Simple TWAMP (STAMP) Extensions for Segment Routing Networks

draft-gandhi-ippm-stamp-srpm-00

Rakesh Gandhi - Cisco Systems (rgandhi@cisco.com) - Presenter
Clarence Filsfils - Cisco Systems (cfilsfil@cisco.com)
Daniel Voyer - Bell Canada (daniel.voyer@bell.ca)
Mach(Guoyi) Chen - Huawei (mach.chen@huawei.com)
Bart Janssens - Colt (Bart.Janssens@colt.net)

Agenda

- Requirements and Scope

- History of the Draft

- Summary of Extensions

- Next Steps

Requirements and Scope

Requirements:

- Delay and synthetic Loss Measurement
- Support stand-alone direct-mode Loss Measurement

Scope:

- STAMP [RFC 8762]
- STAMP TLVs [draft-ietf-ippm-stamp-option-tlv]

STAMP - Summary of PM Drafts

draft-gandhi-spring-stamp-srpm

• Defines procedures for delay, synthetic loss and direct-mode loss measurements

– For Links and end-to-end SR Paths for SR-MPLS and SRv6 data planes

draft-gandhi-ippm-stamp-srpm

• Defines extensions for STAMP for Segment Routing

– Defines Session-Sender Control Code field for in-band response request

– Defines stand-alone direct-mode loss measurement query and response messages

– Defines TLVs to carry Destination Node Address and Return Path

History of the Draft

- Feb 2019
  - Draft was published - *draft-gandhi-spring-twamp-srpm-00*
- Mar 2019
  - Presented *draft-gandhi-spring-twamp-srpm-00* at IETF 104 Prague in SPRING WG
- May 2019
  - Added STAMP TLV for Return Path
- July 2019
  - Presented *draft-gandhi-spring-twamp-srpm-01* at IETF 105 Montreal in IPPM WG
    - Slide 9 Titled - Applicability of STAMP
- Nov 2019
  - SPRING Chairs announced in the meeting the agreement with IPPM chairs to progress the draft in SPRING WG
  - Presented *draft-gandhi-spring-twamp-srpm-04* at IETF 106 Singapore in SPRING WG
- Mar 2020
  - Moved STAMP support to *draft-gandhi-spring-**stamp**-srpm-00*
  - Keep TWAMP Light support as informational in *draft-gandhi-spring-**twamp**-srpm-08*
- Jul 2020
  - Presented *draft-gandhi-spring-stamp-srpm-01* at IETF 108 in SPRING and IPPM WG
- October 2020
  - Split draft into *draft-gandhi-**spring**-stamp-srpm-03 and draft-gandhi-**ippm**-stamp-srpm-00*

STAMP - Session-Sender Control Code Field

In a Query: Session-Sender Control Code

0x0: Out-of-band Response Requested.
This is the existing behavior.

0x1: In-band Response Requested.
Indicates that this query has been sent over
a bidirectional path and the probe response
is required over the same path in reverse
direction.

0x2: No Response Requested.

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Sequence Number                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                          Timestamp                            |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|         Error Estimate        |              SSID             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|         MBZ                                   |Se Control Code|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
|                    MBZ   (24 octets)                          |
|                                                               |
|                                                               |
|                                                               |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

     Figure: Session-Sender Control Code in STAMP DM Message
```
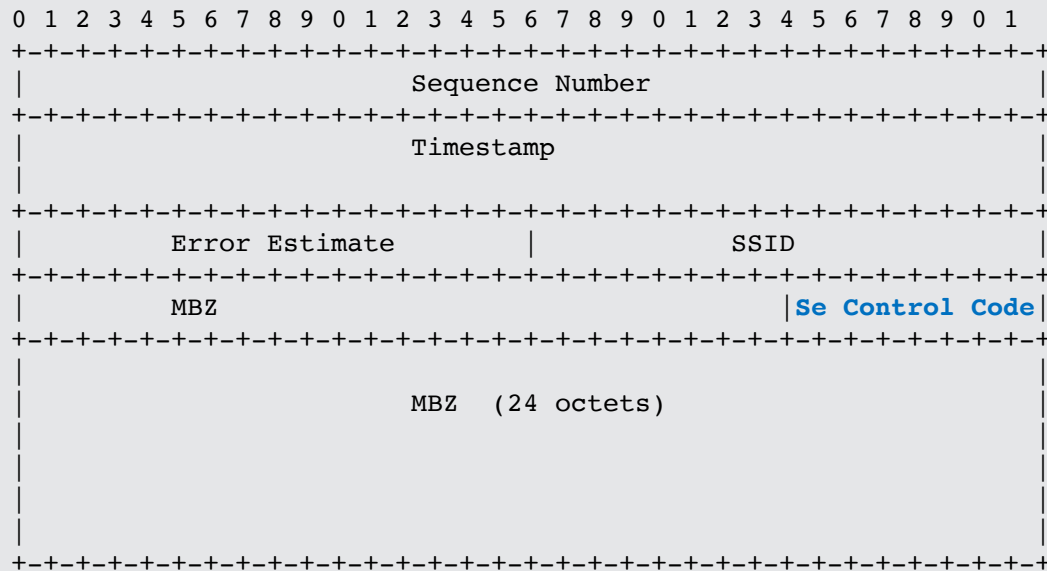
- With this, the Session-Reflector node does
  not require any additional state for PM

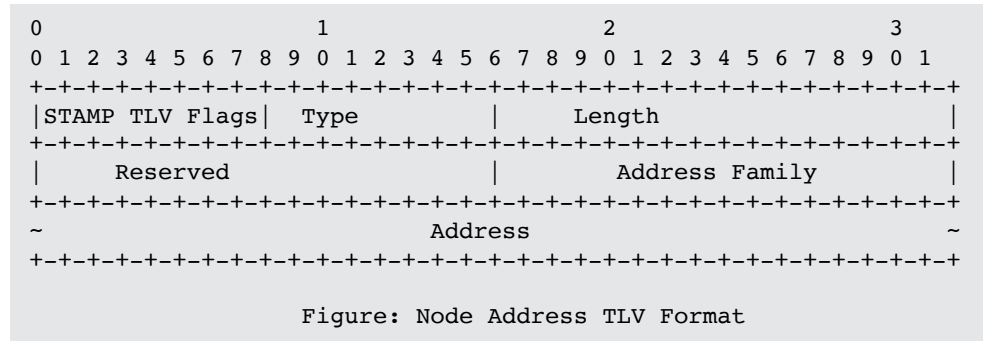# STAMP - Stand-alone Direct-mode LM Message Format

- Stand-alone Direct-mode Loss Measurement (LM) query and response messages defined
  - Hardware efficient counter-stamping
    - Well-known locations for transmit and receive traffic counters
  - Stand-alone LM message, not tied to DM
- Direct-mode LM message format is also defined for authenticated mode
- User-configured destination UDP **Port2** is used for identifying direct-mode LM probe packets
- Does not modify existing STAMP (which is for DM) procedure as different destination UDP port is used for direct-mode LM

```
 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
+---------------------------------------------------------------+
| IP Header                                                     |
. Source IP Address = Session-Sender IPv4 or IPv6 Address       .
. Destination IP Address = Session-Reflector IPv4 or IPv6 Addr  .
. Protocol = UDP                                                .
.                                                               .
+---------------------------------------------------------------+
| UDP Header                                                    |
. Source Port = As chosen by Session-Sender                     .
. Destination Port = User-configured Port2 for Loss Measurement.
.                                                               .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Sequence Number                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Transmit Counter                         |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|X|B| Reserved   | Block Number  | SSID                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Receive Counter                          |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Session-Sender Sequence Number                |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Session-Sender Counter                      |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|X|B| Reserved   |Sender Block Nu|  MBZ                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Sender TTL    |       MBZ                                    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

STAMP - Destination Node Address TLV

Destination Node Address TLV (value TBA1):

- Indicates the address of the intended recipient node of the query message.
- The Session-Reflector node **MUST NOT** send response if it is not the intended destination node of the query.
- Useful when query is sent with 127/8 destination address.

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|STAMP TLV Flags|   Type        |            Length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Reserved              |            Address Family          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
~                         Address                                ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

            Figure: Node Address TLV Format
```

STAMP - Return Path TLV

Return Path TLV (value TBA2):

Sub-TLVs Types:

- Type (value 1): Return Address. Target node address of the response; different than the Source Address in the query

- Type (value 2): SR-MPLS Label Stack of the Reverse SR Path

- Type (value 3): SR-MPLS Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy

- Type (value 4): SRv6 Segment List of the Reverse SR Path

- Type (value 5): SRv6 Binding SID [draft-ietf-pce-binding-label-sid] of the Reverse SR Policy
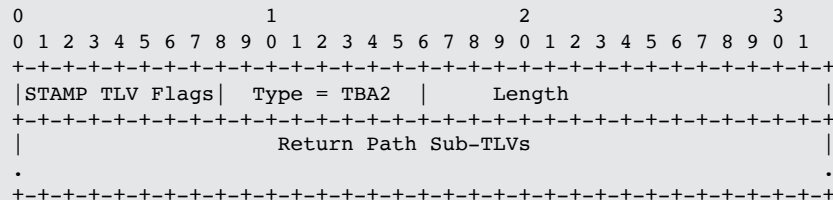
```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|STAMP TLV Flags|  Type = TBA2  |            Length             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Return Path Sub-TLVs                     |
.                                                              .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

                   Figure: Return Path 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|STAMP TLV Flags|   Type        |            Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Segment(1)                            |
.                                                              .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
.                                                              .
.                                                              .
.                                                              .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Segment(n)                            |
.                                                              .
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

            Figure: Segment List Sub-TLV in Return Path TLV
```
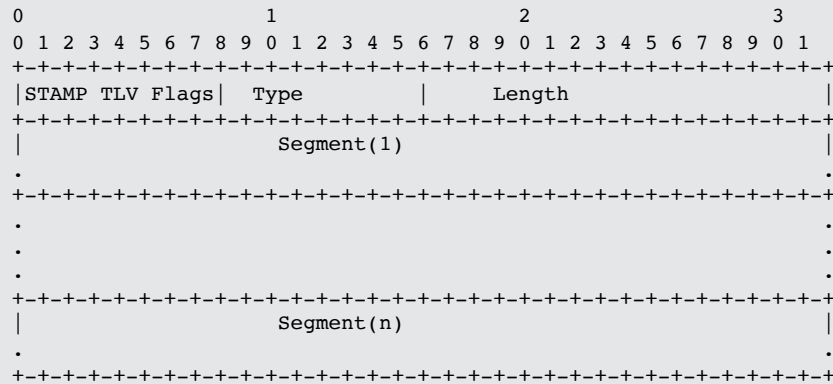
draft-gandhi-ippm-stamp-srpm - Review Comments

1. Draft status:
   a) Draft defines extensions for STAMP (is not a new protocol)
   b) Update RFC 8762 due to new field (control code) in the message
2. Extensions are not specific to SR, document should be renamed
3. Does not introduce any new security issue with this draft
4. Editorial
   a) Define Abbreviations (BSID, SRH, HMAC-SHA)
   b) Use Session-Sender, Session-Reflector terms
   c) Show entire test packet with session-sender control code field
   d) Indicate packet loss is direct-mode loss
   e) Move Receive Counter and other Response message fields to Section 4.1 from 3.2
      • Explain how the counters and sequence numbers are used to do loss measurement
5. Extend ICMP for direct-mode loss measurement – out of scope

draft-gandhi-spring-stamp-srpm - Review Comments

1. Destination UDP port used has zero UDP checksum with IPv6 header
    – Add Reference for RFC 6936 in Security Section
2. Add references for well-known terms "Link", "SR Path", and "Congruent paths"
3. Add reference for Yang data model draft in provisioning model section
4. Liveness is to compute "connection loss" performance metric
    – Similar to the widely deployed synthetic packet loss metric
5. Editorial
    – Indicate packet loss is direct-mode loss
    – Use test packet term for query message
    – H/W timestamps required -> H/W timestamps recommended
    – IPv6 address ::1/128 or ::FFFF:127/104
    – Clarify - Section 4.1.4.2 and 4.2.2.2 depict the packet format with word "as needed" for inner IP Header
    – Different UDP destination port when running authenticated and unauthenticated sessions simultaneously

Next Steps

- Welcome your comments and suggestions
- Request IPPM WG adoption

Thank you