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BGP Extensions for BIER
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Abstract

Bit Index Explicit Replication (BIER) is a new multicast forwarding architecture which doesn't require an explicit tree-building protocol and doesn't require intermediate routers to maintain any multicast state. BIER is applicable in a multi-tenant data center network environment for efficient delivery of Broadcast, Unknown-unicast and Multicast (BUM) traffic while eliminating the need for maintaining a huge amount of multicast state in the underlay. This document describes BGP extensions for advertising the BIER-specific information. These extensions are applicable in those multi-tenant data centers where BGP instead of IGP is deployed as an underlay for network reachability advertisement. These extensions may also be applicable in other scenarios.

Requirements Language

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](#)].

Status of This Memo

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Table of Contents

1.	Introduction	2
2.	Terminology	3
3.	BIER Path Attribute	3
4.	Originating BIER Attribute	4
5.	Restrictions on Sending/Receiving	5
6.	Deployment Considerations	5
7.	Acknowledgements	5
8.	IANA Considerations	5
9.	Security Considerations	6
10.	Normative References	6
	Authors' Addresses	6

[1.](#) Introduction

Bit Index Explicit Replication (BIER) [[RFC8279](#)] is a new multicast forwarding architecture which doesn't require an explicit tree-building protocol and doesn't require intermediate routers to maintain any multicast state. BIER is applicable in a multi-tenant data center network environment for efficient delivery of Broadcast, Unknown-unicast and Multicast (BUM) traffic while eliminating the need for maintaining a huge amount of multicast state in the underlay. This document describes BGP extensions for advertising the BIER-specific information. More specifically, in this document, we define a new optional, non- transitive BGP attribute, referred to as

the BIER attribute, to convey the BIER-specific information such as BFR-ID, BitString Length (BSL) and so on. In addition, this document specifies procedures to prevent the BIER attribute from "leaking out" of a BIER domain.

These extensions are applicable in those multi-tenant data centers where BGP instead of IGP is used as an underlay [RFC7938]. These extensions may also be applicable to other BGP based network scenarios.

2. Terminology

This memo makes use of the terms defined in [RFC4271] and [RFC8279].

3. BIER Path Attribute

This draft defines a new optional, transitive BGP path attribute, referred to as the BIER attribute. This attribute can be attached to a BGP UPDATE message by the originator so as to indicate the BIER-specific information of a particular BFR which is identified by the /32 or /128 address prefix contained in the NLRI. In other words, if the BIER path attribute is present, the NLRI is treated by BIER as a "BFR-prefix". When creating a BIER attribute, a BFR needs to include one BIER TLV for every <Sub-domain, BFR-ID> pair that it supports. The attribute type code for the BIER Attribute is TBD. The value field of the BIER Attribute contains one or more BIER TLV as shown in Figure 1.

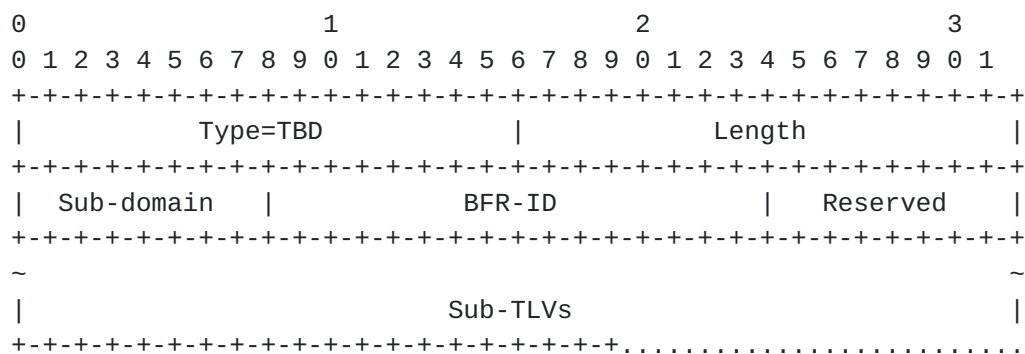


Figure 1:BIER TLV

Type: Two octets encoding the BIER TLV Type: TBD.

Length: Two octets encoding the length in octets of the TLV, including the type and length fields. The length is encoded as an unsigned binary integer. (Note that the minimum length is 8, indicating that no sub-TLV is present.)

Sub-domain: a one-octet field encoding the sub-domain ID corresponding to the BFR-ID.

BFR-ID: a two-octet field encoding the BFR-ID.

Sub-TLVs: contains one or more sub-TLV. The BIER MPLS Encapsulation sub-TLV is one of such sub-TLVs.

The BIER MPLS Encapsulation sub-TLV is encoded as follows:

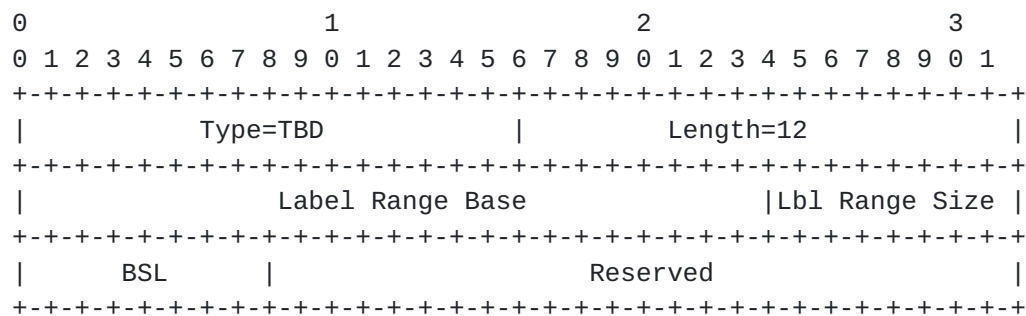


Figure 2:BIER MPLS Encapsulation sub-TLV

Type:TBD

Length:12

Label Range Size: a one-octet field indicating the size of the label range.

Label Range Base: a 3-octet field where the 20 rightmost bits represent the first label in the label range while the other bits MUST be set to 0 when transmitting, and MUST be ignored upon receipt.

BSL: a one-octet field indicating the length of the Bitstring in 4-octets. The field MUST be filled with one of the valid BSL values as specified in [RFC8279]. Upon receiving a BSL-TLV containing an invalid BSL value, it MUST be ignored.

4. Originating BIER Attribute

An implementation that supports the BIER attribute MUST support a policy to enable or disable the creation of the BIER attribute and its attachment to specific BGP routes. An implementation MAY disable the creation of the BIER attribute unless explicitly configured to do so otherwise. A BGP speaker MUST only attach the locally created BIER attribute to a BGP UPDATE message in which at least one of its BFR-prefixes is contained in the NLRI

5. Restrictions on Sending/Receiving

An implementation that supports the BIER attribute MUST support a per-EBGP-session policy, that indicates whether the attribute is enabled or disabled for use on that session. The BIER attribute MUST NOT be sent on any EBGP peers for which the session policy is not configured. If an BIER attribute is received on a BGP session for which session policy is not configured, then the received attribute MUST be treated exactly as if it were an unrecognised non-transitive attribute. That is, "it MUST be quietly ignored and not passed along to other BGP peers".

To prevent the BIER attribute from "leaking out" of an BIER domain, each BGP router on the BIER domain MUST support an outbound route announcement policy. Such a policy MUST be disabled on each EBGP session by default unless explicitly configured.

6. Deployment Considerations

It's assumed by this document that the BIER domain is aligned with the Administrative Domain (AD) which are composed of multiple ASes (either private or public ASes). Use of the BIER attribute in other scenarios is outside the scope of this document.

Since the BIER attribute is an optional, transitive BGP path attribute, a non-BFR BGP speakers could still advertise the received route with a BIER attribute. This is desirable in the incremental deployment scenario where a BGP speaker could tunnel a BIER packet or the payload of a BIER packet to a BFER directly if the BGP next-hop of the route for that BFER is a non-BFR. Furthermore, a BGP speaker is allowed to tunnel a BIER packet to the BGP next-hop if these two BFR-capable BGP neighbors are not directly connected (e.g., multi-hop EBGP).

7. Acknowledgements

Thanks a lot for Eric Rosen and Peter Psenak for their valuable comments on this document.

8. IANA Considerations

IANA is requested to assign a codepoint in the "BGP Path Attributes" registry to the BIER attribute. IANA shall create a registry for "BGP BIER Attribute Types". The type field consists of two octets, with possible values from 1 to 65535 (The value 0 is "reserved".) The allocation policy for this field is to be "First Come First Serve". Type codes should be allocated for BIER TLV and BIER MPLS Encapsulation sub-TLV respectively.

9. Security Considerations

This document introduces no new security considerations beyond those already specified in [RFC4271].

10. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
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- [RFC7938] Lapukhov, P., Premji, A., and J. Mitchell, Ed., "Use of BGP for Routing in Large-Scale Data Centers", [RFC 7938](#), DOI 10.17487/RFC7938, August 2016, <<https://www.rfc-editor.org/info/rfc7938>>.
- [RFC8279] Wijnands, IJ., Ed., Rosen, E., Ed., Dolganow, A., Przygienda, T., and S. Aldrin, "Multicast Using Bit Index Explicit Replication (BIER)", [RFC 8279](#), DOI 10.17487/RFC8279, November 2017, <<https://www.rfc-editor.org/info/rfc8279>>.

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