BGP Link-State Extensions for Seamless BFD
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Problem and Requirement

- [RFC7880] introduces Seamless BFD (S-BFD)

- IS-IS, OSPF and OSPFv3 have been extended to advertise the S-BFD Discriminators.
  - [RFC7883] & [RFC7884].

- Seamless MPLS [I-D.ietf-mpls-seamless-mpls] extends a large network into a single MPLS domain
  - Often include core domain and integrates aggregation and access domains
  - Can be organized across different autonomous systems
  - An E2E LSP will be created across different autonomous systems / areas
  - Meanwhile, the customer will see only two service-end points
  - BFD MAY be used for the Service Layer (e.g. for MPLS VPNs, PW) and the Transport Layer, So the need arises that the BFD session has to span across AS domain.
  - Flooding based propagation of the S-BFD Discriminators using IGPs is limited by the perimeter of the IGP domain

- For advertising the S-BFD Discriminators which span across IGP domains (e.g. multiple ASes), BGP is better
  - This document defines extensions requirement to the BGP Link-state address-family to carry the S-BFD Discriminators information via BGP.

S-BFD Discriminators TLV in Node Attribute

- S-BFD Discriminators TLV can be mapped into a TLV of 'Node Attribute' .

- The following 'Node Attribute' TLVs are defined:

```
+--------------+------------------------+---------+----------------+
|   TLV Code   | Description            | Length  |     ISIS/OSPF  |
|    Point     |                        |         |    TLV/Sub-TLV |
+--------------+------------------------+---------+----------------+
|     TBD      | S-BFD Discriminators   | variable|            TBD |
|     ...      | ...                    | ...     |            ... |
+--------------+------------------------+---------+----------------+
```

- The Value portion of the TLV is variable and is equal to the corresponding Value portion of the TLV defined in [RFC7883] and [RFC7884].

Inter-AS VPN Network Use case

- In an inter-as VPN network as follows, ASBR1 and ASBR2 establish a BGP-LS session for exchanging S-BFD Discriminators information.

```
                     |-------------------|          |-----------------|
                     |       AS1         |          |      AS2        |
         -----  |    ------             |          |                 |
        |CE1|--- |PE1||------|          |          |                 |
         -----  |   ------             |          |                 |
                |                      |          |                 |
                |           Initiator  |          | S-BFD           |
                |                      |          | Discriminators  |
                |                      |          | Exchanging via  |    Reflector
                |                      |          | BGP-LS          |
                |           --------   | <---------->  | --------  -----  | -----
                |      |----| ASBR1|-------------------| ASBR2|--|PE3|---|CE3|
                |      |     --------   |          | --------  -----  | -----
         -----  |    ------             |          |                 |
        |CE2|--- |PE2 |                 |   S-BFD Control Packets    |
         -----  |   ------             |          |                 |
                |                      |          |                 |
                |-------------------|          |-----------------|

         |<-----------S-BFD Connectivity Test----------->|
         PE1/PE2                                    PE3
```
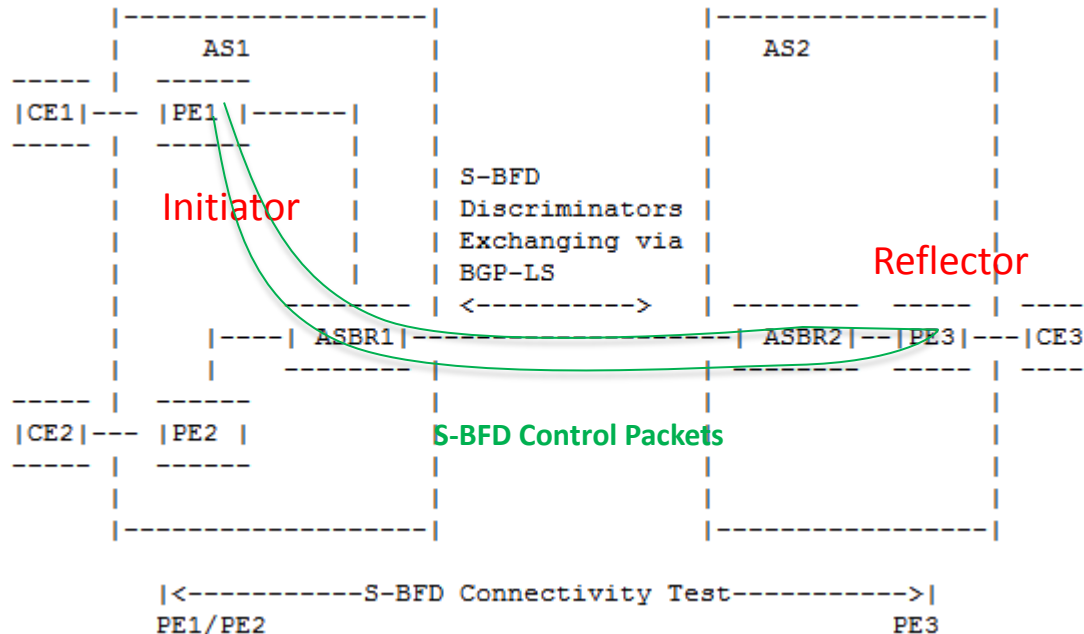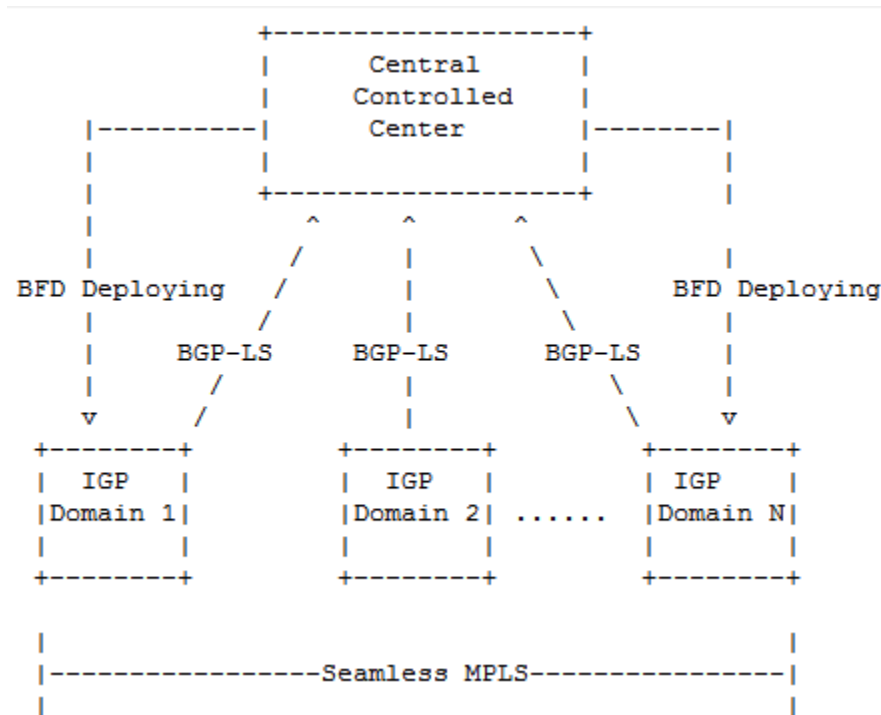
- Using S-BFD Procedures defines in [RFC7880] between the PEs which belong to different AS.

- Example: PE1 as S-BFD Initiators and PE3 as S-BFD Reflector

Central Controlled for BFD Deploying Use Case

```
                        +-------------------+
                        |     Central       |
                        |    Controlled     |
           |-----------|      Center        |--------|
           |           |                   |        |
           |           +-------------------+        |
           |                ^      ^      ^          |
           |               /       |      \          |
 BFD Deploying            /        |       \      BFD Deploying
           |             /         |        \         |
           |    BGP-LS  /   BGP-LS |   BGP-LS \        |
           |           /           |           \       |
           v          /            |            \      v
    +--------+       /         +--------+        \  +--------+
    |  IGP   |      /          |  IGP   |         \ |  IGP   |
    |Domain 1|                 |Domain 2| ...... |Domain N|
    |        |                 |        |         |        |
    +--------+                 +--------+         +--------+

    |                                                    |
    |-------------------Seamless MPLS-------------------|
    |                                                    |
```

- Central Controlled Center collects S-BFD Discriminators from different IGP domain using BGP-LS
- Network Administrator can deploy BFD on-demand via Central Controlled Center

Next Steps

- Collect feedbacks from WG
- Call for WG adoption