

# DetNet

# Data Plane Drafts

**Balázs Varga**, Don Fedyk, Lou Berger, Andrew Malis, Stewart Bryant, János Farkas,  
Jouni Korhonen

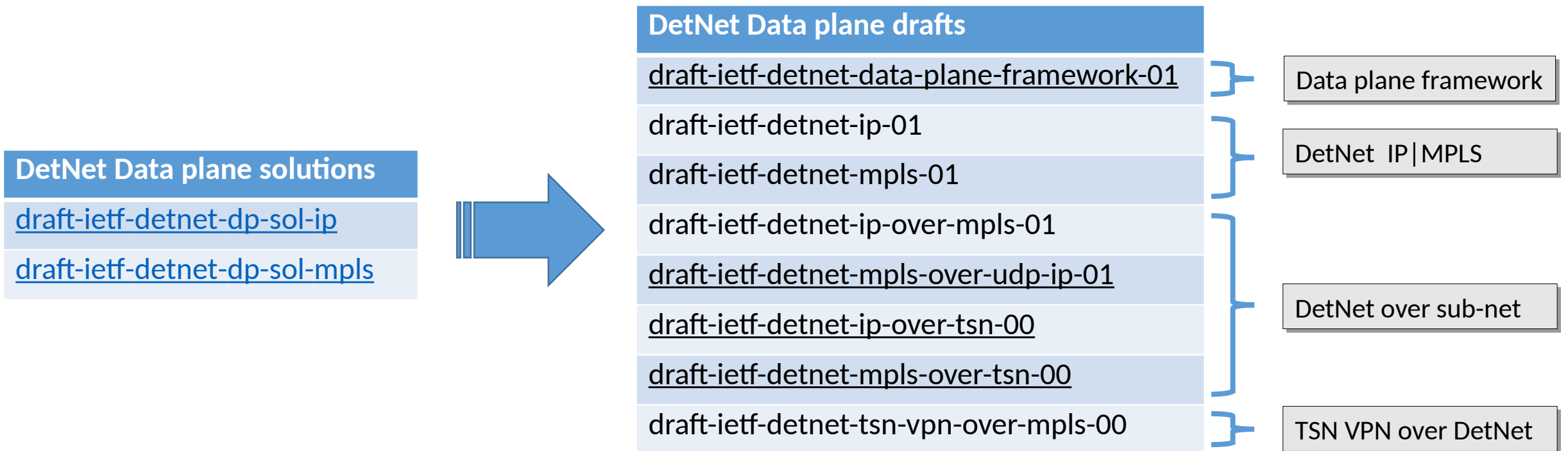
DetNet WG

Montreal, 24<sup>th</sup> July, 2019

# Data plane documents

## Status

- Building block approach
- Solution documents were split in data plane documents



# DetNet Data Plane Framework

## [draft-ietf-detnet-data-plane-framework-01](#)

- Content

- provides an overall framework for the Deterministic Networking data plane.
- covers concepts and considerations that are generally common to any Deterministic Networking data plane specification.

- DetNet Data Plane

- Encapsulation
- DetNet Specific Metadata
- DetNet IP Data Plane
- DetNet MPLS Data Plane
- Service Protection, Aggregation, End-Systems, Sub-Network

- Controller Plane (Management and Control) Considerations

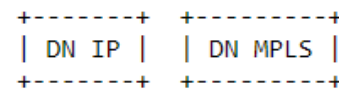


Figure 2: DetNet Services

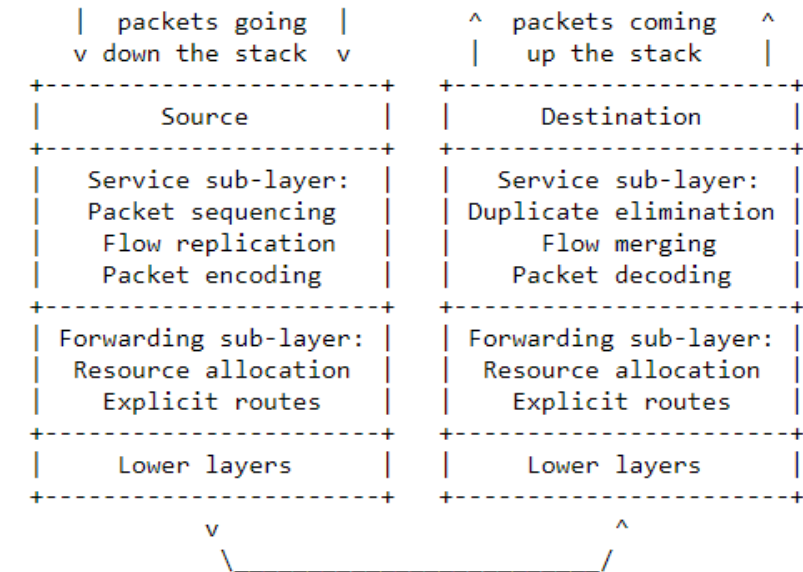


Figure 1: DetNet data plane protocol stack

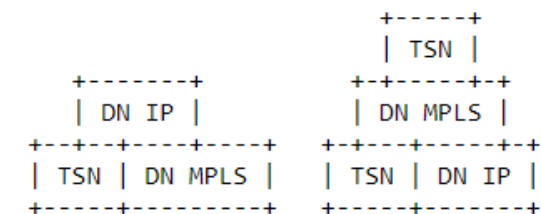


Figure 3: DetNet Service Examples

# DetNet Data Plane: IP

## [draft-ietf-detnet-ip-01](#)

- Content
  - specifies the Deterministic Networking data plane when operating in an IP packet switched network.
- DetNet IP Data Plane
  - DetNet forwarding sub-layer only
- DetNet IP Data Plane Procedures
  - Flow identification: 6-tuple
- Management and Control Information Summary

Note: the DetNet IP data plane does not perform additional encapsulations but operates on the IP header fields already in place.

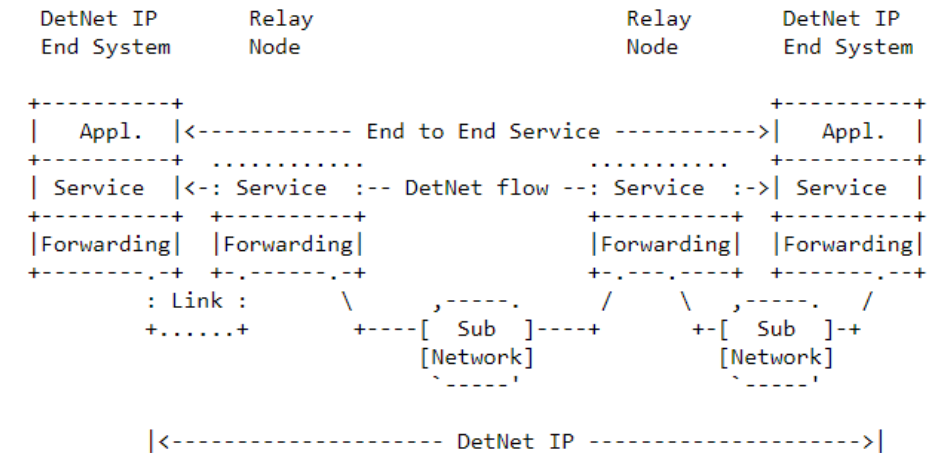


Figure 1: A Simple DetNet (DN) Enabled IP Network

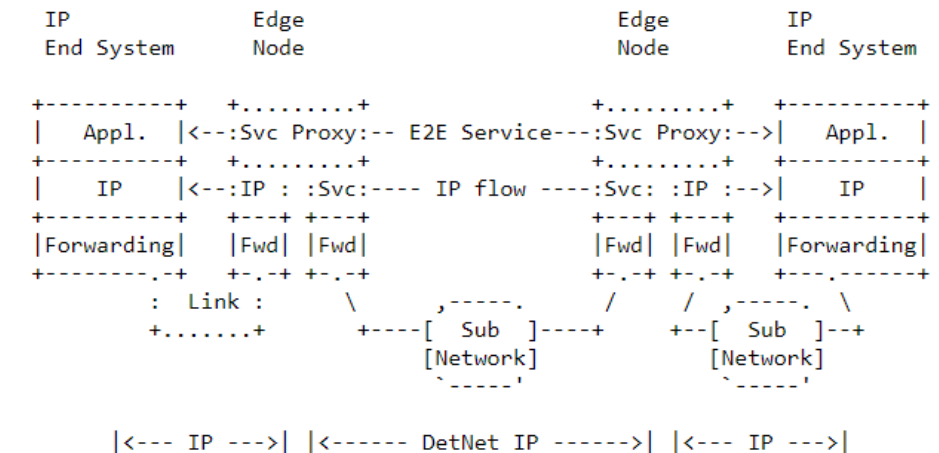


Figure 2: Non-DetNet aware IP end systems with DetNet IP Domain

# DetNet Data Plane: IP Management and Control Information Summary

Set of information that is needed to identify individual and aggregated DetNet flows:

- IPv4 and IPv6 source address field.
- IPv4 and IPv6 source prefix length.
- IPv4 and IPv6 destination address field.
- IPv4 and IPv6 destination prefix length.
- IPv4 protocol field.
- IPv6 next header field.
- IPv4 Type of Service and IPv6 Traffic Class Fields.
- IPv4 Type of Service and IPv6 Traffic Class Field Bitmask.
- IPv6 flow label field.
- TCP and UDP Source Port. Exact and wildcard matching. Port ranges optional.
- TCP and UDP Destination Port. Exact and wildcard matching. Port ranges optional.
- IPsec Header SPI field. Exact matching is required.

# DetNet Data Plane: MPLS

## [draft-ietf-detnet-mpls-01](#)

- Content

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

- DetNet MPLS Data Plane

- DetNet service sub-layer
- DetNet forwarding sub-layer

- DetNet MPLS Data Plane Procedures

- Flow identification: Labels
- Sequence number: d-CW

- Management and Control Information Summary

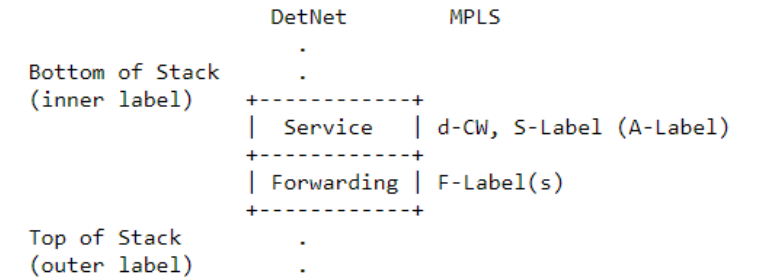


Figure 1: DetNet Adaptation to MPLS Data Plane

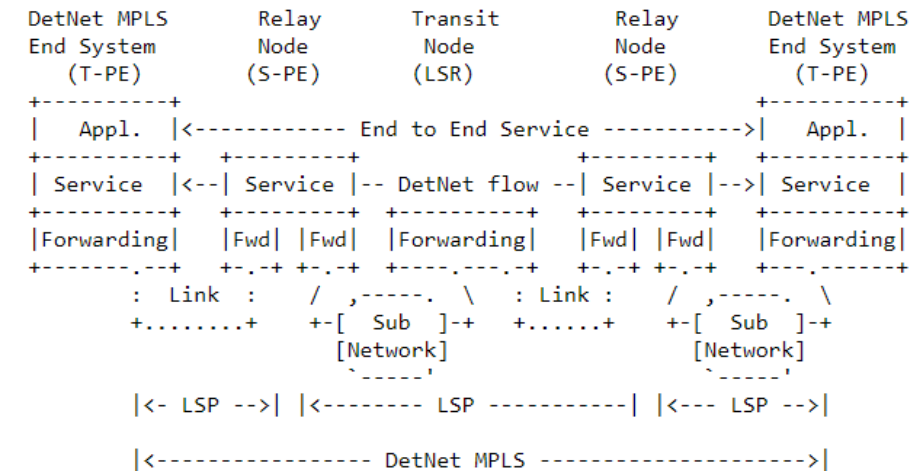
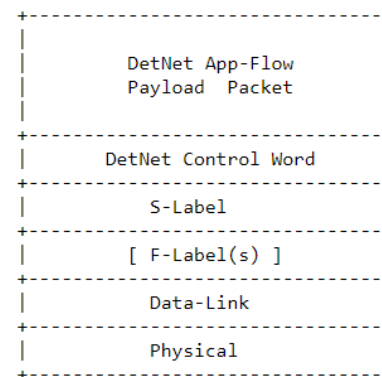


Figure 2: A DetNet MPLS Network

DetNet MPLS-based encapsulation



DetNet data plane  
MPLS encapsulation

Note: zero or more F-labels

# DetNet Data Plane: MPLS

## Management and Control Information Summary

### Service Sub-Layer Information

- App-Flow identification information
- Sequence number length
- S-Label for the service
- PRF used or not
- Associated forwarding sub-layer information

### Service sub-layer (for received traffic)

- Associated forwarding sub-layer information
- S-Label for the received service
- PEF or POF is to be provided
- Sequence number length

### Service Aggregation

- S-Labels or F-Labels that are to be carried over each aggregated service
- A-Label associated with each aggregated service
- Other S-Label information summarized above

### Forwarding Sub-Layer Information

- Outgoing F-Label stack
- Traffic parameters associated with a specific label in the stack
- Outgoing interface and next hop (for unicast traffic)
- Sub-network specific parameters

### Forwarding sub-layer (for received)

- Incoming interface
- Incoming F-Label stack to be popped
- Incoming forwarding sub-layer flow

# DetNet Data Plane: IP over MPLS

## [draft-ietf-detnet-ip-over-mpls-01](#)

- Content

- specifies the Deterministic Networking data plane when operating in an IP over MPLS packet network.

- IP over DetNet MPLS

- Data plane scenarios
- Encapsulation

- IP over DetNet MPLS Procedures

- Flow identification
- Traffic treatment

- Management and Control Information Summary

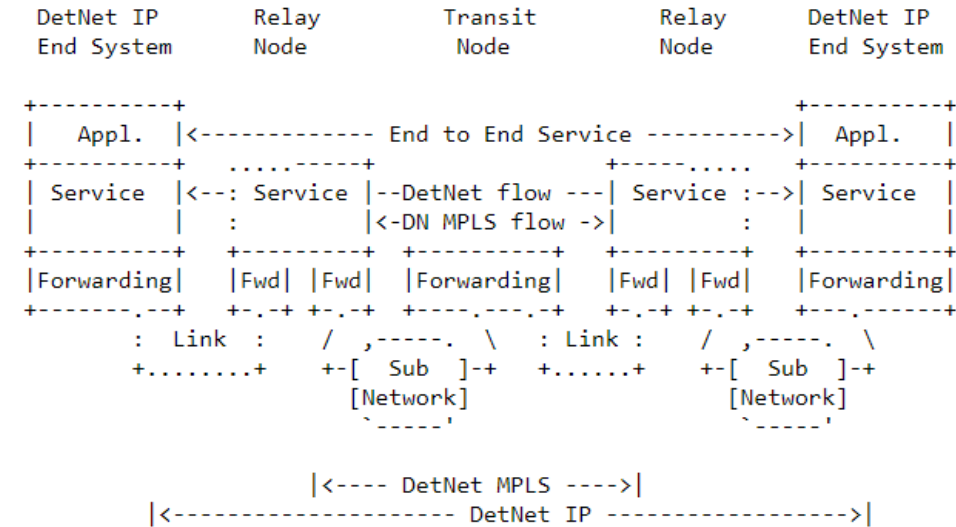
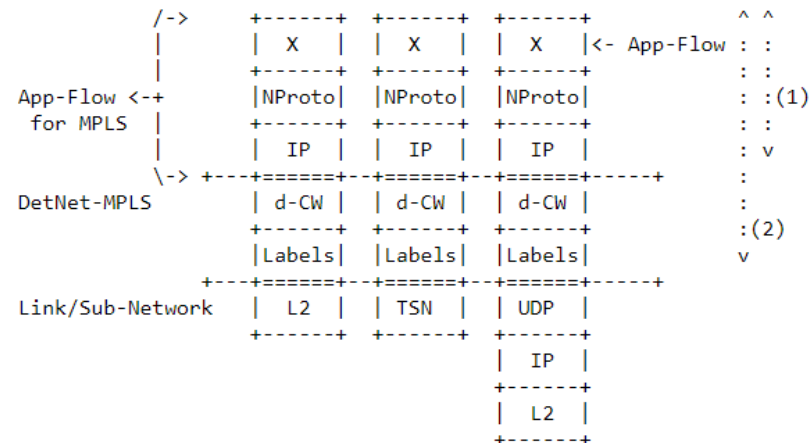


Figure 1: DetNet IP Over DetNet MPLS Network



- (1) DetNet IP Flow (or simply IP flow)
- (2) DetNet MPLS Flow

Figure 3: Example DetNet IP over MPLS Sub-Network Formats



# DetNet Data Plane: IP over MPLS

## Management and Control Information Summary

At the MPLS ingress node:

- Each MPLS App-Flow is identified using the IP flow identification information as defined in [I-D.ietf-detnet-ip]. Includes all wildcards, port ranges and ability to ignore specific IP fields.
- The DetNet MPLS service that is to be used to send the matching IP traffic. Includes both service and traffic delivery information.

At the MPLS egress node:

- S-Label values that are carrying MPLS over IP encapsulated traffic.
- For each S-Label, how the received traffic is to be handled.

# DetNet Data Plane: MPLS over UDP/IP

[draft-ietf-detnet-mpls-over-udp-ip-01](#)

- Content
  - specifies the MPLS Deterministic Networking data plane operation and encapsulation over an IP network.

- DetNet MPLS over DetNet IP
- IP over DetNet MPLS Procedures
- Management and Control Information Summary

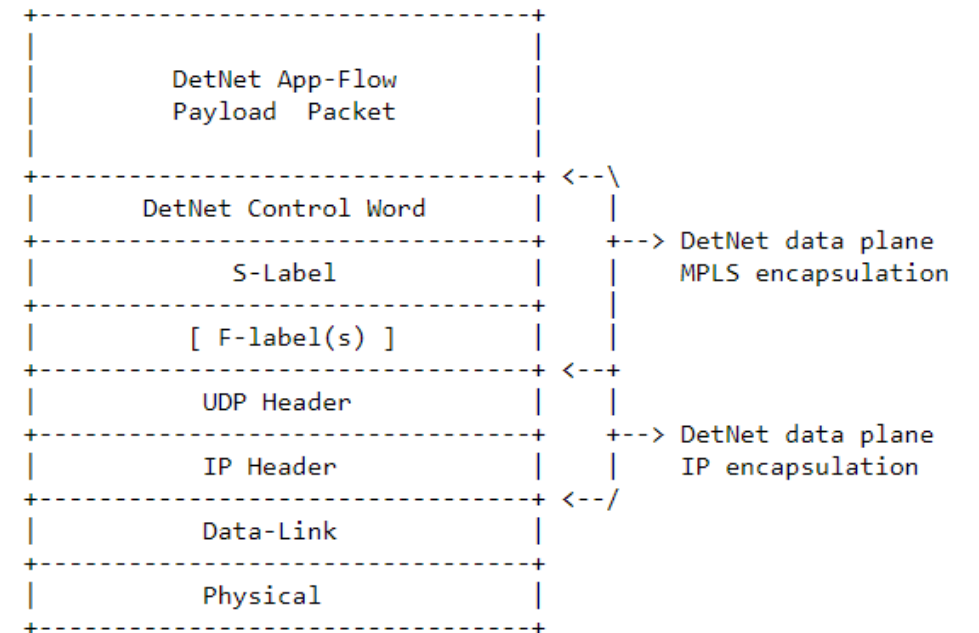


Figure 1: UDP/IP Encapsulation of DetNet MPLS

# DetNet Data Plane: MPLS over UDP/IP

## Management and Control Information Summary

Set of information that is needed to configure DetNet MPLS over UDP/IP

- Label information (S-label or F-label) to be mapped to UDP/IP flow.
- IPv4 and IPv6 source address field.
- IPv4 and IPv6 destination address field.
- IPv4 Type of Service and IPv6 Traffic Class Fields.
- UDP Source Port.
- UDP Destination Port.

# DetNet Data Plane: TSN related cases

- DetNet Data Plane: IP over IEEE 802.1 Time Sensitive Networking (TSN)  
[draft-ietf-detnet-ip-over-tsn-00](#)
- DetNet Data Plane: MPLS over IEEE 802.1 Time Sensitive Networking (TSN)  
[draft-ietf-detnet-mpls-over-tsn-00](#)
- DetNet Data Plane: IEEE 802.1 Time Sensitive Networking over MPLS  
[draft-ietf-detnet-tsn-vpn-over-mpls-00](#)
  
- We have just created these drafts during split
- Further work needed, contributions are welcome

# Summary – Next Steps

- WG last call on:

Draft:	Ready for WG last call
<u>draft-ietf-detnet-data-plane-framework-01</u>	<input type="radio"/>
draft-ietf-detnet-ip-01	<input type="radio"/>
draft-ietf-detnet-ip-over-mpls-01	<input type="radio"/>
draft-ietf-detnet-mpls-01	<input type="radio"/>
<u>draft-ietf-detnet-mpls-over-udp-ip-01</u>	<input type="radio"/>

- Further work needed on TSN related drafts

Thanks ...