

Simple 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

Direct Loss Measurement Probe Packet for Data Packet Loss Detection

- Base Direct Loss Measurement probe 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
 - 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

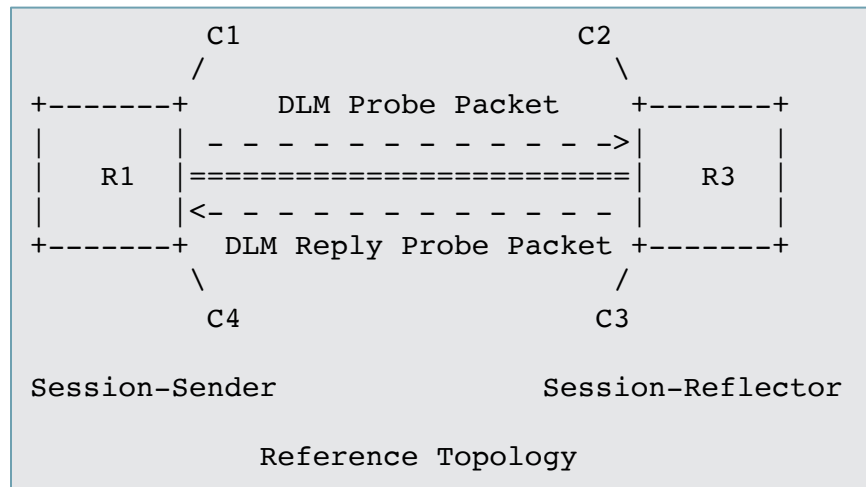


Figure: Session-Reflector Direct Loss Measurement Probe Packet

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 scan for DM TLV in each received probe packet on Session-Reflector in hardware (there can be multiple TLVs)	Yes	Yes	No
Need to write timestamp (clock sync needed for one-way delay)	Yes	Yes	No
Counters at fixed location in the probe packet for hardware counter-stamping	No (TLV-based)	No (TLV-based)	Yes
Reply probe packets with counters at the fixed location for in-band hardware counter-stamping	No	No	Yes
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 $(n-1)^{\text{th}}$ Direct Loss Measurement probe packets.
 - Transmit Loss $\text{TxL}[n-1, n] = (C1[n] - C1[n-1]) - (C2[n] - C2[n-1])$
 - Receive Loss $\text{RxL}[n-1, n] = (C3[n] - C3[n-1]) - (C4[n] - C4[n-1])$
- 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].

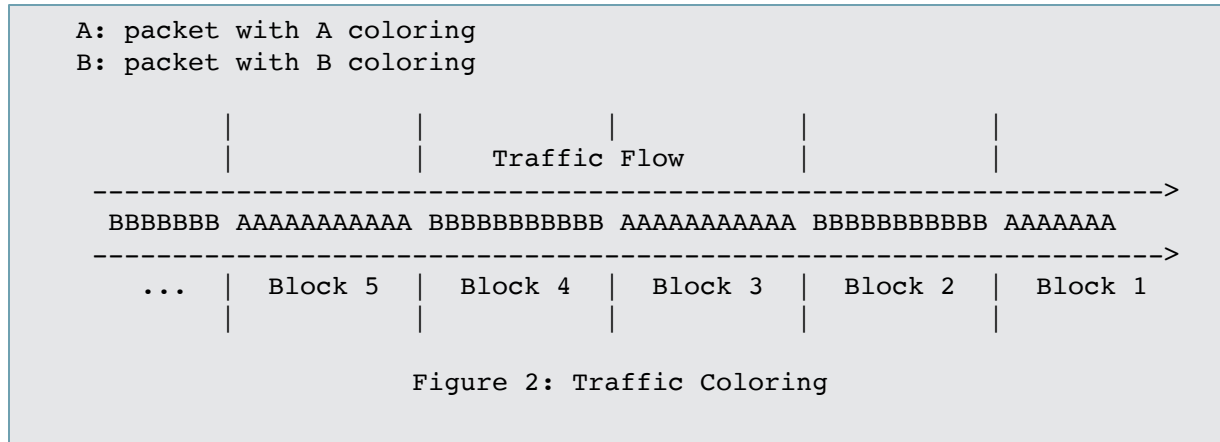
Next Steps

- Welcome your comments and suggestions
- Requesting WG adoption

Thank you

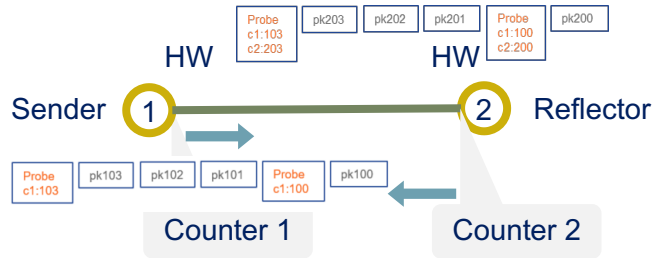
Alternate Marking Method for Packet Loss

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



Direct Link Loss 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	
+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	
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STAMP Test Packet with Direct Measurement TLV



Figure: Session-Sender Test Packet Format

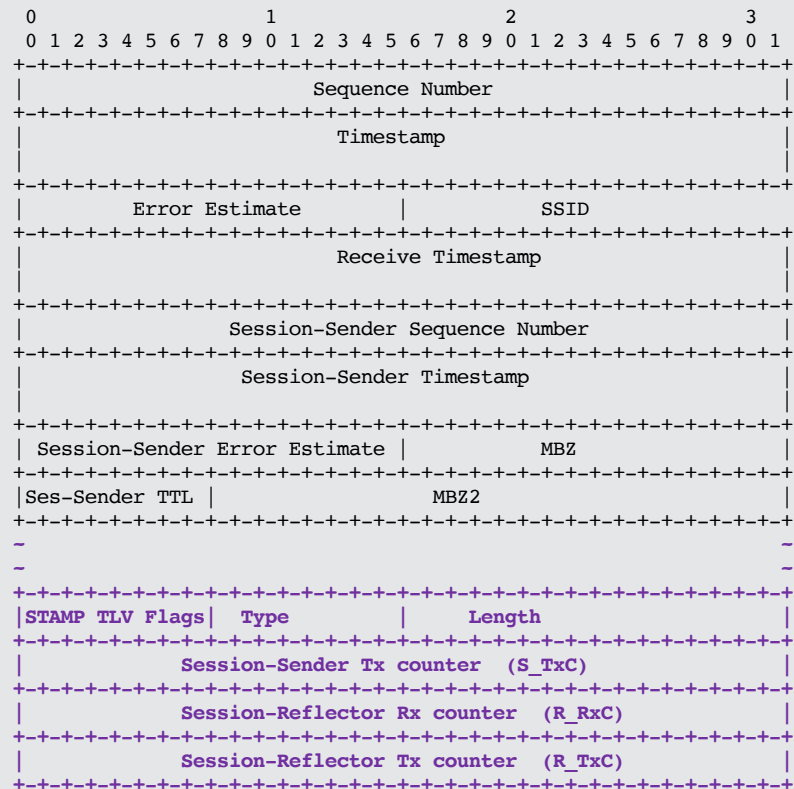


Figure: Session-Reflector Test Packet Format

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