DetNet
DetNet Flow Information Model
draft-ietf-detnet-flow-information-model-03

János Farkas, Balázs Varga,
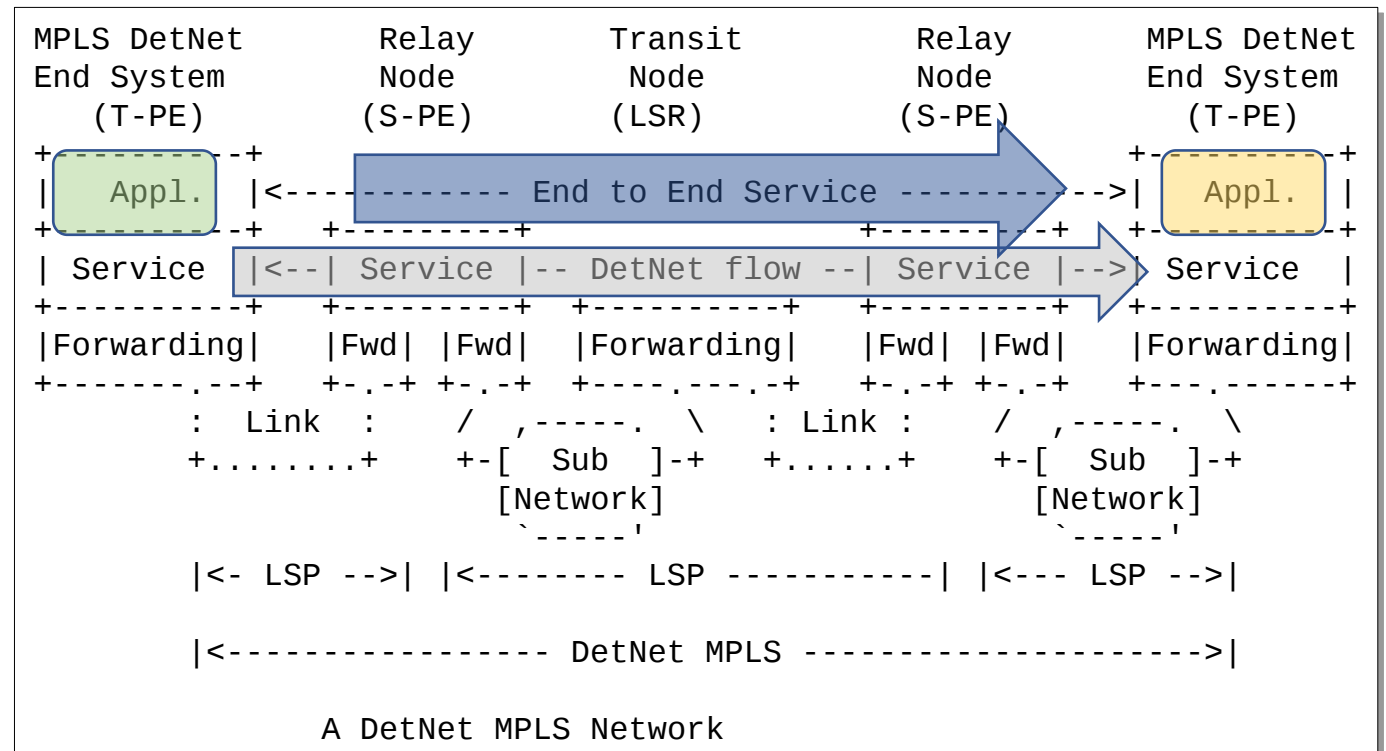Rodney Cummings, Jiang Yuanlong

janos.farkas@ericsson.com, balazs.a.varga@ericsson.com,
rodney.cummings@ni.com, jiangyuanlong@huawei.com,

DetNet WG

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Content
Overview

- Model related discussions

- Updates

- Next steps

```
MPLS DetNet        Relay         Transit         Relay        MPLS DetNet
End System         Node           Node           Node          End System
   (T-PE)          (S-PE)         (LSR)          (S-PE)           (T-PE)
+---------+--+     +---------+                +---------+     +--+---------+
|  Appl.  |  |<-------------- End to End Service ---------->|  Appl.  |
+---------+--+     +---------+                +---------+     +--+---------+
| Service |  |<--| Service |-- DetNet flow --| Service |-->| Service  |
+---------+       +---------+   +---------+   +---------+     +---------+
|Forwarding|     |Fwd| |Fwd|    |Forwarding|    |Fwd| |Fwd|     |Forwarding|
+--------.--+    +-.-+ +-.-+    +----.----.--+   +-.-+ +-.-+    +---.------+
      :  Link  :     /  ,-----.  \   :  Link :      /  ,-----.  \
      +........+    +-[  Sub  ]-+    +......+    +-[  Sub  ]-+
                       [Network]                   [Network]
                        `-----'                     `-----'
      |<- LSP -->|  |<-------- LSP -----------|  |<--- LSP -->|

      |<---------------- DetNet MPLS -------------------->|

                         A DetNet MPLS Network
```

Information/Data models for DetNet
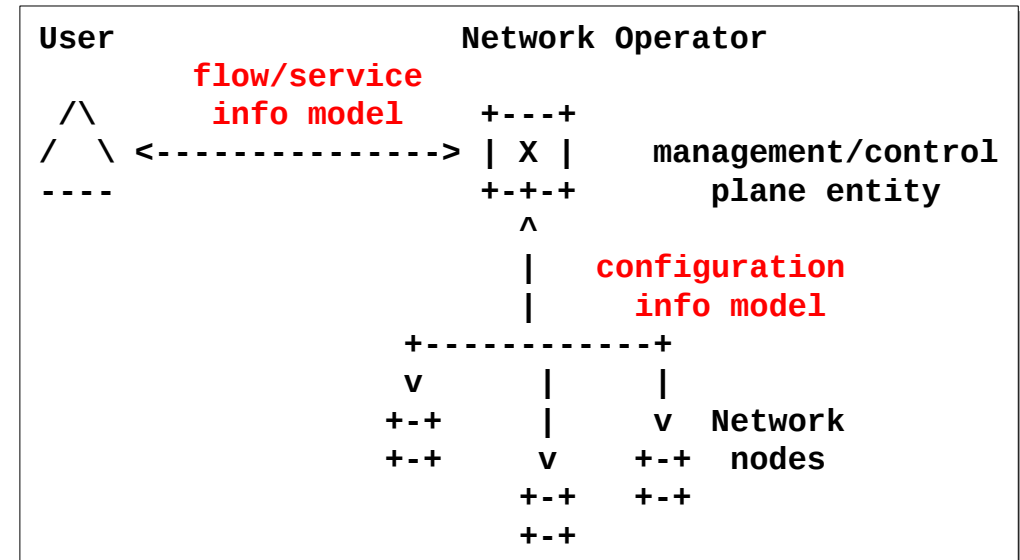## Service / Flow / Configuration

Reminder of target

- DetNet: three models are distinguished:

  - Flow information model:
    describes characteristics of data flows. It includes in detail all relevant aspects of a flow that are needed to support the flow properly by the network between the source and the destination(s).

  - Service information model:
    describes characteristics of services being provided for data flows over a network. It can be treated as a network operator independent information model.

  - Configuration data model:
    describes in detail the settings required on network nodes to serve a data flow properly.

Flow
Information Model

Customer
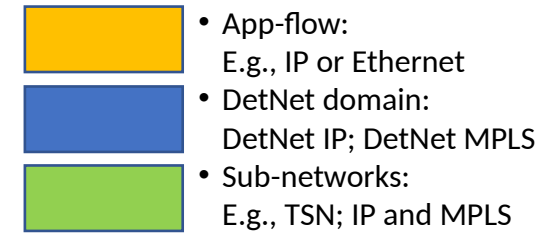Service Model

Network Element
YANG Modules

```
User                        Network Operator
                flow/service
 /\             info  model
/  \ <--------------> | X |      management/control
----                  +-+-+          plane entity
                       ^
                       |      configuration
                       |       info model
             +-----------+
             v     |     |
            +-+    |     v  Network
            +-+    v    +-+  nodes
                  +-+   +-+
                  +-+
```

Flow definition (reminder …)
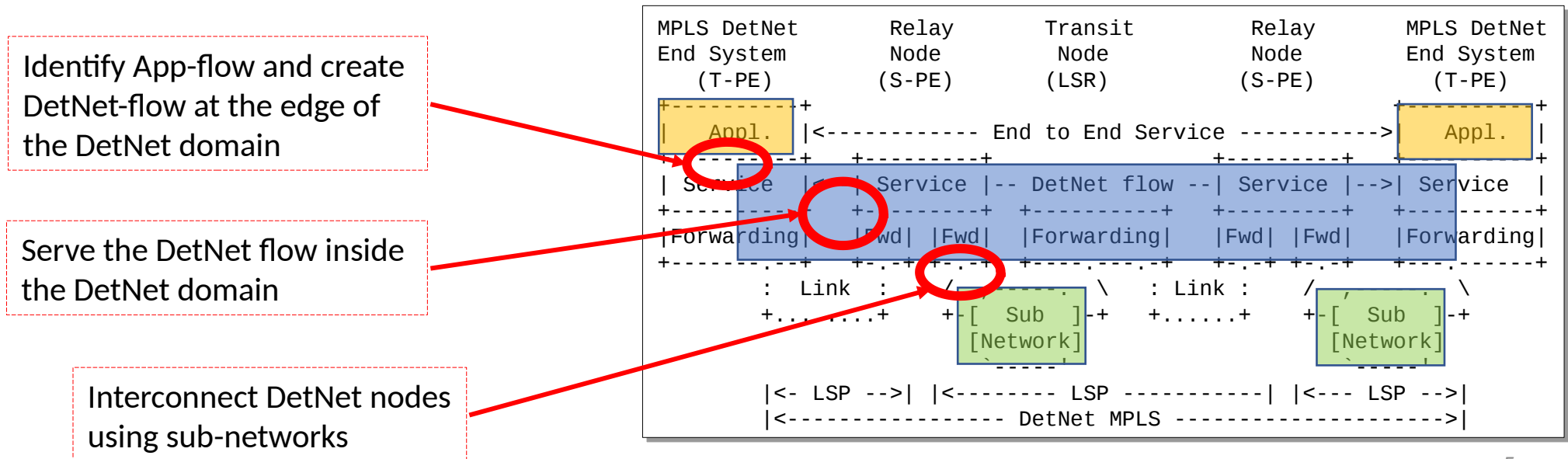## Based on latest architecture draft

- App-flow: application data without DetNet added headers

- DetNet flow: App-flow + DetNet encapsulation
  - DetNet encapsulation may simply reuse the App-flow header information within the DetNet domain, e.g., current DetNet IP
  - When having protection
    - DetNet compound flow
    - DetNet member flow
  - When doing aggregation
    - Results in a new aggregated DetNet flow / similar to MPLS hierarchy

Model related discussions
Planned changes

- App-flow:
  E.g., IP or Ethernet
- DetNet domain:
  DetNet IP; DetNet MPLS
- Sub-networks:
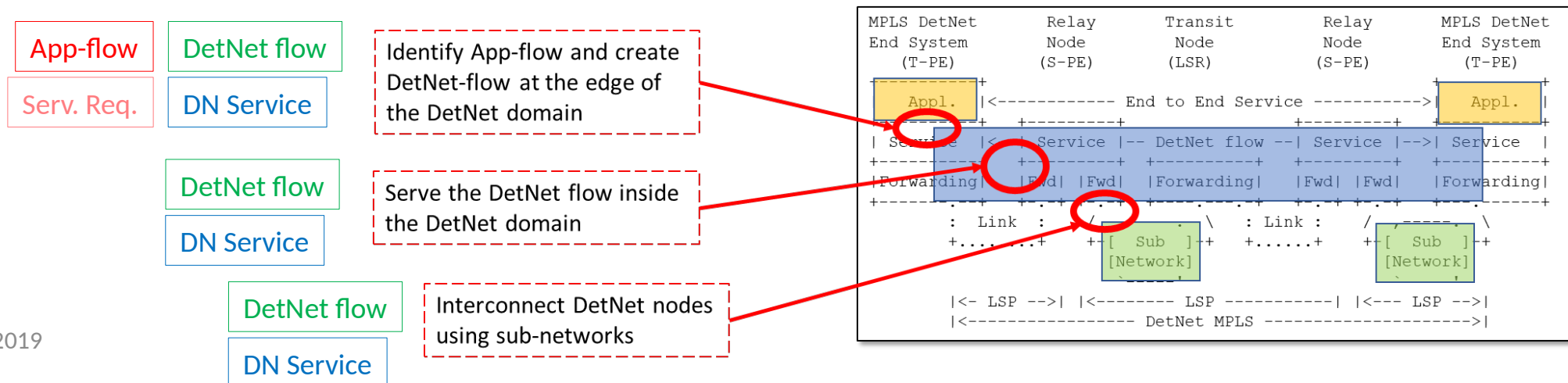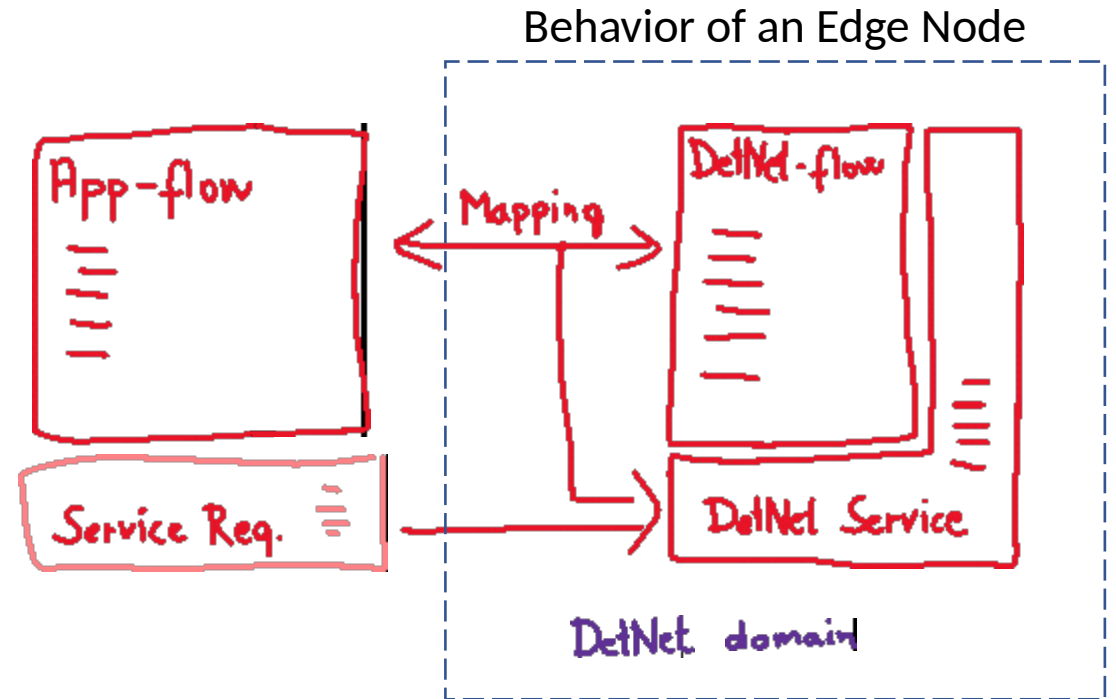 E.g., TSN; IP and MPLS

- Terminology clean up
  - Adapt to latest versions of architecture (IESG review comments related changes) and recent data-plane changes

- Target:
  - Update to be consistent with architecture and data plane drafts

Identify App-flow and create DetNet-flow at the edge of the DetNet domain

Serve the DetNet flow inside the DetNet domain

Interconnect DetNet nodes using sub-networks

```
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+----------+                                                       +----------+
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+----------+    +---------+    +----------+  +---------+    +----------+
|Forwarding|    |Fwd| |Fwd|    |Forwarding|  |Fwd| |Fwd|    |Forwarding|
+----------+    +...+.+...+    +----------+  +...+.+...+    +----------+
      :   Link  :    /       .    \    :  Link  :    /       .    \
      +.....+      +-[  Sub   ]-+   +......+    +-[  Sub   ]-+
                     [Network]                     [Network]
                      `------'                      `------'
|<- LSP -->|  |<-------- LSP ----------|  |<--- LSP -->|
|<--------------- DetNet MPLS ------------------->|
```

# Structuring attributes
## Focus on DetNet domain

- An end-to-end service needs
  4 sets of information (attributes)
  - App-Flow(s)
  - Service requirements of App-Flow(s)
  - DetNet flow created at Edge
  - DetNet Service attributes

Behavior of an Edge Node



App-flow   DetNet flow

Serv. Req.   DN Service

Identify App-flow and create DetNet-flow at the edge of the DetNet domain

DetNet flow

DN Service

Serve the DetNet flow inside the DetNet domain

DetNet flow

DN Service

Interconnect DetNet nodes using sub-networks

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|Forwarding|    |Fwd| |Fwd|  |Forwarding|  |Fwd| |Fwd|    |Forwarding|
+----------+    +--+----+--+  +----------+  +--+----+--+    +----------+
       : Link :      \     .   : Link :    /   _____  \
       +......+    +--+[ Sub ]+--+  +......+  +--+[ Sub ]+--+
                      [Network]                  [Network]
                       `.____.'                   `.____.'

       |<- LSP -->| |<--------- LSP -----------| |<--- LSP -->|
       |<---------------- DetNet MPLS -------------------->|
```

Attribute structure
Getting to the point …
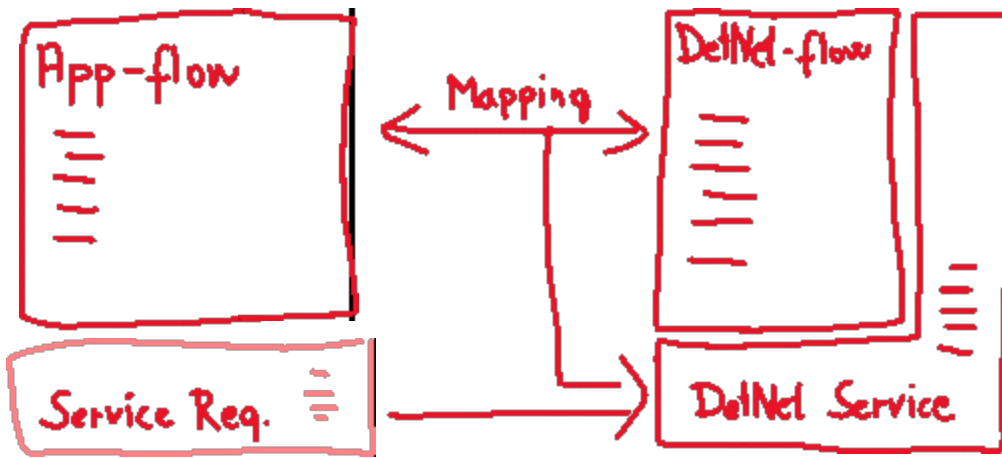
draft-ietf-detnet-flow-information-model

**App-flow
(scope limited to Edge Node)**
- Type: IP, Ethernet, (future)
  - L2: e.g., 802.1Qcc
  - L3: very similar to DetNet IP flow attributes

**Service Requirements
(scope limited to Edge Node)**
- ForForwarding
- Etc.

Service Requirements similar to e.g., 802.1Qcc Attributes like UserToNetworkRequirements

DetNet flow (described at UNI)
- Flow parameters
  - DataFlowSpecification
  - TrafficSpecification
  - FlowRank
  - FlowRequirements
- FlowStatus
- Edge: Ingress, Egress(es)

DN Service (provided by DetNet network for a DetNet flow)
- BW, Delay. Loss
- Max-misordering
- Connection type (p2p, p2mp)
- ServiceRank
- ServiceStatus

Flow information – Updates
draft-ietf-detnet-flow-information-model-03

- Terminology clean up
  - Adapt to latest architecture version (IESG review comments related changes)

- Next steps
  - Chapter 1. ToDo list
    - Align with updated architecture and data plane documents (partly done).
    - App-flow parameters will not be defined in detail (add references only, e.g., 802.1Qcc). We focus on DetNet flows.
    - Clarification on relationship between DetNet flow model and DetNet service model.
    - Parameter set needs finalization, some re-org of the sets may be needed.
    - Sort out which parameter belongs to DetNet flow model and which to DetNet service model.
    - Clarify relationship between App-flow and DetNet flow (N:1 vs 1:1).

Thanks …

Backup slides

Background
Service / Flow / Configuration related models

- Discussion on different models (information, data, YANG, etc.)
    - During/after IETF99

- Some IETF definitions
    - RFC3444 - information model
        - The main purpose of an information model is to model managed objects at a conceptual level, independent of any specific implementations or protocols used to transport the data. … In order to make the overall design as clear as possible, an information model should hide all protocol and implementation details. Another important characteristic of an information model is that it defines relationships between managed objects.
    - RFC3444 - data model
        - Data models, conversely, are defined at a lower level of abstraction and include many details. They are intended for implementers and include protocol-specific constructs.

Background ... (cont.)
Service / Flow / Configuration related models

- Some IETF definitions
  - RFC8309 - Service Model:
    A service model is a specific type of data model. It describes a service and the parameters of the service in a portable way that can be used uniformly and independent of the equipment and operating environment. The service model may be divided into the two following categories:
    - Customer Service Model: A customer service model is used to describe a service as offered or delivered to a customer by a network operator. It can be used by a human (via a user interface such as a GUI, web form, or CLI) or by software to configure or request a service, and may equally be consumed by a human (such as via an order fulfillment system) or by a software component. Such models are sometimes referred to simply as "service models" [RFC8049] ... customer service models are technology agnostic so that the customer does not have influence over or knowledge of how the network operator engineers the service.
    - Service Delivery Model: A service delivery model is used by a network operator to define and manage how a service is engineered in the network. It can be used by a human operator (such as via a management station) or by a software tool to instruct network components. The YANG modules that encode such models are sometimes referred to as "network service YANG modules" [RFC8199] and are consumed by "external systems" such as Operations Support System (OSS). A service delivery module is expressed as a core set of parameters that are common across a network type and technology: additional features that are specific to the configuration of individual vendor equipment or proprietary protocols would be defined in extensions or augmentations of the module. Service delivery modules include technology-specific modules.

Background ... (cont.)
Service / Flow / Configuration related models

- Some IETF definitions
  - RFC8199 - YANG Modules
    - Network Element YANG Modules:
      describe the configuration, state data, operations, and notifications of specific device-centric technologies or features.
    - Network Service YANG Modules:
      describe the configuration, state data, operations, and notifications of abstract representations of services implemented on one or multiple network elements.
    - Note: Network Service YANG Modules describe the characteristics of a service, as agreed upon with consumers of that service. That is, a service module does not expose the detailed configuration parameters of all participating network elements and features but describes an abstract model that allows instances of the service to be decomposed into instance data according to the Network Element YANG Modules of the participating network elements. The service-to-element decomposition is a separate process; the details depend on how the network operator chooses to realize the service.