# OOPT NOS - Goldstone

1. Introduction

This document describes the project undertaken by PalC Networks in bringing open source NOS for OOPT TIP group. The OOPT-NOS group focuses on a reference open source Network Operating System (NOS) that supports OOPT disaggregated hardware platforms offering the following benefits to accelerate the innovation in IP and Optical networks:

1. Enable Hardware technology providers to validate the hardware functionality and performance,
2. Allow NOS technology providers to benchmark against, or give NOS technology providers or SI a leg up to build on,
3. Allow Optical solution technology providers (SI) to validate optical solutions without partnership with commercial NOS providers,
4. Offer Connectivity operators with in-house service and software development and operations skillsets to be more agile to meet new business requirements. (shorter time to business).

The packet optical DWDM switch has 100GbE packet switching ports and 100/200GbE coherent optical interfaces. The box was purpose built to enable network operators to easily extend and migrate existing metro and long-haul Dense Wavelength Division Multiplexing (DWDM) networks to add new 200G capacities for data-center interconnect and service provider back-haul use-cases.
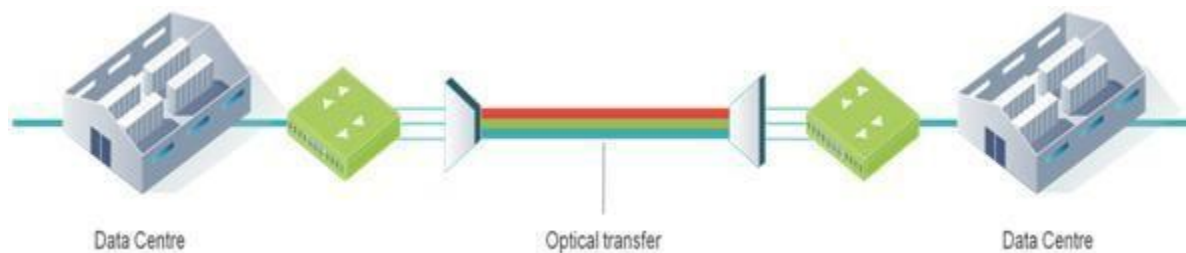

2. Hardware Details:

Hardware is a 1.5RU form factor with system throughput of 3.2Tbps based on Broadcom StrataXGS™ Tomahawk™ Plus switch silicon. The design offers sixteen fixed 100 Gigabit Ethernet QSFP28 ports, plus 8 line-card slots to incorporate a flexible mix of additional 200GbE ports or ACO/DCO optical ports based on coherent DSP and optical transceivers from leading optical technology partners.

The following line cards can be as required, providing the network operator with a scalable pay- as-you-grow platform.
- 100GbE Line Card: 2 x 100GbE QSFP28.
- DCO Line Card: 1 x 100G/200G CFP2 with supporting DCO pluggable transceivers;

- ACO Line Card: 1 x 100G/200G CFP2 with supporting ACO transceivers;

3. System Architecture:
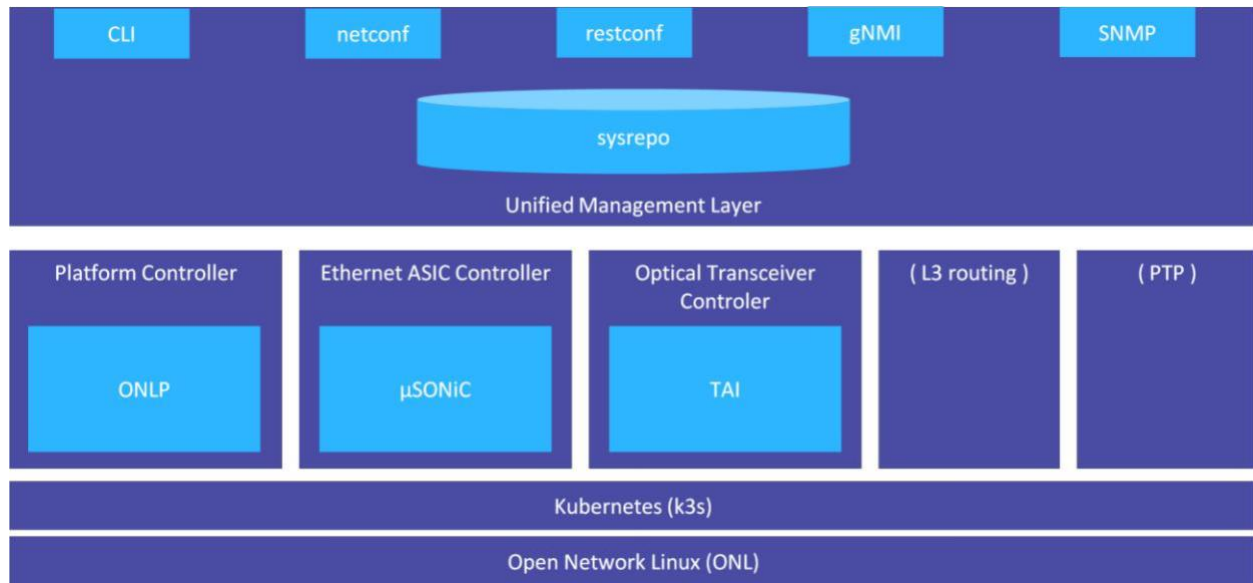
The OOPT-NOS utilizes many existing open source components which have been developed in Open Compute Project (OCP) and Telecom Infra Project (TIP) including Open Network Linux (ONL), SONiC, Switch Abstraction Interface (SAI) and Transponder Abstraction Interface (TAI) to provide a full-fledged open source solution. ONL is used as the base operating system and provides a wide range of open network device support. On top of ONL, Kubernetes is employed to enable containerized application management, which realizes flexible and modular software composition. SONiC/SAI is deployed as a fleet of containers when the target hardware comprises Ethernet switch ASIC, whereas TAI is used when the target hardware has coherent transponder components. Because of its modular architecture, Goldstone can be extended to support networking devices, which don't have Ethernet ASIC, but may include conventional transponders, ROADMs or amplifiers in the future.

ONLP

The Open Network Linux Platform APIs provide a common, consistent abstraction interface for accessing important platform assets such as SFPs, PSUs, Fans, Thermals, LEDs, and ONIE TLV storage devices.

All Open Networking platforms contain some subset of these objects but the programming requirements to access them are highly dependent upon the hardware design and knowledge thereof. The goal of the ONLP APIs is to both standardize access to these objects at a functional level for system applications and provide a common implementation framework for hardware developers.

SONiC

SONiC is an open source network operating system based on Linux that runs on

switches from multiple vendors and ASICs. SONiC offers a full-suite of network functionality, like BGP and RDMA, that has been production-hardened in the data centers of some of the largest cloud-service providers. It offers teams the flexibility to create the network solutions they need while leveraging the collective strength of a large ecosystem and community.
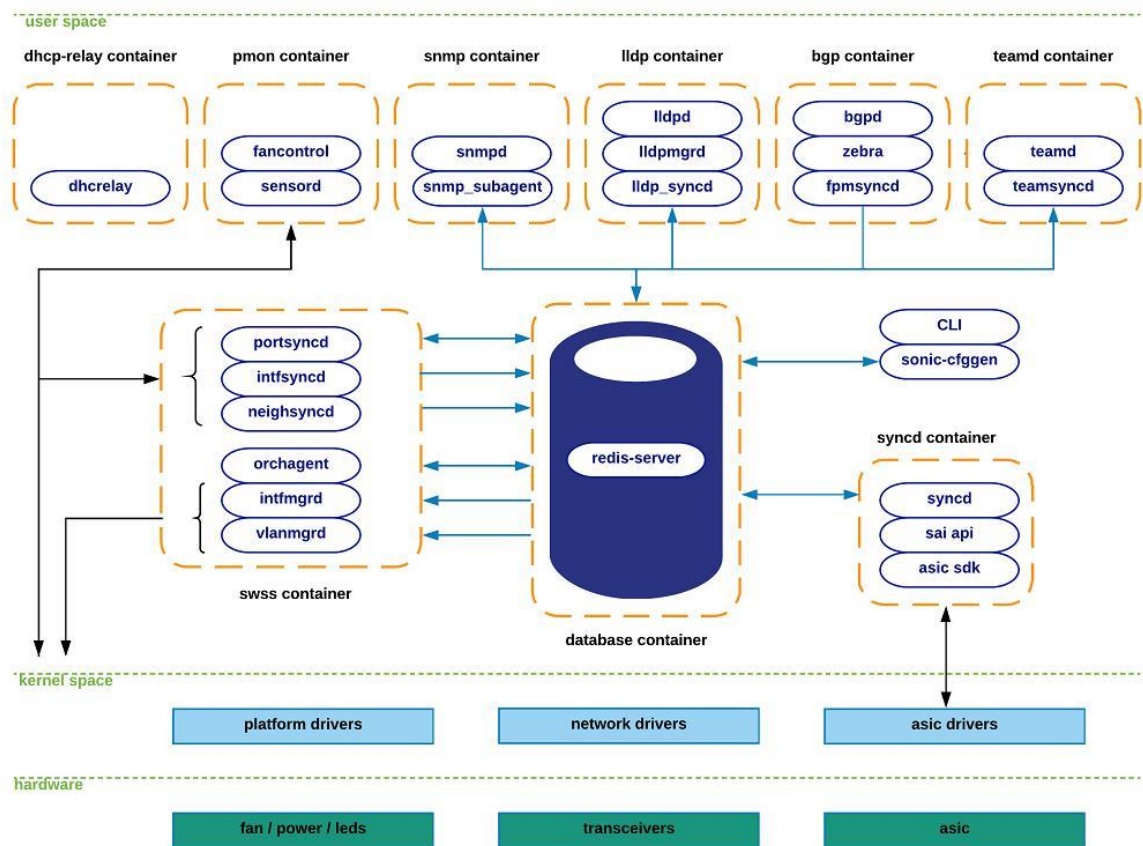

TAI: Transponder Abstraction Interface

Transponder Abstraction Interface [TAI], defines API's to provide a vendor independent way of programming the transponders from various vendors.

TAI acts as hardware abstraction interface between the system software (NOS) and the coherent optical devices. There by allowing all the TAI complaint transponders to operate with any system software having TAI layer integrated.
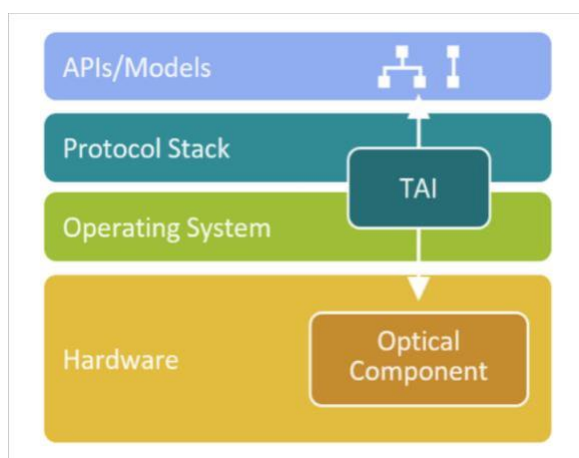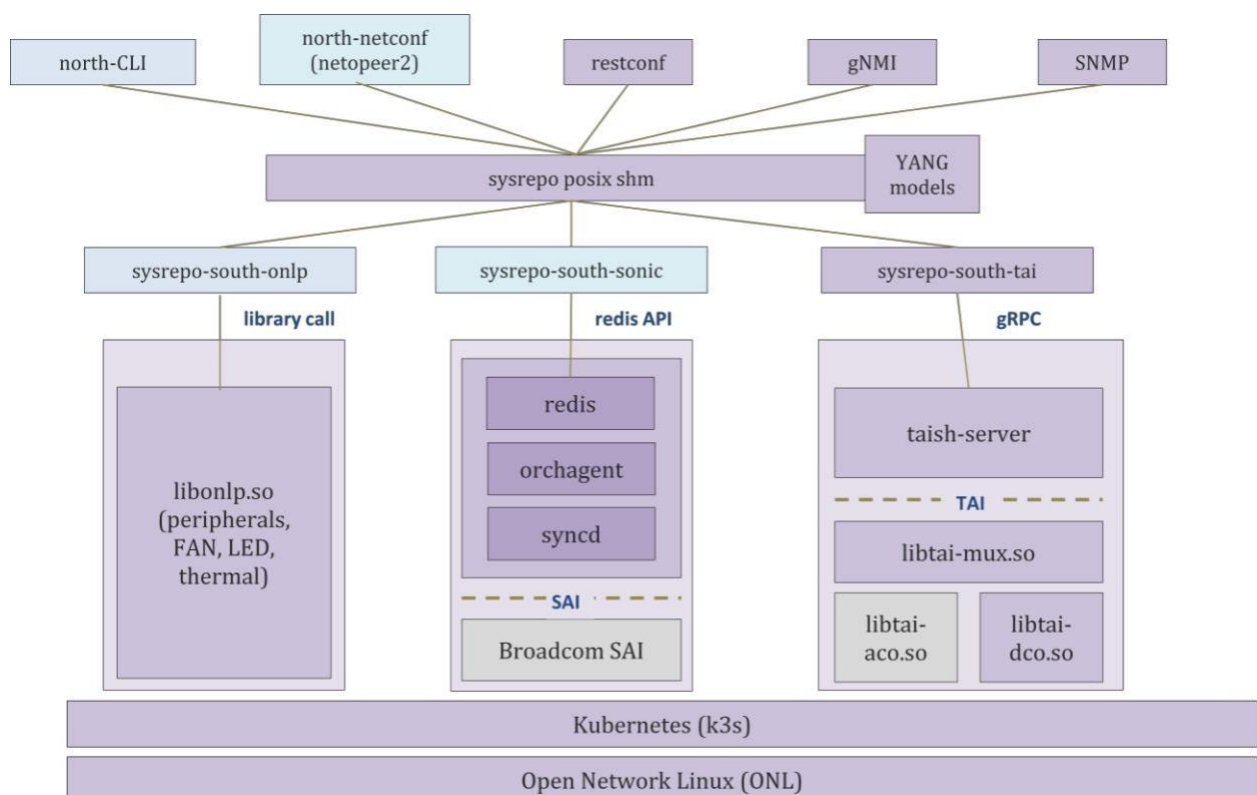

As part of this project, we integrated open-source TAI library in to NOS and developed TAI complaint vendor specific driver modules, the architecture of which is as shown below.
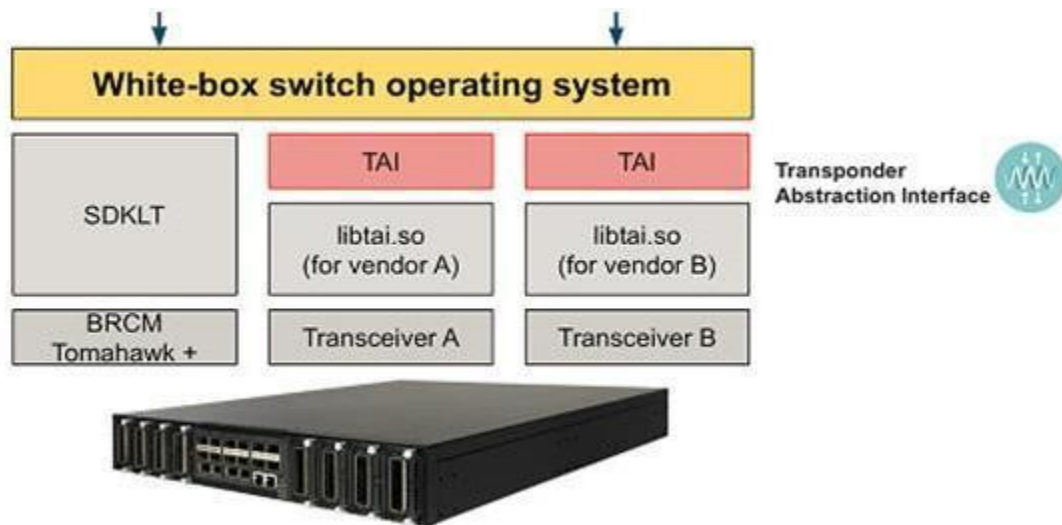
The TAI layer provides generic API's to switch operating system to manage the optical coherent- devices. The switch operating system uses the TAI abstraction layer to talk to vendor-specific driver code (libtai-dco.so) to program the underlying coherent-device. As part of this integration, we also designed and developed the libtai.so driver for DCO optical CFP2 module.

Unified Management Layer

The unified management layer provides a common APIs towards different north bound management protocols like CLI, netconf, restconf, gNMI SNMP etc.

4. References:

1. https://telecominfraproject.com/oopt/
2. https://www.opennetworking.org/onos/
3. https://github.com/Telecominfraproject/oopt-tai