Configuring IPv6 Multicast PFC3 and DFC3 Layer 3 Switching

The PFC3 and DFC3 provide hardware support for IPv6 multicast traffic. Use these publications to configure IPv6 multicast in Cisco IOS Release 12.2SX:

- The *Cisco IOS IPv6 Configuration Library*, "Implementing IPv6 Multicast":
  http://www.cisco.com/en/US/docs/ios-xml/ios/ipv6/configuration/12-2sy/ipv6-12-2sy-book.html
- The *Cisco IOS IPv6 Command Reference*:
  http://www.cisco.com/en/US/docs/ios/ipv6/command/reference/ipv6_book.html

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

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These sections provide additional information about IPv6 multicast support in Cisco IOS Release 12.2SX:

Features that Support IPv6 Multicast

These features support IPv6 multicast:

- RPR redundancy mode—See Chapter 7, "Configuring RPR Supervisor Engine Redundancy."
- Multicast Listener Discovery version 2 (MLDv2) snooping—See Chapter 36, "Configuring MLD Snooping for IPv6 Multicast Traffic."

Note MLDv1 snooping is not supported.

- IPv6 Multicast rate limiters—See Chapter 52, "Configuring Denial of Service Protection."
- IPv6 Multicast: Bootstrap Router (BSR)—See the BSR information in the *Cisco IOS IPv6 Configuration Library* and the *Cisco IOS IPv6 Command Reference*.
- IPv6 Access Services—See this publication for more information:

  http://www.cisco.com/en/US/docs/ios-xml/ios/ipv6/config_library/15-sy/ipv6-15-sy-library.html
- SSM mapping for IPv6—See this publication for more information:

  http://www.cisco.com/en/US/docs/ios-xml/ios/ipv6/config_library/15-sy/ipv6-15-sy-library.html

IPv6 Multicast Guidelines and Restrictions

These guidelines and restrictions apply to IPv6 multicast support in Cisco IOS Release 12.2SX:

- The PFC3 and DFC3 provide hardware support for the following:
  - Completely switched IPv6 multicast flows
  - IPv6 PIM-Sparse Mode (PIM-SM) (S,G) and (*,G) forwarding

Note Release 12.2(33)SXH provides initial support for IPv6 PIM-SM (*,G) forwarding.

  - Multicast RPF check for IPv6 PIM-SM (S,G) traffic using the NetFlow table
  - Rate limiting of IPv6 PIM-SM (S,G) traffic that fails the multicast RPF check
  - Static IPv6 multicast routes
  - SSM Mapping for IPv6 (PIM-SSM)
  - IPv6 multicast forwarding information base (MFIB) using the NetFlow table
  - IPv6 distributed MFIB (dMFIB) using the NetFlow table
  - Link-local and link-global IPv6 multicast scopes
  - Egress multicast replication with the **ipv6 mfib hardware-switching** command
  - Ingress interface statistics for multicast routes (egress interface statistics not available)
  - RPR redundancy mode (see Chapter 7, "Configuring RPR Supervisor Engine Redundancy")
  - Ingress and egress PFC QoS (see Chapter 43, "Configuring PFC QoS")
  - Input and output Cisco access-control lists (ACLs)

- The PFC3 and DFC3 do not provide hardware support for the following:
  - Partially switched IPv6 multicast flows
  - Multicast RPF check for PIM-SM (*,G) traffic
  - Multicast helper maps
  - Site-local multicast scopes
  - Manually configured IPv6 over IPv4 tunnels
  - IPv6 multicast 6to4 tunnels
  - IPv6 multicast automatic tunnels
  - IPv6 over GRE tunnels
  - IPv6-in-IPv6 PIM register tunnels
  - IPv6 multicast basic ISATAP tunnels
  - ISATAP tunnels with embedded 6to4 tunnels

New or Changed IPv6 Multicast Commands

See the Cisco IOS Master Command List for information about these IPv6 multicast commands:

- **ipv6 mfib hardware-switching**
- **mls rate-limit multicast ipv6** (see Chapter 52, "Configuring Denial of Service Protection")
- **show ipv6 mfib**
- **show mls rate-limit** (see Chapter 52, "Configuring Denial of Service Protection")
- **show platform software ipv6-multicast**
- **show tcam interface**

Configuring IPv6 Multicast Layer 3 Switching

To configure IPv6 multicast Layer 3 switching, perform this task:

	Command	Purpose
Step 1	`Router(config)# ipv6 unicast-routing`	Enables unicast routing on all Layer 3 interfaces.
Step 2	`Router(config)# ipv6 multicast-routing`	Enables PIM-SM on all Layer 3 interfaces.
Step 3	`Router(config)# ipv6 mfib hardware-switching`	Enables MFIB hardware switching globally.

Using show Commands to Verify IPv6 Multicast Layer 3 Switching

These sections describe how to use **show** commands to verify IPv6 multicast Layer 3 switching:

Note The **show** commands in the following sections are for a switch with a DFC3-equipped switching module in slot 1 and a Supervisor Engine 720 with a PFC3 in slot 6.

Verifying MFIB Clients

This example shows the complete output of the **show ipv6 mrib client** command:

```
Router# show ipv6 mrib client
IP MRIB client-connections
mfib ipv6:81    (connection id 0)
igmp:124        (connection id 1)
pim:281 (connection id 2)
slot 1  mfib ipv6 rp agent:15   (connection id 3)
slot 6  mfib ipv6 rp agent:15   (connection id 4)
```

This example shows how to display the MFIB client running on the route processor (RP):

```
Router# show ipv6 mrib client | include ^mfib ipv6
mfib ipv6:81    (connection id 0)
```

This example shows how to display the MFIB clients running on the PFC3 and any DFC3s:

```
Router# show ipv6 mrib client | include slot
slot 1  mfib ipv6 rp agent:15   (connection id 3)
slot 6  mfib ipv6 rp agent:15   (connection id 4)
```

Displaying the Switching Capability

This example displays the complete output of the **show platform software ipv6-multicast capability** command:

```
Router# show platform software ipv6-multicast capability

 Hardware switching for IPv6 is enabled
 (S,G) forwarding for IPv6 supported using Netflow
 (*,G) bridging for IPv6 is supported using FIB
 Directly-connected entries for IPv6 is supported using ACL-TCAM.
```

```
Current System HW Replication Mode : Ingress
Auto-detection of Replication Mode : ON

Slot Replication-Capability Replication-Mode
   1 Ingress                Ingress
   2 Egress                 Ingress
   6 Egress                 Ingress
   8 Ingress                Ingress
```

Verifying the (S,G) Forwarding Capability

This example shows how to verify the (S,G) forwarding:

```
Router# show platform software ipv6-multicast capability | include (S,G)
 (S,G) forwarding for IPv6 supported using Netflow
```

Verifying the (*,G) Forwarding Capability

This example shows how to verify the (*,G) forwarding:

```
Router# show platform software ipv6-multicast capability | include (\*,G)
 (*,G) bridging for IPv6 is supported using FIB
```

Verifying the Subnet Entry Support Status

This example shows how to verify the subnet entry support status:

```
Router# show platform software ipv6-multicast capability | include entries
 Directly-connected entries for IPv6 is supported using ACL-TCAM.
```

Verifying the Current Replication Mode

This example shows how to verify the current replication mode:

```
Router# show platform software ipv6-multicast capability | include Current
Current System HW Replication Mode : Ingress
```

Note Enter the **no ipv6 mfib hardware-switching replication-mode ingress** command to enable replication mode auto-detection.

Displaying the Replication Mode Auto-Detection Status

This example shows how to display the replication mode auto-detection status:

```
Router# show platform software ipv6-multicast capability | include detection
Auto-detection of Replication Mode : ON
```

Displaying the Replication Mode Capabilities

This example shows how to display the replication mode capabilities of the installed modules:

```
Router# show platform software ipv6-multicast capability | begin ^Slot
Slot Replication-Capability Replication-Mode
   1 Ingress                Ingress
   2 Egress                 Ingress
   6 Egress                 Ingress
   8 Ingress                Ingress
```

Displaying Subnet Entries

This example shows how to display subnet entries:

```
Router# show platform software ipv6-multicast connected
IPv6 Multicast Subnet entries
Flags : H - Installed in ACL-TCAM
        X - Not installed in ACL-TCAM due to
            label-full exception
Interface: Vlan20 [ H ]
         S:20::1 G:FF00::
Interface: Vlan10 [ H ]
         S:10::1 G:FF00::
```

Note In this example, there are subnet entries for VLAN 10 and VLAN 20.

Displaying the IPv6 Multicast Summary

This example shows how to display the IPv6 multicast summary:

```
Router# show platform software ipv6-multicast summary
IPv6 Multicast Netflow SC summary on Slot[1]:
Shortcut Type               Shortcut count
----------------------------+--------------
(S, G)                      100
(*, G)                      0
IPv6 Multicast FIB SC summary on Slot[1]:
Shortcut Type               Shortcut count
----------------------------+--------------
(*, G/128)                  10
(*, G/m)                    47

IPv6 Multicast Netflow SC summary on Slot[6]:
Shortcut Type               Shortcut count
----------------------------+--------------
(S, G)                      100
(*, G)                      0
IPv6 Multicast FIB SC summary on Slot[6]:
Shortcut Type               Shortcut count
----------------------------+--------------
(*, G/128)                  10
(*, G/m)                    47
```

Displaying the NetFlow Hardware Forwarding Count

This example shows how to display the NetFlow hardware forwarding count:

```
Router# show platform software ipv6-multicast summary
IPv6 Multicast Netflow SC summary on Slot[1]:
Shortcut Type               Shortcut count
---------------------------+--------------
(S, G)                      100
(*, G)                      0

<...Output deleted...>

IPv6 Multicast Netflow SC summary on Slot[6]:
Shortcut Type               Shortcut count
---------------------------+--------------
(S, G)                      100
(*, G)                      0
<...Output truncated...>
```

Note The NetFlow (*, G) count is always zero because PIM-SM (*,G) forwarding is supported in software on the RP.

Displaying the FIB Hardware Bridging and Drop Counts

This example shows how to display the FIB hardware bridging and drop hardware counts:

```
Router# show platform software ipv6-multicast summary | begin FIB
IPv6 Multicast FIB SC summary on Slot[1]:
Shortcut Type               Shortcut count
---------------------------+--------------
(*, G/128)                  10
(*, G/m)                    47

<...Output deleted...>

IPv6 Multicast FIB SC summary on Slot[6]:
Shortcut Type               Shortcut count
---------------------------+--------------
(*, G/128)                  10
(*, G/m)                    47
```

Note

- The (*, G/128) value is a hardware bridge entry count.
- The (*, G/m) value is a hardware bridge/drop entry count.

Displaying the Shared and Well-Known Hardware Adjacency Counters

The **show platform software ipv6-multicast shared-adjacencies** command displays the shared and well-known hardware adjacency counters used for IPv6 multicast by entries in FIB and ACL-TCAM.

```
Router# show platform software ipv6-multicast shared-adjacencies
```

```
---- SLOT [1] ----

Shared IPv6 Mcast Adjacencies Index  Packets       Bytes
----------------------------- ------ ------------ ------------------
Subnet bridge adjacency       0x7F802  0            0
Control bridge adjacency      0x7      0            0
StarG_M bridge adjacency      0x8      0            0
S_G bridge adjacency          0x9      0            0
Default drop adjacency        0xA      0            0
StarG (spt == INF) adjacency  0xB      0            0
StarG (spt != INF) adjacency  0xC      0            0

---- SLOT [6] ----

Shared IPv6 Mcast Adjacencies Index  Packets       Bytes
----------------------------- ------ ------------ ------------------
Subnet bridge adjacency       0x7F802  0            0
Control bridge adjacency      0x7      0            0
StarG_M bridge adjacency      0x8      0            0
S_G bridge adjacency          0x9      0            0
Default drop adjacency        0xA      28237        3146058
StarG (spt == INF) adjacency  0xB      0            0
StarG (spt != INF) adjacency  0xC      0            0
```

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