A YANG Data Module for Network Virtualization Overlay Resource Management

draft-wu-opsawg-network-overlay-resource-model-00

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Why this draft?

- Goal:
  - Define Resource facing model for resource management (network reoptimization, path selection, binding between the service and the path)
  - Work together with Customer facing model to provide service creation, service provision, service monitor and assurance.
- Motivation:
  - L3SM service model specified in RFC8022 is only designed for connectivity Service creation
  - L3SM service model doesn't support operations such as exposing abstract service topology to e.g., operators themselves, retrieving, and allocating the relevant topology resource information.
  - The resource facing model is translated and instantiated from L3SM service and replace location and constraint information with determined access point information.

Why Customer Service model and Network Element model are not enough?

Top down view of Network Service (Service Abstraction)

L0 service
L1 Service
L2 Service
L3 Service :L3SM model (L3VPN Sevice Model)
L4-L7 Service, SFC service : I2NSF customer facing model
Security Service: Dots data channel and signaling channel model
Application Service
Other new service

Bottom up view of Network Resource(Resource abstraction)

Network Topology (link, node)

L2 Topo, L3 Topo, TE Topology, SR TE topo, L3 TE topo, OTN topo

TE Tunnel, VXLAN Tunnel

Network performance, Warning

OAM (BFD, LIME, MPLS OAM,etc)

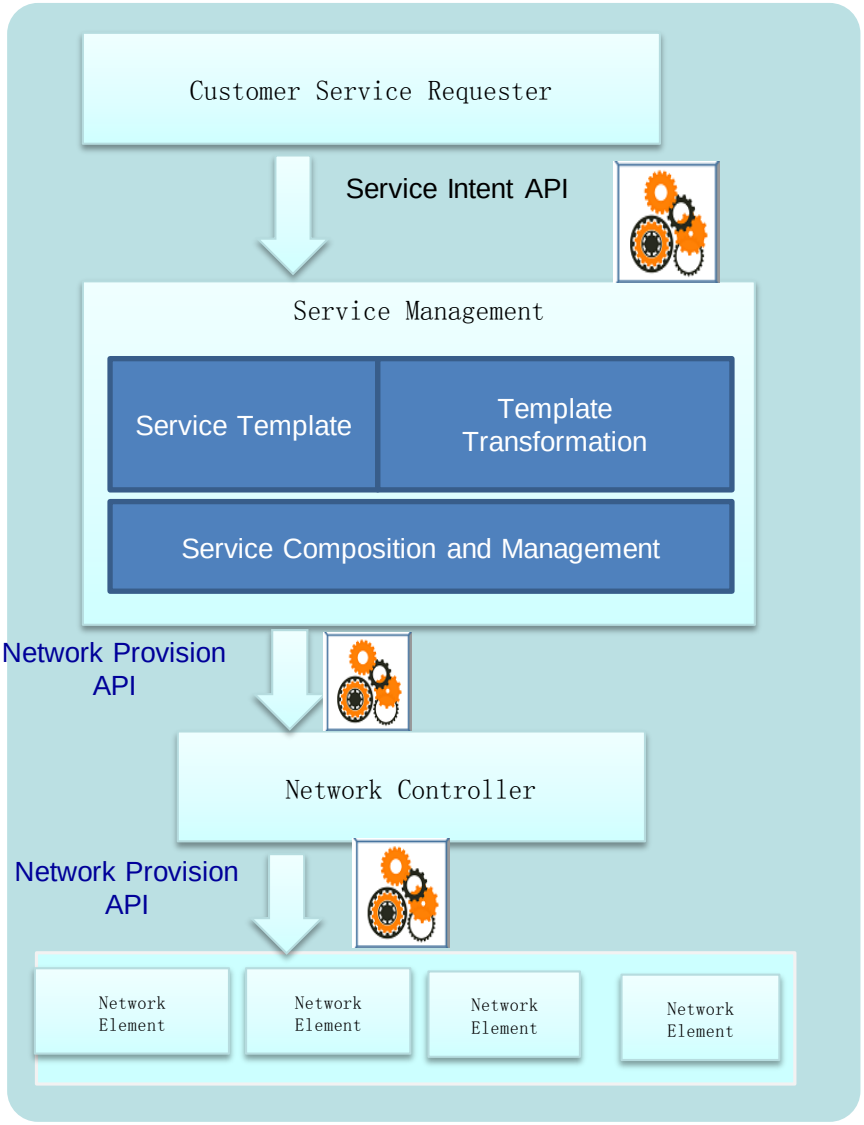
ACL,,QoSPolicy, Routing Policy

BGP, OSPF, RIP, VRRP, Core Routing, PCEP, LDP, LMAP, TWAMP, etc.

MPLS, etc.

Network Instance model, Logical Network Element model (allow partition host device resource)

Why Customer Service model and Network Element model are not enough?



■ **Top down models(Service Intent API):**

- Independent of technology and vendor
- Specify what customer wants, but not how to implement it, using business-friendly concepts
- Model Driven Service API, e.g., IETF L3SM model

Service Mapping

■**Bottom up models**

■**Network Element model**

- Technology specific model, specify how to realize the service

Questions:

■How do we expose network resource to operators themselves?

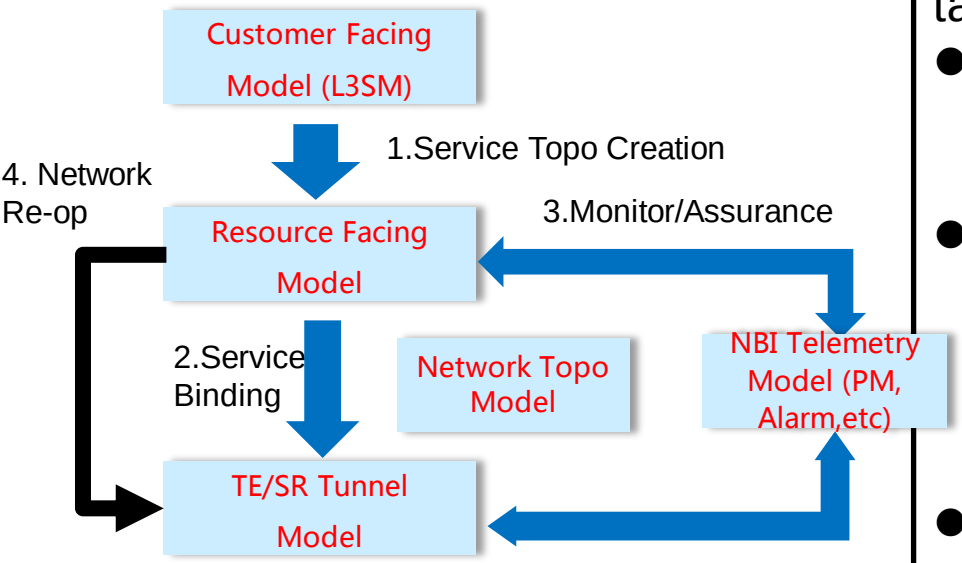
■How do we monitor network state and provide service assurance?

Approaches:

a. Extend L3SM model to support resource exposure and monitor/assurance?

b. Have a separate model translated from L3Sm to support?

What does the draft do?



Define Resource facing model to provide automated, agile, orchestrated VPN service. It is translated from Customer facing model(e.g., L3SM).

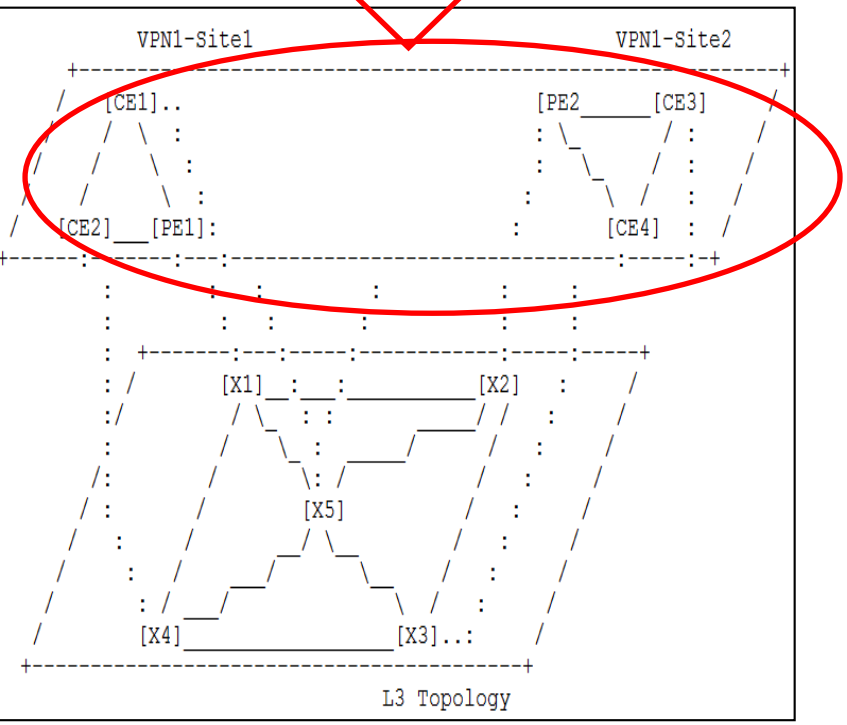
Resource facing model fulfills the following task:

- **Service Topo creation Phase**
  - ➢ Select network access attachment point
- **Service binding phase**
  - ➢ Calculate Select path for each service flow
  - ➢Setup path for each service flow

- **Monitor/Assurance Phase (to be extended)**
  - PM alarm reporting based on topo and Tunnel model
- **Network-Reoptimization Phase** (to be extended)

Service Topo Creation

```
+--rw vn-rsc
   +--rw vn-services
      +--rw vn-service* [vn-id]
         +--rw vn-id                      svc-id
         +--rw customer-name?             string
         +--rw service-topology?          identityref
         +--rw site-network-accesses
            +--rw site-network-access* [site-network-access-id]
               +--rw site-network-access-id    svc-id
               +--rw ingress-device-id         svc-id
               +--rw egress-device-id          svc-id
```

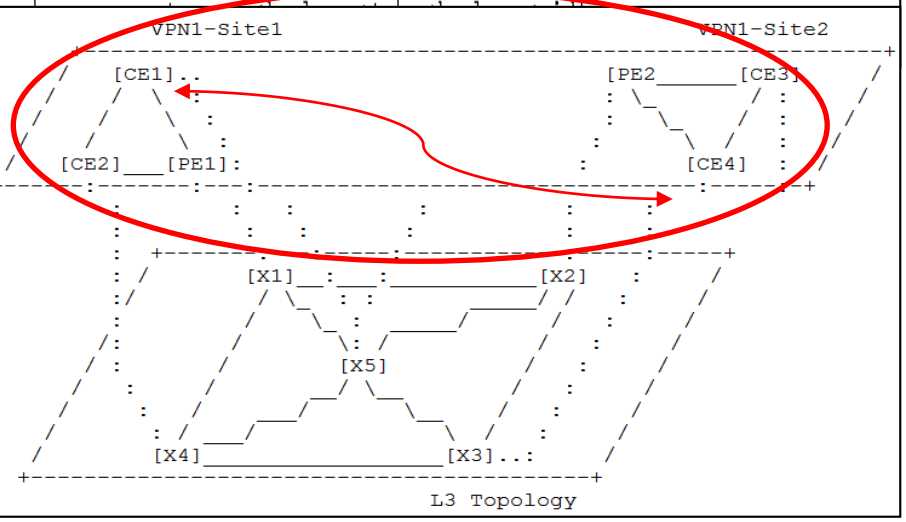


- For each "site-network-access", the ingress device(e.g., CE1) and egress device (e.g.PE1) will be selected to connect to the provider network based on location and constraint parameter defined in L3SM model.

- With selected ingress device and egress device and VN membership, VN service topology can be constructed.
  - Resource (e.g., bandwidth resource, path resource) for Site to Site connectivity or connectivity within site can be further allocated based on this VN service topology.

Binding between Service and Path

```
rpcs:
  +---x vn-path-element-compute
  |  +---w input
  |  |  +---w vn-member-list* [vn-member-id]
  |  |     +---w vn-member-id          -> /vn-svc/vn-services/vn-service/vn-id
  |  |     +---w source-access         svc-id
  |  |     +---w dstination-access     svc-id
  |  |     +---w constraint
  |  |     |  +---w path-element* [path-element-id]
  |  |     |     +---w path-element-id
  |  |     |     +---w address?
  |  |     +---w objective-function?   identityref
  |  |     +---w metric* [metric-type]
  |  |        +---w metric-type     identityref
  |  |        +---w metric-value?   uint32
  |  +--ro output
  |     +--ro vn-member-list* [vn-member-id]
  |        +--ro vn-member-id    -> /vn-svc/vn-services/vn-service/vn-id
  |        +--ro metric* [metric-type]
  |        |  +--ro metric-type     identityref
  |        |  +--ro metric-value?   uint32
  |        +--ro path
```



- Calculate end to end path for each service flow between any two site in the VPN or through network-access connectivity within site based on QoS parameters(e.g., delay, bandwidth) allocated to each service flow.
- Select path for each service flow
- Setup path and establish the binding between the service and path.

Service Monitor and Assurance

```
module: ietf-vn-rsc
   +--rw site-network-accesses
     +--rw site-network-access* [site-network-access-id]
      +--rw site-network-access-id   leafref
      +--rw service
       | +--rw svc-input-bandwidth?  uint32
       | +--rw svc-output-bandwidth?  uint32
       | +--rw svc-mtu?        uint16
       | +--rw qos {qos}?
       | | +--rw qos-classification-policy
       | | | +--rw rule* [id]
       | | |    +--rw id           uint16
       | | |    +--rw (match-type)?
       | | |    | +--:(match-flow)
       | | |    | | +--rw match-flow
       | | |    | |    ...
       | | |    | +--:(match-application)
       | | |    |    +--rw match-application?  identityref
       | | |    +--rw target-class-id?   string
       | | +--rw qos-profile
       | |    +--rw (qos-profile)?
       | |     +--:(standard)
       | |     | +--rw profile?  string
       | |     +--:(custom)
       | |       +--rw classes {qos-custom}?
       | |        +--rw class* [class-id]
```

- Per-Site network access traffic performance measurement parameters are indexed by the key site-network-access-id and **can be not only used by customer to describe service requirements but also used by operator to report network performance**:
  - Upload bandwidth and download bandwidth are performance parameters associated each domain-network-access.
  - Latency, jitter, and bandwidth utilization are performance requirements associated with each service flow or application.

```
module: ietf-vn-rsc
+--rw sites
  +--rw site* [site-id]
   +--rw site-id          svc-id
   +--rw service
    | +--rw qos {qos}?
    | | +--rw qos-classification-policy
    | | | +--rw rule* [id]
    | | |    +--rw id           uint16
    | | |    +--rw (match-type)?
    | | |    | +--:(match-flow)
    | | |    | | +--rw match-flow
    | | |    | |    +--rw target-sites*     svc-id
    | | |    +--rw target-class-id?   string
    | | +--rw qos-profile
    | |    +--rw (qos-profile)?
    | |     +--:(standard)
    | |     | +--rw profile?  string
    | |     +--:(custom)
    | |       +--rw classes {qos-custom}?
    | |        +--rw class* [class-id]
    | |          +--rw class-id   string
    | |          +--rw rate-limit?  uint8
    | |          +--rw latency
    | |          | +--rw (flavor)?
    | |          |    ...
    | |          +--rw jitter
    | |          | +--rw (flavor)?
    | |          |    ...
    | |          +--rw bandwidth
```

- site-to-site network performance parameters are indexed by the key site-id and target-site and **can be not only used by customer to describe service requirements but also used by operator to report network performance.**
  - Site to site network access QoS requirements are applied to end to end network connectivity
  - Latency, jitter, and bandwidth utilization are performance requirements associated with each service flow or application

Q&A

THANK YOU