

DetNet Configuration YANG Model Update

draft-geng-detnet-conf-yang-03

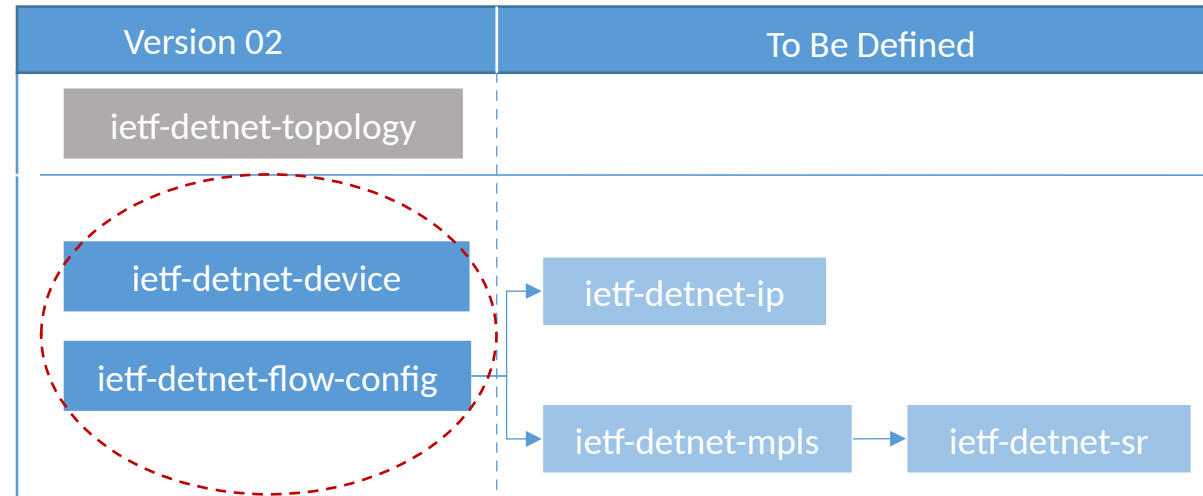
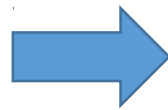
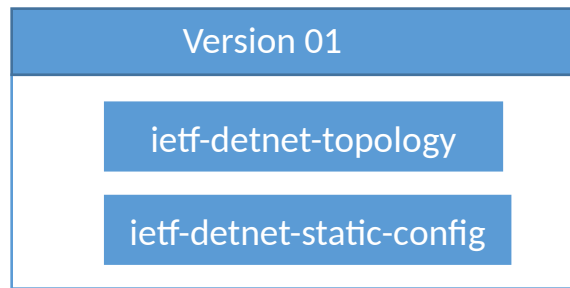
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DetNet Configuration YANG Model Structure



- Quick Review of version 01

- Topology Data Model
 - Collect the detnet capability data from the network ([ietf-detnet-topology](#))
- Static Configuration Model

- What's new in version 02

- Change `ietf-detnet-static-config` to `ietf-detnet-flow-config`
 - Flow dependent configurations after path computation ([ietf-detnet-flow-config](#))
- Add a new model: Device Data Model
 - Flow independent configurations, common for all flows ([ietf-detnet-device](#))

DetNet Flow Configuration YANG Model

- **DetNet Service Proxy Instance (DSPI)**

- For DetNet Edge Node configuration;
- Map client flows to DetNet services ;

- **DetNet Service Instance (DSI)**

- For DetNet Relay Node configuration;
- Enable/disable Replication/Elimination/Ordering;
- Configure service path (e.g., multi-detnet-segment) ;

- **DetNet Transit Instance (DTI)**

- For DetNet Transit Node configuration;
- Build up transit tunnel between DetNet Service Instance;
- Configure QoS parameters (e.g., bandwidth, priority, etc.) of the tunnels;
 - Configure queuing management algorithm parameters;

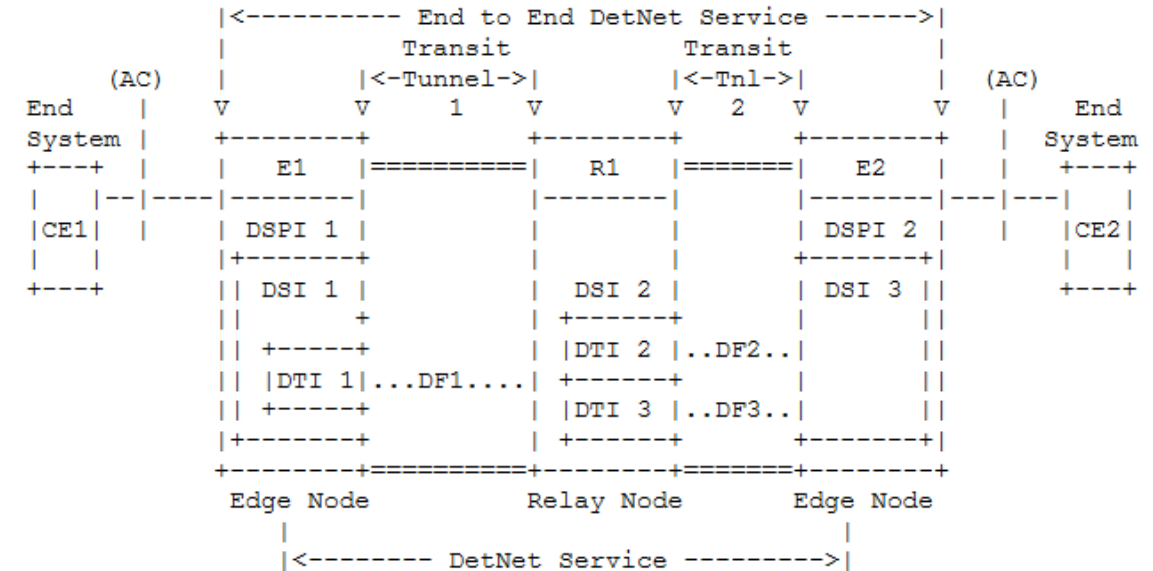


Figure 3: End-to-end DetNet Flow Configuration

draft-finn-detnet-bounded-latency-00
5.1.1. Per-flow queuing

DetNet Service Proxy Instance

- DSPI intends to define the mapping relationship between “client flows” and a DetNet Service Instance (DSI):
 - For each Edge Node, there will be multiple DSPIs (defined as a list);
 - Each DSPI includes:
 - A list of client flows, each flow includes:
 - Flow Identification: for differentiating client flows;
 - Traffic Specification: for flow filtering and shaping;
 - A DetNet Service Instance;
 - One or multiple client flow map to a single DetNet Service Instance (DSI)

```
+---:(detnet-edge-node-type)
+---ro detnet-service-proxy-instance
+---ro flow-to-detnet-mappings* [flow-to-detnet-mapping-id]
+---ro flow-to-detnet-mapping-id uint16
+---ro client-flows
| +---ro client-flows* [client-flow-id]
| | +---ro client-flow-id uint16
| | +---ro flow-id? uint16
| | +---ro flow-identification
| | | +---ro source-ip-address? inet:ip-address
| | | +---ro destination-ip-address? inet:ip-address
| | | +---ro source-mac-address? yang:mac-address
| | | +---ro destination-mac-address? yang:mac-address
| | | +---ro ipv6-flow-label? uint32
| | | +---ro mpls-label? rt-types:mpls-label
| | +---ro traffic-specification
| | | +---ro max-packets-per-interval? uint16
| | | +---ro max-packet-size? uint16
| | | +---ro queuing-algorithm-selection? uint8
+---ro control-plane-protocol
| +---ro name? string
+---ro detnet-service-instance
```

DetNet Service Instance

- A DSI includes
 - in-segments: defined as a list
 - out-segments: defined as list
 - The mapping between the in-segments and the out-segments
- **In-segment** :
 - Function
 - Replication/Elimination/Ordering/Inter-network Function(see next slides)
 - Two use cases:
 - non-detnet-in-segment
 - At the ingress Edge Node
 - Enable Sequence-number-generation
 - detnet-in-segment
 - At the Relay Nodes or Egress Node;
 - Incoming-interface
 - Flow identification: flow identification in this relay node or egress node
- **Out-segment includes:**
 - Out-going-interface
 - Flow Identification: flow identification in next relay node(or egress node)
 - *DetNet Transport Instance* : highly depends on the data plane solution(TBD)

```

+---rw detnet-service-instance
+---rw segment-mapping* [segment-mapping-id]
+---rw segment-mapping-id      uint32
+---rw active?                  boolean
+---rw last-updated?           yang:date-and-time
+---rw in-segment
|
|   +---rw in-segment-list
|   |   +---rw in-segment* [in-segment-id]
|   |   |   +---rw in-segment-id      uint32
|   |   |   +---rw function
|   |   |   |   +---rw (function-type)?
|   |   |   |   |   +---:(packet-replication-function)
|   |   |   |   |   +---:(packet-elimination-function)
|   |   |   |   |   +---:(packet-ordering-function)
|   |   |   |   |   +---:(detnet-inter-working-function)
|   |   |   +---rw (in-segment-type)?
|   |   |   +---:(non-detnet-in-segment)
|   |   |   |   +---rw sequence-number-generation
|   |   |   |   |   +---rw bit-number?      uint32
|   |   |   |   |   +---rw upper-bound?    uint32
|   |   |   |   |   +---rw lower-bound?   uint32
|   |   |   +---:(detnet-in-segment)
|   |   |   |   +---rw incoming-interface?      if:interface-ref
|   |   |   |   +---rw flow-identification
|   |   |   |   |   +---rw source-ip-address?    inet:ip-address
|   |   |   |   |   +---rw destination-ip-address?  inet:ip-address
|   |   |   |   |   +---rw source-mac-address?    yang:mac-address
|   |   |   |   |   +---rw destination-mac-address? yang:mac-address
|   |   |   |   |   +---rw ipv6-flow-label?      uint32
|   |   |   |   |   +---rw mpls-label?          rt-types:mpls-label
|   |   +---rw out-segment
|   |   |   +---rw out-segment-list
|   |   |   |   +---rw out-segment* [out-segment-id]
|   |   |   |   |   +---rw out-segment-id      uint32
|   |   |   |   |   +---rw outgoing-interface?  if:interface-ref
|   |   |   |   |   +---rw flow-identification
|   |   |   |   |   |   +---rw source-ip-address?    inet:ip-address
|   |   |   |   |   |   +---rw destination-ip-address?  inet:ip-address
|   |   |   |   |   |   +---rw source-mac-address?    yang:mac-address
|   |   |   |   |   |   +---rw destination-mac-address? yang:mac-address
|   |   |   |   |   |   +---rw ipv6-flow-label?      uint32
|   |   |   |   |   |   +---rw mpls-label?          rt-types:mpls-label
|   |   |   +---rw detnet-transport-instance
|   |   |   |   +---rw detnet-transport-instance

```

DetNet Service Instance Functions

- **Replication & Elimination**

- With the in-segments and out-segments and the mapping between them, the Replication and Elimination Functions can be implemented.
- The right figures show different mapping models

- **Ordering**

- Ordering Packet number
 - Maximum number of packets that are allowed to be buffered
 - Limited by the buffer size

- **DetNet Inter-network Function**

- Flow Identification
 - Included by the in-segment content
- Sequence Number
 - Copy : the sequence number is directly copied from one encapsulation to the other encapsulation
 - Translation: the sequence number of one encapsulation maps to the other encapsulation
 - Re-generation: generate new sequence number when the encapsulation changes

draft-ietf-detnet-dp-sol-mpls-00
 Section 5.3 DetNet Inter-Working Function
 Add a new function: **Detnet Inter-working function**

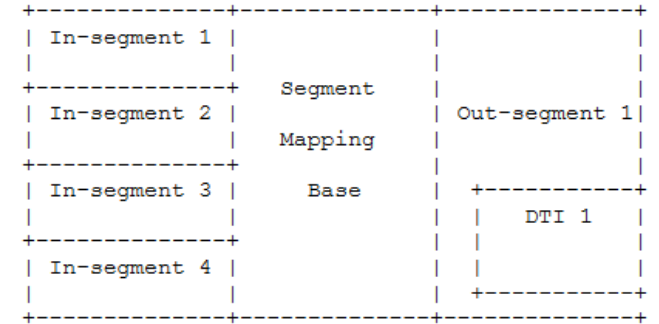


Figure 7: DetNet Service Instance for packet elimination

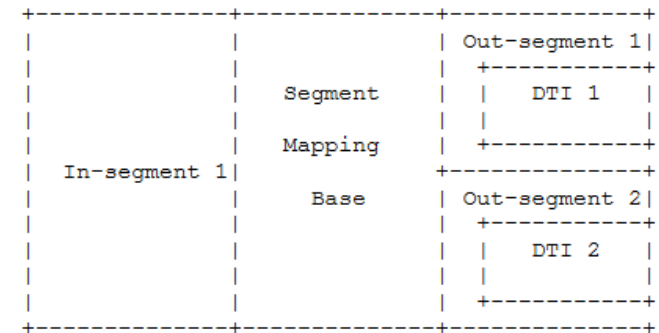


Figure 6: DetNet Service Instance for packet replication

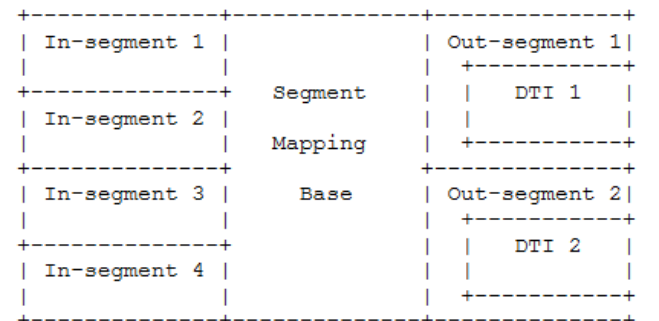
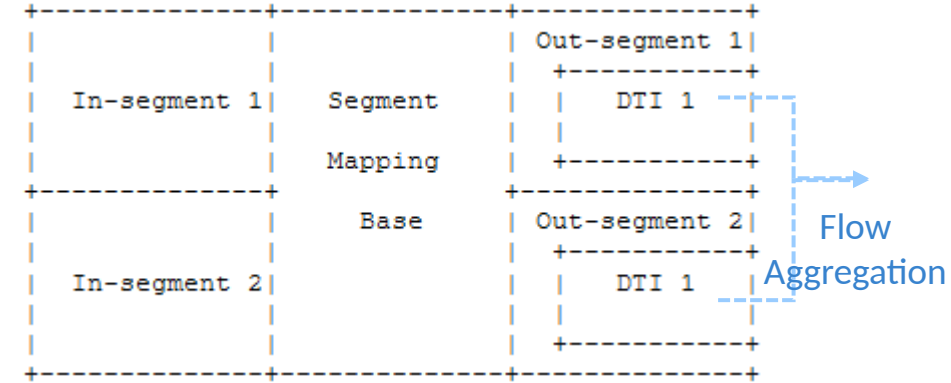


Figure 8: DetNet Service Instance for packet elimination and replication

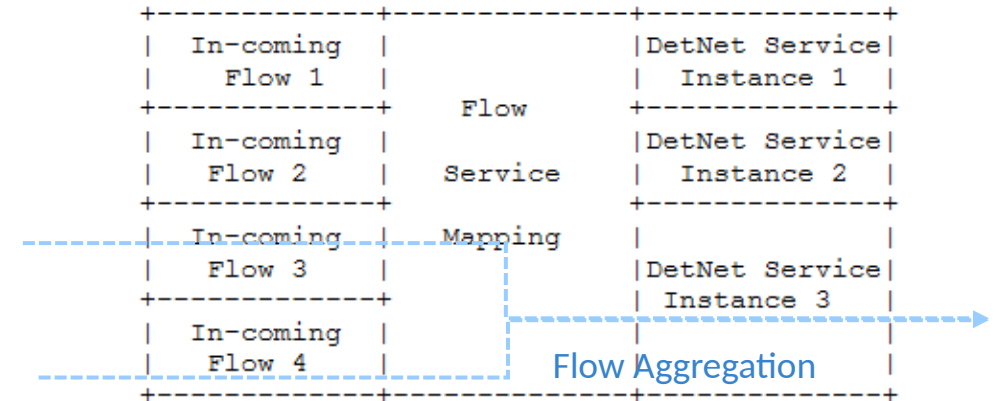
DetNet Flow Aggregation

draft-ietf-detnet-dp-sol-mpls-00
 Section 6.7 Flow Aggregation
 Three methods of doing flow aggregation

- **Aggregation at the LSP**
 - Defined in DetNet Service Instance(DSI)
 - Multiple DetNet flows share the same DetNet Transport Instance (DTI)
- **Aggregating DetNet flows as a new DetNet flow**
 - Defined in DetNet Service Proxy Instance(DSPI)
 - Multiple client flows map to a single DetNet Service Instance (DSI)
 - Both Service and Aggregate layer have Sequence number
- **Simple Aggregation at the DetNet layer**
 - Defined in DetNet Service Proxy Instance(DSPI)
 - Multiple client flows map to a single DetNet Service Instance (DSI)
 - Only service layer has sequence number
 - Aggregate layer does not have sequence number



Aggregation at the LSP



Aggregation at the DetNet layer

DetNet Device YANG Model

It is to be decided that whether it is defined in the device or in the interface

- DetNet Device YANG Model:

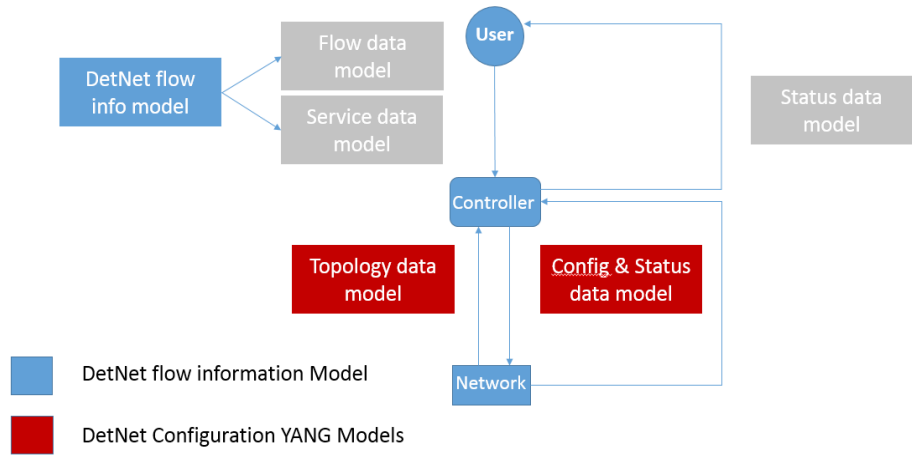
- Enable/disable Packet Replication Function(PRF)
- Enable/disable Packet Elimination Function(PEF)
- Enable/disable Packet Ordering Function(POE)
- DetNet Interfaces:
 - Configure Queuing Management Algorithm
 - Share with the TSN interface configuration
 - Defined in IEEE, augment ietf-interfaces

```
module: ietf-detnet-device
  +--rw detnet-device-config
  |   +--rw PEF-enabled?          boolean
  |   +--rw PRF-enabled?         boolean
  |   +--rw POF-enabled?         boolean
  |   +--rw detnet-interfaces
  +--ro detnet-device-states
  |   +--ro PEF-enabled?          boolean
  |   +--ro PRF-enabled?         boolean
  |   +--ro POF-enabled?         boolean
  |   +--ro detnet-interfaces
```

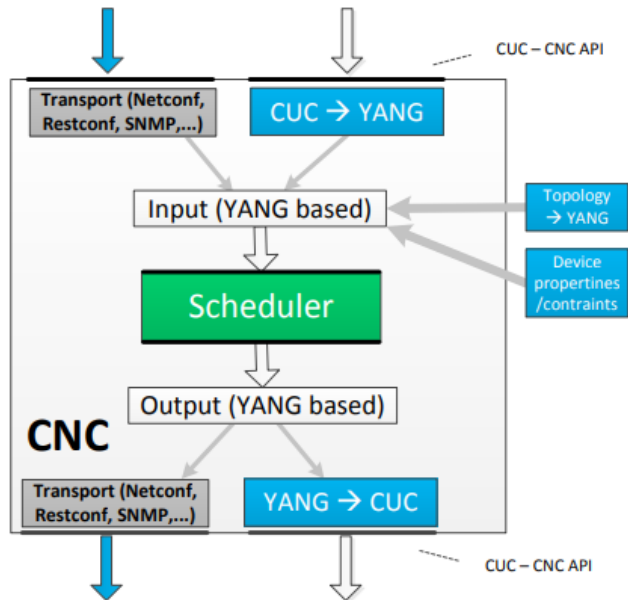
Queuing Management Algorithm	YANG Model in IEEE
IEEE TSN	ieee802-dot1q-tsn
IEEE P802.1 Qbv	ieee802-dot1q-sched
IEEE P802.1 Qci	ieee802-dot1q-psfp
IEEE P802.1 Qcu	TBD
IEEE P802.1 Qch	TBD
IEEE P802.1 Qcr	TBD
IEEE P802.1 CB	TBD

Coordination with TSN Yang Model Design in

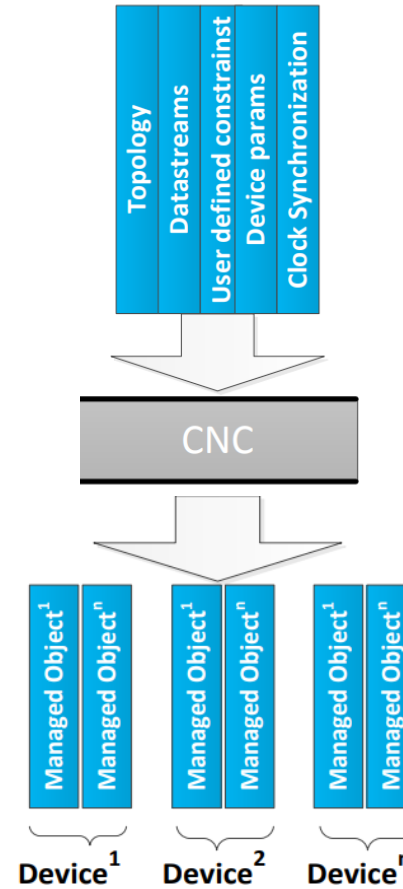
IEEE



Whole picture of yang model in IETF



Whole picture of yang model in IEEE



- Physical Topology (network)
- Device constrains and properties
- TSN datastreams (UNI)
- User defined constrains for datastreams
- Clock synchronization

YANG Output Models

- **1Qbv** (MIB exists, experimental YANG modules)
 - Scheduling
 - Bridge internal routing - mapping of streams ID to queues
- **1CB** (neither MIB nor YANG model exists)

Not related to scheduling

- **1Qci** (MIB exists, no YANG model exists)
- **1AS-rev** (existing MIBs from 1588-2008, no YANG model exists)

What is the next?

- DetNet Transport Instance
- More functions and parameters corresponding to the data plane design
- [ietf-detnet-ip/ietf-detnet-mpls/ietf-detnet-sr](#)
- More Comments and contributions are welcome
- WG adoption?

Thanks