Proposal for Enabling Live Traffic Performance Monitoring of RoE Traffic using Colored Traffic

Joe Haver and John Govert

Viavi Solutions Ltd

12/06/2016

IEEE 1914.3 TF

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IEEE 1914.3
Radio over Ethernet Encapsulations and Mappings
Jouni Korhonen (jouni.korhonen@broadcom.com)

Proposal for Enabling Live Traffic Performance Monitoring of RoE Frames using Colored Traffic
Date: 2016-12-07
Author(s):

Name	**Affiliation**	**Phone [optional]**	**Email [optional]**
Joe Haver	Viavi Solutions	719-332-2449	Joe.haver@viavisolutions.com
John Govert	Viavi Solutions	919-604-0958	John.Govert@viavisolutions.com

Ethernet Test and Assurance Today

KPIs Needed to Manage Ethernet Networks

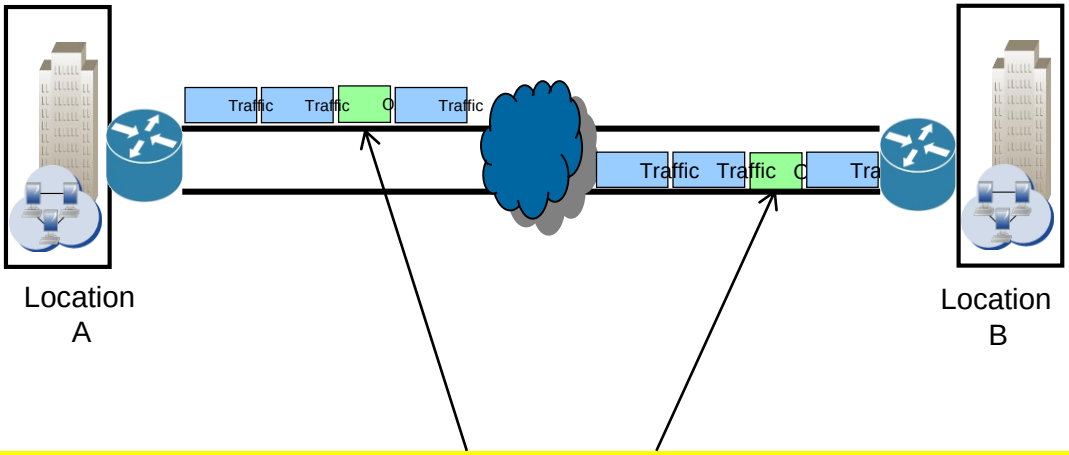
Frame Delay (FD)
- Round Trip
- One way

Frame Delay Variation (FDV)
- IETF / MEF – RFC 3393 Inter-Packet Delay Variation
- ITU – Typically considered Jitter

Frame Loss Rate
- Sampled
- Real

Throughput
- RFC-2544 / Y.1564/ETH-TST
- Offered and Delivered

Availability
- Based on Frame Loss Ratio Percentage
- ITU – Sliding Window
- IEEE – Static Window



Test Frames Inserted into Traffic

Measurements Performed on Test Frames
Not measuring actual Packet/Frame Performance

Test Traffic may impair high priority traffic

Test Frames undersample actual traffic.

Current Limitations

Measurements rely on INJECTED PACKETS…. Not measuring performance of the actual traffic.

Operators want…and NEED…to know the performance of the REAL TRAFFIC running across this network.

Operators will NEED accurate, real-time KPI/SLA feeds, on their high-priority traffic (eg RAN fronthaul, ULL Services) into their Cloud Management System to dynamically optimize the network.

Fronthaul Ethernet PM – a Proposed New Methodology

Build off of IETF IP FPM (IP Flow Performance Management) Framework

Motivation

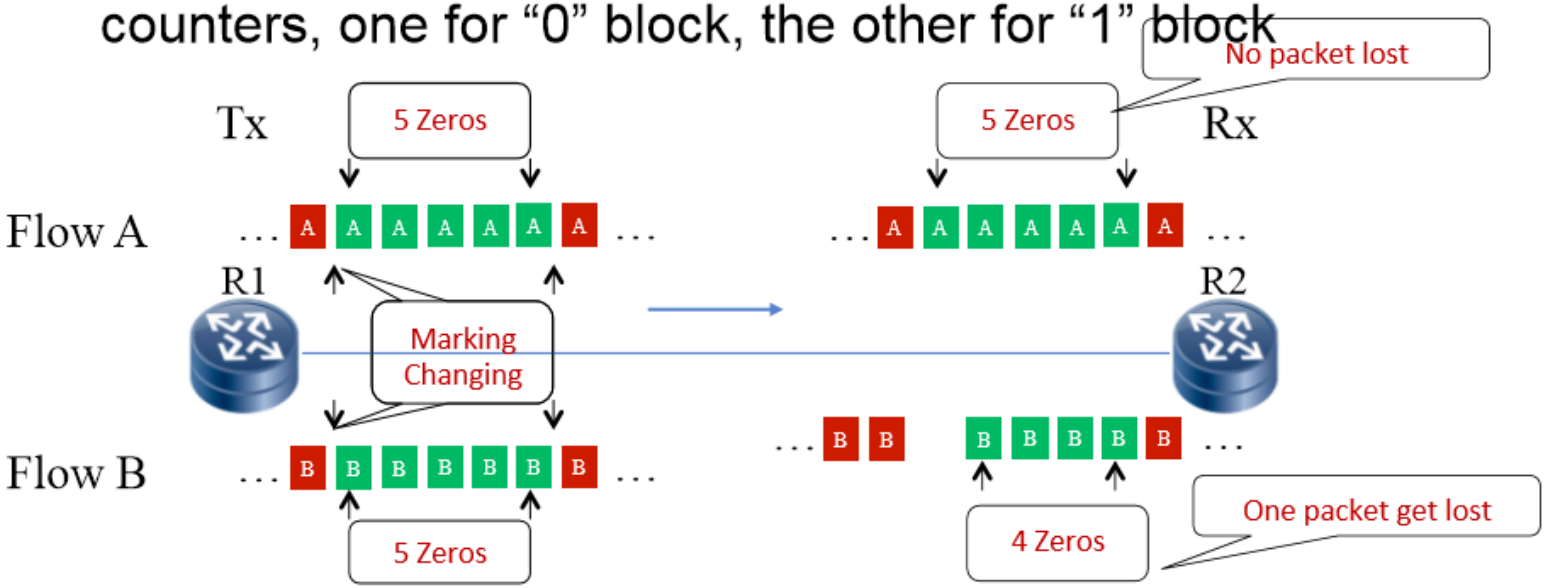
- Why IPFPM?
  - ✓ Measurement rely on injected packets has limitations
  - ✓ Operators needs to know the performance of the real traffic running in their networks

- What Can IPFPM Do?
  - ✓ IP Flow Performance Measurement
  - ✓ Measure the real traffic
  - ✓ Support MP2MP flow measurement, with data correlation and re-order tolerant mechanism
  - ✓ Enable SLA verification, fault localization and fault delimitation

https://tools.ietf.org/html/draft-chen-ippm-ipfpm-report-00

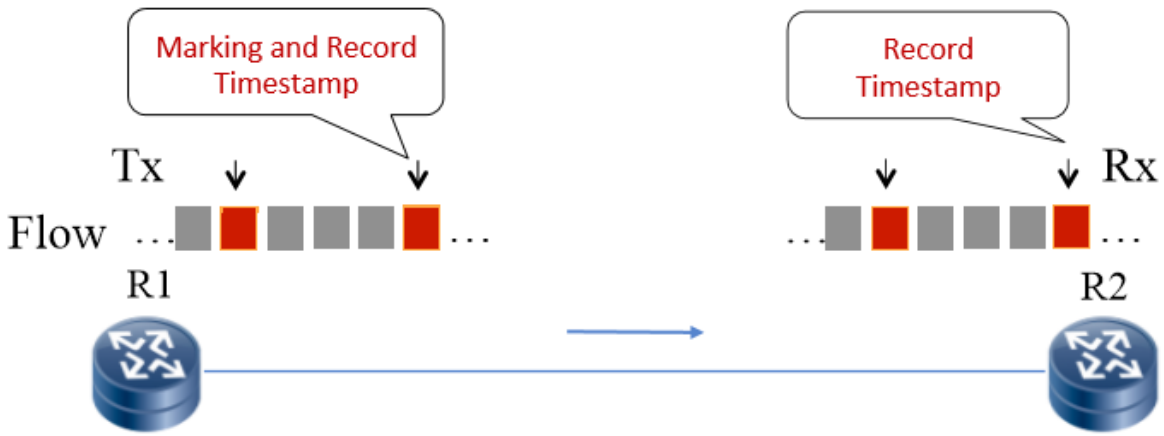
Packet Loss Measurement

- Packet Loss
  - ✓ Use one or more unused bits to mark the packets
  - ✓ Different markings (“0”, “1”) divide the flows into different consecutive blocks
  - ✓ Counting based on each block of marker, two counters, one for “0” block, the other for “1” block



Packet Delay Measurement

- Only marking ONE packet in a period,
- Measure the packet delay based on THE packet
- Time synchronization is required



RoE Flow Performance Measurement Proposal (RoEFPM)

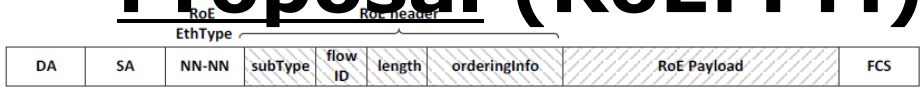


Figure 7: RoE encapsulation in Ethernet packets

4.3 RoE common frame format

This subclause documents the octets of the frame (i.e. the RoE header) that are common to all RoE flow data and control packets. Figure 8 illustrates the frame format and its fields. The offset zero (0) is the first octet of the RoE frame. The common RoE frame format has the following header fields:

a. **subType** (sub type) field: 8 bits
b. **flowID** (flow identifier) field: 8 bits
c. **length (length) field:** 16bits
d. **orderingInfo** (**timestamp**/**seqnum**) field: 32 bit

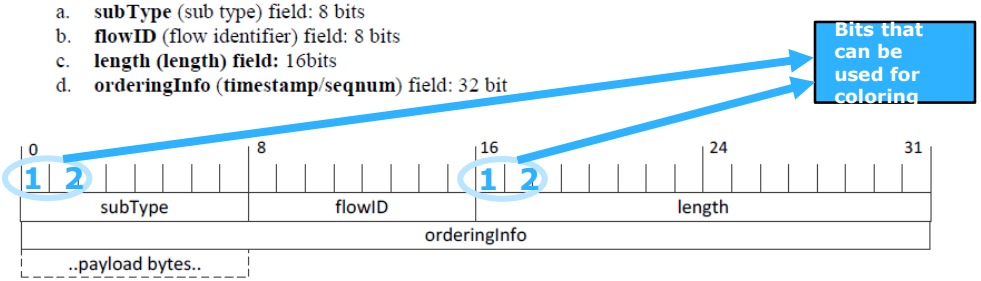


Figure 8: RoE encapsulation common frame format – the RoE header

Two Bit Coloring Example

- Change 'Color' between red and blue tags every 10 Radio frames which equals 100ms
- e.g. 10 RFs = 5,120 RoE frames for option 1 CPRI rates @ 1,500B RoE Payload … up to 81,920 RoE frames for option 7 rates
- 1.x = red | x.1 = blue | 1.1 = purple | 0.0 = no coloring
- Color 'purple' packets to indicate measurement frames
- Measurement frames are used to measure/collect latency and frame delay variation every n^{th} interval
- Different flows are colored independent of each other

Proposal: Suggest IEEE working group assign a minimum of 2 bits for PM coloring from existing fields

Suggestion #1: Use the subType field

- subType is 8 bits which allows for 256 subTypes
- Only 6 subTypes are defined today
- Reduce subType to 6 bits which still allows for 64 subTypes

Suggestion #2: Use the length field

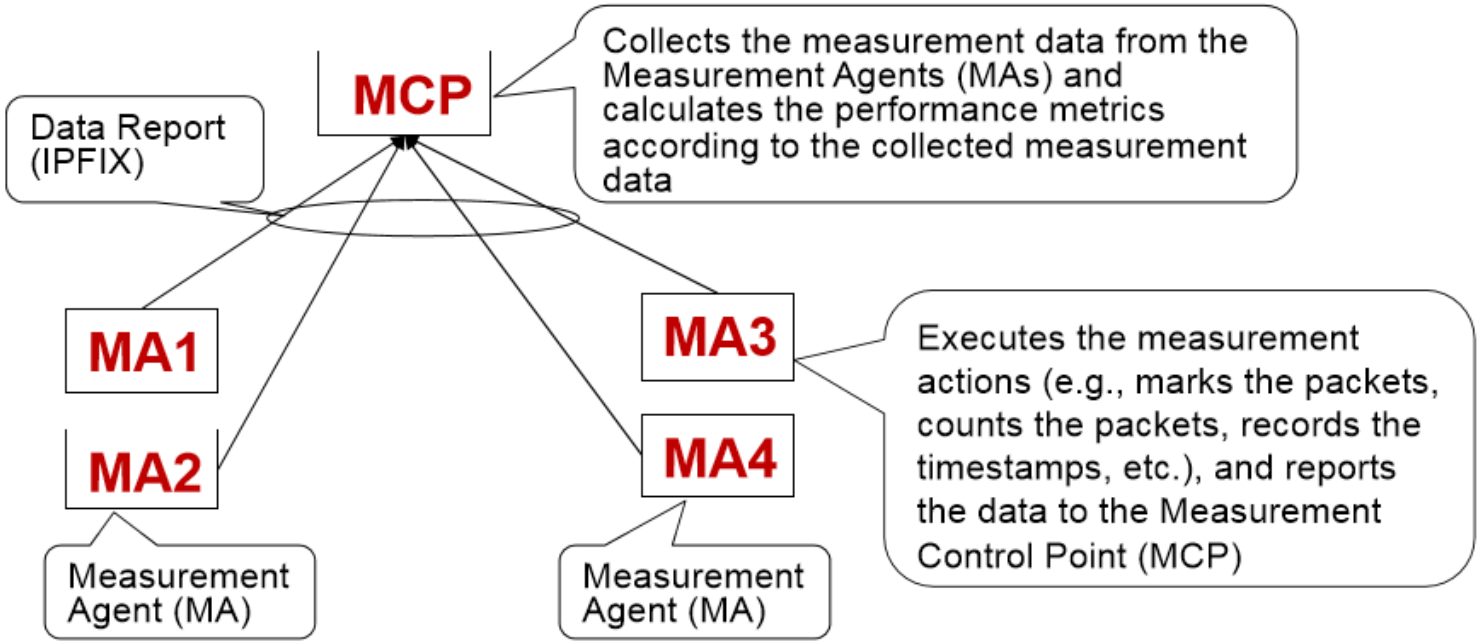
- length is 16 bits which allows for lengths up to 65,535 Bytes
- A 'Jumbo' is 9,000 Bytes of payload and requires only 14 bits to define
- 14 bits allows for lengths up to 16,383 Bytes which exceeds current max jumbo Ethernet payload lengths
- Current RoE payload lengths are 1,500 Bytes

Suggestion #3: Optional Reserved Bits in the Sequence Number (seqnum) field

- If the Ordering Info is a timestamp, then Sequence Number field is not available.

Back-up

IPFPM Components



- Period Number
  - ✓ Data collected correlation