.

LACP uses the port priority to decide which ports should be put in standby mode when there is a limitation that prevents all compatible ports from aggregating and which ports should be put into active mode. A higher port priority value means a lower priority for LACP. You can configure the port priority so that specified ports have a lower priority for LACP and are most likely to be chosen as active links, rather than hot-standby links.

LACP Administrative Key

LACP automatically configures an administrative key value equal to the channel-group number on each port configured to use LACP. The administrative key defines the ability of a port to aggregate with other ports. A port's ability to aggregate with other ports is determined by these factors:

- Port physical characteristics, such as the data rate and the duplex capability
- Configuration restrictions that you establish

LACP Marker Responders

You can dynamically redistribute the data traffic by using port channels. This redistribution may result from a removed or added link or a change in the load-balancing scheme. Traffic redistribution that occurs in the middle of a traffic flow can cause misordered frames.

LACP uses the Marker Protocol to ensure that frames are not duplicated or reordered due to this redistribution. The Marker Protocol detects when all the frames of a given traffic flow are successfully received at the remote end. LACP sends Marker PDUs on each of the port-channel links. The remote system responds to the Marker PDU once it receives all the frames received on this link prior to the Marker PDU. The remote system then sends a Marker Responder. Once the Marker Responders are received by the local system on all member links of the port channel, the local system can redistribute the frames in the traffic flow with no chance of misordering. The software supports only Marker Responders.

LACP-Enabled and Static Port Channels Differences

Table 5-2 summarizes the major differences between port channels with LACP enabled and static port channels.

Table 5-2 Port Channels with LACP Enabled and Static Port Channels

Configurations	Port Channels with LACP Enabled	Static Port Channels
Protocol applied	Enable globally	Not applicable
Channel mode of links	Can be either: • Active • Passive	Can only be On
Maximum number of links in channel	16	8

LACP Compatibility Enhancements

Several new commands have been added in Release 4.2(3) to address interoperability issues and to assist with faster LACP protocol convergence.

When the Cisco Nexus 7000 is connected to a non-Nexus peer, its graceful failover defaults may delay the time taken for a disabled port to be brought down or cause traffic from the peer to be lost. To address these conditions, the **lacp graceful-convergence** command was added.

By default, LACP sets a port to the suspended state if it does not receive an LACP PDU from the peer. In some cases, although this feature helps in preventing loops created due to misconfigurations, it can cause servers to fail to boot up as they require LACP to logically bring-up the port. You can put a port into individual state using the **lacp suspend-individual** command.

LACP Offload to Fabric Extenders

To reduce the load on the control plane of the Cisco Nexus 7000 Series device, Cisco NX-OS provides the ability to offload link-level protocol processing to the Fabric Extender CPU. This is supported by LACP by default as soon as there is at least one LACP port-channel configured on a fabric extender.

LACP Fast Timers

You can change the LACP timer rate to modify the duration of the LACP timeout. Use the **lacp rate** command to set the rate at which LACP control packets are sent to an LACP-supported interface. You can change the timeout rate from the default rate (30 seconds) to the fast rate (1 second). This command is supported only on LACP-enabled interfaces. To configure the LACP fast time rate, see Configuring the LACP Fast Timer Rate, page 5-29.

ISSU and stateful switchover cannot be guaranteed with LACP fast timers.

Virtualization Support

You must configure the member ports and other port channel-related configuration from the virtual device context (VDC) that contains the port channel and member ports. You can configure up to 256 port channels across all VDCs. You can use the numbers from 1 to 4096 in each VDC to number the port channels and you can reuse these port channel numbers in different VDCs. For example, you can configure port channel 100 in VDC1 and also configure a different port channel 100 in VDC2.

However, the LACP system ID is different for each VDC. For more information on LACP, see the "LACP Overview" section on page 5-8.

Note See the *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 4.x* for complete information on VDCs and assigning resources.

All ports and VLANs in one port channel must be in the same VDC. When you are using LACP, all possible eight active ports and all possible eight standby ports must be in the same VDC. Because port channels are created globally, you need to be aware of which member ports are assigned to each VDC before you configure the member port in a port channel. The port channels can originate in one VDC (with all ports in that channel in the same VDC) and partner with a port channel in another VDC (again, all ports in that channel must be in that VDC).

Note The port-channeling load-balancing mode works either for a single module or across the entire device. You must configure load balancing using port channels in the default VDC. You cannot configure load balancing using port channels within specified VDCs. See the "Load Balancing Using Port Channels" section on page 5-6 for more information on load balancing.

High Availability

Port channels provide high availability by load balancing traffic across multiple ports. If a physical port fails, the port channel is still operational if there is an active member in the port channel. You can bundle ports from different modules and create a port channel that remains operational even if a module fails because the settings are common across the module.

Port channels support stateful and stateless restarts. A stateful restart occurs on a supervisor switchover. After the switchover, the Cisco NX-OS software applies the runtime configuration after the switchover.

Note See the *Cisco Nexus 7000 Series NX-OS High Availability and Redundancy Guide, Release 4.x* for complete information on high-availability features.

Licensing Requirements for Port Channeling

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	Port channeling requires no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you. For a complete explanation of the NX-OS licensing scheme, see the *Cisco NX-OS Licensing Guide*.

However, using VDCs requires an Advanced Services license.

Prerequisites for Port Channeling

Port channeling has the following prerequisites:

- You must be logged onto the device.

- If necessary, install the Advanced Services license and enter the desired VDC.
- All ports in the channel group must be in the same VDC.
- All ports for a single port channel must be either Layer 2 or Layer 3 ports.
- All ports for a single port channel must meet the compatibility requirements. See the "Compatibility Requirements" section on page 5-4 for more information on the compatibility requirements.
- You must configure load balancing from the default VDC.

Guidelines and Limitations

Port channeling has the following guidelines and restrictions:

- You must enable LACP before you can use that feature.
- You can configure multiple port channels on a device.
- All Ethernet ports on all modules, including those ports on a redundant supervisor engine, support port channels (with a maximum of eight active ports) with no requirement that the ports be physically contiguous or on the same module.
- Do not put shared and dedicated ports into the same port channel. (See Chapter 2, "Configuring Basic Interface Parameters," for information on shared and dedicated ports.)
- For Layer 2 port channels, ports with different STP port path costs can form a port channel if they are compatibly configured with each other.
- In STP, the port-channel bundle is considered as a single port. The port cost is the aggregation of all the configured port costs that are assigned to that channel.
- After you configure a port channel, the configuration that you apply to the port-channel interface affects the port-channel member ports. The configuration that you apply to the member ports affects only the member port where you apply the configuration.
- LACP does not support half-duplex mode. Half-duplex ports in LACP port channels are put in the suspended state.
- You must remove the port-security information from a port before you can add that port to a port channel. Similarly, you cannot apply the port-security configuration to a port that is a member of a channel group.
- Do not configure ports that belong to a port-channel group as private VLAN ports. While a port is part of the private VLAN configuration, the port channel configuration becomes inactive.
- Channel member ports cannot be a source or destination SPAN port.

Configuring Port Channels

This section includes the following topics:

Note See Chapter 2, "Configuring Basic Interface Parameters,"for information on configuring the MTU for the port-channel interface. See Chapter 4, "Configuring Layer 3 Interfaces" for information on configuring IPv4 and IPv6 addresses on the port-channel interface.

Note If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

Creating a Port Channel

You can create a port channel before you create a channel group. The software automatically creates the associated channel group.

BEFORE YOU BEGIN

Enable LACP if you want LACP-based port channels.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *channel-number*
3. **show port-channel summary**
4. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface port-channel** *channel-number*
	
	Example:
	switch(config)# interface port-channel 1
	switch(config-if)
		Specifies the port-channel interface to configure, and enters the interface configuration mode. The range is from 1 to 4096. The Cisco NX-OS software automatically creates the channel group if it does not already exist.

Step 3	**show port-channel summary** **Example**: switch(config-router)# show port-channel summary	(Optional) Displays information about the port channel.
Step 4	**copy running-config startup-config** **Example:** switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

Use the **no interface port-channel** command to remove the port channel and delete the associated channel group.

Command	Purpose
no interface port-channel *channel-number* **Example:** switch(config)# no interface port-channel 1	Removes the port channel and deletes the associated channel group.

This example shows how to create a port channel:

```
switch# config t
switch (config)# interface port-channel 1
```

See the "Compatibility Requirements" section on page 5-4 for details on how the interface configuration changes when you delete the port channel.

Adding a Layer 2 Port to a Port Channel

You can add a Layer 2 port to a new channel group or to a channel group that already contains Layer 2 ports. The software creates the port channel associated with this channel group if the port channel does not already exist.

BEFORE YOU BEGIN

Enable LACP if you want LACP-based port channels.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

All Layer 2 member ports must run in full-duplex mode and at the same speed.

SUMMARY STEPS

1. **config t**
2. **interface** *type slot/port*
3. **switchport**
4. **switchport mode trunk**
5. **switchport trunk** {**allowed vlan** *vlan-id* | **native** *vlan-id*}
6. **channel-group** *channel-number* [**force**] [**mode** {**on** | **active** | **passive**}]
7. **show interface** *type slot/port*
8. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**config t**
	
	Example:
	`switch# config t`
	`switch(config)#`
		Enters configuration mode.

Step 2	**interface** *type slot/port*
	
	Example:
	`switch(config)# interface ethernet 1/4`
	`switch(config-if)`
		Specifies the interface that you want to add to a channel group, and enters the interface configuration mode.

Step 3	**switchport** **Example:** `switch(config-if)# switchport`	Configures the interface as a Layer 2 access port.
Step 4	**switchport mode trunk** **Example:** `switch(config-if)# switchport mode trunk`	(Optional) Configures the interface as a Layer 2 trunk port.
Step 5	**switchport trunk** {**allowed vlan** *vlan-id* | **native** *vlan-id*} **Example:** `switch(config-if)# switchport trunk native 3`	(Optional) Configures necessary parameters for a Layer 2 trunk port.

	Command	Purpose
Step 6	**channel-group** *channel-number* [**force**] [**mode** {**on** | **active** | **passive**}] **Example:** `switch(config-if)# channel-group 5`	Configures the port in a channel group and sets the mode. The channel-number range is from 1 to 4096. This command creates the port channel associated with this channel group if the port channel does not already exist. All static port-channel interfaces are set to mode **on**. You must set all LACP-enabled port-channel interfaces to **active** or **passive**. The default mode is **on**.
	Example: `switch(config-if)# channel-group 5 force`	(Optional) Forces an interface with some incompatible configurations to join the channel. The forced interface must have the same speed, duplex, and flow control settings as the channel group. **Note** The **force** option fails if the port has a QoS policy mismatch with the other members of the port channel.
Step 7	**show interface** *type slot/port* **Example:** `switch(config-router)# show interface port channel 5`	(Optional) Displays interface information.
Step 8	**copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Use the **no channel-group** command to remove the port from the channel group.

Command	Purpose
no channel-group **Example:** `switch(config)# no channel-group`	Removes the port from the channel group.

This example shows how to add a Layer 2 Ethernet interface 1/4 to channel group 5:

```
switch# config t
switch (config)# interface ethernet 1/4
switch(config-if)# switchport
switch(config-if)# channel-group 5
```

Adding a Layer 3 Port to a Port Channel

You can add a Layer 3 port to anew channel group or to a channel group that is already configured with Layer 3 ports. The software creates the port channel associated with this channel group if the port channel does not already exist.

If the Layer 3 port that you are adding has a configured IP address, the system removes that IP address before adding the port to the port channel. After you create a Layer 3 port channel, you can assign an IP address to the port-channel interface. You can also add subinterfaces to an existing Layer 3 port channel.

BEFORE YOU BEGIN

Enable LACP if you want LACP-based port channels.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

Remove any IP addresses configured on the Layer 3 interface.

SUMMARY STEPS

1. **config t**
2. **interface** *type slot/port*
3. **no switchport**
4. **channel-group** *channel-number* [**force**] [**mode** {**on** | **active** | **passive**}]
5. **show interface** *type slot/port*
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**config t**
	
	Example:
	`switch# config t`
	`switch(config)#`
		Enters configuration mode.

Step 2	**interface** *type slot/port*
	
	Example:
	`switch(config)# interface ethernet 1/4`
	`switch(config-if)`
		Specifies the interface that you want to add to a channel group, and enters the interface configuration mode.

Step 3	**no switchport** **Example:** `switch(config-if)# no switchport`	Configures the interface as a Layer 3 port.

Step 4	**channel-group** *channel-number* [**force**] [**mode** {**on** | **active** | **passive**}]
	
	Example:
	`switch(config-if)# channel-group 5`
	
	Example:
	`switch(config-if)# channel-group 5 force`
		Configures the port in a channel group and sets the mode. The channel-number range is from 1 to 4096.The Cisco NX-OS software creates the port channel associated with this channel group if the port channel does not already exist.
		
		(Optional) Forces an interface with some incompatible configurations to join the channel. The forced interface must have the same speed, duplex, and flow control settings as the channel group.

	Command	Purpose
Step 5	**show interface** *type slot/port* **Example:** `switch(config-router)# show interface ethernet 1/4`	(Optional) Displays interface information.
Step 6	**copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

Use the **no channel-group** command to remove the port from the channel group. The port reverts to its original configuration. You must reconfigure the IP addresses for this port.

Command	Purpose
no channel-group **Example:** `switch(config)# no channel-group`	Removes the port from the channel group.

This example shows how to add a Layer 3 Ethernet interface 1/5 to channel group 6 in on mode:

```
switch# config t
switch (config)# interface ethernet 1/5
switch(config-if)# no switchport
switch(config-if)# channel-group 6
```

This example shows how to create a Layer 3 port-channel interface and assign the IP address:

```
switch# config t
switch(config)# interface port-channel 4
switch(config-if)# ip address 192.0.2.1/8
```

Configuring the Bandwidth and Delay for Informational Purposes

The bandwidth of the port channel is determined by the number of total active links in the channel.

You configure the bandwidth and delay on port-channel interfaces for informational purposes.

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *channel-number*
3. **bandwidth** *value*
4. **delay** *value*
5. **exit**
6. **show interface port-channel** *channel-number*
7. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface port-channel** *channel-number*
	
	Example:
	switch(config)# interface port-channel 2
	switch(config-if)
		Specifies the port-channel interface that you want to configure, and enters the interface mode.

Step 3	**bandwidth** *value* **Example:** switch(config-if)# bandwidth 60000000 switch(config-if)#	Specifies the bandwidth, which is used for informational purposes. The range is from 1 to 80,000,000 kbs. The default value depends on the total active interfaces in the channel group.
Step 4	**delay** *value* **Example:** switch(config-if)# delay 10000 switch(config-if)#	Specifies the throughput delay, which is used for informational purposes. The range is from 1 to 16,777,215 tens of microseconds. The default value is 10 microseconds. **Note** Prior to Cisco Release 4.2(1), the default delay value was 100 microseconds.
Step 5	**exit** **Example:** switch(config-if)# exit switch(config)#	Exits the interface mode and returns to the configuration mode.
Step 6	**show interface port-channel** *channel-number* **Example:** switch(config-router)# show interface port-channel 2	(Optional) Displays interface information for the specified port channel.
Step 7	**copy running-config startup-config** **Example:** switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to configure the informational parameters of the bandwidth and delay for port channel 5:

```
switch# config t
switch (config)# interface port-channel 5
switch(config-if)# bandwidth 60000000
switch(config-if)# delay 10000
switch(config-if)#
```

Shutting Down and Restarting the Port-Channel Interface

You can shut down and restart the port-channel interface. When you shut down a port-channel interface, no traffic passes and the interface is administratively down.

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *channel-number*
3. **shutdown | no shutdown**
4. **exit**
5. **show interface port-channel** *channel-number*
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**config t**
	
	Example:
	`switch# config t`
	`switch(config)#`
		Enters configuration mode.

Step 2	**interface port-channel** *channel-number*
	
	Example:
	`switch(config)# interface port-channel 2`
	`switch(config-if)`
		Specifies the port-channel interface that you want to configure, and enters the interface mode.

Step 3	**shutdown**
	
	Example:
	`switch(config-if)# shutdown`
	`switch(config-if)#`
		Shuts down the interface. No traffic passes and the interface displays as administratively down. The default is no shutdown.

	no shutdown
	
	Example:
	`switch(config-if)# no shutdown`
	`switch(config-if)#`
		Opens the interface. The interface displays as administratively up. If there are no operational problems, traffic passes. The default is no shutdown.

Step 4	**exit**
	
	Example:
	`switch(config-if)# exit`
	`switch(config)#`
		Exits the interface mode and returns to the configuration mode.

Step 5	**show interface port-channel** *channel-number* **Example**: `switch(config-router)# show interface port-channel 2`	(Optional) Displays interface information for the specified port channel.
Step 6	**copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

This example shows how to bring up the interface for port channel 2:

```
switch# config t
switch (config)# interface port-channel 2
switch(config-if)# no shutdown
```

Configuring a Port-Channel Description

You can configure a description for aport channel.

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *channel-number*
3. **description**
4. **exit**
5. **show interface port-channel** *channel-number*
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**config t**
	
	Example:
	`switch# config t`
	`switch(config)#`
		Enters configuration mode.

Step 2	**interface port-channel** *channel-number*
	
	Example:
	`switch(config)# interface port-channel 2`
	`switch(config-if)`
		Specifies the port-channel interface that you want to configure, and enters the interface mode.

Step 3	**description**
	
	Example:
	`switch(config-if)# description engineering`
	`switch(config-if)#`
		Allows you to add a description to the port-channel interface. You can use up to 80 characters in the description. By default, the description does not display; you must configure this parameter before the description displays in the output.

Step 4	**exit**
	
	Example:
	`switch(config-if)# exit`
	`switch(config)#`
		Exits the interface mode and returns to the configuration mode.

Step 5	**show interface port-channel** *channel-number* **Example:** `switch(config-router)# show interface port-channel 2`	(Optional) Displays interface information for the specified port channel.
Step 6	**copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

This example shows how to add a description to port channel 2:

```
switch# config t
switch (config)# interface port-channel 2
```

```
switch(config-if)# description engineering
```

Configuring the Speed and Duplex Settings for a Port-Channel Interface

You can configure the speed and duplex settings for a port-channel interface.

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *channel-number*
3. **speed** {**10** | **100** | **1000** | **auto**}
4. **duplex** {**auto** | **full** | **half**}
5. **exit**
6. **show interface port-channel** *channel-number*
7. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface port-channel** *channel-number*
	
	Example:
	switch(config)# interface port-channel 2
	switch(config-if)
		Specifies the port-channel interface that you want to configure, and enters the interface mode.

Step 3	**speed** {**10** | **100** | **1000** | **auto**} **Example:** switch(config-if)# speed auto switch(config-if)#	Sets the speed for the port-channel interface. The default is auto for autonegotiation.
Step 4	**duplex** {**auto** | **full** | **half**} **Example:** switch(config-if)# speed auto switch(config-if)#	Sets the duplex for the port-channel interface. The default is auto for autonegotiation.
Step 5	**exit** **Example:** switch(config-if)# exit switch(config)#	Exits the interface mode and returns to the configuration mode.

	Command	Purpose
Step 6	**show interface port-channel** *channel-number* **Example:** switch(config-router)# show interface port-channel 2	(Optional) Displays interface information for the specified port channel.
Step 7	**copy running-config startup-config** **Example:** switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to set port channel 2 to 100 Mb/s:

```
switch# config t
switch (config)# interface port-channel 2
switch(config-if)# speed 100
```

Configuring Flow Control

You can enable or disable the capability of the port-channel interfaces that run at 1 Gb or higher to send or receive flow-control pause packets. For port-channel interfaces that run at lower speeds, you can enable or disable only the capability of the port-channel interfaces to receive pause packets.

Note The settings have to match at both the local and remote ends of the link so that flow control can work properly.

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *channel-number*
3. **flowcontrol** {**receive** | **send**} {**desired** | **off** | **on**}
4. **exit**
5. **show interface port-channel** *channel-number*
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface port-channel** *channel-number*
	
	Example:
	switch(config)# interface port-channel 2
	switch(config-if)
		Specifies the port-channel interface that you want to configure, and enters the interface mode.

Step 3	**flowcontrol** {**receive** | **send**} {**desired** | **off** | **on**} **Example:** switch(config-if)# flowcontrol send desired switch(config-if)#	Sets the flow control parameters for sending and receiving the pause packets for the port-channel interface. The default is desired.
Step 4	**exit** **Example:** switch(config-if)# exit switch(config)#	Exits the interface mode and returns to the configuration mode.
Step 5	**show interface port-channel** *channel-number* **Example**: switch(config-router)# show interface port-channel 2	(Optional) Displays interface information for the specified port channel.
Step 6	**copy running-config startup-config** **Example:** switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to configure the port-channel interface for port channel group 2 to send and receive pause packets:

```
switch# config t
switch (config)# interface port-channel 2
switch(config-if)# flowcontrol receive on
switch(config-if)# flowcontrol send on
```

Configuring Load Balancing Using Port Channels

You can configure the load-balancing algorithm for port channels that applies to the entire device or to only one module regardless of the VDC association. Module-based load balancing takes precedence over device-based load balancing.

BEFORE YOU BEGIN

Enable LACP if you want LACP-based port channels.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **config t**
2. **port-channel load-balance ethernet** {**dest-ip-port** | **dest-ip-port-vlan** | **destination-ip-vlan** | **destination-mac** | **destination-port** | **source-dest-ip-port** | **source-dest-ip-port-vlan** | **source-dest-ip-vlan** | **source-dest-mac** | **source-dest-port** | **source-ip-port** | **source-ip-port-vlan** | **source-ip-vlan** | **source-mac** | **source-port**} [*module-number*]
3. **show port-channel load-balance**
4. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.
Step 2	**port-channel load-balance ethernet** {**dest-ip-port** | **dest-ip-port-vlan** | **destination-ip-vlan** | **destination-mac** | **destination-port** | **source-dest-ip-port** | **source-dest-ip-port-vlan** | **source-dest-ip-vlan** | **source-dest-mac** | **source-dest-port** | **source-ip-port** | **source-ip-port-vlan** | **source-ip-vlan** | **source-mac** | **source-port**} [module-*number*] **Example:** switch(config)# port-channel load-balance ethernet source-destination-mac switch(config)#	Specifies the load-balancing algorithm for the device or module. The range depends on the device. The default for Layer 3 is **source-dest-ip** for both IPv4 and IPv6, and the default for non-IP is **source-dest-mac.**
Step 3	**show port-channel load-balance** **Example:** switch(config-router)# show port-channel load-balance	(Optional) Displays the port-channel load-balancing algorithm.
Step 4	**copy running-config startup-config** **Example:** switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

Use the **no port-channel load-balance ethernet** to restore the default load-balancing algorithm of source-dest-mac for non-IP traffic and source-dest-ip for IP traffic.

Command	Purpose
no port-channel load-balance ethernet **Example:** switch(config)# no port-channel load-balance ethernet	Restores the default load-balancing algorithm.

This example shows how to configure source IP load balancing for port channels on module 5:

```
switch# config t
switch (config)# port-channel load-balance ethernet source-ip-port module 5
```

Enabling LACP

LACP is disabled by default; you must enable LACP before you begin LACP configuration. You cannot disable LACP while any LACP configuration is present.

LACP learns the capabilities of LAN port groups dynamically and informs the other LAN ports. Once LACP identifies correctly matched Ethernet links, it group the links into a port channel. The port channel is then added to the spanning tree as a single bridge port.

To configure LACP, you must do the following:

- Enable LACP globally by using the **feature lacp** command.
- You can use different modes for different interfaces within the same LACP-enabled port channel. You can change the mode between **active** and **passive** for an interface only if it is the only interface that is designated to the specified channel group.

BEFORE YOU BEGIN

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **config t**
2. **feature lacp**
3. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

	Command	Purpose
Step 2	**feature lacp** **Example:** switch(config)# feature lacp	Enables LACP on the device.
Step 3	**copy running-config startup-config** **Example:** switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to enable LACP:

```
switch# configure terminal
switch (config)# feature lacp
```

Configuring LACP Port-Channel Port Modes

After you enable LACP, you can configure the channel mode for each individual link in the LACP port channel as **active** or **passive**. This channel configuration mode allows the link to operate with LACP.

When you configure port channels with no associated aggregation protocol, all interfaces on both sides of the link remain in the **on** channel mode.

BEFORE YOU BEGIN

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **config t**
2. **interface** *type slot/port*
3. **channel-group** *number* **mode** {**active** | **on** | **passive**}
4. **show port-channel summary**
5. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface** *type slot/port*
	
	Example:
	switch(config)# interface ethernet 1/4
	switch(config-if)
		Specifies the interface to configure, and enters the interface configuration mode.

	Command	Purpose
Step 3	**channel-group** *number* **mode** {**active** | **on** | **passive**} **Example:** `switch(config-if)# channel-group 5 mode active`	Specifies the port mode for the link in a port channel. After LACP is enabled, you configure each link or the entire channel as active or passive. When you run port channels with no associated aggregation protocol, the port-channel mode is always on. The default port-channel mode is on.
Step 4	**show port-channel summary** **Example:** `switch(config-if)# show port-channel summary`	(Optional) Displays summary information about the port channels.
Step 5	**copy running-config startup-config** **Example:** `switch(config-if)# copy running-config startup-config`	(Optional) Copies the running configuration to the startup configuration.

This example shows how to set the LACP-enabled interface to the active port-channel mode for Ethernet interface 1/4 in channel group 5:

```
switch# config t
switch (config)# interface ethernet 1/4
switch(config-if)# channel-group 5 mode active
```

Configuring the LACP Fast Timer Rate

You can change the LACP timer rate to modify the duration of the LACP timeout. Use the **lacp rate** command to set the rate at which LACP control packets are sent to an LACP-supported interface. You can change the timeout rate from the default rate (30 seconds) to the fast rate (1 second). This command is supported only on LACP-enabled interfaces.

BEFORE YOU BEGIN

Ensure that you have enabled the LACP feature.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **configure terminal**
2. **interface** *type slot/port*
3. **lacp rate fast**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	**interface** *type slot/port* **Example:** switch(config)# interface ethernet 1/4	Specifies the interface to configure and enters the interface configuration mode.
Step 3	**lacp rate fast** **Example:** switch(config-if)# lacp rate fast	Configures the fast rate (one second) at which LACP control packets are sent to an LACP-supported interface. To reset the timeout rate to its default, use the **no** form of the command.

This example shows how to configure the LACP fast rate on Ethernet interface 1/4:

```
switch# configure terminal
switch (config)# interface ethernet 1/4
switch(config-if)# lacp rate fast
```

This example shows how to restore the LACP default rate (30 seconds) on Ethernet interface 1/4.

```
switch# configure terminal
switch (config)# interface ethernet 1/4
switch(config-if)# no lacp rate fast
```

Configuring the LACP System Priority

The LACP system ID is the combination of the LACP system priority value and the MAC address.

You can reuse the same configuration for the system priority values in more than one VDC.

BEFORE YOU BEGIN

Enable LACP.

Ensure that you are in the correct VDC (or use the **switch tovdc** command).

SUMMARY STEPS

1. **config t**
2. **lacp system-priority** *priority*
3. **show lacp system-identifier**
4. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.
Step 2	**lacp system-priority** *priority* **Example:** switch(config)# lacp system-priority 40000	Configures the system priority for use with LACP. Valid values are 1 through 65535, and higher numbers have lower priority. The default value is 32768. **Note** Each VDC has a different LACP system ID because the software adds the MAC address to this configured value.
Step 3	**show lacp system-identifier** **Example:** switch(config-if)# show lacp system-identifier	Displays the LACP system identifier.
Step 4	**copy running-config startup-config** **Example:** switch(config)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to set the LACP system priority to 2500:

```
switch# configure terminal
switch(config)# lacp system-priority 2500
```

Configuring the LACP Port Priority

When you enable LACP, you can configure each link in the LACP port channel for the port priority.

BEFORE YOU BEGIN

Enable LACP.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **config t**
2. **interface** *type slot/port*
3. **lacp port-priority** *priority*
4. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface** *type slot/port*
	
	Example:
	switch(config)# interface ethernet 1/4
	switch(config-if)
		Specifies the interface to configure, and enters the interface configuration mode.

Step 3	**lacp port-priority** *priority* **Example:** switch(config-if)# lacp port-priority 40000.	Configures the port priority for use with LACP. Valid values are 1 through 65535, and higher numbers have lower priority. The default value is 32768.
Step 4	**copy running-config startup-config** **Example:** switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to set the LACP port priority for Ethernet interface 1/4 to 40000:

```
switch# config t
switch (config)# interface ethernet 1/4
switch(config-if)# lacp port-priority 40000
```

Disabling LACP Graceful Convergence

By default LACP graceful convergence is enabled. In situations where you need to support LACP interoperability with devices where the graceful failover defaults may delay the time taken for a disabled port to be brought down or cause traffic from the peer to be lost, you can disable convergence.

Note The port channel has to be in the administratively down state before the command can be run.

BEFORE YOU BEGIN

Enable LACP.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *number*
3. **shutdown**
4. **no lacp graceful-convergence**

5. **no shutdown**
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface port-channel** *number*
	
	Example:
	switch(config)# interface port-channel 1
	switch(config-if)
		Specifies the port channel interface to configure, and enters the interface configuration mode.

Step 3	**shutdown** **Example:** switch(config-if) shutdown	Administratively shuts down the port channel.
Step 4	**no lacp graceful-convergence** **Example:** switch(config-if)# no lacp graceful-convergence	Disables LACP graceful convergence on the port channel.
Step 5	**no shutdown** **Example:** switch(config-if) no shutdown	Brings the port channel administratively up.
Step 6	**copy running-config startup-config** **Example:** switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to disable LACP graceful convergence on a port channel:

```
switch# config t
switch (config)# interface port-channel 1
switch(config-if)# shutdown
switch(config-if)# no lacp graceful-convergence
switch(config-if)# no shutdown
```

Re-enabling LACP Graceful Convergence

If the default LACP graceful convergence is once again required, you can re-enable convergence.

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *number*
3. **shutdown**

4. **lacp graceful-convergence**
5. **no shutdown**
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface port-channel** *number*
	
	Example:
	switch(config)# interface port-channel 1
	switch(config-if)
		Specifies the port channel interface to configure, and enters the interface configuration mode.

Step 3	**shutdown** **Example:** switch(config-if) shutdown	Administratively shuts down the port channel.
Step 4	**lacp graceful-convergence** **Example:** switch(config-if)# lacp graceful-convergence	Enables LACP graceful convergence on the port channel.
Step 5	**no shutdown** **Example:** switch(config-if) no shutdown	Brings the port channel administratively up.
Step 6	**copy running-config startup-config** **Example:** switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to enable LACP graceful convergence on a port channel:

```
switch# config t
switch (config)# interface port-channel 1
switch(config-if)# shutdown
switch(config-if)# lacp graceful-convergence
switch(config-if)# no shutdown
```

Disabling LACP Suspend Individual

LACP sets a port to the suspended state if it does not receive an LACP PDU from the peer. This can cause some servers to fail to boot up as they require LACP to logically bring-up the port. You can tune behavior to individual use.

Note You should only run the **lacp suspend-individual** command on edge ports. The port channel has to be in the administratively down state before the command can be run.

BEFORE YOU BEGIN

Enable LACP.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *number*
3. **shutdown**
4. **no lacp suspend-individual**
5. **no shutdown**
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**config t**
	
	Example:
	`switch# config t`
	`switch(config)#`
		Enters configuration mode.

Step 2	**interface port-channel** *number*
	
	Example:
	`switch(config)# interface port-channel 1`
	`switch(config-if)`
		Specifies the port channel interface to configure, and enters the interface configuration mode.

Step 3	**shutdown** **Example:** `switch(config-if) shutdown`	Administratively shuts down the port channel.

Step 4	**no lacp suspend-individual**
	
	Example:
	`switch(config-if)# no lacp`
	`suspend-individual`
		Disables LACP individual port suspension behavior on the port channel.

Step 5	**no shutdown** **Example:** `switch(config-if) no shutdown`	Brings the port channel administratively up.

Step 6	**copy running-config startup-config**
	
	Example:
	`switch(config-if)# copy running-config`
	`startup-config`
		(Optional) Copies the running configuration to the startup configuration.

This example shows how to disable LACP individual port suspension behavior on a port channel:

```
switch# config t
switch (config)# interface port-channel 1
switch(config-if)# shutdown
switch(config-if)# no lacp suspend-individual
switch(config-if)# no shutdown
```

Re-enabling LACP Suspend Individual

You can re-enable the default LACP individual port suspension behavior.

SUMMARY STEPS

1. **config t**
2. **interface port-channel** *number*
3. **shutdown**
4. **lacp suspend-individual**
5. **no shutdown**
6. **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**config t** **Example:** switch# config t switch(config)#	Enters configuration mode.

Step 2	**interface port-channel** *number*
	
	Example:
	switch(config)# interface port-channel 1
	switch(config-if)
		Specifies the port channel interface to configure, and enters the interface configuration mode.

Step 3	**shutdown** **Example:** switch(config-if) shutdown	Administratively shuts down the port channel.
Step 4	**lacp suspend-individual** **Example:** switch(config-if)# lacp suspend-individual	Enables LACP individual port suspension behavior on the port channel.
Step 5	**no shutdown** **Example:** switch(config-if) no shutdown	Brings the port channel administratively up.
Step 6	**copy running-config startup-config** **Example:** switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to re-enable LACP individual port suspension behavior on a port channel:

```
switch# config t
switch (config)# interface port-channel 1
switch(config-if)# shutdown
switch(config-if)# lacp suspend-individual
switch(config-if)# no shutdown
```

Verifying Port-Channel Configuration

Use the following commands to display port-channel configuration information.

Command	Purpose
show interface port-channel *channel-number*	Displays the status of a port-channel interface.
show feature	Displays enabled features.
load- interval {**interval** *seconds* {**1** | **2** | **3**}}	Beginning with Cisco NX-OS Release 4.2(1) for the Cisco Nexus 7000 Series devices, sets three different sampling intervals to bit-rate and packet-rate statistics.
show port-channel compatibility-parameters	Displays the parameters that must be the same among the member ports in order to join a port channel.
show port-channel database [**interface port-channel** *channel-number*]	Displays the aggregation state for one or more port-channel interfaces.
show port-channel load-balance	Displays the type of load balancing in use for port channels.
show port-channel summary	Displays a summary for the port-channel interfaces.
show port-channel traffic	Displays the traffic statistics for port channels.
show port-channel usage	Displays the range of used and unused channel numbers.
show lacp {**counters** [**interface port-channel** *channel-number*] | [**interface** *type/slot*] | **neighbor** [**interface port-channel** *channel-number*] | **port-channel** [**interface port-channel** *channel-number*] | **system-identifier**]]}	Displays information on LACP.
show running-config interface port-channel *channel-number*	Displays information on the running configuration of the port-channel.

For more information about these commands, see the *Cisco Nexus 7000 Series NX-OS Interfaces Command Reference, Release 4.x*.

Displaying Statistics

Use the following commands to display port-channel interface configuration information.

Command	Purpose
clear counters interface port-channel *channel-number*	Clears the counters.
clear lacp counters [**interface port-channel** *channel-number*]	Clears the LACP counters.
load- interval {**interval** *seconds* {**1** | **2** | **3**}}	Beginning with Cisco NX-OS Release 4.2(1) for the Cisco Nexus 7000 Series devices, sets three different sampling intervals to bit-rate and packet-rate statistics.
show interface counters [**module** *module*]	Displays input and output octets unicast packets, multicast packets, and broadcast packets.
show interface counters detailed [**all**]	Displays input packets, bytes, and multicast and output packets and bytes.
show interface counters errors [**module** *module*]	Displays information on the number of error packets.
show lacp counters	Displays statistics for LACP.

See the *Cisco Nexus 7000 Series NX-OS Interfaces Command Reference, Release 4.x* for information on these commands.

Port Channel Example Configuration

This example shows how to create an LACP port channel and add two Layer 2 interfaces to that port channel.

```
switch# config t
switch (config)# feature lacp
switch (config)# interface port-channel 5
switch (config-if)# interface ethernet 1/4
switch(config-if)# switchport
switch(config-if)# channel-group 5 mode active
switch(config-if)# lacp port priority 40000
switch(config-if)# interface ethernet 1/7
switch(config-if)# switchport
switch(config-if)# channel-group 5 mode
```

This example shows how to add two Layer 3 interfaces to a channel group. The Cisco NX-OS software automatically creates the port channel.

```
switch# config t
switch (config)# interface ethernet 1/5
switch(config-if)# no switchport
switch(config-if)# no ip address
switch(config-if)# channel-group 6 mode active
switch (config)# interface ethernet 2/5
switch(config-if)# no switchport
switch(config-if)# no ip address
```

```
switch(config-if)# channel-group 6 mode active
switch (config)# interface port-channel 6
switch(config-if)# ip address 192.0.2.1/8
```

Default Settings

Table 5-3 lists the default settings for port-channel parameters.

Table 5-3 Default Port-Channel Parameters

Parameters	Default
Port channel	Admin up
Load balancing method for Layer 3 interfaces	Source and destination IP address
Load balancing method for Layer 2 interfaces	Source and destination MAC address
Load balancing per module	Disabled
LACP	Disabled
Channel mode	on
LACP system priority	32768
LACP port priority	32768

Additional References

For additional information related to implementing port channels, see the following sections:

- Related Documents, page 5-40
- MIBs, page 5-40

Related Documents

Related Topic	Document Title
Configuring Layer 2 interface	Chapter 3, "Configuring Layer 2 Interfaces"
Configuring Layer 3 interfaces	Chapter 4, "Configuring Layer 3 Interfaces"
Shared and dedicated ports	Chapter 2, "Configuring Basic Interface Parameters"
Command reference	*Cisco Nexus 7000 Series NX-OS Interfaces Command Reference, Release 4.x*
Interfaces	*Cisco DCNM Interfaces Configuration Guide*
System management	*Cisco Nexus 7000 Series NX-OS System Management Configuration Guide, Release 4.x*
High availability	*Cisco Nexus 7000 Series NX-OS High Availability and Redundancy Guide, Release 4.x*
VDCs	*Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 4.x*
Licensing	*Cisco NX-OS Licensing Guide*
Release Notes	*Cisco Nexus 7000 Series NX-OS Release Notes, Release 4.x*

Standards

Standards	Title
IEEE 802.3ad	—

MIBs

MIBs	MIBs Link
• IEEE8023-LAG-CAPABILITY • CISCO-LAG-MIB	To locate and download MIBs, go to the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

Feature History for Configuring Port Channels

Table 5-4 lists the release history for this feature.

Table 5-4 Feature History for Configuring Port Channels

Feature Name	Releases	Feature Information
Port channels	4.0(1)	This feature was introduced.
Port channels	4.2(1)	Support increased to 256 port channels.