What is the Next Step for IETF YANG?

IETF 105, Montreal

Time: 8:30am Tuesday 23 July

Room: Notre Dame

Note Well

This is a reminder of IETF policies in effect on various topics such as patents or code of conduct. It is only meant to point you in the right direction. Exceptions may apply. The IETF's patent policy and the definition of an IETF "contribution" and "participation" are set forth in BCP 79; please read it carefully.

As a reminder:

- By participating in the IETF, you agree to follow IETF processes and policies.
- If you are aware that any IETF contribution is covered by patents or patent applications that are owned or controlled by you or your sponsor, you must disclose that fact, or not participate in the discussion.
- As a participant in or attendee to any IETF activity you acknowledge that written, audio, video, and photographic records of meetings may be made public.
- Personal information that you provide to IETF will be handled in accordance with the IETF Privacy Statement.
- As a participant or attendee, you agree to work respectfully with other participants; please contact the ombudsteam (https://www.ietf.org/contact/ombudsteam/) if you have questions or concerns about this.

Definitive information is in the documents listed below and other IETF BCPs. For advice, please talk to WG chairs or ADs:

- BCP 9 (Internet Standards Process)
- BCP 25 (Working Group processes)
- BCP 25 (Anti-Harassment Procedures)
- BCP 54 (Code of Conduct)
- BCP 78 (Copyright)
- BCP 79 (Patents, Participation)
- https://www.ietf.org/privacy-policy/ (Privacy Policy)

Welcome to YANG Side meeting

- Coordinator
  - Geng Liang (China Mobile)
- Note Well
- Signing sheets
- Minutes:
  - Minutes Taker
- Material Slides:
  - https://github.com/xx/xx

Agenda

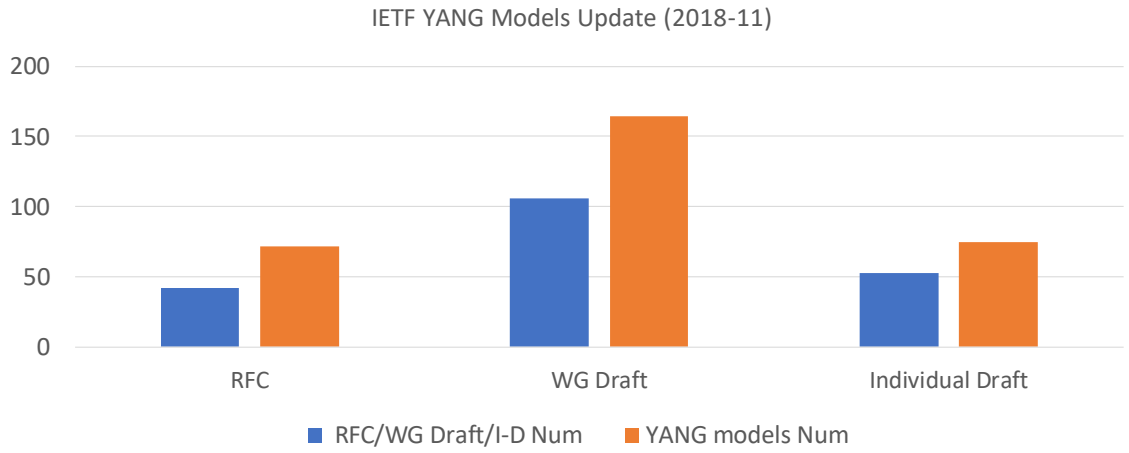
1. YANG Model Status Update, Problem statement. (GengLiang 10 minutes)
2. What have already been done for IETF YANG. (Qin Wu 20 minutes)
   - YANG Catalog Project Update in IETF
   - YANG Data model Interconnection Framework Development in IETF
   - China YANG Round Table meeting Update (Reach out to China Operator Community)

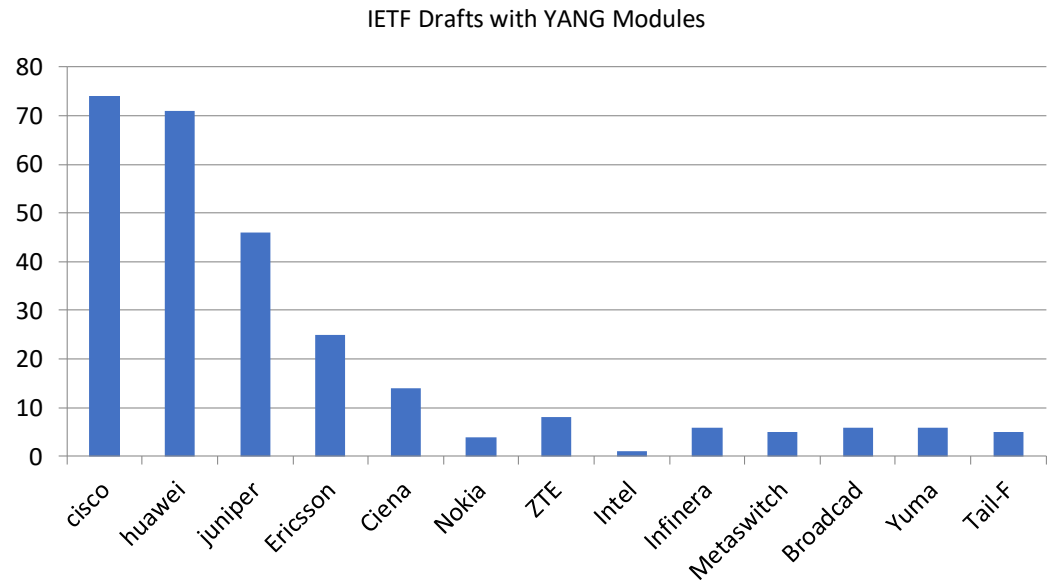
3. Open Discussion Questions (30 minutes)

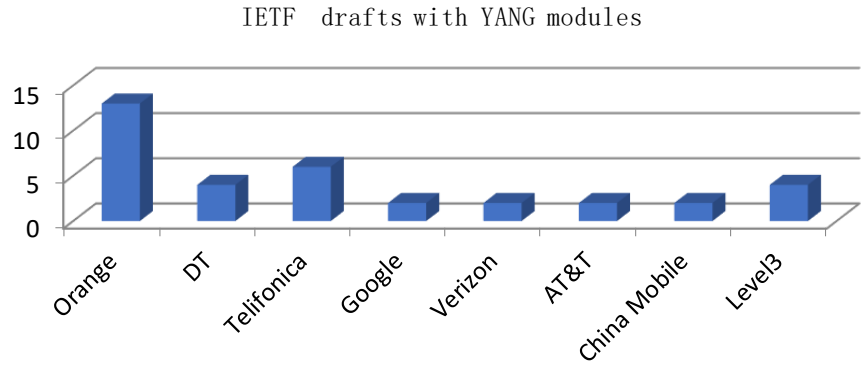
Open Discussion Questions list

- Are IETF YANG data models ready for deployment? What are missing?
- Do we need service catalog to support deployment?
- How YANG data models work together?
- How YANG data models work with the management protocol and data collection mechanism?
- How IETF works with other SDOs and Open Source community on YANG?
- **Is IETF the right venue to discuss the gap between IETF YANG and Industry needs?**

IETF YANG Model Standardization Overview

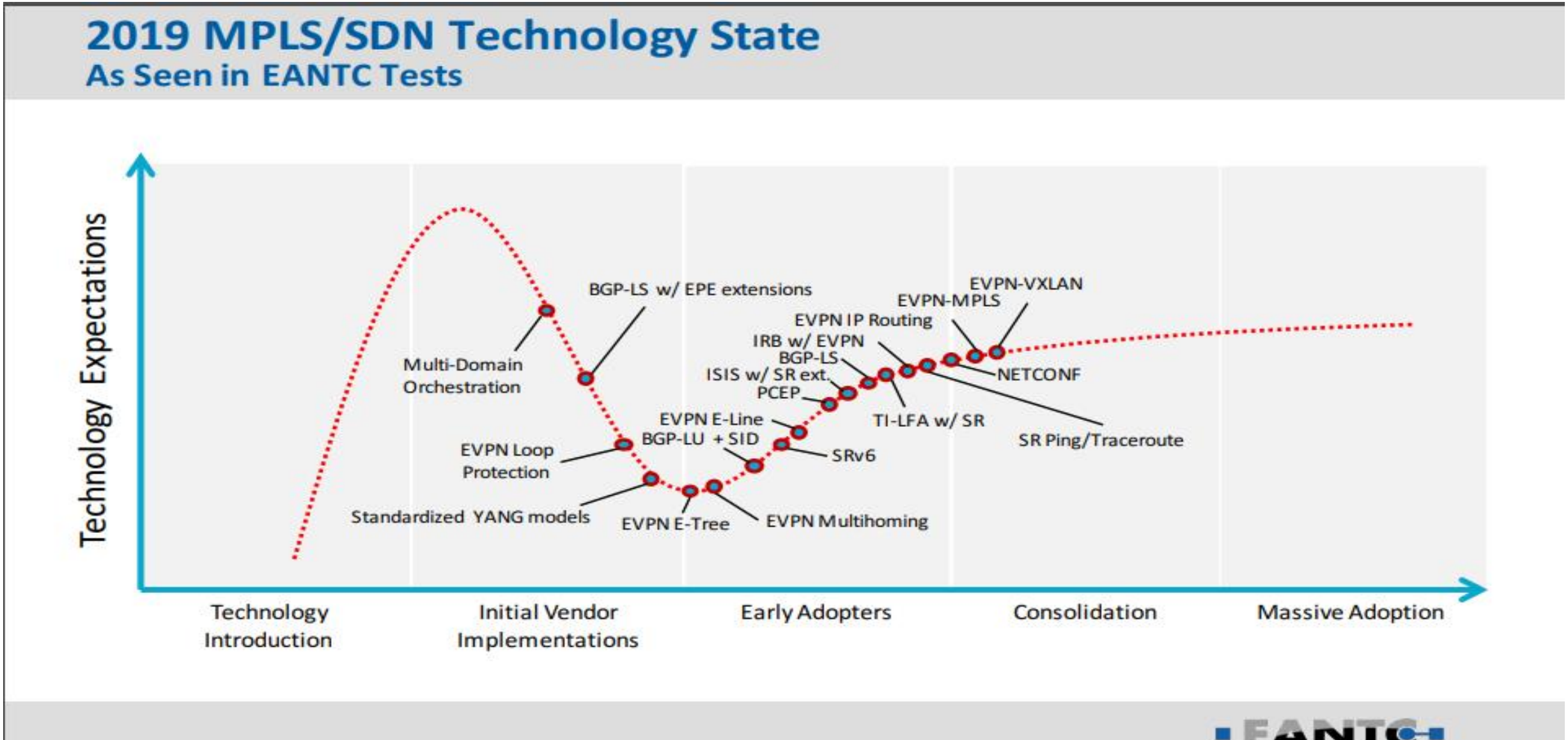






Until IETF 105, more than 50 YANG data model RFCs get published, more than 100 WG drafts and 80 Individual drafts being developed. The number of published RFCs is still growing.

NETCONF YANG adoption Benchmarking



Gap between IETF YANG vs Industry needs?

- Many operators are not engaged enough in the IETF to create that perfect world.
- The operators expected to deploy these technologies often don't even know that the standards are being developed.
- The operators who know that the standards are being developed don’t know may not know how these models work together to configure a device, manage a set of devices involved in a service.
- This lead to critical new technologies currently being developed without sufficient direct operator input.

What Have been done for IETF YANG

What have already been done to address the gap

- IETF YANG Catalog Project effort
- Work with operator community for YANG Data Model interconnection Framework Development
- Work together with China SDN Alliance to organize YANG round table meeting with Top 3 Operators, Vendors,Industry partners.

IETF YANG Catalog Project Update

- YANG Catalog project was started around 2015 and contributed by Cisco, Huawei, Juniper, CESNET, Patheon, etc. in IETF Hackathon and now transitioned to the IETF LLC.
- The YANG catalog will be supported by the IETF tools team to operate YANG Catalog website.
- YANG model catalog and registry
  - allows users find models relevant to their use cases from the large and growing number of YANG modules being published.
  - serves as a reference for all YANG modules available in the industry, for both YANG developers and for operators (to discover the more mature YANG models to automate services). YANG catalog
- YANG model also provide meta-data information related to data model such as:
  - Maturity level
  - Contact
  - module type
  - Implemented model or not
  - RFC or Draft?

YANG Data Model Interconnection Framework

- Work with Operator team to design YANG data model interconnection Framework in March 2018

(https://www.ietf.org/id/draft-wu-model-driven-management-virtualization-05.txt)

- Cook YANG data model interconnection Framework draft for 5 IETF meetings to keep on align with IETF YANG model standardization pace.
- First presented in both opsawg and rtgwg session in IETF 104 Prague meeting.
  - Raise awareness of IETF YANG standardization issues
    - IETF process overloaded
    - Gap between operator's requirements and IETF YANG models
  - Be bold to provide suggestions to tackle IETF YANG standardization issues
    - Introduce operator community review into IETF process
    - Provide guideline for operators and implementers for IETF deployment

Objectives of the YANG data Model Interconnection Framework

Goal:

- Discuss YANG model architecture for service and network management automation
- Articulate common functionality and framework to be used by multiple models and help operationalizing YANG-based model.
- Guidance on how models at different level interconnect and glue together for service delivery and fulfillment

Motivation:

- Considerable number of YANG data models are used to model devices, e.g., configuration data and operation state and services (for example, the L3VPN Service Model produced by the L3SM working group)
- They cover many of the networking protocols and techniques.
- how these models work together to configure a device, manage a set of devices involved in a service, or even provide a service is something that is not currently documented either within the IETF or other SDOs.

Interconnection Framework: Data Model Layering and Representation

An overview of Layered YANG Modules

L3VPN | L2VPN | SDWAN | .....

Network Service Modules

Network Topo | L3 Topo | TE Topo | L2 Topo | TE Tunnel | .....

Network Resource Modules

<<Composition Modules>>

Device Model | Logical Network Element Model | Network Instance (L2VPN,L3VPN, EVPN Instance)

<<Function Modules>>

Common (Interface, IPv4/IPv6,System,etc) | Transport (MPLS, Ethernet,SR,etc) | Routing (BGP,ISIS, OSPF,RIP,etc) | Policy (ACL,QoS, Routing Policy,ECA,etc)

Multicast (IGMP,MLD,etc) | OAM (BFD,LSP Ping,etc)

Network Element Modules

House Consumer

House Building Blueprint

Electricity

Water Supply

Trench for sewerage

House building Block

House building Foundation

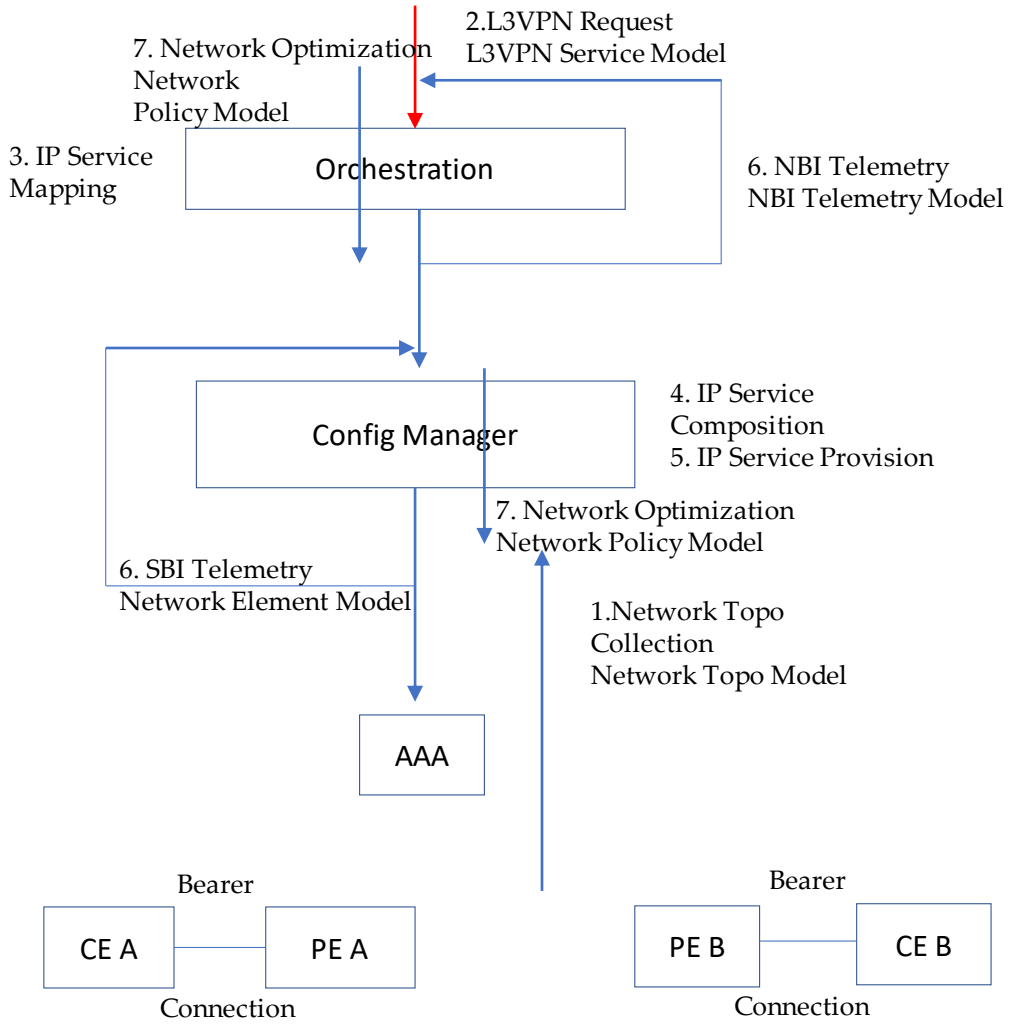
YANG data model Interconnection Model: Interconnection Type

- Model top down Decomposition
  - Model mapping from high layer to lower layer
  - Model mapping between service and resource
  - Model translation from multiple domain to each single domain
- Interact with periphery component(e.g., topology, inventory, performance monitoring)?
  - Define Northbound interface telemetry model, troubleshooting model
  - Monitor the resource changes in the network resource module
  - Troubleshoot the network problem in the network topology
- Model bottom up Composition
  - Assemble a set of network element modules to provision each network device type all at once
- Close Loop Control with the same layer model
  - Model driven telemetry
  - Model driven provision
  - Common Network Policy model

Model Interconnection Framework: Functional Components

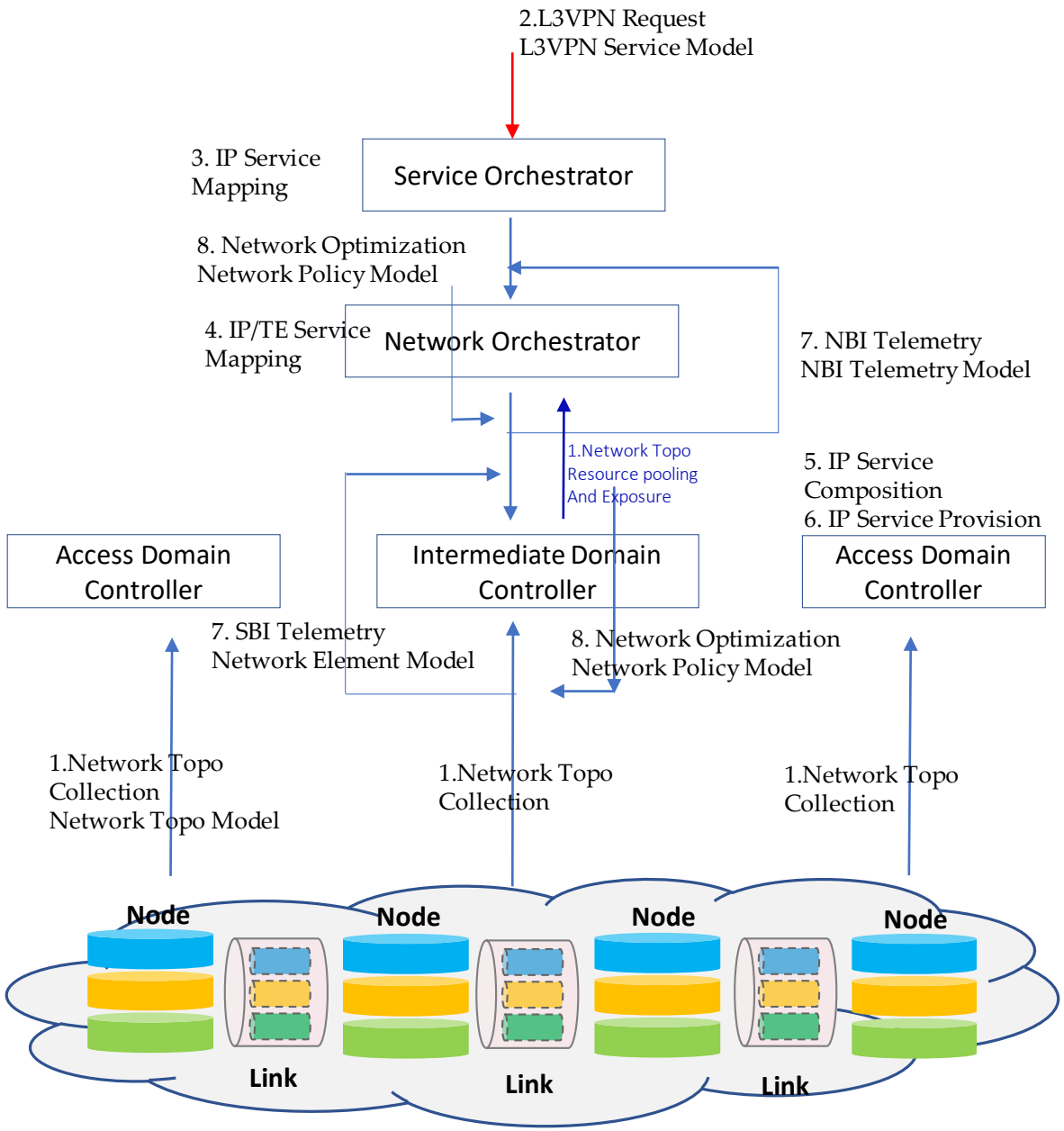
- **Resource Collection and abstraction**
  - Pub/Sub mechanism, Management Plane telemetry (e.g.,YANG push, gNMI)
  - Network topology Model, L3/TE/L2 Topo Model
- **Service Exposure**
  - Service Catalog (analogous to app store)
- **IP Service Mapping**
  - Mapping between Service abstraction and network technology
- **TE Service Mapping**
  - Mapping between service abstraction and TE topo, TE tunnel and VN
- **TE/IP Service NBI/SBI Telemetry**
  - Pub/Sub mechanism
  - NBI telemetry model
  - SBI Network Element Model
- **IP Service composition**
  - Schema Mount
  - Device Model creation
- **IP Service Provision**
  - SBI Network Element Model
- **Path Management**
  - PCEP Computation API model

Model Interconnection Framework: Use Case - A



- **Single domain L3VPN Service Delivery Case**
- Resource creation method:
  - Customer Initiated
  - Network Initiated
- Service creation
  - Service Request
  - IP Service Mapping
  - IP Service composition
  - IP service provision
- Service assurance
  - NBI/SBI Telemetry
  - Network optimization
- Service maintenance
  - OAM (ping, traceroute,etc)

Model Interconnection Framework: Use Case - B



- **Multi-domain L3VPN Service Delivery**
- Resource creation method:
  - Customer Initiated
  - Network Initiated
- Resource creation
  - Pool resource based on pre-configured service requirements
- Service creation
  - Service Request
  - IP Service Mapping
  - IP Service Composition
  - IP Service Provision
- Service Mapping To Resource
  - Allow user select pooled resource (e.g., Topo, Tunnel) to meet service requirements
  - Setup Tunnel based on on demand service requirement
- Service assurance
  - NBI/SBI Telemetry
  - Network optimization
- Service maintenance
  - OAM (ping, traceroute,etc)

IETF YANG Model Standardization and Industrialization RoundTable Meeting Update

- **The first IETF YANG Model Standardization and Industrialization Roundtable meeting was held in April 17, 2019 Beijing, Hosted by China SDN Alliance.**
  http://www.sdnfv.org.cn/article/content/view?id=253794
- **Goal:**
  - Discuss YANG data model commercial adoption and deployment. The YANG advantages and its values to the Transport Network;
  - Explore how to smoothly evolve to YANG from today's Transport network
- Sponsor: China SDN/NFV/AI Alliance
- Operator Participants:
  - China Mobile
  - China Telecom
  - China Unicom
  - Deutsche Telekom(Relay the message)
- Vendor Participants:
  - Huawei
  - Cisco
  - ZTE
- Industry Partners:
  - Spirent (active)
  - IXIA (Active)
  - YiYang
  - CAICT
- Key results :
  - YANG models are enabler of future and emerging Network automation;
  - Ease of use for YANG data model should be improved step by step.
  - YANG data model should be use case driven and the reference framework, use case, requirements spec should be developed to profile YANG data models list and instruct operators and implementer on how to use these YANG data models
- Recommendation to operators and vendors:
  - Speedup IETF YANG model standardization process by more participation.
  - help with prototypes and early deployments, early interop test.

Open Discussion

Open Discussion Questions list

- Is IETF YANG data models ready for deployment? What is missing?
- Do we need service catalog to support deployment?
- How YANG data models work together?
- Do we have guideline on how YANG data model work with management protocol?
- Where to document different Use Case and Requirements for YANG model integration?
- How IETF works with other SDOs and Open Source community on YANG?
- **Do you agree with gaps exist between IETF YANG and Industry needs?Is IETF the right venue to address all these gaps?**

Open Discussion: **Ready for deployment?**

- The number of IETF developed model is huge, there are many YANG models still being developed;
- What's our deployment plan and implementation plan for IETF YANG?
  - Early deployment, early test?
- What is preventing us from the implementation of IETF YANG?
  - NMDA transition?
  - legacy vendor-specific models refactoring?
  - Overloaded process in IETF delaying YANG models?

Open Issue: Service Catalog to support deployment

- Operators express the need for Service catalog which provide a service portfolio that is published and provided to customers as a support for deployment.

- Existing Effort:
  - YANG Catalog

- Where to define a service catalog to support for deployment and gluing model together? Or leave this out?

Open Discussion:
How do you see models work together

- A set of device level models work together for service fulfillment?
- Standard models work together with vendor specific native models?
  - Vendor is facing implemented vendor specific native model refactoring
- Different level model works together
  - Service level mode works together with device level model
- IETF models work together with Openconfig Models?
  - Different name space and different schema path
- Questions: Do you see YANG data model interconnection Framework sufficient to provide standard guidelines?

Open Discussion Questions list

- Is IETF YANG data models ready for deployment? What is missing?
- Do we need service catalog to support deployment?
- How YANG data models work together?
- How YANG data model work with management protocol?
- Do we have guideline on how YANG data model work with management protocol?
- Where to document different Use Case and Requirements for YANG model integration?
- **How IETF works with other SDOs and Open Source community on YANG?**
- **Do you agree with gap exist between IETF YANG and Industry needs?Is IETF the right venue to address all of these gaps?**