

Cross-Stack EtherChannel on a Catalyst 3750 Switch Configuration Example

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Introduction

This document provides a sample configuration for the configuration of cross-stack EtherChannel on a Cisco Catalyst 3750 Switch that runs Cisco IOS® system software. EtherChannel can be called Fast EtherChannel or Gigabit EtherChannel. This depends on the speed of the interfaces or ports that are used to form the cross-stack EtherChannel.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on the Catalyst 3750 Switch that runs Cisco IOS Software Release 12.2(25)SEC.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Background Theory

In this document, these interfaces are bundled for the cross-stack EtherChannel:

- Two Gigabit Ethernet interfaces of one of the Catalyst 3750 Switches
- One Gigabit Ethernet interface of another Catalyst 3750 Switch of the same stack
- Three Gigabit Ethernet interfaces on a Catalyst 3750 Switch of a different stack

The Cisco StackWise interconnect technology is designed with two counter-rotating paths of 16 Gb each. In order to efficiently load balance traffic, packets are allocated between these two logical counter-rotating paths, which creates the 32-Gb interconnection. There are dual paths from any port to any other port within the Catalyst 3750 stack. Therefore, maximum uptime is ensured because there is always an alternate path available if a failure occurs in either path. The Catalyst 3750 supports:

- Cross-stack EtherChannel
- Cross-stack UplinkFast (with subsecond failover)
- Cross-stack equal cost routes across different switches in the stack

Link Aggregation Control Protocol (LACP) and Port Aggregation Protocol (PAgP)

EtherChannels have automatic configuration with either Port Aggregation Protocol (PAgP) or Link Aggregation Control Protocol (LACP). PAgP is a Cisco-proprietary protocol that you can only run on Cisco switches and on those switches that licensed vendors license to support PAgP. IEEE 802.3ad defines LACP. LACP allows Cisco switches to manage Ethernet channels between switches that conform to the 802.3ad protocol.

PAgP cannot be enabled on cross-stack EtherChannels while LACP is supported on cross-stack EtherChannels from Cisco IOS Software Release 12.2(25)SEC and later. Switch interfaces exchange LACP packets only with partner interfaces with the active or passive mode configuration. You can configure up to 16 ports to form a channel. Eight of the ports are in active mode, and the other eight are in standby mode. When any one of the active ports fails, a standby port becomes active. Interfaces with the on mode configuration do not exchange PAgP or LACP packets.

These EtherChannel modes are supported on cross-stack EtherChannel:

- active Places an interface into an active negotiation state, in which the interface starts negotiations with other interfaces by sending LACP packets.
- passive Places an interface into a passive negotiation state, in which the interface responds to LACP packets that the interface receives, but does not start LACP packet negotiation. This setting minimizes the transmission of LACP packets.
- on Forces the interface into an EtherChannel without PAgP or LACP. With the on mode, a usable EtherChannel exists only when an interface group in the on mode has a connection to another interface group in the on mode.

EtherChannel and Switch Stacks

If a stack member that has ports participating in an EtherChannel fails or leaves the stack, the stack master removes the failed stack member switch ports from the EtherChannel. The remaining ports of the EtherChannel, if any, continue to provide connectivity.

When a switch is added to an existing stack, the new switch receives the running configuration from the stack master and updates itself with the EtherChannel-related stack configuration. The stack member also receives

the operational information (the list of ports that are up and are members of a channel).

When two stacks merge that have EtherChannels configured between them, self-looped ports result. Spanning tree detects this condition and acts accordingly. Any PAgP or LACP configuration on a winning switch stack is not affected, but the PAgP or LACP configuration on the losing switch stack is lost after the stack reboots.

With PAgP, if the stack master fails or leaves the stack, a new stack master is elected. A spanning-tree reconvergence is not triggered unless there is a change in the EtherChannel bandwidth. The new stack master synchronizes the configuration of the stack members to that of the stack master. The PAgP configuration is not affected after a stack master change unless the EtherChannel has ports residing on the old stack master.

With LACP, the system-id uses the stack MAC address from the stack master, and if the stack master changes, the LACP system-id can change. If the LACP system-id changes, the entire EtherChannel will flap, and there will be an STP reconvergence. Use the **stack-mac persistent timer** command to control whether or not the stack MAC address changes during a master failover.

Configuration Guidelines

Follow the guidelines specific to the cross-stack EtherChannel:

- For cross-stack EtherChannel configurations, ensure that all ports targeted for the EtherChannel are either configured for LACP or are manually configured to be in the channel group. Use the **channel-group channel-group-number mode on** interface configuration command in order to manually configure ports to be in the channel group. The PAgP protocol is not supported on cross-stack EtherChannels.
- If cross-stack EtherChannel is configured and the switch stack partitions, loops and forwarding issues can occur.
- Configure a cross-stack EtherChannel with up to two 10-Gigabit Ethernet module ports.

Refer to EtherChannel Configuration Guidelines for a complete list of guidelines related to EtherChannel configuration.

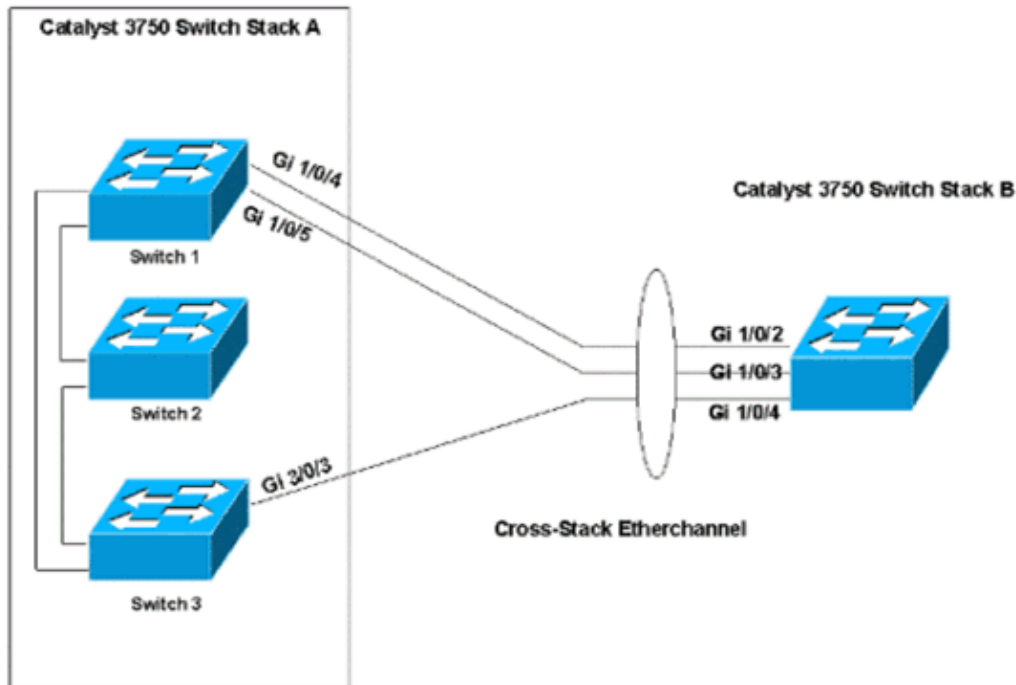
Configure

In this section, you are presented with the information to configure the features described in this document.

Note: Use the Command Lookup Tool [↗](#) (registered customers only) to obtain more information on the commands used in this section.

Network Diagram

This document uses this network setup:



In this network diagram, there are two Catalyst 3750 Switch stacks, Stack A and Stack B. Stack A has three switch members, and Stack B has only one switch member. The EtherChannel is formed with two ports on Switch 1 and one port on Switch 3 of Stack A. These ports connect to the three ports in Stack B.

The network setup is used to configure the ports as trunk ports.

Configurations

This document uses these configurations:

- Configure Cross-Stack EtherChannel Without PAgP or LACP
- Configure Cross-Stack EtherChannel with LACP

Configure Cross-Stack EtherChannel Without PAgP or LACP

This configuration example provides the cross-stack EtherChannel configuration if you turn off PAgP or LACP:

Catalyst 3750 Switch Stack A
<pre> 3750switchstackA(config)#interface range gigabitethernet 1/0/4 - 5 3750switchstackA(config-if-range)#channel-group 1 mode on !--- This command creates the port channel 1 interface. Because the mode !--- is configured ON, both the PAgP and LACP are disabled on these ports. !--- Issue the channel-group command first, before you enter any other commands on these !--- interfaces. Any commands that you issue on these interfaces after you issue the !--- channel-group command are added to the port channel interface automatically. !--- If you configure the port with all the commands and you issue the channel-group !--- command last, the port channel interface is created but does not have any !--- configurations. You must then add the other commands to the port channel interface !--- manually. 3750switchstackA(config-if-range)#switchport trunk encapsulation dot1q 3750switchstackA(config-if-range)#switchport mode trunk </pre>

```

3750switchstackA(config)#interface gigabitethernet 3/0/3
3750switchstackA(config-if)#channel-group 1 mode on
3750switchstackA(config-if)#switchport trunk encapsulation dot1q
3750switchstackA(config-if)#switchport mode trunk

```

Catalyst 3750 Switch Stack B

```

3750switchstackB(config)#interface range gigabitethernet 1/0/2 - 4
3750switchst(config-if-range)#channel-group 1 mode on
3750switchst(config-if-range)#switchport
3750switchst(config-if-range)#switchport trunk encapsulation dot1q
3750switchst(config-if-range)#switchport mode trunk

```

You can verify the EtherChannel status in this way:

```

3750switchstackA#show interfaces port-channel 1

Port-channel1 is up, line protocol is up (connected)
  Hardware is EtherChannel, address is 0015.c6c1.3003 (bia 0015.c6c1.3003)
  MTU 1500 bytes, BW 300000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Full-duplex, 100Mb/s, link type is auto, media type is unknown
  input flow-control is off, output flow-control is unsupported
  Members in this channel: Gi1/0/4 Gi1/0/5 Gi2/0/3
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:01, output 00:07:06, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 1000 bits/sec, 2 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    2080 packets input, 191872 bytes, 0 no buffer
    Received 1638 broadcasts (0 multicast)
      0 runts, 0 giants, 0 throttles
      0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
      0 watchdog, 1616 multicast, 0 pause input
      0 input packets with dribble condition detected
    3242 packets output, 261916 bytes, 0 underruns
      0 output errors, 0 collisions, 7 interface resets
      0 babbles, 0 late collision, 0 deferred
      0 lost carrier, 0 no carrier, 0 PAUSE output
      0 output buffer failures, 0 output buffers swapped out

```

```

3750switchstackA#show etherchannel summary

```

```

Flags: D - down          P - in port-channel
       I - stand-alone  s - suspended
       H - Hot-standby (LACP only)
       R - Layer3       S - Layer2
       U - in use       f - failed to allocate aggregator
       u - unsuitable for bundling
       w - waiting to be aggregated
       d - default port

```

```

Number of channel-groups in use: 1
Number of aggregators:          1

```

Group	Port-channel	Protocol	Ports
1	Po1(SU)	-	Gi1/0/4(P) Gi1/0/5(P) Gi2/0/3(P)

Note: This example shows the error message that displays when you try to configure the EtherChannel with PAgP:

```
Catalyst 3750 Switch Stack A
3750switchstackA(config)#interface range gigabitethernet 1/0/4 - 5
3750switchstackA(config-if-range)#channel-group 1 mode desirable
3750switchstackA(config-if-range)#switchport trunk encapsulation dot1q
3750switchstackA(config-if-range)#switchport mode trunk

3750switchstackA(config)#interface gigabitethernet 3/0/3
3750switchstackA(config-if)#channel-group 1 mode desirable

%With PAgP enabled, all ports in the Channel should belong to the same switch
Command rejected (Port-channel1, Gi2/0/3): Invalid etherchnl mode
```

Configure Cross-Stack EtherChannel with LACP

This example shows the configuration of the EtherChannel when you enable LACP. The minimum version of IOS that supports LACP in cross-stack Etherchannel is Cisco IOS Software Release 12.2(25)SEC. This example uses the active-active mode LACP configuration:

```
Catalyst 3750 Switch Stack A
3750switchstackA(config)#interface range gigabitethernet 1/0/4 - 5
3750switchstackA(config-if-range)#channel-group 1 mode active

!--- This creates port channel 1 and configures it with LACP.

3750switchstackA(config-if-range)#switchport trunk encapsulation dot1q
3750switchstackA(config-if-range)#switchport mode trunk

3750switchstackA(config)#interface gigabitethernet 3/0/3
3750switchstackA(config-if)#channel-group 1 mode active
3750switchstackA(config-if)#switchport trunk encapsulation dot1q
3750switchstackA(config-if)#switchport mode trunk
```

```
Catalyst 3750 Switch Stack B
3750switchstackB(config)#interface range gigabitethernet 1/0/2 - 4
3750switchst(config-if-range)#channel-group 1 mode active
3750switchst(config-if-range)#switchport trunk encapsulation dot1q
3750switchst(config-if-range)#switchport mode trunk
```

You can verify the EtherChannel status in this way:

```
3750switchstackA#show interfaces port-channel 1

Port-channel1 is up, line protocol is up (connected)
Hardware is EtherChannel, address is 0015.c6c1.3003 (bia 0015.c6c1.3003)
MTU 1500 bytes, BW 300000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Full-duplex, 100Mb/s, link type is auto, media type is unknown
input flow-control is off, output flow-control is unsupported
Members in this channel: Gi1/0/4 Gi1/0/5 Gi2/0/3
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:01, output 00:01:09, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
```

```

Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 1000 bits/sec, 1 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 2628 packets input, 236478 bytes, 0 no buffer
Received 2112 broadcasts (0 multicast)
 0 runts, 0 giants, 0 throttles
 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
 0 watchdog, 2090 multicast, 0 pause input
 0 input packets with dribble condition detected
3398 packets output, 280241 bytes, 0 underruns
 0 output errors, 0 collisions, 7 interface resets
 0 babbles, 0 late collision, 0 deferred
 0 lost carrier, 0 no carrier, 0 PAUSE output
 0 output buffer failures, 0 output buffers swapped out

```

```
3750switchstackA#show etherchannel 1 summary
```

```

Flags:  D - down          P - in port-channel
        I - stand-alone  s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

```

```

Number of channel-groups in use: 1
Number of aggregators:          1

```

Group	Port-channel	Protocol	Ports
1	Pol(SU)	LACP	Gil/0/4(P) Gil/0/5(P) Gi2/0/3(P)

This example shows the passive-active mode LACP configuration:

Catalyst 3750 Switch Stack A
<pre> 3750switchstackA(config)#interface range gigabitethernet 1/0/4 - 5 3750switchstackA(config-if-range)#channel-group 1 mode passive 3750switchstackA(config-if-range)#switchport trunk encapsulation dot1q 3750switchstackA(config-if-range)#switchport mode trunk 3750switchstackA(config)#interface gigabitethernet 3/0/3 3750switchstackA(config-if)#channel-group 1 mode passive 3750switchstackA(config-if)#switchport trunk encapsulation dot1q 3750switchstackA(config-if)#switchport mode trunk </pre>

Catalyst 3750 Switch Stack B
<pre> 3750switchstackB(config)#interface range gigabitethernet 1/0/2 - 4 3750switchst(config-if-range)#channel-group 1 mode active 3750switchst(config-if-range)#switchport trunk encapsulation dot1q 3750switchst(config-if-range)#switchport mode trunk </pre>

You can verify the EtherChannel status in this way:

```

3750switchstackA#show interfaces port-channel 1

Port-channel1 is up, line protocol is up (connected)
Hardware is EtherChannel, address is 0015.63f6.b704 (bia 0015.63f6.b704)
MTU 1500 bytes, BW 300000 Kbit, DLY 100 usec,
reliability 255/255, txload 1/255, rxload 1/255

```

```

Encapsulation ARPA, loopback not set
Full-duplex, 100Mb/s, link type is auto, media type is unknown
input flow-control is off, output flow-control is unsupported
Members in this channel: Gi1/0/4 Gi1/0/5 Gi2/0/3
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:00, output 00:07:33, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 1000 bits/sec, 2 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 3436 packets input, 302216 bytes, 0 no buffer
 Received 2807 broadcasts (0 multicast)
  0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 watchdog, 2785 multicast, 0 pause input
  0 input packets with dribble condition detected
3632 packets output, 306875 bytes, 0 underruns
  0 output errors, 0 collisions, 7 interface resets
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier, 0 PAUSE output
  0 output buffer failures, 0 output buffers swapped out

```

```
3750switchstackA#show etherchannel 1 summary
```

```

Flags:  D - down          P - in port-channel
        I - stand-alone  s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

```

```

Number of channel-groups in use: 1
Number of aggregators:          1

```

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Gi1/0/4(P) Gi1/0/5(P) Gi2/0/3(P)

Verify

Use this section to confirm that your configuration works properly.

The Output Interpreter Tool [🔗](#) (registered customers only) (OIT) supports certain **show** commands. Use the OIT to view an analysis of **show** command output.

Issue these commands in order to verify the port channel in Catalyst 3750 Switches that run Cisco IOS system software:

- **show interfaces port-channel** *[channel-group-number]*
- **show etherchannel** *[channel-group-number]* **summary**

Troubleshoot

There is currently no specific troubleshooting information available for this configuration.

Related Information

- **Unable to create more than twelve EtherChannels on the Catalyst 3750 stack using Cisco Network Assistant (CNA).**
 - **Sample Configuration: EtherChannel Between Catalyst Switches Running CatOS and Cisco IOS Software**
 - **EtherChannel Between Catalyst 3550/3560/3750 Series Switches and Catalyst Switches Running Cisco IOS System Software Configuration Example**
 - **Sample Configuration: EtherChannel Between Catalyst Switches Running CatOS**
 - **Configuring EtherChannel Between Catalyst 2900XL/3500XL Switches and CatOS Switches**
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