A Network YANG Model for Service Attachment Point (SAP)

O. Gonzalez de Dios (Telefonica)
S. Barguil (Telefonica)
Q. Wu (Huawei)
M. Boucadair (Orange)
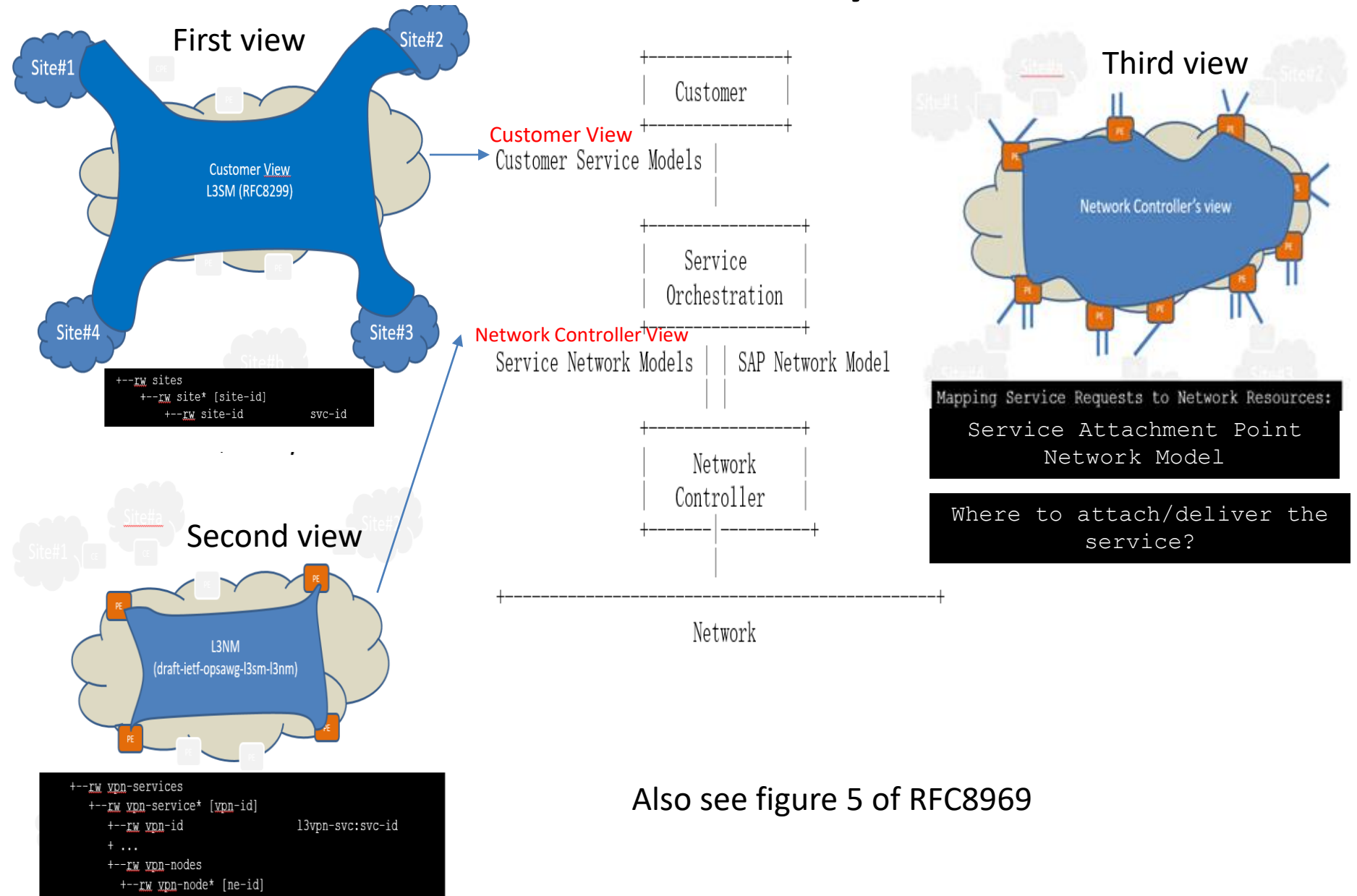Victor Lopez (Nokia)

History & Rationale

- Used to be UNI (User-Network Interface)

- Derived from L3NM and L2NM work
  - Work with L3NM/L2NM to provide closed loop lifecycle management for the VPN service
  - The use case has been documented in OPSAWG Automation Framework (RFC8969)

- Revived the UNI Topology work now that L3NM and L2NM are stable
  - Abandon the UNI terminology: better insist on the I-D focus
  - Create a network topology where to attach network services
  - The services can be delivered to an end customer or to a peer network service provider
  - Renamed to SAP (Service Attachment Points) Network Model to add clarity.

The SAP Approach

- Service Attachment Point (SAP) is a general concept in the deployments of network services: VPN service, SDWAN service, managed VoIP Sservice, network slice servie, etc.
  - Used to decide where to attach and deliver the service (e.g. L3SM and L2SM)

- To support service provision and resource management, the control elements need to exchange information for upper layer control elements (service orchestrators) to
  - Learn the capability and available endpoint(s) of interconnection resource of the underlying network
  - Determine the feasibility of an end-to-end connectivity service and to derive the sequence of domains and the points of interconnection to use

- SAP Network Model is proposed to represent an abstract view of the Service Provider network topology containing the points from which its services can be attached (e.g., basic connectivity, VPN).
  - Network topology model [RFC8345] is augmented with SAP-related attribute.

One Service, Many Views

First view

Customer View
L3SM (RFC8299)

Site#1 Site#2 Site#3 Site#4

```
+--rw sites
   +--rw site* [site-id]
      +--rw site-id          svc-id
```

Second view

L3NM
(draft-ietf-opsawg-l3sm-l3nm)

```
+--rw vpn-services
   +--rw vpn-service* [vpn-id]
      +--rw vpn-id              l3vpn-svc:svc-id
      + ...
      +--rw vpn-nodes
         +--rw vpn-node* [ne-id]
```

```
+----------------+
|   Customer     |
+----------------+
```
Customer View
Customer Service Models

```
+----------------+
|    Service     |
|  Orchestration |
+----------------+
```
Network Controller View
Service Network Models | | SAP Network Model
                       | |

```
+----------------+
|    Network     |
|   Controller   |
+-------|--------+
```

```
+-----------------------------------------+
```
Network

Third view

Network Controller's view

Mapping Service Requests to Network Resources:
Service Attachment Point
Network Model

Where to attach/deliver the service?

Also see figure 5 of RFC8969

4

SAP-Augmented Network Model (1)

- Augments the ietf-network model with service-attachment-points

```
module: ietf-sap-ntw
    augment /nw:networks/nw:network/nw:network-types:
      +--rw sap-network!
        +--rw sap-type* identityref

    augment /nw:networks/nw:network/nw:node:
      +--rw service-attachment-point* [attachment-id]
        +--rw attachm...
        +--rw type...
        +--rw admi...
        +--rw oper-sta...
        +--rw encapsulation-type?   identityref
        +--rw sap-type*             identityref
        +--rw service-description
```

- Add a new network topology type
- Indicate the service type(s) that are bound to this topology

SAP-Augmented Network Model (2)

- Augments the ietf-network model with
  service-attachment point

```
module: ietf-
    augment
      +--rw sa
        +--rw sap

    augment /nw:networks/nw:network/nw:node:
      +--rw service-attachment-point* [attachment-id]
        +--rw attachment-id          nt:tp-id
        +--rw type?                  identityref
        +--rw admin-status?          boolean
        +--rw oper-status?           boolean
        +--rw encapsulation-type?    identityref
        +--rw sap-type*              identityref
        +--rw service-description?   string
```

- Inventory of nodes and the SAPs
- A SAP may be used for one or multiple service types
- A SAP may be already servicing a customer or is ready for service activation

A Simple Example of SAP Network Model: Node Filter
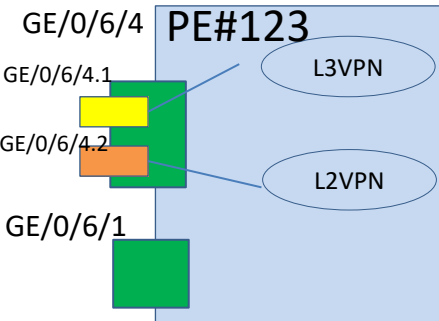
RESPONSE from RESTCONF Server

GET
/nw:networks/nw:network/nw:node/sap:servi
ce-attachment-point
Host:example.com
Accept: application/yang-data+json

Service Orchestration

Capability
Query

Network Controller

GE/0/6/4   PE#123

GE/0/6/4.1   L3VPN

GE/0/6/4.2   L2VPN

GE/0/6/1

Two Physical interface: GE0/6/1,GE0/6/4
Two sub-interfaces of GE0/6/4
  GE0/6/4.1,GE0/6/4.2

```
{
  "ietf-sap-ntw:service-attachment-point": [
    {
      "attachment-id": "GE0/6/1",
      "type": "if:gigabitEthernet",
      "admin-status": "false",
      "operation-status": "false",
      "encapsulation-type": "ethernet",
      "sap-type": [],
      "service-description":"No service enabled via GE0/6/1."
    }
  ],
  "ietf-sap-ntw:service-attachment-point": [
    {
      "attachment-id": "GE0/6/4",
      "type": "if:gigabitEthernet",
      "admin-status": "true",
      "operation-status": "true",
      "encapsulation-type": "ethernet",
      "sap-type": [l3vpn,l2vpn],
      "service-description":"Enable L3VPN service, L2VPN service via GE0/6/4"
    }
  ],
  "ietf-sap-ntw:service-attachment-point": [
    {
      "attachment-id": "GE0/6/4.1",
      "type": "if:Ether-sub-interface",
      "admin-status": "true",
      "operation-status": "true",
      "encapsulation-type": "vlan",
      "sap-type": [l3vpn,l2vpn],
      "service-description":"L3VPN service has been activated via GE0/6/4.1"
    }
  ],
  "ietf-sap-ntw:service-attachment-point": [
    {
      "attachment-id": "GE0/6/4.2",
      "type": "if:Ether-sub-interface",
      "admin-status": "true",
      "operation-status": "true",
      "encapsulation-type": "vlan",
      "sap-type": [l3vpn,l2vpn],
      "service-description":"L2VPN service has been deactivated via GE0/6/4.2"
    }
  ]
}
```

Next Steps

- Request WG adoption call

- Comments & Question are welcome

Appendix

Relation with other Models

```
+-------------------------+
|                         |
|  Abstract Network Model |
|                         |
+-----------+-------------+
            |
    +-------+-------+
    |               |
+---V---+       +---V----+
|Abstract|      |Inventory|
|Network |      |Model(s) |
|Topology|      |e.g.,SAP |
|Model   |      |Network  |
|        |      |Model    |
+---+----+      +----+----+
    |
 +------------+------------+
 |            |            |
+--V---+  +--V---+  +--V---+
|TE Topo| |L3 Topo| |L2 Topo|
| Model | | Model | | Model | ...
+-------+  +-------+  +-------+
```
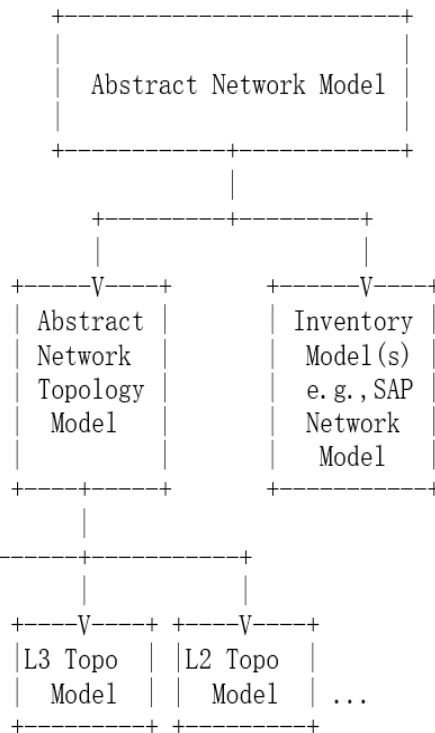
Figure 6: Relation of SAP Network Model to Other Models

service-attachment-point   Termination-point

- SAP Network model can be seen as *an inventory data* associated with service attachments (e.g., PE nodes)
  - It maintains an inventory of nodes contained in a network based on RFC8345. For design choice, See quoted text in RFC8345: "Although it would be possible to combine both parts into a single data model, the separation facilitates integration of network topology and network inventory data models, because it allows network inventory information to be augmented separately, and without concern for topology, into the network data model."

- There is no overlapping with TE topo model
  - TE topo model augments from Network topology while SAP Network model augments from Network model and import Network Topo Model
  - 'service-attachment-point' defined in SAP Network model is *not a 'ttp' nor a link but abstraction of termination point defined in RFC8345*
  - 'service-attachment-point' defined in SAP Network model is related to CE facing interface of PE rather than network facing interface of PE