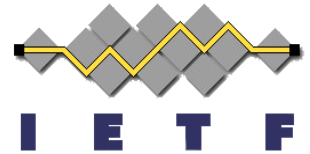# Inter-AS OAM for SR Networks
IETF 105, Montreal

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Agenda

- Problem statement
- Previous work and Issues
- New proposal
- Reverse Path label stack TLV
- Working Example
- Ask & Next step

Inter-AS OAM Problem

- Controller has complete view of topology from both ASes.
- Controller sets up TE path(LSP) spanning both ASes using Node-Sid, Adjacency-SID and EPE SID.
  - R1-R2-ASBR1-ASRB3-R3-R4
- Need to perform OAM (ping/traceroute) on these Inter-AS SR path.
- IP connectivity is needed for Echo reply to reach the originating router, which might not be present across Ases.
- LSP ping from R1 will fail because R4 has no knowledge of reverse path for ping response.
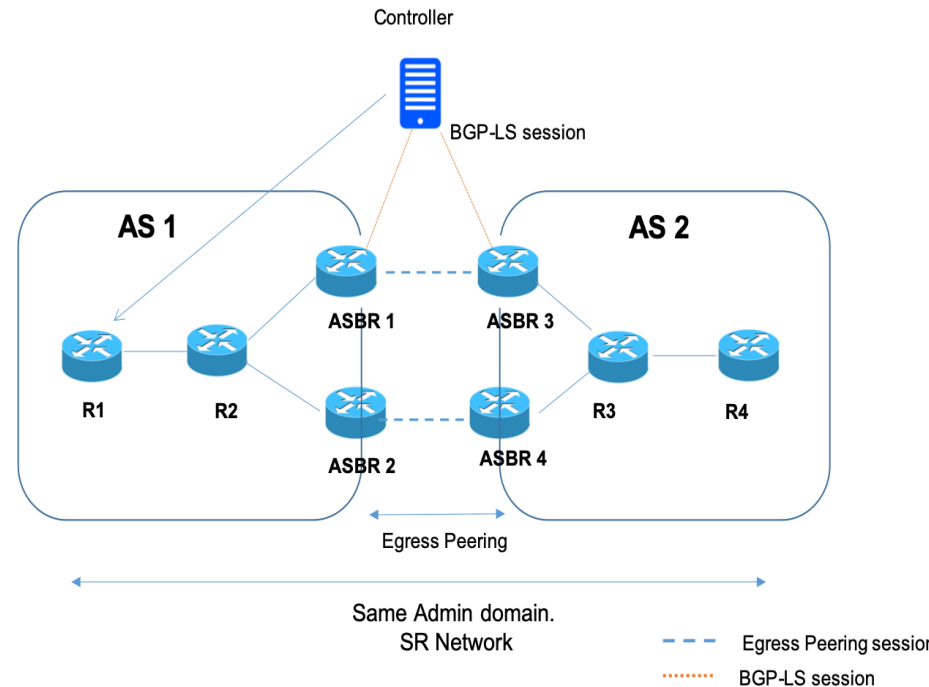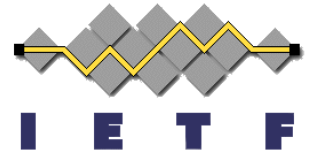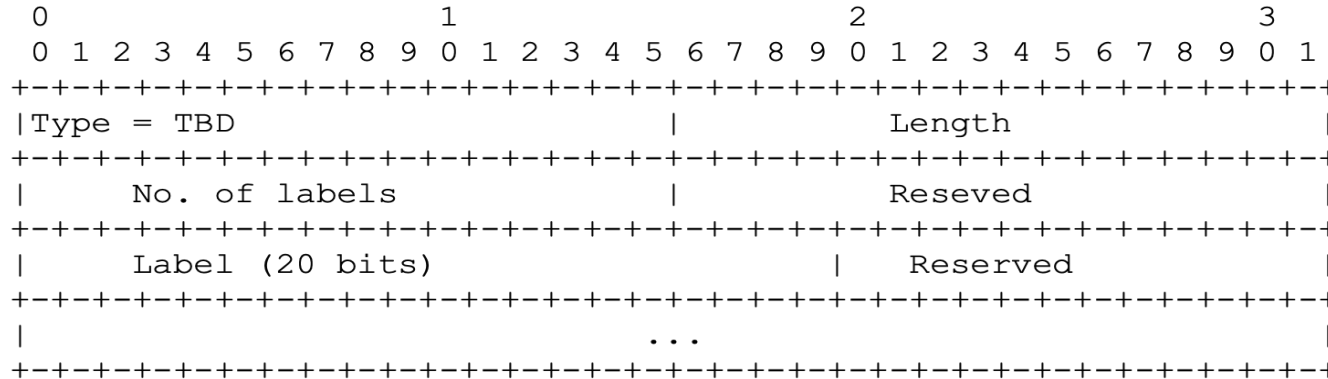
Previous Work and Issues

- RFC 8403 describes mechanisms to carry out the MPLS ping/traceroute from a PMS, which is operationally heavy. Building GRE tunnels to each router in the network would need a highly scalable and sophisticated system.

- RFC 7743 describes a Echo-relay based solution based on advertising a new Relay Node Address Stack TLV containing stack of Echo-relay ip addresses. This mechanism requires the return ping packet to reach the control plane on every relay node.

New Proposal

- For SR network, as the SID labels are known, define the reverse path using stack of SID labels.

- Each MPLS Echo-request SHOULD contain "Reverse Path label stack TLV" for inter-AS cases, which will enable remote end to send the reply to source.

- This TLV contains a list of labels which may be a prefix/adjacency/binding SID/EPE SID.

- This optional TLV MAY appear in the Echo-request message in any order before or after Target FEC Stack TLV.

- Operationally simple.

- Only data plane forwarding along the path.

Reverse Path label stack TLV

```
 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 = TBD                      |             Length           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     No. of labels              |             Reseved          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Label (20 bits)               |       Reserved           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                               ...                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- Type: TBD

- Length: Length of TLV including TLV header

- No. Of labels: Ordered set of Labels in the Reverse Path label stack

- Label : Represents 20 bit label. This field should be used to build the return packet. The first label in the label stack represents the top most label that should be encoded in the return packet.
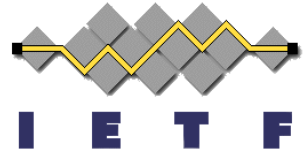
Working Example
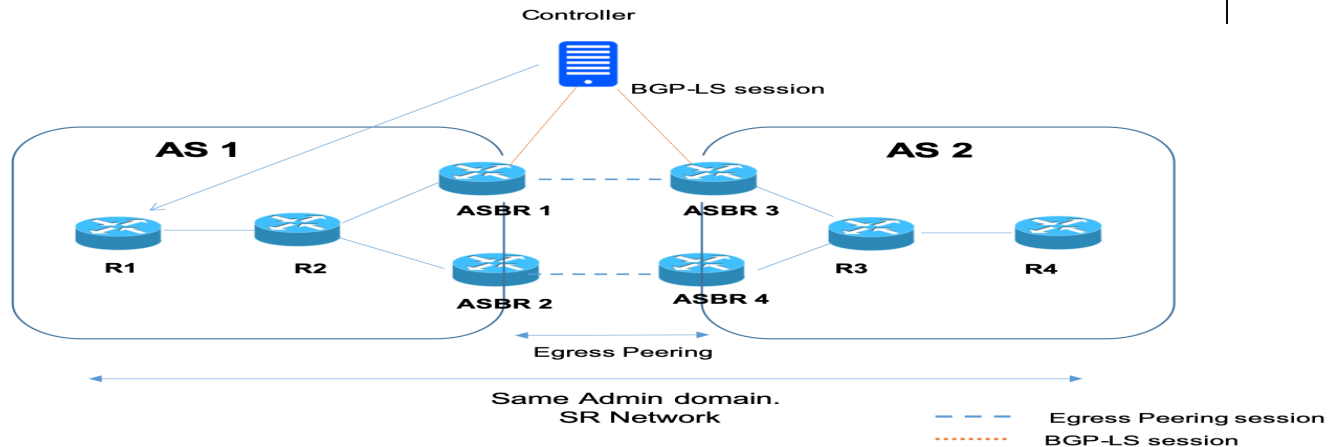
- Notatoin
  - Node SIDs : N-R1 etc.
  - Adjacency SIDs : Adj-R1-R2 etc.
  - EPE SIDS : EPE-ASBR1-ASBR3 etc.
- To perform LSP ping procedure on an SR-Path from R1 to R4 consisting of label stack [N-R2,N-ASBR1,EPE-ASBR1-ASBR3, N-PE4], the remote end(R4) needs IP connectivity to head end(PE1) for the Segment Routing ping to succeed.
- R1 adds Reverse Path from R4 to R1 in the MPLS Echo-request using multiple labels in "Reverse Path Label Stack TLV"

  [N-ASBR4, EPE-ASBR4-ASBR1, N-R1]

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Summary & Next steps

- Proposal provides simple solution for Inter-AS SR OAM

- Request IDR to accept it as wg document

Thank you