# EtherChannel Flow-Based Limited 1:1 Redundancy

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EtherChannel flow-based limited 1:1 redundancy provides MAC, or layer 2, traffic protection to avoid higher layer protocols from reacting to single link failures and re-converging. To use EtherChannel flow-based limited 1:1 redundancy, you configure an EtherChannel with two ports (one active and one standby). If the active link goes down, the EtherChannel stays up and the system performs fast switchover to the hot-standby link. Depending on how you have the priorities set, when the failed link becomes operational again, the EtherChannel performs another fast switchover to revert to the original active link. if all port-priorities are the same, it will not revert, but remain on the current active link.

With 1:1 redundancy configured, only one link is active at any given time so all flows are directed over the active link.

## Finding Feature Information

For the latest feature information and caveats, see the release notes for your platform and software release.

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

## Contents



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# Information About EtherChannel Flow-based Limited 1:1 Redundancy

Before configuring EtherChannel Flow-Based Limited 1:1 Redundancy, you should be familiar with the following topics:

## EtherChannel Flow-Based Limited 1:1 Redundancy Functionality

Flow-based load balancing allows you to identify different flows of traffic based on the key fields in the data packet. For example, IPv4 source and destination IP addressees can be used to identify a flow. The various data traffic flows are mapped to different member links of a specified port-channel. Once the mapping is configured, the data traffic on that flow is transmitted through the specified member link. The flow mapping is dynamic and can change if there is any change in the state of the member link to which it is assigned. The flow mappings may also change if member links are added to or removed from the EtherChannel. Multiple flows may be mapped to each member link.

EtherChannel flow-based limited 1:1 redundancy provides an EtherChannel configuration with one active link and fast switchover to a hot standby link.

To use EtherChannel flow-based limited 1:1 redundancy, you configure an LACP EtherChannel with two ports (one active and one standby). If the active link goes down, the EtherChannel stays up and the system performs fast switchover to the hot standby link. Depending on how the priorities of the links are set, when the failed link becomes operational again, the EtherChannel performs another fast switchover to revert to the original active link, or to the link with the higher priority.

For EtherChannel flow-based limited 1:1 redundancy to work correctly (especially the fast switchover capability) the feature needs to be enabled at both ends of the link.



## Traffic Flow Balancing on a Per-Port-Channel Basis

All port channels use either VLAN manual load balancing and dynamic flow-based load balancing. If VLAN load balancing is not configured explicitly, the load balancing is flow-based.

## Dynamic Mapping of Flows to the Member Links of a Port-channel

Flow-to-member link mappings are managed through buckets. The various defined traffic flows are mapped to the buckets and the buckets are distributed among the member links. The flows mapped to a bucket use the member link to which this bucket is assigned. The ASR1000 forwarding processor receives mapping information and forwards it to be programmed in the QFP, including

- bucket-to-member link mappings
- member link state changes
- additions or removal of member links to and from a port-channel

When a member link goes down or is removed from a port-channel, the buckets associated with that member link are re-distributed among the other active member links. When a member link comes up or is added to a port-channel, some of the buckets associated with other links are assigned to this link.

You can display the bucket-to-member link mapping through show commands. When you display information about the links configured for the 1:1 redundancy, you will see that all buckets are directed to the active link.

# How to Configure Flow-Based Load Balancing

Flow-based load balancing has to be enabled globally. If nothing is configured on a port-channel, the load-balancing type configuration is enabled by default at the global level.

This section contains the following tasks:


- Configuring EtherChannel Flow-Based Limited 1:1 Redundancy with Fast-Switchover, page 3
- Setting the Switchover Rate with Carrier Delay, page 5


## Configuring EtherChannel Flow-Based Limited 1:1 Redundancy with Fast-Switchover

The EtherChannel flow-based 1:1 redundancy provides an EtherChannel configuration with one active link and fast switchover to a hot standby link.

To use EtherChannel flow-based 1:1 redundancy, configure an LACP EtherChannel with two ports (one active and one standby). If the active link goes down, the EtherChannel stays up and the system performs fast switchover to the hot-standby link. Depending on the priorities assigned to each link, when the failed link becomes operational again, the EtherChannel performs another fast switchover to revert to the original active link if that link is the one with the higher priority.

You can control which link is the primary active link by setting the port priority on the links used for the redundancy. To prevent the switchover to revert, you can assign both link the same priority.

### Prerequisites for Configuring EtherChannel Flow-Based Limited 1:1 Redundancy

To use EtherChannel 1:1 redundancy, especially the fast switchover capability, the feature needs to be enabled at both ends of the link.

The EtherChannel must contain exactly two links, of which only one is active. You may use bundled links. To configure a primary link and enable the EtherChannel to revert to the original link, one link must have a higher port priority than the other and the LACP max-bundle must be set to 1. This configuration results in link 1 being active and link 2 being in hot standby state.

#### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. interface port-channel number
4. **lacp fast-switchover**
5. **`lacp max-bundle 1`**

6. **interface tengigabitethernet** *number/slot/port*
7. **channel-group 1 mode active**
8. **lacp port-priority** *priority*
9. **interface tengigabitethernet***number/slot/port*
10. **channel-group 1 mode active**
11. **lacp port-priority** *priority*
12. **end**

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **enable**<br><br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface port-channel** *number*<br><br>**Example:**<br>`Router(config)# interface port-channel number` | Selects an LACP port channel interface. |
| **Step 4** | **lacp fast-switchover**<br><br>**Example:**<br>`Router(config-if)# lacp fast-switchover` | Enables the fast switchover feature for this EtherChannel. |
| **Step 5** | **lacp max-bundle 1**<br><br>**Example:**<br>`Router(config-if)# lacp max-bundle 1` | Sets the maximum number of active member ports to 1. |
| **Step 6** | **interface tengigabitethernet** *type carrier card/port adapter/port numb*<br><br>**Example:**<br>`Router(config)# interface tengigabitethernet 0/0/0` | Selects the first interface to add to the port channel. |
| **Step 7** | **channel-group 1 mode** *mode*<br><br>**Example:**<br>`Router(config-if)# channel-group 1 mode active` | Adds the member link to the port-channel and actively participates in LACP negotiation. |

| | Command | Purpose |
|---|---|---|
| **Step 8** | **lacp port-priority** *priority*<br><br>**Example:**<br>`Router(config-if)# lacp port-priority 32768` | Sets the priority on the port-channel. This priority is set to the default value. |
| **Step 9** | **interface tengigabitethernet** *type carrier card/port adapter/port numb*<br><br>**Example:**<br>`Router(config)# interface tengigabitethernet 1/0/0` | Selects the interface to add to the port channel. |
| **Step 10** | **channel-group 1 mode** *mode*<br><br>**Example:**<br>`Router(config-if)# channel-group 1 mode active` | Adds the member link to the port-channel and actively participates in LACP negotiation. |
| **Step 11** | **lacp port-priority** *priority*<br><br>**Example:**<br>`Router(config-if)# lacp port-priority 32767` | Sets the port priority higher than the other link by using a value lower than the default value of 32768. This forces this link to be the active link whenever it is capable of carrying traffic. |
| **Step 12** | **end**<br><br>**Example:**<br>`Router(config-if)# end` | Exits configuration mode. |

# Setting the Switchover Rate with Carrier Delay

Optionally, you can control the speed of the switchover between the active and standby links by setting the carrier delay on each link. The **carrier-delay** command controls how long it takes for IOS to propagate the information about the links status to other modules.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface tengigabitethernet** *type carrier card/port adapter/port numb*
4. **carrier-delay msec** *0-1000*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br><br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | `Router(config)#`**interface tengigabitethernet***type carrier card*/*port adapter*/*port numb*<br><br>**Example:**<br>`Router(config-if)#` **interface tengigabitethernet 0/1/0** | Enters interface configuration mode and opens the configuration for the specified interface. |
| **Step 4** | `Router(config)#`**carrier-delay msec** *0-1000*<br><br>**Example:**<br>`Router(config)#`**carrier-delay msec 11** | Sets how long it takes for IOS to propagate the link status to other modules. |
| **Step 5** | `end`<br><br>**Example:**<br>`Router(config-if)#` **end** | Exits interface configuration level. |
| **Step 6** | `exit`<br><br>**Example:**<br>`Router(config)#` **exit** | Exit to leave configuration mode. |

## Troubleshooting Tips

Use these show commands to verify the configuration and to display information about the port channel.

| | | |
|---|---|---|
| **Step 1** | `Router#` **show running-config interface** *type carrier card*/*port adapter*/*port numb*<br>`Router#` **show interfaces** *type carrier card*/*port adapter*/*port numb* **etherchannel** | Verifies the configuration.<br>*type*—**gigabitethernet**, **tengigabitethernet**. |
| **Step 2** | `Router#` **show etherchannel** *channel-group* **port-channel** | Displays the port channel fast-switchover feature capability. |

# Configuration Examples for EtherChannel Flow-based Limited1:1 Redundancy

This section contains the following examples:



## EtherChannel 1:1 Active Standby: Example

This example shows how to configure a port channel for 1:1 link redundancy for equal priority ports so there is no preference for which port is active.

```
Router# enable
Router# configure terminal
Router(config)# interface port-channel 2
Router(config-if)# ip address 10.1.1.1 255.255.0.0
Router(config-if)# negotiation auto
Router(config-if)# lacp max-bundle 1
Router(config-if)# lacp fast-switchover

Router(config)# interface Tengigabitethernet0/1/0
Router(config-if)# channel-group 2 mode active
Router(config-if)# negotiation auto

Router(config)# interface Tengigabitethernet 2/1/0
Router(config-if)# channel-group 2 mode active
Router(config-if)# negotiation auto
Router(config)# interface GigabitEthernet0/1/6
Router(config-if)# negotiation auto
Router(config-if)#channel-group 19 mode active
Router(config-if)#interface GigabitEthernet0/1/7
Router(config-if)#negotiation auto
Router(config-if)#channel-group 19 mode active
Router(config-if)# interface Port-channel19
Router(config-if)# ip address 10.19.1.1 255.255.255.0
Router(config-if)# no negotiation auto
Router(config-if)# lacp fast-switchover
Router(config-if)# lacp max-bundle 1
Router(config-if)# end
```

Notice that in the show command display that the priorities are the same value.

```
Router# show lacp internal

Flags: S - Device is requesting Slow LACPDUs
    F - Device is requesting Fast LACPDUs
    A - Device is in Active mode P - Device is in Passive mode
Channel group 19
LACP port Admin Oper Port Port
Port Flags State Priority Key Key Number State
Gi0/1/6 SA bndl 32768 0x13 0x13 0x47 0x3D
Gi0/1/7 FA hot-sby 32768 0x13 0x13 0x48 0x7
```

## Setting Priority for 1:1 Redundancy Using LACP: Example

This example shows how to configure an LACP EtherChannel with 1:1 redundancy. GigabitEthernet 0/1/7 is the active link, because it is configured with a lower number which gives it a higher port priority.

```
Router> enable
Router# configure terminal
Router(config)# interface GigabitEthernet0/1/6
Router(config-if)# lacp port-priority 32767
Router(config-if)# end

Router(config)#interface GigabitEthernet0/1/7
Router(config-if)#lacp fast-switchover
Router(config-if)#lacp max-bundle 1
Router(config-if)#negotiation auto
Router(config-if)#channel-group 19 mode active
```

In this show display, notice that the bundled link is set at a higher priority. This will ensure that the bundled link is used as the first active link in the standby configuration.

```
Router#show lacp internal
Flags: S - Device is requesting Slow LACPDUs
    F - Device is requesting Fast LACPDUs
    A - Device is in Active mode P - Device is in Passive mode
Channel group 19
LACP port Admin Oper Port Port
Port Flags State Priority Key Key Number State
Gi0/1/6 FA hot-sby 32768 0x13 0x13 0x47 0x7
Gi0/1/7 SA bndl 32767 0x13 0x13 0x48 0x3D
```

# Additional References

The following sections provide references related to the <<Feature Name>> feature.

## Related Documents

| Related Topic | Document Title |
|---|---|
| LAN Switching commands | *Cisco IOS LAN Switching Command Reference* |

## Standards

| Standard | Title |
|---|---|
| No standards were created or modified to support this feature. | – |

# MIBs

| MIB | MIBs Link |
|---|---|
| • No MIBS were created or modified to support this feature. | To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:<br>http://www.cisco.com/go/mibss |

# RFCs

| RFC | Title |
|---|---|
| No RFCs were created or modified to support this feature. | – |

# Technical Assistance

| Description | Link |
|---|---|
| The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.<br>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.<br>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password. | http://www.cisco.com/ |

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