Simple TWAMP (STAMP) Extensions for Direct Measurement

draft-gandhi-ippm-stamp-direct-loss-00

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Agenda

- Requirements and Scope
- Summary of Extensions
- Next Steps

Requirements and Scope

Requirements:

- Support stand-alone Direct Measurement for accurate data packet loss
- High scale for number of test sessions and faster packet loss detection interval
  - Support hardware implementation

Goals:

- Avoid provisioning test sessions on Session-Reflector for stateless mode
- Avoid control protocol for signaling dynamic parameters

Scope:

- STAMP [RFC 8762] based

Stand-alone Direct Measurement Test Packet for Data Packet Loss

- Stand-alone Direct Measurement test packet defined
  - Hardware efficient counter-stamping
    - Well-known locations for traffic counters
  - Block number of the counters for alternate marking method [RFC 8321]
  - Traffic class of the counters for per class packet loss
  - Direct Measurement test packet is also defined for authenticated mode
- User-configured destination UDP Port is used for identifying direct measurement test packets
- Does not modify the existing STAMP procedure as different destination UDP port is used for direct measurement test packets
  - Other than Timestamp vs. Counter in the test packet, the protocol is same as STAMP
- Sequence Numbers allow to detect direct measurement test packet loss - connectivity loss detection (session state up/down)
- Flags
  - X set to 1 for 64-Bit Counter, set to 0 for 32-Bit Counter
  - B set to 1 for Byte Counter, set to 0 for Packet Counter
  - T set to 1 for Sender-DSCP scoped Counter

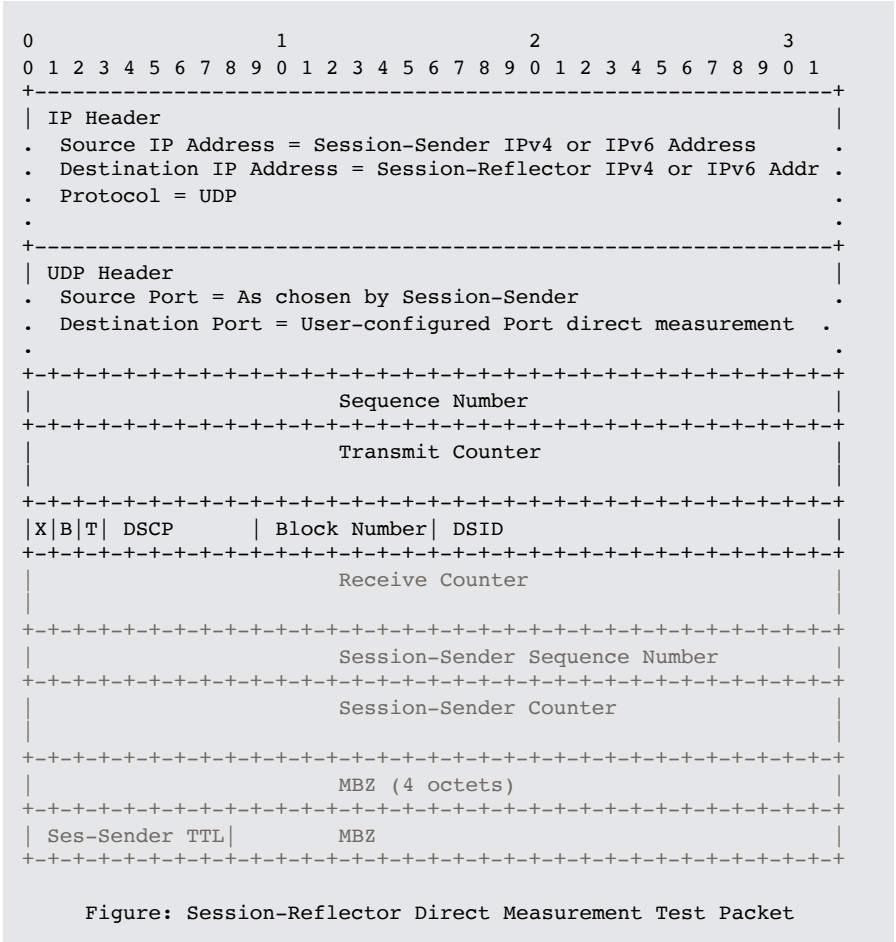


Figure: Session-Reflector Direct Measurement Test Packet

Direct Measurement TLV vs. Direct Measurement Test Packet

	Direct Measurement TLV	Direct Measurement Test Packet
Need to scan for DM TLV in each received packet on Session-Reflector in hardware (there can be multiple different TLVs)	Yes	No
Need to write timestamp (clock sync needed for one-way delay)	Yes	N/A
Minimum bytes to load in write-able memory in hardware	114 (Eth 18, IPv6 40, UDP 8, STAMP 44, TLV Type 4, Total = 114 Byte)	70 (Eth 18, IPv6 40, UDP 8, Seq 4, Total = 70 Byte)
Counters at fixed location in the test packet for in-band hardware counter-stamping	No (TLV-based)	Yes
Reply test packets with counters at the fixed location for in-band hardware counter-stamping	No	Yes
Byte counters	No	Yes
64-bit packet and byte counters	No	Yes
Alternate-marking method packet loss - using block number for counters (out-of-order data packet support)	No	Yes
Per Traffic Class Counters	No	Yes

Alternate Marking Method for Packet Loss

- RFC 8321 - Alternate-Marking Method for Passive and Hybrid Performance Monitoring
- RFC 8957 - Synonymous Flow Label Framework
- Control plane-based packet loss measurement with distributed forwarding LCs, using block number of the counters

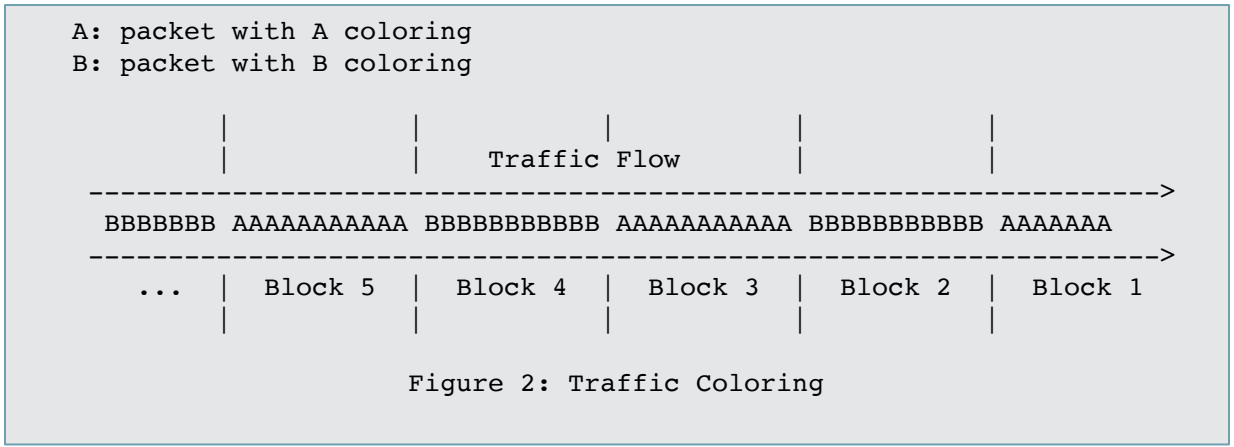
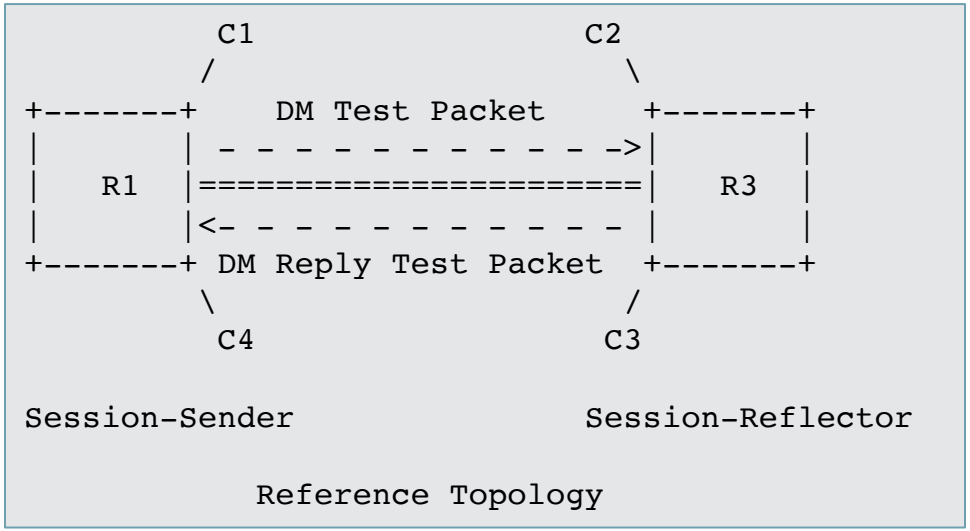


Figure 2: Traffic Coloring

Data Packet Loss Calculation



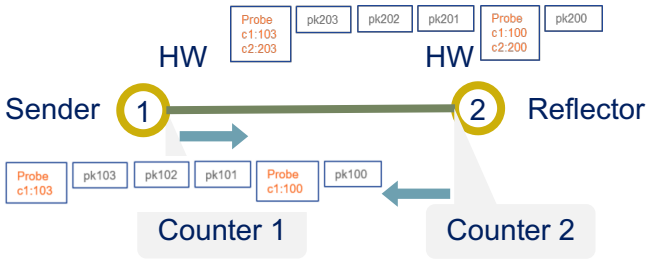
- Using the Counters C1, C2, C3 and C4 as per reference topology, from the n^{th} and $(n-1)^{th}$ direct measurement test packets.
  - Transmit Loss TxL[n-1, n] = (C1[n] - C1[n-1]) - (C2[n] - C2[n-1])
  - Receive Loss RxL[n-1, n] = (C3[n] - C3[n-1]) - (C4[n] - C4[n-1])
- When using Alternate-Marking Method, all Counters used for the loss calculation belongs to the same Block Number, as described in Section 3.1 of [RFC8321].

Next Steps

- Welcome your comments and suggestions
- Requesting WG adoption

Thank you

Link Loss Direct Measurement (P2P Circuits) - In-band Counter-stamping in Hardware



- Advertise extended TE metrics – link loss percentage
  - RFC 8570 (IS-IS)
  - RFC 7471 (OSPF)
  - RFC 8571 (BGP-LS)

- TX Packet Loss %
  = 100* (((C1(t) – C1(t-1)) – (C2(t) – C2(t-1)) / (C1(t) – C1(t-1))
  = 100* (((103 – 100) – (203 – 200)) / (103 – 100))
  = 0

```
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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Type        |     Length    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|A|  RESERVED   |                      Link Loss                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
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STAMP Test Packet with Direct Measurement TLV

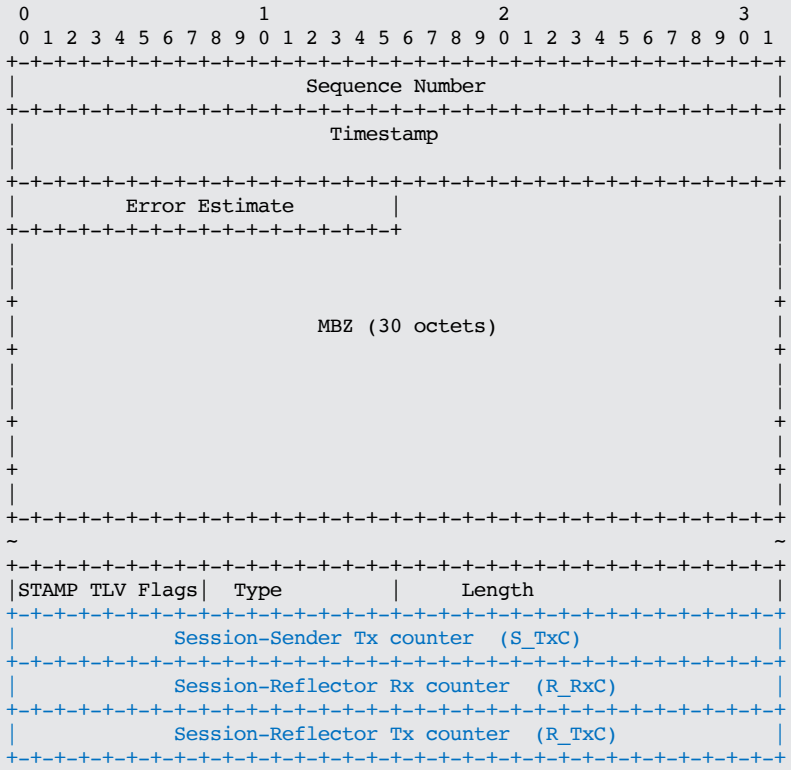

Figure: Session-Sender Test Packet Format

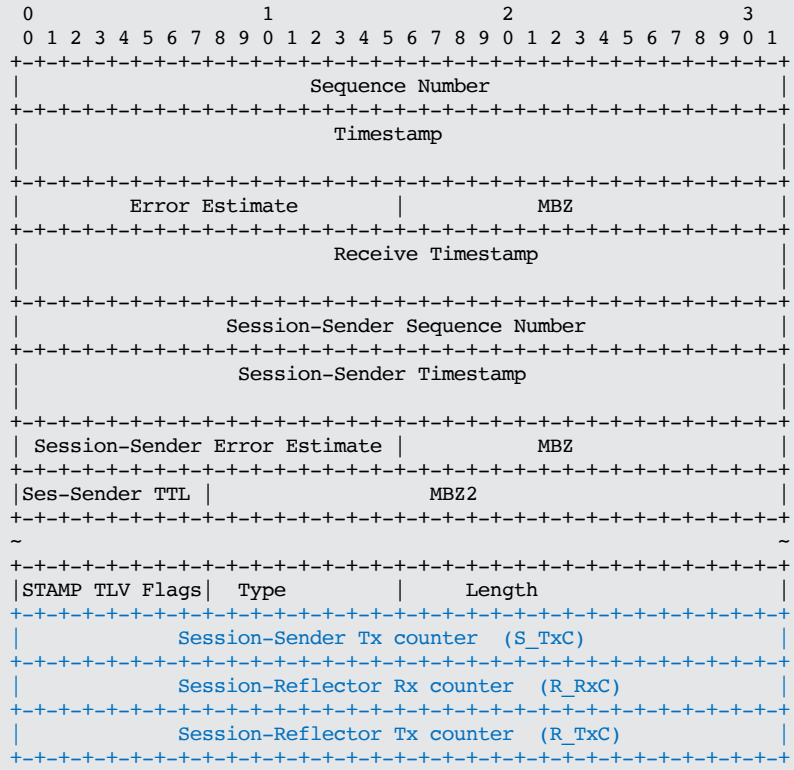

Figure: Session-Reflector Test Packet Format