Simple Two-Way Direct Loss Measurement Procedure

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Agenda

- Requirements and Scope
- Summary
- Next Steps

Requirements and Scope

Requirements:

- Direct Loss Measurement (DLM) for accurate data packet loss
- Support Alternate-Marking Method (AMM) [RFC 8321]
- High scale for number of sessions and faster packet loss detection interval
  - Support hardware implementation

Goals:

- Avoid provisioning and maintaining sessions on Session-Reflector
- Avoid control protocol for signaling dynamic parameters

Scope:

- Follow STAMP [RFC 8762] approach

Alternate Marking Method for Packet Loss

- RFC 8321 - Alternate-Marking Method for Passive and Hybrid Performance Monitoring
- RFC 8957 - Synonymous Flow Label Framework

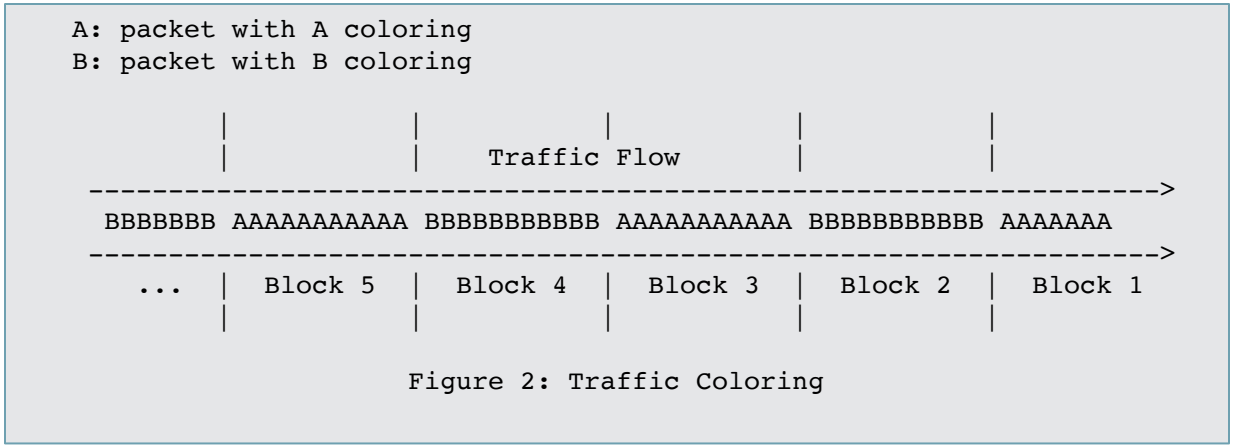


Figure 2: Traffic Coloring

Direct Loss Measurement Probe Packet for Data Packet Loss Detection

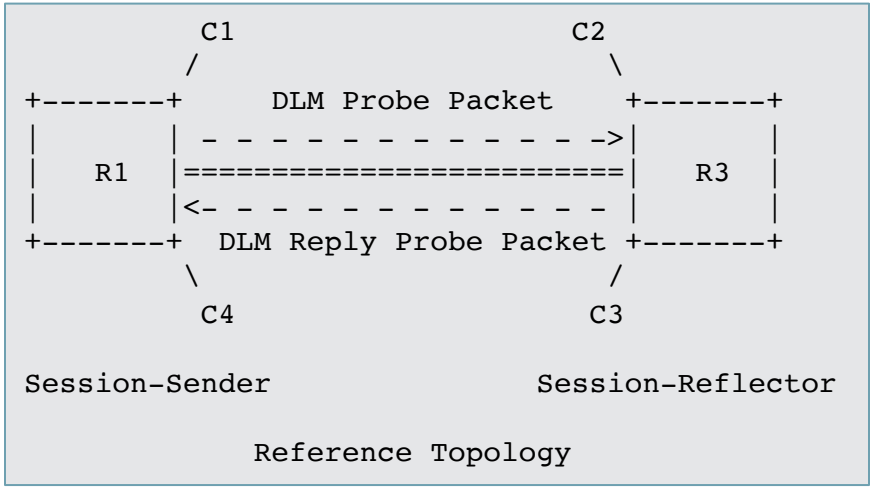
- Base Direct Loss Measurement probe packet defined
  - Hardware efficient counter updating
    - Well-known locations for traffic counters
  - Block number of the counters for alternate-marking method [RFC 8321]
  - Traffic class of the counters for per class packet loss
  - DLM probe packet is also defined for authenticated mode
- User-configured destination UDP Port is used for identifying DLM probe packets (different than port 862 and the one used by STAMP)
- Sequence Number allows to monitor DLM session status
- 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 Loss Measurement Probe Packet

Direct Measurement TLV vs. Direct Loss Measurement Probe Packet

Attributes	Direct Measurement TLV	*Define New Direct Measurement TLV?*	Direct Loss Measurement Probe Packet
Need to write timestamp (clock sync needed for one-way delay)	Yes	*Yes*	No
Counter at fixed location in the probe packet for hardware counter-stamping	No (TLV-based)	*No (TLV-based)*	Yes
Reply probe packets with counter at fixed location for hardware counter-stamping	No	*No*	Yes
Need to scan for DM TLV in each received probe packet on Session-Reflector in hardware (there can be multiple TLVs)	Yes	*Yes*	No
32-bit and 64-bit Byte counters	No	*Yes*	Yes
64-bit packet counters	No	*Yes*	Yes
Alternate-marking method packet loss - using block number for counters (out-of-order data packet support)	No	*Yes*	Yes
Per Traffic Class Counters	No	*Yes*	Yes

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 Loss Measurement probe 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

STAMP Test Packets with Direct Measurement TLV

Figure: Session-Sender Test Packet Format

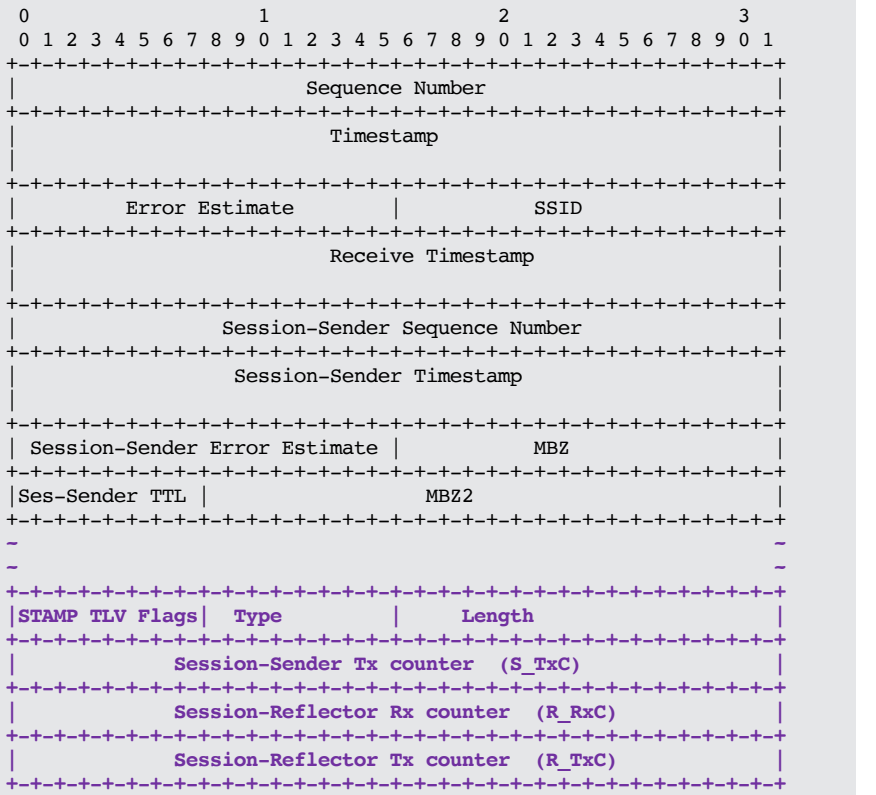
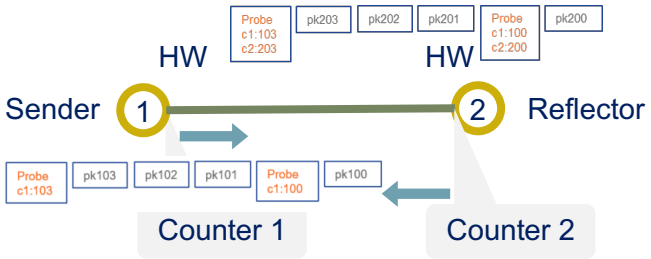


Figure: Session-Reflector Test Packet Format

Thank you

Link/P2P L2 Circuits - 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                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Direct Measurement TLV vs. Direct Loss Measurement Probe Packet

Attribute	Direct Measurement TLV	Direct Loss Measurement Probe Packet
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)

Thank you