mLDP extension for P2MP/tree based BIER
draft-xie-mpls-ldp-bier-extensions-00

RSVP-TE extension for P2MP/tree based BIER
draft-xie-mpls-rsvp-bier-extensions-00

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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.
- RFC6388: mLDP
- RFC4875: RSVP-TE for P2MP

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.
- mLDP: Multicast-specific protocol, independent of any underlay routing protocol: IGP/BGP/static/…
- RSVP-TE for P2MP: Multicast-specific protocol extension...
Background: P2MP/tree-based BIER

![Diagram showing network flow and BIER header structure](image)

- **Eth 0x8847**
- **Label**: 200
- **BIER Header**: 0101
- **Payload (S,G)**

**P2MP/BIER-Label**
- Changes hop-by-hop

**BitString inside**
- Unchanges hop-by-hop
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- D--C: Label Mapping(FEC<Root=A, ID=10, BSL=256, SI=0>, Label=400, FBM=0001>)
- F--C: Label Mapping(FEC<Root=A, ID=10, BSL=256, SI=0>, Label=600, FBM=0010>)
- C--B: Label Mapping(FEC<Root=A, ID=10, BSL=256, SI=0>, Label=300, FBM=0011>)
- E--B: Label Mapping(FEC<Root=A, ID=10, BSL=256, SI=0>, Label=500, FBM=0100>)
- B--A: Label Mapping(FEC<Root=A, ID=10, BSL=256, SI=0>, Label=200, FBM=0111>)
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<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>ID(High 8bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>------</td>
<td>--------</td>
<td>----------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ID(Low 24bits)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reserve</td>
</tr>
</tbody>
</table>

Type: TBD. Need to be less than 255.
Length: 6
ID: A 32-bit integer, same as RFC6388.
BS Len: Bit String Length
Set Identifier: as defined in RFC8279.

**Figure 2: P2MP BIER LSP Identifier**

- P2MP BIER LSP Identifier = (ID, BS Len, Set Identifier). The right two fields are add for BIER.
- The (BS Len, Set Identifier) in BIER TLV, and the (BS Len, Set Identifier) in LSP ID, are the same.
The (BS Len, Set Identifier) in BIER TLV, and the (BS Len, Set Identifier) in LSP ID, are the same.

P2MP Leaf should compute the F-BM using (BFR-ID, BS Len, Set Identifier).
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Figure 4: BIER Capability

- LDP Hello option to support BIER Forwarding Capability and Error handling
- Refer to <draft-xie-bier-mvpn-mpls-p2mp-01> for the P/D/I/R flags.
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- **SubLSPs (A->D/F/E) PATH messages:**
  - PATH (Session<P2MP_ID, BSL=256, SI=0, TunnelID, ExtTunnelID>, Label_Request, S2L_BIER_SUB_LSP<DestIP=D, BFR-ID=0>)
  - PATH (Session<P2MP_ID, BSL=256, SI=0, TunnelID, ExtTunnelID>, Label_Request, S2L_BIER_SUB_LSP<DestIP=F, BFR-ID=0>)
  - PATH (Session<P2MP_ID, BSL=256, SI=0, TunnelID, ExtTunnelID>, Label_Request, S2L_BIER_SUB_LSP<DestIP=E, BFR-ID=0>)

- **SubLSPs (A->D/F/E) RESV messages:**
  - D->C: RESV (Session<P2MP_ID, BSL=256, SI=0, TunnelID, ExtTunnelID>, LABEL, S2L_BIER_SUB_LSP<DestIP, BFR-ID=1>)
  - F->C: RESV (Session<P2MP_ID, BSL=256, SI=0, TunnelID, ExtTunnelID>, LABEL, S2L_BIER_SUB_LSP<DestIP, BFR-ID=2>)
  - E->B: RESV (Session<P2MP_ID, BSL=256, SI=0, TunnelID, ExtTunnelID>, LABEL, S2L_BIER_SUB_LSP<DestIP, BFR-ID=3>)
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- P2MP BIER Tunnel IPv4/IPv6 SESSION Object = (P2MP ID, BS Len, Set Identifier, TunnelID, Extended Tunnel ID)
- The (BS Len, Set Identifier) used for calculating P2MP-BIFTs.
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```xml
<Path Message> ::= <Common Header> [ <INTEGRITY> ]
  [ [MESSAGE_ID_ACK] | [MESSAGE_ID_NACK] ] ...
  [ MESSAGE_ID ]
  <SESSION> <RSVP_HOP>
  <TIME_VALUES>
  [ <EXPLICIT_ROUTE> ]
  <LABEL_REQUEST>
  [ <PROTECTION> ]
  [ LABEL_SET ] ...
  [ SESSION_ATTRIBUTE ]
  [ NOTIFY_REQUEST ]
  [ ADMIN_STATUS ]
  [ POLICY_DATA ] ...
  <sender descriptor>
  [ <S2L BIER sub-LSP descriptor list> ]

<S2L BIER sub-LSP descriptor list> ::= <S2L BIER sub-LSP descriptor>
  [ <S2L BIER sub-LSP descriptor list> ]

<S2L BIER sub-LSP descriptor> ::= <S2L BIER SUB LSP>
  [ <P2MP SECONDARY_EXPLICIT_ROUTE> ]
```

Figure 2: PATH Message

- PATH message, has a Sub-LSP descriptor list of `<S2L_BIER_SUB_LSP>`, which include the Leaf DestIP.
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- RESV message, has a flow descriptor list of `<S2L_BIER_SUB_LSP>`, which include the Leaf BFR-ID.
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- BFR-ID is per sub-domain of a batch P2MPs/Trees. E.g. BFR-ID =1 to 500 while BSL = 256.
- Reference to <RFC8279> for what BFR-ID mean.
Next Step

• Add Capability and Error handling to <rsvp-bier-extension>
  • <mldp-bier-extension> already have such a handling description.

• Get feedbacks and handle Questions/Comments
  • Discuss on mail-list is preferred.
Thanks!