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Enhanced Alternate Marking Method
draft-zhou-ippm-enhanced-alternate-marking-02

Abstract

This document proposes several ways to encapsulate the alternate marking field with enough space. More information can be considered within the alternate marking field to facilitate the efficiency and ease the deployment.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

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[1. Introduction](#)

The Alternate Marking [[RFC8321](#)] technique is an hybrid performance measurement method, per [[RFC7799](#)] classification of measurement methods. It can be used to measure packet loss, latency, and jitter on live traffic. Because this method is based on marking consecutive batches of packets.

For the basic Alternate Marking method, bits are needed to record the mark. However, in some protocols, no additional bit can be used, which blocks the wide deployment of the alternate marking technique. And the basic Alternate Marking method is limited with the scalability for further extension.

This document proposes several ways to encapsulate the alternate marking field with enough space. More information can be considered within the alternate marking field to facilitate the efficiency and ease the deployment. Specifically, the flow identifier is applied as an enhancement for the basic Alternate Marking when determining packet loss and packet delay measurement. The flow identifier helps the data plane to identify the specific flow, hence to do the processing with respect to the Alternate Marking. It also simplifies the export by directly being encapsulated as the index for the associated metrics.

2. Encapsulation Considerations

2.1. Use the IOAM Data

In-situ Operations, Administration, and Maintenance (IOAM [[I-D.ietf-ippm-ioam-data](#)]) defines a generic meta data structure to records OAM information within user packets while the packets traverse a network. The data types and data formats for IOAM data records have been defined in [[I-D.ietf-ippm-ioam-data](#)]. The IOAM data can be embedded in many protocol encapsulations such as Network Services Header, Segment Routing, and IPv6 [[I-D.brockners-inband-oam-transport](#)].

The IOAM edge-to-edge option is to carry data that is added by the IOAM encapsulating node and interpreted by IOAM decapsulating node. It provide a bit map to indicate what is present in the data, so that alternate marking filed can be included in the IOAM edge-to-edge option. This provides a way for an end to end deployment for the alternate marking method.

Since the IOAM edge-to-edge option data is not able to be interpreted by the intermediate node, alternate marking method cannot be applied within the path hop by hop with this encapsulation way.

2.2. Use the PostCard based Telemetry Header

The PostCard Base Telemetry (PBT) [[I-D.song-ippm-postcard-based-telemetry](#)] is proposed to directly exports the telemetry data to a collector through separated OAM packets called postcards, while not require inserting telemetry data into user packets. The alternate making data can also be encapsulated in this option header. Different from the IOAM edge-to-edge option, the PostCard based Telemetry facilitates the hop by hop deployment of alternate marking method.

2.3. Encapsulate within the Transport Directly

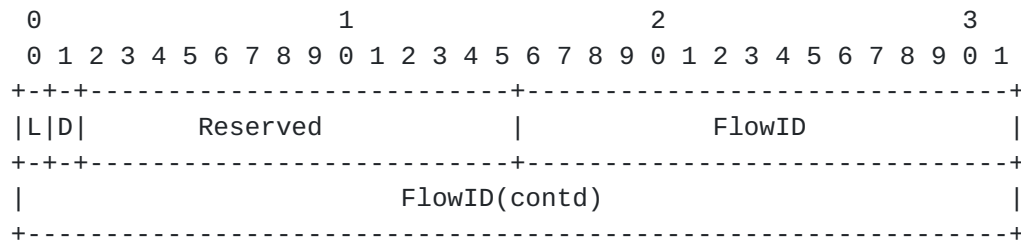
In addition to the previous ways which carry the alternate marking field within the existing generic OAM header. The alternate marking field can also be encapsulate within the transport protocol directly as an extension header or so. This may vary according to the transport protocol.

3. Encapsulating Alternate Marking Field

3.1. Encapsulate with the End to End IOAM

The IOAM-E2E-Type field within the IOAM edge-to-edge option header is a 16-bit identifier which specifies which data types are used in the E2E option data. The IOAM-E2E-Type value is a bit field, in which bit 0-3 are currently defined by [\[I-D.ietf-ippm-ioam-data\]](#). So one bit from bit 4-15 can be used to indicate the presence of data used for alternate marking.

The alternate marking data is a 8-octet field defined as follows:



where:

- o L - Loss flag as defined in [\[RFC8321\]](#);
- o D - Delay flag as defined in [\[RFC8321\]](#);
- o FlowID - 6-octet unsigned integer. Flow identifier field is to uniquely identify a monitored flow within the in-situ OAM domain. The field is set at the ingress node. The FlowID can be uniformly assigned by the central controller or algorithmically generated by the ingress node. The latter approach cannot guarantee the uniqueness of FlowID, yet the conflict probability is small due to the large FlowID space.

3.2. Encapsulate with the PostCard Base Telemetry

The following figures show a proposed change to the Telemetry Information Header (TIH) [\[I-D.song-ippm-postcard-based-telemetry\]](#).


```

      0               1               2               3
    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
+-----+-----+-----+-----+
| Next Header |  TIH Length |  Reserved  |L|D|  Hop Count  |
+-----+-----+-----+-----+

```

This proposes to use the two bits from the Reserved field from the Telemetry Information Header.

Where:

- o L - Loss flag as defined in [\[RFC8321\]](#);
- o D - Delay flag as defined in [\[RFC8321\]](#).

The Data Element Bitmap defined in the TIH is an 31-bit bitmap indicating the list of required data elements. One not used bit from the Data Element Bitmap can be used to indicate the presence of the marking bits, and trigger the statistic process.

4. Implementing Multipoint Alternate Marking

There are some considerations to do on how to manage the general Multipoint Alternate Marking application in order to get more adaptable performance measurement.

[I-D.ietf-ippm-multipoint-alt-mark] introduces the network clustering approach for Alternate Marking: the network clusters partition can be done at different levels to perform the needed degree of detail. The Network Management can use an intelligent strategy: it can start without examining in depth, and, in case of problems (i.e. measured packet loss or too high delay), various filtering criteria can be specified in order to perform a detailed analysis by using different combination of clusters or, at the limit, a per-flow measurement.

4.1. IOAM vs PBT

Both IOAM and PBT can easily include the base Alternate Marking method. But the more general implementation of Multipoint Alternate Marking, described in [\[I-D.ietf-ippm-multipoint-alt-mark\]](#), needs a centralized Data Collector and Network Management to allow the intelligent and flexible Alternate Marking algorithm. For this purpose, the PostCard based Telemetry Header can really be useful.

[I-D.song-ippm-postcard-based-telemetry] introduces the architecture to directly export the telemetry data from network nodes to a collector through separated OAM packets called postcards.

The overall architecture of PBT and the closed loop between Nodes, Telemetry Data Collector and Network Management enables exactly the application of the network clustering approach for Alternate Marking.

5. Security Considerations

TBD

6. IANA Considerations

TBD

7. Acknowledgements

TBD

8. References

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