Instantiation of IETF Network Slices in service providers networks

draft-barguil-teas-network-slices-instantation-06

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IETF#116, Yokohama, March 2023

Context

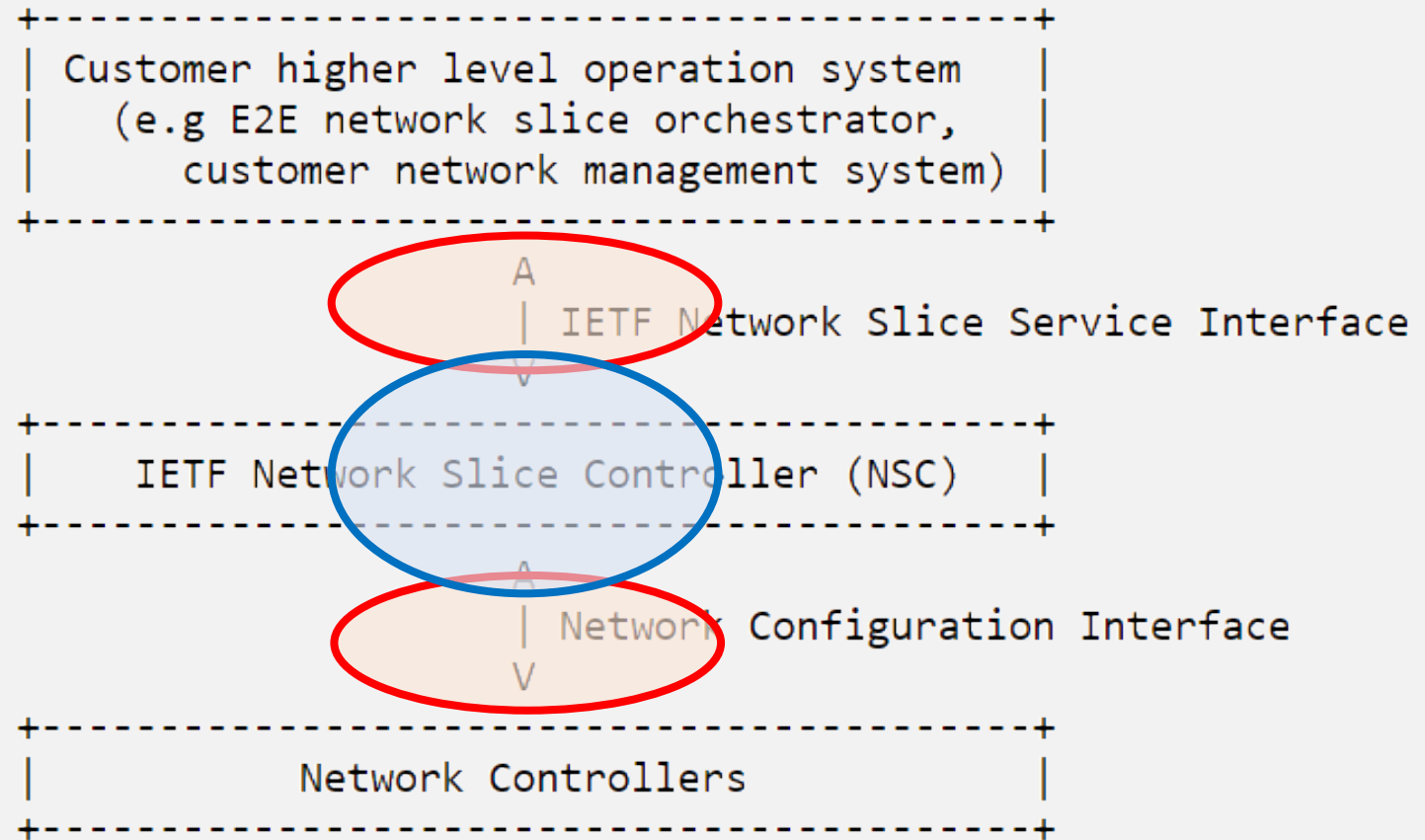[I-D. barguil-teas-network-slices-instantiation]

Scope:

- How NBI Slice YANG model relates to LxSM and LxNM models

[I-D. contreras-teas-slice-controller-models]

Scope:

- How the different slicing models relate each other


```
+---------------------------------------------+
| Customer higher level operation system      |
|    (e.g E2E network slice orchestrator,     |
|       customer network management system)   |
+---------------------------------------------+
                    A
                    |  IETF Network Slice Service Interface
                    V
+---------------------------------------------+
|    IETF Network Slice Controller (NSC)      |
+---------------------------------------------+
                    A
                    |  Network Configuration Interface
                    V
+---------------------------------------------+
|              Network Controllers            |
+---------------------------------------------+
```
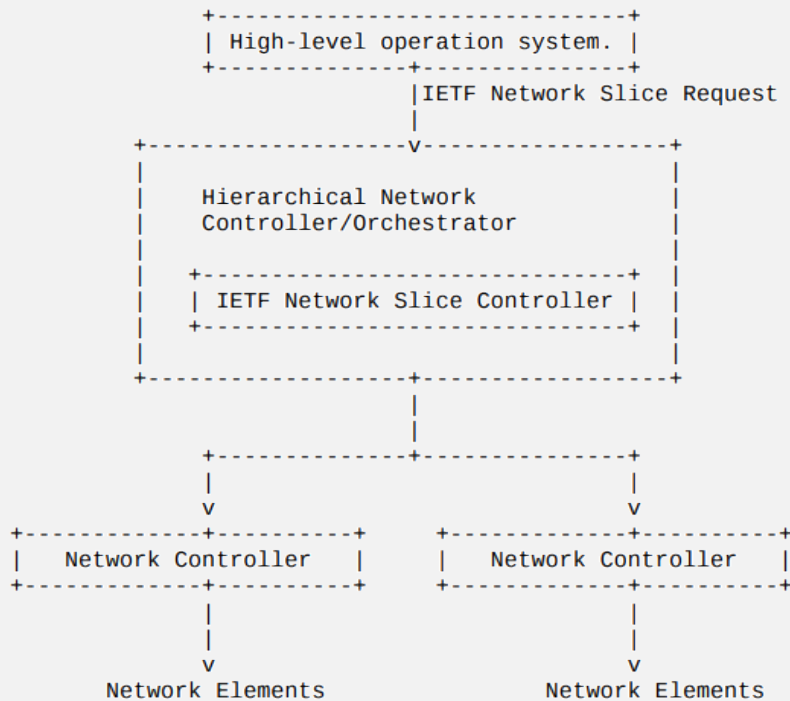
Relationship between models (reminder)

- Based on RFC 8309 models relationship
- Realization of IETF NS service model could be mapped either to a Service model (i.e., LxSM) or to a Network model (i.e., LxNM)
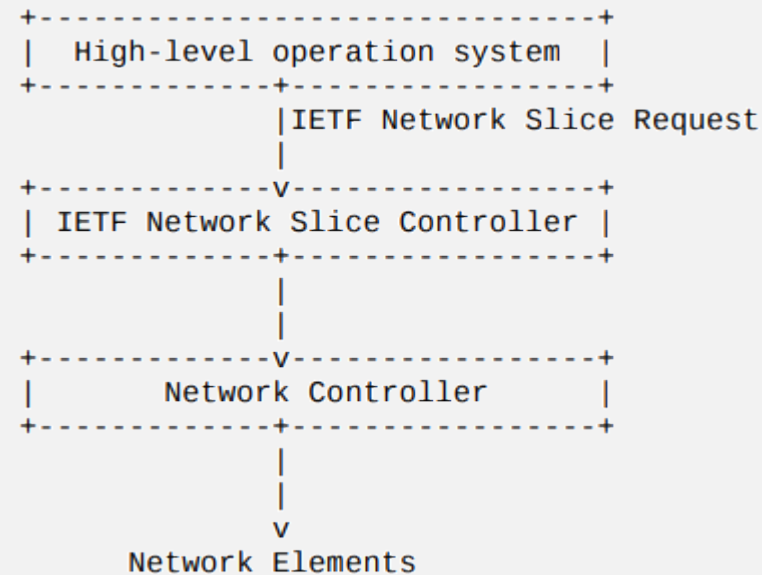
```
                Operations Support and Business Support YANG Modules

        +--------------------------------+    +------------------------+
        |                                |    |                        |
        |       Customer Service         |    |         Other          |
        |        YANG Modules            |    |  Operations Support    |
        |                                |    |         and            |
        |                                |    |   Business Support     |
        |   +------------------+         |    |     YANG Modules       |
        |   |  IETF Network    |         |    |                        |
        |   |  Slice service   |         |    |                        |
        |   |     model        |         |    |                        |
        |   +--------+---+-----+         |    |                        |
        |      (a) |     | (b)  |        |    |                        |
        |          |     +------------+  |    |                        |
        |          V                  |  |    |                        |
        |    _____           |  |    |                        |
        |   / +------+    +------+\    |  |    |                        |
        |   | |      |    |      | |   |  |    |                        |
        |   | | L2SM |    | L3SM | |   |  |    |                        |
        |   | |      |    |      | |   |  |    |                        |
        |   | +------+    +------+ |   |  |    |                        |
        |   |_____/|   |  |    |                        |
        +--------------|-----------+   |  |    +------------------------+
                       |               |  |
      - - - - - - - - -|- - - - - - - -|- |- - - - - - - - - - - - - - -
                       |               |               Network Service YANG Modules
        _____V_____V_____
       /                                                                  \
      / +-----------+    +-----------+    +-----------+    +-----------+ \
      | |           |    |           |    |           |    |           | |
      | | - L2VPN   |    | - L2VPN   |    |   EVPN     |    |   L3VPN   | |
      | | - VPWS    |    | - VPLS    |    |           |    |           | |
      | |           |    |           |    |           |    |           | |
      | +-----------+    +-----------+    +-----------+    +-----------+ |
```

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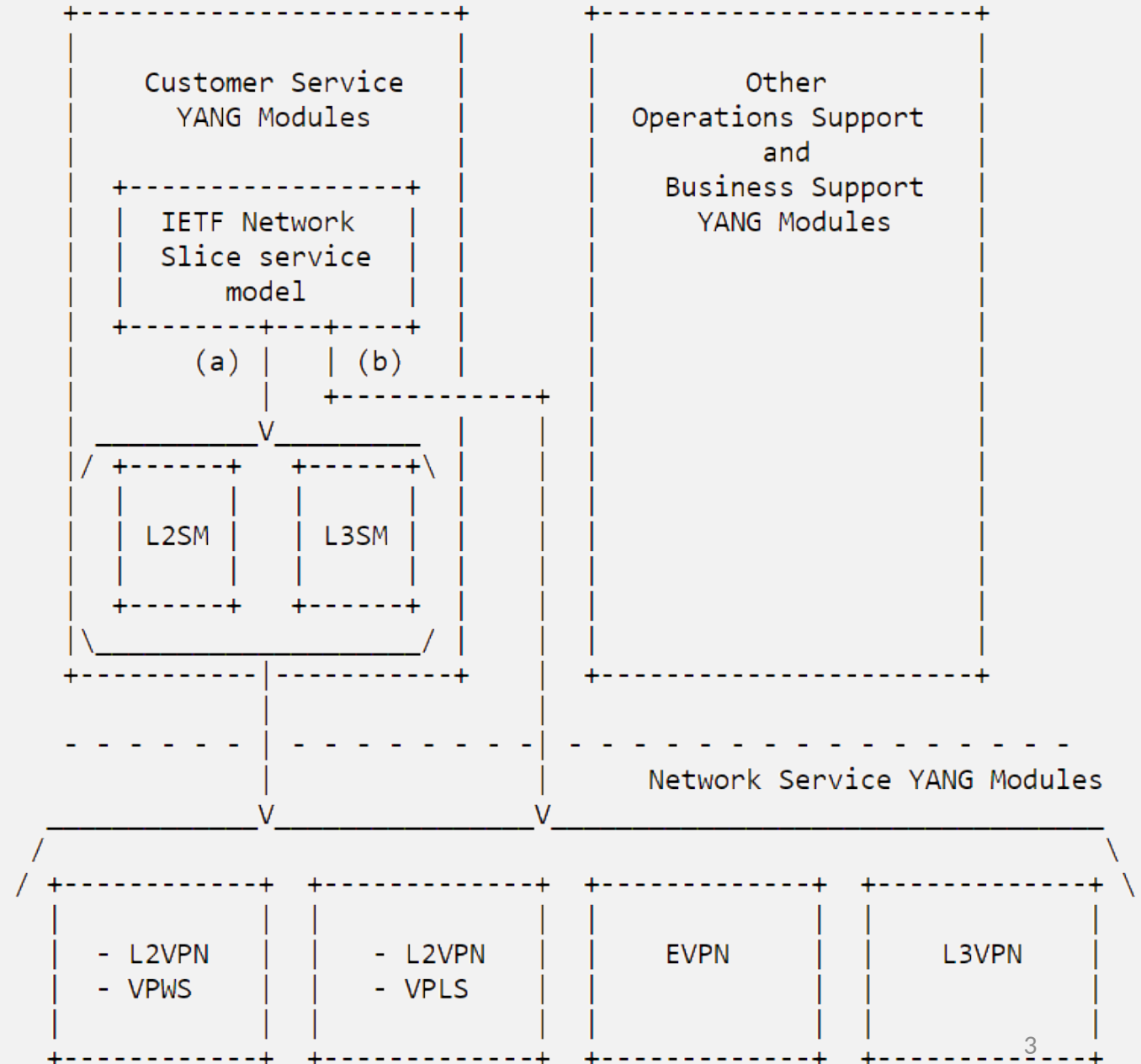
Possible architectural options (reminder)

IETF NSC as a module of the Hierarchical SDN controller

```
+--------------------------------+
| High-level operation system.  |
+-------------+------------------+
              |IETF Network Slice Request
+-------------v------------------+
|                                |
|   Hierarchical Network         |
|   Controller/Orchestrator      |
|                                |
|  +--------------------------+  |
|  | IETF Network Slice Controller |  |
|  +--------------------------+  |
|                                |
+----------------+---------------+
                 |
                 |
     +-----------+----------+
     |                      |
     v                      v
+----------+---------+  +----------+---------+
| Network Controller |  | Network Controller |
+----------+---------+  +----------+---------+
           |                       |
           |                       |
           v                       v
   Network Elements        Network Elements
```

IETF NSC as a stand-alone entity

```
+-----------------------------------+
|  High-level operation system      |
+--------------------+--------------+
                     |IETF Network Slice Request
                     |
+--------------------v--------------+
|  IETF Network Slice Controller    |
+--------------------+--------------+
                     |
                     |
+--------------------v--------------+
|     Network Controller            |
+--------------------+--------------+
                     |
                     |
                     v
          Network Elements
```

IETF NSC as a module of the Network controller

```
+-----------------------------------+
|  High-level operation system      |
+--------------+--------------------+
               |IETF Network Slice Request
               |
+--------------v--------------------+
|     Network Controller            |
|                                   |
|+-------------------------------+| |
|| Network Slice Controller      || |
|+-------------------------------+| |
|                                   |
+--------------+--------------------+
               |
               |
               v
      Network Elements
```

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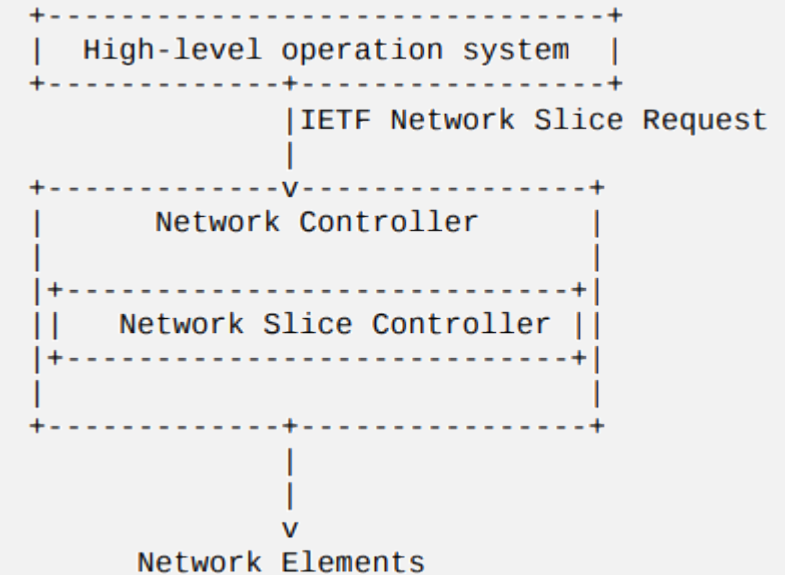
Updates from -05 version

- Text clean-up and editorial pass through document structure
- Daniel as co-author
- Added the analysis of Relationship between IETF NBI model parameters and L3NM and L2NM

Relationship between IETF NBI model parameters and LxNM model parameters

L3NM (RFC 9182)	L2NM (RFC 9291)	IETF NSC NBI YANG model
Bandwidth between CE and PE.	Bandwidth between CE and PE. Different types: per CoS, per VPN network access, per site, etc.	Sum of bandwidth SLO per NSE counting all connections
MTU (layer 3 service)	MTU (layer 2 service and link MTU)	MTU attribute in SLE
QoS - QoS classification policy (based on layer 3 and 4 info) - QoS profile (not defined)	QoS - QoS classification policy (based on layer 2 info) - QoS profile (not defined)	QoS Defined in the model as network-access-qos-policy-name to be applied per access-point Defined in the model as incoming/outgong rate-limits per end-point (or access-point) One-way / Two-way latency SLO One-way / Two-way delay variation SLO One-way / Two-way bandwidth SLO
Multicast	Broadcast, Unknown, Unicast and Multicast (BUM)	The need of replication can be inferred from ns-connectivity-type. Further details are not available (e.g. source or receiver role)
N/A	N/A	Availability as the ratio of up-time to total_time(up-time+down-time)

Next Steps

- Version -07 will provide further updates
  - Alignment with latest version of [I-D.ietf-teas-ietf-network-slice-nbi-yang]
  - Better describe the implications of not full alignment between parameters in NBI slicing YANG model and the ones in LxSM and LxNM
  - (Text clean up is yet needed)

- Pending from -05

  - Evaluation of a new architectural option where a service model is further mapped/realized to a IETF NS service (e.g., to an OTN slice)

- Collect feedback / comments from the WG to enhance the document.