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PIM Flooding Mechanism and Source Discovery for BIER
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Abstract

PIM Flooding Mechanism and Source Discovery (PFM-SD) is a mechanism for source discovery within a PIM domain. PIM signaling over BIER has been defined, allowing for BIER to interoperate with PIM. This document defines PFM-SD over BIER, such that PFM-SD can be used by PIM in a PIM domain to discover sources that are reachable via BIER. Also, this document provides PFM-SD extensions to discover the BIER ingress router closest to the source. This can be used by BIER overlays, such as PIM signaling over BIER, to determine which router to signal.

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1. Introduction

PIM Flooding Mechanism (PFM) and Source Discovery (SD) [RFC8364] provides a generic flooding mechanism for distributing information throughout a PIM domain. In particular it allows for source discovery. There are various deployment scenarios where PIM and BIER need to co-exist. For instance, consider migration scenarios where a few routers in a PIM domain are upgraded to support BIER. In that case, one may use PIM Signaling Through BIER Core [I-D.ietf-bier-pim-signaling], allowing PIM to build trees passing through the BIER routers. This document defines PFM over BIER. This allows PFM to pass through the BIER routers, allowing PFM to be used in the PIM domain.

One challenge with PIM signaling over BIER [I-D.ietf-bier-pim-signaling] is to determine which BIER router is closest to the source. A number of options are discussed in that document. This document provides an alternative solution for discovering which BIER router to signal. It may also be used with other signaling mechanisms such as IGMP/MLD [I-D.ietf-bier-mld]. This is achieved by introducing two new PFM TLVs. When a BIER router forwards a PFM message into BIER, it adds a new TLV specifying the BIER sub-domain, its BFR-ID and its BIER prefix. Also, any Group Source Holdtime TLVs, defined in [RFC8364], are replaced with new TLVs that include the router's cost of reaching the sources.

1.1. Conventions Used in This Document

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 [RFC2119].

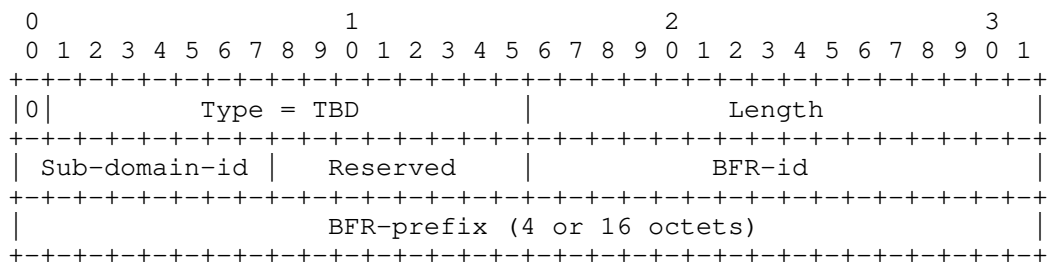
2. PFM over BIER

When a BIER enabled router accepts a PFM message from a PIM neighbor according to [RFC8364], it SHOULD in addition to the forwarding defined in [RFC8364], also send a copy to all BIER routers (an implementation SHOULD allow the set of BIER routers to send PFM messages to, to be configured).

When a router receives a BIER encapsulated PFM message, it MUST process the message according to [RFC8364], except there is no requirement for the message to come from a PIM neighbor, and there is no RPF check. The message MUST be forwarded out on the PIM interfaces according to [RFC8364]. It MAY also be BIER forwarded, if the router acts as a border router between BIER domains.

3. PFM Ingress BIER Router TLV

When a router is forwarding a PFM message into a BIER domain, it MUST add this TLV. If the TLV is already present, all occurrences should be removed. This TLV encodes the BIER prefix, sub-domain ID and BFR-ID of the router. This TLV SHOULD only be present within the BIER domain. When a router receives a PFM message with this TLV, all occurrences of the TLV SHOULD be removed. If the router is forwarding the message into a new BIER domain, it should add a new TLV with its own prefix, sub-domain ID and BFR-ID. A PFM message is expected to have at most one such TLV. A router MUST NOT add more than one such TLV. When forwarding a PFM message, the TLV in the received message MUST be removed from the forwarded message.



0: The Transitive bit is set to 0.

Type: Type is TBD.

Length: The length of the value in octets.

Sub-domain-id: The ID of the sub-domain that this PFM is forwarded into. The length is 1 octet.

Reserved: MUST be set to 0, and ignored when received. The length is 1 octet.

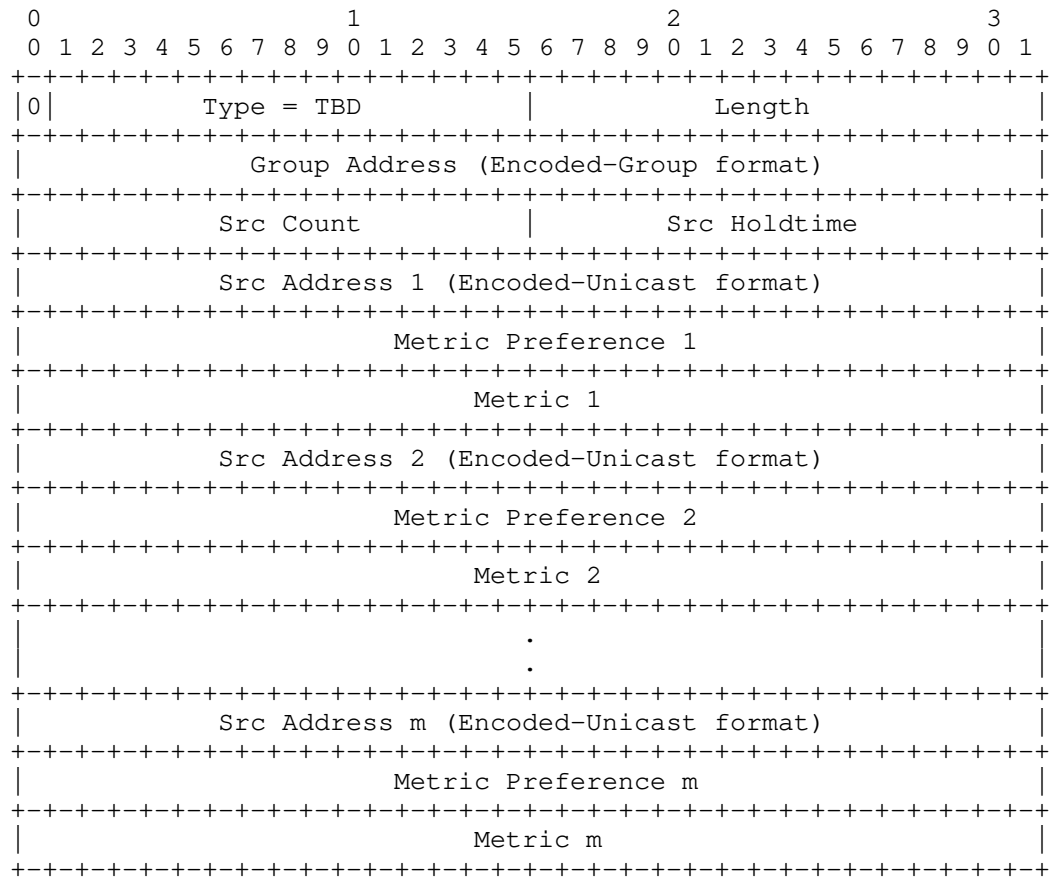
BFR-id: The BFR-id of the router that added this TLV in the sub-domain specified. The length is 2 octets.

BFR-prefix: The BFR-prefix of the router that added this TLV in the sub-domain specified. This length is 4 octets for IPv4 and 16 octets for IPv6.

4. Group Source Holdtime Metric TLV

When a router forwards a PFM message into a BIER domain, it should replace all Group Source Holdtime TLVs defined in [RFC8364] with the Group Source Holdtime Metric TLVs defined here. They are the same, except here we also add metric preference and metric. The metric preference and metric MUST be set to this router's metric and preference to reach the specified source. If the source is not reachable, the TLV MUST be omitted. This TLV is used together with the PFM Ingress BIER Router TLV is used to indicate the ingress router's cost of reaching the source.

When a router receives a message containing this TLV, it SHOULD store this information, but it MUST NOT forward these TLVs. If forwarding into another BIER domain, the metric preference and metric MUST be updated with this router's cost of reaching the source. If forwarding into a PIM domain, all the TLVs SHOULD be replaced with Group Source Holdtime TLVs as defined in [RFC8364]. The same information is used, except that the metric preference and metric are left out. One could potentially make use of the metric in a PIM domain as well, but it is not clear whether this is useful, and the PIM routers may not support this TLV.



0: The Transitive bit is set to 0.

Type: Type is TBD.

Length: The length of the value in octets.

Group Address: The group that sources are to be announced for. The format for this address is given in the Encoded-Group format in [RFC7761].

Src Count: The number of source addresses that are included.

Src Holdtime: The Holdtime (in seconds) for the included source(s).

Src Address: The source address for the corresponding group. The format for these addresses is given in the Encoded-Unicast address in [RFC7761].

Metric Preference: Preference value assigned to the unicast routing protocol that provided the route to the source.

Metric: The unicast routing table metric associated with the route used to reach the source. The metric is in units applicable to the unicast routing protocol used.

5. BIER signaling enhancements

A BIER border router SHOULD cache all the Group Source Holdtime Metric TLVs it receives, along with the respective PFM Ingress BIER Router TLV. This allows the router to determine which sources are active, and which BIER border router is closest to the source. The sub-domain ID, BFR-id and BFR-prefix in the TLV provide the necessary information for use by signaling mechanisms such as [I-D.ietf-bier-pim-signaling] to signal the preferred ingress router. It may also be used by [I-D.ietf-bier-mld]. IGMP/MLD reports would generally be sent to all BIER routers as it is not known which sources are active and which routers can reach them. But by using the enhancements in this document, a source-specific report can be sent to the router closest to the source. Also a group report might be set to the set of routers that are closest to the sources for that group. This reduces the amount of receiver state on the BIER routers, and also the amount of messages each routers needs to process.

6. Security Considerations

TBD

7. IANA Considerations

This document defines two new PFM TLVs that needs to be assigned from the "PIM Flooding Mechanism Message Types" registry.

8. References

8.1. Normative References

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- [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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