# IPv6 Application of the Alternate Marking Method

**draft-fz-6man-ipv6-alt-mark-01**

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# Alternate Marking at a glance

Alternate Marking methodology is an OAM PM technique and enables Packet Loss, Delay and Delay Variation measurements

(see RFC 8321 and draft-ietf-ippm-multipoint-alt-mark)

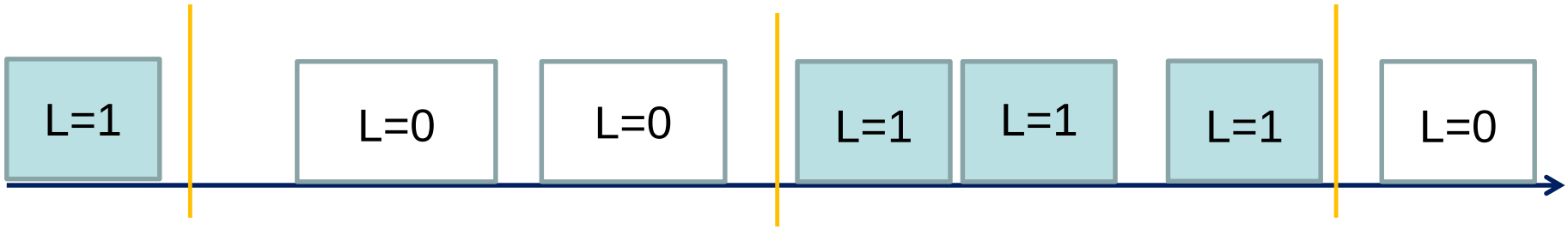
- Every marking interval the packet mark is changed between Red and Blue.
- When the Red packet counters are running the Blue counters are still and viceversa.
- Packet Loss calculation by comparing the counters for each block.
- Also Delay and Delay Variation can be measured.

Main Strengths of the methodology:

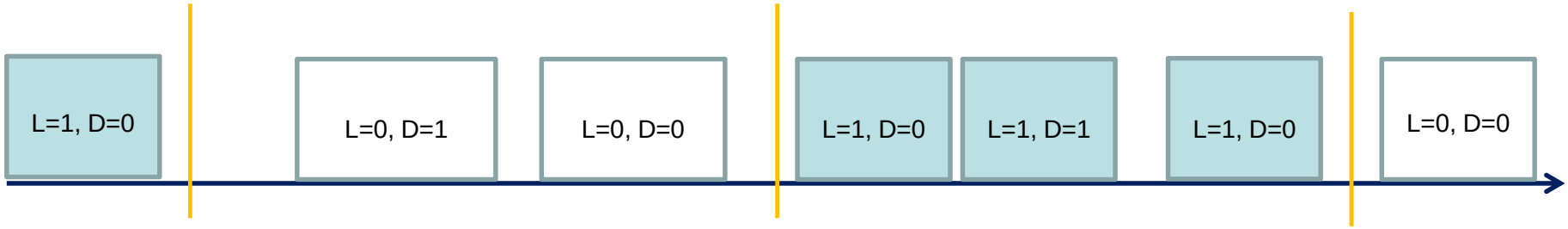
- It works on Real Production Traffic
- It works even in case of Out of Sequence.
- It works on not synchronized networks (strict sync is not needed!)
- It works without OAM packets to divide «precisely» traffic blocks.

# Single Mark / Double Mark

- Batching packets based on time interval to measure **Packet Loss** by switching value of the L flag.
- **First/Last Packet Delay calculation**: capture timestamp of when L flag value flips. Method is sensitive to packet loss and packet re-ordering
- **Average Packet Delay and Delay Variation** calculation is possible




- Use L flag to create batch of packets and measure **Packet Loss** as in Single Mark
- Use D flag to create new set of marked packets that are fully identified over the network. Collect and compare timestamps on D-marked packets to calculate **more informative Packet Delay Metrics**, such as minimum, maximum delay, median and percentiles values.



# What about IPv6 (and SRv6)

A document was already presented (draft-fioccola-v6ops-ipv6-alt-mark) and reported a summary on the possible implementation options for the alternate marking method in an IPv6 domain.

The application of the alternate marking requires a marking field.

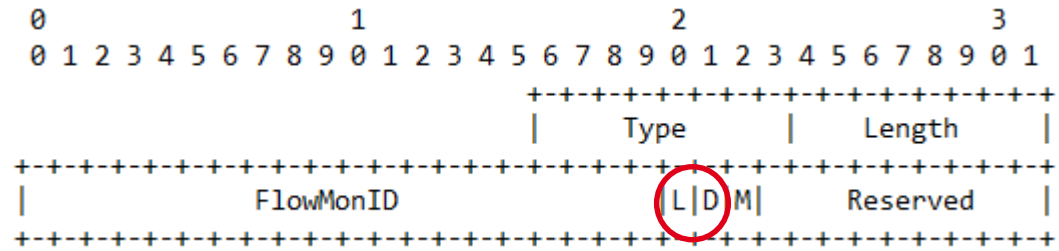
The alternatives that can be taken into consideration for the choice of the marking field are the following:

- ***IPv6 Addresses as Marking Field***: Using the DA to encode this alternate marking processing seems expensive.
- ***IPv6 Flow Label as Marking Field***: The flow-label as marking field allows less bits on the wire. But RFC6438 describes flow-label based load balancing, ECMP or LAG.
- ***IPv6 Extension Headers as Marking Field***: A new type of EH may be a proposal

***The definition of an Option Header or SRH TLV is the best solution!***

# Generalized Alternate Marking Data Fields

- It is always better to generalize!
- The data fields format for enhanced alternate marking EH Option/TLV. This AltMark data is expected to be encapsulated to specific encapsulation, e.g. the IPv6 Option or SRH TLV.




- **Type/Option Type**: 8 bit identifier of the type of Option/TLV that needs to be allocated.
- **Length/Opt Data Len**: The length of the length Data Fields of this Option/TLV in bytes.
- **FlowMonID**: 20 bits unsigned integer. The FlowMon identifier field uniquely identifies a monitored flow within the measurement domain.
- **L**: Loss flag as defined in RFC8321;
- **D**: Delay flag as defined in RFC8321;
- **M**: Marking bit as defined in PBT-M draft-song-ippm-postcard-based-telemetry;
- **Reserved**: is reserved for further use. These bits MUST be set to zero.

# AltMark: EH Option or SRH TLV

Hop-By-Hop Options Header or Destination Options Header can be used based on the chosen type of performance measurement.

SRH TLV can also be used to encode the AltMark Data Fields for SRv6.

In summary, it is possible to list the alternative options:

- ✓ **Destination Option** => measurement only by node in Destination Address.
- ✓ **Hop-By-Hop Option** => every router on the path with feature enabled.
- ✓ **SRH TLV** => every node along the SR path.
- ✓ **Destination Option + SRH** => every node along the SR path.

Note that Destination Option + SRH  is not suggested because it’s the same of SRH TLV.

# Changes from -00

We got several comments on the mailing list

Thank you to Bob Hinden, Ole Troan, Tom Herbert and Stefano Previdi for the fruitful feedbacks and improvements to the document:

- Help to investigate the alternatives for Alternate Marking application
- Adjust the wording and update the references

# Next Steps

- We have found an agreed way to apply RFC 8321 and its evolution for IPv6
- Adopt by WG
- Welcome questions, comments

Thank you