# SONiC Layer-1 Subgroup

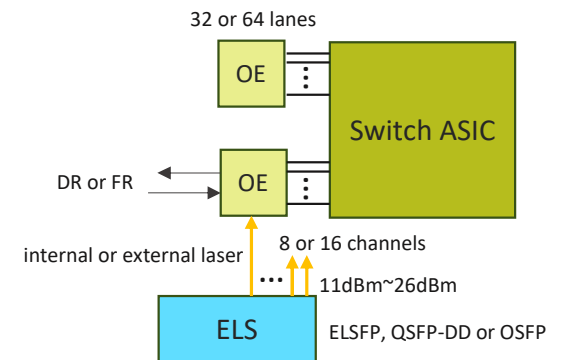Prince George/Guohan Lu/Eddy Kvetny/Shivu Vibhuti

Why Layer-1 Subgroup

- The physical layer transforms the data from bits into signals that can be transmitted as electrical signals or optical signals

- Increased complexity and challenges of meeting the demand for high-speed technologies of the future

- Demand for improved signal quality and diagnosability

- Future proof SONiC with advancement in the transceiver technologies like CPO, LRO, LPO
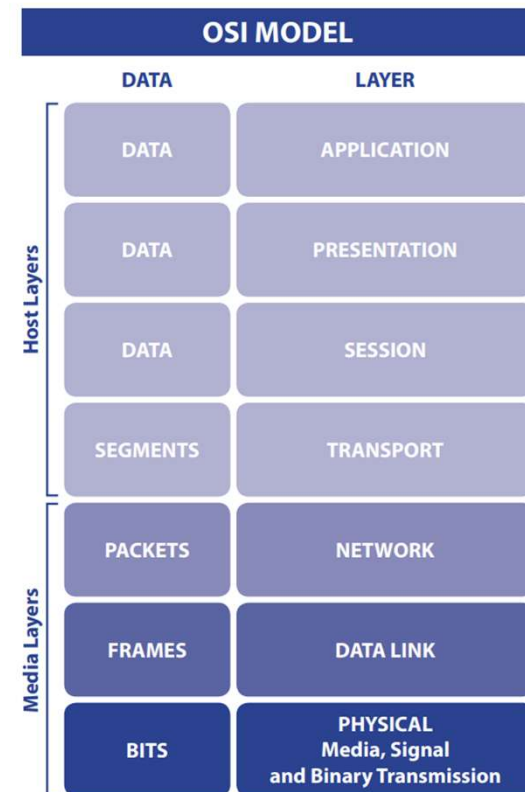
CPO Support

- Standardization Effort: OIF IA for a 3.2Tb/s Co-Packaged(CPO) Module (March 2023)

- Optical Engine(OE) (non-pluggable):
  - # of lanes: 32, 64
  - PMD: DR, FR(CWDM), BiDi
  - Laser: internal or external

- External Laser Source(ELS) (pluggable):
  - form factor: ELSFP(blind mate), QSFP-DD, OSFP
  - # of channels: 8, 16
  - output power: from Low Power 11dBm to Super High Power(26dBm)

32 or 64 lanes

OE

Switch ASIC

DR or FR

OE

internal or external laser

8 or 16 channels

11dBm~26dBm

ELS

ELSFP, QSFP-DD or OSFP

OE Management via SPI

- Pluggable transceiver management via I2C

- OIF choose SPI as the management communication interface (MCI) for CPO
    - SONiC uses optoe driver for pluggable module EEPROM
    - Need new driver in sonic for SPI device access
    - Multi-bank page support needed
    - Need support for managing ELSP
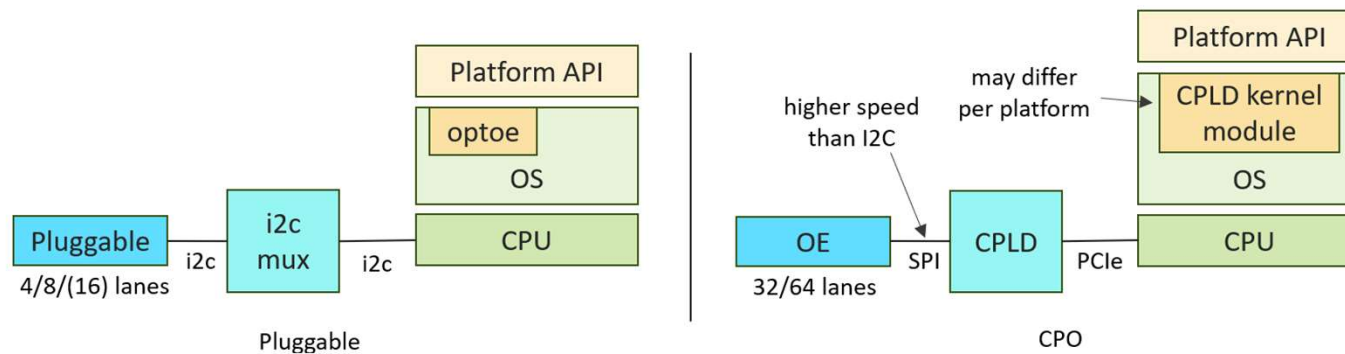
CMIS Link Training

- Why CMIS-LT ?
  - Create optimum preset for specific deployment scenario
  - To train C2M (Chip-to-Module) link at higher link speed
  - Read SNR/BER and monitor link degradations
  - Improved channel loss margin

- Bi-directional OOB communication between host Serdes and module DSP

- Can support any data rate 112G and above

- It is necessary for 224G C2M and would be standardized by OIF PLL group and IEEE std

- LT need to be integrated with existing CMIS state machine

Layer-1 Scope in SONiC

- Support for newer transceiver technologies like CPO, LPO, LRO
- Support of CMIS v5.3 and beyond
- Auto-negotiation and link training of 400G, 800G and 1.6T+
- Reliable link bring up for passive and active cables
- Module diagnostics and monitoring capabilities
- Link health monitoring and debuggability
- Telemetry, logging & tracing

Subgroup Setup

- Chair: Prince George (Microsoft)
- Co-chair: Shivu Vibhuti (Cisco), Eddy Kvetny (Nvidia)
- Workgroup Meeting Candence: Monthly
- Objective:
  - Layer 1 support in SONiC as ultra-highspeed technologies evolve
- Tasks:
  - Review/Signoff design proposals
  - Facilitate code review processes
  - Test automation