OPEN PCE:
A Role of PCE in Cross-Stratum Optimized Open Source Environment

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Agenda

• CSO Overview
• Open Source Projects
• CSO-enabled Open PCE
• Summary and Conclusion
What is Cross-Stratum?

Application Stratum
- Distributed Resources: servers, content, data sets, computing power, cache/mirror, storage, VM
- Uses Network Resources (LAN/WAN)
- Different QoS requirements for each application

Network Stratum
- Bandwidth, Connections, Links,
- Connection Processing (Creation, Deletion, Management)
- Admission Control, Resource Reservation
- Applications uses resources in IP, MPLS, and/or OTN, DWDM/Fiber
Cross-Stratum Optimization Objectives

- Exchange network capabilities or application demand/resource information
- Exchange topology and/or traffic-engineering related information between the stratum (virtualization/abstraction)
- Initiate service instantiation of application to network with profile exchange (provisioning)
- Exchange application/network congestion/failure information (monitoring)
CSO Architectural Entities

• Application Controller (AC)
  – Accesses application related data and processes
  – Communicates with NC
  – Provides abstraction/virtualization and constraints to outside entities

• Network Controller (NC)
  – Accesses network related data
  – Communicates with AC
  – Communicates with network processes such as admission control, resource reservation, connection processing.
  – Provides abstraction/virtualization and constraints to outside entities
Information Sharing and Privacy

- **Information Privacy**
  - Limit information flow; use abstraction/virtualization, don’t provide full access to management or control planes.

- **Application CSO Processes**
  - May need some type of network information, e.g., some type of topology information

- **Network CSO Processes**
  - May need some type of application information, e.g., client and server identification

- **3rd Party CSO**
  - Uses both application and network info
Data Center Selection Problem

DC Resource Abstraction

Application Controller

Network Resource Abstraction

Domain Controller 1

Domain Controller 2

Domain Controller 3

Domain Controller 4

DC 1

DC 2

Network Resource Abstraction

Domain 1

Domain 2

Domain 3

Domain 4

Network Resource Abstraction

Application Controller

DC Resource Abstraction
Operator Topology
Simulation Assumptions

• The service application usage is selected randomly from 0.5% to 1% for each application demand.

• All DCs have all the same size.

• Network bandwidth required for each application is assumed one wavelength equivalent. Each node supports 80 wavelengths with no wavelength conversion or 3R regeneration capability.
- A Set of different algorithm policy is enabled
- Clear benefit with CSO-enabled Path Computation Algorithm
Open Source Projects

- Addresses different areas of industry (IT/Data Center, Packet Networks, Optical Networks, Network Function Virtualization, etc.)
- Platform dependent
- Serves well in its open source community
- Useful Open APIs, Data Models (YANG)
- More to come (E.g., ONF Open Source Project, etc...)
Open Source Projects & PCE

• PCE is an important element in most if not all Open Source Projects

- PCE is a SDN enabler in various Open Source Projects for a centralized computation
- With different objective functions and constraints to support its use-cases and project need.
CSO-enabled OPEN PCE

- Do not reinvent a new wheel
- Focus on an end-to-end PCE Model
- Allow multiple API platforms to be mapped and translated via CSO-enabled OPEN PCE architecture
- Algorithm Service is the main thrust of OPEN PCE
Summary and Conclusion

• Potential for a CSO-enabled Open PCE architecture are:
  – Different objective functions and constraints can be experimented using open source projects (e.g., connectivity, service/network policy, security, VNFs, etc.)
  – Open source path computation algorithm research can be triggered.
  – Different standard organizations and open source projects can work together to mutually benefit to each other.