SDN Control of Packet-Optical Networks

**Goal**
Multi-layer SDN control with ONOS for programmability and optimization across packet and optical networks for a more efficient WAN.

**Inefficiencies with Current Practices**
- Packet and optical networks managed independently
- Each network does its planning independently resulting in overprovisioning and significant inefficiencies.
- Provisioning of Optical networks is static and lacks agility (bandwidth on demand is slow)

**Solution**: Optimization across packet and optical networks, programmability and agility with Multi-layer SDN Control.

**Multi-layer SDN Control with ONOS**
- **BW Calendaring application provides:**
  - Ability to specify bandwidth scheduling with a set of SLAs and optimization parameters.
- **ONOS provides:**
  - NB Intent Framework for provisioning across packet and optical
  - PCE for multi-layer optimal path selection
  - Network graph abstraction with both layers
  - Packet and optical Data model
  - Topology discovery of packet and optical
  - Pluggable SB for adaptors
  - Failure detection and rerouting
  - Visibility (GUI) and statistics

**Emulated Packet & Optical demo environment:**
- Packet switches: OVS
- ROADMs: LINC-OE
- Orchestration/emulation: Mininet

**ONOS Partners:**
- at&t
- ciena
- ERICSSON
- FUJITSU
- HUAWEI
- intel
- NEC
- R&T Communication