

# PCE for BIER-TE Path

draft-chen-pce-bier-te-path-00

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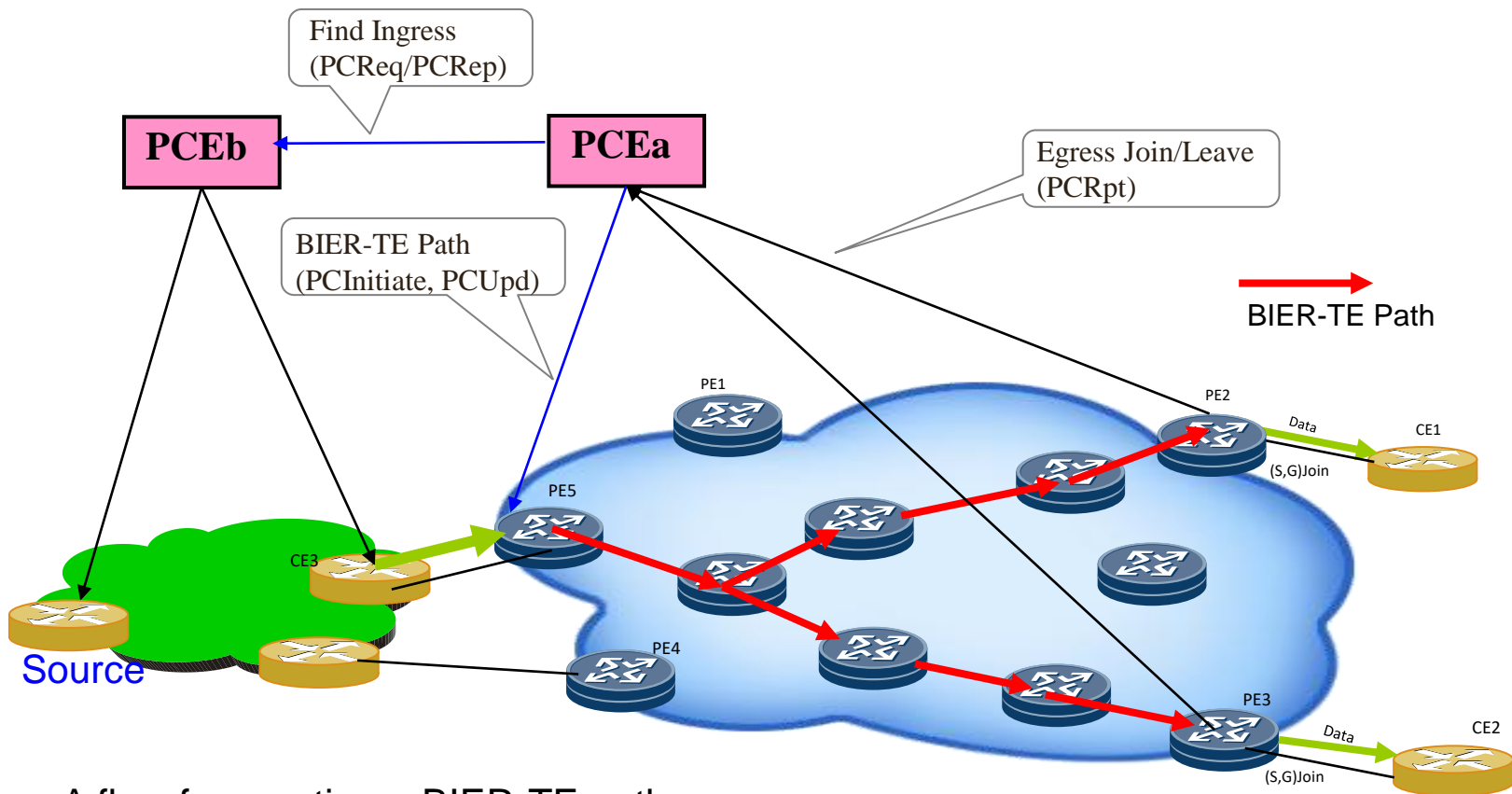
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IETF 110

# PCE for BIER-TE Path Overview



A flow for creating a BIER-TE path

1. PCEa gets reports about egresses in PCRpt
2. PCEa requests PCEb to find Ingress by PCReq
3. PCEb finds ingress, and sends it to PCEa in PCRpt
4. PCEa computes path, sends it to Ingress using PCInitiate
5. Ingress creates path, sends PCEa report in PCRpt
6. PCEa gets report about path creation, records it

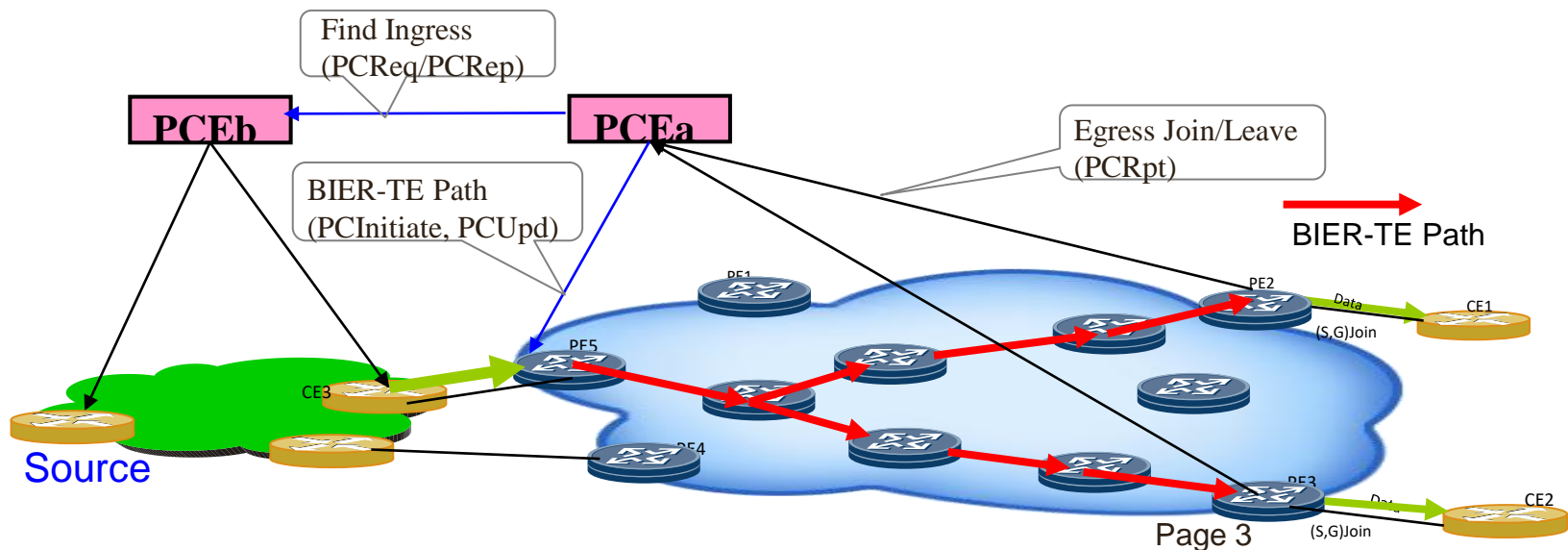
# More on BIER-TE Path

A flow for updating a BIER-TE path

1. PCEa gets reports about existing egress leave in PCRpt
2. PCEa computes a new path, sends it to Ingress using PCUpd
3. Ingress replaces old path with new one, sends PCEa report in PCRpt
4. PCEa gets report about path update in PCRpt, records it

Another flow for creating a BIER-TE path

1. PCEa gets a request from a user for a path from ingress to egresses
2. PCEa computes a path, sends it to Ingress using PCInitiate
3. Ingress creates path, sends PCEa report in PCRpt
4. PCEa gets report about path creation in PCRpt, records it



# Extensions to PCE

## Extensions to PCEP Objects

1. BIER-TE Path Capability
2. Extensions to SRP
3. Ingress Node Object
4. Objective Functions
5. BIER-TE Path Subobject

## Extensions to PCEP Messages

1. PCRpt Message
2. PCUpd Message
3. PCInitiate Message
4. PCReq Message
5. PCRep Message

## Procedures

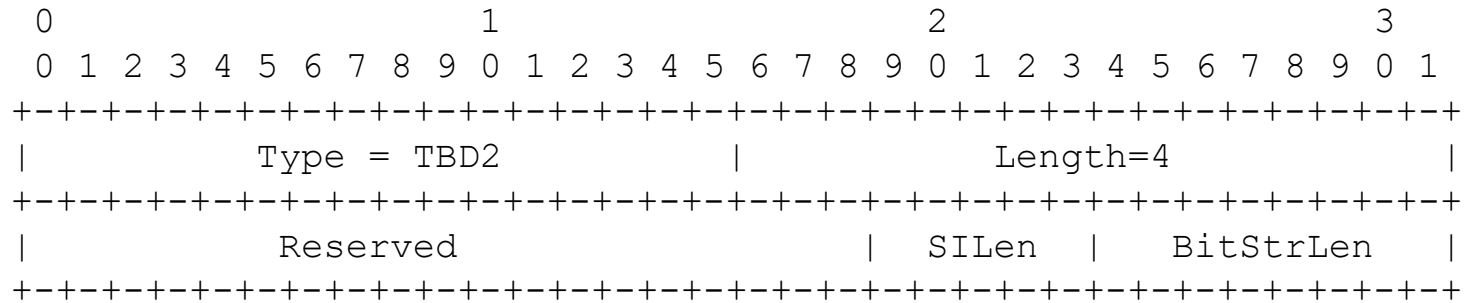
1. BIER-TE Path Creation
2. BIER-TE Path Update
3. BIER-TE Path Deletion

# Capability for BIER-TE Path

PCC and PCE exchange capabilities of BIER-TE path

PATH\_SETUP\_TYPE\_CAPABILITY TLV with PST = TBD1 + sub-TLV in Open

\* PST = TBD1: Path is setup using BIER-TE.



PCE-BIER-TE-Path-Capability sub-TLV

- o SLen (SI Length) - 5 bits: The length in bits of the SI field
- o BitStrLen (Bit String Length) - 8 bits: The length in bits of the BitString field according to RFC8296. If k is the length of the BitString, the value of BitStrLen is  $\log_2(k)-5$ . For example, BitStrLen = 1 indicates k = 64, BitStrLen = 7 indicates k = 4096.

# Extensions to SRP (1/4)

For BIER-TE path, SRP MUST include:

- PATH-SETUP-TYPE TLV with PST = TBD1 for path setup using BIER-TE

Three contiguous bits (bit 27-29) in SRP Flag Field are defined as AOP (Assistant Operation).

## Multicast Traffic TLV

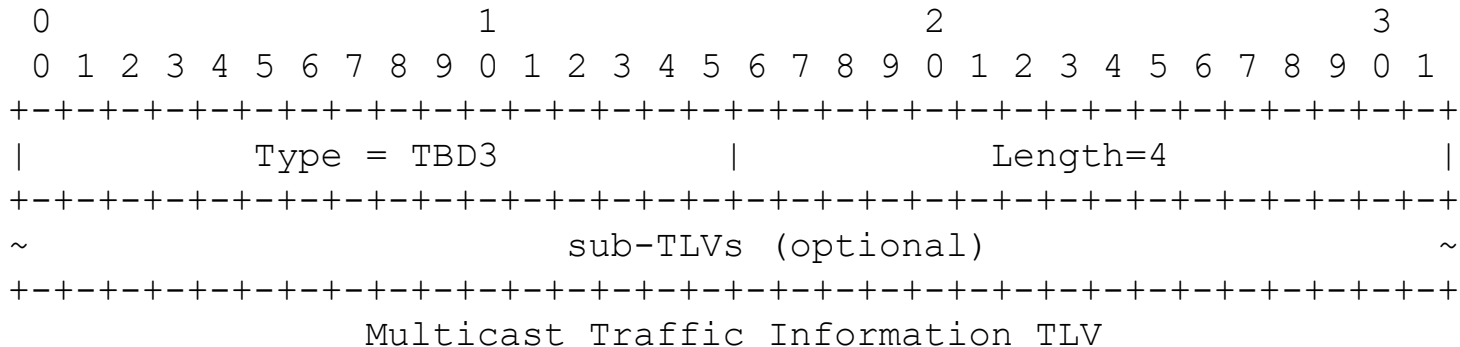
AOP Value	Meaning (Assistant Operation)
0x001 (J):	Join with Multicast Group and Source
0x010 (L):	Leave from Multicast Group and Source
0x011 (I):	Ingress node computation

- When the PCC running on an edge node of a BIER-TE domain sends the PCE for the domain a PCEP message such as PCRpt to report that the edge node receives a multicast join, the message MUST include a SRP object with AOP == 0x001 (J).
- When the PCC running on an edge node of a BIER-TE domain sends the PCE for the domain a PCEP message such as PCRpt to report that the edge node receives a multicast leave, the message MUST include a SRP object with AOP == 0x010 (L).
- When the PCE for the domain sends a PCEP message such as PCReq to another PCE for requesting to find an ingress node for a BIER-TE path, the message MUST include a SRP object with AOP == 0x011 (I).

# Extensions to SRP (2/4)

## Multicast Traffic TLV

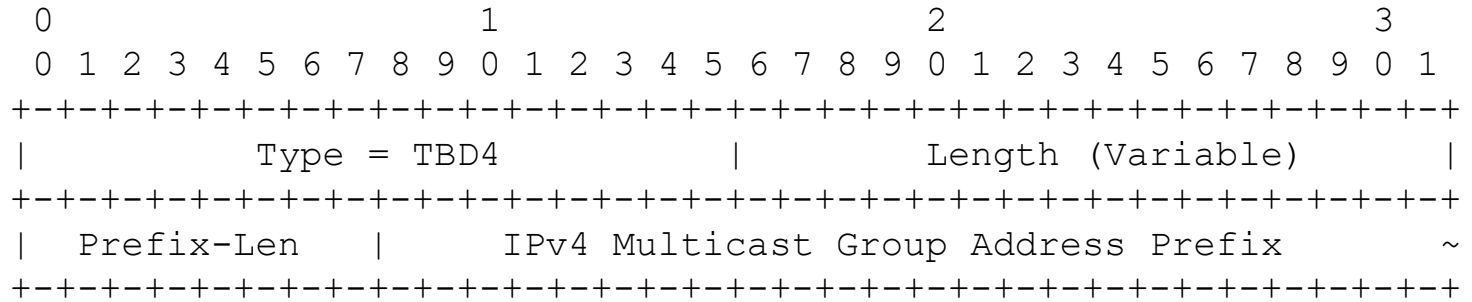
- For a PCE-Initiated BIER-TE path, when a PCE sends a PCC a PCInitiate message to create a BIER-TE path in a BIER-TE domain, the message MUST contain the Multicast Traffic Information TLV in SRP.
- When PCC on an edge node of a BIER-TE domain sends PCE for the domain a message to report that the edge node receives a multicast join or leave with a multicast group/address and source, the message MUST contain the Multicast Traffic Information TLV in SRP.
- When the PCE for a BIER-TE domain sends another PCE a message to request for finding an ingress node of a BIER-TE path, the message MUST contain the Multicast Traffic Information TLV in SRP.



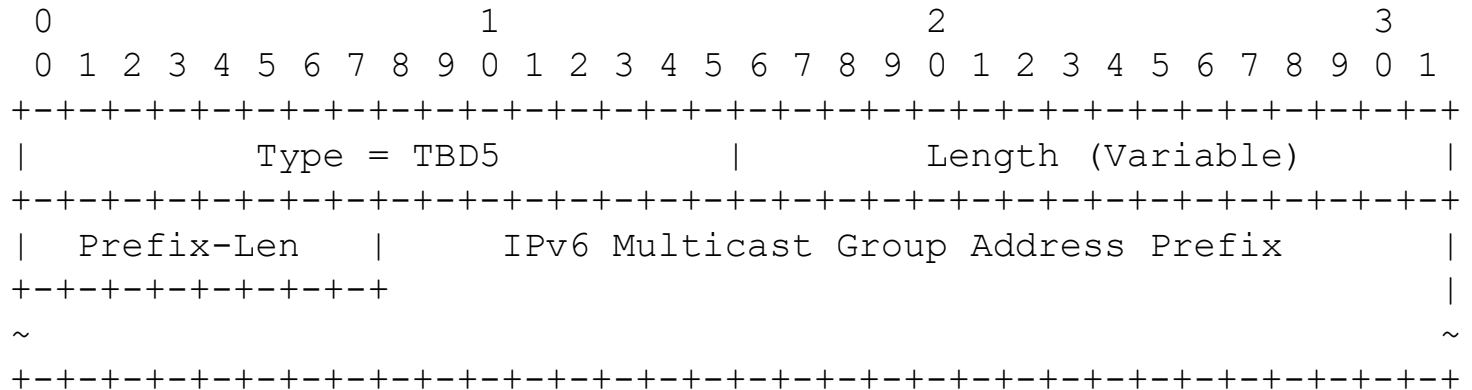
Two groups of sub-TLVs for IPv4/IPv6:

- IPv4/IPv6 multicast group address prefix sub-TLV and
- IPv4/IPv6 multicast source address prefix sub-TLV.

# Extensions to SRP (3/4)



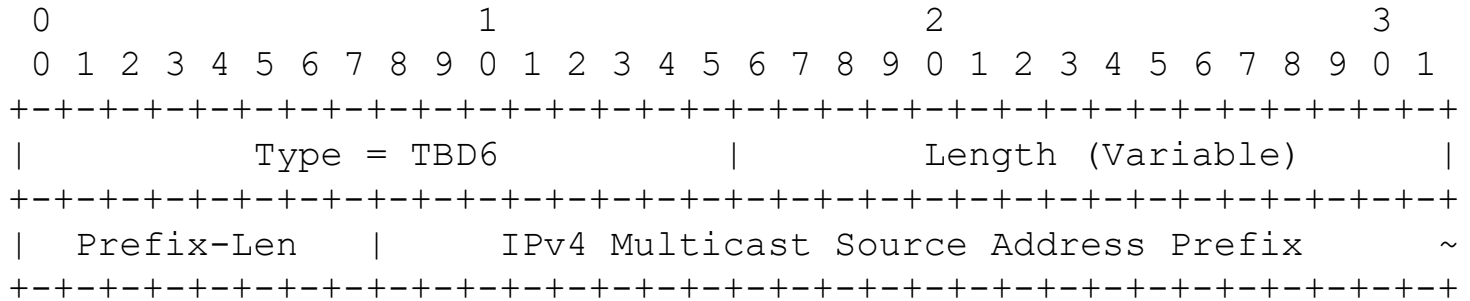
IPv4 Multicast Group Address Prefix sub-TLV



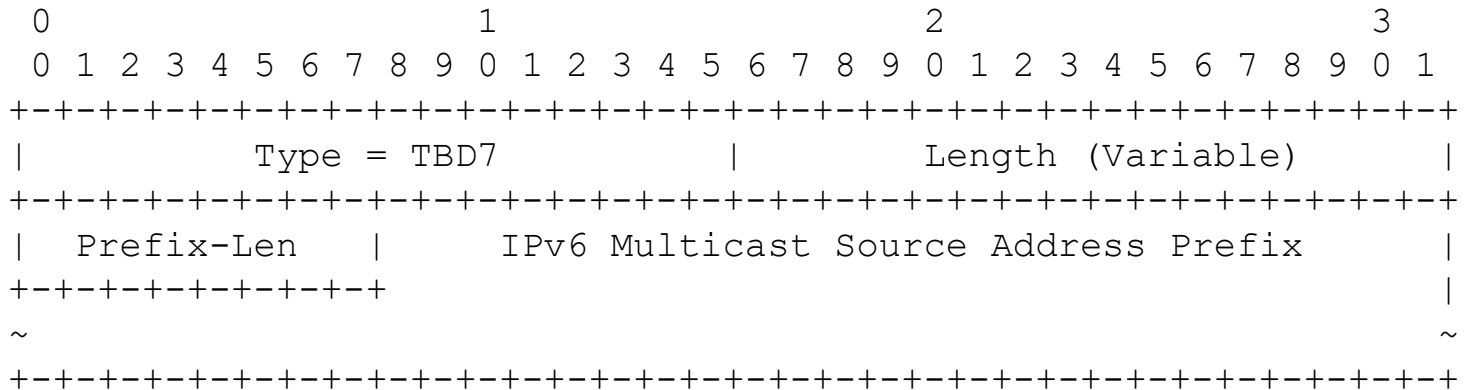
IPv6 Multicast Group Address Prefix sub-TLV



# Extensions to SRP (4/4)



IPv4 Multicast Source Address Prefix sub-TLV



IPv6 Multicast Source Address Prefix sub-TLV



# Objective Functions

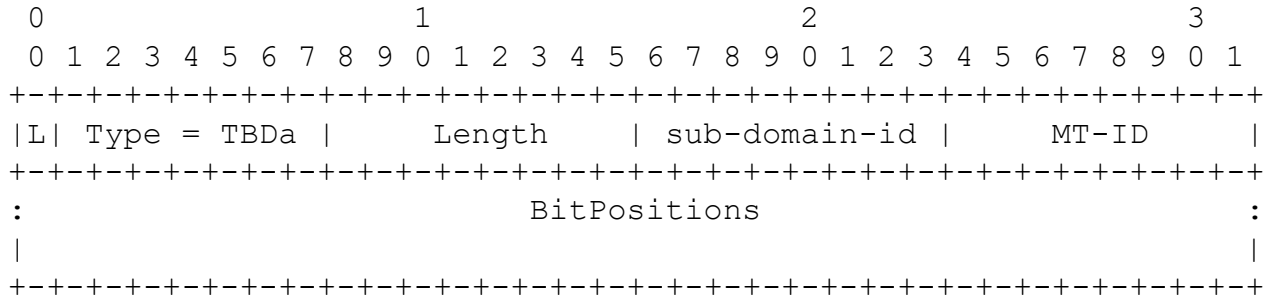
New OF defined for BIER-TE path

OF Code: TBD8  
Name: Minimum Bit Sets (MBS)  
Description: Find a path represented by BitPositions that has the minimum number of bit sets.

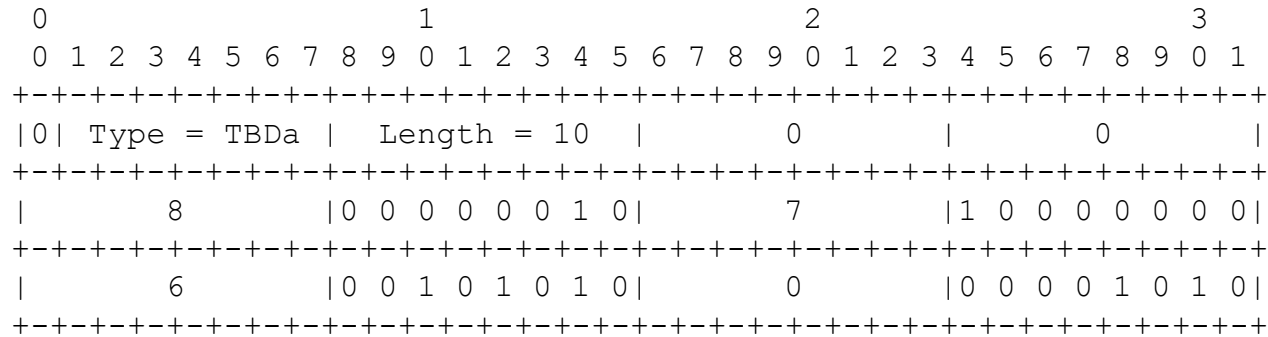
OF Code: TBD9  
Name: Minimum Bits (MB)  
Description: Find a path represented by BitPositions that has the minimum bit distance. The bit distance of BitPositions is the distance from the lowest bit to the highest bit in BitPositions.

# BIER-TE Path Subobject

New subobject, called BIER-TE Path subobject (or BIER-TE-ERO subobject), is defined to contain the information about one or more BitPositions.



BIER-TE Path Subobject in ERO

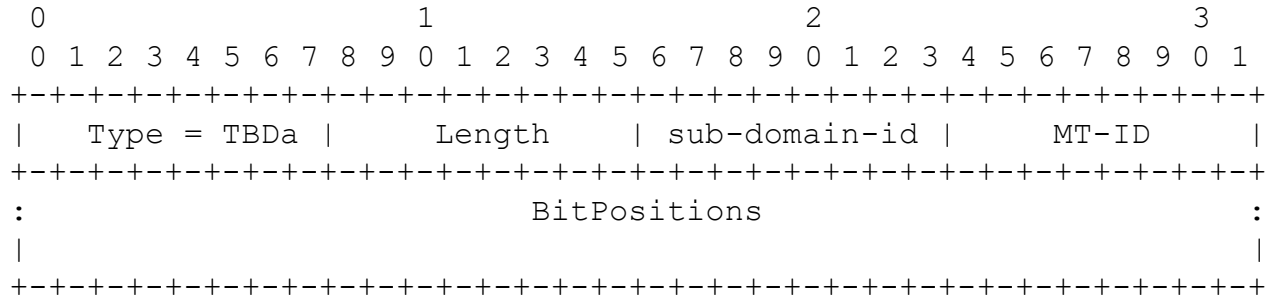


BIER-TE Path Subobject for Path {18', 16', 6', 4', 2', 4, 2}

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{18' (8:00000010), 16' (7:10000000), 6' (6:00100000), 4' (6:00001000),
 2' (6:00000010), 4 (0:00001000), 2 (0:00000010)}.
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# BIER-TE Path Subobject in RRO

BIER-TE Path Subobject in RRO (Record Route Object) has the same format as BIER-TE Path subobject in ERO except for L flag.



BIER-TE Path Subobject in RRO

# Extensions to PCEP Messages

Every PCEP message for BIER-TE path MUST include

- SRP containing PATH-SETUP-TYPE TLV with PST = TBD1 for path setup using BIER-TE

PCRpt includes

- BIER-TE path represented by a BIER-TE path subobject or
- Multicast Traffic TLV in SRP
- Flags in SRP set for egress join or leave

PCUpd includes

- BIER-TE path represented by a BIER-TE path subobject

PCInitiate includes

- BIER-TE path represented by a BIER-TE path subobject
- Multicast Traffic TLV in SRP

PCReq includes

- Multicast Traffic TLV in SRP
- OF for BIER-TE path or
- Flags in SRP set for computing ingress

PCRep includes

- BIER-TE path represented by a BIER-TE path subobject or
- Ingress nodes represented by ingress node objects

# Next Step

Comments