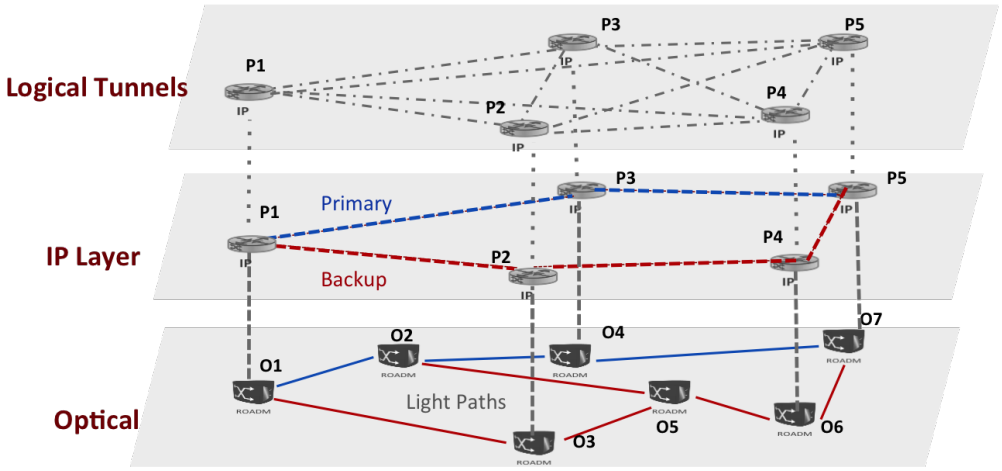
Multi-layer Network Control with ONOS

During the ONS2015, ON.Lab and partners including AT&T, Ciena, Fujitsu, Huawei, Corsa, and Spirent are demonstrating control plane interoperability using real hardware from multiple vendors at both packet and optical layer, i.e., a dev-ops ready control platform for programmability of converged L3/L2 and L0.

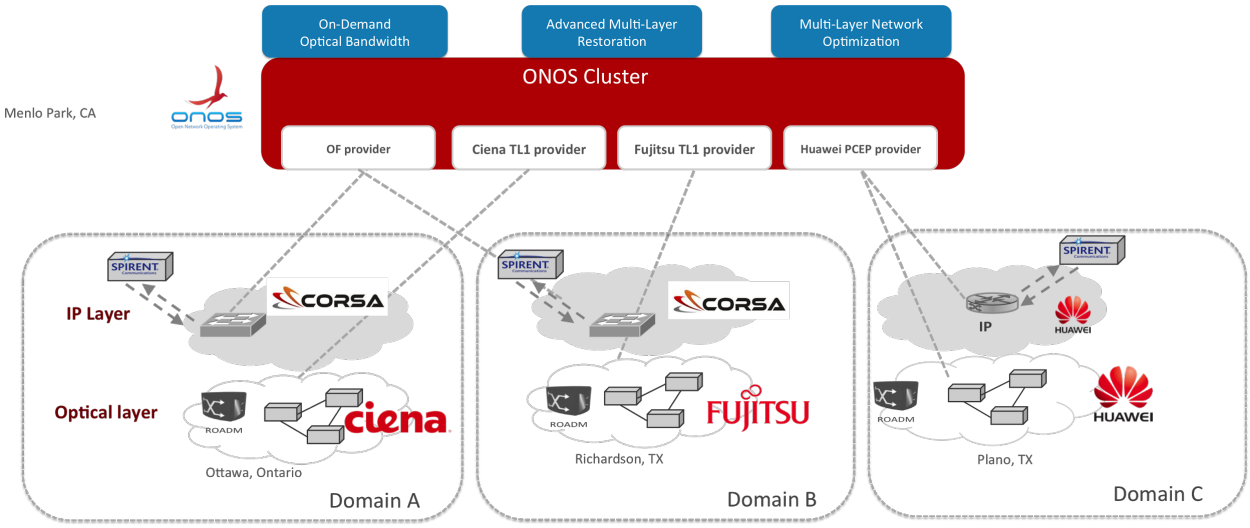
Today, operators deal with multi-layer networks and services comprised of multi-vendor equipment with proprietary interfaces. Furthermore, the lack of integrated control between the packet and optical layers of these networks adds complexity to management, maintenance, rollout and upgrades of new services. Service provider customers are asking for services such as bandwidth on demand, and cannot afford to wait days, weeks or months to add or subtract capacity. The ability to reconfigure multilayer networks dynamically and in real-time would present a tremendous opportunity for improving network efficiency and major CAPEX-and OPEX savings.



To address these issues, a SDN empowered multi-layer network control solution POC is created. We will demonstrate it using ONOS (Open Network Operating System) and multi-vendor hardware. ONOS will be the multi-layer SDN control plane, manage both packet and optical layer networks, with multiple interfaces, equipment types, and protocols. ONOS, as open source software, is developed by ON.Lab and its partners. With ONOS, operators are able to adjust capacity across packet and optical layers and, in theory, across multiple vendor equipment domains

in minutes - as opposed to the weeks it would take otherwise. A series of applications will be demonstrated during this demo: Bandwidth on demand, Multi-Layer Network Optimization, and Advanced Multi-Layer Restoration.

In the past, we have done similar demos with ONOS in large scale using packet and optical emulators. We were able to showcase the scale and HA of ONOS, showing its extensibility as a SDN platform and its capabilities in addressing network operators' demands. One of the main differences between the current demo and the past one is that this time we will use real hardware from multiple vendors in both packet and optical layers. All applications run in real time, supported by the same ONOS intent framework; a unified multi-layer multi-domain topology view is also presented through ONOS. Unlike many other solutions presented by the industry in the past, in this demo any application can apply policy to any network layer.



Rather than statically provisioning spare capacity, applications utilizing ONOS can find spare capacity and respond to failures or new traffic demands in seconds. By dynamically rearranging traffic at the transport level, the network will capitalize on available packet and optical layer resources were sufficient capacity can be found in real-time to meet many emerging needs such as data center on demand capacity shifting.

The application on the northbound can request on demand connectivity, which extends across both packet and optical layers. ONOS will manage traffic distribution across these tunnels utilizing the service demands, predefined policies,

and underlying resource changes. The advantages of multi-layer control at both packet and optical layer for the operators are zero touch, real time traffics engineering, and smooth migration to SDN. In addition, ONOS will be responsible for optimization of packet tunnels, and circuit usages, optimization and load balancing practices, maintenance and discovery of packet tunnels, OTN, and ROADM topology. In summary ONOS will perform functions such as resize existing packet tunnels responding to quick traffic flows variation between DCs, implement rerouting/restoration in optical layer, and provision new tunnels over a proper layer.

This POC shows carriers like AT&T can achieve increased flexibility and network efficiency. It represents an example of a multi-Layer SDN solution that not only provides seamless control over packet and optical layers, but also abstracts protocols and devices through southbound plugins with protocols such as OpenFlow, TL1, and PCEP.

Additional Information

Watch the original video demonstration of the IP/Optical control here.
Find packet optical technical information on our wiki.