# 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 Base 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 (different than port 862)
- Does not modify the existing STAMP procedure as different destination UDP port is used for direct measurement test packets
  - Other than Timestamp vs. Counter, the DM test packet format is same as Base STAMP test packet
- Sequence Numbers allow to detect direct measurement test packet loss - Detect 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

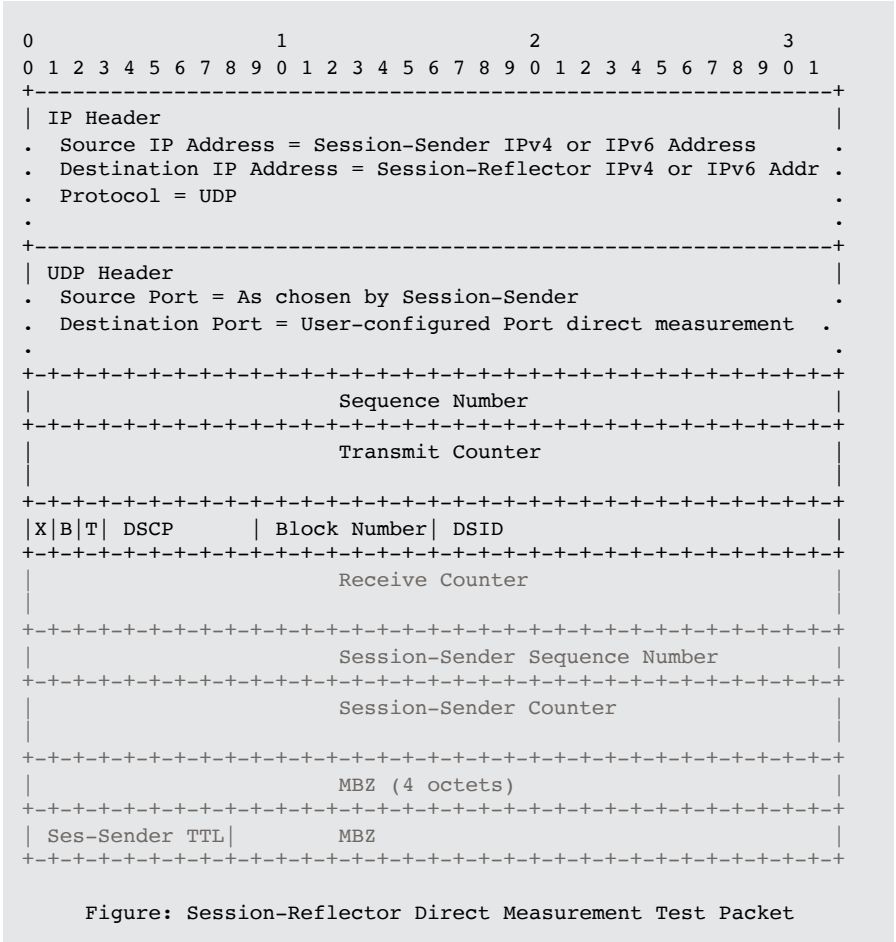



Figure: Session-Reflector Direct Measurement Test Packet

# Direct Measurement TLV vs. Direct Measurement Test Packet

| | Direct Measurement TLV | Direct Measurement Test Packet |
|---|---|---|
| Need to scan for DM TLV in each received test packet on Session-Reflector in hardware (there can be multiple 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 (not accounting multiple TLVs) | 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 |
| 32-bit and 64-bit Byte counters | No | Yes |
| 64-bit packet 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

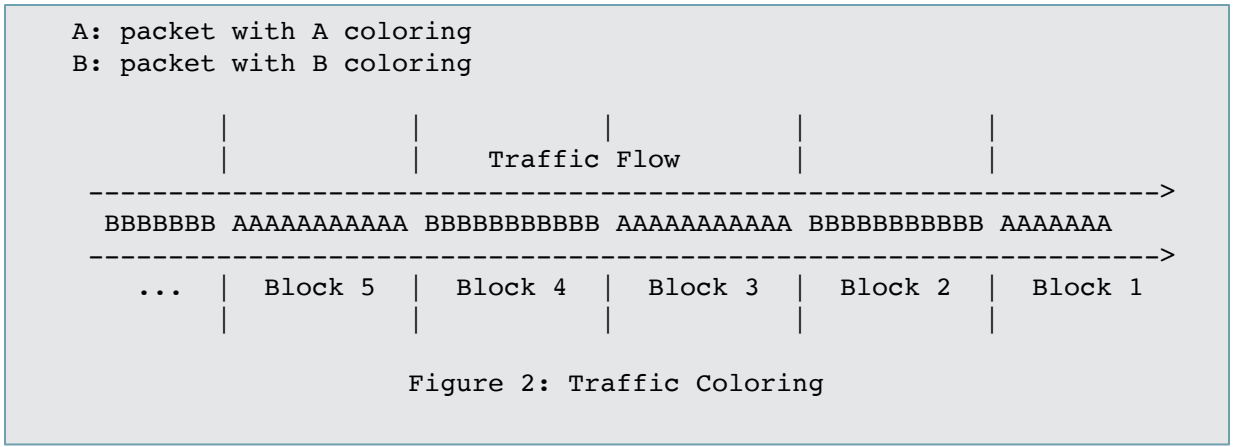
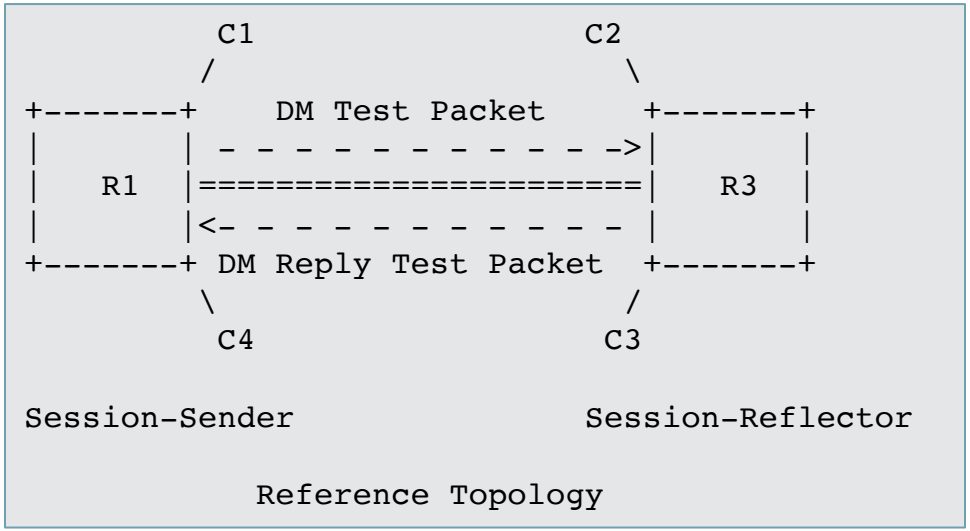



Figure 2: Traffic Coloring

# Data Packet Loss Calculation



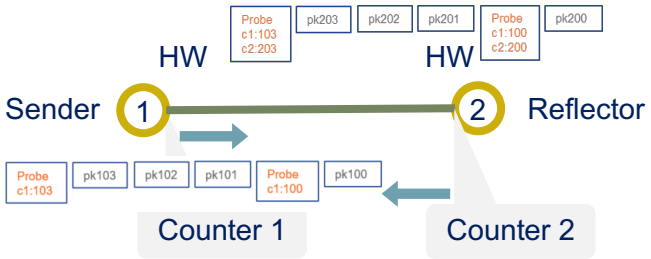

- Using the Counters C1, C2, C3 and C4 as per reference topology, from the $n^{th}$ and $(n-1)^{th}$ direct measurement test packets.
  - Transmit Loss TxL[n-1, n] = (C1[n] - C1[n-1]) - (C2[n] - C2[n-1])
  - Receive Loss RxL[n-1, n] = (C3[n] - C3[n-1]) - (C4[n] - C4[n-1])
- When using Alternate-Marking 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                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

# STAMP Test Packet with Direct Measurement TLV


Figure: Session-Sender Test Packet Format

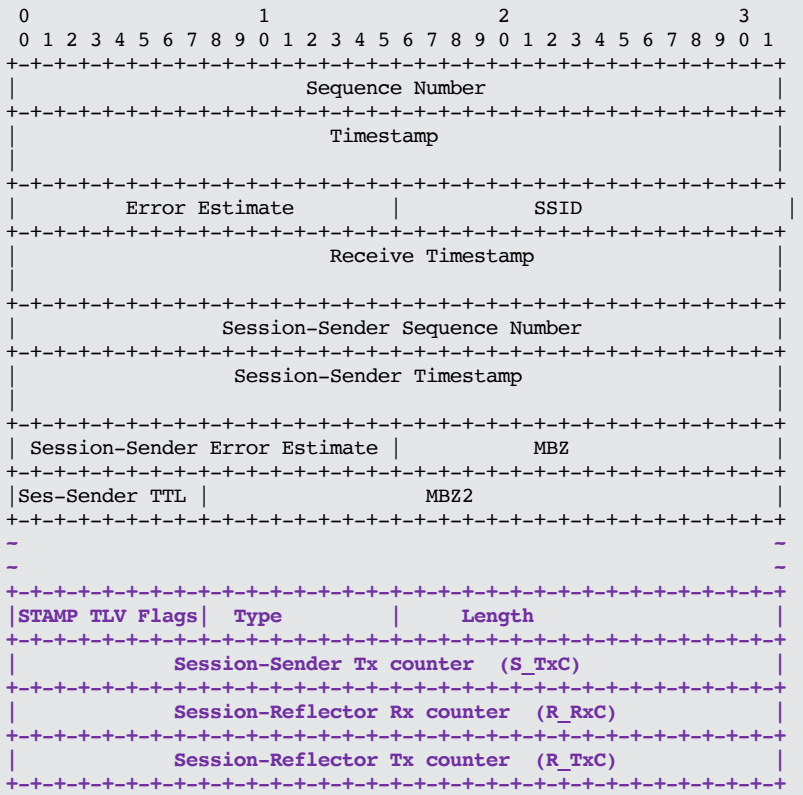



Figure: Session-Reflector Test Packet Format