Transport SDN from the OIF’s perspective

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Outline

- Transport SDN
- OIF Role and Structure
- Transport SDN Architecture & Requirements
- Summary
Trends

• Carrier environment has evolved and changed
  • All IP services
  • Changing traffic patterns
  • Need for new business models

• Network standardization environment has changed and there is increasing emphasis on
  • Virtualized environment –
    • Separation of HW and SW
    • Separation of transport and control functions
    • Software implementation of network functions
  • Standard (COTS) hardware
  • Application aware routing
  • Programmable optical networks

• New forums – ONF, NFV, OGF, OpenDaylight, …
• SDN – an approach for optimizing networking
Orchestration - One main Aspect of SDN

Orchestration

- Processing
- Transport
- Storage
What is the OIF?

• Since 1998 OIF has brought together industry groups from the data and optical worlds

• Mission: To foster the development and deployment of interoperable products and services for data switching and routing using optical networking technologies

• Our 100+ member companies represent the entire industry ecosystem:
  • Carriers and network users
  • Component and systems vendors
  • Testing and software companies
How OIF is organized

Board of Directors

Technical Committee
- Carrier WG
- Networking & Operations WG
- Interop WG
- Physical & Link Layer WG

PLUG* WG

Market Awareness & Education Committee

Implementation Agreements

*PLUG: Physical Layer User Group
OIF Carrier WG

- Requirements on Transport Networks in SDN Architectures - *Transport SDN*
  - Document is based on contributions of major carriers worldwide
  - Comprises requirements on Transport SDN
    - Orchestrator (transport network relevant part)
    - Control and management planes
    - Data plane
  - Being used as guidance within OIF but also communicated to other SDO and forums
SDN Reference Architecture

Components of Transport SDN

- **Service**
- **Service**
- **Service**

**Orchestrator**

**DC Mgt/Controller**

**Transport**

**Data Center**

**Application Plane**

**Mgt- & Control-Plane**

**Transport Network**

**Data Plane**

**SDN southbound:**
- OF, XML, SNMP, PCEP, ...
  (could be NE-internal)

**SDN northbound:**
- OGF NSI, ...

**OF, MTOSI, REST, ...**
General Requirements

• Requirements are not aimed at a particular set of protocols, HW and SW implementations
  • Packet & circuit switching
  • Centralized & distributed control instances
  • Allow multiple protocols
  • Modular SW and HW (COTS)
  • Decoupling of network layers

• Guarantee interoperability among different vendor implementations, carrier network domains, data center functions, ...
  • Well defined interfaces for an increased level of interoperability
Requirements on Communication between Transport SDN Components

- Transport SDN components:
  - Orchestrator
  - Control and management planes
  - Data plane
- Message exchanges must be supported by data communication capabilities that meet operator needs of resilience, scalability, performance, and security
- A dedicated data communications network is assumed
- The DCN being used for SDN purposes does not need to be identical with an existing (legacy) DCN/SCN already in operation
SDN Reference Architecture

Orchestrator

Service

SDN northbound: OGF NSI, ...

OF, MTOSI, REST, ...

SDN southbound: OF, XML, SNMP, PCEP, ...

(could be NE-internal)

DC Mgt/Controller

Data Center

Application Plane

Mgt- & Control-Plane

Transport

Network

Data Plane
Requirements on Orchestrator

New

• The Orchestrator is responsible for the coordination and management of SDN services

• The Orchestrator
  • Coordinates data center and transport network actions
  • Requests transport network service primitives from the control and management plane
  • Represents the transport network to the Application Plane using virtualization and abstraction

• The Orchestrator needs to provide structured, extensible, flexible, well defined interfaces
  • To the application plane (northbound API)
  • To the TN control and MP (southbound)
  • To the DC control and Mgt. systems (southbound)
  • Between SDN controllers (hierarchical/federated)
SDN Reference Architecture

Management & Control Plane

Data Plane

Transport

Application Plane

Mgt- & Control-Plane

SDN southbound:
OF, XML, SNMP, PCEP, …
(could be NE-internal)

SDN northbound:
OGF NSI, …

OF, MTOSI, REST, …
Requirements on Control Plane

- The Control Plane (CP) supports connection management, discovery mechanisms, resilience functions, dissemination, and abstraction functions
  - OIF Carrier WG Guideline Document on “Control Plane Requirements for Multi-Domain Optical TN”

- The CP needs to operate in a network functions virtualization environment

- The CP needs to support
  - Virtual networks in a multi-layer transport network context
  - Northbound interfaces to the Orchestrator
  - Southbound interface(s) for communication to the DP
  - Interfaces for communication with the Management Plane

- The CP shall not be restricted to a specific protocol suite
Requirements on Management Plane

- The Management Plane (MP) is responsible for the support of all aspects of network and network element management.
- The MP provides fault, configuration, accounting, performance, security management (FCAPS).
- The MP needs to support:
  - Southbound interfaces to the Data Plane
  - Northbound interfaces to the Orchestrator:
    - Provision of abstract network state, resource availability, network utilization
    - Requests from Orchestrator
  - Virtual networks in a multi-layer TN context
  - Interfaces for communication with the Control Plane
SDN Reference Architecture
Data Plane

Service

DC Mgt/Controller

Orchestrator

SDN northbound: OGF NSI, ...

SDN southbound: OF, XML, SNMP, PCEP, ...
(could be NE-internal)

Mgt- & Control-Plane

Transport Network

Application Plane

Data Plane

Transport
Requirements on Data Plane

- Many existing Data Plane (DP) standards and specifications are needed as a basis for interoperable implementations of SDN architectures.
- The DP should support a variety of resilience mechanisms (Protections and/or restoration).
- The DP requires northbound interfaces to the Control Plane and the Management Plane to support:
  - Provision of physical parameters, network state, resource availability, network utilization information.
  - Requests from Management Plane and Control Plane.
- The DP needs to support network slicing in a multi-layer transport network context using:
  - Dedicated DP resources per service.
  - Sharable resources among services.
On-demand services are provisioned, based on ASON/GMPLS control plane functions:
- Multi-domain
- Multi-layer
- Multi-technology

- OIF control plane follows ASON multi-domain architecture and allows UNI, E-NNI protocol separate from domain operation.
- Interworking with SDN domains is ensured.

The Vision – Seamless Interworking

- Control plane
- Transport plane

Domains can use Network Management, SDN or distributed control plane internally.

Domains can use different technologies internally.
• SDN has great promise to improve transport control
  • Programmability
    • Ability to deliver new behaviors not (yet) considered by standards, vendors, …
  • Simplified multi-layer control
  • Common behavior in heterogeneous NE deployments
  • Application awareness
• OIF is providing guidance to accelerate deployment
  • Carrier requirements
  • Framework document
  • Use cases and architecture
  • Demonstrations
Thank you for your kind attention!

Carrier Requirements Document
www.oiforum.com