



## Flex Links

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**Note**

- For complete syntax and usage information for the commands used in this chapter, see these publications:  
[http://www.cisco.com/en/US/products/ps11846/prod\\_command\\_reference\\_list.html](http://www.cisco.com/en/US/products/ps11846/prod_command_reference_list.html)
- Cisco IOS Release 15.1SY supports only Ethernet interfaces. Cisco IOS Release 15.1SY does not support any WAN features or commands.



**Tip**

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

[http://www.cisco.com/en/US/products/hw/switches/ps708/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html)

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## Prerequisites for Flex Links

None.

## Restrictions for Flex Links

- You can configure only one Flex Links backup link for any active link, and it must be a different interface from the active interface.
- An interface can belong to only one Flex Links pair. An interface can be a backup link for only one active link. An active link cannot belong to another Flex Links pair.
- Neither of the links can be a port that belongs to an EtherChannel. However, you can configure two port channels (EtherChannel logical interfaces) as Flex Links, and you can configure a port channel and a physical interface as Flex Links, with either the port channel or the physical interface as the active link.
- A backup link does not have to be the same type as the active link (Fast Ethernet, Gigabit Ethernet, or port channel). However, you should configure both Flex Links with similar characteristics so that there are no loops or changes in operation if the standby link becomes active.
- STP is disabled on Flex Links ports. If STP is disabled on the switch, be sure that there are no Layer 2 loops in the network topology.
- Do not configure any STP features (for example, PortFast, BPDU Guard, and so forth) on Flex Links ports or the ports to which the links connect.
- Local administrative shut down or a link that starts forwarding again due to preemption is not considered a link failure. In those cases, the feature flushes the dynamic hosts and does not move them.
- Static MAC addresses that are configured on the primary link are not moved to the standby link.
- Static MAC addresses configured on a flex links port are restored when it starts forwarding again.

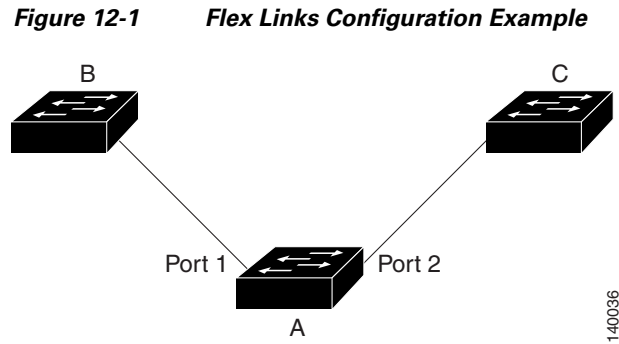
## Information About Flex Links

Flex Links are a pair of Layer 2 interfaces (ports or port channels), where one interface is configured to act as a backup to the other. Flex Links are typically configured in service-provider or enterprise networks where customers do not want to run STP. Flex Links provide link-level redundancy that is an alternative to Spanning Tree Protocol (STP). STP is automatically disabled on Flex Links interfaces.

Release 15.1SY supports a maximum of 16 Flex Links. Flex Links are supported only on Layer 2 ports and port channels, not on VLANs or on Layer 3 ports.

To configure the Flex Links feature, you configure one Layer 2 interface as the standby link for the link that you want to be primary. With Flex Links configured for a pair of interfaces, only one of the interfaces is in the linkup state and is forwarding traffic. If the primary link shuts down, the standby link starts forwarding traffic. When the inactive link comes back up, it goes into standby mode.

In [Figure 12-1](#), ports 1 and 2 on switch A are connected to uplink switches B and C. Because they are configured as Flex Links, only one of the interfaces is forwarding traffic and the other one is in standby mode. If port 1 is the active link, it begins forwarding traffic between port 1 and switch B; the link between port 2 (the backup link) and switch C is not forwarding traffic. If port 1 goes down, port 2 comes up and starts forwarding traffic to switch C. When port 1 comes back up, it goes into standby mode and does not forward traffic; port 2 continues to forward traffic.



If a primary (forwarding) link goes down, a trap notifies the network management stations. If the standby link goes down, a trap notifies the users. When a primary link fails, the feature takes these actions:

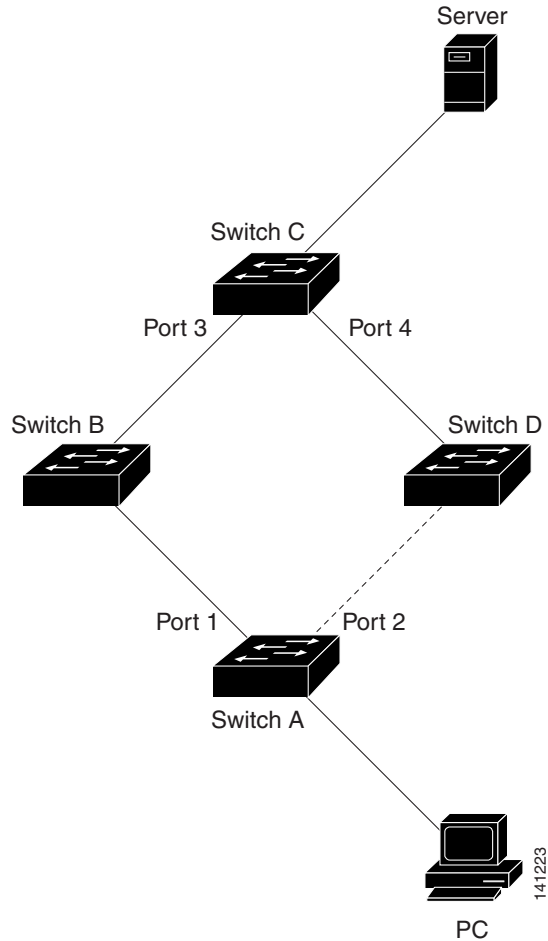
- Detects the failure.
- Moves any dynamic unicast MAC addresses that are learned on the primary link to the standby link.
- Moves the standby link to a forwarding state.
- Transmits dummy multicast packets over the new active interface. The dummy multicast packet format is:
  - Destination: 01:00:0c:cd:cd:cd
  - Source: MAC address of the hosts or ports on the newly active Flex Link port.

In [Figure 12-2](#), ports 1 and 2 on switch A are connected to switches B and D through a Flex Link pair. Port 1 is forwarding traffic, and port 2 is in the blocking state. Traffic from the PC to the server is forwarded from port 1 to port 3. The MAC address of the PC has been learned on port 3 of switch C. Traffic from the server to the PC is forwarded from port 3 to port 1.

If port 1 shuts down, port 2 starts forwarding traffic. If there is no traffic from the PC to the server after failover to port 2, switch C does not learn the MAC address of the PC on port 4, and because of that, switch C keeps forwarding traffic from the server to the PC out of port 3. There is traffic loss from the server to the PC because port 1 is down. To alleviate this problem, the feature sends out a dummy multicast packet with the source MAC address of the PC over port 2. Switch C learns the PC MAC address on port 4 and start forwarding traffic from the server to the PC out of port 4. One dummy multicast packet is sent out for every MAC address.

Flex links interface preemption specifies one of the ports in a flex links pair as preferred for traffic forwarding. The preference can be unconditional or it can be based on bandwidth availability. See the [“How to Configure Flex Links”](#) section on page 12-4.

Figure 12-2 Flexlink Dummy Multicast Packets Example



## Default Settings for Flex Links

- Flex links: not configured.
- Flex links interface preemption: not configured.
- Flex links interface preemption delay: 35 seconds.

## How to Configure Flex Links

To configure Flex Links, perform this task:

	Command	Purpose
Step 1	Router# <b>configure terminal</b>	Enters global configuration mode.
Step 2	Router(conf)# <b>interface</b> {{type slot/port}   {port-channel number}}	Specifies a Layer 2 interface.

	Command	Purpose
Step 3	Router(conf-if)# <b>switchport backup interface</b> <i>interface_id</i>	Configures the interface as part of a flex links pair. <ul style="list-style-type: none"> <li>The <i>interface_id</i> specifies can be a physical port or a port-channel interface.</li> <li>The backup interface must already be configured as a Layer 2 port.</li> </ul>
Step 4	Router(conf-if)# <b>switchport backup interface</b> <i>interface_id</i> <b>preemption mode</b> [ <b>forced</b>   <b>bandwidth</b>   <b>off</b> ]	(Optional) Configures the preferred flex links interface preemption port in the flex links pair. <ul style="list-style-type: none"> <li>The <i>interface_id</i> can be a physical port or a port-channel interface.</li> <li><b>forced</b>—the active interface always preempts the backup.</li> <li><b>bandwidth</b>—the interface with the higher bandwidth always acts as the active interface.</li> <li><b>off</b>—no preemption happens from active to backup.</li> </ul>
Step 5	Router(conf-if)# <b>switchport backup interface</b> <i>interface_id</i> <b>preemption delay</b> <i>delay_time</i>	(Optional) Configures the flex links interface preemption delay time for the flex links pair. <ul style="list-style-type: none"> <li>The <i>interface_id</i> can be a physical port or a port-channel interface.</li> <li>The range for <i>delay_time</i> is 1 through 300 seconds.</li> </ul>
Step 6	Router(conf-if)# <b>exit</b>	Exits configuration mode.

This example shows how to configure an interface with a flex links backup interface and how to verify the configuration:

```
Router# configure terminal
Router(conf)# interface tengigabitethernet 2/9
Router(conf-if)# switchport backup interface tengigabitethernet 2/12
Router(conf-if)# switchport backup interface tengigabitethernet 2/12 preemption mode
[forced | bandwidth | off]
Router(conf-if)# switchport backup interface tengigabitethernet 2/12 preemption delay 35
Router(conf-if)# exit
Router# show interface switchport backup detail
```

Switch Backup Interface Pairs:

```
Active Interface      Backup Interface      State
-----
Te2/9                Te2/12                Active Up/Backup Standby
Interface Pair       : Te2/9, Te2/12
Preemption Mode      : forced
Preemption Delay     : 35 seconds (default)
Bandwidth            : 10000000 Kbit (Te2/9), 10000000 Kbit (Te2/12)
```

# Monitoring Flex Links

To monitor the Flex Links configuration, perform this task:

Command	Purpose
<code>show interface</code> [{ <i>type slot/port</i> }   { <i>port-channel number</i> }] <code>switchport backup</code>	Displays the Flex Links backup interface configured for an interface, or displays all Flex Links configured on the switch and the state of each active and backup interface (up or standby mode).



### Tip

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

[http://www.cisco.com/en/US/products/hw/switches/ps708/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/hw/switches/ps708/tsd_products_support_series_home.html)

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