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OSPFv2 Extensions for BIER-TE

Abstract

This document describes OSPFv2 extensions for distributing the BitPositions configured on a Bit-Forwarding Router (BFR) in a "Bit Index Explicit Replication Traffic Engineering" (BIER-TE) domain.

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 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

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Table of Contents

- [1. Introduction](#)
- [2. Extensions to OSPFv2](#)
 - [2.1. Link BitPosition](#)
 - [2.2. Routed and Localdecap BitPositions](#)
- [3. Security Considerations](#)
- [4. IANA Considerations](#)
- [5. References](#)
 - [5.1. Normative References](#)
 - [5.2. Informative References](#)
- [Acknowledgments](#)
- [Authors' Addresses](#)

1. Introduction

[RFC9262] introduces Bit Index Explicit Replication (BIER) Traffic/Tree Engineering (BIER-TE). It is an architecture for per-packet stateless explicit point to multipoint (P2MP) multicast path/tree. There are three types of BitPositions (BPs) in a BIER-TE domain: link BitPosition (BP), routed BP and localdecap BP. A link BP is a BP configured on a link from Bit-Forwarding Router (BFR) X to BFR Y for a forward connected adjacency from X to Y. A routed BP is a BP configured on BFR X for a forward routed adjacency from X to a remote BFR Z not directly connected to X. A localdecap BP is a BP configured on a BFR.

[RFC8444] describes OSPFv2 Extensions for distributing the BFR identifier (BFR-id) configured on a BFR. This document specifies OSPFv2 extensions for distributing the BitPositions configured a BFR in a BIER-TE domain. The BitPositions distributed may be used by a BFR as a Point of Local Repair (PLR) for Fast-ReRoute (FRR).

2. Extensions to OSPFv2

This section describes protocol extensions to OSPFv2 for distributing the BitPositions configured on a BFR in a BIER-TE domain.

2.1. Link BitPosition

This section defines a Sub-TLV for distributing a link BitPosition (BP).

[RFC7684] defines the OSPFv2 Extended Link TLV to advertise the information about a link. Multiple Link TLVs for the links of a router are included in the OSPFv2 Extended Link Opaque LSA of the router. The OSPFv2 Extended Link TLV has the following format:

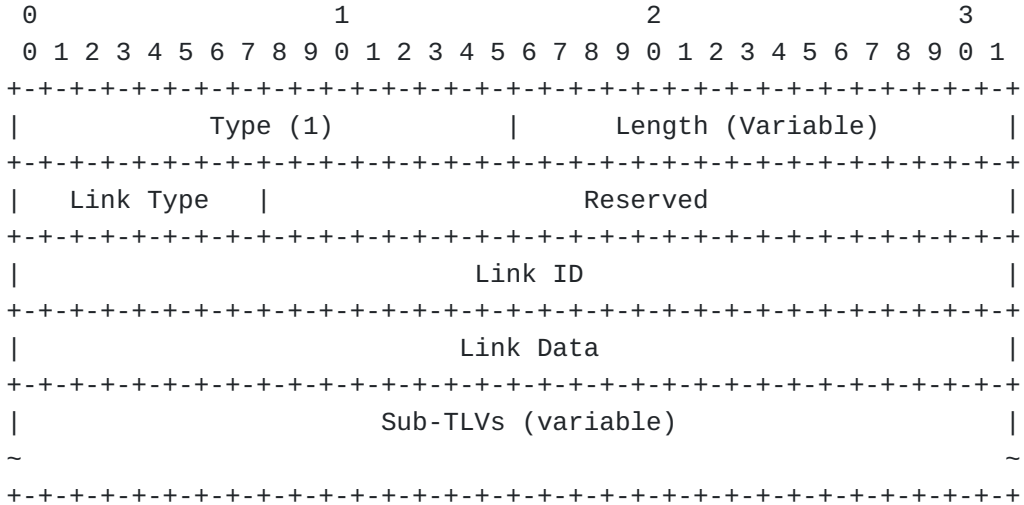


Figure 1: OSPFv2 Extended Link TLV

Type: 1.

Length: Variable, dependent on Sub-TLVs.

Link Type, Link ID and Link Data: They are defined in Section A.4.2 of [RFC2328].

Reserved: MUST be set to 0 on transmission and MUST be ignored on reception.

Under the OSPFv2 Extended Link TLV for a link, a Sub-TLV, called Link-BP Sub-TLV, is defined for distributing a link BitPosition. A Link-BP Sub-TLV is included in the Link TLV for a link of Link Type P2P (Point-to-Point) or Broadcast (or say LAN or Transit Network). The Link-BP Sub-TLV has the following format:

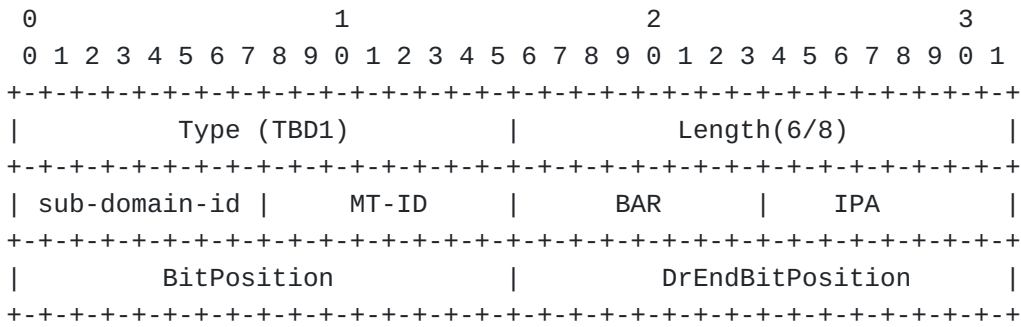


Figure 2: Link-BP Sub-TLV

Type: TBD1 is to be assigned by IANA.

Length: Variable. For a P2P link, it is 6 since there is no DrEndBitPosition. For a broadcast link, it is 8 since there is a DrEndBitPosition.

sub-domain-id: Unique value identifying a BIER-TE sub-domain.

MT-ID: Multi-Topology ID identifying the topology that is associated with the BIER-TE sub-domain.

BAR: Single-octet BIER Algorithm used to calculate underlay paths to reach other BFRs. Values are allocated from the "BIER Algorithm" registry defined in [\[RFC8401\]](#).

IPA: Single-octet IGP Algorithm used to either modify, enhance, or replace the calculation of underlay paths to reach other BFRs as defined by the BAR value. Values are defined in the "IGP Algorithm Types" registry.

BitPosition: A 2-octet field encoding the BitPosition locally configured on the link/interface when the Link Type of the link in the OSPFv2 Extended Link TLV containing this Sub-TLV is 1 (i.e., Point-to-Point connection to another router) or 2 (i.e., connection to Transit Network or say LAN).

DrEndBitPosition: A 2-octet field encoding the BitPosition of the connection on the designated router (DR) end. This field exists when the Link Type in the OSPFv2 Extended Link TLV containing this Sub-TLV is 2 (i.e., Transit Network or LAN). For the other value of the Link Type, this field MUST NOT exist. The DrEndBitPosition may be configured on the link/interface to a transit network (i.e., broadcast link or say LAN) as described in [\[I-D.chen-bier-te-lan\]](#).

2.2. Routed and Localdecap BitPositions

A TLV, called Node BPs TLV, is defined within the body of the OSPF Router Information (RI) Opaque Link State Advertisement (LSA) [RFC7770]. The TLV contains Sub-TLVs. Two types of Sub-TLVs are defined. One is for a Routed BitPosition and the other for a Localdecap BitPosition.

The Node BPs TLV has the following format:

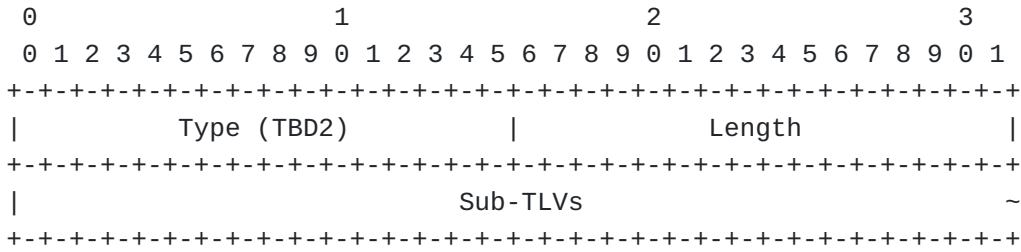


Figure 3: Node BPs TLV

Type: TBD2 is to be assigned by IANA.

Length: Variable.

Sub-TLVs: Sub-TLVs containing the Routed BitPositions and Localdecap BitPosition configured on a BFR.

The Routed-BP Sub-TLV has the following format:

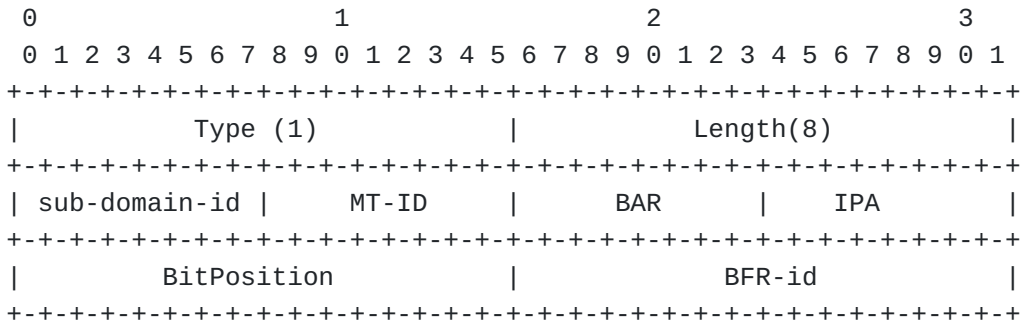


Figure 4: Routed-BP Sub-TLV

Type: 1 is the type for routed BP.

Length: It is 8.

BitPosition: A 2-octet field encoding the BitPosition configured on a BFR for a forward routed adjacency to a remote BFR.

BFR-id:

A 2-octet field encoding the BFR-id of the remote BFR.

sub-domain-id, MT-ID, BAR and IPA: They are the same as those described in [Section 2.1](#).

The Localdecap-BP Sub-TLV has the following format:

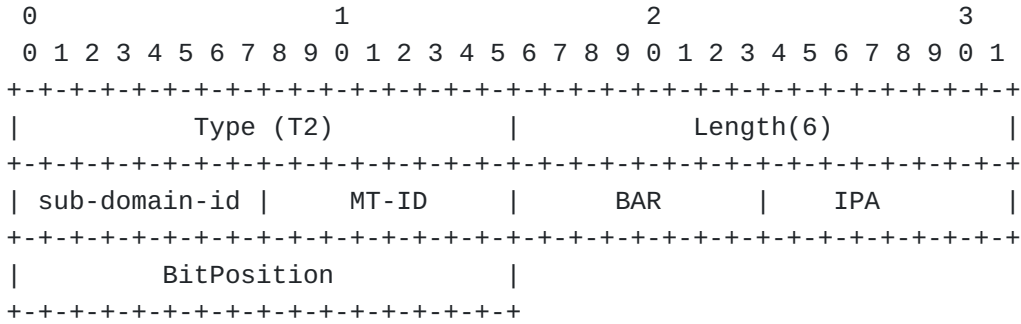


Figure 5: Localdecap-BP Sub-TLV

Type: 2 is the type for localdecap BP.

Length: It is 6.

BitPosition: A 2-octet field encoding the localdecap BitPosition configured on a BFR.

sub-domain-id, MT-ID, BAR and IPA: They are the same as those described [Section 2.1](#).

3. Security Considerations

Protocol extensions defined in this document do not affect the OSPF security other than those as discussed in the Security Considerations section of [\[RFC7684\]](#).

4. IANA Considerations

Under "OSPFv2 Extended Link TLV Sub-TLVs" registry as defined in [\[RFC7684\]](#), IANA is requested to assign a new registry value for Link-BP Sub-TLV as follows:

```

+-----+-----+-----+-----+
| Value      | Description      | reference      |
+-----+-----+-----+-----+
| TBD1 (25) | Link-BP          | This document  |
+-----+-----+-----+-----+

```

Under "OSPF Router Information (RI) TLVs" registry as defined in [RFC7770], IANA is requested to assign a new registry value for Node BPs TLV as follows:

Value	Description	reference
TBD2 (21)	Node BPs	This document

IANA is requested to create a new subregistry called the "OSPF Node BPs Sub-TLVs" under the "Open Shortest Path First (OSPF) Parameters" registry. The initial values are as follows:

Value	Description	reference
0	Reserved	This document
1	Routed BP	This document
2	Localdecap BP	This document
3 - 65535	To be allocated in First Come First Served	

5. References

5.1. 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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[RFC8174]

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[RFC9262]

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[RFC8401]

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[RFC8444]

Psenak, P., Ed., Kumar, N., Wijnands, IJ., Dolganow, A., Przygienda, T., Zhang, J., and S. Aldrin, "OSPFv2 Extensions for Bit Index Explicit Replication (BIER)", RFC 8444, DOI 10.17487/RFC8444, November 2018, <<https://www.rfc-editor.org/info/rfc8444>>.

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