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Flag-based MPLS Network Actions (MNA) for On-Path Telemetry
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Abstract

This document describes the support of two flag-based variants of on-path Telemetry techniques, Postcard-Based On-Path Telemetry (PBT) and Alternate Marking (AM), as MPLS Network Actions (MNA)for OAM in MPLS networks. The scheme only uses a few bits in the MNA header opcode dedicated for the flag-based actions.

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1. Introduction

On-path telemetry, as described in [I-D.song-opsawg-ifit-framework], is a hybrid type I network OAM [RFC7799] which directly measure and monitor the user packets. Some on-path telemetry technique incur very little overhead but offer big benefits on network performance monitoring and troubleshooting. Marking-based PBT [I-D.song-ippm-postcard-based-telemetry] (Postcard-Based On-Path Telemetry using Packet Marking) is such on-path telemetry technique which uses only a single flag bit to trigger the collection of the telemetry data regarding the packet. Alternate Marking method [RFC9341] is another on-path performance measurement method which uses only two flag bits to measure packet loss, delay, and jitter for live data traffic.

In MPLS networks, MPLS Network Action (MNA) [I-D.ietf-mpls-mna-fwk] extends the MPLS label stack by supporting extra in-stack network actions and ancillary data encoded in stack, the in-stack MNA header is described in [I-D.ietf-mpls-mna-hdr]. MNA also extends the MPLS payload by supporting extra post-stack network actions and ancillary data encoded post-stack, the post-stack MNA header is described in [I-D.jags-mpls-ps-mna-hdr].

This document describe the scheme to use flag-based MNAs to support PBT and AM.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119][RFC8174] when, and only when, they appear in all capitals, as shown here.

2. PBT-M Action

A flag bit (TBA1) in the flag-based network action field is used as the PBT-M indicator. If the bit is set to '1', a configured node is triggered to collect and export the telemetry data as configured by the control plane. The detailed method on node configuration, data export and correlation are recommended in [I-D.song-ippm-postcard-based-telemetry].

3. Alternate Marking Action

Two flag bits (TBA2) in the flag-based network action field are used to support the alternate marking method as described in [RFC9341].

4. Action Encoding

The proposed action encoding is shown in Figure 1 changed from [I-D.ietf-mpls-mna-hdr]. In the figure, 'P' stands for PBT-M flag and 'AM' stands for alternate marking flags.

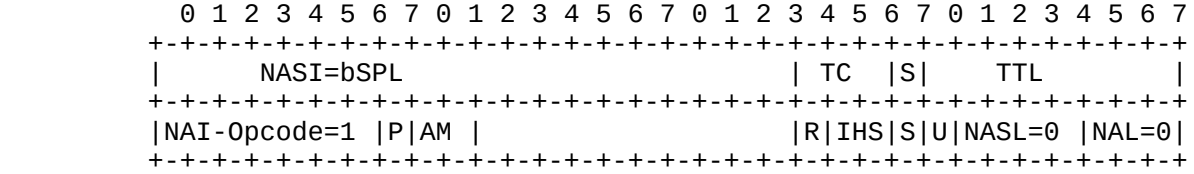

Figure 1: Action Encoding

MNA Label, a base Special Purpose Label (bSPL), as assigned by [I-D.ietf-mpls-mna-hdr].

TC, the Traffic Class, are assigned values based on local policies.

S, Bottom of Stack bit (BoS), the bit is set in the last Label Stack Entry (LSE) of the Label Stack.

TTL, Time To Live, number of hop before the packet is dropped.

NAI-Opcode, Network Action Indicator Opcode. If the Opcode has the value of 'one', then the 13 bits following the Opcode carries NAI-flags.

P-flag, the first flag bit in the flag-based network action field is used as the PBT indicator. If the bit is set to '1', a node is triggered to collect and export the telemetry data as configured by the control plane.

Alternate Marking, bit 2 and 3 are used to indicate Alternate Marking.

IHS, the scope of the Network Action is carried in the IHS field for Ingress-To-Egress (I2E), Hop-By-Hop (HBH) or Select.

NASL, Network Action Sub-Stack Length indicates number of additional LSEs following the first network action LSE. A value of zero indicates that only the 13 bits of the first LSE is in use. No Post Stack Network Action is required for this.

Note that the in-stack MNA encoding may take different form as the header encoding draft evolves, and these flag-based on-path telemetry use cases would adapt to the change.

5. Security Considerations

Only the ingress node is allowed to set these flag bits. The other on-path nodes can only react to the bit values. The tampering of these flag-based actions would result in DoS attack or unreliable measurements. Therefore, security measures must be taken to ensure the proper functioning of these actions.

6. IANA Considerations

This document requires IANA to assign a bit for PBT-M action (TBA1) and two bits for Alternate Marking (TBA2) from the MPLS "In-Stack MPLS Network Action Indicator Flags" registry created in [I-D.ietf-mpls-mna-hdr].

7. Acknowledgments

8. References

8.1. Normative References

[I-D.ietf-mpls-mna-hdr]
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