



## Stateless MNA-based Egress Protection (SMEP)

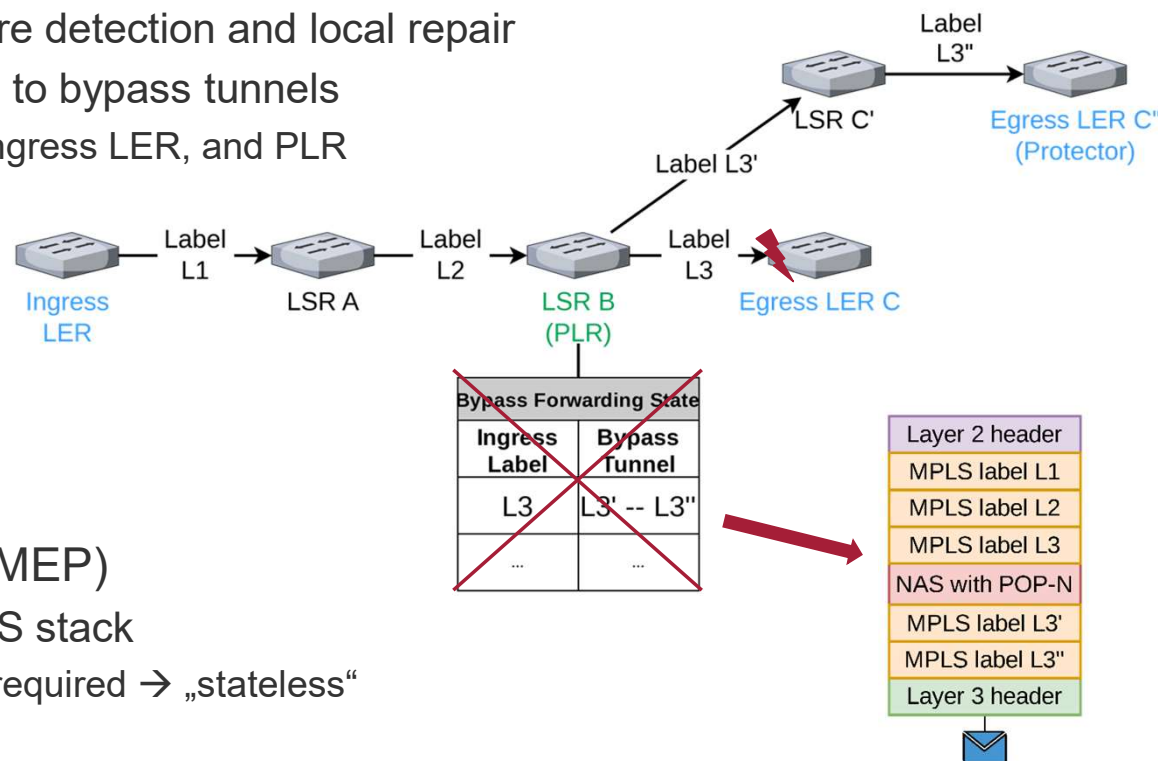
Fabian Ihle <fabian.ihle@uni-tuebingen.de>, Michael Menth <michael.menth@uni-tuebingen.de>  
*draft-ihle-mpls-mna-stateless-egress-protection-01*

<http://kn.inf.uni-tuebingen.de>

# Stateless MNA-based Egress Protection (SMEP)

► MPLS Egress Protection Framework (RFC 8679) establishes bypass tunnels for egress routers on an egress failure

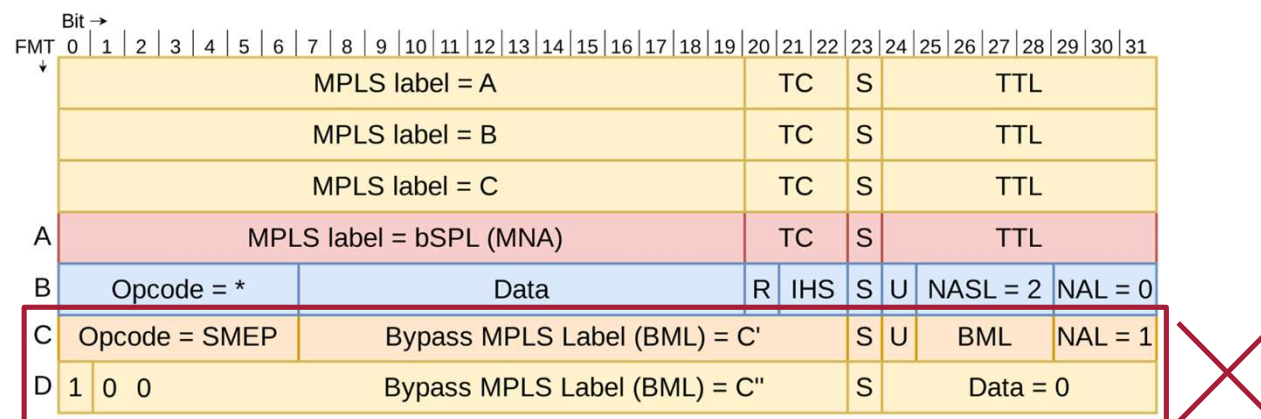
- Relies on Point of Local Repair (PLR) for failure detection and local repair
- PLR maintains a mapping of transport tunnels to bypass tunnels
  - Signaled between egress LER, Protector LER, ingress LER, and PLR



► Stateless MNA-based Egress Protection (SMEP)

- Egress bypass tunnels are carried in the MPLS stack
  - No mapping from label to bypass tunnel in PLR required → „stateless“
  - Signaling with the PLR is not required anymore
- PLR uses the bypass MPLS label (BML) from the stack to reroute traffic on an egress failure

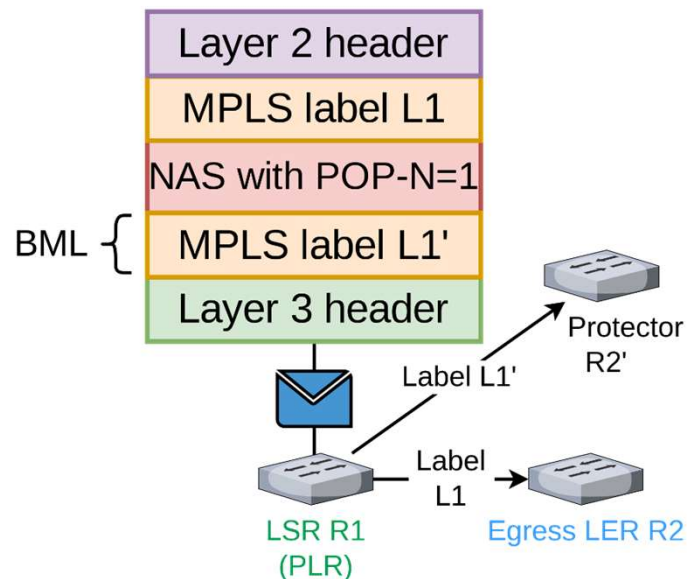
- ▶ [draft-ihle-mpls-mna-stateless-egress-protection-00] encoded BMLs in AD fields of a SMEP network action
  - This network action is removed from the draft
  
- ▶ The POP-N-LSE operation from [draft-ihle-mpls-mna-stack-management] is now used





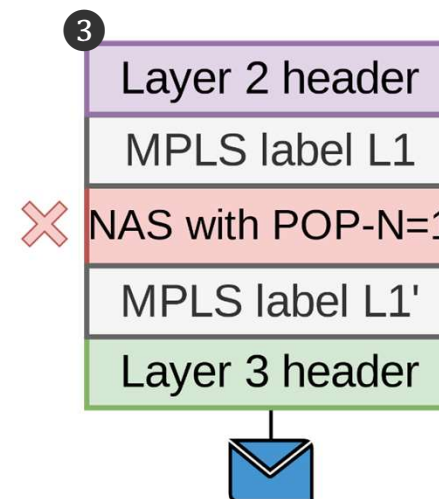
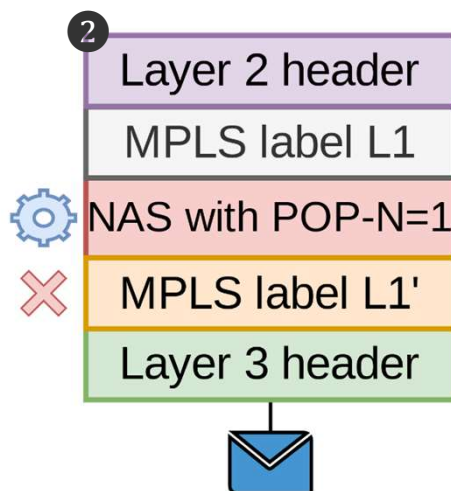
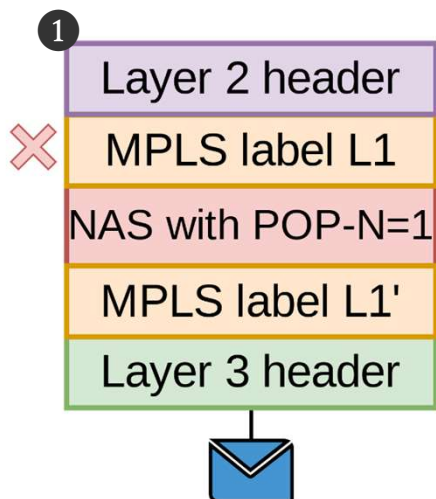
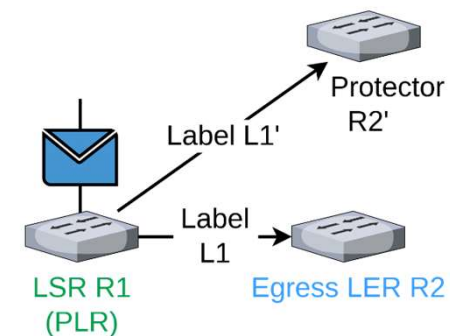
## ► The ingress ...

- inserts Bypass MPLS Labels (BMLs) to reach the protector
  - Those were previously encoded as AD in the SMEP action
- inserts select-scoped POP-N operation destined for PLR



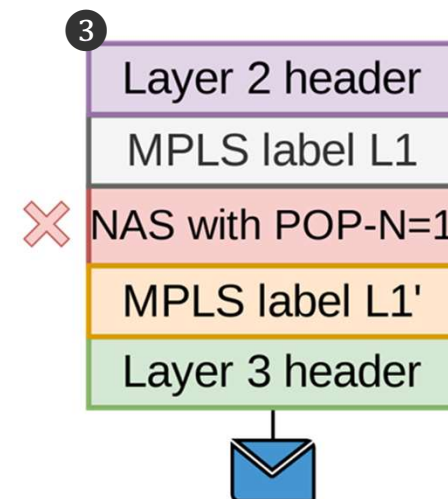
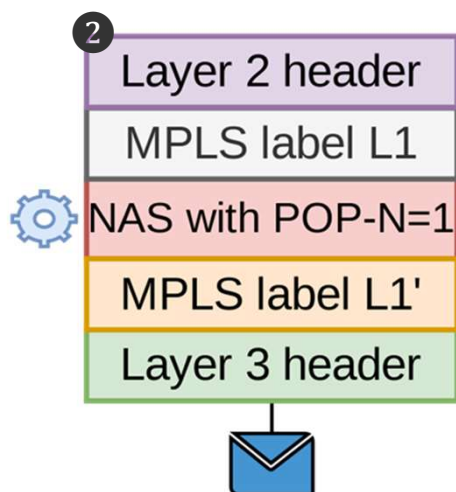
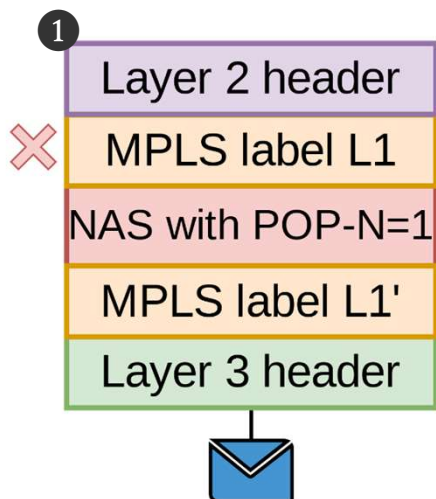
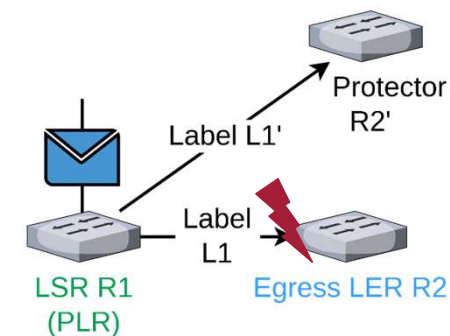
## PLR Behaviour – No Failure

- 1 Pop top-of-stack label and set egress port accordingly
- 2 Process NAS and pop BMLs via POP-N-LSE
- 3 Pop NAS since exposed to the top  
→ Forward to R2



## PLR Behaviour – Failure

- 1 Pop top-of-stack label
- 2 Process NAS and ignore POP-N action
- 3 Pop NAS since exposed to the top  
BMLs become top-of-stack, set egress port accordingly  
→ Forward to R2'



- ▶ The security issues discussed in [[I-D.ietf-mpls-mna-hdr](#)] and in [[RFC8679](#)] apply to this document.
  
- ▶ This document makes no request of IANA.
  - Previously requested an opcode for SMEP



▶ Discussion

- Is SMEP with POP-N helpful?

▶ Proof of Concept implementation

▶ Looking for collaborators

▶ Feedback is welcome!

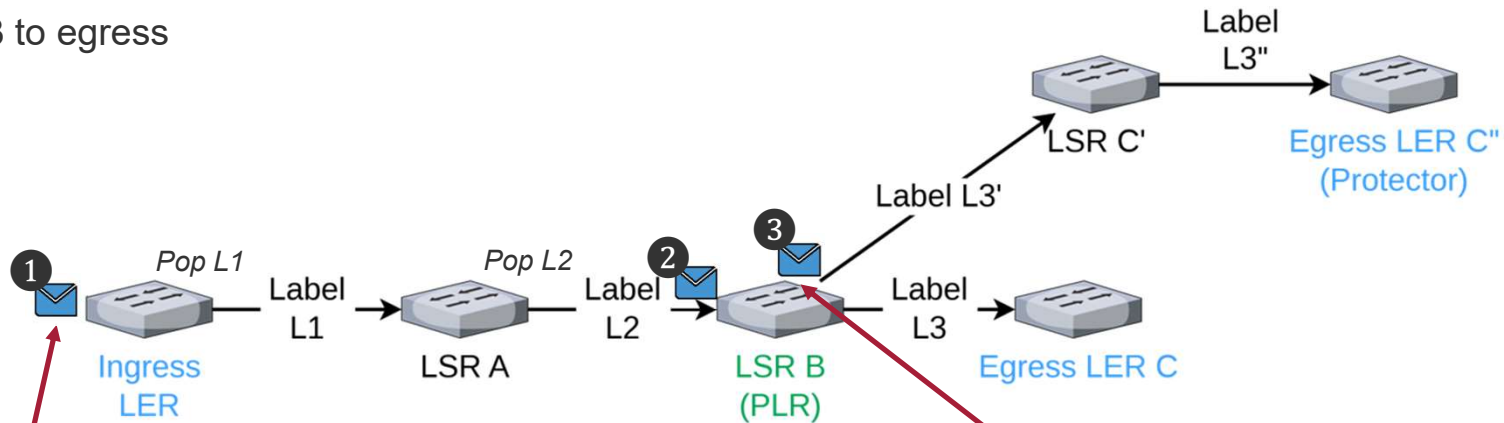


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Questions, Comments, Discussion

**THANK YOU**

- 1 Imposed label stack
- 2 Apply POP-N and remove L3' and L3''
- 3 Forward with L3 to egress



| Bit → | 0                       | 1 | 2         | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13  | 14  | 15 | 16       | 17 | 18      | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
|-------|-------------------------|---|-----------|---|---|---|---|---|---|---|----|----|----|-----|-----|----|----------|----|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|
|       | MPLS label = L1         |   |           |   |   |   |   |   |   |   |    |    | TC | S   | TTL |    |          |    |         |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       | MPLS label = L2         |   |           |   |   |   |   |   |   |   |    |    | TC | S   | TTL |    |          |    |         |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       | MPLS label = L3         |   |           |   |   |   |   |   |   |   |    |    | TC | S   | TTL |    |          |    |         |    |    |    |    |    |    |    |    |    |    |    |    |    |
| A     | MPLS label = bSPL (MNA) |   |           |   |   |   |   |   |   |   |    |    | TC | S   | TTL |    |          |    |         |    |    |    |    |    |    |    |    |    |    |    |    |    |
| B     | Opcode = MGMT           |   | POP-N = 2 |   |   |   |   |   |   |   |    |    | R  | IHS | S   | U  | NASL = 0 |    | NAL = 0 |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       | MPLS label = L3'        |   |           |   |   |   |   |   |   |   |    |    | TC | S   | TTL |    |          |    |         |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       | MPLS label = L3''       |   |           |   |   |   |   |   |   |   |    |    | TC | S   | TTL |    |          |    |         |    |    |    |    |    |    |    |    |    |    |    |    |    |

} Path to protector

|   |                         |  |           |  |  |  |  |  |  |  |  |  |    |     |     |   |          |  |         |  |  |  |  |  |  |  |  |  |  |  |
|---|-------------------------|--|-----------|--|--|--|--|--|--|--|--|--|----|-----|-----|---|----------|--|---------|--|--|--|--|--|--|--|--|--|--|--|
|   | MPLS label = L3         |  |           |  |  |  |  |  |  |  |  |  | TC | S   | TTL |   |          |  |         |  |  |  |  |  |  |  |  |  |  |  |
| A | MPLS label = bSPL (MNA) |  |           |  |  |  |  |  |  |  |  |  | TC | S   | TTL |   |          |  |         |  |  |  |  |  |  |  |  |  |  |  |
| B | Opcode = MGMT           |  | POP-N = 2 |  |  |  |  |  |  |  |  |  | R  | IHS | S   | U | NASL = 0 |  | NAL = 0 |  |  |  |  |  |  |  |  |  |  |  |
|   | MPLS label = L3'        |  |           |  |  |  |  |  |  |  |  |  | TC | S   | TTL |   |          |  |         |  |  |  |  |  |  |  |  |  |  |  |
|   | MPLS label = L3''       |  |           |  |  |  |  |  |  |  |  |  | TC | S   | TTL |   |          |  |         |  |  |  |  |  |  |  |  |  |  |  |

# Example – Egress Failure

- 1 Imposed label stack
- 2 Pop L3, pop NAS, ignore POP-N
- 3 Forward with L3' and L3'' to protector

