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BGP Link-State extensions for BIER
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Abstract

Bit Index Explicit Replication (BIER) is an architecture that provides optimal multicast forwarding through a "BIER domain" without requiring intermediate routers to maintain any multicast related per-flow state. BIER also does not require any explicit tree-building protocol for its operation. A multicast data packet enters a BIER domain at a "Bit-Forwarding Ingress Router" (BFIR), and leaves the BIER domain at one or more "Bit-Forwarding Egress Routers" (BFERs). The BFIR router adds a BIER header to the packet. The BIER header contains a bitstring in which each bit represents exactly one BFER to forward the packet to. The set of BFERs to which the multicast packet needs to be forwarded is expressed by setting the bits that correspond to those routers in the BIER header.

This document specifies extensions to the BGP Link-state address-family in order to advertising BIER information.

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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This Internet-Draft will expire on January 31, 2018.

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1. Introduction

Bit Index Explicit Replication (BIER) is an architecture that provides optimal multicast forwarding through a "BIER domain" without requiring intermediate routers to maintain any multicast related per-flow state. BIER also does not require any explicit tree-building protocol for its operation. A multicast data packet enters a BIER domain at a "Bit-Forwarding Ingress Router" (BFIR), and leaves the BIER domain at one or more "Bit-Forwarding Egress Routers" (BFERs). The BFIR router adds a BIER header to the packet. The BIER header contains a bitstring in which each bit represents exactly one BFER to forward the packet to. The set of BFERs to which the multicast packet needs to be forwarded is expressed by setting the bits that correspond to those routers in the BIER header.

This document specifies extensions to the BGP Link-state address-family in order to advertising BIER-specific. An external component (e.g., a controller) then can collect BIER information in the "northbound" direction within the BIER domain.

2. 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 RFC2119.

3. BGP-LS Extensions for BIER

Each BFR MUST be assigned a "BFR-Prefix". A BFR's BFR-Prefix MUST be an IP address (either IPv4 or IPv6) of the BFR, and MUST be unique and routable within the BIER domain as described in section 2 of [I-D.ietf-bier-architecture], and then external component (e.g., a controller) need to collect BIER information of BIER routers are associated with the BFR-Prefix in the "northbound" direction within the BIER domain.

Given that the BIER information is associated with the prefix, the BGP-LS Prefix Attribute TLV [I-D.ietf-idr-ls-distribution] can be used to carry the BIER information. A new Prefix Attribute TLV and Sub-TLV are defined for the encoding of BIER information.

3.1. The BIER TLV

A new Prefix Attribute TLV (defined in [I-D.ietf-idr-ls-distribution] is defined for distributing BIER information. The new TLV is called the BIER TLV. The BIER TLVs may appear multiple times.

The following BIER TLV is defined:

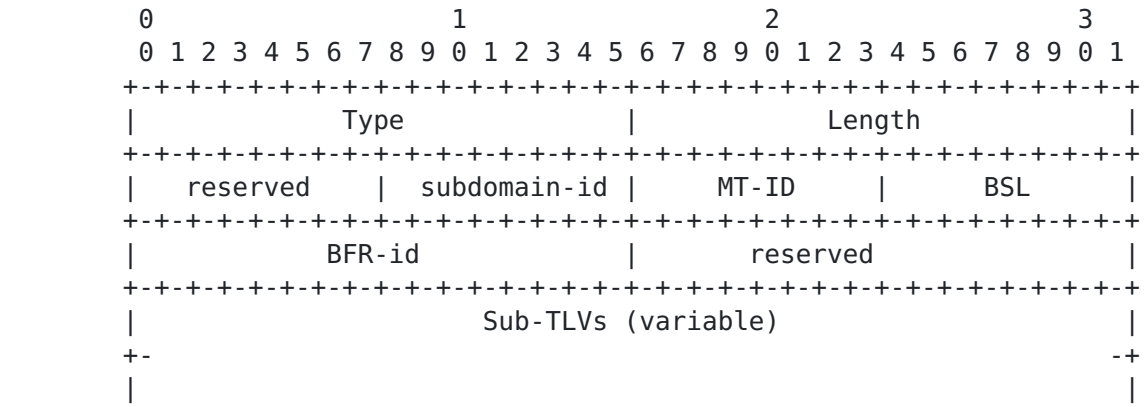

Figure 1

Type:as indicated in IANA Considerations section.

Length: 2 octet.

Reserved: MUST be 0 on transmission, ignored on reception. May be used in future versions.

Subdomain-id: Unique value identifying the BIER sub-domain, 1 octet.

MT-ID: Multi-Topology ID that identifies the topology that is associated with the BIER sub-domain.1 octet.

BitString Length (BS Len): A 1 octet field encoding the supported BitString length associated with this BFR-prefix.This field are specified in section 3 of [I-D.ietf-bier-mpls-encapsulation].Given that the bier router can support BSL values set, this field encoding the BSL values set that BIER routers supported.

BFR-id: A 2 octet field encoding the BFR-id, as documented in [I-D.ietf-bier-architecture]. If the BFR-id is zero, it means, the advertising router is not advertising any BIER-id.In some environment, BFR-id can be configured by NMS, The BFR-id should be sent to a controller.

If multiple BIER Sub-TLVs are present, all having the same BS Length and Subdomain-id values, first one MUST be used and subsequent ones MUST be ignored.

3.1.1. The BIER MPLS Encapsulation Sub-TLV

The BIER MPLS Encapsulation Sub-TLV is a sub-TLV of the BIER TLV. BIER MPLS Encapsulation Sub-TLV is used in order to advertise MPLS specific information used for BIER. It MUST appear multiple times in the BIER TLV as described in [I-D.ietf-bier-ospf-bier-extensions]

The following the BIER MPLS Encapsulation Sub-TLV is defined:

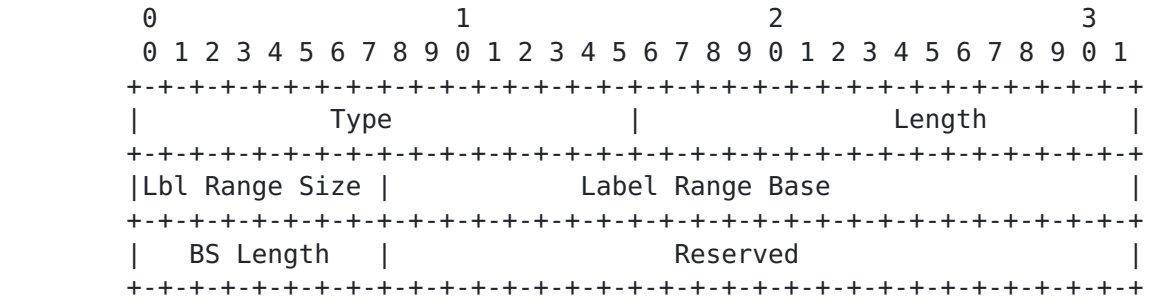

Figure 2

Type: as indicated in IANA Considerations section.

Length: 2 octet.

Label Range Size: A 1 octet field encoding the label range size of the label range. It MUST be greater than 0, otherwise the TLV MUST be ignored.

Label Range Base: A 3 octet field, where the 20 rightmost bits represent the first label in the label range.

BS Length: Bitstring length for the label range that this router is advertising per [I-D.ietf-bier-mpls-encapsulation]. 1 octet.The values allowed in this field are specified in section 3 of [I-D.ietf-bier-mpls-encapsulation].

The "label range" is the set of labels beginning with the label range base and ending with (label range base)+(label range size)-1. A unique label range is allocated for each BitStream length and Sub-domain-ID. These label is used for BIER forwarding as described in [I-D.ietf-bier-architecture] and [I-D.ietf-bier-mpls-encapsulation].Label ranges within the sub-TLV MUST NOT overlap, otherwise the whole sub-TLV MUST be disregarded

BS length in multiple BIER MPLS Encapsulation Sub-TLV inside the same BIER Sub-TLV MUST NOT repeat, otherwise only the first BIER MPLS Encapsulation Sub-TLV with such BS length MUST be used and any subsequent BIER MPLS Encapsulation Sub-TLVs with the same BS length MUST be ignored.

3.2. The BIER-TE TLV

This TLV is used to collect BIER-TE information in the "northbound" direction within the BIER-TE domain.

The section will be added in next version.

4. IANA Considerations

This document requests assigning code-points from the registry for the new Prefix Attribute TLV and Sub-TLV.

TLV Code Point	Description	Value defined
1158(recommend)	BIER	this document

Table 1: The new Prefix Attribute TLV

Sub-TLV Code Point	Description	Value
1 (recommend)	BIER MPLS Encapsulation	this document

Table 2: The new Prefix Attribute Sub-TLV

5. Security Considerations

Procedures and protocol extensions defined in this document do not affect the BGP security model. See [RFC6952] for details.

6. Acknowledgements

We would like to thank Peter Psenak (Cisco) for his comments and support of this work.

7. Normative references

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[I-D.ietf-bier-mpls-encapsulation]
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[I-D.ietf-bier-ospf-bier-extensions]
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[RFC6952] Jethanandani, M., Patel, K., and L. Zheng, "Analysis of BGP, LDP, PCEP, and MSDP Issues According to the Keying and Authentication for Routing Protocols (KARP) Design Guide", RFC 6952, DOI 10.17487/RFC6952, May 2013, <http://www.rfc-editor.org/info/rfc6952>.

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