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
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
Where we fit

IETF
ASON Architecture & Requirements
ITU-T
ASON A
OTN/Optical Interfaces
IEEE
IEEE 100G Interfaces
ONF
OTN/Optical Interfaces
Transport SDN
ONF
Ethernet Alliance
NFV
100G Interfaces
ONF
NFV
Transport SDN
ONF
Ethernet Alliance
TMF
Fibre Channel T11
MEF
Infiniband Trade Assn
MEF
Ethernet Services
Interop Testing
Implementation Agreements
GMPLS Protocols
CP management
OIF OPTICAL INTERNETWORKING FORUM
How OIF is organized

Board of Directors

Technical Committee

Carrier WG

Networking & Operations WG

Physical & Link Layer WG

Interop WG

Market Awareness & Education Committee

Implementation Agreements

Interop Demonstrations

Implementation Agreements

*PLUG: Physical Layer User Group

OIF

Optical Internetworking Forum
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

Orchestrator

Application Plane

Mgt- & Control-Plane

Transport Network

Data Plane

Data Center

Transport

TN Controller

Mgt

SDN northbound: OGF NSI, ...

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

OF, MTOSI, REST, ...

SDN northbound:

Service

Service

Service

Data Center
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

Service

Service

Application Plane

Mgt- & Control-Plane

Transport Network

Data Plane

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Transport

Data Center

DC Mgt/

Controller

TN Controller

TN Controller

TN Controller

TN Controller
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

Service

Orchestrator

DC Mgt/Controller

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Transport

Application Plane

Mgt- & Control-Plane

Transport Network

Data Plane

Data Center
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

Application Plane

Mgt- & Control-Plane

Transport Network

Data Plane

Orchestrator

Service

Service

Service

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OF, MTOSI, REST, ...

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Transport

TN Controller

Mgt

DC Mgt/Controller

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Data Center

App. Plane

SDN northbound: OGF NSI, ...

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DC Mgt/Controller

DC Mgt/Controller

Data Center
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.
The Vision – Seamless Interworking

- 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
Summary

- 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

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