

Use Cases for MPLS Network Action Indicators and MPLS Ancillary Data

I-D.ietf-mpls-mna-usecases

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OVERVIEW

- The document was developed in the early process of MPLS MNA activities
- The document describes use cases that have a need for encoding network action indicators (and associated ancillary data) inside MPLS packets
- The document is not an exhaustive set of use-cases, but contains those actively discussed by WGs in the MPLS MNA activities

USE-CASE 1: No Further Fast Reroute (NFFRR)

- Problem initially described in I-D.draft-kompella-mpls-nffrr
- Avoids subsequent fast reroutes of packets that are already impacted by a 1st fast reroute event
- For example, in multi-homed PE usecase when multiple CE-PE links fail
- PE detecting failure can reroute protected traffic between them in a loop
- Packets that are to be NFFRR'ed require an **Indicator** so transit LSRs can identify them and avoid subsequent fast reroutes

Consider the following topology for multihoming an Ethernet VPN (EVPN [RFC7432]) Customer Edge (CE) device for protection against the failure of a Provider Edge (PE) device or a PE-CE link. To do so, there is a backup MPLS path between PE2 and PE3 (denoted by the starred line).



Figure 1: EVPN Multihoming

USE-CASE 2:

Insitu-OAM (iOAM)

- Enables recording of IOAM operational and telemetry information for data packets while they traverse an MPLS LSP path
- [RFC9197] defines following IOAM-Option-Types: Pre-allocated Trace Option, Incremental Trace Option, Proof of Transit (POT) Option, and Edge-to-Edge Option
- [RFC9326] defines IOAM-Option-Type called the "IOAM Direct Export (DEX) Option-Type"
 - Used as a trigger for IOAM data to be originated for exporting or statistical processing while data packets traverse an MPLS LSP path
- The IOAM packet data fields for OAM and PM are defined in [RFC9197] and [RFC9326]
- iOAM can be enabled for:
 - Hop-by-hop IOAM case: requires for **IOAM Indicator** to alert transit and edge LSRs to process/update IOAM data
 - Edge-to-edge case: requires an **IOAM Indicator** to alert egress LER to process/dispose of IOAM data

USE-CASE 3:

Network Slicing and Network Resource Partitions

- Network slices and resource partitioning are described in draft-ietf-teas-ietf-network-slices and I-D.bestbar-teas-ns-packet
 - A Network Resource Partitions (NRP) is a subset of resources and associated policies on each of a connected set of links in the underlay network
 - NRP may be built NRPs with dedicated topologies, or share topology with other NRPs
- MPLS packets carried over Label Switched Paths may traverse a specific NRP that require enforcing specific scheduling and/or drop policy associated with the NRP
- An ***NRP Indicator*** is required to be carried in MPLS packets to alert transit LSRs to associate those packets with the NRP resources

USE-CASE 4:

DETNET requirements for Time-Bounded Applications

- Problem initially described in I-D.stein-srtsn and I-D.draft-eckert-detnet-glb
- Time sensitive traffic requires packets be delivered to their destinations by a strict deadline time
 - An approach can be that packet headers carry the packet birth time and a delay budget
 - Routers use current time, birth time and delay budget to properly schedule packets
 - Another approach is to carry precalculated individual "local" deadlines applicable to each traversed router to properly schedule a packet
 - The local deadlines can be carried in a "stack" like fashion similar to how Segment Routing carries forwarding instructions
 - For example, the number of deadline values encoded in the stack may be the number of routers the packet needs to traverse in the network, and each deadline value corresponds to a specific router
- Reach out to the DetNet WG to confirm their interest in this use case

Possible New Use-cases with the Applicability to MNA

Requires further discussions in the WG on whether to include in scope of MNA

- **Flag-based network telemetry and measurement:**
 - A scheme to support on-path telemetry techniques, PBT-M and Alternate Marking using MPLS Actions Indicators
 - A proposal is detailed in (draft-song-mpls-flag-based-opt)
- **Support segment routing with network programming using MNA (draft-song-mpls-sr-eh)**
 - An approach to implement SR in MPLS networks that reduces the MPLS label stack depth and provide advanced functions such as network programming (similar to SRv6)
 - A proposal is detailed in (draft-song-mpls-sr-eh)
- **MNA for Performance Measurement with Alternate Marking Method**
 - A proposal for packet encoding using MNA is detailed in (draft-cx-mpls-mna-inband-pm)

Next Steps

- Some of the documented use-cases need to be revalidated
 - Some have been identified as outside of scope of interest and will be removed from the document
- Proposals for progressing the document
 1. Keep the document alive and update as needed while MNA framework and requirements stabilize. Progress to publication after.
 2. Stabilize this document (independent of other documents) and project a target to progress it to publication
 3. Keep the document alive and update as needed while MNA framework and requirements stabilize. Do not publish it as solution to each use-case is documented separately
- Welcome further input or updates to documented use-cases from the WG