

DetNet Configuration YANG Model

draft-geng-detnet-conf-yang-01

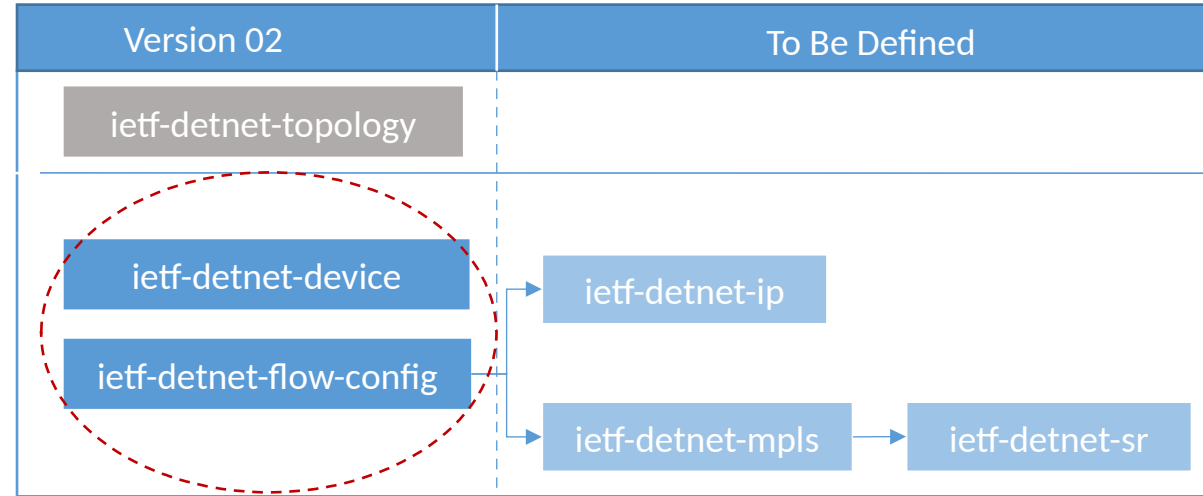
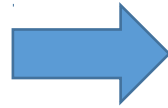
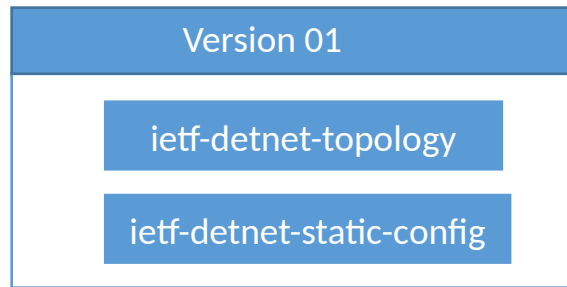
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DetNet Configuration YANG Model Structure



- Quick Review of version 01

- Topology Data Model
 - Collect the detnet capability data from the network ([ietf-detnet-topology](#))
- Flow Configuration Data 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)** intends to
 - 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;

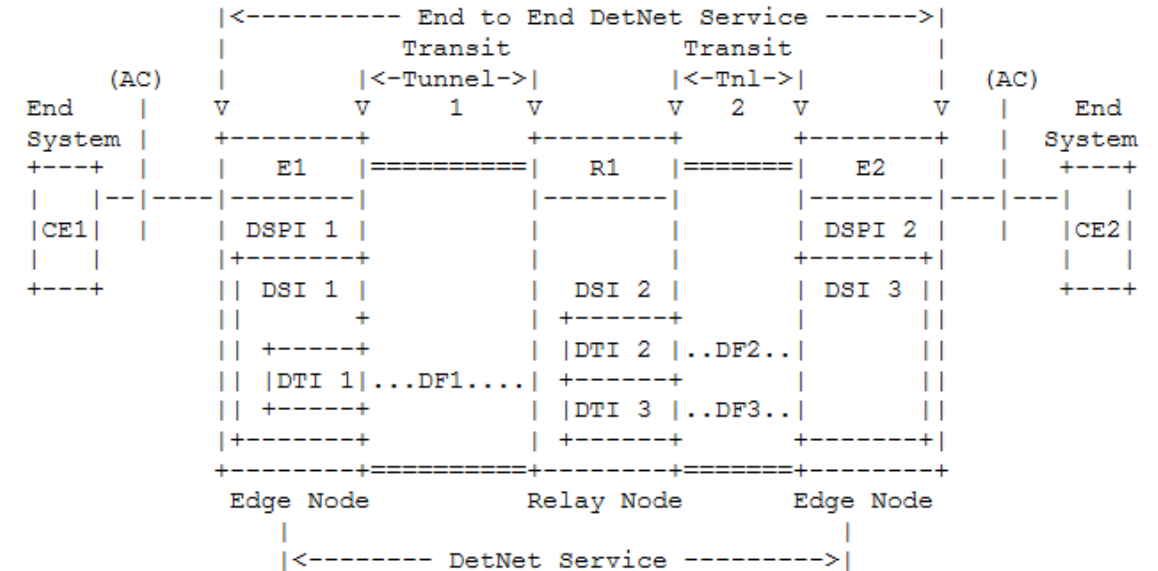


Figure 3: End-to-end DetNet Flow Configuration

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 (see next slides)
 - The mapping between the in-segments and the out-segments
- **In-segment :**
 - Function
 - Replication/Elimination/Ordering/Inter-network Function
 - 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

- It is to be decided whether we will reuse the IEEE Yang, or define a new one.
 - Configuration parameters of replication and elimination are also defined in IEEE 802.1 CB, and the corresponding yang model is under develop.
- The relationship between in-segment and out-segment are showed in the picture

• Ordering

- Ordering Packet number
 - Limited by the buffer size

• DetNet Inter-network Function

- Flow Identification
 - Included by the in-segment content
- Sequence Number
 - Copy : the sequence number is unchanged
 - Match: the bit-number of sequence number is different, a match rule should be defined
 - Re-generation: uses sequence-number-generation

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

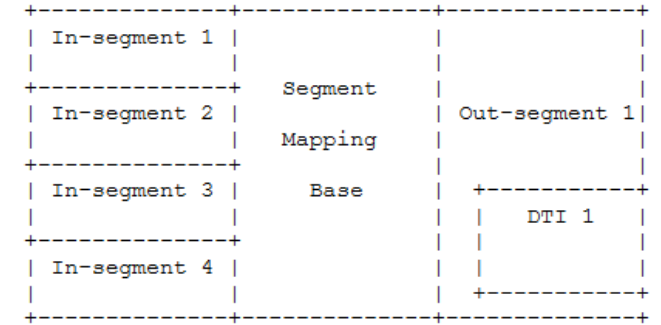


Figure 7: DetNet Service Instance for packet elimination

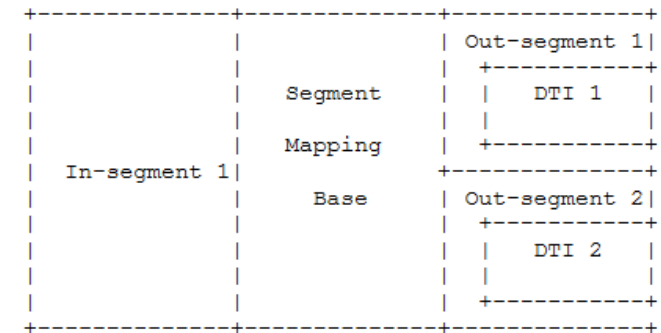


Figure 6: DetNet Service Instance for packet replication

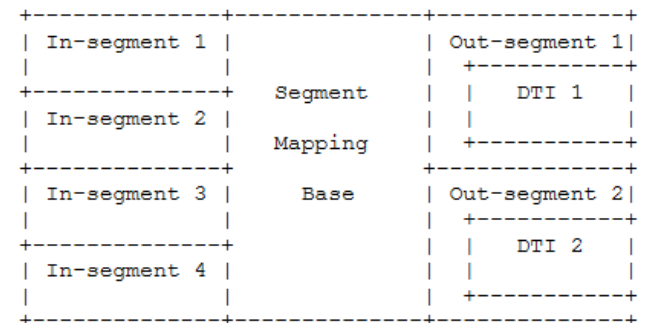
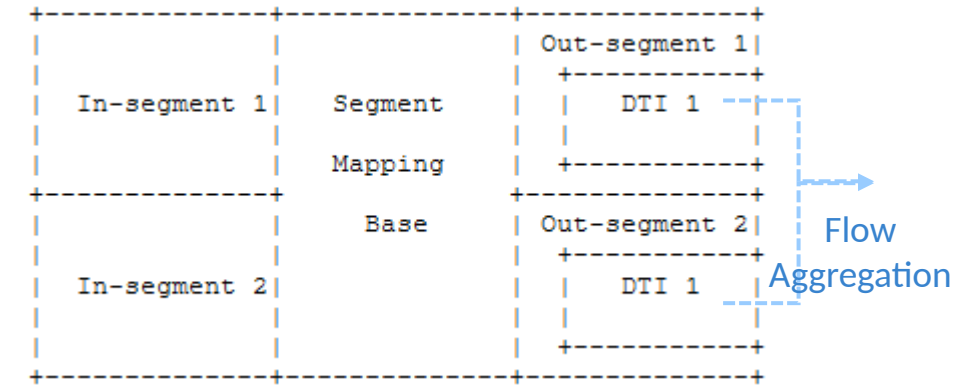


Figure 8: DetNet Service Instance for packet elimination and replication

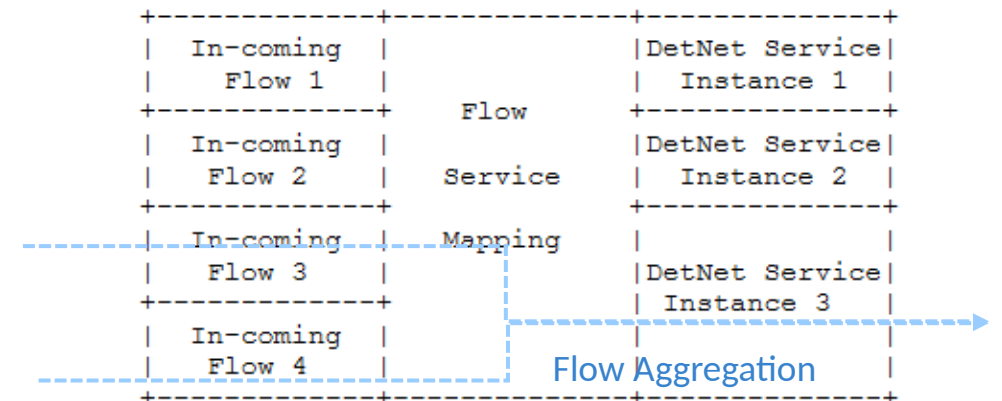
DetNet Flow Aggregation

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

- **Aggregate at the LSP (Transport)**
 - Defined in DetNet Service Instance(DSI)
 - Two DetNet flows share the same DetNet Transport Instance (DTI)
- **Aggregation at the DetNet layer**
 - Defined in DetNet Service Proxy Instance(DSPI)
 - Two client flows map to the same DetNet Service Instance (DSI)
- **Aggregating DetNet flows as a new DetNet flow**
 - Defined in DetNet Service Instance(DSI)
 - Two new functions: aggregation/de-aggregation should be defined
 - Aggregation: in-segment identification of flows are kept, and map to the same out-segment;
 - De-aggregation: in-segment identification of the aggregation flow is taken off, and map to different out-segment



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:

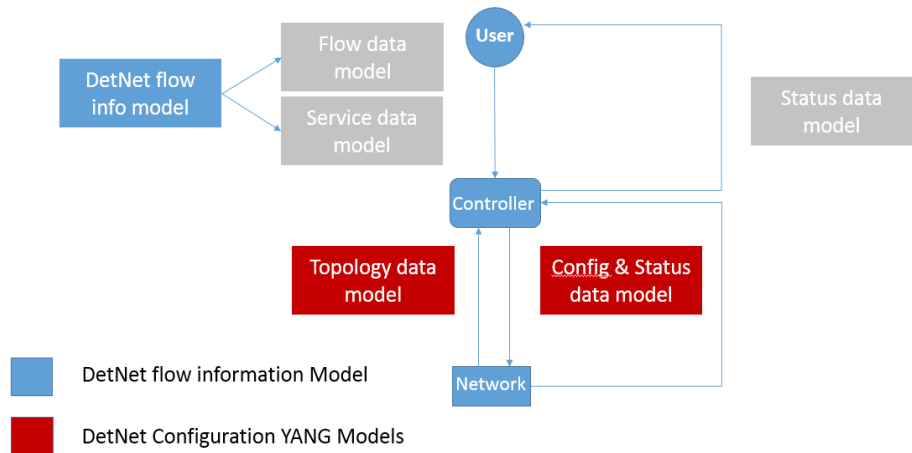
- Enable/disable Packet Replication Function(PRF)
- Enable/disable Packet Elimination Function(PEF)
- Enable/disable Packet Ordering Function(POE)
- DetNet Interfaces:
 - Configure Queuing Management Algorithm
 - Defined in IEEE

```
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
```

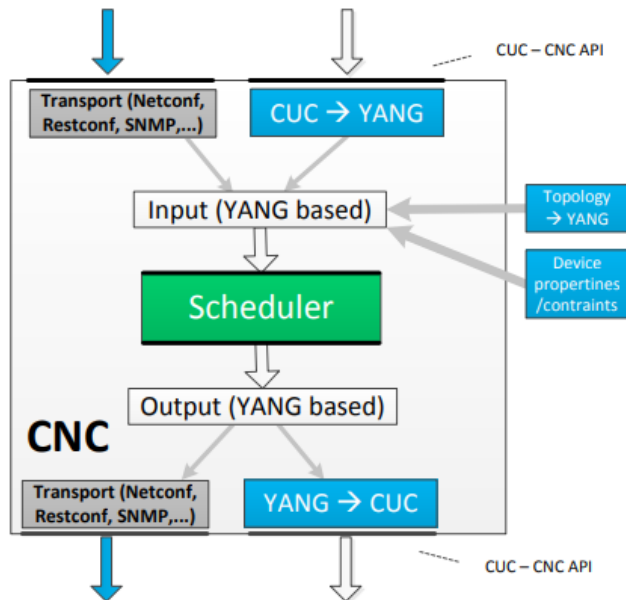
Queuing Management Algorithm	YANG Model in IEEE
IEEE TSN	ieee802-dot1q-tsn
IEEE P802.1 Qbv	ieee802-dot1q-sched
IEEE P802.1 Qci	ieee802-dot1q-psfp
IEEE P802.1 Qcu	TBD
IEEE P802.1 Qch	TBD
IEEE P802.1 Qcr	TBD
IEEE P802.1 CB	TBD

Coordination with TSN Yang Model Design in

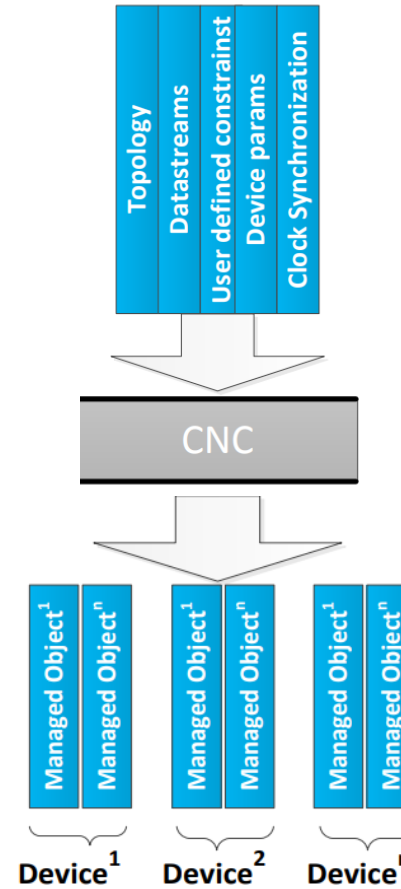
IEEE



Whole picture of yang model in IETF



Whole picture of yang model in IEEE



- Physical Topology (network)
- Device constraints and properties
- TSN datastreams (UNI)
- User defined constraints 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
 - Flow relevant DetNet Queuing Management based on the work of draft-finn-detnet-bounded-latency, maybe cooperate with IEEE
- 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
- Call for Adoption by WG

Thanks