



# CHAPTER 22

## Configuring Flex Links and the MAC Address-Table Move Update Feature

This chapter describes how to configure Flex Links, a pair of interfaces on the IE 3000 switch that provide a mutual backup. It also describes how to configure the MAC address-table move update feature, also referred to as the Flex Links bidirectional fast convergence feature.

**Note**

For complete syntax and usage information for the commands used in this chapter, see the command reference

The chapter consists of these sections:

- [Understanding Flex Links and the MAC Address-Table Move Update, page 22-1](#)  
[Configuring Flex Links and the MAC Address-Table Move Update, page 22-7](#)  
[Monitoring Flex Links and the MAC Address-Table Move Update, page 22-14](#)

## Understanding Flex Links and the MAC Address-Table Move Update

- - [VLAN Flex Link Load Balancing and Support, page 22-2](#)  
[Flex Link Multicast Fast Convergence, page 22-3](#)  
[MAC Address-Table Move Update, page 22-6](#)

### Flex Links

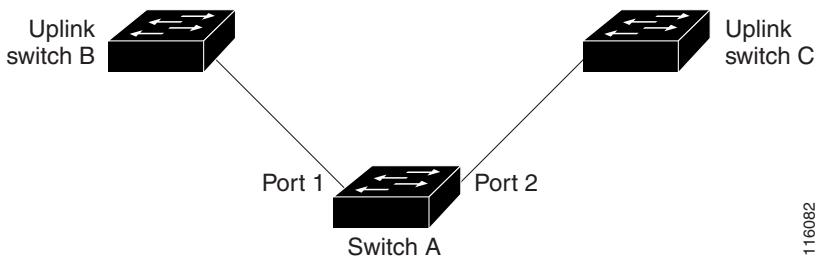
Flex Links are a pair of a Layer 2 interfaces (switch ports or port channels) where one interface is configured to act as a backup to the other. The feature provides an alternative solution to the Spanning Tree Protocol (STP). Users can disable STP and still retain basic link redundancy. Flex Links are typically configured in service provider or enterprise networks where customers do not want to run STP on the switch. If the switch is running STP, Flex Links is not necessary because STP already provides link-level redundancy or backup.

You configure Flex Links on one Layer 2 interface (the active link) by assigning another Layer 2 interface as the Flex Link or backup link. When one of the links is up and forwarding traffic, the other link is in standby mode, ready to begin forwarding traffic if the other link shuts down. At any given time, only one of the interfaces is in the linkup state and forwarding traffic. If the primary link shuts down, the standby link starts forwarding traffic. When the active link comes back up, it goes into standby mode and does not forward traffic. STP is disabled on Flex Link interfaces.

In Figure 22-1, 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; the other 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 forwarding traffic.

You can also choose to configure a preemption mechanism, specifying the preferred port for forwarding traffic. For example, in the example in [Figure 22-1](#), you can configure the Flex Links pair with preemption mode. In the scenario shown, when port 1 comes back up and has more bandwidth than port 2, port 1 begins forwarding traffic after 60 seconds. Port 2 becomes the standby port. You do this by entering the interface configuration **switchport backup interface** **preemption mode** **bandwidth** **switchport backup interface** **preemption delay**

## **Figure 22-1 Flex Links Configuration Example**

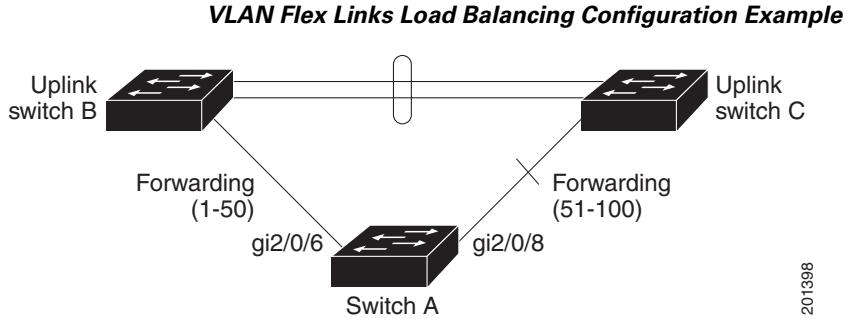


If a primary (forwarding) link goes down, a trap notifies the network management stations. If the standby link goes down, a trap notifies the users.

Flex Links are supported only on Layer 2 ports and port channels, not on VLANs.

# VLAN Flex Link Load Balancing and Support

are configured for 1-100 VLANs, the traffic of the first 50 VLANs can be forwarded on one port and the rest on the other port. If one of the ports fail, the other active port forwards all the traffic. When the failed port comes back up, it resumes forwarding traffic in the preferred VLANs. This way, apart from providing the redundancy, this Flex Link pair can be used for load balancing. Also, Flex Link VLAN load-balancing does not impose any restrictions on uplink switches.



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## Flex Link Multicast Fast Convergence

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- Generating IGMP Reports, page 22-3
  - Leaking IGMP Reports, page 22-4
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### Learning the Other Flex Link Port as the *mrouter* Port

In a typical multicast network, there is a querier for each VLAN. A switch deployed at the edge of a network has one of its Flex Link ports receiving queries. Flex Link ports are also always forwarding at any given time.

A port that receives queries is added as an *mrouter*

### Generating IGMP Reports

*interface-id* **multicast fast-convergence**

## Configuration Examples

Link is configured on GigabitEthernet1/1 and GigabitEthernet1/2, with output for the command:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface GigabitEthernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
                  switchport mode trunk
                  switchport backup interface Gi1/2
                  exit
interface GigabitEthernet1/2
                  switchport trunk encapsulation dot1q
                  switchport mode trunk
                  end
show interfaces switchport backup detail
Switch Backup Interface Pairs:
Active Interface Backup Interface State
GigabitEthernet1/1 GigabitEthernet1/2 Active Up/Backup Standby
Preemption Mode : off
Multicast Fast Convergence : Off
Bandwidth : 100000 Kbit (Gi1/1), 100000 Kbit (Gi1/2)
Mac Address Move Update Vlan : auto
```

Vlan	IP Address	IGMP Version	Port
1	1.1.1.1	v2	Gi1/1
401	41.41.41.1	v2	Gi1/1

Here is output for the command for VLANs 1 and 401:

```
Switch#
Vlan      ports
----      -----
1        Gi1/1(dynamic), Gi1/2(dynamic)
401     Gi1/1(dynamic), Gi1/2(dynamic)
```

```
1      228.1.5.1    igmp      v2          Gi1/1, Gi1/2, Fa2/1  
1      228.1.5.2    igmp      v2          Gi1/1, Gi1/2, Fa2/1
```

this example, when a host sends a report for the group 228.1.5.1, it is forwarded only on GigabitEthernet1/1, because the backup port GigabitEthernet1/2 is blocked. When the active link, GigabitEthernet1/1, goes down, the backup port, GigabitEthernet1/2, begins forwarding.

As soon as this port starts forwarding, the switch sends proxy reports for the groups 228.1.5.1 and 228.1.5.2 on behalf of the host. The upstream router learns the groups and starts forwarding multicast data. This is the default behavior of Flex Link. This behavior changes when the user configures fast convergence using the **switchport backup interface gigabitEthernet    multicast fast-convergence**

```
fast-convergence  
exit  
show interfaces switchport backup detail
```

```
show ip igmp snooping querier
```

```
show ip igmp snooping mrouter
```

```
show ip igmp snooping groups
```

## MAC Address-Table Move Update

switches B and D through a Flex Link pair. Port 1 is forwarding traffic, and port 2 is in the backup 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.

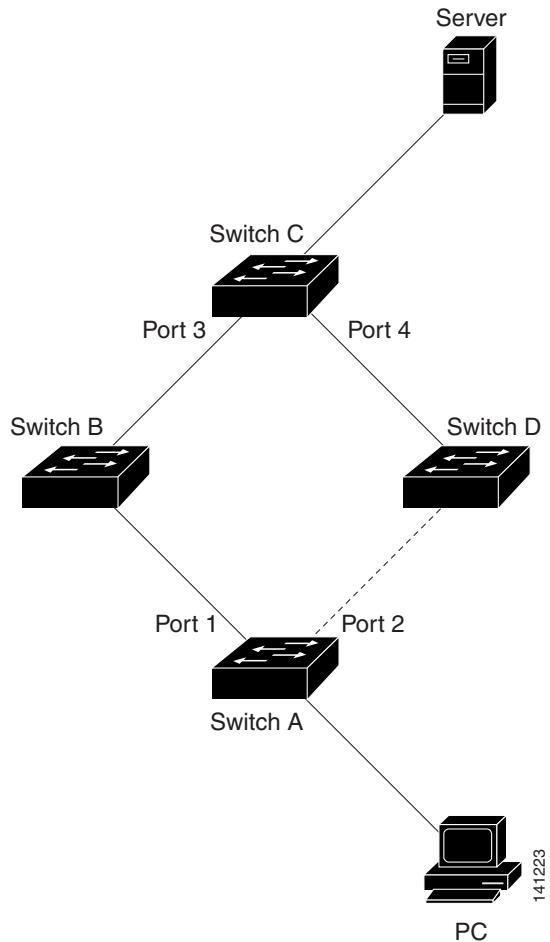
If the MAC address-table move update feature is not configured and port 1 goes down, port 2 starts forwarding traffic. However, for a short time, switch C keeps forwarding traffic from the server to the PC through port 3, and the PC does not get the traffic because port 1 is down. If switch C removes the MAC address of the PC on port 3 and relearns it on port 4, traffic can then be forwarded from the server to the PC through port 2.

If the MAC address-table move update feature is configured and enabled on the switches in [Figure 22-3](#) and port 1 goes down, port 2 starts forwarding traffic from the PC to the server. The switch sends a MAC address-table move update packet from port 2. Switch C gets this packet on port 4 and immediately learns the MAC address of the PC on port 4, which reduces the reconvergence time.

You can configure the access switch, switch A, to *send*

*get*

**Figure 22-3 MAC Address-Table Move Update Example**



## Configuring Flex Links and the MAC Address-Table Move Update

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[Configuring the MAC Address-Table Move Update Feature, page 22-12](#)

## **Default Configuration**

## **Configuration Guidelines**

Beginning in privileged EXEC mode, follow these steps to configure a pair of Flex Links:

Step	Command	Purpose
Step 1		
Step 2		
Step 3		
Step 4		
Step 5	[ ]	Verify the configuration.
Step 6		

To disable a Flex Link backup interface, use the configuration command.

interface

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

```
Vlans Preferred on Active Interface: 1-3,5-4094
Vlans Preferred on Backup Interface: 4
```

Step	Command	Purpose
Step 1		
Step 2		

Command	Purpose
]  <i>delay-time</i>	<p>Configure a preemption mechanism and delay for a Flex Link interface pair. You can configure the preemption as:</p> <ul style="list-style-type: none"> <li>Forced—the active interface always preempts the backup.</li> <li>Bandwidth—the interface with the higher bandwidth always acts as the active interface.</li> <li>Off—no preemption happens from active to backup.</li> </ul>
Step 7	
Step 8	

```

switchport backup interface gigabitethernet1/2 preemption delay 50
end

show interfaces switchport backup detail

```

```

Preemption Delay : 50 seconds
Bandwidth : 100000 Kbit (Gi1/1), 100000 Kbit (Gi1/2)
Mac Address Move Update Vlan : auto

```

## Configuring VLAN Load Balancing on Flex Links

	Enter global configuration mode.
	Specify the interface, and enter interface configuration mode. The interface can be a physical Layer 2 interface or a port channel (logical interface). The port-channel range is 1 to 6.
<i>prefer vlan</i>	

```
switchport backup interface gigabitEthernet 1/2 prefer vlan 60,100-120
```

```
show interfaces switchport backup
```

Vlans Preferred on Backup Interface: 60, 100-120

When a Flex Link interface goes down (LINK\_DOWN), VLANs preferred on this interface are moved to the peer interface of the Flex Link pair. In this example, if interface Gi1/1 goes down, Gi1/2 carries all VLANs of the Flex Link pair.

interface and moved to the forwarding state on the interface that has just come up. In this example, if interface Gi1/1 comes up, VLANs preferred on this interface are blocked on the peer interface Gi1/2 and forwarded on Gi1/1.

## Configuring the MAC Address-Table Move Update Feature

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	<b>Command</b>	<b>Purpose</b>
<b>Step 1</b>		
<b>Step 2</b>		
<b>Step 3</b>		


```
Switch-ID : 010b.4630.1780
Dst mac-address : 0180.c200.0010
Vlans/Macs supported : 1023/8320
Default/Current settings: Rcv Off/On, Xmt Off/On
Max packets per min : Rcv 40, Xmt 60
Rcv packet count : 5
Rcv conforming packet count : 5
Rcv invalid packet count : 0
Rcv packet count this min : 0
Rcv threshold exceed count : 0
Rcv last sequence# this min : 0
Rcv last interface : Po2
Rcv last src-mac-address : 000b.462d.c502
Rcv last switch-ID : 0403.fd6a.8700
Xmt packet count : 0
Xmt packet count this min : 0
Xmt threshold exceed count : 0
Xmt pak buf unavail cnt : 0
Xmt last interface : None
```


Switch#  
Switch(conf)#  
Switch(conf)#