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An Optional Encoding of the BIFT-id Field in the non-MPLS BIER Encapsulation
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Abstract

   Bit Index Explicit Replication (BIER) is an architecture that
   provides optimal multicast forwarding through a "multicast domain",
   without requiring intermediate routers to maintain any per-flow state
   or to engage in an explicit tree-building protocol. The Multicast
   packet is encapsulated using a BIER Header and transported through an
   MPLS or non-MPLS network. When MPLS is used as the transport, the
   Bit Indexed Forwarding Table (BIFT) is identified by a MPLS Label.
   When non-MPLS transport is used, the BIFT is identified by a 20bit
   value. This document describes one way of encoding the 20bit value.

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1. Introduction

   Bit Index Explicit Replication (BIER) [RFC8279] is an architecture
   that provides optimal multicast forwarding through a "multicast
   domain", without requiring intermediate routers to maintain any per-
   flow state or to engage in an explicit tree-building protocol. The
   Multicast packet is encapsulated [RFC8296] using a BIER Header and
   transported through an MPLS or non-MPLS network. When MPLS is used
   as the transport, the Bit Indexed Forwarding Table (BIFT) is
   identified by a MPLS Label. When non-MPLS transport is used, the
   BIFT is identified by a 20bit value. This document describes one way
   of encoding the 20bit value, based on the Sub-Domain (SD), Set
   Identifier (SI) and BitStringLength (BSL) values.

   The BIER architecture requires that a BFR has a BIFT for every
   combination of <SD, SI, BSL> that is being used. When processing a
   BIER packet, the correct BIFT is inferred from the BIFT-id field of
   the encapsulation. When the non-MPLS encapsulation is used in a
   given BIER domain, it may be desirable for the a BIFT-id to be unique
   in that domain. This document describes an OPTIONAL method that can
   be used to form domain-wide unique BIFT-ids based on the <SD, SI,
   BSL> triples. If in the future the BIER architecture is extended
   with an additional BIFT argument, this encoding does not generate
   domain-wide unique identifiers anymore.

This encoding, if used, is only for the convenience of the network adminstrators. When forwarding a BIER packet, the BIFT-id is used as an opaque 20-bit value that identifies a BIFT; the forwarding procedures do not parse the 20-bit value, they just use it as a lookup key.

2. Terminology and Definitions

Readers of this document are assumed to be familiar with the terminology and concepts of the documents listed as Normative References. For convenience, some of the more frequently used terms appear below.

BIER:
    Bit Indexed Explicit Replication.

BIFT-id:
    Bit Indexed Forwarding Table Identifier.

3. Specification of Requirements

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].

4. The Bit Index Forwarding Table

In MPLS networks a BIER label is allocated for each Bit Index Forwarding Table (BIFT) from the platform specific, downstream label database ([RFC8296]). This label is associated with a particular combination of BIER Sub-Domain (SD), Set Identifier (SI) and BitStringLength (BSL). In order for the network to know which MPLS label represents a particular combination of <SD, SI, BS>, this mapping has to be advertised through the network. This is currently done through an IGP or BGP. In MPLS networks this is not a drawback as the MPLS label has to be advertised anyway.

When the non-MPLS encoding is chosen, there is no need to advertise the BIFT-id to <SD, SI, BSL> mapping if the BIFT-id is domain-wide unique. For this reason we're defining two encodings that MAY be used by operators to compute the domain-wide unique BIFT-id values from the SD, BSL and/or SI. Although the BIFT-id is not expected to change, it may change when the BSL mismatch procedures [RFC8279] section 6.10.2 are applied.

5. The Non-MPLS Static BSL-SD-SI BIFT Encoding

   Find below the first 32 bits of the BIER header, encoding the SD, SI
   and BSL into the 20 bit BIFT-id field.

```
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | BSL  |       SD       |       SI       | TC  |S|       TTL     |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

   |-------- 20 bit BIFT-id Field ---------|
```

                               Figure 1

    BSL: This 4-bit field encodes the length in bits of the BitString.
    These are the same values as documented in [RFC8296].

    SD: This is a 8-bit field that encodes the Sub-Domain as described
    in [RFC8279].

    SI: This is a 8-bit field that encodes the Set-ID as described in
    [RFC8279].

    TC: This is a 3-bit field set to 000 (following [RFC8296]).

    S: This is a 1-bit field set to 1 (following [RFC8296]).

    TTL: See [RFC8296].

6. The Non-MPLS Static IBU-SI BIFT Encoding

   Find below the first 32 bits of the BIER header, encoding the
   provisioned Index BIFT Unit (IBU) and SI into the 20 bit BIFT-id
   field. The IBU replaces the BSL and SD values as described in the
   encoding above. This provides additional flexibility in-case there
   is a need to support additional arguments other than BSL and SD to
   create the BIFT-id.

```
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |           IBU          |       SI       | TC  |S|       TTL     |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

   |-------- 20 bit BIFT-id Field ---------|
```

                               Figure 2

IBU: The IBU is a 12-bit field that encodes the provisioned Index BIFT Unit.

SI: This is a 8-bit field that encodes the Set-ID as described in [RFC8279].

TC: This is a 3-bit field set to 000 (following [RFC8296]).

S: This is a 1-bit field set to 1 (following [RFC8296]).

TTL: See [RFC8296].

7. Security Considerations

This document does not introduce any new security considerations other than already discussed in [RFC8279].

8. IANA Considerations

There is no IANA consideration.

9. Acknowledgments

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