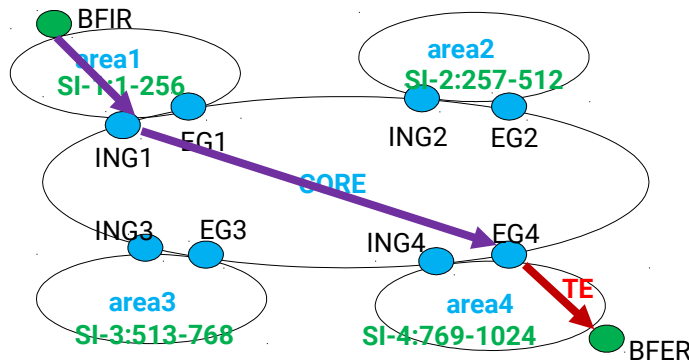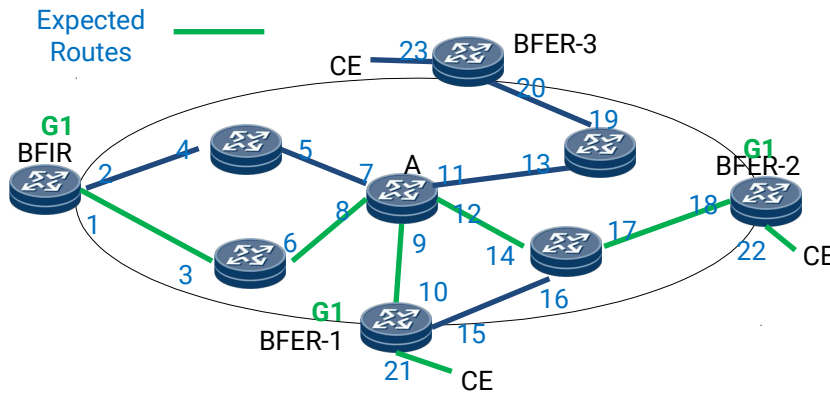# BIER-TE Encapsulation and Extension

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Motivation

- BIER-TE uses every BitPosition of the BitString to indicate one or more adjacencies, which brings traffic engineer to native BIER.

- However, it has the scalability issue: Due to the limited size of BitString, one BIER-TE packet can only travel through a small area of the network.

- It can be solved by sending multiple packets, but not the complete end to end traffic engineering.

- Thus, we bring out this extension for discussion.
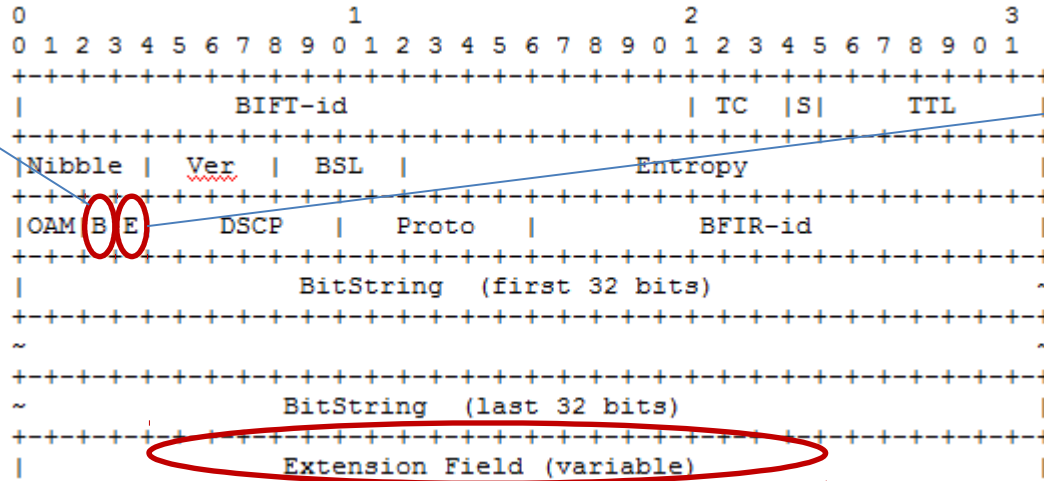
BIER-TE Extensions

- SI is re-defined as the segment area index.
  - The number of adjacencies assigned BitPosition inside one SI is not larger than the value of BSL

- Some Rules
  - A packet is allowed to travel to multiple segment areas with different SIs
    - ☐ To do that, multiple bitstrings belonging to different SIs may be carried in the packet header.
  - the total length of all the bitstrings that a packet can carry is the maximum BSL 4096.
    - ☐ If the topology of the network is well planned, this design is sufficient for use.
  - If the packet leaves one segment area, the corresponding bitstring can be removed.
    - This means all the BP of the bistring is 0.
  - The BIFT is used as described in [I-D.eckert-bier-te-arch], which is indexed by SI:BitPosition

BIER-TE Encapsulation
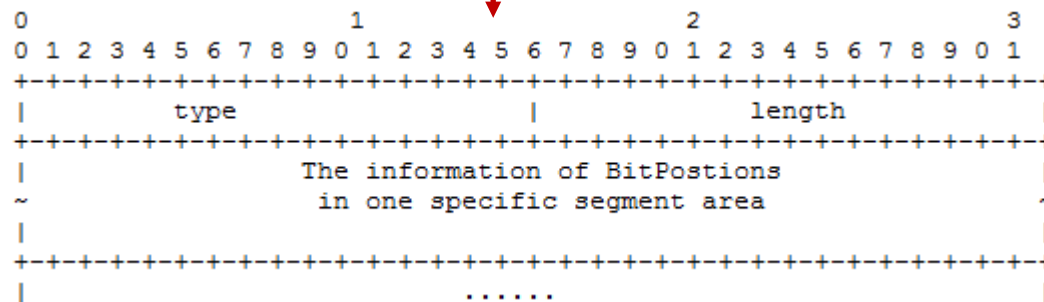
Indicates extension field existence

Indicates BIER or BIER-TE

Indicates extension field existence

BIER Header

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 BIFT-id                | TC  |S|     TTL      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Nibble |  Ver  |  BSL  |              Entropy                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|OAM|B|E|   DSCP  |    Proto    |           BFIR-id            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  BitString   (first 32 bits)              ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                                                            ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                  BitString   (last 32 bits)                |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  Extension Field (variable)                |
```

Extension TLV

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          type             |              length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              The information of BitPostions                |
~               in one specific segment area                ~
|                                                            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         ......                             |
```

- The detailed format for the bitstring information in different segment area is undefined yet.

Forwarding Example
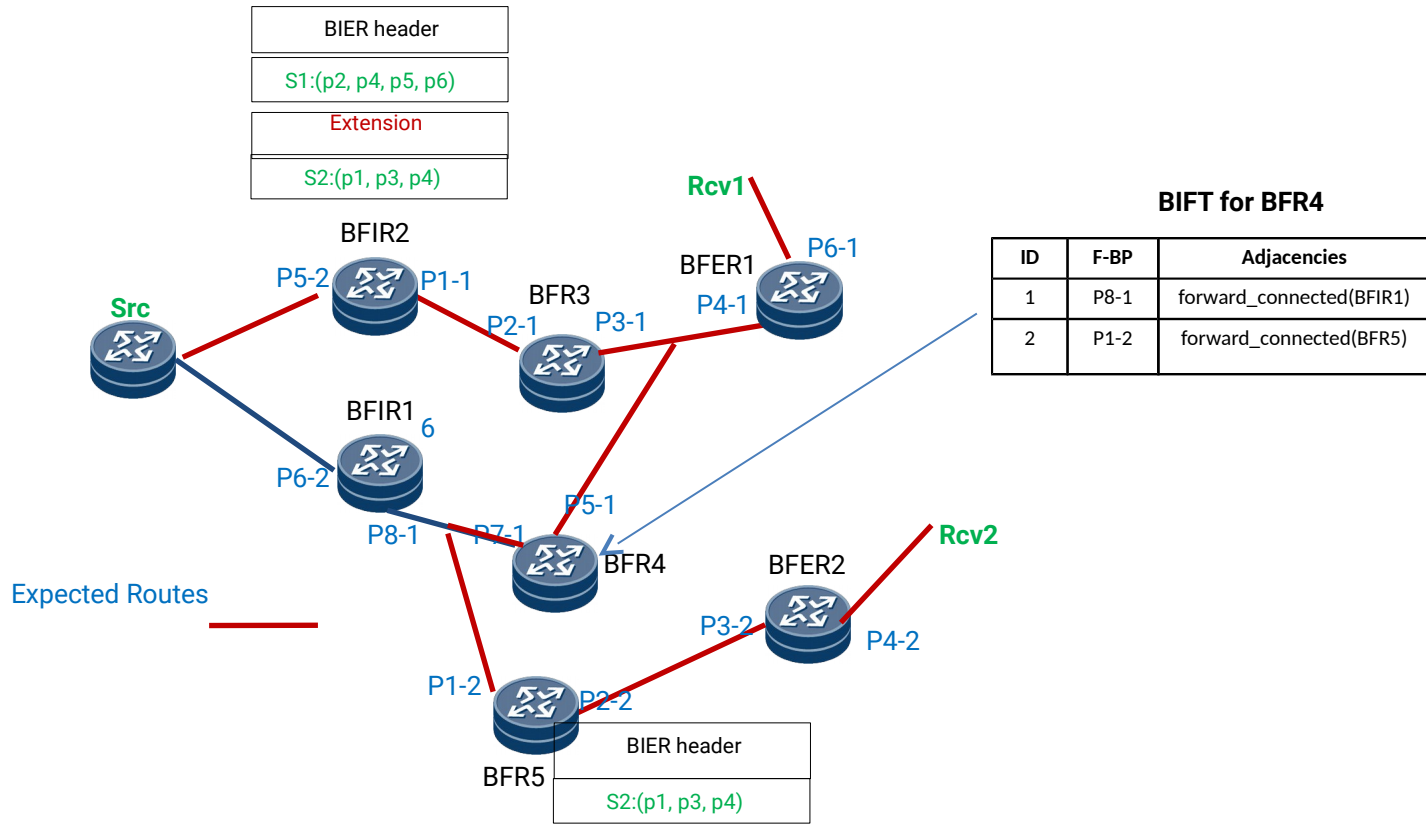
Next Step

- Welcome reviews.
- Seeking for suggestions on the follow-up.