Virtual Transport Network Services

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BTE
OIF Workshop:
Gearing Up for Transport SDN Deployment
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Virtual Transport Network Service controlled by customers, enabled by transport SDN
Virtualization

- Sharing of Transport Network Resources
  - No dedicated resources
  - Dynamically allocated
- Isolating traffic between different services
  - Limited to service endpoints
- Exposing control at abstract level
  - Varying levels
Evolution
From the Physical Transport Network Order
Days/ Weeks/ Months

RFQ
-Demand Matrix
-Performance Requirements
-Etc

Quote
-Topology
- $$
-Performance Better

Customer / Client

Add traffic

Agreement

Transport Network Provider

Build
Evolution

To the Virtual Transport Network Order Minutes

Create Virtual Network
- Demand Matrix
- Performance Requirements
- Etc

Selection

Quote
- Topology
- $$
- Performance Better

API

Quote
- Topology
- $ Performance Good

Customer / Client

Add traffic

Transport Network Provider

Client Controller

App

Transport Controller
Benefits

- **Real Time**
  - Request On Line
  - Real-time planning
  - Real-time setup

- **Resilient**
  - Autonomous Control
  - Dynamic expansion
  - Optimization

- **Robust**
  - Multi-level SLA
  - Recovery
  - Network migration

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Benefits of the network architecture:

- **Online Slicing**
- **Path Computation**
- **Survivability Analysis**
- **Global Optimization**

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**Network as a Service**

- **Tenants**
- **Physical Optical Network**
- **Virtual Network Topology**
- **T-SDN Controller**
Transport Network Virtualization
Use Cases

- **Private Cloud**
  - More dynamic optical tunnels on-demand

- **Data Center Interconnect (DCI)**
  - Integrate transport network with DC orchestration

- **Integrated Packet and Optical Network**
  - Reconfigure optical domain based on IP
Today’s Model for SDN-Enabled Transport Network

- Application Layer:
  - Apps
  - App controls exposed topology

- Control Layer:
  - Transport Controller
  - Controls Physical Network

- Infrastructure Layer:
  - Physical Infrastructure
  - Transport Network

- Optical Internetworking Forum (OIF)
Introducing the Client Layer Control

Application Layer

Client Control Layer

Transport Control Layer

Infrastructure Layer

App controls exposed topology

Client Controls Virtual Transport Network

Transport Network

Controls Physical Network

Physical Infrastructure

VTN Topology 1

VTN Topology 2

OIF INTERNETWORKING FORUM
OIF Virtual Transport Network Services

Application Layer

Transport Control Layer

Transport Controller

Infrastructure Layer

Physical Infrastructure

Transport Network

Client Control Layer

Client Controls Virtual Transport Network

App controls exposed topology

Client Controller 1

VTN Topology 1

Client Controller 2

VTN Topology 2
Virtual Network Service Definition

- Take advantage of virtualization in SDN
- Offer customers controllable network slice

Fixed Connection

Dynamic Connection

Connection controlled by network providers

Endpoints Only

Dynamic Connection

Virtual network with vNE & vLink

Service requirements

Dynamic

Dynamic Connection

Rent virtual network resources from provider

Virtual network with vNE & vLink

Dynamic/recursive virtual network topology

Leased Line

Client site A

Client site B

Client site C

Client site D

Ctrl of virtual XC

Client controller

OIF

OPTICAL INTERNETWORKING FORUM
Type 1 – Fixed Connection
Type 2 – Dynamic Connection
Topology Exposes Endpoints

- Connection
- VTN Topology
- Carrier Network

OIF OPTICAL INTERNETWORKING FORUM
Type 3 – Dynamic Connection
Fixed Topology

Carrier
Network

VTN
Topology

Connection
Type 4 – Dynamic Connection
Dynamic Virtual Topology
What is OIF defining?

- Service Attributes
- Service Capabilities
- Recovery Requirements
- OAM Requirements

Harmonize Services Definitions for all players, i.e.
Transport Network Services
- Providers
- Users
- Equipment/SW Vendors
Service Attributes

- **Service**
  - ID / name
  - Service End Points
  - Type of Service

- **Topology**
  - ID / name
  - Service Level Agreement

- **Connection**
  - Type of Connection
  - TE Parameters
  - Traffic Matrix
  - Scheduling
  - Service Level Agreement
Service Capabilities

- **Connection** – Is the customer allowed to
  - Create
  - Delete
  - Modify
  - Query
  - Receive automatic status updates?

- **Topology** – Is the customer allowed to
  - Create
  - Delete
  - Modify
  - Query
  - Receive automatic status updates?
Connection Level Protection/Restoration
  • May be provided by service provider or customer

Topology Level Protection/Restoration
  • Provided by provider

How to use both levels
  • Coordination mechanism when customer is responsible for connection recovery
Client Connection Recovery

Connection

VTN Topology

Carrier Network

Failure notification
Provider Topology Recovery

Connection

VTN Topology

Carrier Network

Failure notification – repaired
- **East-West**
  - Virtual Link OAM requirements
- **North-South**
  - VTN Topology / Connection
  - Query/automatic Status Requirements
Applications

Users

Vendors

Providers

... for the Ecosystem
Be involved

- Want to be part of the ecosystem?
- Want to provide input?
- Contact the OIF Networking & Operations WG Chair
Thank you!