Proposed SMF Objectives for 400GPL

Single Wavelength PMD types for 1.6TE, 800GE, and 400GE

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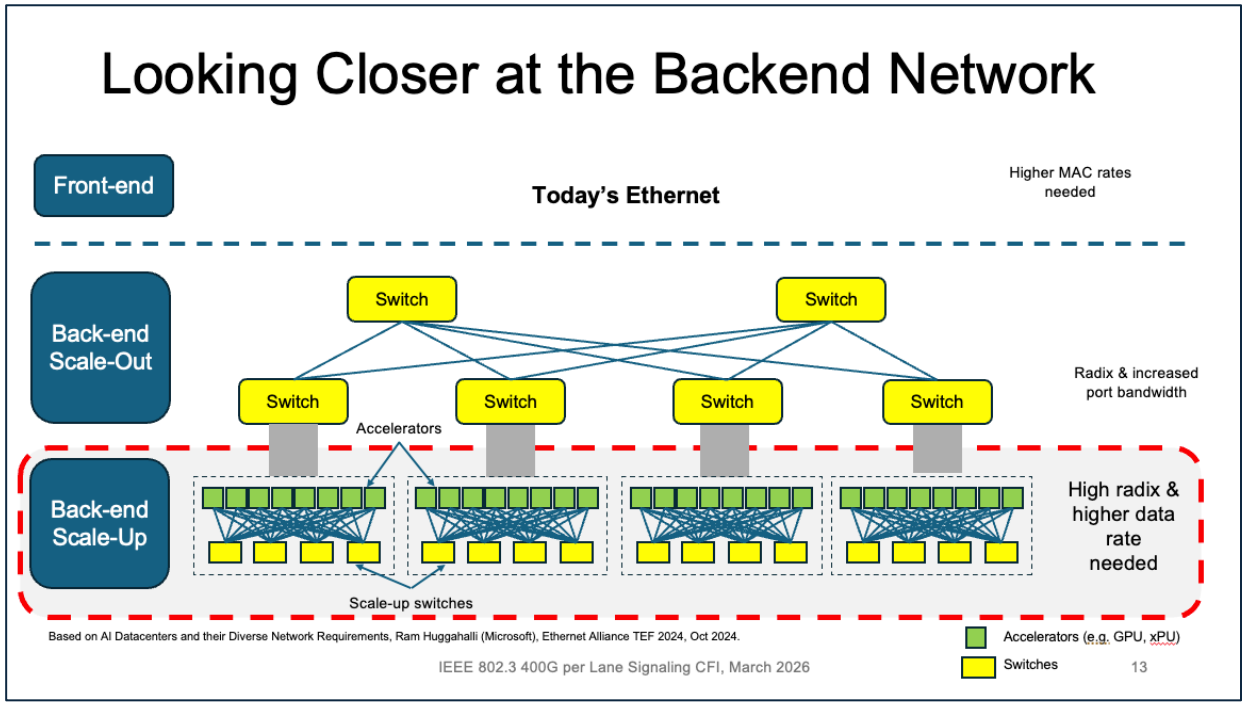
Study Group Charter (from March CFI)

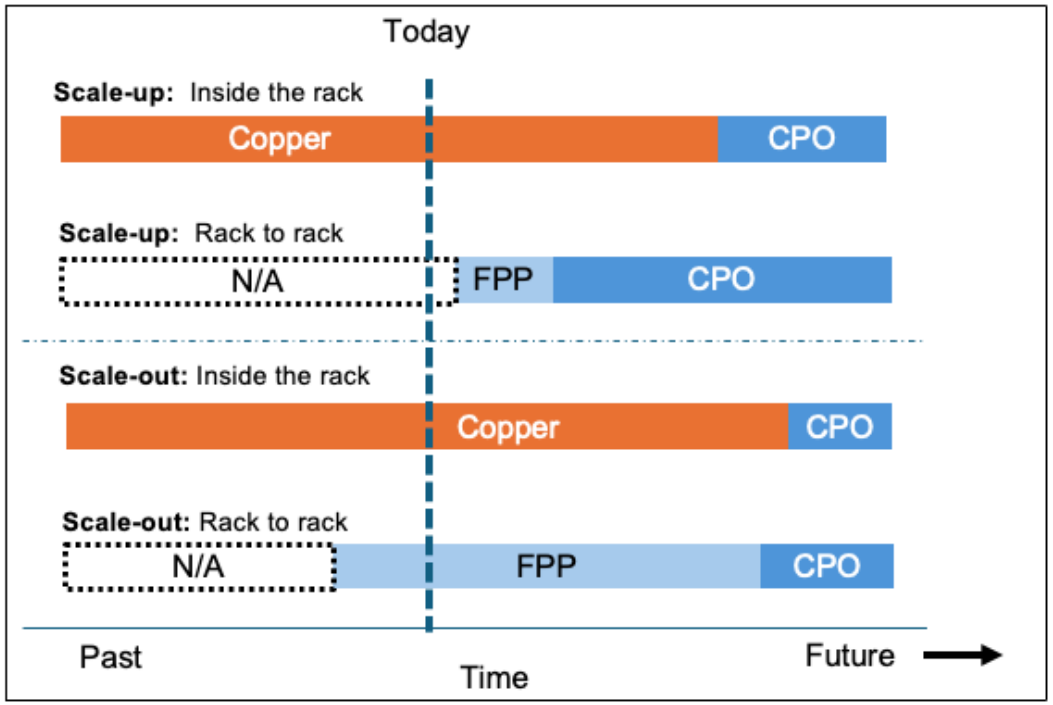
This call for interest is to initiate a Study Group to develop a Project Authorization Request (PAR) and Criteria for Standards Development (CSD) for Physical Layer specifications supporting existing Ethernet rates using 400 Gbps-per-lane signaling for electrical interconnects as well as optical interconnects with reaches of up to 500 meters.

https://ieee802.org/3/cfi/request_0326_1.html

Addressing network applications



https://www.ieee802.org/3/cfi/0326_1/CFI_01_0326.pdf



Based on AI Networking: What do scaleup and scaleout really mean for networking demand, Alan Weckel (650 Group), https://www.ieee802.org/3/ad_hoc/E4AI/public/25_0327/weckel_e4ai_01_250327.pdf

500m reach supports:

- Future front-end intra-datacenter links
- Scale-out: Intra-Datacenter links
- Scale Up: Intra-Rack and Inter-Rack Domains

Motivations for Objectives

- 500m single wavelength optical PMD types have seen **large scale deployment** in AI networks, with considerable deployment of 100GPL and rapidly scaling deployment of 200GPL
  - High radix support important feature driving single wavelength PMDs

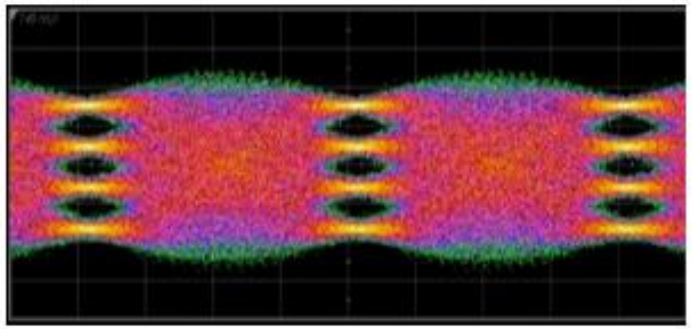
- 500m single wavelength solutions present **fewer technical challenges** that alternate PMD types (longer reach and/or multi-wavelength)
  - Ie, lower channel losses and impairments

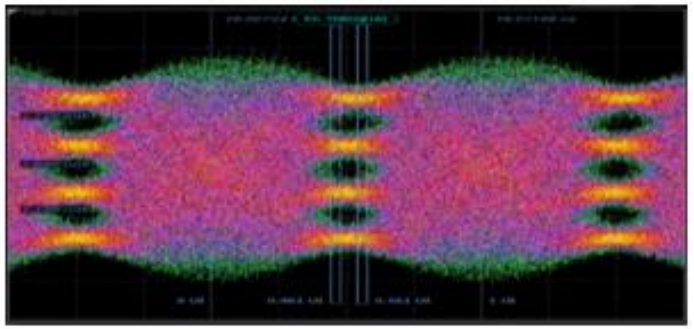
- 500m single wavelength optical PMD types are generally/recently the **first deployed** within a new rate generation

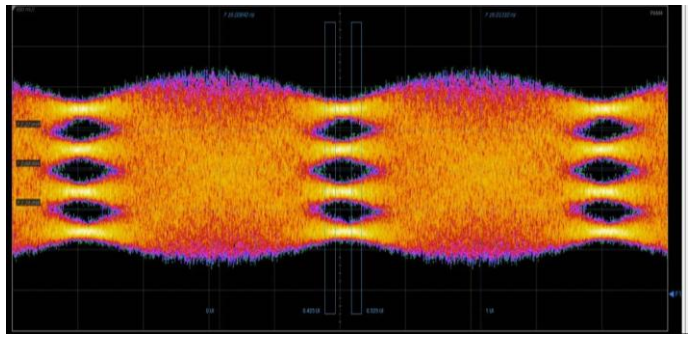
Proposed Objectives

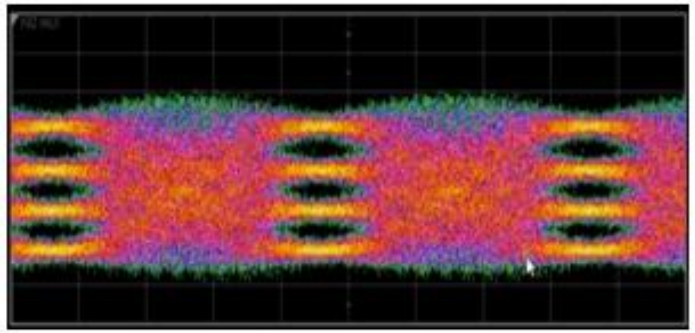
1. Define a physical layer specification that supports 1.6 Tb/s operation over 4 pairs of SMF with lengths up to at least 500 meters.
2. Define a physical layer specification that supports 800 Gb/s operation over 2 pairs of SMF with lengths up to at least 500 meters.
3. Define a physical layer specification that supports 400 Gb/s operation over 1 pair of SMF with lengths up to at least 500 meters.

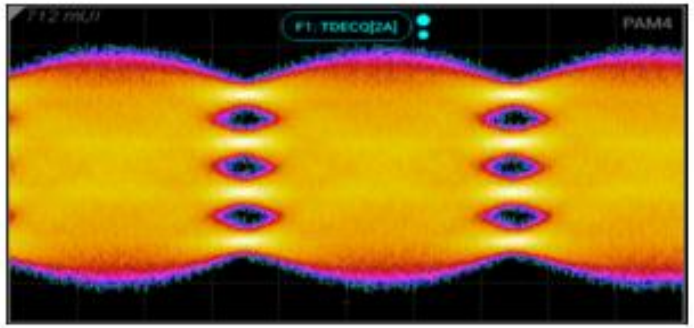
Technical Feasibility: 400G Optical Tx eyes

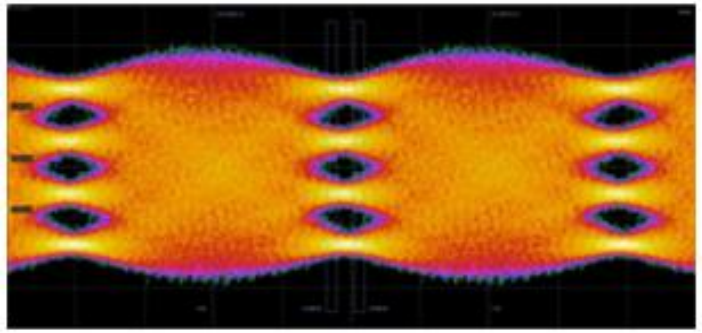


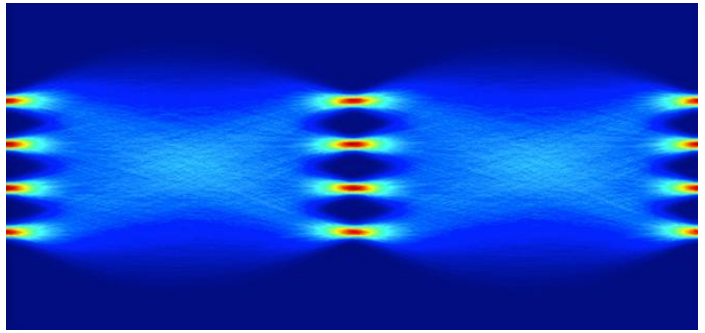












Various technical demonstrations from different module implementations with different DSPs and different modulators have been shared.

Source: V. Parthasarathy, J. Johnson (Broadcom), Eric Maniloff (Ciena), Micheal He (Terahop)

Other Considerations

- No specific objectives proposed at this time for multi-core fiber (MCF). It is expected that “pairs of SMF” could describe both single-core and multicore fiber.

- It is expected that alternative reach objectives (from 500m) could be considered in task force, if it is found advantageous to do so.
  - Multi-Wavelength PMD objectives could also be part of that exploration

Recommendation

- Adopt the proposed set of objectives for 500m reach which represents a known requirement and a sufficient set for the study group approval to occur

- Use task force to continue discussing potential additional objectives

Thank you

Supporting Consideration: Compatibility

- Market requirements for datacenter optics include they be multi-rate compatible for up to two PMD generations:
  - Example: 800BASE-DR4 ↔ 400BASE-DR4 ↔ 200BASE-DR4
  - Projected: 1.6TBASE-DR4 ↔ 800BASE-DR4 ↔ 400BASE-DR4

- Breakout support also required (by customers):
  - Example: 800GBASE-DR4 ↔ 4x200GBASE-DR1
  - Projected: 1.6TBASE-DR4 ↔ 4x400GBASE-DR1