DetNet

DetNet PW and OAM for the DetNet Service Sub-Layer

draft-varga-detnet-service-sub-layer-oam

Balázs Varga, János Farkas, Greg Mirsky

PALS/MPLS/DetNet

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DetNet Data Plane: MPLS

- RFC 8964
  - specifies the Deterministic Networking data plane when operating over an MPLS Packet Switched Networks.

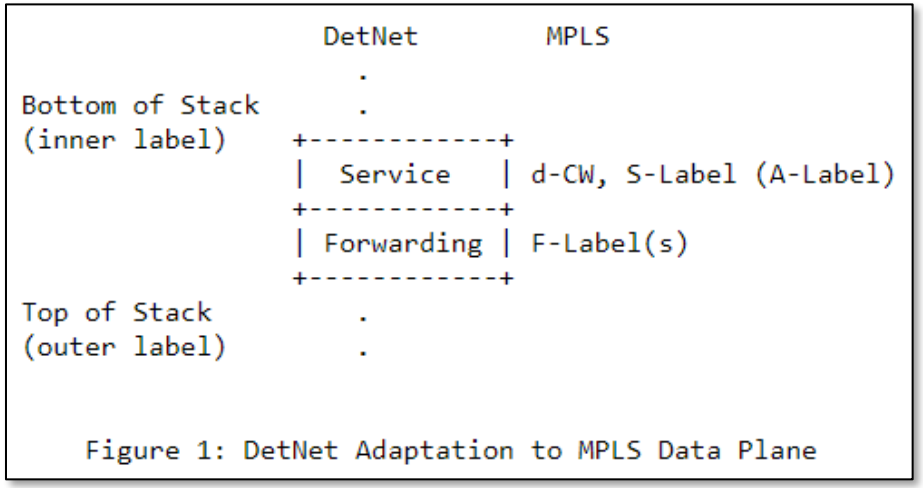


Figure 1: DetNet Adaptation to MPLS Data Plane

- DetNet MPLS Data Plane
  - DetNet service sub-layer
  - DetNet forwarding sub-layer
- DetNet MPLS Data Plane Procedures
  - Flow identification: Labels
  - Sequence number: d-CW

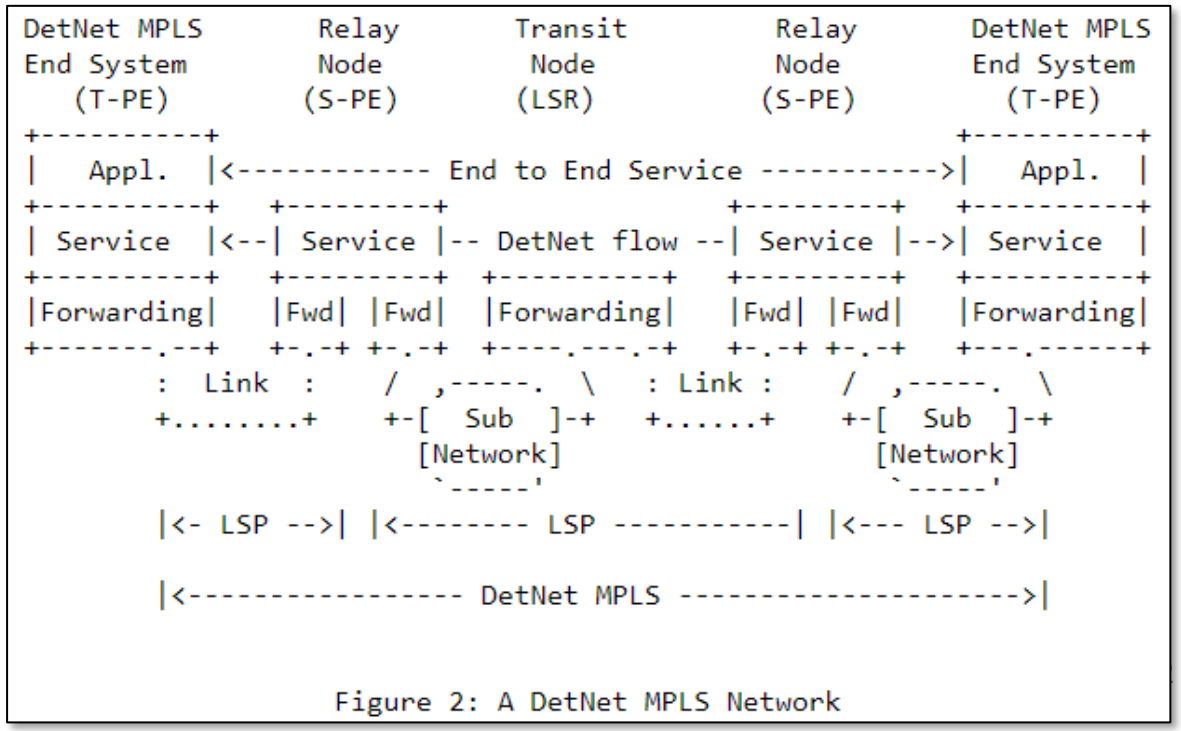


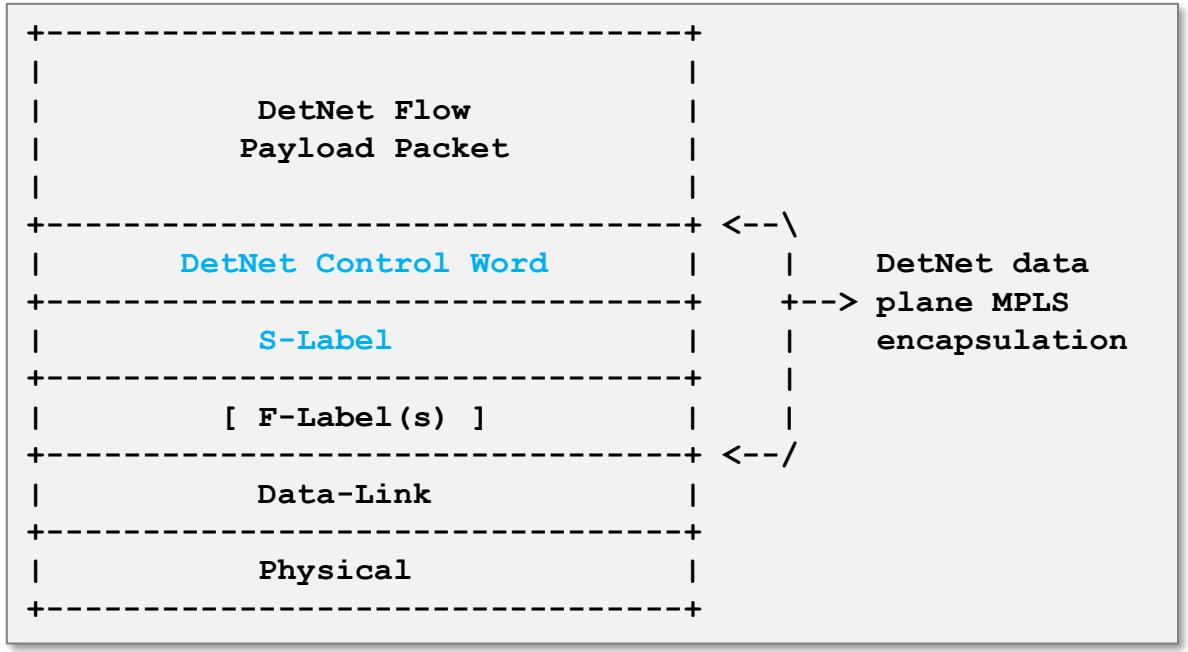
Figure 2: A DetNet MPLS Network

MPLS data plane – Encapsulation

DetNet PW

- MPLS-based DetNet data plane encapsulation:
  - DetNet CW (d-CW) or d-ACH contain sequencing information for packet replication and duplicate elimination purposes, and the OAM indicator.
  - DetNet service Label (S-label) identifies a DetNet flow.
  - Zero or more MPLS forwarding LSP label(s) (F-label) used to direct the packet along the label switched path (LSP) to the next peer node.
  - The necessary data-link encapsulation is then applied prior to transmission over the physical media.

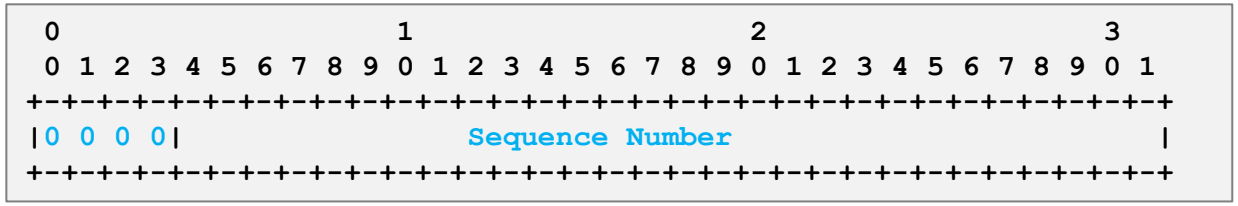
d-CW is immediate after the label stack: its usage is MANDATORY for DetNet flows

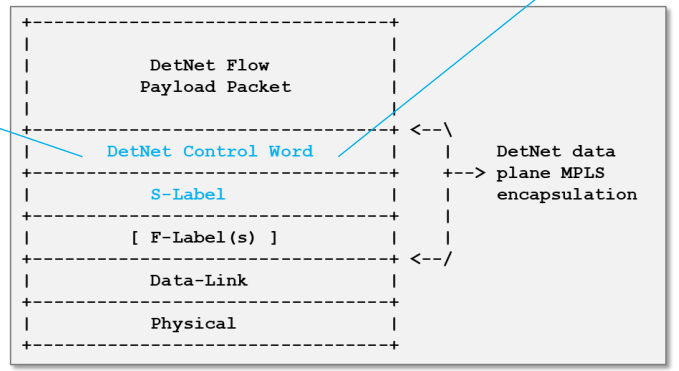


MPLS data plane – Encapsulation
DetNet Control Word

d-CW data packet:
First nibble is 0x0000

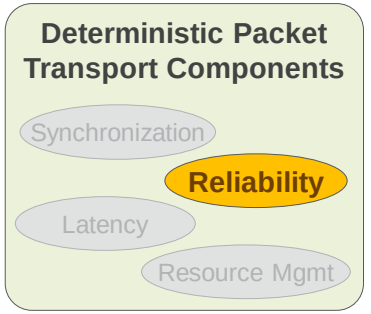
- d-CW:
  - d-CW MUST always be present in a packet (even if it is not used)
  - A DetNet control word (d-CW) conforms
    - to the Generic PW MPLS Control Word (PWMCW) defined in [RFC4385]
  - Two sequence number sizes are supported:
    - 16 bits and 28 bits.
  - The sequence number size
    - in use for the d-CW associated with a DetNet flow (S-Label) is configured either by a controller plane or manually for each DetNet flow.
  - Zero is an ordinary sequence number with no special meaning



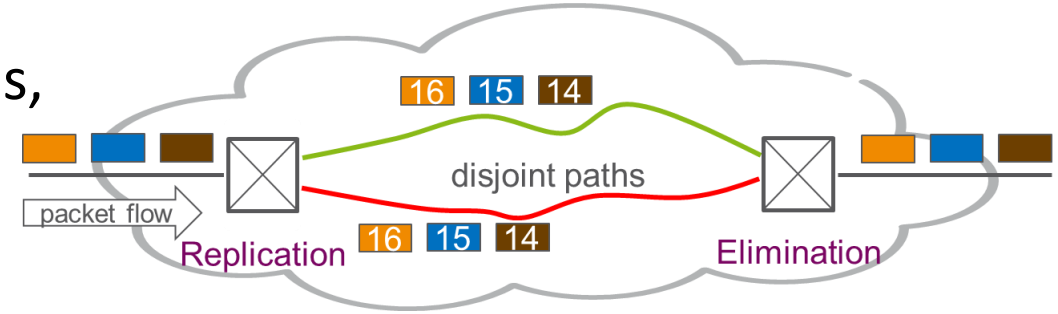


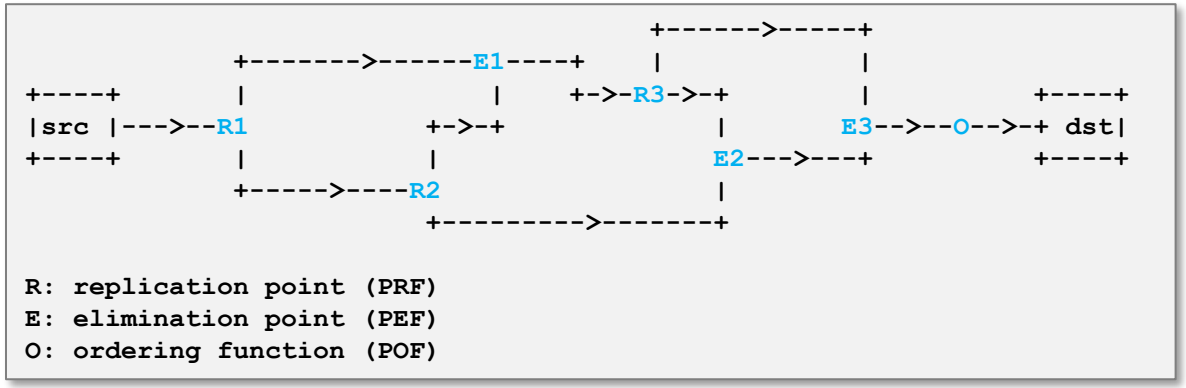
DetNet Service sub-layer: PREOF function

How it works per RFC 8655



- PREOF: Packet Replication, Elimination and Ordering Function
- Basics:
  - Per packet 1+1 (1+N) redundancy
  - Send packets on two (or more) disjoint paths, then combine and delete extras
  - No primary/backup paths differentiated, all paths are active ("zero switchover time")





PREOF acts as proactive per-packet protection: functions have a per-flow state.

OAM for The Service Sub-Layer

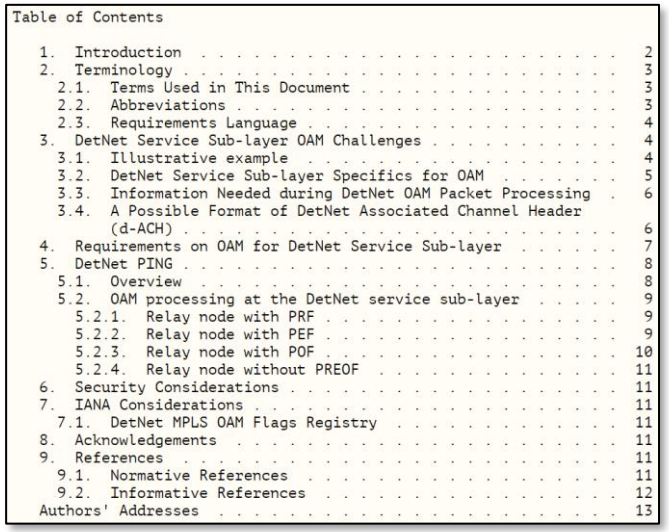


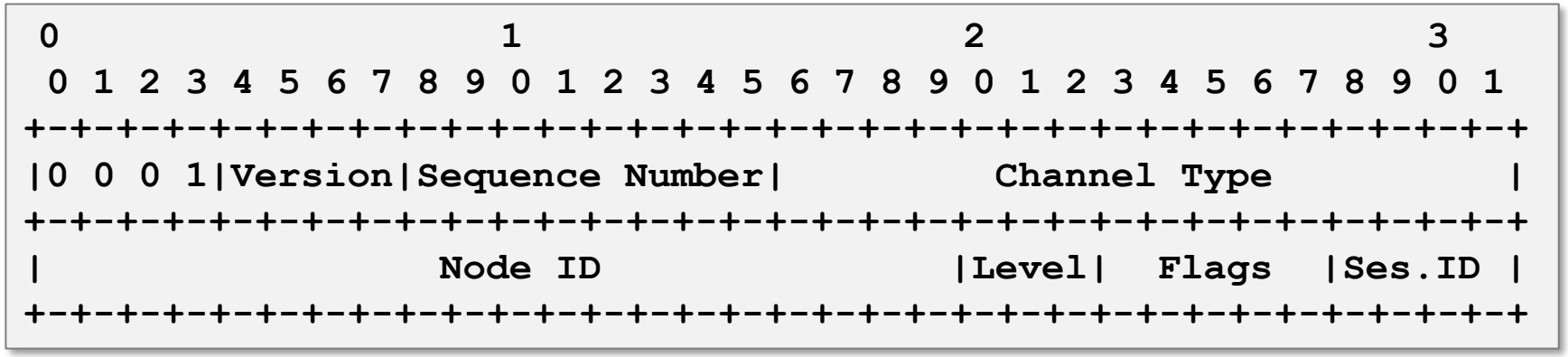
Table of Contents

- DetNet Service Sub-layer Specifics for OAM
  - The service sub-layer graph is segmented into multiple parts, as forwarding sub-layer paths are terminated at DetNet relay nodes.
  - Characteristics of DetNet PW:
    - PREOF acts as proactive per-packet protection. PEF is a brand-new functionality at network layer, due to the per-packet merge action.
    - All paths are active and forward traffic. These paths may have a different number of hops.
    - Mandatory usage of a sequence number.
- Requirements on OAM for DetNet Service Sub-layer
  - Discover DetNet relay nodes in a DetNet network.
  - Collect DetNet service sub-layer specific information from DetNet relay nodes, e.g.: configuration/operation/status
  - Applicable to both DetNet data planes: (i) MPLS and (ii) IP.

OAM packets MUST follow precisely the same path as the packets of the corresponding DetNet data flow. All paths are active and forward traffic.

OAM for The Service Sub-Layer

- DetNet Associated Channel Header (d-ACH)
  - First nibble: MUST be 0b0001
  - Version = 0x1
  - Sequence number: OAM session specific
  - Channel Type: DetNet Associated Channel Type
  - Node ID: Originator node
  - An active DetNet OAM packet MUST include d-ACH immediately following the S-label.



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