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Use of PIM Address List Hello across address families draft-ietf-pim-ipv4-prefix-over-ipv6-nh-02.txt

Abstract

In the PIM Sparse Mode standard there is an Address List Hello option used to list secondary addresses of an interface. Usually the addresses would be of the same address family as the primary address. In this document we provide a use case for listing secondary addresses that are from a different family. In particular, Multi-Protocol BGP (MP-BGP) has support for distributing next-hop information for multiple address families using one AFI/SAFI Network Layer Reachability Information (NLRI). When using this combined with PIM, the Address List Hello option can be used to determine which PIM neighbor to use as RPF neighbor.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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Table of Contents

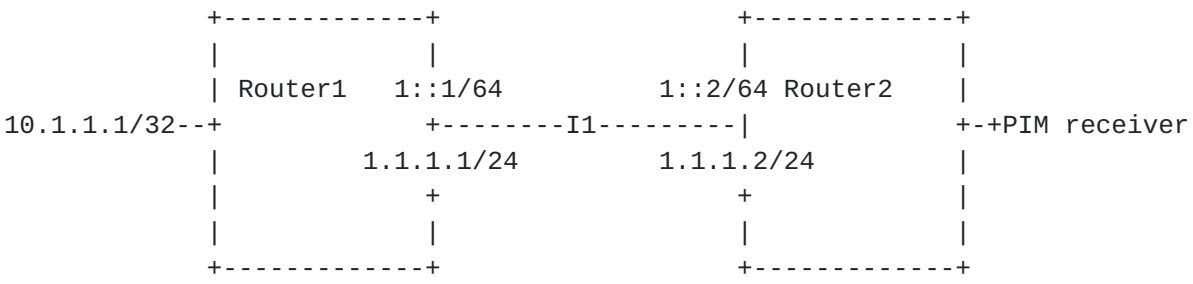
1. Introduction

The PIM Sparse Mode standard [RFC7761] defines an Address List Hello option used to list secondary addresses of an interface. It specifies that the addresses listed SHOULD be of the same address family as the primary address. It was not anticipated that it could be useful to list addresses of a different address family. This document describes a use-case for listing different address families.

While use of MP-BGP along with [RFC5549] enables one routing protocol session to exchange next-hop info for both IPv4 and IPv6 prefixes, forwarding plane needs additional procedures to enable forwarding in data-plane. For example, when a IPv4 prefix is learnt over IPv6 next-hop, forwarding plane resolves the MAC-Address (L2-Adjacency) for IPv6 next-hop and uses it as destination-mac while doing inter-subnet forwarding. While it's simple to find the required information for unicast forwarding, multicast forwarding in same scenario poses additional requirements.

Multicast traffic is forwarding on a tree build by multicast routing protocols such as PIM. Multicast routing protocols are address family dependent and hence a system enabled with IPv4 and IPv6 multicast routing will have two PIM sessions one for each of the AF. Also, Multicast routing protocol uses Unicast reachability information to find unique Reverse Path Forwarding Neighbor. Further it sends control messages such as PIM Join to form the tree. Now when a PIMv4 session needs to initiate new multicast tree in event of discovering new receiver It consults Unicast control plane to find next-hop information. While this multicast tree can be Shared or Shortest Path tree, PIMv4 will need a PIMv4 neighbor to send join. However, the Unicast control plane can provide IPv6 next-hop as explained earlier and hence we need certain procedures to find corresponding PIMv4 neighbor address. This address is vital for correct prorogation of join and furthermore to build multicast tree. This document describes various approaches along with their use-cases and pros-cons.

Figure 1: Example Topology



In example topology, Router1 and Router2 are PIMv4 and PIMv6 neighbors on Interface I1. Router2 learns prefix 10.1.1.1/32's next-hop as 1::1/64 on Interface I1 as advertised by Router1 using BGP IPV6 NLRI.But in order to send (10.1.1.1/32, multicast-group) PIMv4 join on Interface I1, Router2 needs to find corresponding PIMv4 neighbor. In case there are multiple PIMv4 neighbors on same Interface I1, problem is aggravated.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14, [RFC2119].

2. Solution

A PIM router can advertise its locally configured IPv6 addresses on the interface in PIMv4 Hello messages as per [RFC7761] section 4.3.4. Same applies for IPv4 address in PIMv6 Hello. PIM will keep this info for each neighbor in Neighbor-cache along with DR-priority, hold-time etc. Once IPv6 Next-hop is notified to PIMv4, it will look into neighbors on the notified RPF-interface and find PIMv4 neighbor advertising same IPv6 local address in secondary Neighbor-list. If such a match is found, that particular neighbor will be uses as IPv4 RPF-Neighbor for initiating upstream join.

This method is valid for networks enabled with PIMv4 and PIMv6 both as well for the networks enabled with only PIMv4 with IPv6 BGP session or PIMv6 with IPv4 BGP session. This method does't required any additional config changes in the network.

3. Security Considerations

There are no new security considerations.

4. IANA Considerations

There are no IANA considerations.

5. References

5.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

5.2. Informative References

[RFC5549] Le Faucheur, F. and E. Rosen, "Advertising IPv4 Network Layer Reachability Information with an IPv6 Next Hop", RFC 5549, DOI 10.17487/RFC5549, May 2009, <https://www.rfc-editor.org/info/rfc5549>.

[RFC7761] Fenner, B., Handley, M., Holbrook, H., Kouvelas, I., Parekh, R., Zhang, Z., and L. Zheng, "Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)", STD 83, RFC 7761, DOI 10.17487/RFC7761, March 2016, <https://www.rfc-editor.org/info/rfc7761>.

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