Framework for Automating Service and Network Management with YANG

draft-wu-model-driven-management-virtualization-02

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Objectives of the Draft

Goal:

- Provide a framework that discusses the architecture for service and network management automation
- Discuss top to bottom service delivery using coordinated YANG models
- Investigate an applicability of YANG data model to automation of virtualized network service

Motivation:

• The large number of data models including configuration models and service models developed or under development in IETF covering much of networking protocols and techniques.

- More and more get published since last IETF meeting and mature enough

• These models standardization is scattered around different WG, hard for operators to Decide which models fit into their use cases(e.g.,DCN or DCI).

•How these models work together to fully configure a device, or manage a set of devices involved in a service aren't developed yet in IETF.

Data Model Layering and Representation

YANG Model Classification described in RFC8199

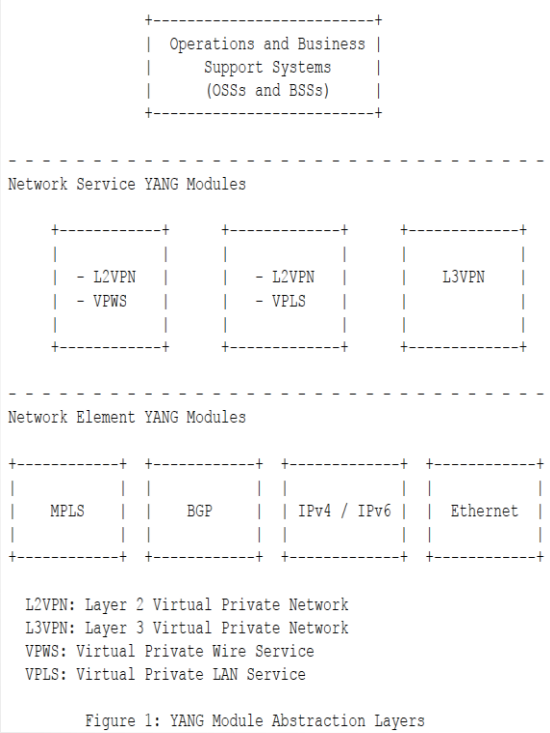
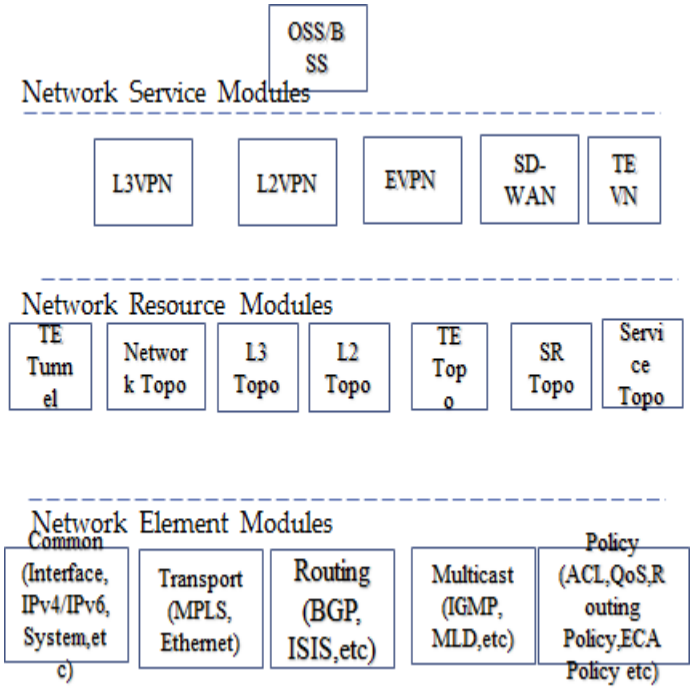


Figure 1: YANG Module Abstraction Layers

YANG Model Classification described in this document



House Consumer

House Building Blueprint

Electricity

Water Supply

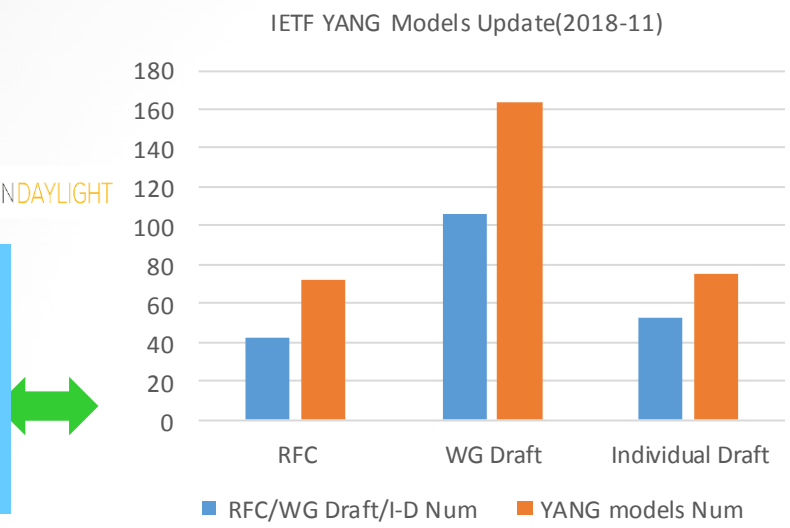
Trenc

House building Block

House building Foundation

Observation: policy related model, especially technology independent policy model make slow progress.

IETF NETCONF YANG Update



OPENCONFIG OPENDAYLIGHT

NMDA, YANG Push BGP, Routing Policy Consolidated MPLS, Device Model, Network Instance model, Logical Network Element Model

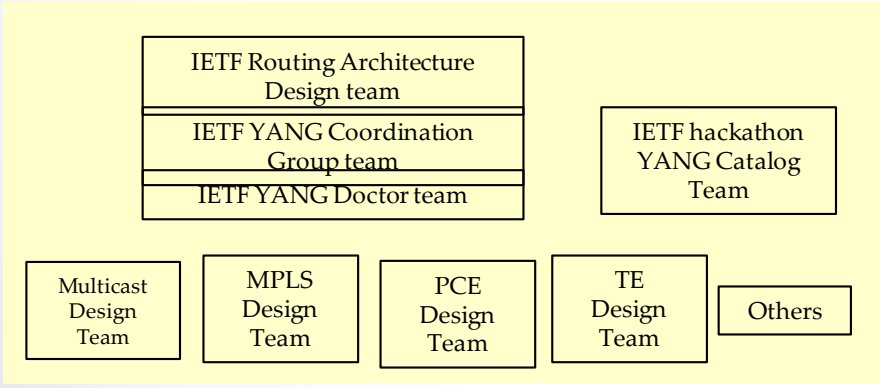
3GPP A GLOBAL INITIATIVE — 5G Transport Network Slicing Management

broadband forum — IPFIX,Common YANG, BBF YANG tool

MEF — IP Service, EVC Service, Optical Service,SD-WAN Service definition

IEEE — Common Interface, Sub-interface

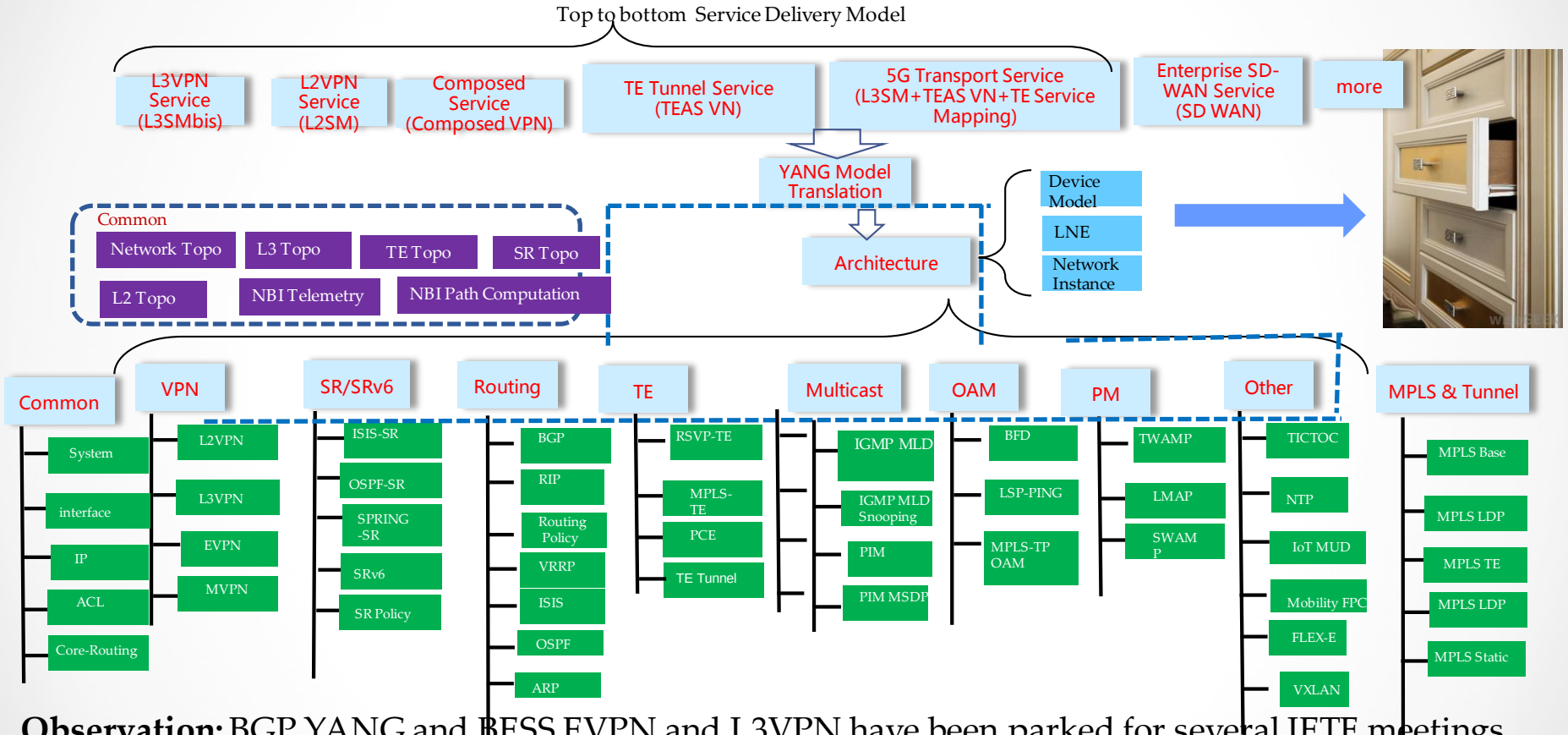
ONUG — SD-WAN YANG model



Summary：

1. Most of YANG models are standardized in IETF Routing area and applicable to SDN SBI. YANG models are distributed in several WGs in OPS and RTG area.
2. Until now, more than 106 YANG model WG drafts and around 80 Individual drafts are produced, 42 YANG model RFCs get published, YANG Pub/Sub/telemetry are ready for publication process, NMDA NC/RC will be published soon.
3. Getting input from Openconfig and ODL, have coordination with BBF,MEF, IEEE, ONUG.

IETF YANG Model Standardization Overview

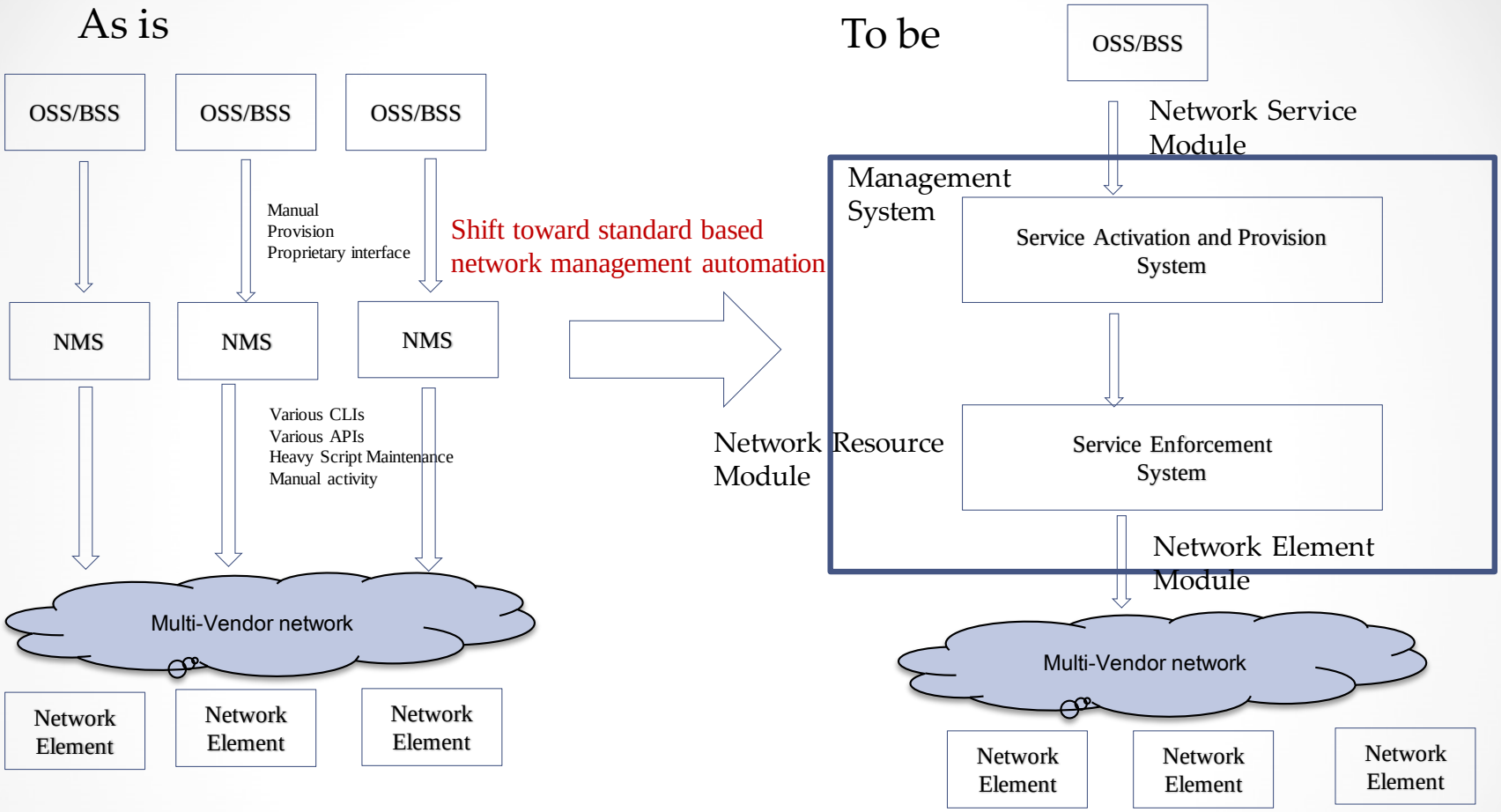


Observation: BGP YANG and BESS EVPN and L3VPN have been parked for several IETF meetings without progress However, they are crucial to many service?

Issues to be addressed:

IETF YANG is not use case driven and scattered in different protocol WG for standardization, therefore hard to track of maturity of YANG Model pertaining to specific use case.

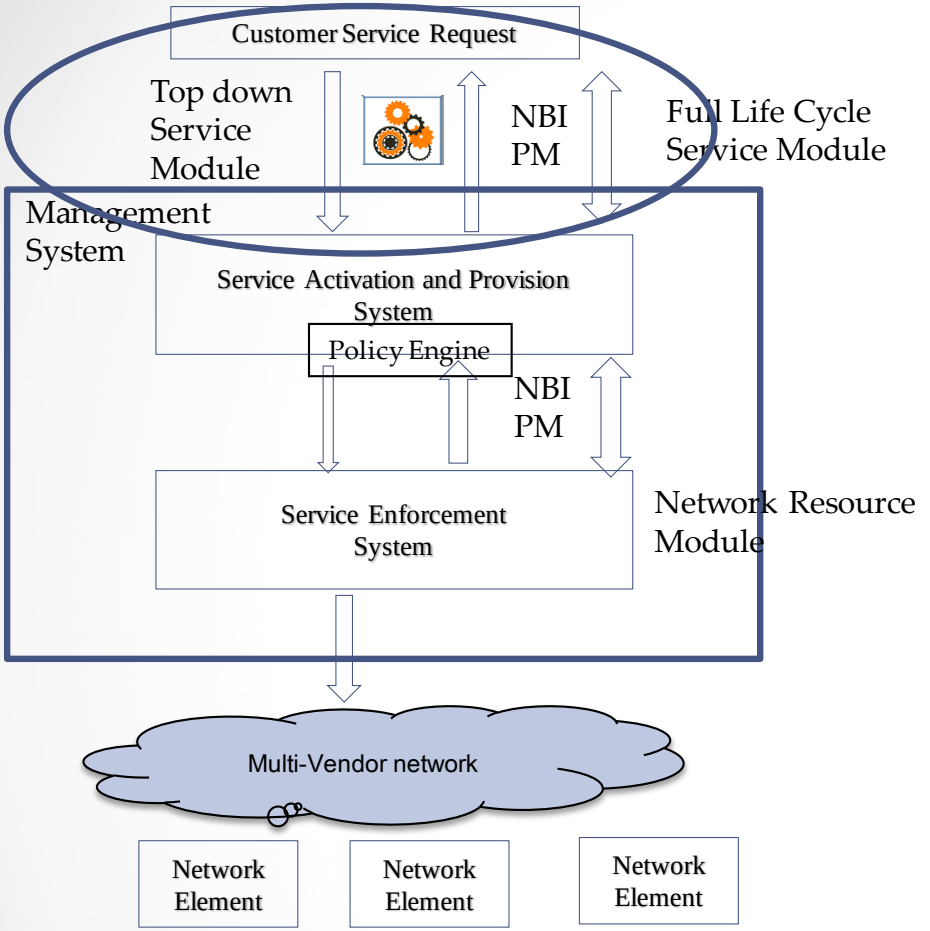
Service and Network management Evolving

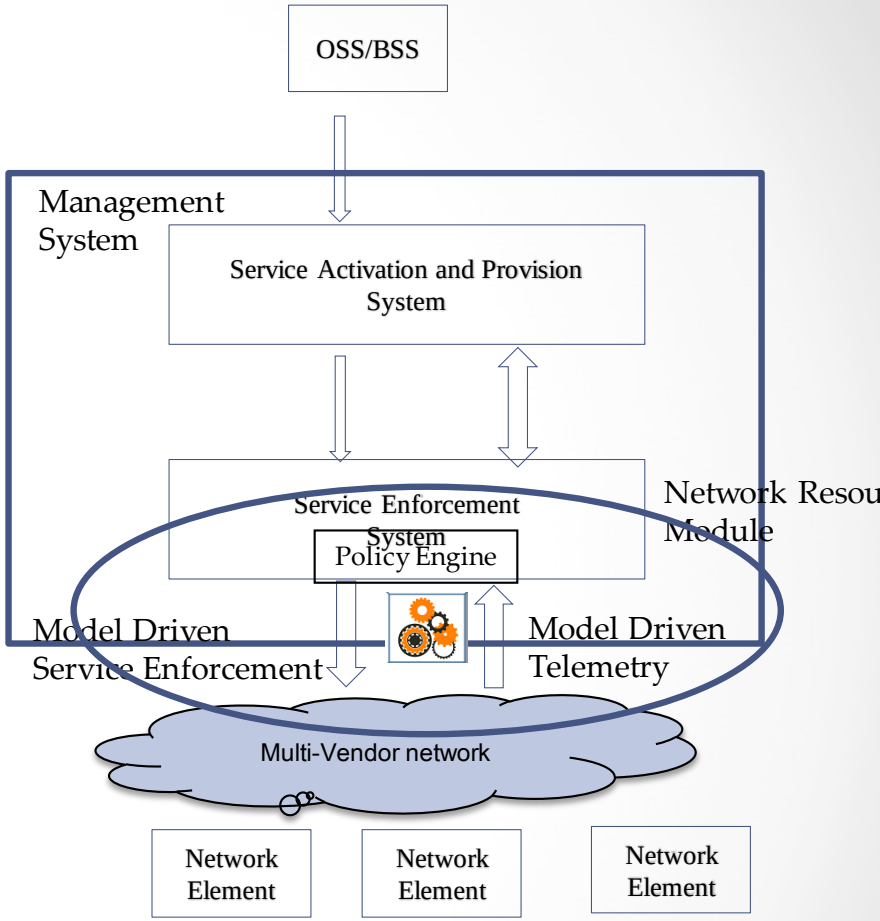


- Traditional Service Delivery
  - Preconfigured with customer service requirements and has slow response to customer needs
  - Vendor specific tools, CLI, manual activity and therefore has slow response to network changes

- Modern Service Delivery
  - Separate service definition from how the service is realized and drive service innovation faster
  - Decouple Service activation and provision from Service Enforcement

Service management automation vs Network Management Automation

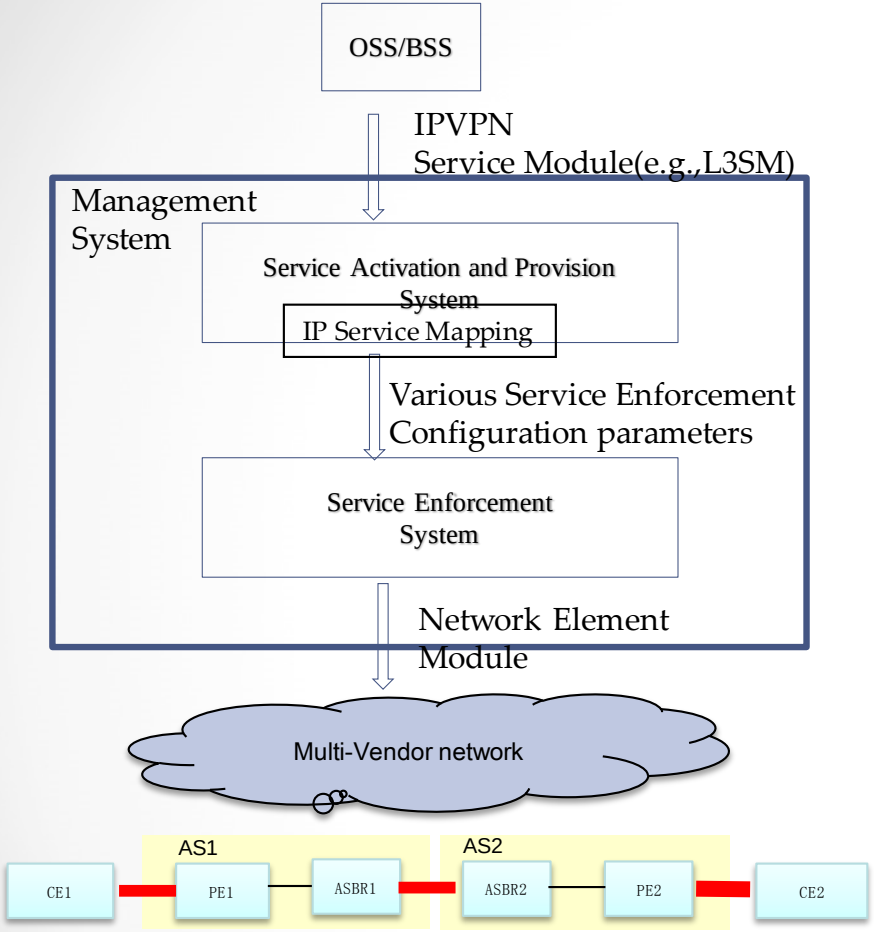


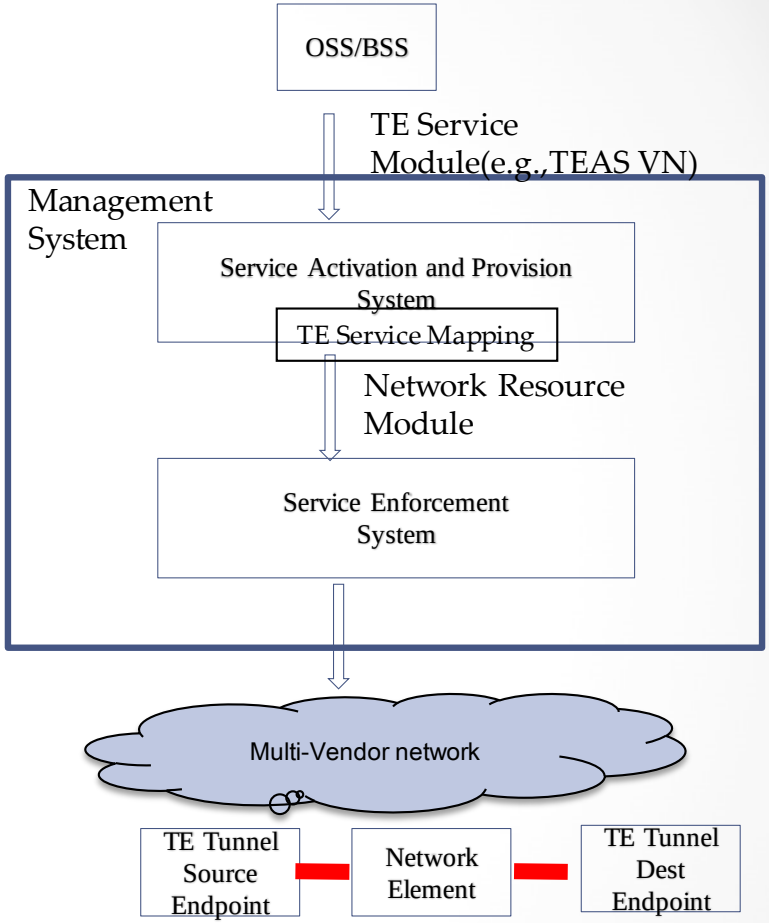


- Northbound Service management Automation
  - Provide full life cycle Service management
    - Top down service request module + NBI Telemetry module +NBI alarm module +ECA Policy module

- Southbound Network management Automation
  - Provide full life cycle of network management and device management
    - Device module for service enforcement+ Device module for Telemetry data + ECA Policy module

End to End Service Delivery and Enforcement: IP Service Mapping vs TE Service Mapping





- IP Service Mapping
  - Site Location, Network Access,Svc QoS(bandwidth, Delay, Jitter) per connectivity(PE-CE, ASBR-ASBR),
  - BGP, VRF, ACL, Multicast, NAT, ISIS, OSPF,

- TE Service Mapping
  - VPN(VPN-id), Network Access(Network Access-id)
  - VN (vn-id,src,dest, connectivity-matrix)Access Point(Access-point-id)
  - TE Topo (TE-Topo-id)
  - TE Tunnel list

Take away

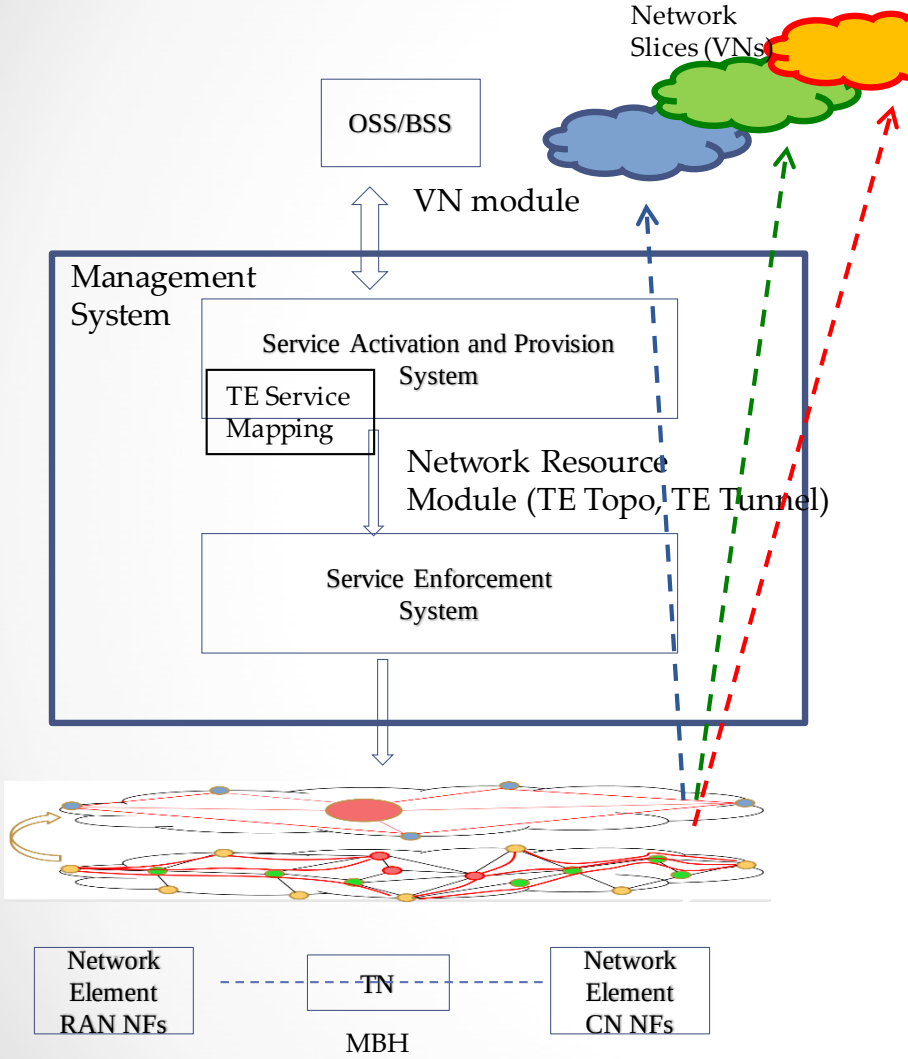
- **IETF process is slow**
  - Some of IETF YANG data model needs more attention from IETF community and operator community such as BGP model, BESS L3VPN, EVPN model, ECA Policy model, QoS model, etc.
- **Create YANG standards for protocols and data modeling that meet all relevant network operator requirements**
  - Conduct Survey on operator model selection and main automation use case
  - Operator design team should be established to drive typical use case for IETF model deployment.
  - Adopt YANG Catalog tool, increase operator visibility to IETF YANG maturity and a variety of application developed by vendor, user, open source project
  - IETF YANG model standardization should be changed into use case driven or project driven:
  - YANG data model list for typical use case should be provide as a reference.
- **Top to bottom service delivery using coordinated YANG models**
  - Framework for management automation should be specified to provide usage guideline for developer, implementer, operator to make a fully integrated YANG-based system.
- **It is time for operators to deploy these IETF models now**
  - Implement a single network element model is not sufficient, top down service delivery require implementing a set of Network elements modules
  - Report implementation issues back to IETF YANG model github

Q&A

Or talk to us on the mailing list

THANK YOU

Applicability of YANG data model to automation of virtualized network service



Network as a Service
Legend:
MBH: Mobile Backhaul CN: Core Network
TN: Transport Network RAN: Radio Access Network

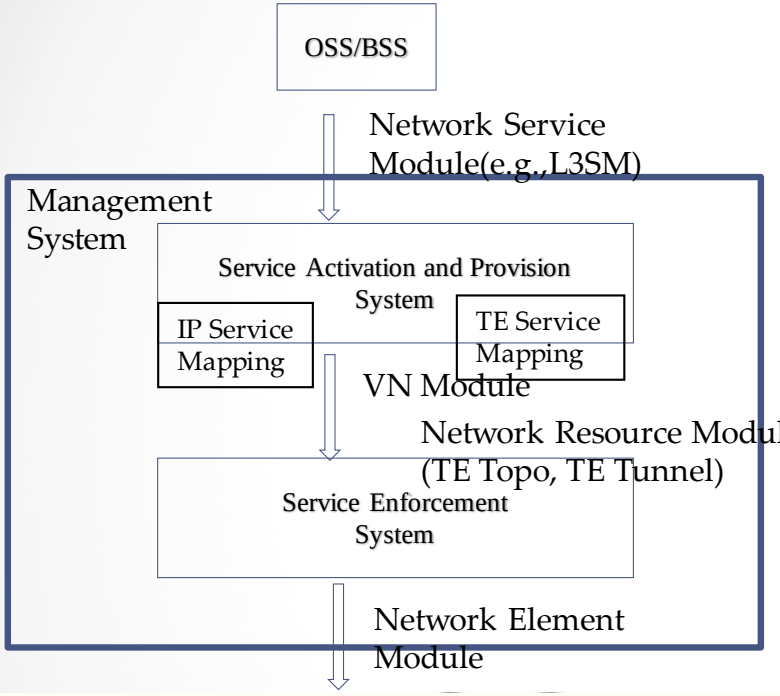
Pre-provision VN: Pre-provision multiple VNs on top of the same basic network infrastructure based on pre-configured service

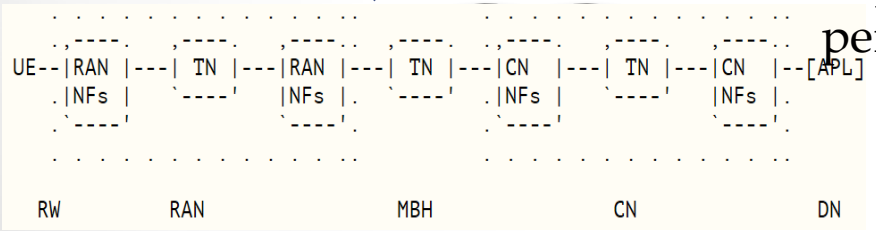
VN Selection: Customer Selects and uses one which fulfills most its requirement among the service templates.

TE Service Mapping:

TE Service assurance and Monitoring:

Applicability of YANG data model to automation of IPVPN+TE tunnel service





1. **Customer Service Request:** Request to create two sites based on L3SM Service model

2. **IP Service Mapping:** Translate L3SM service model into PE configuration and CE configuration(such as BGP, QoS, Multicast, NAT,etc)

3: **TE Service Mapping:** Translate L3SM service model into TEAS VN model and TE Tunnel model

4. IP Servce &**TE Service assurance:** Expose TE Tunnel performance and VPN performance.

Legend:
MBH: Mobile Backhaul CN: Core Network
TN: Transport Network RAN: Radio Access Network

Related Work

- RFC8199 discusses YANG model classification.
  - Define a set of concepts and associated terms to support consistent classification of YANG modules
- RFC8299 defines L3VPN service model
  - provide an example of the translation of service provisioning requests to router configuration lines.
- RFC8528 defines schema mount mechanism
  - allows for mounting one data model consisting of any number of YANG modules at a specified location of another (parent) schema.
- draft-clacla-netmod-model-catalog-03
- draft-openconfig-netmod-model-catalog-02
  - a YANG model catalog and registry that allows users to find models relevant to their use cases
  - define bundles of YANG modules required to realize a particular service or function.
- [draft-arkko-arch-virtualization-01]provides a summary of IETF technologies that relate to network virtualization

Data Model Representation

House Consumer

Network Service Modules

L3VPN | L2VPN | EVPN | SD-WAN | TE VN

House Building Blueprint

Network Resource Modules

TE Tunnel | Network Topo | L3 Topo | L2 Topo | TE Topo | SR Topo | Service Topo

Electricity

Water Supply

Trench for sewerage

House building Block

Network Element Modules

Common (Interface, IPv4/IPv6, System,etc) | Transport (MPLS, Ethernet) | Routing (BGP, ISIS,etc) | Multicast (IGMP, MLD,etc) | Policy (ACL,QoS,Routing Policy,etc)

House building Foundation