PIM extension for P2MP/tree based BIER

draft-xie-pim-bier-extensions-00

IETF-101 London

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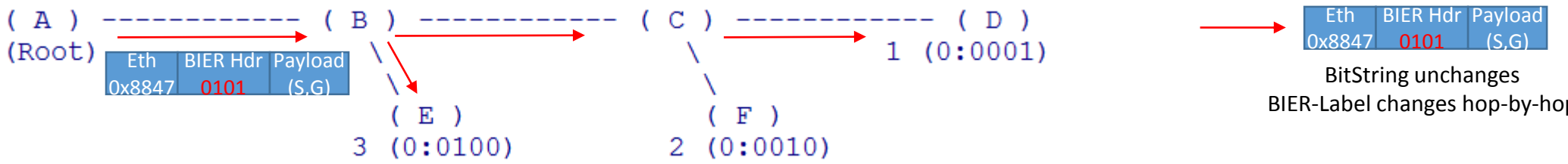
Background: P2MP/tree-based BIER

- **<RFC8279/RFC8296> describe an alternative multicast by using a Multicast-specific BIER-header**
- **<draft-xie-bier-mvpn-mpls-p2mp> describe an multicast by using a P2MP/BIER combining.**
- **<RFC4601/7761>: PIM -- Protocol Independent Multicast**

- **Put them together:**
  - **BIER-encapsulation: Multicast-specific packet header, BIER-header**
  - **BIER-Label: Multicast-specific Label, to indicating the following of this label is the left part of the BIER-header.**
  - **PIM: Multicast-specific protocol, independent of any underlay routing protocol: IGP/BGP/static/…**

Background: P2MP/tree-based BIER



Forwarding Table on A (FTN and NHLFE)	
FTN	(S,G, TreeID, Flag=CheckBS|Root, BSL)
NHLFE1	(TreeID, OutInterface<toB>, OutLabel<alloc by B>, F-BM<0111>)

Forwarding Table on B (ILM and NHLFE)	
ILM	(inLabel<alloc by B>, action<Rep to TreeID>, Flag=CheckBS|Branch, BSL)
NHLFE1	(TreeID, outInterface<to C>, outLabel<alloc by C>, **F-BM<0011>)**
NHLFE2	(TreeID, outInterface<to E>, outLabel<alloc by E>, **F-BM<0100>)**

Forwarding Table on E (ILM and NHLFE)	
ILM	(inLabel<alloc by D>, action<Rep to TreeID>, Flag=CheckBS|Leaf, BSL)
NHLFE1	(TreeID, **F-BM<0100>, flag=PopBIERincluding)**

Forwarding Table on C (ILM and NHLFE)	
ILM	(inLabel<alloc by C>, action<Rep to TreeID>, Flag=CheckBS|Branch, BSL)
NHLFE1	(TreeID, outInterface<to D>, outLabel<alloc by D>, **F-BM<0001>**
NHLFE2	(TreeID, outInterface<to F>, outLabel<alloc by F>, **F-BM<0010>**

Forwarding Table on D (ILM and NHLFE)	
ILM	(inLabel<alloc by D>, action<Rep to TreeID>, Flag=CheckBS|Leaf, BSL)
NHLFE1	(TreeID,**F-BM<0001>, flag=PopBIERincluding)**

Forwarding Table on F (ILM and NHLFE)	
ILM	(inLabel<alloc by F>, action<Rep to TreeID>, Flag=CheckBS|Leaf, BSL)
NHLFE1	(TreeID,**F-BM<0010>, flag=PopBIERincluding)**

- CheckBS means, when Replicate to every NHLFE of a Tree, Checking the result by AND'ing the BitString in packet and the F-BM in the NHLFE, Forwarding only when result is not zero.
- PopBIERincluding means, to pop the entire BIER header including the BIER Label in packet.

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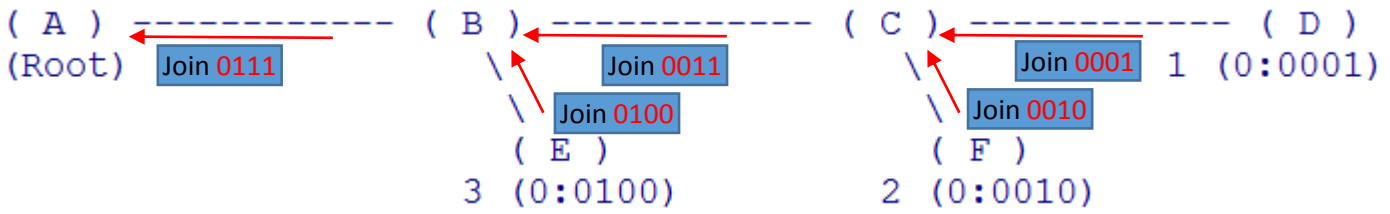

- **D-->C: PIM Join(S=A, G=232.0.0.1, Nbr=C, Attribute<Label=400, BSL=256, Set=0, FBM=0001>)**
- **F-->C: PIM Join(S=A, G=232.0.0.1, Nbr=C, Attribute<Label=600, BSL=256, Set=0, FBM=0010>)**
- **C-->B: PIM Join(S=A, G=232.0.0.1, Nbr=B, Attribute<Label=300, BSL=256, Set=0, FBM=0011>)**
- **E-->B: PIM Join(S=A, G=232.0.0.1, Nbr=B, Attribute<Label=500, BSL=256, Set=0, FBM=0100>)**
- **B-->A: PIM Join(S=A, G=232.0.0.1, Nbr=A, Attribute<Label=200, BSL=256, Set=0, FBM=0111>)**

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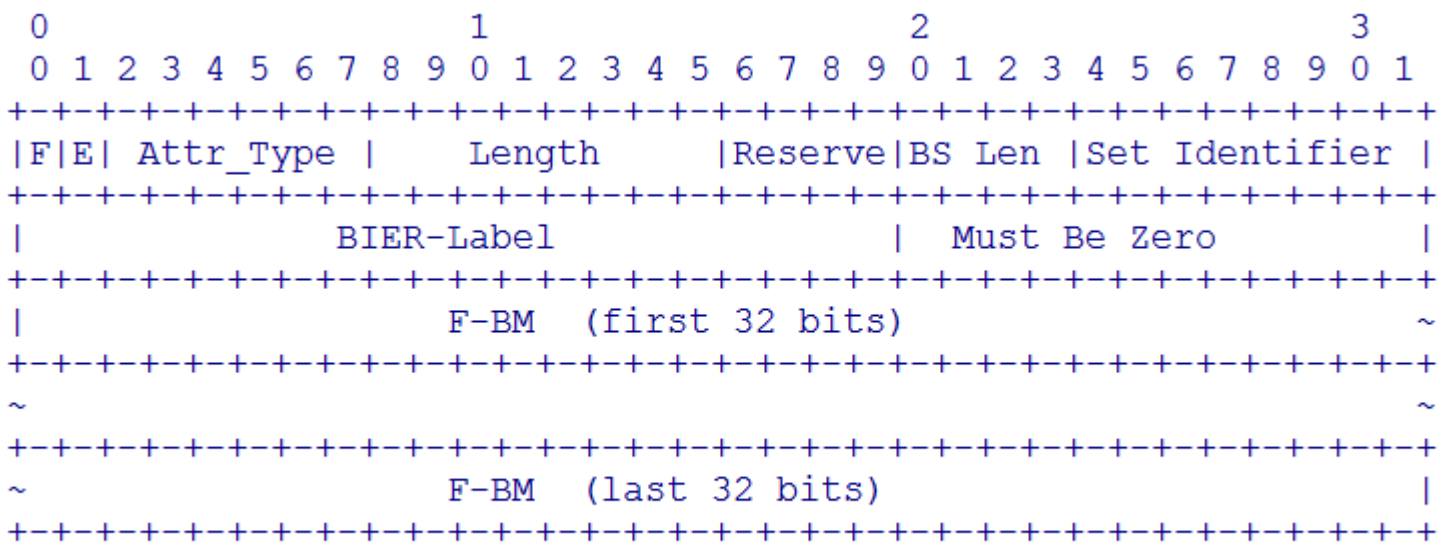

Figure 3: BIER Join Attribute

- BIER Join Attribute (BS Len, Set ID, BIER-Label, F-BM)
- PIM Leaf should compute the F-BM using (BFR-ID, BS Len, Set Identifier).
- PIM Build MRIB and MFIB/P2MP-BIFT. MFIB for OAM, P2MP-BIFT for Data forwarding.

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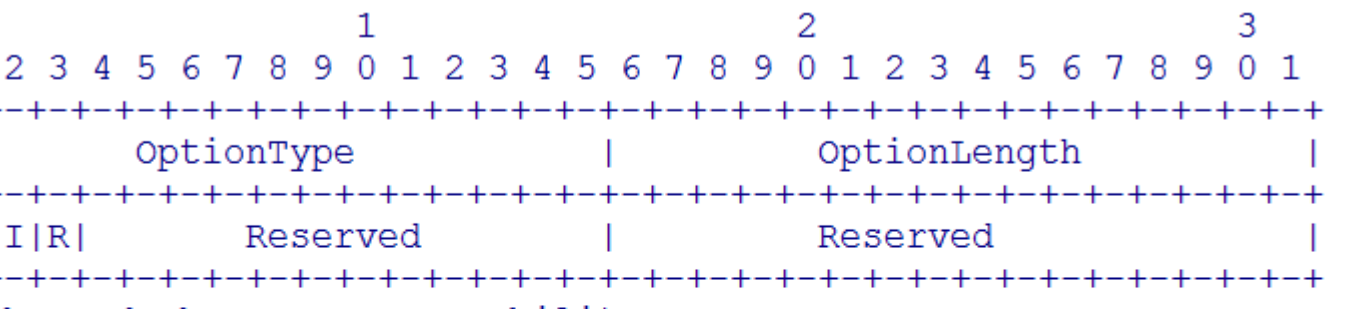

Figure 2: BIER-Supported Hello Option

- PIM Hello option

Next Step

- Add Capability and Error handling
- Add BIER Non-MPLS encapsulation support
- Get feedbacks and handle Questions/Comments

Thanks !