

IETF 106 – Singapore  
Nov 2019

# SR Generic FEC TLV for LSP Ping

(draft-nainar-mpls-spring-lsp-ping-sr-generic-sid)

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# Problem Statement

- Requires new target FEC Stack sub-TLV definition and standardization efforts for each new Segment ID defined.
  - Define new TLV.
  - Update FEC validation procedure of RFC-8029
- Requires domain/node wide software upgrade depending on the type of the Segment ID defined.
- Raises scalability challenges.

# Problem Statement (A partial list of New SR FECs)

## BGP Peer Node SID

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	2	3	4
Type = TBD1										Length = x																								
AF.Type					Reserved																													
Local BGP Router ID (4 octets)																																		
Local ASN (4 octets)																																		
Peer BGP Router ID (4 octets)																																		
Peer ASN (4 octets)																																		
Local Interface address (4 or 16 octets)																																		
Remote Interface address (4 or 16 octets)																																		

## BGP Peer Adj-SID

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	2	3	4
Type = TBD2										Length = 24																								
Local BGP Router ID (4 octets)																																		
Local ASN (4 octets)																																		
Peer BGP Router ID (4 octets)																																		
Peer ASN (4 octets)																																		
Local Link Identifier (4 octet)																																		
Remote Link Identifier (4 octet)																																		

## BGP Peer Set SID

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	2	3	4
Type = TBD3										Length = x																								
Local BGP Router ID (4 octets)																																		
Local ASN (4 octets)																																		
Peer Set Count										Reserved																								

List of Peer Set Sub-TLVs

## BGP Peer Set SID Sub-TLVs

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	2	3	4
Type = 1 (Peer)										Length = 8																								
Peer ASN (4 octets)																																		
Peer BGP Router ID (4 octets)																																		

## FEC changes for Flex-Algo

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	2	3	4
IPv4 prefix																																		
Prefix Length					Protocol					Algo					Reserved																			

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	2	3	4
Type = 2 (Link Id)										Length = 12																								
Peer ASN (4 octets)																																		
Local Link Identifier (4 octet)																																		
Remote Link Identifier (4 octet)																																		

## Problem Statement (Cont'ed)

- Requires a lot of information to be derived by the Initiator to include in the Echo Request.
- Complex FEC filling procedures at Ingress (one for each Prefix SID type).
- Complex validation procedures at Egress (one for each Prefix SID type).

# Solution

- SR SID data model is:
  - Segment ID (Label)
  - SID Assigner
  
- FEC validation Procedure
  - Segment ID to Interface mapping is maintained by any node.
    - Local implementation matter
  - Initiator defines the SID value and LSP EndPoint while triggering LSP Ping
    - Manually defined via CLI or dynamic PCE query.
  - Responder validates the LSP End Point and incoming interface.
    - Respond based on the validation.

# SR Generic Label Sub-TLV

SR SID (20 Bits)
SID Assigner (32 Bits)
LSP End Point (Optional; may be 0.0.0.0)

- SR SID
  - Carries 20 bits of Segment ID used for validation.
- SID Assigner
  - Node address of the Segment ID assigner.
- LSP End Point
  - Node address of the endpoint that terminates the LSP.
  - LSP End Point may be set to 0.0.0.0 by the initiator.
    - E.g., for parallel adjacency.
  - If LSP End Point address is set, the Egress MAY skip the SID assigner check.
    - E.g., for BSID

# Procedure

## Prefix SID Validation

16000x → Prefix SID for Rx for Algo 0

16128x → Prefix SID for Rx for Algo 128



- Initiator (R1) triggers LSP Ping with below SR Generic Label Sub-TLV:
  - For Prefix SID 160008 {SID=160008; SID Assigner = R8; LSP-EndPoint = R8}
  - For Prefix SID 161288 {SID=161288; LSP-EndPoint = R8}
- R8 validates if LSP-EndPoint == self; and if 160008 is assigned locally.

# Procedure

## Parallel Adj-SID Validation

16000x → Prefix SID for Rx for Algo 0

16128x → Prefix SID for Rx for Algo 128

9zxy → Adj-SID from Rx to Ry over Link z



- Initiator (R1) triggers LSP Ping with below SR Generic Label Sub-TLV:
  - For Parallel Adj SID 9378 {SID=9378; SID Assigner = R7; LSP-EndPoint = R8}
- R8 validates if LSP-EndPoint == self; and if Interface-I matches interface for 9378.



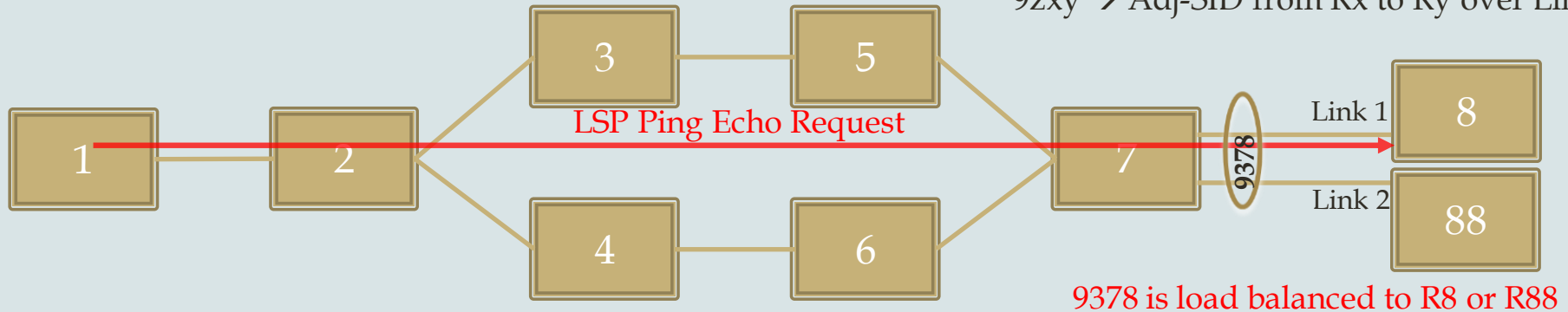
# Procedure

## Parallel Adj-SID Validation

16000x → Prefix SID for Rx for Algo 0

16128x → Prefix SID for Rx for Algo 128

9zxy → Adj-SID from Rx to Ry over Link z



- Initiator (R1) triggers LSP Ping with below SR Generic Label Sub-TLV:
  - For Parallel Adj SID 9378 {SID=9378; SID Assigner = R7; LSP-EndPoint = 0.0.0.0}
- Responder (R8 or R88) validates if SID Assigned==upstream; validates if Inteface-I matches interface for 9378.

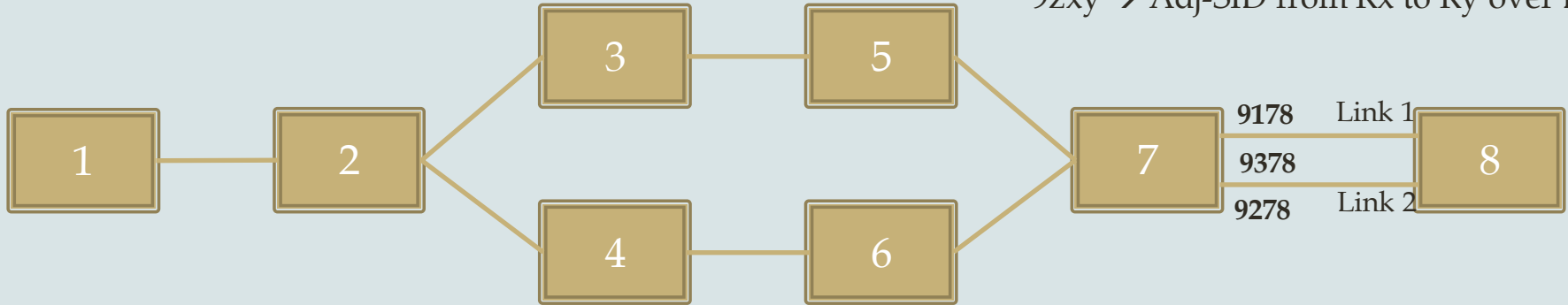
# Procedure

## Segment ID to Interface Mapping

16000x → Prefix SID for Rx for Algo 0

16128x → Prefix SID for Rx for Algo 128

9zxy → Adj-SID from Rx to Ry over Link z



➤ R8 maintains the below mapping:

- 160008 → Incoming Interface: {Any}
- 161288 → Incoming Interface: ({Any})
- 9178 → Incoming Interface: {Link 1}
- 9278 → Incoming Interface: {Link 2}
- 9378 → Incoming Interface: {Link 1 or Link 2}

# In a nut shell

- One Target FEC Stack Sub-TLV that covers multiple Segment IDs.
- Drastically reduces the information required on the Initiator.
  - Ease of operation.
- Reduces the information to be processed by the responder.
- Extendable to accommodate future Segment IDs.

# IANA Registry Allocation

- Request for a new Sub-TLV for TLV types 1, 16 and 21.
- Value from range 38-31743 (Unassigned range)
- Re-uses existing Return codes and Return Sub-codes

# I-D Status

- Next Steps:
  - WG feedback sought
  - Textual Contributions Welcomed!
  - WG Adoption after Singapore
- Thank you!

Details

# Responder behavior

