Configuring Multicast VLAN Registration

Finding Feature Information

Your software release may not support all the features documented in this module. 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 software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Restrictions for MVR

The following are restrictions for MVR:

- Only Layer 2 ports participate in MVR. You must configure ports as MVR receiver ports.

- Only one MVR multicast VLAN per switch or switch stack is supported.

- The switch supports homogeneous stacking, but does not support mixed stacking.

- Receiver ports can only be access ports; they cannot be trunk ports. Receiver ports on a switch can be in different VLANs, but should not belong to the multicast VLAN.

- The maximum number of multicast entries (MVR group addresses) that can be configured on a switch (that is, the maximum number of television channels that can be received) is 256.

- MVR multicast data received in the source VLAN and leaving from receiver ports has its time-to-live (TTL) decremented by 1 in the switch.

- Because MVR on the switch uses IP multicast addresses instead of MAC multicast addresses, alias IP multicast addresses are allowed on the switch. However, if the switch is interoperating with Catalyst 3550 or Catalyst 3500 XL switches, you should not configure IP addresses that alias between themselves or with the reserved IP multicast addresses (in the range 224.0.0.xxx).

- Do not configure MVR on private VLAN ports.

- MVR is not supported when multicast routing is enabled on a switch. If you enable multicast routing and a multicast routing protocol while MVR is enabled, MVR is disabled, and you receive a warning message. If you try to enable MVR while multicast routing and a multicast routing protocol are enabled, the operation to enable MVR is cancelled, and you receive an error message.

- MVR data received on an MVR receiver port is not forwarded to MVR source ports.

- MVR does not support IGMPv3 messages.

Note   MVR can coexist with IGMP snooping on a switch.

Information About Multicast VLAN Registration

Multicast VLAN Registration (MVR) is designed for applications using wide-scale deployment of multicast traffic across an Ethernet ring-based service-provider network (for example, the broadcast of multiple television channels over a service-provider network). MVR allows a subscriber on a port to subscribe and unsubscribe to a multicast stream on the network-wide multicast VLAN. It allows the single multicast VLAN to be shared in the network while subscribers remain in separate VLANs. MVR provides the ability to continuously send multicast streams in the multicast VLAN, but to isolate the streams from the subscriber VLANs for bandwidth and security reasons.

MVR and IGMP

MVR assumes that subscriber ports subscribe and unsubscribe (join and leave) these multicast streams by sending out IGMP join and leave messages. These messages can originate from an IGMP version-2-compatible host with an Ethernet connection. Although MVR operates on the underlying method of IGMP snooping, the two features operate independently of each other. One can be enabled or disabled without affecting the behavior of the other feature. However, if IGMP snooping and MVR are both enabled, MVR reacts only to join and leave messages from multicast groups configured under MVR. Join and leave messages from all other multicast groups are managed by IGMP snooping.

The switch CPU identifies the MVR IP multicast streams and their associated IP multicast group in the switch forwarding table, intercepts the IGMP messages, and modifies the forwarding table to include or remove the subscriber as a receiver of the multicast stream, even though the receivers might be in a different VLAN from the source. This forwarding behavior selectively allows traffic to cross between different VLANs.

Modes of Operation

You can set the switch for compatible or dynamic mode of MVR operation:

- In compatible mode, multicast data received by MVR hosts is forwarded to all MVR data ports, regardless of MVR host membership on those ports. The multicast data is forwarded only to those receiver ports that MVR hosts have joined, either by IGMP reports or by MVR static configuration. IGMP reports received from MVR hosts are never forwarded from MVR data ports that were configured in the switch.

- In dynamic mode, multicast data received by MVR hosts on the switch is forwarded from only those MVR data and client ports that the MVR hosts have joined, either by IGMP reports or by MVR static configuration. Any IGMP reports received from MVR hosts are also forwarded from all the MVR data ports in the host. This eliminates using unnecessary bandwidth on MVR data port links, which occurs when the switch runs in compatible mode.

Switch Stacks

Only one MVR multicast VLAN per switch or switch stack is supported.

Receiver ports and source ports can be on different switches in a switch stack. Multicast data sent on the multicast VLAN is forwarded to all MVR receiver ports across the stack. When a new switch is added to a stack, by default it has no receiver ports.

If a switch fails or is removed from the stack, only those receiver ports belonging to that switch will not receive the multicast data. All other receiver ports on other switches continue to receive the multicast data.

MVR in a Multicast Television Application

In a multicast television application, a PC or a television with a set-top box can receive the multicast stream. Multiple set-top boxes or PCs can be connected to one subscriber port, which is a switch port configured as an MVR receiver port.

The following is an example configuration.

Figure 1: Multicast VLAN Registration Example
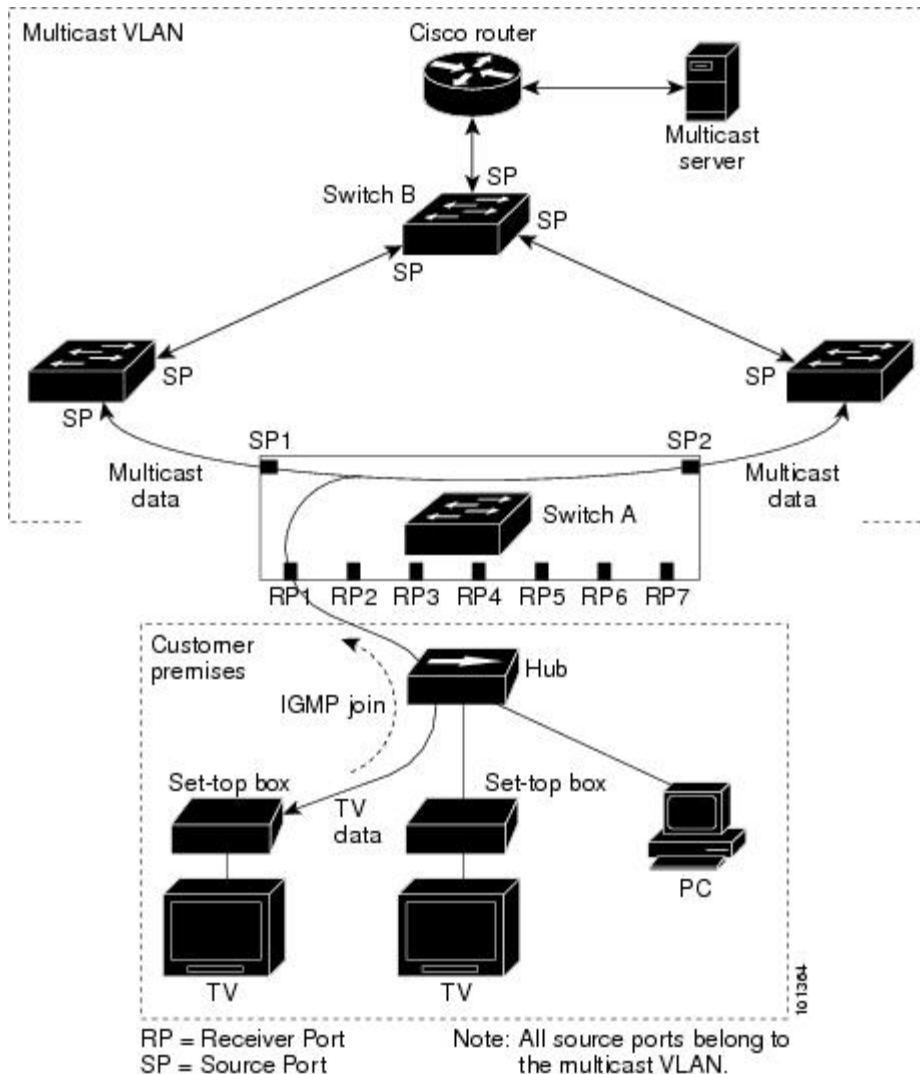
In this example configuration, DHCP assigns an IP address to the set-top box or the PC. When a subscriber selects a channel, the set-top box or PC sends an IGMP report to Switch A to join the appropriate multicast. If the IGMP report matches one of the configured IP multicast group addresses, the switch CPU modifies the hardware address table to include this receiver port and VLAN as a forwarding destination of the specified multicast stream when it is received from the multicast VLAN. Uplink ports that send and receive multicast data to and from the multicast VLAN are called MVR source ports.

When a subscriber changes channels or turns off the television, the set-top box sends an IGMP leave message for the multicast stream. The switch CPU sends a MAC-based general query through the receiver port VLAN. If there is another set-top box in the VLAN still subscribing to this group, that set-top box must respond within the maximum response time specified in the query. If the CPU does not receive a response, it eliminates the receiver port as a forwarding destination for this group.

Without Immediate Leave, when the switch receives an IGMP leave message from a subscriber on a receiver port, it sends out an IGMP query on that port and waits for IGMP group membership reports. If no reports

are received in a configured time period, the receiver port is removed from multicast group membership. With Immediate Leave, an IGMP query is not sent from the receiver port on which the IGMP leave was received. As soon as the leave message is received, the receiver port is removed from multicast group membership, which speeds up leave latency. Enable the Immediate-Leave feature only on receiver ports to which a single receiver device is connected.

MVR eliminates the need to duplicate television-channel multicast traffic for subscribers in each VLAN. Multicast traffic for all channels is only sent around the VLAN trunk once—only on the multicast VLAN. The IGMP leave and join messages are in the VLAN to which the subscriber port is assigned. These messages dynamically register for streams of multicast traffic in the multicast VLAN on the Layer 3 device. The access layer switch, Switch A, modifies the forwarding behavior to allow the traffic to be forwarded from the multicast VLAN to the subscriber port in a different VLAN, selectively allowing traffic to cross between two VLANs.

IGMP reports are sent to the same IP multicast group address as the multicast data. The Switch A CPU must capture all IGMP join and leave messages from receiver ports and forward them to the multicast VLAN of the source (uplink) port, based on the MVR mode.

Default MVR Configuration

Table 1: Default MVR Configuration

Feature	Default Setting
MVR	Disabled globally and per interface
Multicast addresses	None configured
Query response time	0.5 second
Multicast VLAN	VLAN 1
Mode	Compatible
Interface (per port) default	Neither a receiver nor a source port
Immediate Leave	Disabled on all ports

How to Configure MVR

Configuring MVR Global Parameters

You do not need to set the optional MVR parameters if you choose to use the default settings. If you do want to change the default parameters (except for the MVR VLAN), you must first enable MVR.

✎

Note   For complete syntax and usage information for the commands used in this section, see the command reference for this release.

SUMMARY STEPS

1. **configure terminal**
2. **mvr**
3. **mvr group** *ip-address* [*count*]
4. **mvr querytime** *value*
5. **mvr vlan** *vlan-id*
6. **mvr mode** {**dynamic** | **compatible**}
7. **end**
8. Use one of the following:
    - **show mvr**
    - **show mvr members**
9. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**mvr** **Example:** Switch (config)# **mvr**	Enables MVR on the switch.
Step 3	**mvr group** *ip-address* [*count*] **Example:** Switch(config)# **mvr group 228.1.23.4**	Configures an IP multicast address on the switch or use the *count* parameter to configure a contiguous series of MVR group addresses (the range for *count* is 1 to 256; the default is 1). Any multicast data sent to this address is sent to all source ports on the switch and all receiver ports that have elected to receive data on that multicast address. Each multicast address would correspond to one television channel. **Note** To return the switch to its default settings, use the **no mvr** [**mode** | **group** *ip-address* | **querytime** | **vlan**] global configuration commands.

	Command or Action	**Purpose**
Step 4	**mvr querytime** *value* **Example:** Switch(config)# **mvr querytime 10**	(Optional) Defines the maximum time to wait for IGMP report memberships on a receiver port before removing the port from multicast group membership. The value is in units of tenths of a second. The range is 1 to 100, and the default is 5 tenths or one-half second.
Step 5	**mvr vlan** *vlan-id* **Example:** Switch(config)# **mvr vlan 22**	(Optional) Specifies the VLAN in which multicast data is received; all source ports must belong to this VLAN. The VLAN range is 1 to 1001 and 1006 to 4094. The default is VLAN 1.
Step 6	**mvr mode** {**dynamic** | **compatible**} **Example:** Switch(config)# **mvr mode dynamic**	(Optional) Specifies the MVR mode of operation: • **dynamic**—Allows dynamic MVR membership on source ports. • **compatible**—Is compatible with Catalyst 3500 XL and Catalyst 2900 XL switches and does not support IGMP dynamic joins on source ports. The default is **compatible** mode. **Note** To return the switch to its default settings, use the **no mvr** [**mode** | **group** *ip-address* | **querytime** | **vlan**] global configuration commands.
Step 7	**end** **Example:** Switch(config)# **end**	Returns to privileged EXEC mode.

Step 8	Use one of the following:
	
	   • **show mvr**
	   • **show mvr members**
	
	Example:
	
	Switch# **show mvr**
	or
	Switch# **show mvr members**
		Verifies the configuration.

Step 9	**copy running-config startup-config** **Example:** Switch# **copy running-config**	(Optional) Saves your entries in the configuration file.

Command or Action	Purpose
`startup-config`	

Related Topics

Configuring MVR Interfaces

SUMMARY STEPS

1. **configure terminal**
2. **mvr**
3. **interface** *interface-id*
4. **mvr type** {**source** | **receiver**}
5. **mvr vlan** *vlan-id* **group** [*ip-address*]
6. **mvr immediate**
7. **end**
8. Use one of the following:

   - **show mvr**

   - **show mvr interface**

   - **show mvr members**

9. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# `configure terminal`	Enters the global configuration mode.
Step 2	**mvr** **Example:** Switch (config)# `mvr`	Enables MVR on the switch.

	Command or Action	**Purpose**
Step 3	**interface** *interface-id* **Example:** Switch(config)# **interface gigabitethernet1/0/2**	Specifies the Layer 2 port to configure, and enter interface configuration mode.
Step 4	**mvr type** {**source** | **receiver**} **Example:** Switch(config-if)# **mvr type receiver**	Configures an MVR port as one of these: • **source**—Configures uplink ports that receive and send multicast data as source ports. Subscribers cannot be directly connected to source ports. All source ports on a switch belong to the single multicast VLAN. • **receiver**—Configures a port as a receiver port if it is a subscriber port and should only receive multicast data. It does not receive data unless it becomes a member of the multicast group, either statically or by using IGMP leave and join messages. Receiver ports cannot belong to the multicast VLAN. The default configuration is as a non-MVR port. If you attempt to configure a non-MVR port with MVR characteristics, the operation fails. **Note** To return the interface to its default settings, use the **no mvr** [**type** | **immediate** | **vlan** *vlan-id* | **group**] interface configuration commands.
Step 5	**mvr vlan** *vlan-id* **group** [*ip-address*] **Example:** Switch(config-if)# **mvr vlan 22 group 228.1.23.4**	(Optional) Statically configures a port to receive multicast traffic sent to the multicast VLAN and the IP multicast address. A port statically configured as a member of a group remains a member of the group until statically removed. **Note** In compatible mode, this command applies to only receiver ports. In dynamic mode, it applies to receiver ports and source ports. Receiver ports can also dynamically join multicast groups by using IGMP join and leave messages.
Step 6	**mvr immediate** **Example:** Switch(config-if)# **mvr immediate**	(Optional) Enables the Immediate-Leave feature of MVR on the port. **Note** This command applies to only receiver ports and should only be enabled on receiver ports to which a single receiver device is connected.
Step 7	**end** **Example:** Switch(config)# **end**	Returns to privileged EXEC mode.

	Command or Action	Purpose
Step 8	Use one of the following: • **show mvr** • **show mvr interface** • **show mvr members** **Example:** ```Switch# show mvr interface``` Port Type Status Immediate Leave ---- ---- ------- -------------- Gi1/0/2 RECEIVER ACTIVE/DOWN ENABLED	Verifies the configuration.
Step 9	**copy running-config startup-config** **Example:** ```Switch# copy running-config startup-config```	(Optional) Saves your entries in the configuration file.

Related Topics

Monitoring MVR

You can monitor MVR for the switch or for a specified interface by displaying the following MVR information.

Table 2: Commands for Displaying MVR Information

Command	Purpose
show mvr	Displays MVR status and values for the switch—whether MVR is enabled or disabled, the multicast VLAN, the maximum (256) and current (0 through 256) number of multicast groups, the query response time, and the MVR mode.

Command	Purpose
show mvr interface [*interface-id*] [**members** [**vlan** *vlan-id*]]	Displays all MVR interfaces and their MVR configurations. When a specific interface is entered, displays this information: • Type—Receiver or Source • Status—One of these states: ∘ Active means the port is part of a VLAN. ∘ Up/Down means that the port is forwarding or nonforwarding. ∘ Inactive means that the port is not part of any VLAN. • Immediate Leave—Enabled or Disabled If the **members** keyword is entered, displays all multicast group members on this port or, if a VLAN identification is entered, all multicast group members on the VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094.
show mvr members [*ip-address*]	Displays all receiver and source ports that are members of any IP multicast group or the specified IP multicast group IP address.

Configuration Examples for MVR

Example: Configuring MVR Global Parameters

This example shows how to enable MVR, configure the group address, set the query time to 1 second (10 tenths), specify the MVR multicast VLAN as VLAN 22, and set the MVR mode as dynamic:

```
Switch(config)# mvr
Switch(config)# mvr group 228.1.23.4
Switch(config)# mvr querytime 10
Switch(config)# mvr vlan 22
Switch(config)# mvr mode dynamic
Switch(config)# end
```

Related Topics

Example: Configuring MVR Interfaces

This example shows how to configure a port as a receiver port, statically configure the port to receive multicast traffic sent to the multicast group address, configure Immediate Leave on the port, and verify the results.

```
Switch(config)# mvr
Switch(config)# interface gigabitethernet1/0/2
Switch(config-if)# mvr type receiver
Switch(config-if)# mvr vlan 22 group 228.1.23.4
Switch(config-if)# mvr immediate
Switch(config)# end
Switch# show mvr interface

Port Type Status Immediate Leave
---- ---- ------- ---------------
Gi1/0/2 RECEIVER ACTIVE/DOWN ENABLED
```

Related Topics

Where to Go Next for MVR

You can configure the following:

• IGMP Snooping

Additional References

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	*Catalyst 2960-XR Switch IP Multicast Command Reference*

Standards and RFCs

Standard/RFC	Title
—	—

MIBs

MIB	MIBs Link
All supported MIBs for this release.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

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. 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. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature History and Information for MVR

Release	Modification
Cisco IOS 15.0(2)EX1	This feature was introduced.