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IPv6 Application of the Alternate Marking Method
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Abstract

This document describes how the alternate marking method in [[RFC8321](#)] and [[I-D.ietf-ippm-multipoint-alt-mark](#)] can be used as the passive performance measurement method in an IPv6 domain and reports implementation considerations. It proposes how to define a new encapsulation header to encode alternate marking technique.

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

[RFC8321] and [[I-D.ietf-ippm-multipoint-alt-mark](#)] describe passive performance measurement method, which can be used to measure packet loss, latency and jitter on live traffic. Since this method is based on marking consecutive batches of packets, the method often referred as Alternate Marking Method.

This document defines how the alternate marking method can be used to measure packet loss and delay metrics of IPv6 and SRv6.

The IPv6 Header Format defined in [[RFC8200](#)] introduces the format of the IPv6 addresses, the Extension Headers in the base IPv6 Header and the availability of a 20-bit flow label, that can be considered for the application of the Alternate Marking methodology. In this respect, [[I-D.fioccola-v6ops-ipv6-alt-mark](#)] reported a summary on the

possible implementation options for the application of the alternate marking method in an IPv6 domain.

[I-D.zhou-ippm-enhanced-alternate-marking] defines the data field for the alternate marking in order to generalize its application. More

information can be considered within the alternate marking field to facilitate the efficiency and ease the deployment.

For the overall application of the methodology [[I-D.song-ippm-postcard-based-telemetry](#)] introduces a new approach named Postcard-Based Telemetry (PBT). It includes alternative ways which can collect the same data of In-band OAM ([\[I-D.ietf-ippm-ioam-data\]](#)) but avoid or mitigate the In-band OAM issues. There are two variations of PBT: PBT-M and PBT-I. PBT-M marks the user packets (set one bit) or configure the flow filter to invoke the data collection. At each PBT-aware node, if the mark is detected, a postcard is generated and sent to a collector. Instead, PBT-I can be seen as a trade-off between IOAM and PBT-M. It needs to add a fixed length instruction header to user packets for OAM data collection, called Per-Hop Postcard (PHP), but, unlike IOAM, data are exported through dedicated postcards.

Both PBT-M and PBT-I variations can allow the implementation of [[RFC8321](#)] and [[I-D.ietf-ippm-multipoint-alt-mark](#)] and this is also discussed in [[I-D.zhou-ippm-enhanced-alternate-marking](#)].

2. IPv6 application of Alternate Marking

The application of the alternate marking requires a marking field. Several alternatives have been analysed in [[I-D.fioccola-v6ops-ipv6-alt-mark](#)] (Extension Header, IPv6 Address, Flow Label). Anyway the best choice would be the use of an Extension Header (EH).

3. IPv6 Extension Headers as Marking Field

A new type of EH can be defined for this scope. In this way there is enough space to implement and optimize the deployment of the Alternate Marking method.

A possibility can be to use a Destination or a Hop-By-Hop(HBH)

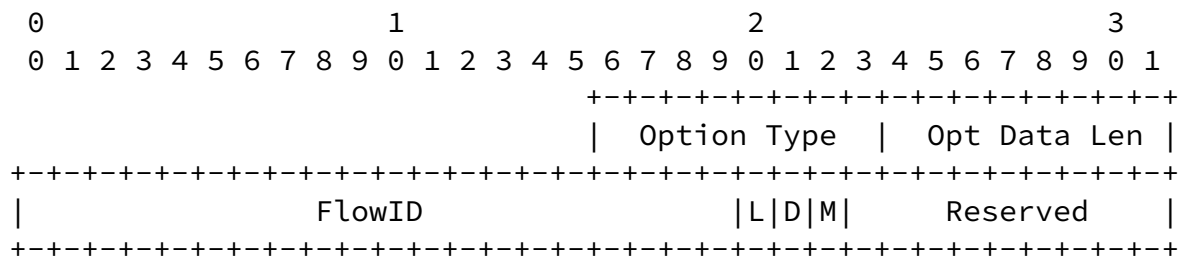
Extension Header(EH). The assumption is that an EH with an alternate marking measurement option can be defined. The router processing can be easily optimized to handle this use case.

3.1. Definition of the AltMark Extension Header

The desired choice is to define a new Extension Header. [\[I-D.zhou-ippm-enhanced-alternate-marking\]](#) generalizes the data fields for the alternate marking method and inspired the layout.

3.1.1. Data Fields Format

The following figure shows the data fields format for enhanced alternate marking. This data is expected to be encapsulated to specific transports, in this case the IPv6 Option Header named AltMark.



where:

- o Option Type - 8 bit identifier of the type of option. It needs to be allocated.
- o Opt Data Len - 8 bit unsigned integer. Length of the Option Data field of this option, in octets.
- o FlowID - 20 bits unsigned integer. Flow identifier field is to uniquely identify a monitored flow within the measurement 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.

- o L - Loss flag as defined in [[RFC8321](#)];
- o D - Delay flag as defined in [[RFC8321](#)];
- o M - Marking bit as defined in PBT-M [[I-D.song-ippm-postcard-based-telemetry](#)];
- o Reserved - is reserved for further use. These bits MUST be set to zero.

Note that PBT-I [[I-D.song-ippm-postcard-based-telemetry](#)] can also be used and the marking fields, in this case, are included in the PHP Header Format as described in [[I-D.song-ippm-postcard-based-telemetry](#)].

[3.1.2](#). AltMark: Destination Option and Hop-by-Hop Option

Using a new EH assumes that all routers in the domain support this type of headers, but, beyond backward compatibility, the new AltMark Option Layout seems the best way to implement the Alternate Marking method.

It is important to highlight that the Option Layout can be used both as Destination Option and as Hop-By-Hop Option depending on the Use Cases. In general, it is needed to perform end-to-end or hop-by-hop measurements, and the alternate marking methodology in [[RFC8321](#)] allows, by definition, both end-to-end and hop-by-hop performance measurements.

4. Alternate Marking Method Operation

[[RFC8321](#)] and [[I-D.ietf-ippm-multipoint-alt-mark](#)] describe in detail the methodology.

5. Security Considerations

tbc

6. IANA Considerations

The option type should be assigned in IANA's "Destination Options and Hop-by-Hop Options" registry.

7. Acknowledgements

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