Next steps on Transport SDN

Lyndon Ong
Co-Chair, OIF MA&E Committee
Ciena

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Providing carriers with essential tools in the Transport SDN toolbox

- SDN Carrier Framework supporting multi-domain, multi-layer Transport SDN
- Transport SDN API specifications to allow SDN deployment over multiple technologies
- Further prototyping and testing of real implementations for experience and interoperability
SDN: an Open Network Control Architecture

- Diverse applications
  - Planning, optimization, services, etc.

- Common framework
- Multi-vendor NW SW
  - Routing, Resiliency

- Common APIs
- Open Platform
- Standard Interfaces

- Standard, programmatic interfaces across layers
- Open/common device data models
Multi-Domain Carrier Transport SDN Framework

Validated in the Joint OIF/ONF Prototype Demo in Fall 2014
Multi-vendor, Multi-domain Demo
- 5 Carrier Labs
- 9 Vendors
Ethernet, L1 and L0 switching
OpenFlow Optical Transport Extensions
Simple Prototype NBI for Connectivity Service and Topology
Whitepaper available with details

Application Layer

Control Layer

Infrastructure Layer

Network Orchestrator

Parent Controller

Domain Controller

SBI

Cloud Orchestrator

Compute

Storage

Network Orchestrator

Domain 1

Domain 2

Domain 3
Takeaways from the OIF/ONF Demo

Successful demonstration of SDN Architecture for carriers

- Can be realized over WAN and provide carrier benefits
- Highly Flexible
  - Multiple technology layers
  - Multiple domains
  - Greenfield and brownfield

OpenFlow Optical Transport Extensions

- No major interoperability problems identified, only minor notes
- Now being approved as an ONF Technical Specification

Transport NBI/API

- Key area for multi-domain services
- REST/JSON base advantages
  - Development time, flexibility, debugging
- Need work on commonality, esp. Information Model
Moving Forward at OIF

- SDN Framework whitepaper
- Virtual Network Service definition
- Transport API work
  - Joint work with ONF
- Potential 2016 interop demonstration
Documents multi-domain/multi-layer carrier architecture
Uses well-known ITU-T ASON architecture as a basis for identifying key application interfaces
  - Service Request, Connection, Topology and Path Computation APIs in particular

* Figure does not imply specific distribution of components, e.g., centralized or distributed
Virtual Network Service Definition

Take advantage of virtualization in SDN
Offer customers controllable network slice

Virtual network with vNE & vLink
Leasing virtual network + connection control over the virtual network

Leasing virtual network + recursive virtual network creation

Similar to SCS

Connection controlled by network providers
Leasing virtual network (connection)

Leased Line
Client site A
Client site B
Client site C
Client site B
Client site D

VPN Similar to SCS

Ctrl of virtual XC
Virtual network with vNE & vLink

Dynamic

VNS (PVNS)

Client controller

Client controller

Client site
Client site
Client site
Client site

Rent virtual network resources from provider

Leasing virtual network + recursive virtual network creation

OIF OPTICAL INTERNETWORKING FORUM
SBI and NBI work

Completing Transport SDN

Southbound Interface - ONF Follow-On OpenFlow Extensions

- Autonomous Functions - programmability of local functions
  - Generation and processing of Performance Monitoring (bit errors or SNR)
  - Pre-programmed local protection functions to meet service requirements

Northbound Interface - OIF API Project

- Use ONF work aiming at commonality across platforms
  - Common Core Information Model across technologies
  - Mappable to REST/JSON interfaces
- OIF Project to define API specs
  - Use joint OIF/ONF prototyping and testing, ideally with open source participation such as ONOS, ODL
SDN NorthBound Interface

- Common interface for controlling and analyzing networks
  - Service request interface
  - Connection interface
  - Topology interface
  - Path Computation interface
- Flexible interface
  - Different levels of control
  - Potential abstraction
  - Virtual networks
- Utilizes Common Information Model
  - Consistency rather than divergence
2016 Demo Plans

Projecting forward – 2016 likely demo timeframe

Potential topics:

• Standardized OpenFlow Optical extensions
  • Based on Technical Spec issued by ONF
• Testing with Open Source Controllers
  • ODL, ONOS
• Approved IAs for Transport APIs
  • Cooperative efforts by OIF and ONF
  • Based on Common Information Model work