PIMv6 Anycast RP Solution

Information About the PIMv6 Anycast RP Solution

PIMv6 Anycast RP Solution Overview

The anycast RP solution in IPv6 PIM allows an IPv6 network to support anycast services for the PIM-SM RP. It allows anycast RP to be used inside a domain that runs PIM only. Anycast RP can be used in IPv4 as well as IPv6, but it does not depend on the Multicast Source Discovery Protocol (MSDP), which runs only on IPv4. This feature is useful when interdomain connection is not required.

Anycast RP is a mechanism that ISP-based backbones use to get fast convergence when a PIM RP device fails. To allow receivers and sources to rendezvous to the closest RP, the packets from a source need to get to all RPs to find joined receivers.

A unicast IP address is chosen as the RP address. This address is either statically configured or distributed using a dynamic protocol to all PIM devices throughout the domain. A set of devices in the domain is chosen to act as RPs for this RP address; these devices are called the anycast RP set. Each device in the anycast RP set is configured with a loopback interface using the RP address. Each device in the anycast RP set also needs a separate physical IP address to be used for communication between the RPs. Each device in the Anycast set must contain the list of all the devices in the Anycast set.

The RP address, or a prefix that covers the RP address, is injected into the unicast routing system inside of the domain. Each device in the anycast RP set is configured with the addresses of all other devices in the anycast RP set, and this configuration must be consistent in all RPs in the set. The IP address of the local device must be included in the set so that all devices in anycast set have the same IP addresses.

PIMv6 Anycast RP Normal Operation

The following illustration shows PIMv6 anycast RP normal operation and assumes the following:

- RP1, RP2, RP3, and RP4 are members in the same anycast RP group.

• S11 and S31 are sources that use RP1 and RP3, respectively, based on their unicast routing metric.

• R11, R12, R2, R31, and R32 are receivers. Based on their unicast routing metrics, R11 and R12 join to RP1, R2 joins to RP2 and R31, and R32 joins to RP3, respectively.
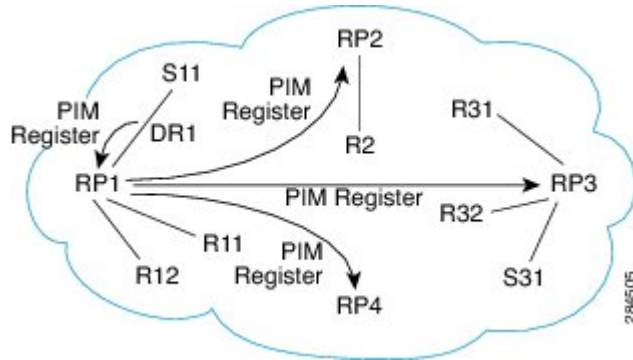

The following sequence of events occurs when S11 starts sending packets:

1. DR1 creates (S,G) states and sends a register to RP1. DR1 may also encapsulate the data packet in the register.

2. Upon receiving the register, RP1 performs normal PIM-SM RP functionality, and forwards the packets to R11 and R12.

3. RP1 also sends the register (which may encapsulate the data packets) to RP2, RP3, and RP4.

4. RP2, RP3, and RP4 do not further forward the register to each other.

5. RP2, RP3, and RP4 perform normal PIM-SM RP functionality, and if there is a data packet encapsulated, RP2 forwards the data packet to R2 and RP3 forwards the data packet to R31 and R32, respectively.

6. The previous five steps repeat for null registers sent by DR1.

PIMv6 Anycast RP Failover

The following illustration shows PIM anycast RP failover.
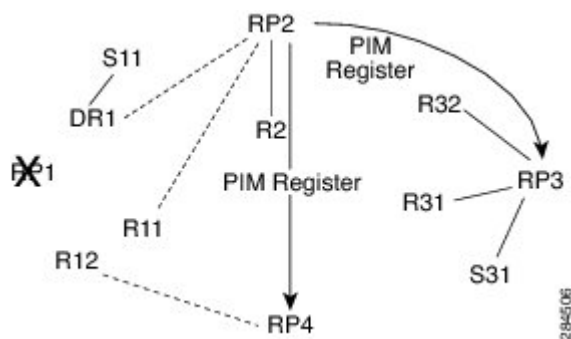
In failover, when RP1 is not reachable, the following occurs:

• Registers from DR1 will be routed transparently to RP2.

• R11 uses RP2 as the RP, and R12 uses RP4 as the RP.

> • Registers from DR1 will be routed from RP2 to RP3 and RP4.

In this way, the loss of the RP (RP1 in this case) is transparent to DR1, R11, and R12, and the network can converge as soon as the IGP is converged.

How to Configure the PIMv6 Anycast RP Solution

Configuring PIMv6 Anycast RP

This task describes how to configure two PIMv6 anycast RP peers. Steps 3 through 11 show the configuration for RP1, and Steps 12 through 19 show the configuration for RP2.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 address** {*ipv6-address/prefix-length* | *prefix-name sub-bits /prefix-length*}
4. **interface** *type number*
5. **ipv6 address** {*ipv6-address/prefix-length* | *prefix-name sub-bits /prefix-length*}
6. **no shut**
7. **interface** *type number*
8. **ipv6 pim** [**vrf** *vrf-name*] **rp-address** *ipv6-address* [*group-address-list*] [**bidir**]
9. **no shut**
10. **exit**
11. **ipv6 pim anycast-RP** *rp-address peer-address*
12. **ipv6 address** {*ipv6-address/prefix-length* | *prefix-name sub-bits /prefix-length*}
13. **interface** *type number*
14. **ipv6 address** {*ipv6-address/prefix-length* | *prefix-name sub-bits /prefix-length*}
15. **no shut**
16. **interface** *type number*
17. **ipv6 pim** [**vrf** *vrf-name*] **rp-address** *ipv6-address* [*group-address-list*] [**bidir**]
18. **no shut**
19. **ipv6 pim anycast-RP** *rp-address peer-address*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**ipv6 address** {*ipv6-address*/*prefix-length* | *prefix-name* *sub-bits* /*prefix-length*} **Example:** Device(config-if)# ipv6 add 2001:DB8::1:1/128	Configures an IPv6 address based on an IPv6 general prefix and enable IPv6 processing on an interface.
Step 4	**interface** *type number* **Example:** Device(config)# interface Loopback4	Specifies an interface type and number, and places the device in interface configuration mode.
Step 5	**ipv6 address** {*ipv6-address*/*prefix-length* | *prefix-name* *sub-bits* /*prefix-length*} **Example:** Device(config-if)# ipv6 address 2001:DB8::4:4/64	Configures an IPv6 address based on an IPv6 general prefix and enable IPv6 processing on an interface.
Step 6	**no shut** **Example:** Device(config-if)# no shut	Enables an interface.
Step 7	**interface** *type number* **Example:** Device(config-if)# interface Loopback5	Specifies an interface type and number, and places the device in interface configuration mode.
Step 8	**ipv6 pim** [**vrf** *vrf-name*] **rp-address** *ipv6-address* [*group-address-list*] [**bidir**] **Example:** Device(config)# ipv6 pim rp-address 2001:DB8::1:1 acl_sparse1	Configures the address of a PIM RP for a particular group range.
Step 9	**no shut** **Example:** Device(config-if)# no shut	Enables an interface.
Step 10	**exit** **Example:** Device(config-if)# exit	Enter this command to exit interface configuration mode and enter global configuration mode.
Step 11	**ipv6 pim anycast-RP** *rp-address* *peer-address* **Example:** The following example shows configuring PIM RP for an anycast group range for a remote and local router: Device(config)# ipv6 pim anycast-rp 2001:DB8::1:1 2001:DB8::3:3 # ipv6 pim anycast-rp 2001:DB8::1:1 2001:DB8::4:4	Use this command to configure the address of the PIM RP for an anycast group range. • The IP address of the local device must be included in the set so that all devices in anycast set have the same IP addresses.

	Command or Action	Purpose
Step 12	**ipv6 address** {*ipv6-address/prefix-length* | *prefix-name* *sub-bits* /*prefix-length*} **Example:** `Device(config-if)# ipv6 add 2001:DB8::1:1/128`	Configures an IPv6 address based on an IPv6 general prefix and enables IPv6 processing on an interface.
Step 13	**interface** *type number* **Example:** `Device(config)# interface Loopback4`	Specifies an interface type and number, and places the device in interface configuration mode.
Step 14	**ipv6 address** {*ipv6-address/prefix-length* | *prefix-name* *sub-bits* /*prefix-length*} **Example:** `Device(config-if)# ipv6 address 2001:DB8::3:3/64`	Configures an IPv6 address based on an IPv6 general prefix and enables IPv6 processing on an interface.
Step 15	**no shut** **Example:** `Device(config-if)# no shut`	Enables an interface.
Step 16	**interface** *type number* **Example:** `Device(config-if)# interface Loopback5`	Specifies an interface type and number, and places the device in interface configuration mode.
Step 17	**ipv6 pim** [**vrf** *vrf-name*] **rp-address** *ipv6-address* [*group-address-list*] [**bidir**] **Example:** `Device(config)# ipv6 pim rp-address 2001:DB8::1:1 acl_sparse1`	Configures the address of a PIM RP for a particular group range.
Step 18	**no shut** **Example:** `Device(config-if)# no shut`	Enables an interface

Step 19	**ipv6 pim anycast-RP** *rp-address* *peer-address*
	
	Example:
	The following example shows configuring PIM RP for an anycast group range for a remote and local router:
	
	`Device(config-if)# ipv6 pim anycast-rp`
	`2001:DB8::1:1 2001:DB8::3:3`
	`# ipv6 pim anycast-rp 2001:DB8::1:1 2001:DB8::4:4`
		Use this command to configure the address of the PIM RP for an anycast group range for a remote or local router.

Configuration Examples for the PIMv6 Anycast RP Solution

Example: Configuring PIMv6 Anycast RP

```
RP1
Device1(config)# ipv6 pim rp-address 2001:DB8::1:1 acl_sparse1
Device1(config)# interface Loopback4
Device1(config-if)# ipv6 address 2001:DB8::4:4/64
Device1(config-if)# no shut

Device1(config)# interface Loopback5
Device1(config-if)# ipv6 address 2001:DB8:0:ABCD::1/64
Device1(config-if)# no shut
Device1(config-if)# exit
Device1(config)# ipv6 pim anycast-rp 2001:DB8:0:ABCD::1 2001:DB8::3:3

RP2 (Anycast RP Peer)
Device2(config)# ipv6 pim rp-address 2001:DB8::1:1 acl_sparse1
Device2(config)# interface Loopback4
Device2(config-if)# ipv6 address 2001:DB8::3:3/64
Device2(config-if)# no shut

Device2(config)# interface Loopback5
Device2(config-if)# ipv6 address 2001:DB8:0:ABCD::1/64
Device2(config-if)# no shut
Device2(config)# ipv6 pim anycast-rp 2001:DB8::1:1 2001:DB8::4:4


Device2 show ipv6 pim anycast-rp 2001:DB8::1:1

Anycast RP Peers For 2001:DB8::1:1   Last Register/Register-Stop received
  2001:DB8::3:3 00:00:00/00:00:00
  2001:DB8::4:4 00:00:00/00:00:00
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IPv6 commands	Cisco IOS IPv6 Command Reference
Cisco IOS IPv6 features	Cisco IOS IPv6 Feature Mapping

Standards and RFCs

Standard/RFC	Title
RFC 4610	*Anycast-RP Using Protocol Independent Multicast (PIM)*

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for PIMv6 Anycast RP Solution

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 https://cfnng.cisco.com/. An account on Cisco.com is not required.