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G. Mirsky
ZTE Corp.
J. Xiaoli
ZTE Corporation

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Bidirectional Forwarding Detection (BFD) for Multi-point Networks and Protocol Independent Multicast - Sparse Mode (PIM-SM) Use Case draft-mirsky-pim-bfd-p2mp-use-case-00

Abstract

This document discusses use of Bidirectional Forwarding Detection (BFD) for multi-point networks to provide nodes that participate in Protocol Independent Multicast - Sparse Mode (PIM-SM) over shared-media segment with sub-second convergence of the Designated Router and defines the extension to bootstrap point-to-multipoint BFD session. Optional extension to PIM-SM Hello, as defined in RFC 7761, also defined in this document.

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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1. Introduction

[RFC7761] is the current specification of the Protocol Independent Multicast - Sparse Mode (PIM-SM) for IPv4 and IPv6 networks. Confirming implementation of PIM-SM elects a Designated Router (DR) on each PIM-SM interface. When a group of PIM-SM nodes are connected to shared-media segment, e.g. Ethernet, the one elected as DR is to act on behalf of directly connected hosts in context of the PIM-SM protocol. Failure of the DR impacts quality of the multicast services it provides to directly connected hosts because the default failure detection interval for PIM-SM routers is 105 seconds. Introduction of Backup DR (BDR), proposed in [I-D.ietf-pim-dr-improvement] improves convergence time in the PIM-SM over shared-media segment but still depends on long failure detection interval.

Bidirectional Forwarding Detection (BFD) [RFC5880] had been originally defined to detect failure of point-to-point (p2p) paths - single-hop [RFC5881], multihop [RFC5883]. [I-D.ietf-bfd-multipoint] extends [RFC5880] for multipoint and multicast networks, which precisely characterizes deployment scenarios for PIM-SM over LAN segment. This document demonstrates how point-to-multipoint (p2mp) BFD can enable faster detection of PIM-SM DR and BDR failure and thus minimize multicast service disruption. The document also defines the extension to PIM-SM [RFC7761] to bootstrap a PIM-SM router to join in p2mp BFD session over shared-media link.

1.1. Conventions used in this document

1.1.1. Terminology

BFD: Bidirectional Forwarding Detection

BDR: Backup Designated Router

DR: Designated Router

p2mp: Pont-to-Multipoint

PIM-SM: Protocol Independent Multicast - Sparse Mode

1.1.2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. Problem Statement

Several PIM-SM routers may be connected over shared-media link, e.g. Ethernet. [RFC7761] does not provide method for fast, e.g. sub-second, DR failure detection by other PIM-SM routers on the same Ethernet link. BFD already has many implementations based on HW that are capable to support multiple sub-second session concurrently. [Editor's note: monitoring of PIM-SM BDR liveliness will be addressed in the next update of the draft.]

3. Applicability of p2mp BFD

[I-D.ietf-bfd-multipoint] may provide the efficient and scalable solution for fast-converging environment that has head-tails relationships. Each such group presents itself as p2mp BFD session with its head being the root and other routers being tails of the p2mp BFD session. Figure 1 displays the new BFD Discriminator TLV [RFC7761] to bootstrap tail of the p2mp BFD session.

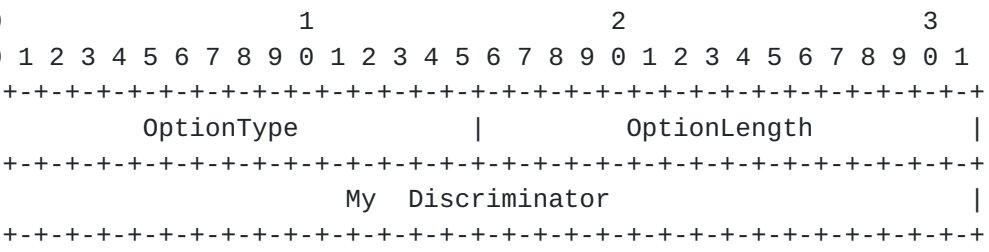

Figure 1: BFD Discriminator TLV to Bootstrap P2MP BFD session

where new fields are interpreted as:

OptionType is value (TBA1) assigned by IANA Section 4 that identifies the TLV as BFD Discriminator TLV;

OptionLength value is always 4

My Discriminator - My Discriminator value allocated by the root of the p2mp BFD session.

If PIM-SM routers, that support this specification, are configured to use p2mp BFD for faster convergence, then the DR MUST create BFD session MultipointHead, as defined in [I-D.ietf-bfd-multipoint]. PIM-SM DR MUST include BFD TLV in its PIM-Hello message. PIM-SM DR periodically transmits BFD control packets. Source IP address of the BFD control packet MUST be the same as the source IP address of the PIM-Hello with BFD TLV messages being transmitted by the DR. The values of My Discriminator in the BFD control packet and My Discriminator field of the BFD TLV in PIM-Hello, transmitted by the PIM-SM DR, MUST be the same. When non-DR PIM-SM router receives PIM-Hello packet from DR with BFD TLV it MAY create p2mp BFD session as MultipointTail, as defined in [I-D.ietf-bfd-multipoint], and demultiplex p2mp BFD test session based on DR source IP address the My Discriminator value value it learned from BFD Discriminator TLV. If DR ceased to include BFD TLV in its PIM-Hello message, other PIM-SM nodes MUST close corresponding MultipointTail BFD session.

3.1. Multipoint BFD Encapsulation

The MultipointHead of p2mp BFD session when transmitting BFD control packet:

MUST set TTL value to 1;

SHOULD use group address ALL-PIM-ROUTERS ('224.0.0.13' for IPv4 and 'ff02::d' for IPv6) as destination IP address

MAY use network broadcast address for IPv4 or link-local all nodes multicast group for IPv6 as destination IP address;

MUST set destination UDP port value to 3784 when transmitting BFD control packets, as defined in [I-D.ietf-bfd-multipoint].

4. IANA Considerations

IANA is requested to allocate new OptionType value from PIM Hello Options registry according to:

Value Name	Length Number	Name Protocol	Reference
TBA	4	BFD Discriminator	This document

Table 1: BFD Discriminator option type

5. Security Considerations

Security considerations discussed in [RFC7761], [RFC5880], and [I-D.ietf-bfd-multipoint], apply to this document.

6. Acknowledgements

TBD

7. Normative References

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Authors' Addresses

Greg Mirsky
ZTE Corp.

Email: gregimirsky@gmail.com

Ji Xiaoli
ZTE Corporation
No.50 Software Avenue, Yuhuatai District
Nanjing
China

Email: ji.xiaoli@zte.com.cn