

Enhanced Performance Measurement Using Simple TWAMP in Segment Routing Networks

draft-gandhi-spring-enhanced-srpm-04

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Abbreviations

Abbreviations	Meaning
AD	Ancillary Data
BOS	Bottom of Stack
bSPL	Base Special Purpose Label
E2E	Edge To Edge
HBH	Hop By Hop
IHS	Ingress-To-Egress, Hop-By-Hop or Select Processing Scope
IOAM	In Situ OAM
ISD	In-Stack Data
MNA	MPLS Network Action
MSD	Maximum Stack Depth
NAI	Network Action Indicator
NAI-OP	Network Action Indicator Opcode
NAS	Network Action Sub-Stack
PSD	Post-Stack Data
TSF	Timestamp and Forward

Agenda

- Requirements and Scope
- Summary of the Solution
 - SR-MPLS
 - SRv6
- Next Steps

Requirements and Scope

Requirements:

- Performance Measurement in SR networks
 - ✓ End-to-end SR paths, including SR Policies
 - ✓ Applicable to SR-MPLS/SRv6 data planes

Goals:

- No Session-Reflector dependency for one-way delay measurement
 - ✓ Session-Reflector unaware of the measurement protocol
 - ✓ State is in the packet - spirit of SR
- Higher number of test session scale and faster detection interval

Scope:

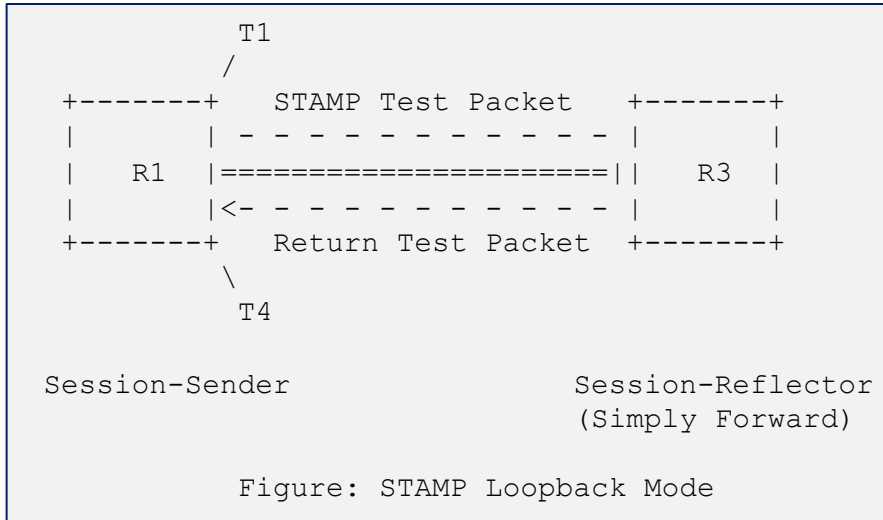
- Using RFC 8762 (Simple TWAMP (STAMP))
- Further extension in *[draft-ietf-spring-stamp-srpm]*

Recap from draft-ietf-spring-stamp-srpm

[draft-ietf-spring-stamp-srpm] defines following 3 measurement modes in Segment Routing networks:

1. One-way measurement mode
2. Two-way measurement mode
3. Loopback measurement mode
 - This mode is being enhanced in the new draft

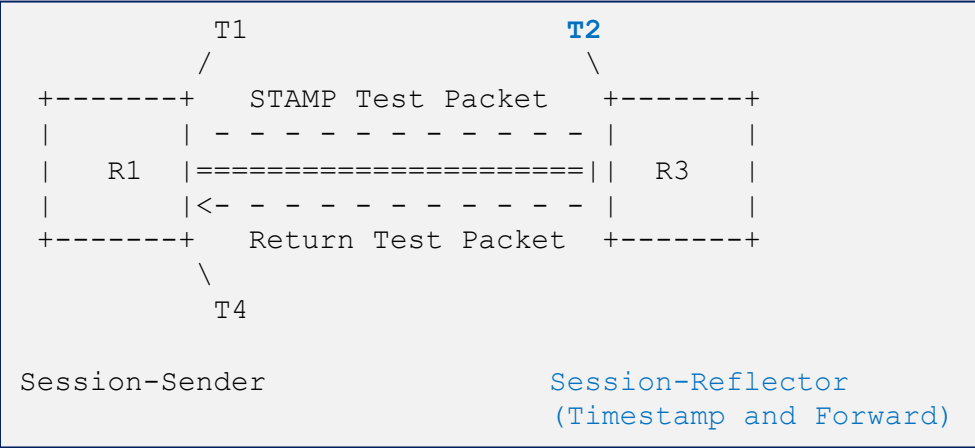
Loopback Mode for SR Policy [draft-ietf-spring-stamp-srpm]



Summary

- STAMP test packets in Loopback Mode as defined in [draft-ietf-spring-stamp-srpm]
- STAMP test packets are transmitted for each Segment List(s) of the SR Policy Candidate Path(s)
- STAMP test packets are forwarded in fast-path just like data traffic on Session-Reflector
- Round-trip delay = (T4 - T1)

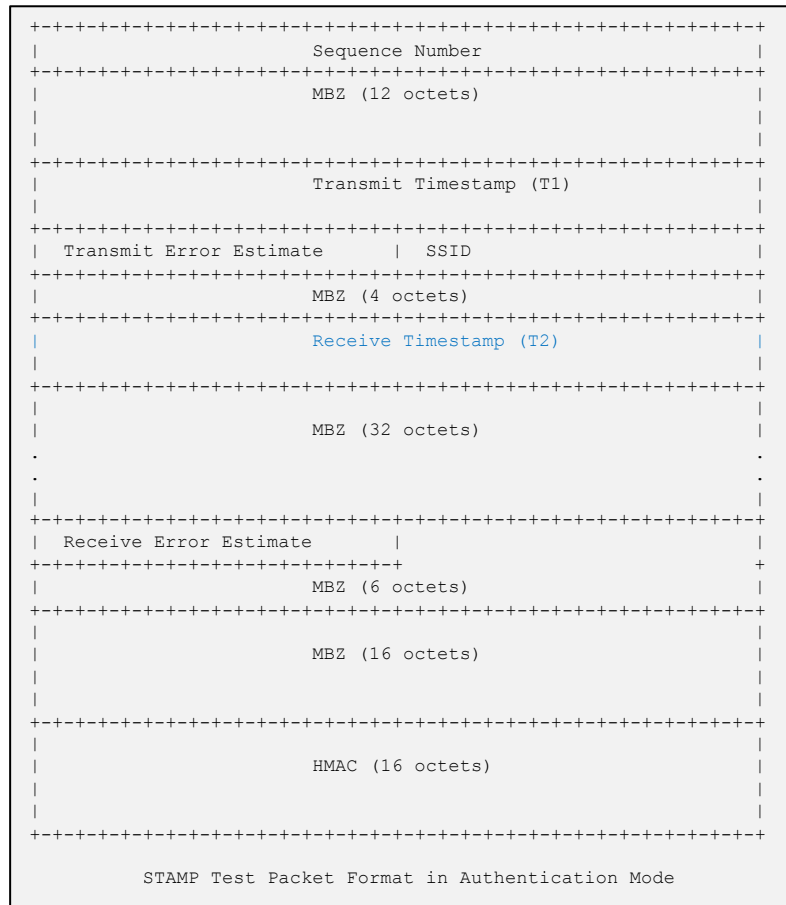
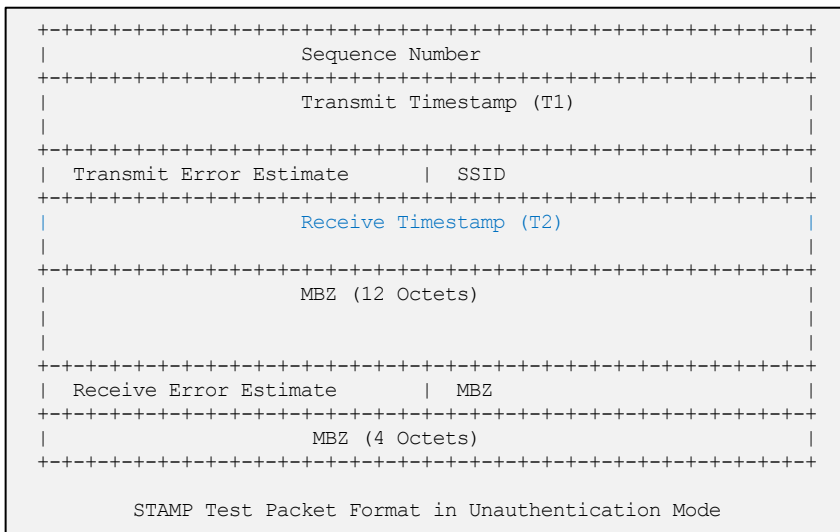
Enhanced Loopback Mode Enabled with Network Programming Function



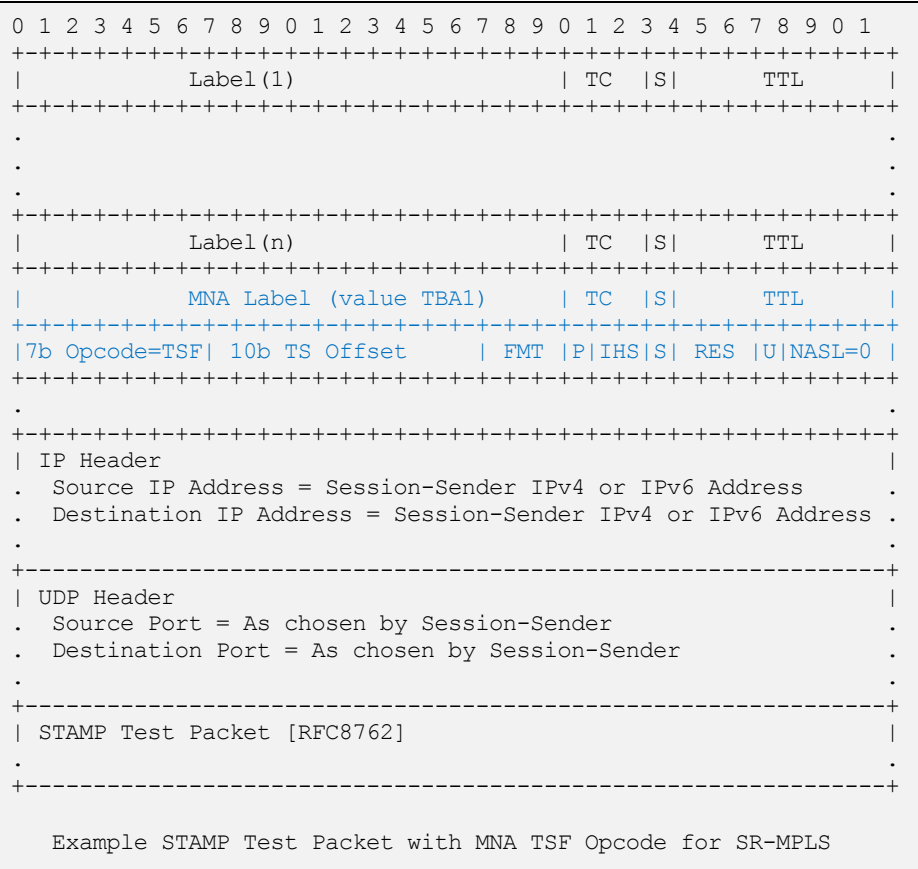
- STAMP test packets transmitted in enhanced loopback mode
 - The network programming function optimizes the "operations of punt and generate the reply test packet" on Session-Reflector
 - As STAMP test packets are forwarded in fast-path, higher number of session scale with faster detection interval can be achieved
- Session-Reflector adds receive timestamp at a specific location in the payload of the received STAMP test packet in fast-path
- One-way delay = (T2 – T1) (Note: assumes the clocks on the Session-Sender and Session-Reflector are synchronized)

STAMP Test Packets

- Using standard STAMP Session-Sender test packets defined in RFC 8762/8972
- Session-Sender adds Transmit Timestamp (T1)
- Session-Reflector adds **Receive Timestamp (T2)** at offset-byte location in payload, for example,
 - offset 16 bytes from the start of the payload in unauthenticated mode, or
 - offset 32 bytes from the start of the payload in authenticated mode



SR-MPLS with Timestamp and Forward Network Action



- MPLS Network Action (MNA) Sub-Stack [draft-ietf-mpls-mna-hdr] containing
 - MNA Label (bSPL value TBA1)
 - Opcode (value TBA2) defined for Timestamp and Forward (TSF) function Network Action
 - 10-bit Data for timestamp offset, e.g., 16 or 32 for STAMP test packets
 - FMT: 3-bit Data for timestamp format (64-bit PTPv2 or NTP)
 - U Flag - Unknown Action Handling can be set to 0 for “Skip to the next Network Action”
 - Network Action Sub-Stack Length (NASL) is set 0 if no additional LSE added after this
 - Session-Reflector removes the MNA Sub-Stack
- Reverse path can be IP/UDP
 - Session-Reflector removes the MPLS header
 - IHS field scope is set to I2E (Ingress-To-Egress)
- Reverse path can be SR-MPLS
 - Reverse direction SR-MPLS path label stack carried in the MPLS Header
 - IHS field scope is set to SELECT

SRv6 with Timestamp and Forward Endpoint Function

```
+-----+
| IP Header |
. Source IP Address = Session-Sender IPv6 Address .
. Destination IP Address = Destination IPv6 Address .
. . . . .
+-----+
| SRH as specified in RFC 8754 |
. <Segment List> .
. <End.uTSF16 or End.uTSF32 with Session-Reflector Node SID> .
. . . . .
+-----+
| IP Header |
. Source IP Address = Session-Sender IPv6 Address .
. Destination IP Address = Session-Sender IPv6 Address .
. . . . .
+-----+
| UDP Header |
. Source Port = As chosen by Session-Sender .
. Destination Port = As chosen by Session-Sender .
. . . . .
+-----+
| STAMP Test Packet [RFC8762] |
. . . . .
+-----+
```

Example STAMP Test Packet with SRv6 Timestamp and Forward Endpoint Function

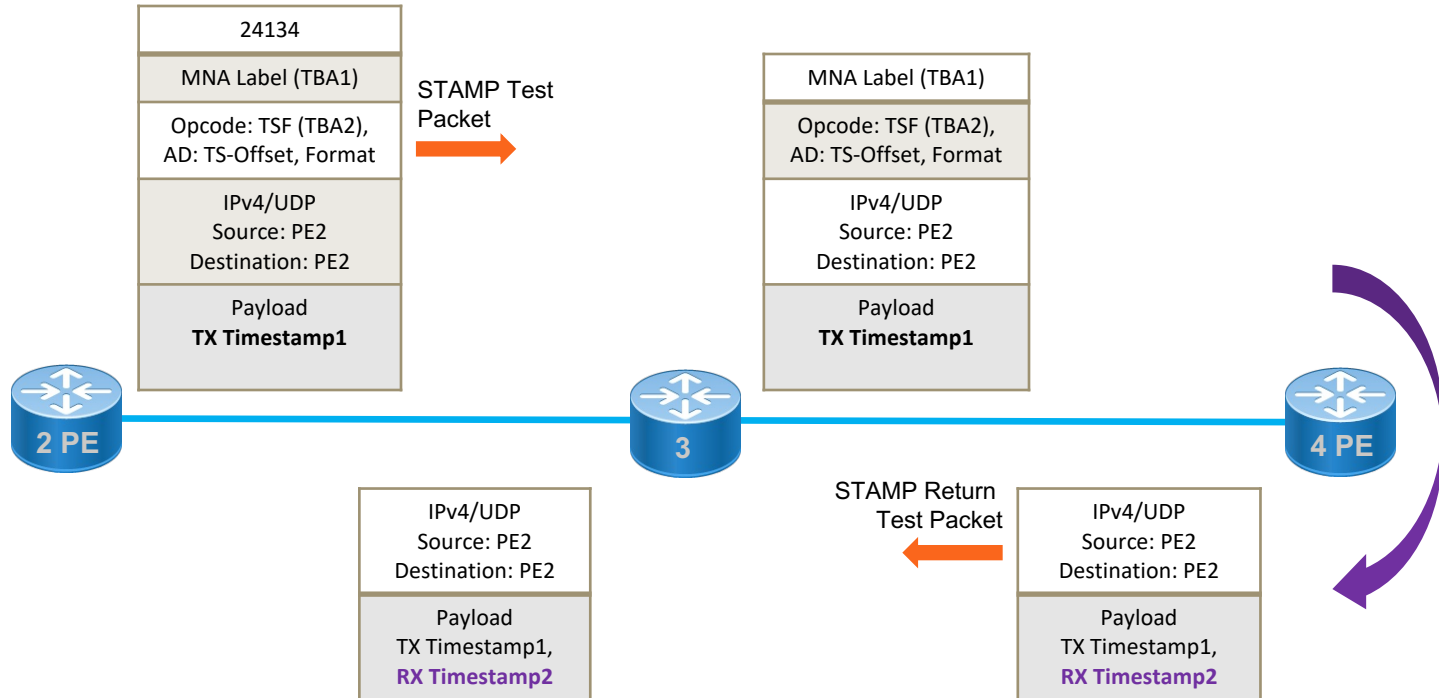
- SRv6 Timestamp Endpoint Functions End.TSF for Timestamp and Forward is carried with the Session-Reflector node Locator SID
- SRv6 uSID behaviors End.uTSF16 for offset-16 and End.uTSF32 for offset-32 statically defined on the reflector
- Reverse path can be IPv6/UDP
 - Inner IPv6 header is used
 - Session-Reflector removes outer IPv6/SRH
- Reverse path can be SRv6
 - Inner IPv6 header not required
 - Reverse direction SRv6 path segment-list carried in IPv6/SRH.SL

Next Steps

- Welcome your comments and suggestions
- Requesting SPRING working group adoption
 1. One-way measurement mode [draft-ietf-spring-stamp-srpm]
 2. Two-way measurement mode [draft-ietf-spring-stamp-srpm]
 3. Loopback measurement mode [draft-ietf-spring-stamp-srpm]
 4. Enhanced loopback measurement mode <-- In this draft

Thank you

Loopback Mode with Timestamp and Forward for SR-MPLS Policy



Thank you