OAM for NRP in MPLS Network

draft-gong-mpls-nrp-oam-mpls-00

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Motivation

- Use existing OAM tools to monitor NRP resource status and rapidly detect faults.

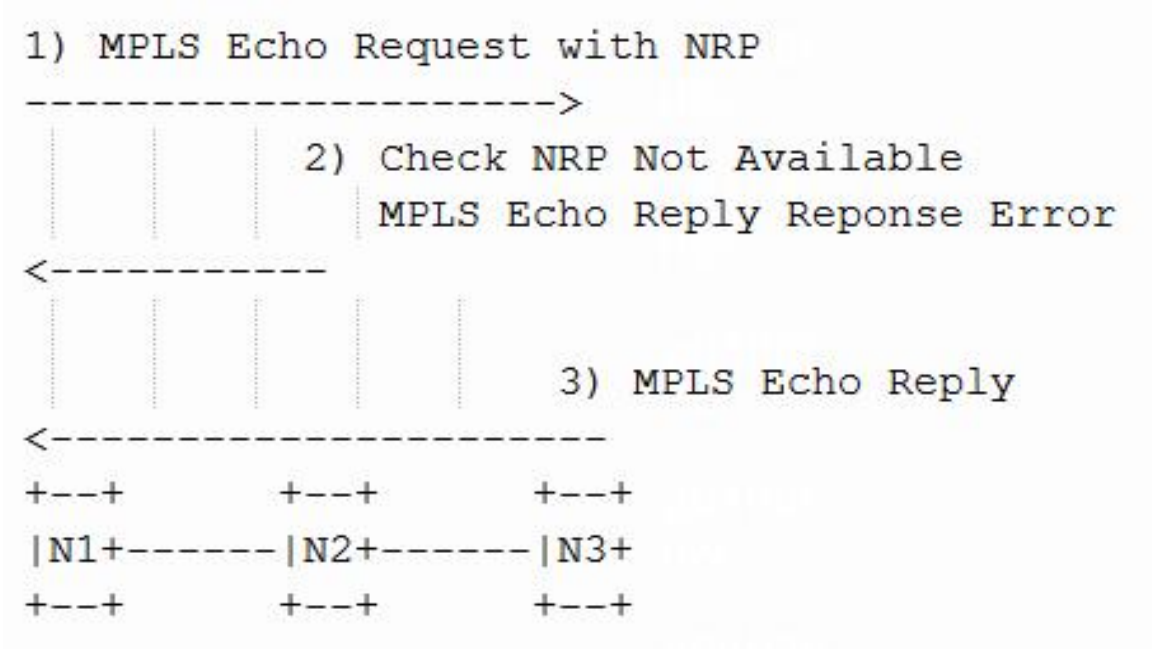
  - ✓ PING[RFC8029] [RFC9259]
  - ✓ TRACEROUTE[RFC8029] [RFC9259]
  - ✓ BFD[RFC5880][RFC5881]
  - ✓ STAMP[RFC8762][RFC9503]

- Draft History

  - ✓ The draft: draft-gong-teas-spring-nrp-oam-00 is a framework document on NRP OAM, first presented at IETF-122 in the TEAS session.
  - ✓ After IETF-122, based on the comments, we separated the content related to MPLS expansion to form draft-gong-mpls-nrp-oam-mpls-00.
  - ✓ This document describes the implementation of the OAM mechanism for NRPs in MPLS networks.

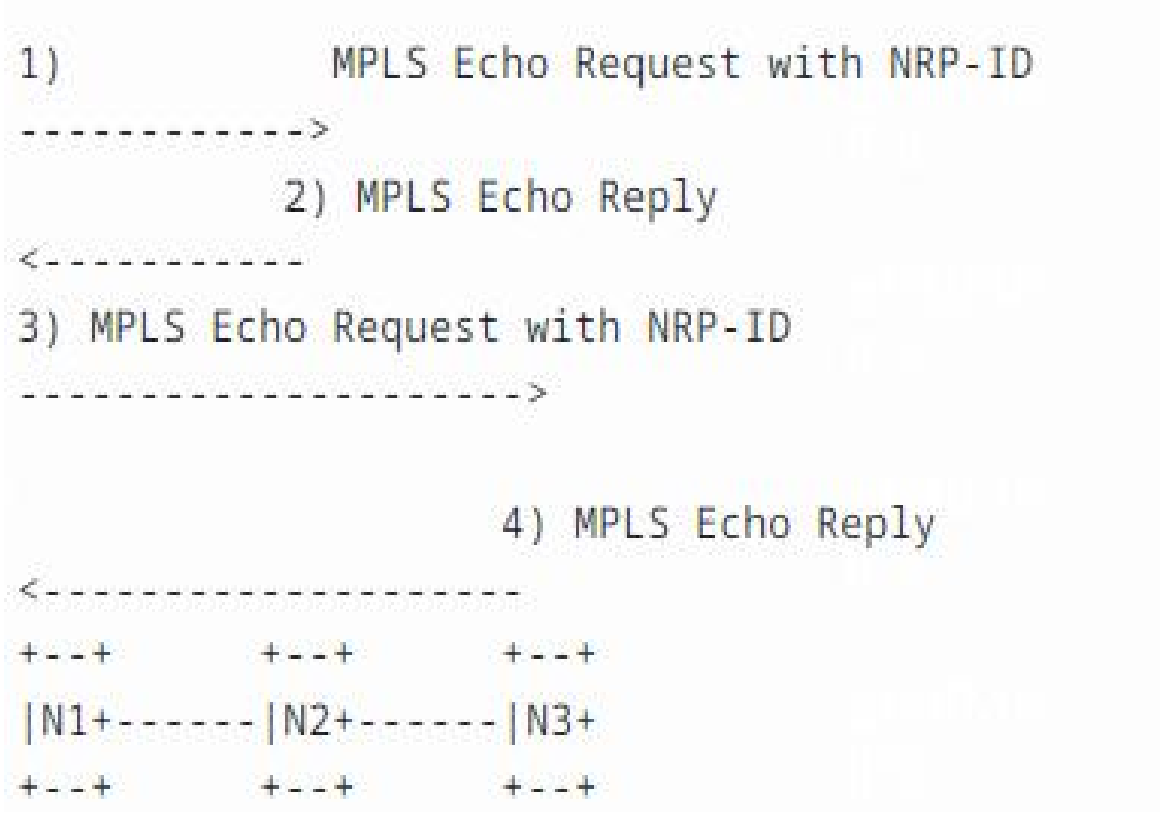
MPLS Ping With NRP

- NRP Resource Availability Check via PING
- PING Request with NRP-ID
  - ✓ MPLS: MPLS Echo Request includes NRP-ID.
- NRP Resource Check
  - ✓ Intermediate/End Point checks NRP availability.
  - ✓ If unavailable, responds "NRP resources unavailable" error
  - ✓ in MPLS Echo Reply.
  - ✓ Extend: Return Codes in MPLS Echo Reply.
- Successful Check
  - ✓ End Point responds with a normal MPLS Echo Reply.
- Round-trip path NRP ID
  - ✓ MPLS Echo Request includes Round-trip NRP-ID.
  - ✓ MPLS Echo Response send in Round-trip NRP-ID.



MPLS Tracert with NRP

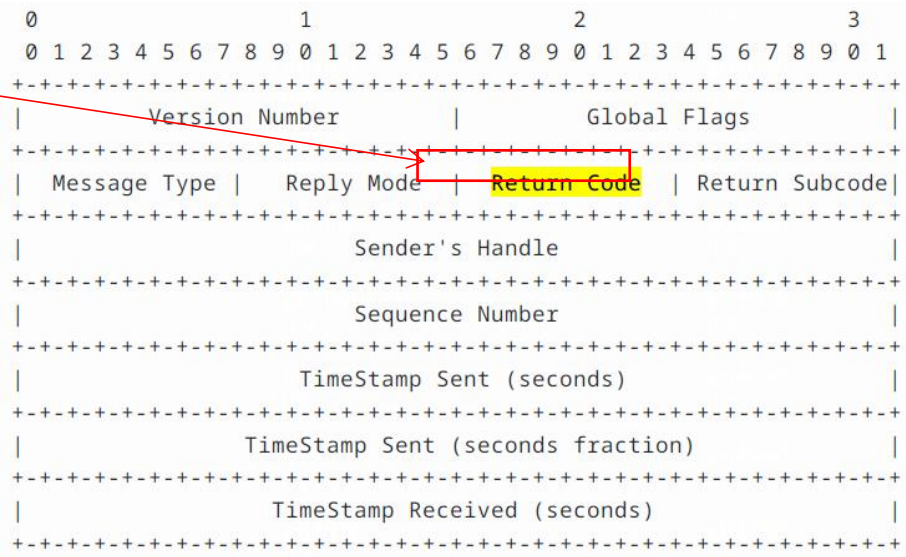
- NRP Resource Availability Check via Traceroute
- Traceroute Request with NRP-ID
  - ✓ MPLS: MPLS Echo Request with TTL 1 to n.
- NRP Resource Check
  - ✓ Intermediate/End Point checks NRP availability.
  - ✓ If unavailable, responds with "NRP resources unavailable" error (same error code as MPLS PING).
- Successful Check
  - ✓ Proceeds with normal MPLS Traceroute, performing hop-by-hop path detection until completion, and outputs results.
- Round-trip path NRP ID
  - ✓ MPLS Echo Request includes Round-trip NRP-ID.
  - ✓ MPLS Echo Response send in Round-trip NRP-ID.



Protocol Extension #1

- **Extend for Error Code**
  - ✓ Defines New return Code as “NRP resource unavailable”

MPLS echo request/reply[RFC8029]



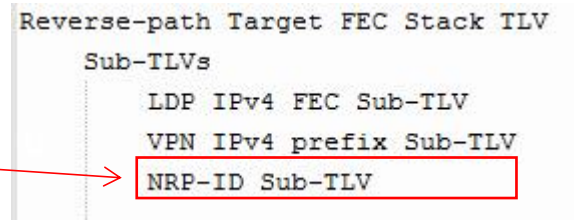
Protocol Extension #2

- **Extend for Round-trip path NRP ID**

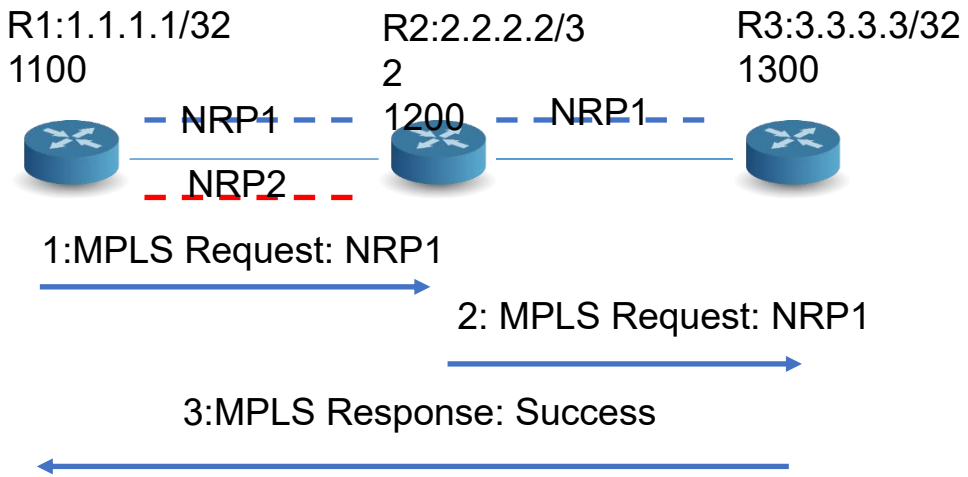
For MPLS PING and TRACERT, include the return NRP-ID in the Reverse-path Target FEC Stack TLV when sending the Request.

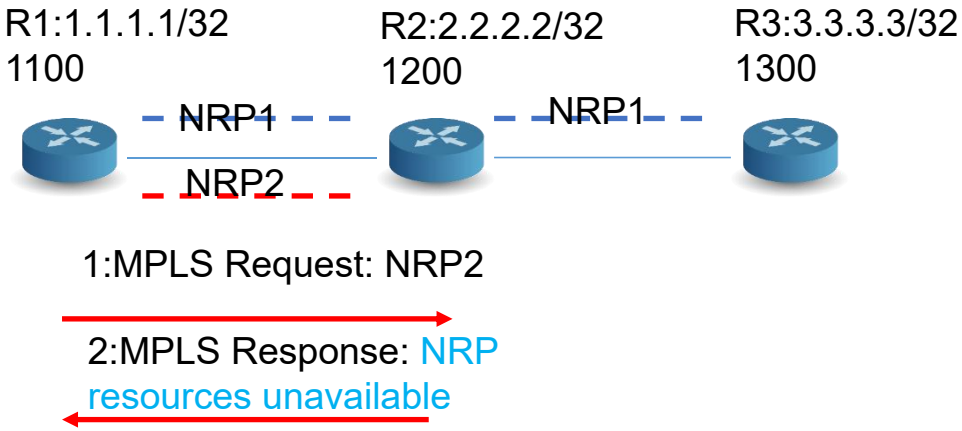
```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  sub-Type = TBD (NRP-ID)      |           Length = 4            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              NRP-ID                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Reverse-path Target FEC Stack TLV



Use case 1: MPLS Ping





MPLS Ping Success process:

① R1 MPLS Echo Request prefix 3.3.3.3/32, with NextLable 1100(R2), NRT1.

② The packet is forwarded to R3 by R2, prefix 3.3.3.3/32, with NextLable 1200(R3), NRT1.

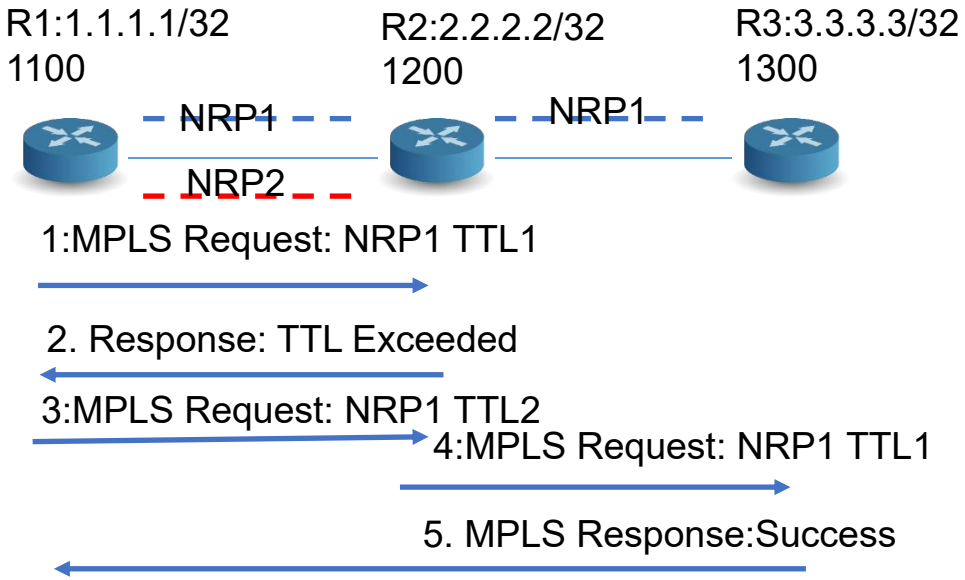
③ R3 receives the MPLS Echo Request and replies with an success MPLS Echo Response.

MPLS Ping Failed process:

① R1 MPLS Echo Request prefix 3.3.3.3/32, label 1200(R2), NRP2.

② R2 checks and finds NRP2 resources unavailable, replies with an MPLS Echo Response containing error code: "NRP resources unavailable".

Use case 2: MPLS TraceRt



MPLS TraceRt Success process:

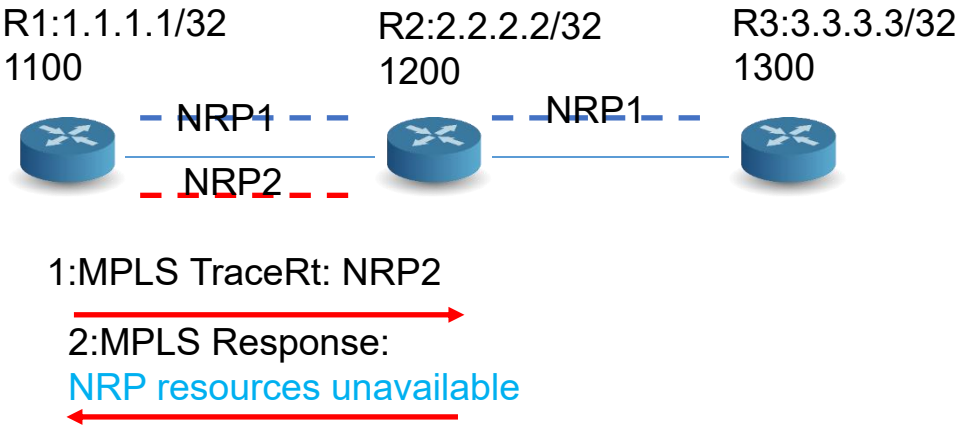
① R1 Frist Probe : MPLS Echo Request prefix 3.3.3.3/32 with NextLable 1100(R2), NRT1, TTL=1;

② R2 receives packet, decrements TTL to 0, drops packet, returns MPLS Echo Reply: TTL Exceeded .

③ R1 Second Probe: MPLS Echo Request prefix 3.3.3.3/32, NextLable 1100(R2), NRT1, TTL=2;

④ R2 receives packet, decrements TTL to 1, forward to 1200(R3), NRP1, TTL=1

⑤ R3 receives packet, returns MPLS Echo Reply: Success.



MPLS TraceRt Failed process:

① R1 First Probe : MPLS Echo Request prefix 3.3.3.3/32 with NextLable 1100(R2), NRT2, TTL=1;

② R2 receives packet, Check NRP2, returns MPLS Echo Reply: "NRP resources unavailable".

Next Steps

- Seek feedback from the working group on whether this protocol extension is necessary and appropriate

- Any questions or comments are welcome.

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Thanks

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