



IP Multicast: Multicast Services Configuration Guide, Cisco IOS Release 15S

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

© 2012 Cisco Systems, Inc. All rights reserved.



CONTENTS

Implementing Multicast Service Reflection	1
Finding Feature Information	1
Prerequisites for Implementing Multicast Service Reflection	1
Restrictions for Implementing Multicast Service Reflection	2
Information About Implementing Multicast Service Reflection	2
Benefits of Using Multicast Service Reflection	2
Rendezvous Points	3
PIM Sparse Mode	3
Vifl Interface	4
Multicast Service Reflection Application	4
How to Implement Multicast Service Reflection	4
Configuring Multicast Service Reflection	4
Configuration Examples for Multicast Service Reflection	7
Example Multicast-to-Multicast Destination Translation	7
Example Multicast-to-Unicast Destination Translation	10
Example Unicast-to-Multicast Destination Translation	12
Example Multicast-to-Multicast Destination Splitting	15
Example Multicast-to-Unicast Destination Splitting	19
Example Unicast-to-Multicast Destination Splitting	22
Additional References	26
Feature Information for Multicast Service Reflection	27



Implementing Multicast Service Reflection

The Cisco Multicast Service Reflection feature provides the capability for users to translate externally received multicast or unicast destination addresses to multicast or unicast addresses that conform to their organization's internal addressing policy. Using this feature, users do not need to redistribute unicast routes from external sources at the translation boundary into their network infrastructure for Reverse Path Forwarding (RPF) to work properly. In addition, users can receive identical feeds from two ingress points in the network and route them independently.

- [Finding Feature Information, page 1](#)
- [Prerequisites for Implementing Multicast Service Reflection, page 1](#)
- [Restrictions for Implementing Multicast Service Reflection, page 2](#)
- [Information About Implementing Multicast Service Reflection, page 2](#)
- [How to Implement Multicast Service Reflection, page 4](#)
- [Configuration Examples for Multicast Service Reflection, page 7](#)
- [Additional References, page 26](#)
- [Feature Information for Multicast Service Reflection, page 27](#)

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

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

Prerequisites for Implementing Multicast Service Reflection

- Configure your multicast-enabled network with the necessary infrastructure to run either Protocol Independent Multicast Sparse Mode (PIM-SM), Bidirectional PIM (bidir-PIM), or PIM Source Specific Multicast (PIM-SSM). The configuration process may include configuring RPs, interface boundaries, or SSM ranges.

For configuration information, see the “Configuring Basic IP Multicast” module.

- Confirm that the virtual interface for multicast service reflection (Vif1 interface) is installed in your border router and the Multicast Service Reflection application is installed and operational.

- Each active receiver must initiate an Internet Group Management Protocol (IGMP) join to the multicast group that is defined on the router in the PIM domain.

Restrictions for Implementing Multicast Service Reflection

- When translating groups of multicast packets that are destined for the same multicast group but are originating from different sources, as in the case when using PIM-SSM, all multicast packets destined for a particular SSM group will get mapped to a single (S, G) after translation has occurred. For example, if (10.1.1.1, 232.1.1.1) and (10.1.1.2, 232.1.1.1) need to be translated, they will appear as a single entry, for example, (92.168.1.2, 232.239.1.1), where 192.168.1.2 is an IP address that resides in the Vif1 IP subnet.
- PIM/IGMP control packets are not translated.
- Cisco Multicast Service Reflection is implemented in the fast switching path in Cisco IOS Release 12.4(4)T on software-based nondistributed forwarding platforms, up to and including Cisco 7200 series routers.
- With the introduction of Cisco IOS 12.2(33)SX14, hardware switching is supported on the Catalyst 6500 series switches. However, multicast-to-unicast and multicast-to-multicast reflection is not supported on Supervisor 720 (Sup720) hardware.

Information About Implementing Multicast Service Reflection

- [Benefits of Using Multicast Service Reflection, page 2](#)
- [Rendezvous Points, page 3](#)
- [Vif1 Interface, page 4](#)
- [Multicast Service Reflection Application, page 4](#)

Benefits of Using Multicast Service Reflection

- Allows users to translate externally received multicast or unicast destination addresses to multicast or unicast addresses that conform to their company's internal addressing policy. This allows the separation of the private addressing scheme used by the content provider from the public addressing used by the service provider. The following types of translations are supported:
 - Multicast-to-Multicast Destination Translation
 - Multicast-to-Unicast Destination Translation
 - Unicast-to-Multicast Destination Translation
 - Multicast-to-Multicast Destination Splitting
 - Multicast-to-Unicast Destination Splitting
 - Unicast-to-Multicast Destination Splitting
- Provides logical separation between private and public multicast networks.
- Provides the flexibility to forward multicast packets--translated or untranslated--out the same outgoing interface.
- Provides redundancy by allowing users to get identical feeds from two ingress points in the network and route them independently.
- Allows users to use the subnet of their choice to be the source network and scope it appropriately.

Rendezvous Points

A rendezvous point (RP) is a role that a router performs when operating in PIM-SM or bidirectional PIM. An RP is required only in networks running PIM-SM or bidirectional PIM. In PIM-SM, only network segments with active receivers that have explicitly requested multicast data will be forwarded the traffic.

An RP acts as the meeting place for sources and receivers of multicast data. In a PIM-SM network, first hop designated routers with directly connected sources initially send their traffic to the RP. This traffic is then forwarded to receivers down a shared distribution tree. By default, when the last hop router with a directly connected receiver receives traffic from the shared tree, it immediately performs a shortest path tree switchover and sends a Join message towards the source, creating a source-based distribution tree between the source and the receiver.

- [PIM Sparse Mode, page 3](#)

PIM Sparse Mode

PIM sparse mode (PIM-SM) uses a pull model to deliver multicast traffic. Only network segments with active receivers that have explicitly requested the data will receive the traffic.

Unlike dense mode interfaces, sparse mode interfaces are added to the multicast routing table only when periodic Join messages are received from downstream routers, or when a directly connected member is on the interface. When forwarding from a LAN, sparse mode operation occurs if an RP is known for the group. If so, the packets are encapsulated and sent toward the RP. When no RP is known, the packet is flooded in a dense mode fashion. If the multicast traffic from a specific source is sufficient, the first hop router of the receiver may send Join messages toward the source to build a source-based distribution tree.

PIM-SM distributes information about active sources by forwarding data packets on the shared tree. Because PIM-SM uses shared trees (at least, initially), it requires the use of a rendezvous point (RP). The RP must be administratively configured in the network.

In sparse mode, a router assumes that other routers do not want to forward multicast packets for a group, unless there is an explicit request for the traffic. When hosts join a multicast group, the directly connected routers send PIM Join messages toward the RP. The RP tracks multicast groups. Hosts that send multicast packets are registered with the RP by the first hop router of that host. The RP then sends Join messages toward the source. At this point, packets are forwarded on a shared distribution tree. If the multicast traffic from a specific source is sufficient, the first hop router of the host may send Join messages toward the source to build a source-based distribution tree.

First-hop designated routers with directly connected sources register with the RP and then data is forwarded down the shared tree to the receivers. The edge routers learn about a particular source when they receive data packets on the shared tree from that source through the RP. The edge router then sends PIM (S, G) Join messages toward that source. Each router along the reverse path compares the unicast routing metric of the RP address to the metric of the source address. If the metric for the source address is better, it will forward a PIM (S, G) Join message toward the source. If the metric for the RP is the same or better, then the PIM (S, G) Join message will be sent in the same direction as the RP. In this case, the shared tree and the source tree would be considered congruent.

If the shared tree is not an optimal path between the source and the receiver, the routers dynamically create a source tree and stop traffic from flowing down the shared tree. This behavior is the default behavior in Cisco IOS software. Network administrators can force traffic to stay on the shared tree by using the Cisco IOS **ip pim spt-threshold infinity** command.

PIM-SM scales well to a network of any size, including those with WAN links. The explicit join mechanism prevents unwanted traffic from flooding the WAN links.

Vif1 Interface

The Vif1 interface is similar to a loopback interface--it is a logical IP interface that is always up when the router is active.

The Vif1 interface needs to reside on its own unique subnet, and that subnet should be advertised in the Interior Gateway Protocol (IGP) updates (RIP, EIGRP, OSPF, ISIS).

The Vif1 interface maintains information about the input interface, private-to-public mgroup mappings, mask length, which defines your pool range, and the source of the translated packet.

Multicast Service Reflection Application

Cisco multicast service reflection is an application running in Cisco IOS software interrupt level switching that processes packets forwarded by Cisco IOS software to the Vif1 interface. Unlike IP multicast Network Address Translation (NAT), which only translates the source IP address, the IP reflect service translates both source and destination addresses. Multicast service reflection is especially useful when users that have not yet moved to the new multicast group still need to receive the untranslated stream.

Multicast service reflection is implemented using an interface CLI statement. Each configured multicast service reflection CLI statement establishes a packet match and rewrite operation acting on packets sent by Cisco IOS unicast or multicast packet routing onto the Vif1 interface. The matched and rewritten packet is sent back into Cisco IOS unicast or multicast packet routing, where it is handled like any other packet arriving from an interface.

The Vif1 interface is a receiver for the original stream and makes it appear that the new stream is coming from a source directly connected to the Vif1 subnet. The Vif1 interface is a Designated Router (DR) for active sources and registers with the appropriate RP.

More than one multicast service reflection operation can be configured to match the same packets, which allows you to replicate the same received traffic to multiple destination addresses.

The Multicast Service Reflection feature is available in Cisco IOS Release 12.4(4)T on software-based nondistributed forwarding platforms, up to and including the Cisco 7200 series routers, as well as Cisco Catalyst 6500 series switches providing forwarding in hardware in Cisco IOS Release 12.2(33)SX14.

How to Implement Multicast Service Reflection

- [Configuring Multicast Service Reflection, page 4](#)

Configuring Multicast Service Reflection

Perform this task to configure multicast service reflection.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip multicast-routing [distributed]**
4. **interface** *type number*
5. **ip pim sparse-mode**
6. **no shutdown**
7. **exit**
8. Repeat Steps 4 through 7 for each PIM interface.
9. **interface** **Vif1**
10. **ip address** *ip-address mask* [**secondary**]
11. **ip pim sparse-mode**
12. **ip service reflect** *input-interface destination destination-address to new-destination-address mask-len number source new-source-address*
13. **ip igmp static-group** { * | *group-address* [**source** { *source-address* | **ssm-map** }] }
14. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.
	Example: Router> enable	<ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal	Enters global configuration mode.
	Example: Router# configure terminal	
Step 3	ip multicast-routing [distributed]	Enables IP multicast routing.
	Example: Router(config)# ip multicast-routing	<ul style="list-style-type: none"> Use the distributed keyword to enable the Multicast Distributed Switching feature.
Step 4	interface <i>type number</i>	Enters interface configuration mode for the specified interface type and number.
	Example: Router(config)# interface ethernet 0	

	Command or Action	Purpose
Step 5	ip pim sparse-mode Example: Router(config-if)# ip pim sparse-mode	Enables PIM sparse mode on the interface.
Step 6	no shutdown Example: Router(config-if)# no shutdown	Enables an interface.
Step 7	exit Example: Router(config-if)# exit	Exits interface configuration mode, and returns to global configuration mode.
Step 8	Repeat Steps 4 through 7 for each PIM interface.	--
Step 9	interface Vif1 Example: Router(config)# interface Vif1	Enters interface configuration mode for the Vif1 interface.
Step 10	ip address <i>ip-address mask</i> [secondary] Example: Router(config-if)# ip address 10.1.1.1 255.255.255.0	Sets a primary or secondary IP address for an interface.
Step 11	ip pim sparse-mode Example: Router(config-if)# ip pim sparse-mode	Enables PIM sparse mode on an interface.

Command or Action	Purpose
<p>Step 12 <code>ip service reflect input-interface destination destination-address to new-destination-address mask-len number source new-source-address</code></p> <p>Example:</p> <pre>Router(config-if)# ip service reflect ethernet0 destination 224.1.1.0 to 239.2.2.0 mask-len 24 source 10.1.1.2</pre>	<p>Matches and rewrites multicast packets routed onto the Vif1 interface.</p> <ul style="list-style-type: none"> The matched and rewritten packets are sent back into Cisco multicast packet routing (or unicast routing if the destination is unicast), where they are handled like any other packets arriving from an interface.
<p>Step 13 <code>ip igmp static-group { * group-address [source {source-address ssm-map}] }</code></p> <p>Example:</p> <pre>Router(config-if)# ip igmp static-group 224.1.1.1</pre>	<p>Configures the router to be a statically connected member of the specified group on the interface, and forwards traffic destined for the multicast group onto the interface.</p> <ul style="list-style-type: none"> This step is only applicable for multicast-to-multicast and multicast-to-unicast scenarios.
<p>Step 14 <code>end</code></p> <p>Example:</p> <pre>Router(config-if)# end</pre>	<p>Exits interface configuration mode, and returns to privileged EXEC mode.</p>

Configuration Examples for Multicast Service Reflection

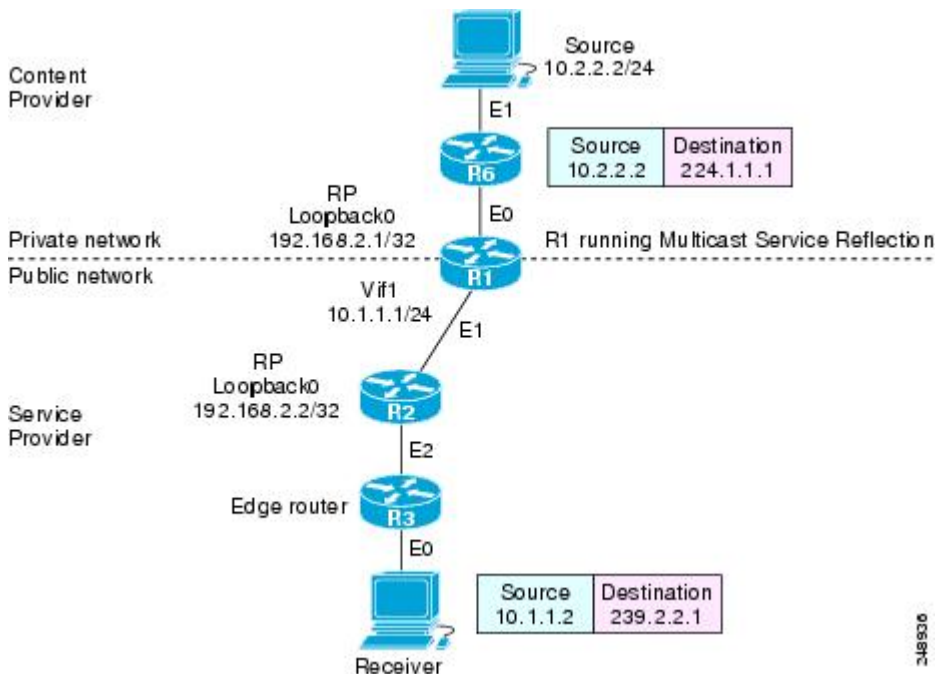
- [Example Multicast-to-Multicast Destination Translation, page 7](#)
- [Example Multicast-to-Unicast Destination Translation, page 10](#)
- [Example Unicast-to-Multicast Destination Translation, page 12](#)
- [Example Multicast-to-Multicast Destination Splitting, page 15](#)
- [Example Multicast-to-Unicast Destination Splitting, page 19](#)
- [Example Unicast-to-Multicast Destination Splitting, page 22](#)

Example Multicast-to-Multicast Destination Translation

The following example shows how to implement multicast service reflection (multicast-to-multicast destination translation) in a service provider network. Multicast-to-Multicast Destination Translation allows service providers to translate externally received content provider multicast destination addresses to multicast destination addresses that conform to the service provider's internal addressing policy.

This example uses the topology illustrated in the figure.

Figure 1 *Multicast Service Reflection (Multicast-to-Multicast Destination Translation) in a Service Provider Network Example Topology*



In this example topology, a content provider is sending financial market information to a service provider, which in turn is sending that information to active receivers (brokerage houses). The service provider may be receiving market data from multiple content providers.

Router R1 is an edge router in the service provider's PIM domain.

Router R1 has a loopback interface and is acting as the RP for the 224.1.1.0/24 address range.

Router R1 has a Vif1 interface and is running the multicast service reflection application.

Router R2 has a loopback interface and is acting as the RP for the 239.2.2.0/24 address range.

Enter these commands on the router running the multicast service reflection application (R1):

```
!  
configure terminal  
    ip multicast-routing  
    interface <all IP numbered interfaces>  
    ip pim sparse-mode  
    no shutdown  
    !  
    ! Configure the loopback interface for the Service Provider RP  
!  
    interface loopback 0  
    ip address 192.168.2.1 255.255.255.255  
    ip pim sparse-mode  
    !  
    ip pim rp-address 192.168.2.1 mcast-content-provider-groups override  
    ip pim rp-address 192.168.2.2 mcast-service-provider-groups override  
    ip access-list standard mcast-content-provider-groups permit 224.1.1.0 0.0.0.255  
    ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255  
    !  
    ! Configure the Vif1 virtual interface for multicast service reflection  
    !  
    interface Vif1  
    ip address 10.1.1.1 255.255.255.0  
    ip pim sparse-mode  
    ip service reflect Ethernet 0 destination 224.1.1.0 to 239.2.2.0 mask-len 24 source  
10.1.1.2  
    ip igmp static-group 224.1.1.0  
    ip igmp static-group 224.1.1.1  
    ip igmp static-group 224.1.1.2  
    ip igmp static-group 224.1.1.3  
    .  
    .  
    .  
    ip igmp static-group 224.1.1.255
```

Enter these commands on the router that is the RP in the service provider network (R2):

```
ip multicast-routing

interface <all IP numbered interfaces>

    ip pim sparse-mode

    no shutdown

!

interface loopback 0

ip address 192.168.2.2 255.255.255.255

ip pim sparse-mode

!

ip pim rp-address 192.168.2.2 mcast-service-provider-groups override

ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

!
```

Enter these commands on all the other routers in the service provider network (R3):

```
ip multicast-routing

interface <all IP numbered interfaces>

ip pim sparse-mode

no shutdown

!

ip pim rp-address 192.168.2.2 mcast-service-provider-groups override

ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

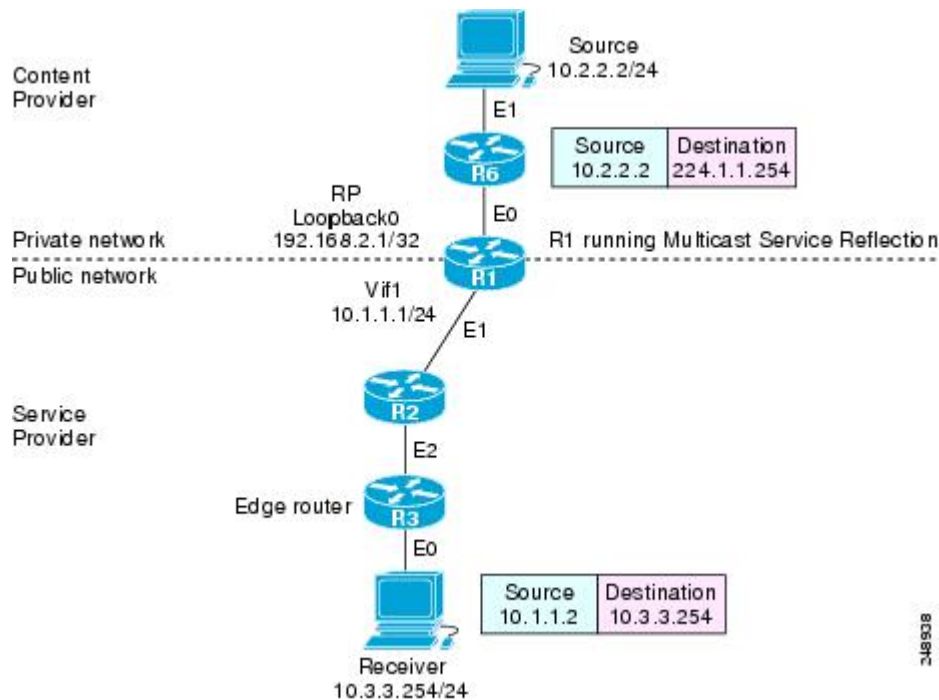
end
```

Example Multicast-to-Unicast Destination Translation

The following example shows how to implement multicast service reflection (multicast-to-unicast destination translation) in a service provider network. Multicast-to-Unicast Destination Translation allows service providers to translate externally received content provider multicast destination addresses to unicast destination addresses that conform to the service provider's internal addressing policy.

This example uses the topology illustrated in the figure.

Figure 2 *Multicast Service Reflection (Multicast-to-Unicast Destination Translation) in a Service Provider Network Example Topology*



In this example topology, a content provider is sending financial market information to a service provider, which in turn is sending that information to active receivers (brokerage houses). The service provider may be receiving market data from multiple content providers.

Router R1 is an edge router in the service provider's PIM domain.

Router R1 has a loopback interface and is acting as the RP for the 224.1.1.0/24 address range.

Router R1 has a Vif1 interface and is running the multicast service reflection application.

Routers R2 and R3 are non PIM enabled routers running unicast routing only in the service provider network.

Enter these commands on the router running the multicast service reflection application (R1):

```
configure terminal

    ip multicast-routing

    interface <all IP numbered interfaces>

    ip pim sparse-mode

    no shutdown

    !

! Configure the loopback interface for the Service Provider RP

!

    interface loopback 0

    ip address 192.168.2.1 255.255.255.255

ip pim sparse-mode

    !

    ip pim rp-address 192.168.2.1 mcast-content-provider-groups override

    ip access-list standard mcast-content-provider-groups permit 224.1.1.10 0.0.0.255

    !

! Configure the Vif1 virtual interface for multicast service reflection

!

    interface Vif1

    ip address 10.1.1.1 255.255.255.0

    ip pim sparse-mode

    ip service reflect Ethernet 0 destination 224.1.1.0 to 10.3.3.0 mask-len 24 source
10.1.1.2

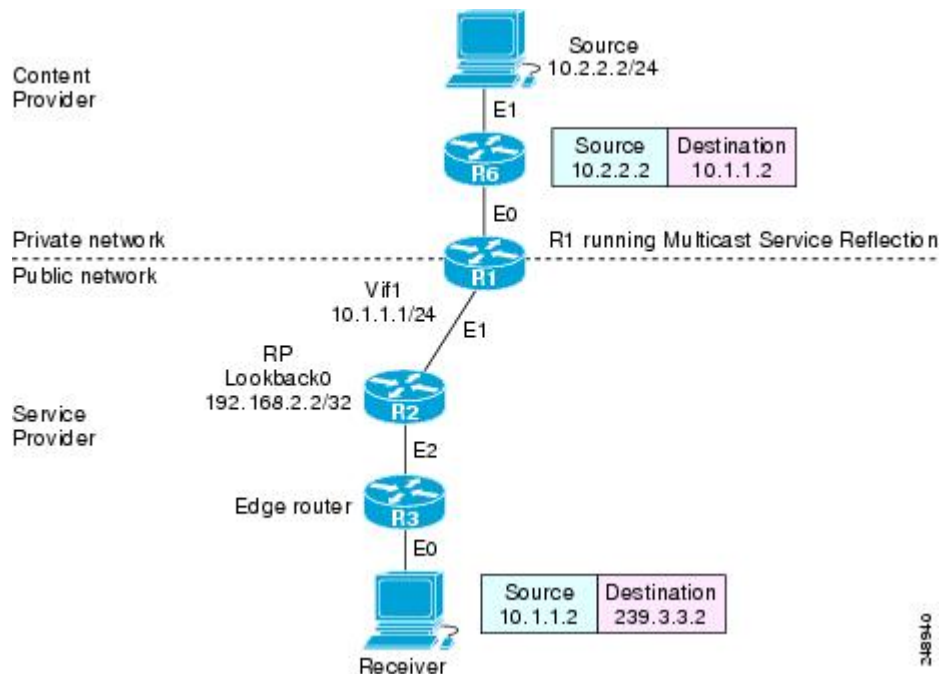
end
```

Example Unicast-to-Multicast Destination Translation

The following example shows how to implement multicast service reflection (unicast-to-multicast destination translation) in a service provider network. Unicast-to-Multicast Destination Translation allows service providers to translate externally received content provider unicast destination addresses to multicast destination addresses that conform to the service provider's internal addressing policy.

This example uses the topology illustrated in the figure.

Figure 3 *Multicast Service Reflection (Unicast-to-Multicast Destination Translation) in a Service Provider Network Example Topology*



In this example topology, a content provider is sending financial market information to a service provider, which in turn is sending that information to active receivers (brokerage houses). The service provider may be receiving market data from multiple content providers.

Router R1 is an edge router in the service provider's PIM domain.

Router R1 has a Vif1 interface and is running the multicast service reflection application.

Router R2 has a loopback interface and is acting as the RP for the 239.3.3.0/24 address range.

Router R3 is another edge router in the service provider's PIM domain.

Enter these commands on the router running the multicast service reflection application (R1):

```
configure terminal

  ip multicast-routing

  interface <all IP numbered interfaces>

  ip pim sparse-mode

  no shutdown

  !

  ip pim rp-address 192.168.2.2 mcast-service-provider-groups override

  ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255

  !

! Configure the Vif1 virtual interface for multicast service reflection

!

  interface Vif1

  ip address 10.1.1.1 255.255.255.0

  ip pim sparse-mode

  ip service reflect Ethernet 0 destination 10.1.1.2 to 239.3.3.2 mask-len 32 source
10.1.1.2
```

Enter these commands on the router that is the RP in the service provider network (R2):

```
ip multicast-routing

  interface <all IP numbered interfaces>

  ip pim sparse-mode

  no shutdown

  interface loopback 0

  ip address 192.168.2.2 255.255.255.255

  ip pim sparse-mode

  !

  ip pim rp-address 192.168.2.2 mcast-service-provider-groups override

  ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255
```

Enter these commands on all the other routers in the service provider network (R3):

```
ip multicast-routing

interface <all IP numbered interfaces>

ip pim sparse-mode

no shutdown

ip pim rp-address 192.168.2.2 mcast-service-provider-groups override

ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255

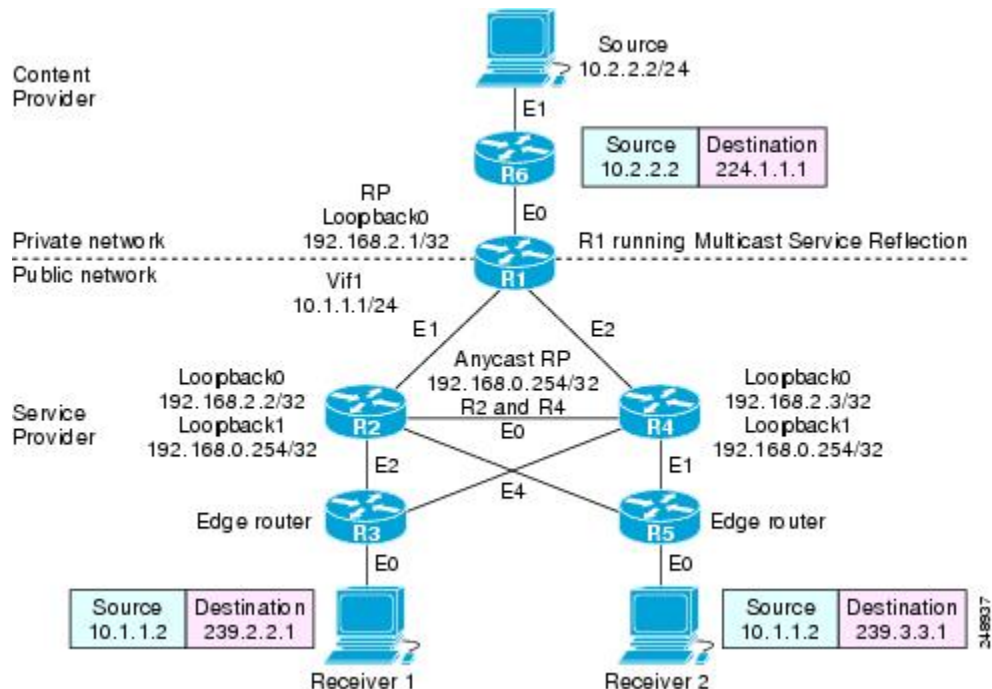
end
```

Example Multicast-to-Multicast Destination Splitting

The following example shows how to implement multicast service reflection (multicast-to-multicast destination splitting where the multicast single stream is converted into two unique multicast streams) in a service provider network. Multicast-to-Multicast Destination Splitting allows service providers to translate externally received content provider multicast destination addresses to multiple multicast destination addresses that conform to the service provider's internal addressing policy.

This example uses the topology illustrated in the figure.

Figure 4 *Multicast Service Reflection (Multicast-to-Multicast Destination Splitting) in a Service Provider Network Example Topology*



In this example topology, a content provider is sending financial market information to a service provider, which in turn is sending that information to active receivers (brokerage houses). The service provider may be receiving market data from multiple content providers.

Router R1 is an edge router in the service provider's PIM domain.

Router R1 has a loopback configured and is acting as an RP for the 224.1.1.0/24 address range.

Router R1 has a Vif1 interface and is running the multicast service reflection application.

Routers R2 and R4 have multiple loopback interfaces and are acting as anycast RPs for the 239.2.2.0 and 239.3.3.0 address ranges.

Router R3 and R5 are edge routers in the service provider's PIM domain.

Enter these commands on the router running the multicast service reflection application (R1):

```
configure terminal
    ip multicast-routing
    interface <all IP numbered interfaces>
    ip pim sparse-mode
    no shutdown
    !
    ! Configure the loopback interface for the Service Provider RP
!
    interface loopback 0
    ip address 192.168.2.1 255.255.255.255
    ip pim sparse-mode
    !
    ip pim rp-address 192.168.2.1 mcast-content-provider-groups override
    ip pim rp-address 192.168.0.254 mcast-service-provider-groups override
    ip access-list standard mcast-content-provider-groups permit 224.1.1.0 0.0.0.255
    ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255
    ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255
    !
! Configure the Vif1 virtual interface for multicast service reflection
!
    interface Vif1
    ip address 10.1.1.1 255.255.255.0
    ip pim sparse-mode
    ip service reflect Ethernet 0 destination 224.1.1.0 to 239.2.2.0 mask-len 24 source
10.1.1.2
    ip service reflect Ethernet 0 destination 224.1.1.0 to 239.3.3.0 mask-len 24 source
10.1.1.2
    ip igmp static-group 224.1.1.0
ip igmp static-group 224.1.1.1
    ip igmp static-group 224.1.1.2
    ip igmp static-group 224.1.1.3
    .
    .
    .
    ip igmp static-group 224.1.1.254
```

Enter these commands on the R2 router that is an anycast RP in the service provider network:

```
ip multicast-routing

interface <all IP numbered interfaces>

    ip pim sparse-mode

    no shutdown

    !

    interface loopback 0

    ip address 192.168.2.2 255.255.255.255

    ip pim sparse-mode

    interface loopback 1

description --- Anycast RP ---

    ip address 192.168.0.254 255.255.255.255

    ip pim sparse-mode

    !

ip msdp peer 192.168.2.3 connect-source Loopback0

ip msdp originator-id Loopback0

    !

ip pim rp-address 192.168.0.254 mcast-service-provider-groups override

ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255
```

Enter these commands on the R4 router that is an anycast RP in the service provider network:

```
ip multicast-routing

interface <all IP numbered interfaces>

    ip pim sparse-mode

    no shutdown

    !

    interface loopback 0

    ip address 192.168.2.3 255.255.255.255

    ip pim sparse-mode

    interface loopback 1

    ip address 192.168.0.254 255.255.255.255

    ip pim sparse-mode

    !

ip pim rp-address 192.168.0.254 mcast-service-provider-groups override

ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255

!

ip msdp peer 192.168.2.2 connect-source Loopback0

ip msdp originator-id Loopback0
```

Enter these commands on the R3 and R5 routers in the service provider network:

```
ip multicast-routing

    ip pim rp-address 192.168.0.254 mcast-service-provider-groups override

    ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

    permit 239.3.3.0 0.0.0.255

    !
```

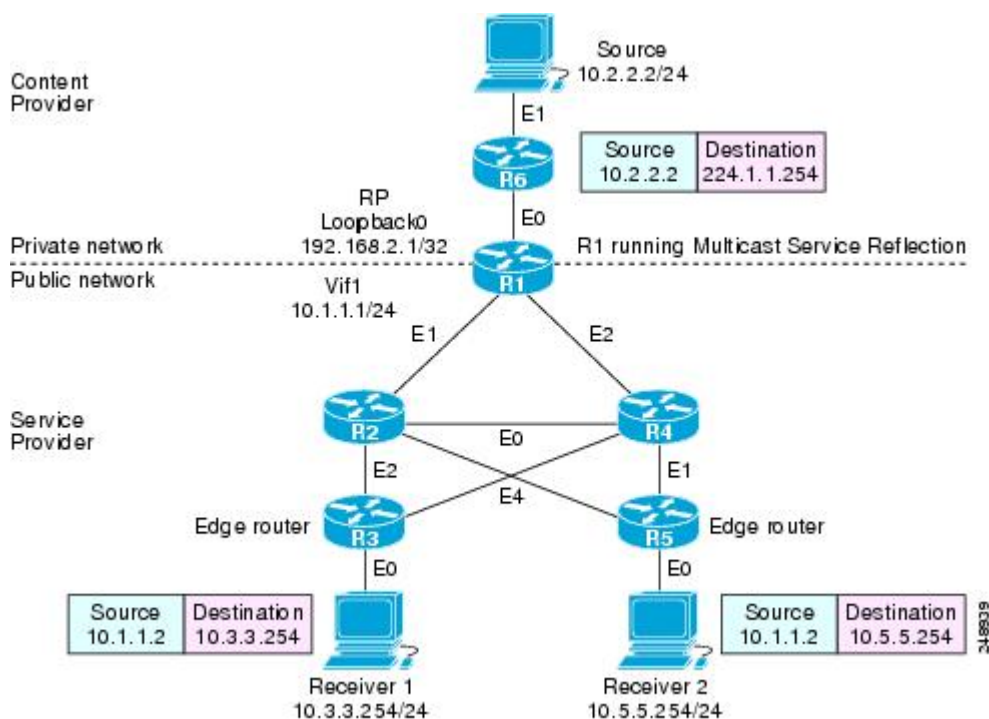
Example Multicast-to-Unicast Destination Splitting

The following example shows how to implement multicast service reflection (multicast-to-unicast destination splitting where the multicast single stream is converted into two unique unicast streams) in a

service provider network. Multicast-to-Unicast Destination Splitting allows service providers to translate externally received content provider multicast destination addresses to multiple unicast destination addresses that conform to the service provider's internal addressing policy.

This example uses the topology illustrated in the figure.

Figure 5 *Multicast Service Reflection (Multicast-to-Unicast Destination Splitting) in a Service Provider Network Example Topology*



In this example topology, a content provider is sending financial market information to a service provider, which in turn is sending that information to active receivers (brokerage houses). The service provider may be receiving market data from multiple content providers.

Router R1 is an edge router in the service provider's PIM domain.

Router R1 is acting as a RP for the 224.1.1.0/24 address range.

Router R1 has a Vif1 interface and is running the multicast service reflection application.

Routers R2, R3, R4 and R5 are not PIM enabled and are running unicast routing only in the service provider network.

Enter these commands on the router running the multicast service reflection application (R1):

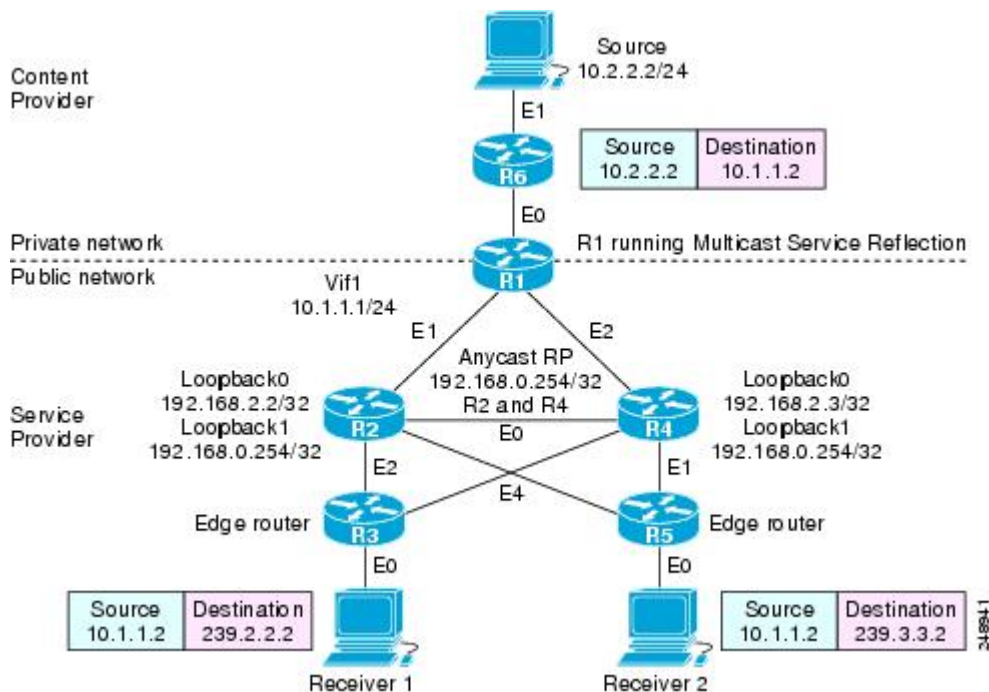
```
configure terminal
    ip multicast-routing
interface <all IP numbered interfaces>
    ip pim sparse-mode
    no shutdown
    !
! Configure the loopback interface for the Service Provider RP
!
    interface loopback 0
    ip address 192.168.2.1 255.255.255.255
ip pim sparse-mode
    !
    ip pim rp-address 192.168.2.1 mcast-content-provider-groups override
    ip access-list standard mcast-content-provider-groups permit 224.1.1.0 0.0.0.255
    !
! Configure the Vif1 virtual interface for multicast service reflection
!
    interface Vif1
    ip address 10.1.1.1 255.255.255.0
    ip pim sparse-mode
    ip service reflect Ethernet 0 destination 224.1.1.0 to 10.3.3.0 mask-len 24 source
10.1.1.2
ip service reflect Ethernet 0 destination 224.1.1.0 to 10.5.5.0 mask-len 24 source
10.1.1.2
    ip igmp static-group 224.1.1.0
    ip igmp static-group 224.1.1.1
    ip igmp static-group 224.1.1.2
    ip igmp static-group 224.1.1.3
    .
    .
    .
    ip igmp static-group 224.1.1.255
    !
end
```

Example Unicast-to-Multicast Destination Splitting

The following example shows how to implement multicast service reflection (unicast-to-multicast destination splitting where the unicast single stream is converted into two unique multicast streams) in a service provider network. Unicast-to-Multicast Destination Splitting allows service providers to translate externally received content provider unicast destination addresses to multiple multicast destination addresses that conform to the service provider's internal addressing policy.

This example uses the topology illustrated in the figure.

Figure 6 *Multicast Service Reflection (Unicast-to-Multicast Destination Splitting) in a Service Provider Network Example Topology*



In this example topology, a content provider is sending financial market information to a service provider, which in turn is sending that information to active receivers (brokerage houses). The service provider may be receiving market data from multiple content providers.

Router R1 is an edge router in the service provider's PIM domain.

Router R1 has a Vif1 interface and is running the multicast service reflection application.

Routers R2 and R4 have multiple loopback interfaces and are acting as anycast RPs for the 239.2.2.0 and 239.3.3.0 address ranges.

Router R3 and R5 are other edge routers in the service provider's PIM domain.

Enter these commands on the router running the multicast service reflection application (R1):

```
configure terminal

  ip multicast-routing

  interface <all IP numbered interfaces>

  ip pim sparse-mode

  no shutdown

  !

  ip pim rp-address 192.168.2.1 mcast-content-provider-groups override

  ip pim rp-address 192.168.0.254 mcast-service-provider-groups override

  ip access-list standard mcast-content-provider-groups permit 224.1.1.0 0.0.0.255

  ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

  ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255

  !

! Configure the Vif1 virtual interface for multicast service reflection

!

  interface Vif1

  ip address 10.1.1.1 255.255.255.0

  ip pim sparse-mode

  ip service reflect Ethernet 0 destination 10.1.1.2 to 239.3.3.2 mask-len 32 source
10.1.1.2

  ip service reflect Ethernet 0 destination 10.1.1.2 to 239.2.2.2 mask-len 32 source
10.1.1.2
```

Enter these commands on the R2 router that is the anycast RP in the service provider network:

```
ip multicast-routing

  interface <all IP numbered interfaces>

    ip pim sparse-mode

    no shutdown

  !

  interface loopback 0

    ip address 192.168.2.2 255.255.255.255

    ip pim sparse-mode

  interface loopback 1

    description --- Anycast RP ---

    ip address 192.168.0.254 255.255.255.255

    ip pim sparse-mode

  !

  ip pim rp-address 192.168.0.254 mcast-service-provider-groups override

  ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

  ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255

  !

  ip msdp peer 192.168.2.3 connect-source Loopback0

  ip msdp originator-id Loopback0
```

Enter these commands on the R4 router that is the anycast RP in the service provider network:

```
ip multicast-routing

interface <all IP numbered interfaces>

    ip pim sparse-mode

    no shutdown

    !

    interface loopback 0

    ip address 192.168.2.3 255.255.255.255

    ip pim sparse-mode

interface loopback 1

description --- Anycast RP ---

ip address 192.168.0.254 255.255.255.255

ip pim sparse-mode

!

ip pim rp-address 192.168.0.254 mcast-service-provider-groups override

    ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

    ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255

    ip msdp peer 192.168.2.2 connect-source Loopback0

ip msdp originator-id Loopback0
```

Enter these commands on all of the other routers in the service provider network:

```
ip multicast-routing

interface <all IP numbered interfaces>

    ip pim sparse-mode

    no shutdown

    !

ip pim rp-address 192.168.0.254 mcast-service-provider-groups override

    ip access-list standard mcast-service-provider-groups permit 239.2.2.0 0.0.0.255

    ip access-list standard mcast-service-provider-groups permit 239.3.3.0 0.0.0.255

end
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Multicast commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<i>Cisco IOS IP Multicast Command Reference</i>

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	--

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature.	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by 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.	http://www.cisco.com/cisco/web/support/index.html
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.	

Feature Information for Multicast Service Reflection

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

Table 1 **Feature Information for Multicast Service Reflection**

Feature Name	Releases	Feature Information
Multicast Service Reflection	12.2(33)SXI 12.4(4)T 12.2(50)SY Cisco IOS XE 3.4S	<p>The Cisco Multicast Service Reflection feature allows you to translate externally received multicast or unicast destination addresses to multicast or unicast addresses that conform to their organization's internal addressing policy. Using this feature, users do not need to redistribute unicast routes from external sources at the translation boundary into their network infrastructure for Reverse Path Forwarding (RPF) to work properly. In addition, users can receive identical feeds from two ingress points in the network and route them independently.</p> <p>The following command was introduced or modified: ip service reflect.</p>

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.