BGP for BIER-TE Path

draft-chen-idr-bier-te-path-00

Huaimo Chen, Mike McBride (Futurewei)
Ran Chen (ZTE)
Gyan Mishra (Verizon)
Aijun Wang (China Telecom)
Yisong Liu (China Mobile)
Yanhe Fan (Casa Systems)
Lei Liu (Fujitsu)
Xufeng Liu (Volta Networks)

IETF 111
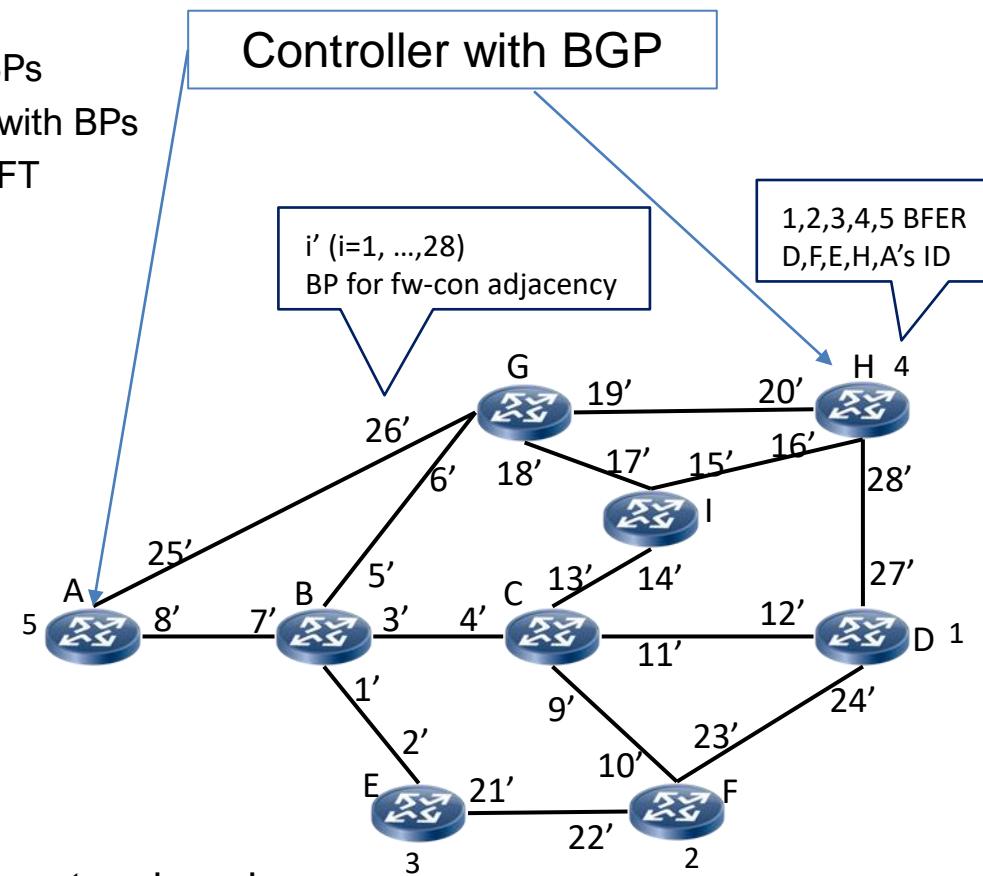
BGP for BIER-TE Path Overview

Introduction to BIER-TE

- BIFT has forwarding entries for its adjacency BPs
- **Ingress has BIER-TE path in BPs**, encaps pkt with BPs
- Each node forwards packets with BPs using BIFT

BIFT on B

BFR-id (SI:Bitstring)	Action	BFR-NBR (Next Hop)
2'(6:00000010)	fw-connected	E
4'(6:00001000)	fw-connected	C
6'(6:00100000)	fw-connected	G
8'(6:10000000)	fw-connected	A

Controller with BGP

i' (i=1, ...,28)
BP for fw-con adjacency

1,2,3,4,5 BFER
D,F,E,H,A's ID
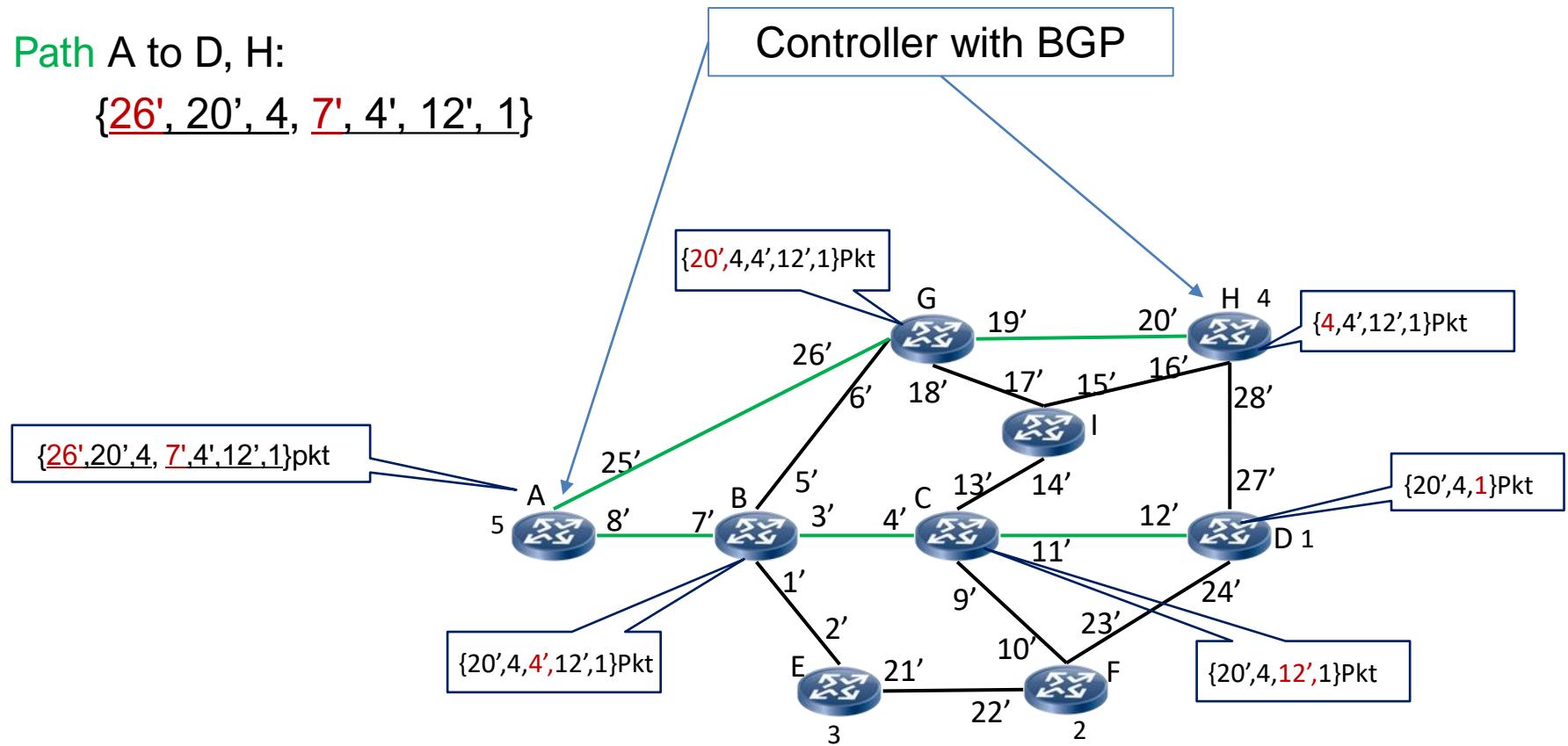
BGP for BIER-TE Path Idea

- ➤ A controller with BGP connects to some network nodes
- ➤ It gets a BIER-TE path as requested
- ➤ It distributes the path to the ingress using BGP
  ingress encapsulates packets with BPs of path
  packets transported along the path

An Example

Path A to D, H:

{26', 20', 4, 7', 4', 12', 1}

Controller with BGP

{20',4,4',12',1}Pkt

{4,4',12',1}Pkt

{26',20',4, 7',4',12',1}pkt

{20',4,1}Pkt

{20',4,4',12',1}Pkt

{20',4,12',1}Pkt

G 19' 20' H 4

26'

18' 17' 15' 16' 28'

6' I

25'

A B 5' C 13' 14' 12' D 1

5 8' 7' 3' 4' 11' 27'

1' 9' 23' 24'

2' 10'

E 21' F

22'

3 2

Distributing Path to Ingress
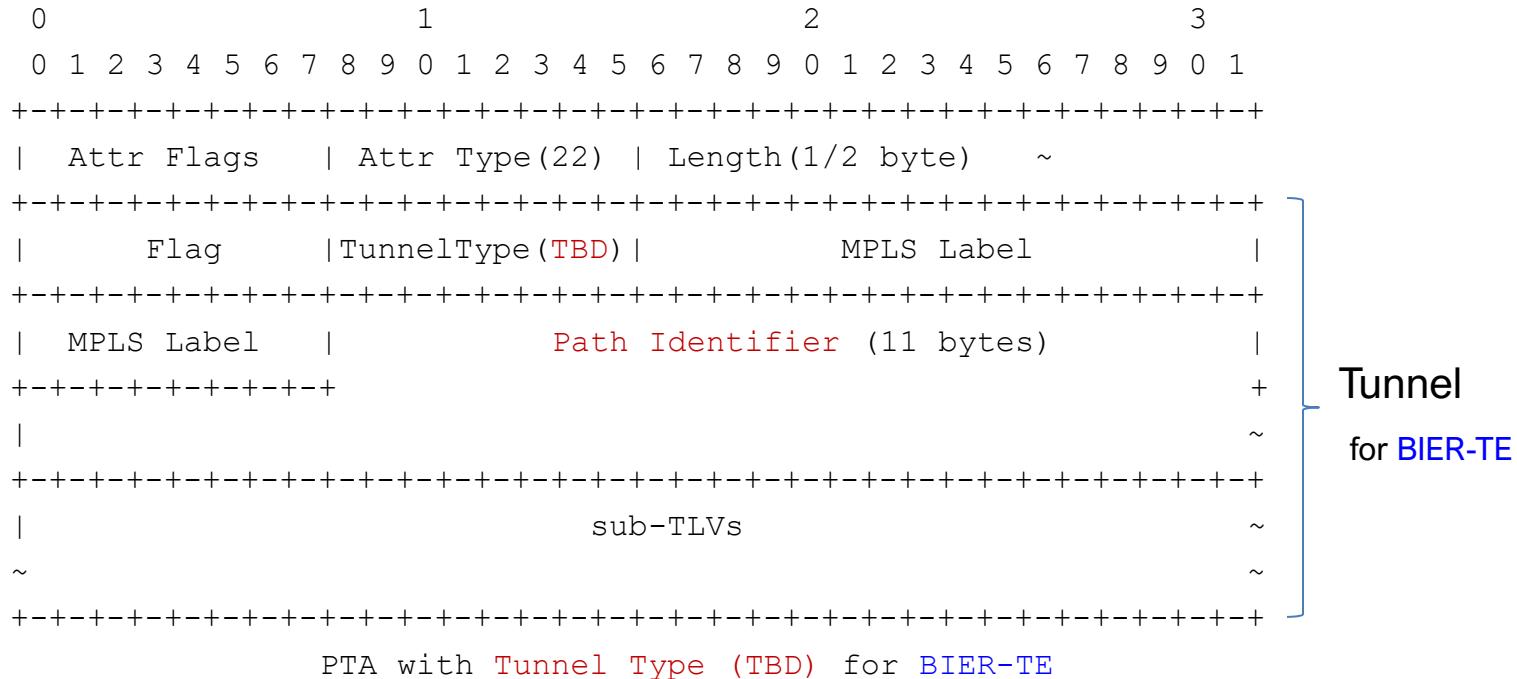
➢ Ingress directly connected to controller

- Path in Update with RT matching ingress ID and NO_ADVERTISE
- Controller sends Update to each of its BGP peers

- Ingress accepts Update and installs a forwarding entry for the path
- Ingress does not advertise it, others do not advertise it.

➢ Ingress not directly connected to controller

- Path in Update with RT matching ingress ID
- Controller advertises Update to all its BGP peers

- Each BGP peer advertises the received Update to its BGP neighbors according to normal BGP propagation rules.
- Eventually, ingress accepts Update and installs a forwarding entry for the path

Extensions to BGP: PTA (1/2)

Two options
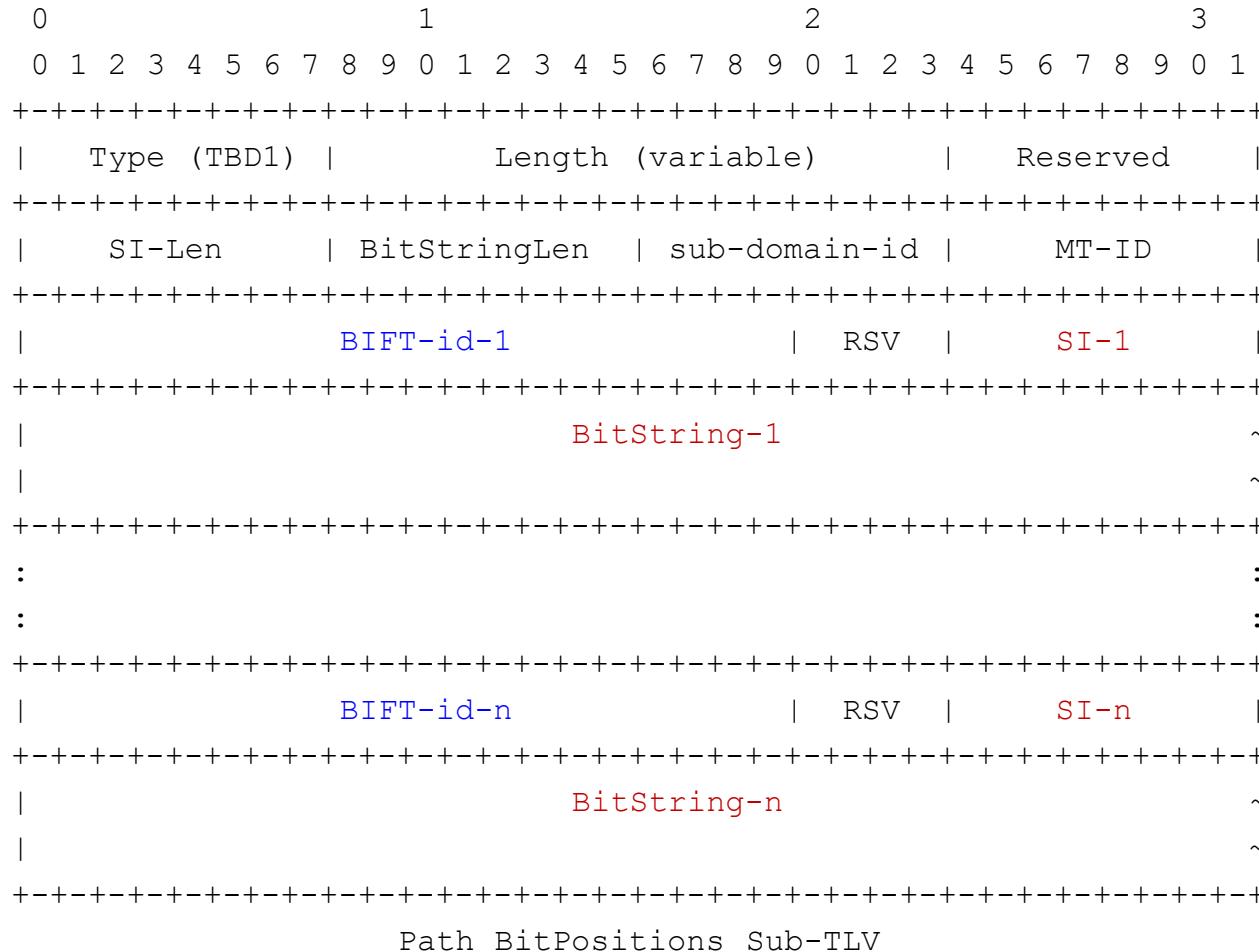
➤ New Tunnel Type for BIER-TE under PMSI_TUNNEL Attribute (PTA)

  • PTA in x-PMSI A-D route identifies P-tunnel
  • For PTA with Tunnel Type BIER-TE, it is constructed by controller and distributed to ingress

➤ New Tunnel Type for BIER-TE under Tunnel Encapsulation Attribute (TEA)

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Attr Flags   | Attr Type(22) | Length(1/2 byte)    ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ ─┐
|      Flag     |TunnelType(TBD)|           MPLS Label           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  MPLS Label   |          Path Identifier (11 bytes)           |
+-+-+-+-+-+-+-+-+                                               +   ├ Tunnel
|                                                               ~       for BIER-TE
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           sub-TLVs                            ~
~                                                               ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ ─┘
          PTA with Tunnel Type (TBD)  for BIER-TE
```

  • Path Identifier: (sub-domain-id, BFR-id of ingress, Tunnel-ID, path number)
  • Sub-TLVs:
    • Path BitPositions sub-TLV encoding an explicit BIER-TE path.
    • Path Name sub-TLV encodes the name of a BIER-TE path.

Extensions to BGP: PTA (2/2)

```
 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 (TBD1) |       Length (variable)     |    Reserved   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   SI-Len      | BitStringLen  | sub-domain-id |     MT-ID     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              BIFT-id-1               | RSV  |     SI-1       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     BitString-1                             ~
|                                                            ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
:                                                            :
:                                                            :
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              BIFT-id-n               | RSV  |     SI-n       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     BitString-n                             ~
|                                                            ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                   Path BitPositions Sub-TLV
```
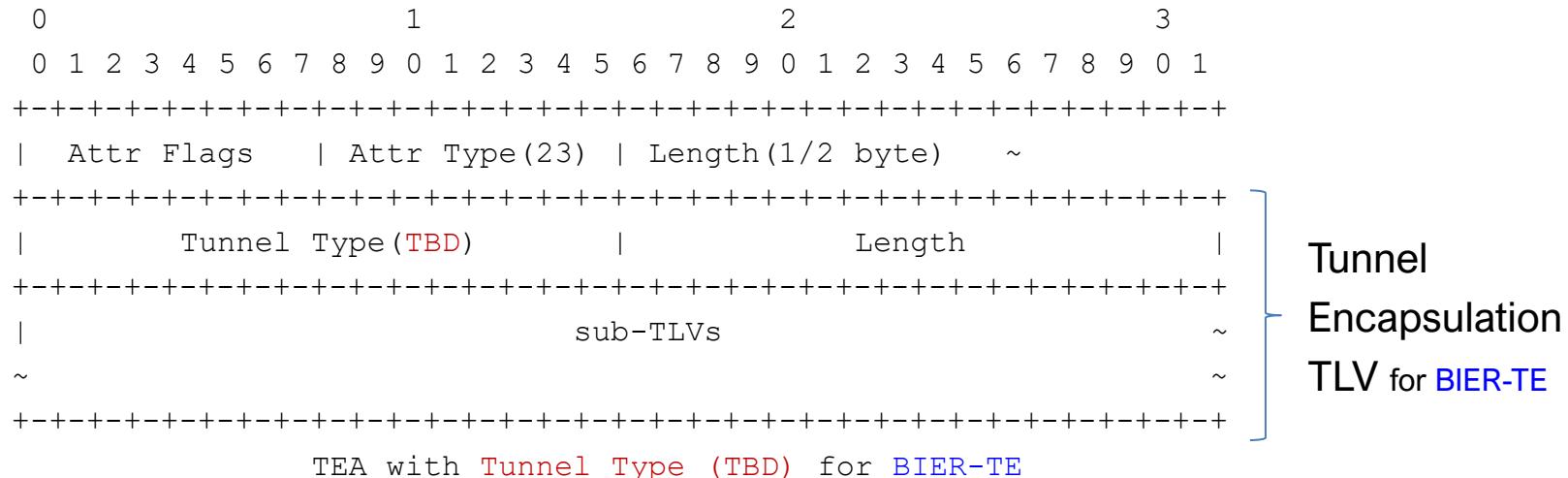
- SI-I,BitString-i (i=1,…,n): encoding a BIER-TE path; BIFT-id-i indicates BIFT for SI-i.
- SI-Len,BitStringLen: indicate SI and BitString lengths respectively

Extensions to BGP: TEA

➤ New Tunnel Type for BIER-TE under Tunnel Encapsulation Attribute (TEA)

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Attr Flags   | Attr Type(23) | Length(1/2 byte)    ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Tunnel Type(TBD)        |              Length          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             sub-TLVs                         ~
~                                                             ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Tunnel Encapsulation TLV for BIER-TE

              TEA with Tunnel Type (TBD) for BIER-TE

Sub-TLVs:

- Path BitPositions sub-TLV encodes an explicit BIER-TE path.
- Path Name sub-TLV encodes the name of a BIER-TE path.
- Path Identifier sub-TLV contains sub-domain-id, BFR-id of ingress, Tunnel-ID and path number
- Traffic Description sub-TLV encodes the multicast traffic to be carried by BIER-TE path.

Next Step

Comments