Protocol Independent Multicast Routing in the Internet Protocol Version 6 (IPv6)

Abstract

This document outlines recommendations in the use of Protocol Independent Multicast routing protocol to support Internet Protocol Version 6. It describes the changes needed in order to handle the differences between IPv6 and IPv4 and conform to the logic introduced by other routing protocols enabled for IPv6.
Contents

1. Definitions 1

2. Introduction 1

3. Definitions and Assumptions 1

4. Protocol Impact 1
   4.1. Hello Message ................................. 1
   4.2. Register Message ............................... 2
   4.3. Register-Stop Message ........................ 2
   4.4. Join/Prune, Graft, and Graft-Ack Messages .... 2
   4.5. Bootstrap Message ............................. 2
   4.6. Assert Message ................................. 2
   4.7. Candidate-RP-Advertisement Message .......... 3

5. IPv6 Address Scoping 3

6. Additional Areas of Work 3
1. Definitions

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 RFC 2119 [RFC 2119].

2. Introduction

This document describes a protocol for efficiently routing to multicast groups communicating with the Internet Protocol Version 6 (IPv6). This document will only describe recommendations for making PIM conform to practices implemented by other IPv6 routing protocols. The existing PIM drafts should be referenced for actual protocol operation.

3. Definitions and Assumptions

- Link Local Address - A local-use, non-routable unicast IPv6 address [RFC 2373].

- All-PIM-Routers multicast address -
  A permanently assigned link-scoped IPv6 multicast address for the PIM protocol [RFC 2375].

It is assumed that a router running PIM for IPv6 will have a network unique, globally routable IPv6 address that will serve as the router’s Router-ID.

4. Protocol Impact

The following will outline suggested values for the PIM protocol messages in order to support IPv6. For most messages, the changes involve the addresses used in the IPv6 header.

4.1. Hello Message

When sending a Hello Message, a PIM router must use a different set of IPv6 addresses in the IPv6 header. The IPv6 destination address must be the All-PIM-Routers multicast address. The IPv6 source address must be the IPv6 link local address of the interface on which this message is being forwarded. The link local address in the source address field will be used to determine
neighbor adjacency and for DR election. It should be noted, that the DR will identify itself using its Router-ID.

4.2. Register Message

The Register Message is addressed to the Router-ID of the RP. The source address of the message is the Router-ID of the DR. The DR sending the Register Message obtains the Router-ID of the RP from the local RP-set information.

4.3. Register-Stop Message

The Register-Stop Message is addressed in the same manner as the Register Message. The RP addresses the message to the Router-ID of the DR. The source address is the Router-ID of the RP. The RP obtains the Router-ID of the DR from the source address field of the Register Message received from the DR.

4.4. Join/Prune, Graft, and Graft-Ack Messages

In the transmission of a Join/Prune Message, a router sets the IPv6 destination address to the All-PIM-Routers multicast address. The IPv6 source address is set to the link local address of the interface on which the message is forwarded. The Upstream Neighbor Address field is set to the link local address of the next hop router, which is obtained from the RPF lookup.

4.5. Bootstrap Message

When sending a Bootstrap Message, a PIM router sets the IPv6 destination address to the All-PIM-Routers multicast address. The source address is the link local address of the interface on which the message is forwarded. The BSR Address is set to the Router-ID of the BSR.

4.6. Assert Message

The Assert Message has an IPv6 destination address of the All-PIM-Routers multicast address and an IPv6 source address of the link local address of the interface forwarding the message. The link local address in the IPv6 source field is used to resolve ties in the
assert process. Downstream routers save the winning assert router’s link local address to resolve any future RPF requirements.

4.7. Candidate-RP-Advertisement Message

The Candidate-RP-Advertisement Message uses the Router-ID of the BSR as the IPv6 destination address. The source address is the Router-ID of the candidate RP. The RP Address field is set to the Router-ID of the candidate RP. Each candidate RP router creates this message and unicasts it to the BSR.

5. IPv6 Address Scoping

With the introduction of scoped addresses in IPv6, new issues arise in the distribution of scoped routes and the forwarding of scoped packets. Currently, work in the area of scoping has been limited. An Internet draft does exist that outlines the changes needed to routing protocols in order to support the IPv6 scoped addresses [SCOPE]. Currently, this work only addresses PIM running within a single site or organization.

6. Additional Areas of Work

The main area of additional work is in the support of site- and organization-scoped IPv6 multicast addresses. If a PIM domain is to cross an IPv6 scope domain, then guidelines for supporting the following will have to be developed:

- Scoped RP addresses
- Scoped DR addresses
- Scoped BSR addresses
References


Security Considerations

This document does introduce any protocol changes that require any additional security considerations above and beyond those described in the original protocol specification documents.

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