The Optical Internetworking Forum:

• Represents an end-to-end ecosystem membership base…
• Focused on multi-layer and multi-domain transport interoperability…
• Positioned at the industry crossroads…
• Optimized for IA development and interop testing…
• Fills gaps, removes obstacles…
• Accelerates market adoption and ROI for new technologies…
• Improves network efficiency, lowers Opex/Capex for network operators…
• Unlike any other forum or SDO
Why Does Transport Need SDN?

- Optical and transport networks continue to be difficult and expensive to manage
  - Many manual processes
  - Very long provisioning times
- SDN and virtualization have the promise of:
  - Simplifying optical transport network control
  - Adding management flexibility
  - Allowing the rapid development of new service offerings by enabling programmable control of optical transport networks
- To improve optical networking operations cost and ROI by:
  - Automating services provisioning and deployment
  - Improving network resource utilization
Goal: Seamless Interworking

- On-demand services are provisioned using ASON control functions
  - Multi-domain
  - Multi-layer
  - Multi-technology

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

Domains can use different technologies internally

No 1:1 relation
Challenges

• Operational simplicity
  • On-board new clients rapidly
• Differentiated service delivery
  • Automate resource allocation on the fly
• Scalability
  • Support X transactions per hour
• Security
  • Service isolation and authentication per client
• Continuous Availability
  • Disaster avoidance / recovery
• Current transport business model

Programmability and Application Awareness
OIF Role and Expectations

- SDN Reference Architecture
- Carrier SDN Requirements
- Meaningful demo and testing in carrier environment showing
  - Status of technology
  - Interfaces and interoperability
  - Operation tools needed
  - Pertinent use cases
OIF/ONF Global Transport SDN Demo

• Goal - accelerate the deployment of practical, programmable transport networks that enable a new era of dynamic services

• Test prototype transport SDN technologies in real-world applications

• Application: Cloud bursting over optical networks

• Features:
  • Subset of OTWG OpenFlow Extensions (ONF lead)
    • CDPI and CVNI
    • Experimental encoding of extensions
  • Northbound Interface Protocols – Service Request and Topology network APIs (OIF lead)
  • Multi-domain controller hierarchy (OIF lead)
OIF/ONF Global Transport SDN Demo

- Testing conducted in carrier labs over 7 week period August-September
  - China Mobile, China Telecom, Deutsche Telekom, TELUS, Verizon
- Participating vendors
  - ADVA, ALU, Ciena, Coriant, FiberHome, Fujitsu, Huawei, NEC, ZTE
- Consulting members
  - China Academy of Telecommunications Research, KDDI R&D Laboratories, Orange
Cloud Bursting

Cloud computing has increased demand on “East-West” interfaces

- Google: 4+ times more traffic than North-South
- Inter-cluster interface
  - VM Migration, Dataset synch/relocation
- Duration needs to be as short as possible
  - High-bandwidth connectivity, short-lived connections
Overview of Control Systems

Application Layer
- Compute
- Network Orchestrator
- Storage

Control Layer
- Parent Controller
- Domain Controller
- Domain Controller
- Domain Controller

Infrastructure Layer
- NE
- NE
- NE
- NE
- NE
- NE

REST APIs
- Service Request
- Topology

OpenFlow
- Control to Dataplane
- Control to Virtual Network
2014 Global Transport SDN Demonstration
Outcome

- Identified a lack of definition for how user applications interact with transport network applications and resource functions
  - The programmability of Transport SDN requires some of the internal interfaces used by ASON to become open
- Whitepaper jointly published by OIF and ONF
- OIF project started to develop API implementation agreements (IAs)
  - Build on Service Request and Topology APIs prototyped in the demo
  - Create IAs for Service Request, Path Computation, Topology and Link Resource Manager interfaces (identified as part of the OIF’s upcoming SDN Framework document)
Summary

- SDN has great promise to improve transport control
  - Programmability
  - Simplified multi-layer control
  - Common behaviors in heterogeneous NE deployments
  - Application awareness
- OIF is providing guidance to accelerate deployment
  - Use cases and architecture
  - Carrier requirements
  - Framework document
  - Demonstrations
  - Implementation Agreements