Supporting SDN in Transport Network

Ping Pan, Ph.D.

October 2012
Problems in Transport Networks

1. Typically, transport equipment cannot talk to each other outside one network domain

2. Network operation over multiple layers (including ROADM, OTN, Ethernet and MPLS) is very expensive

3. Service deployment is very slow (due to technology, operational practice and politics)
Solution: Use SDN to Build an Overlay

- Build an overlay network on top of transport infrastructure
- Deploy network services on top of the overlay
- Define a common, modular, light-weight interface on transport equipment
Open Transport Switch: A light-weight virtual switch in transport equipment
Operation Example #1: Explicit Provisioning

Topography report:
- L1: 10GE
- L2: to B, 100GE

Provisioning (e.g., OpenFlow):
L2-L3 :: map VLAN-200 packets to VIF X
Operation Example #2: Implicit Provisioning

Provisioning:
• Setup A-B with BW X

Provisioning:
• Setup C-D with BW X
• Map data to C-D
# OpenFlow and The Challenges

<table>
<thead>
<tr>
<th>Functions</th>
<th>Example</th>
<th>Problem</th>
<th>Possible Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-connect Setup</td>
<td><img src="Cross-connect_setup.png" alt="Diagram" /></td>
<td>Flows are non-packet (e.g. waves); not defined in OpenFlow</td>
<td>Introduce the concept of flow-id into OpenFlow</td>
</tr>
<tr>
<td>Flow Aggregation</td>
<td><img src="Flow_aggregation.png" alt="Diagram" /></td>
<td>No such concept in v1.0; virtual port is introduced in v1.0, and is only for Ethernet</td>
<td>Introduce the concept of virtual port for non-packet flows</td>
</tr>
<tr>
<td>QoS and CAC</td>
<td><img src="QoS_CAC.png" alt="Diagram" /></td>
<td>QoS is not in v1.0</td>
<td>Largely solved in v1.3</td>
</tr>
<tr>
<td>Implicit provisioning</td>
<td><img src="Implicit_provisioning.png" alt="Diagram" /></td>
<td>How can we make flow id’s unique?</td>
<td>MPLS Label? VXLAN? 😊</td>
</tr>
</tbody>
</table>
Final Words

- SDN can speed up service deployment in transport network through network overlay and virtualization

- Open Transport Switch is a virtual switch installed on transport equipment for SDN Controller to discover, monitor and provision user flows

- OpenFlow needs to be enhanced to support basic transport network operation

- We’d like to work with the research community to define and develop Open Transport Switch together