OIF Activities in Transport SDN

Jonathan Sadler
Vice Chairman
OIF Technical Committee
Coriant, USA

Light Reading Big Telecom Event
Chicago, June 16
Carriers have long desired control for Transport

- Reduce time to deliver service
- Reduce cost using mesh reroute not protection
- Increase availability through 1:n protection
- New Services

Different approaches have been taken

Different technologies deployed

Much to be learned from the Past
Networks deployed with control systems

AT&T ACCUNET1 Bandwidth manager (circa 1988)
- Carrier developed Management system control

VYVX T3 on-demand (circa 1994)
- Carrier developed Management system control

Vodafone (circa 2000)
- NE-integrated control of SDH - based on GMPLS

AT&T and Verizon Mesh Nets (circa 2003)
- NE-integrated control of SDH - based on P-NNI
Carriers benefit from control systems

Traffic Recovery
- March ’11: Japan Earthquake
- One Carrier’s experience
  - 21 cuts on 19 cables
  - High priority restored in 5 min

Communications Day – March 14th, 2011

At Verizon Business, any impact to customer traffic was averted by its optical meshed infrastructure in Asia and across the Pacific, according to Linda Laughlin, director of media relations for Verizon Business’ Global Network Services Group.

“Verizon also participates in several submarine cables throughout the Asia-Pacific region, so if we need to move traffic to alternate network routes, we have the capability to reroute customer traffic using a technology called ‘meshing.’ Meshing creates additional paths to seamlessly reroute traffic in the event of multiple undersea cable breaks or network disruptions,” Laughlin said, adding that Verizon currently operates eight different paths across the Pacific.

Verizon also operates two local networks in Japan – Tokyo and Osaka, Laughlin added, both of which are still online. “All of our networks are operating normally.”
Carriers benefit from control systems

Traffic Rebalancing

- AT&T

The perfect storm of pop culture and new technology powers one of the busiest nights of the year on AT&T’s network: the finale of Fox television’s American Idol. Moser points to a graph showing what happens when viewers text and phone in their votes for the winner of the popular reality TV singing contest. What starts as a typical day instantly turns into a network-straining avalanche of traffic at 9 p.m. Eastern.

“You basically have one customer doubling the usage of the network, so it’s a significant event,” he said. “The fact that you can still use the network and never notice that this is happening is really a credit to the kind of thing we’re doing here.”

- Government Technology, Jan 31, 2012
Carriers benefit from control systems

Multiple faults

- Developing Countries - Significant amount of construction
  - Inadequate records, permitting
- Require Multi-cut resiliency
  - Multiple cuts a day
  - Double failures weekly
Observations

Management-based control

• Dependent on Communications Infrastructure
  • Link failures limit ability to control NEs
• Scaling Limitations
  • Overloaded Communications Infrastructure
  • Overloaded Connection rerouting
• Carriers define network behaviors

NE-based control

• NE-vendors define network behaviors
  • Problems with carrier differentiation
• Dependent on Health of Control Protocols
SDN improves transport control

Control Plane = automation
- Eliminated Manual Operations
- Enabled Network Service Mgmt
  Defined by NE vendors

SDN = New Behaviors
- Enables Carrier differentiation
- Removes hurdles to development
  Delivered through Programmability

Three levels of Programmability
- Dataplane
- Transport Control Behaviors
- Application Awareness
New Dataplane Behaviors

Dataplane configuration in terms of primitive components

- **Traffic Classification**
- **OAM**
- **Protection Switching**

<table>
<thead>
<tr>
<th>NE1</th>
<th>Trigger</th>
<th>Int</th>
<th>TS</th>
<th>Int</th>
<th>TS</th>
<th>Int</th>
<th>TS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCM1 Defect</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NE3</th>
<th>Trigger</th>
<th>Int</th>
<th>TS</th>
<th>Int</th>
<th>TS</th>
<th>Int</th>
<th>TS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCM1 TTI = “a”</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>TCM1 TTI = “b”</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>7</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>TCM1 Defect</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NE4</th>
<th>Trigger</th>
<th>Int</th>
<th>TS</th>
<th>Int</th>
<th>TS</th>
<th>Int</th>
<th>TS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCM1 TTI = “a”</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>TCM1 TTI = “b”</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>TCM1 TTI = “c”</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
New Transport Network Behaviors

Eliminate “One-size-fits-all” solutions

- NE-behaviors may not match carrier requirements
- Example
  - Combined Reroute and Protection

Controller Programmability enables carrier req. to be met
Application awareness

Existing Control Planes are “write-only”

- Request connections without any awareness of network

Business Apps need detail for services available

- E.g. Latency, Congestion

Best solution considers all aspects for Network, Compute and Storage

- Lowest Congestion to overloaded DataCenter
- Light Congestion to underused DataCenter

Match carrier services with application needs
OIF activities to guide Transport SDN

Carrier requirements development

SDN Framework document
- Goal to avoid monolithic systems
- Better define components inside controller, interfaces to applications

Demonstration/testing of SDN
Carrier Requirements

- **Requirements on Transport Networks in SDN Architectures**
  - 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
Emerging Service and Network Framework

Overall Application
- Many
  - Cloud computing
  - Re-optimization

Network-Specific Application
- Service setup
  - Variants (Unprotected, protected, re-routeable)
- Service maintenance
- Resource functions
Goal: Seamless Interworking

On-demand services are provisioned using ASON control functions

- **Multi-domain**
- **Multi-layer**
- **Multi-technology**

Domains can use different technologies internally

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

No 1:1 relation
ONF & OIF Team Up on Transport SDN Prototype Demo

**What and Who:**
- Joint technical and marketing activities supporting a prototype demo
- Organized by OIF Interop WG and ONF Optical Transport WG

**Why:**
- Enable deployment of OpenFlow/SDN in carrier transport networks with seamless evolution and interoperation with carrier network environments
- Assure a seamless operation of heterogeneous networks in a SDN architecture
- Leverage strengths of ONF and OIF:
  - ONF OpenFlow/SDN specifications, with optical extensions and use cases
  - OIF carrier and optical expertise, worldwide interop testing experience

**When, Where, How:**
- March-April: Technical spec development, contracts and NDAs
- August-September: Carrier-hosted lab testing
- March thru October: Joint PR/ marketing
- October: Demo events culminating in read-out at L123 SDN WC Dusseldorf
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 the SDN Ecosystem**

- Carrier Requirements
- Framework Document
- Demonstrations
Thank you for your kind attention!

Carrier Requirements Document
www.oiforum.com