



Configuring IRB on the ML-Series Card

This chapter describes how to configure integrated routing and bridging (IRB) for the ML-Series card. For more information about the Cisco IOS commands used in this chapter, refer to the *Cisco IOS Command Reference* publication.

This chapter includes the following major sections:

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- [Monitoring and Verifying IRB, page 11-4](#)



Caution

Cisco Inter-Switch Link (ISL) and Cisco Dynamic Trunking Protocol (DTP) are not supported by the ML-Series, but the ML-Series broadcast forwards these formats. Using ISL or DTP on connecting devices is not recommended. Some Cisco devices attempt to use ISL or DTP by default.

Understanding Integrated Routing and Bridging

Your network might require you to bridge local traffic within several segments and have hosts on the bridged segments reach the hosts or ML-Series card on routed networks. For example, if you are migrating bridged topologies into routed topologies, you might want to start by connecting some of the bridged segments to the routed networks.

Using the integrated routing and bridging (IRB) feature, you can route a given protocol between routed interfaces and bridge groups within a single ML-Series card. Specifically, local or unroutable traffic is bridged among the bridged interfaces in the same bridge group, while routable traffic is routed to other routed interfaces or bridge groups.

Because bridging is in the data link layer and routing is in the network layer, they have different protocol configuration models. With IP, for example, bridge group interfaces belong to the same network and have a collective IP network address. In contrast, each routed interface represents a distinct network and has its own IP network address. It uses the concept of a Bridge Group Virtual Interface (BVI) to enable these interfaces to exchange packets for a given protocol.

A BVI is a virtual interface within the ML-Series card that acts like a normal routed interface. A BVI does not support bridging but actually represents the corresponding bridge group to routed interfaces within the ML-Series card. It also gives the user an IP management interface for the bridge group. The interface number is the link between the BVI and the bridge group.

Before configuring IRB, consider the following:

- The default routing/bridging behavior in a bridge group (when IRB is enabled) is to bridge all packets. Make sure that you explicitly configure routing on the BVI for IP traffic.
- Packets of unroutable protocols such as local-area transport (LAT) are always bridged. You cannot disable bridging for the unroutable traffic.
- Protocol attributes should not be configured on the bridged interfaces when you are using IRB to bridge and route a given protocol. You can configure protocol attributes on the BVI, but you cannot configure bridging attributes on the BVI.
- A bridge links several network segments into one large, flat network. To bridge a packet coming from a routed interface among bridged interfaces, the bridge group should be represented by one interface.
- All ports in a BVI group must have matching maximum transmission unit (MTU) settings.

Configuring IRB

The process of configuring integrated routing and bridging consists of the following tasks:

1. Configure bridge groups and routed interfaces.
 - a. Enable bridging.
 - b. Assign interfaces to the bridge groups.
 - c. Configure the routing.
2. Enable IRB.
3. Configure the BVI.
 - a. Enable the BVI to accept routed packets.
 - b. Enable routing on the BVI.
4. Configure IP addresses on the routed interfaces.
5. Verify the IRB configuration.

When you configure the BVI and enable routing on it, packets that come in on a routed interface destined for a host on a segment that is in a bridge group are routed to the BVI and forwarded to the bridging engine. From the bridging engine, the packet exits through a bridged interface. Similarly, packets that come in on a bridged interface but are destined for a host on a routed interface go first to the BVI. The BVI forwards the packets to the routing engine that sends them out on the routed interface.

To configure a bridge group and an interface in the bridge group, perform the following procedure, beginning in global configuration mode:

	Command	Purpose
Step 1	<code>ML_Series(config)# bridge <i>bridge-group</i> protocol {<i>ieee</i> <i>rstp</i>}</code>	Defines one or more bridge groups.
Step 2	<code>ML_Series(config)# interface <i>type number</i></code>	Enters interface configuration mode.
Step 3	<code>ML_Series(config-if)# bridge-group <i>bridge-group</i></code>	Assigns the interface to the specified bridge group.

	Command	Purpose
Step 4	ML_Series(config-if)# ip address <i>ip-address ip-address-subnet-mask</i>	Configures IP addresses on routed interfaces.
Step 5	ML_Series(config-if)# end	Returns to privileged EXEC mode.

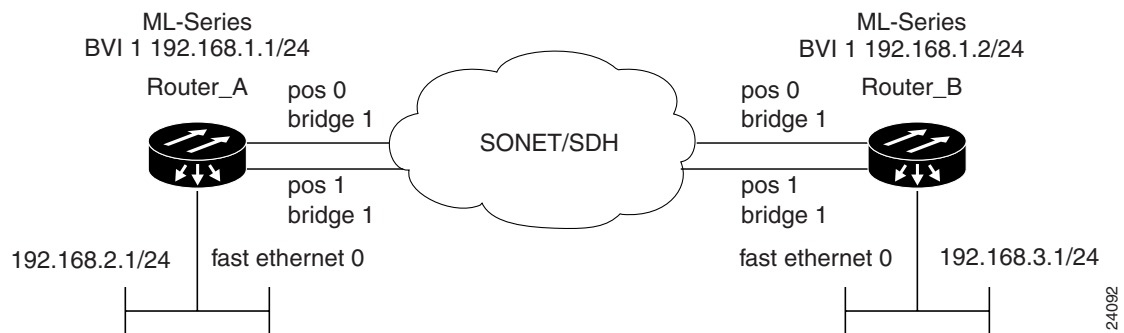
To enable and configure IRB and BVI, perform the following procedure, beginning in global configuration mode:

	Command	Purpose
Step 1	ML_Series(config)# bridge irb	Enables IRB. Allows bridging of traffic.
Step 2	ML_Series(config)# interface bvi <i>bridge-group</i>	Configures the BVI by assigning the number of the corresponding bridge group to the BVI. Each bridge group can have only one corresponding BVI.
Step 3	ML_Series(config-if)# ip address <i>ip-address ip-address-subnet-mask</i>	Configures IP addresses on routed interfaces.
Step 4	ML_Series(config-if)# exit	Exits the interface configuration mode.
Step 5	ML_Series(config)# bridge bridge-group route protocol	Enables a BVI to accept and route routable packets received from its corresponding bridge group. Enter this command for each protocol that you want the BVI to route from its corresponding bridge group to other routed interfaces.
Step 6	ML_Series(config)# end	Returns to the privileged EXEC mode.
Step 7	ML_Series# copy running-config startup-config	(Optional) Saves your configuration changes to NVRAM.

IRB Configuration Example

Figure 11-1 shows an example of IRB configuration. Example 11-1 shows the configuration code for ML_Series A, and Example 11-2 shows the configuration code for ML_Series B.

Figure 11-1 Configuring IRB



Example 11-1 Configuring ML_Series A

```
bridge irb
bridge 1 protocol ieee
  bridge 1 route ip
!
!
interface FastEthernet0
  ip address 192.168.2.1 255.255.255.0

!
interface POS0
no ip address
bridge-group 1
!
interface POS1
no ip address
bridge-group 1
!
interface BVI1
  ip address 192.168.1.1 255.255.255.0
!
router ospf 1
  log-adjacency-changes
  network 192.168.1.0 0.0.0.255 area 0
  network 192.168.2.0 0.0.0.255 area 0
```

Example 11-2 Configuring ML_Series B

```
bridge irb
bridge 1 protocol ieee
  bridge 1 route ip
!
!
interface FastEthernet0
  ip address 192.168.3.1 255.255.255.0

!
interface POS0
no ip address
bridge-group 1
!
interface POS1
no ip address
bridge-group 1
!
interface BVI1
  ip address 192.168.1.2 255.255.255.0
!
router ospf 1
  log-adjacency-changes
  network 192.168.1.0 0.0.0.255 area 0
  network 192.168.3.0 0.0.0.255 area 0
```

Monitoring and Verifying IRB

Table 11-1 shows the privileged EXEC commands for monitoring and verifying IRB.

Table 11-1 Commands for Monitoring and Verifying IRB

Command	Purpose
Router# show interfaces bvi bvi-interface-number	Shows BVI information, such as the BVI MAC address and processing statistics. The bvi-interface-number is the number of the bridge group assigned to the BVI interface.
Router# show interfaces [type-number] irb	Shows BVI information for the following: <ul style="list-style-type: none"> • Protocols that this bridged interface can route to the other routed interface (if this packet is routable). • Protocols that this bridged interface bridges

The following is sample output from the **show interfaces bvi** (Example 11-3) and **show interfaces irb** commands (Example 11-4):

Example 11-3 *show interfaces bvi*

```
Router# show interfaces bvi 22
BVI22 is down, line protocol is down
  Hardware is BVI, address is 0012.0101.362c (bia 0000.0000.0000)
  Internet address is 192.192.192.194/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 5000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation: ARPA, loopback not set
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, 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: 0/0 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts (0 IP multicast)
    0 runs, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
```

Example 11-4 *show interfaces irb*

```
Router# show interfaces irb
BVI 22
pkts_error_giants          0

  Hash Len  Address      Matches  Act    Type
pkts_error_runts
  0x00:  0 ffff.ffff.ffff          0 RCV Physical broadcast
pkts_mcast
  0x2B:  0 0012.0101.362a          0 RCV Interface MAC addressfailures, 0 out
align_errors              0
  0xC0:  0 0100.0ccc.cccc          0 RCV CDPcarrier transitions
Overruns
Bridged protocols on POS0:
```

```

clns      ip
Software MAC address filter on POS0
Hash Len  Address      Matches  Act      Type
0x00:  0  ffff.ffff.ffff      0  RCV  Physical broadcast
0x25:  0  0012.0101.3624      0  RCV  Interface MAC address
0x29:  0  0012.0101.3628      0  RCV  Interface MAC address
0xC0:  0  0100.0ccc.cccc      0  RCV  CDP
0xC2:  0  0180.c200.0000      0  RCV  IEEE spanning tree
POS1
Bridged protocols on POS1:
clns      ip
Software MAC address filter on POS1
Hash Len  Address      Matches  Act      Type
0x00:  0  ffff.ffff.ffff      0  RCV  Physical broadcast
0x24:  0  0012.0101.3625      0  RCV  Interface MAC address
0x29:  0  0012.0101.3628      0  RCV  Interface MAC address
0xC0:  0  0100.0ccc.cccc      0  RCV  CDP
0xC2:  0  0180.c200.0000      0  RCV  IEEE spanning tree

```

Table 11-2 describes significant fields shown in the display.

Table 11-2 *show interfaces irb Field Descriptions*

Field	Description
Routed protocols on...	List of the routed protocols configured for the specified interface.
Bridged protocols on...	List of the bridged protocols configured for the specified interface.
Software MAC address filter on...	Table of software MAC address filter information for the specified interface.
Hash	Hash key/relative position in the keyed list for this MAC-address entry.
Len	Length of this entry to the beginning element of this hash chain.
Address	Canonical (Ethernet ordered) MAC address.
Matches	Number of received packets matched to this MAC address.
Routed protocols on...	List of the routed protocols configured for the specified interface.
Bridged protocols on...	List of the bridged protocols configured for the specified interface.