Multipoint Alternate Marking method for passive and hybrid performance monitoring

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Multipoint Alternate Marking

**Point-to-point flows monitoring**

Alternate Marking (RFC 8321) to monitor unicast point-to-point flows or multicast flows.

To have an IP (TCP/UDP) flow that follows a point-to-point single path we have to define, with a specific value, 5 **identification fields** (IP Source, IP Destination, Transport Protocol, Source Port, Destination Port).

**Multipoint Alternate Marking**

We can monitor a multipoint unicast flow selected by **identification fields without any constrain**.

The monitoring network can be considered as a whole or can be split in Clusters.

The **Network Clusters** partition can be used at different levels to perform the needed degree of detail: Clusters can be **combined in new connected subnetworks** depending on the network topology.

Definition and mathematical formalization of the **algorithm for Cluster partition that can be applied to every graph**.
An Intelligent Performance Management approach

In general, it is resource consuming to monitor continuously all the flows and all the paths. A flexible and intelligent performance management is desired.

Network Zooming

- A Controller can calibrate and manage Performance Measurements.
- It can **start without examining in depth**. In case of necessity (packet loss or too high delay), an **immediate detailed analysis** can be **reconfigured and performed** and the problem can be localized in a specific Cluster or in a combination of Clusters.

Two ways to act:
1) Change the traffic filter (identification fields) and select more detailed flows;
2) Activate new measurement points by defining more specified Clusters.
Example of Application (1/2)

1) Full Network Monitor

Everything is good: Packet Loss = 0 and Delay/Jitter less than SLA values

Counters are activated only at the edge nodes

IN=X pkts

OUT=X pkts
Example of Application (2/2)

2) Packet Loss event for the Full Network

3) Configure Clusters Partition and locate which Cluster has the problem

4) More specific traffic filter

Fault is identified!
A complete Performance Measurement Framework

- **Packet Loss** can be measured on Cluster basis or by considering a combination of Clusters; and the borderline cases of single flows and whole network.

- **Delay measurements** can be done in different ways:
  - **multipoint path basis measurement**: the delay value is representative of an entire multipoint path. The mean delay for a multipoint path can be defined.
  - **single packet basis measurement**: the multipoint path is used just to easily couple packets between inputs and output nodes of a multipoint path. Hashing ([RFC5475](https://www.rfc-editor.org/rfc/rfc5475)) and Multipoint Alternate Marking are coupled in this case
    - Clusters simplify the correlation of the samples from a topological point of view in terms of space
    - Marking method anchor the samples to a specific period and simplify the correlation in terms of time
Changes from -01

Some implementation considerations:

An architecture where the centralized Data Collector and Network Management can apply the intelligent and flexible Alternate Marking algorithm is needed.  
- PBT (draft-song-ippm-postcard-based-telemetry) gives a chance  
- draft-zhou-ippm-enhanced-alternate-marking generalizes the alternate marking metadata

New Use Cases:
- SDWAN: path selection for the WAN connection based on per Cluster and per flow performance
- Helps Traffic Visualization and topology mapping application
Next steps

The document is stable.

Beginning the path to become RFC.

Inputs and Comments always welcome