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BIER Flooding Mechanism
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Abstract

This document introduces a method to flood BIER information in hybrid network to build BIER forwarding plane.

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1. Problem Statement

Some networks have been deployed widely are hybrid networks. There are different dynamic routing protocols running in the hybrid networks. Multicast services can also be provided in these kinds of networks because of the protocol independent feature of PIM.

BIER [I-D.ietf-bier-architecture] provides a new architecture for the forwarding of multicast data packets. It does not require a protocol for explicitly building multicast distribution trees, nor does it require intermediate nodes to maintain any per-flow state. [I-D.ietf-bier-isis-extensions] and [I-D.ietf-bier-ospf-bier-extensions] are good at establishing BIER forwarding plane in network which uses OSPF or IS-IS as BIER underlay protocol.

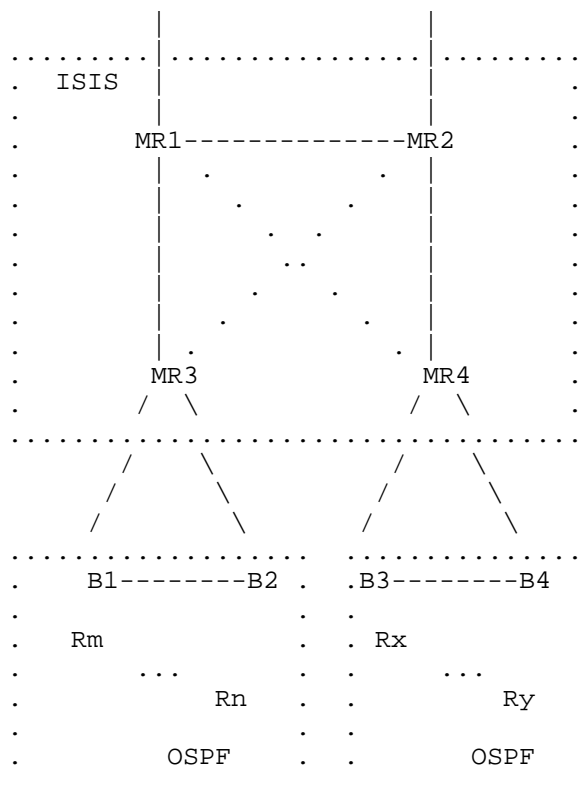


Figure 1: An typical hybrid network

In the mentioned networks, there are more than one dynamic routing protocols running in the networks. For example in figure 1, this is a partial typical network in actually deployment. Two different dynamic routing protocols and are used in the network. Sometimes static configured routes also are used in some parts of the network. In order to deploy BIER multicast, we can divide the network into several BIER domains. Obviously the efficiency slows down due to multiple encapsulating/ decapsulating executions.

2. Solution

The Bootstrap Router mechanism (BSR) [RFC5059] is a commonly used mechanism for distributing dynamic Group to RP mappings in PIM. It is responsible for flooding information about such mappings throughout a PIM domain, so that all routers in the domain can have the same information. [I-D.ietf-pim-source-discovery-bsr] defines a mechanism that can flood any kind of information throughout a PIM domain. This document borrows the idea from the two drafts, introduces a mechanism to flood BIER node's information throughout a

BIER domain to build BIER forwarding plane. Nodes can use unicast forwarding table directly to establish BIER forwarding plane.

The validation processing of PFM messages is the same as the definition in [I-D.ietf-pim-source-discovery-bsr] section 3.2.

BIER node originates BIER information TLV and optional associated sub-TLVs in PFM message. The PFM messages are flooded by throughout the BIER domain. BFR gets routing information from the unicast forwarding table directly, and computes BIER forwarding table. Then BIER forwarding plane is established.

2.1. Scheduled Update

Because PIM advertisement is scheduled, the node's BIER information is refreshed periodically. In case one node's BIER information changes or expires, the other nodes recompute the BIER forwarding table. The holdtime in the BIER information TLV is used to make the item expired.

2.2. Triggered Update

If the BIER node's configuration changes, such as BFR-id, the node should send update PFM messages immediately. Then other nodes can recompute the new BIER forwarding table.

3. Message Format

3.1. PFM message

New TLVs are defined in PFM message to flood node's BIER information, such as BFR-id, BFR-prefix and so on. The new TLVs align exactly with the definition and restrictions in [I-D.ietf-bier-isis-extensions] and [I-D.ietf-bier-ospf-bier-extensions].

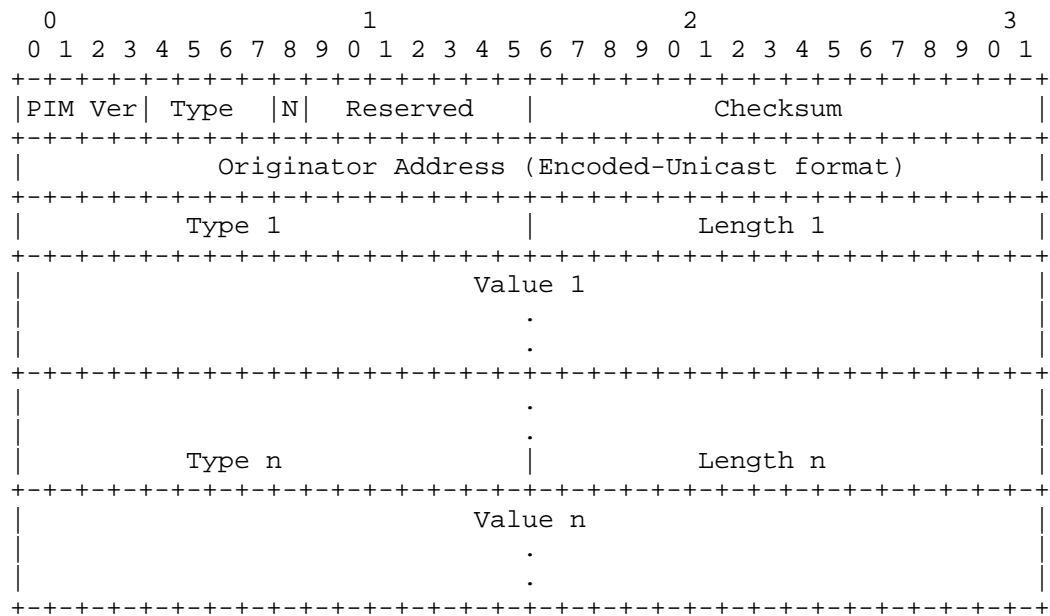


Figure 2: PFM message format

The format of PFM message is defined in [I-D.ietf-pim-source-discovery-bsr].

Originator Address: The router's address that originate the message. The address SHOULD be the same with the node's BFR-prefix.

The other fields is the same as definition in [I-D.ietf-pim-source-discovery-bsr].

3.2. BIER information TLV

A new type of TLV is defined in PFM message. This new type TLV is named by BIER information TLV. Two types of sub-TLV are associated with it. There is no optional BIER tree type sub-TLV in PFM message because of the independence of routing protocol.

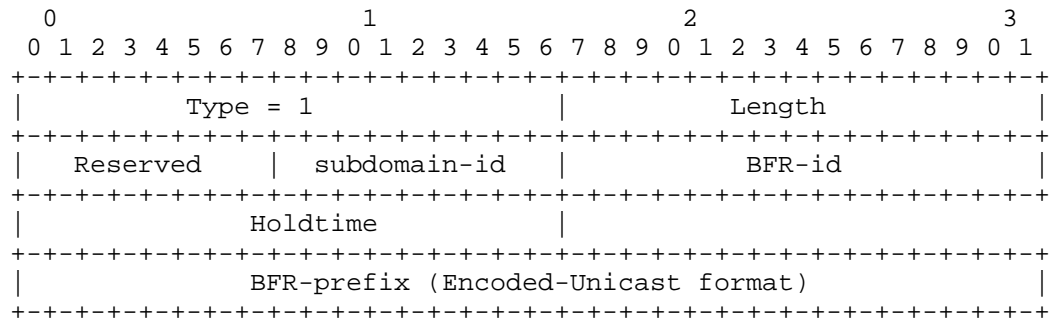


Figure 3: BIER information TLV

- o Type: The value of type should be assigned by IANA.
- o Length: The total length of the BIER information TLV except for the first two fields.
- o Reserved: Must be 0 on transmission, ignored on reception. May be used in future version. 1 octets.
- o Subdomain-id: Unique value identifying the BIER sub-domain. 1 octet.
- o BFR-id: The value of BFR-id defined in [BIER-arch], 2 octets. 0 is invalid value. If the value of this field is set to 0, the whole TLV MUST be ignored and not forwarded.
- o Holdtime: The life cycle of the BIER information. The default value is 60s.
- o BFR-prefix: The BFR-prefix of the node in this sub-domain. The format for this address is given in the Encoded-Unicast address in [RFC7761].

A node may belong to several BIER sub-domains, so it is possible that there are multiple BIER information TLVs in the PFM message.

3.3. BIER MPLS Encapsulation sub-TLV

In case the nodes in the network support MPLS forwarding, BIER MPLS encapsulation sub-TLV can be advertised for a specific bitstring length for a certain (MT,subdomain). This sub-TLV may appear multiple times within single BIER information TLV. The format and restriction is the same as the definition in [I-D.ietf-bier-isis-extensions] and [I-D.ietf-bier-ospf-bier-extensions].

The type value of this sub-TLV should be assigned by IANA. The suggestion value is 1.

3.4. Optional BIER sub-domain BSL conversion sub-TLV

The format and restriction is the same as the definition in [I-D.ietf-bier-isis-extensions] and [I-D.ietf-bier-ospf-bier-extensions]. The type value of this sub-TLV should be assigned by IANA. The suggestion value is 2.

4. Security Considerations

The security considerations are mainly similar to what is documented in [I-D.ietf-pim-source-discovery-bsr].

5. IANA Considerations

This document requires the assignment of a new PFM TLV type for the BIER information Flooding Mechanism. IANA is also requested to create two sub-TLV types for BIER MPLS encapsulation sub-TLV and BIER sub-domain BSL conversion sub-TLV.

6. Normative References

- [I-D.ietf-bier-architecture]
Wijnands, I., Rosen, E., Dolganow, A., Przygienda, T., and S. Aldrin, "Multicast using Bit Index Explicit Replication", draft-ietf-bier-architecture-08 (work in progress), September 2017.
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Ginsberg, L., Przygienda, T., Aldrin, S., and Z. Zhang, "BIER support via ISIS", draft-ietf-bier-isis-extensions-05 (work in progress), July 2017.
- [I-D.ietf-bier-ospf-bier-extensions]
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Wijnands, I., Venaas, S., Brig, M., and A. Jonasson, "PIM flooding mechanism and source discovery", draft-ietf-pim-source-discovery-bsr-06 (work in progress), March 2017.

- [RFC5059] Bhaskar, N., Gall, A., Lingard, J., and S. Venaas, "Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)", RFC 5059, DOI 10.17487/RFC5059, January 2008, <<https://www.rfc-editor.org/info/rfc5059>>.
- [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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