800G-FR4 without inner FEC - Market Needs

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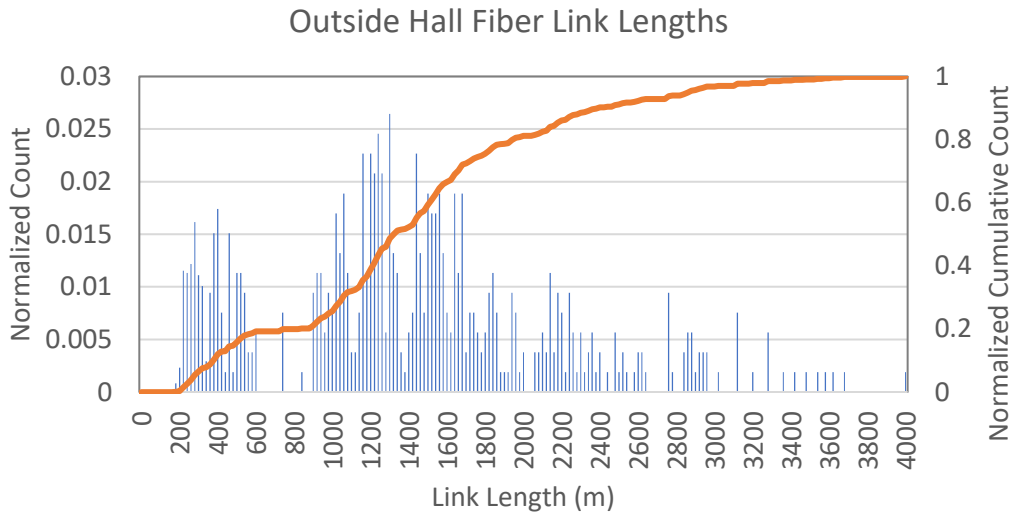
800G-FR4 without inner FEC

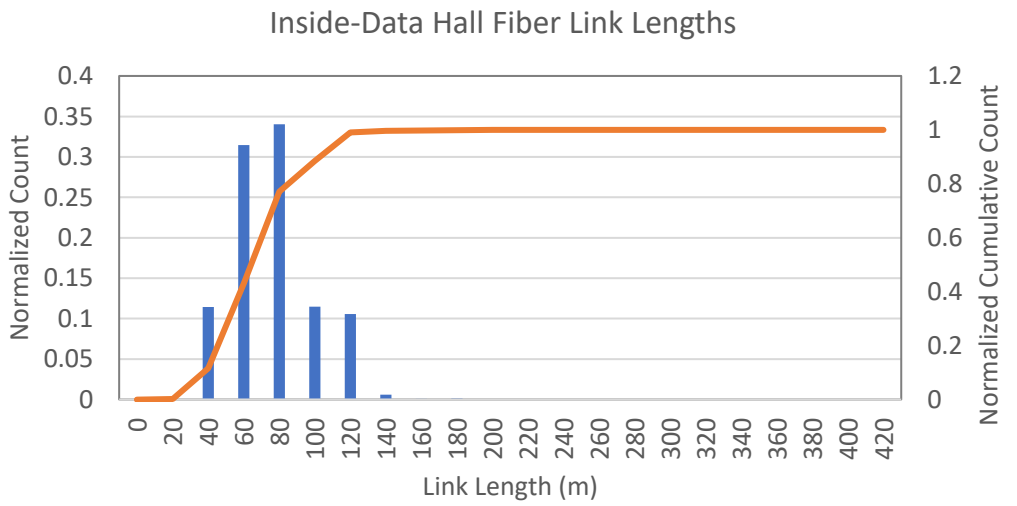
- **Latency Benefit**: FR4 optics currently used for short reach applications
  - Intra Data-Hall average reach < 100m
- **Architecture Benefit**: FR4 optics in CPO/LPO utilize host side SERDES
  - Host not expected/required to have inner FEC
- **Power Benefit**: 800G-FR4 in high density systems
  - Pluggable and CPO/LPO systems

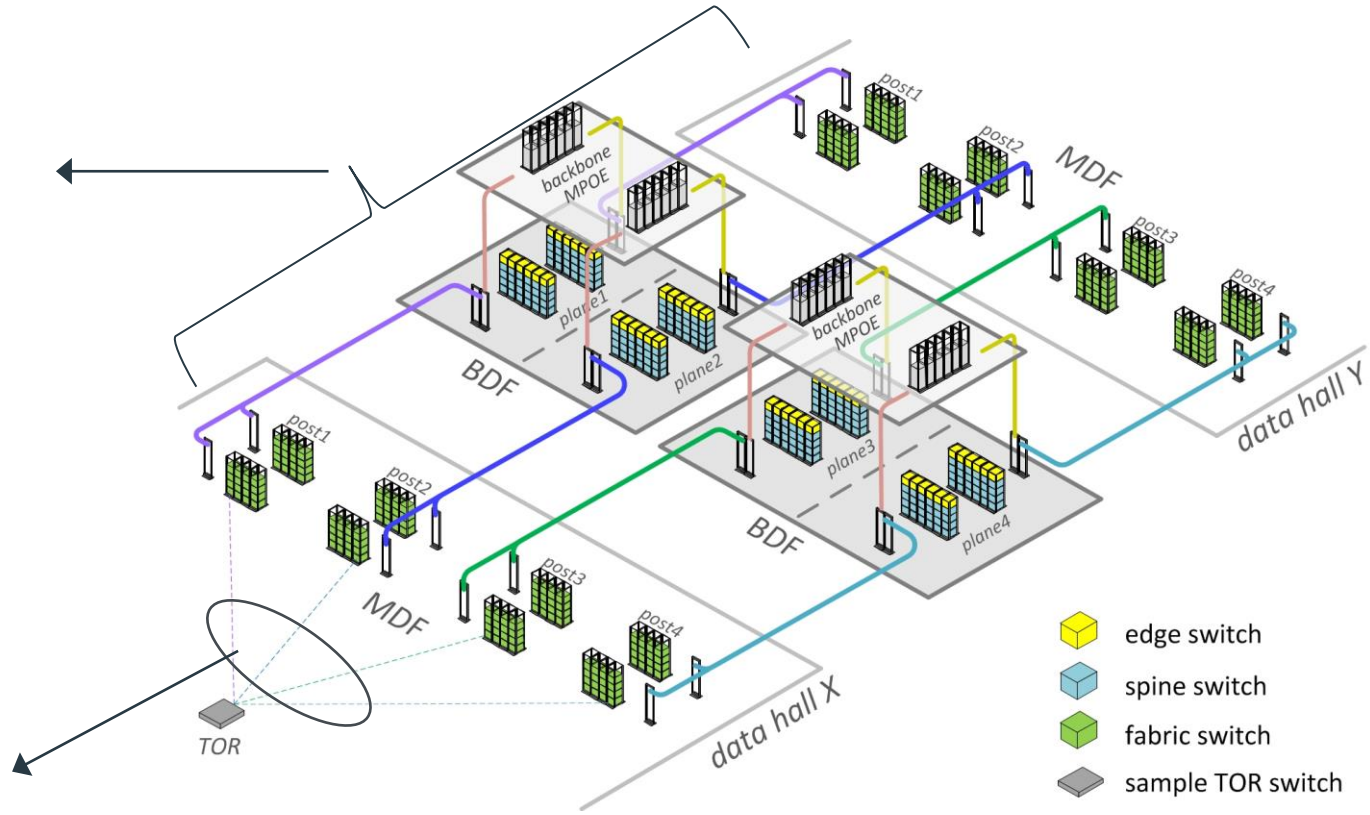
Latency Benefit

- Historical ethernet model would have people use different PMD types for different reaches:
  - Example: MMF for short reach and SMF for long reach
- Contemporary usage in web-scale applications tend to be much more homogenous, with different DCs using either all parallel SMF or all duplex SMF
- Consequently, duplex SMR (FR4) links are routinely used for short reach interconnects

SMF Datacenter Link Lengths







66% of links (inside + outside hall) < 100m length

200G-FR4 / 400G-FR4 / duplex SMF on all intra-DC optical interconnects

IEEE 802.3df

Meta

Architecture Benefit

- Contemporary applications of linear pluggable optics (LPO) and co-packaged optics (CPO) use the host-side SERDES/DSP for PAM4 decoding.

- 200G/L host-side SERDES not expected to have inner FEC
  - No AUI of Copper PMDs being defined based on inner FEC
  - Higher overhead of inner FEC would yield higher channel losses over AUI

- 200G/L LPO and CPO architectures will likely require operation without inner FEC.

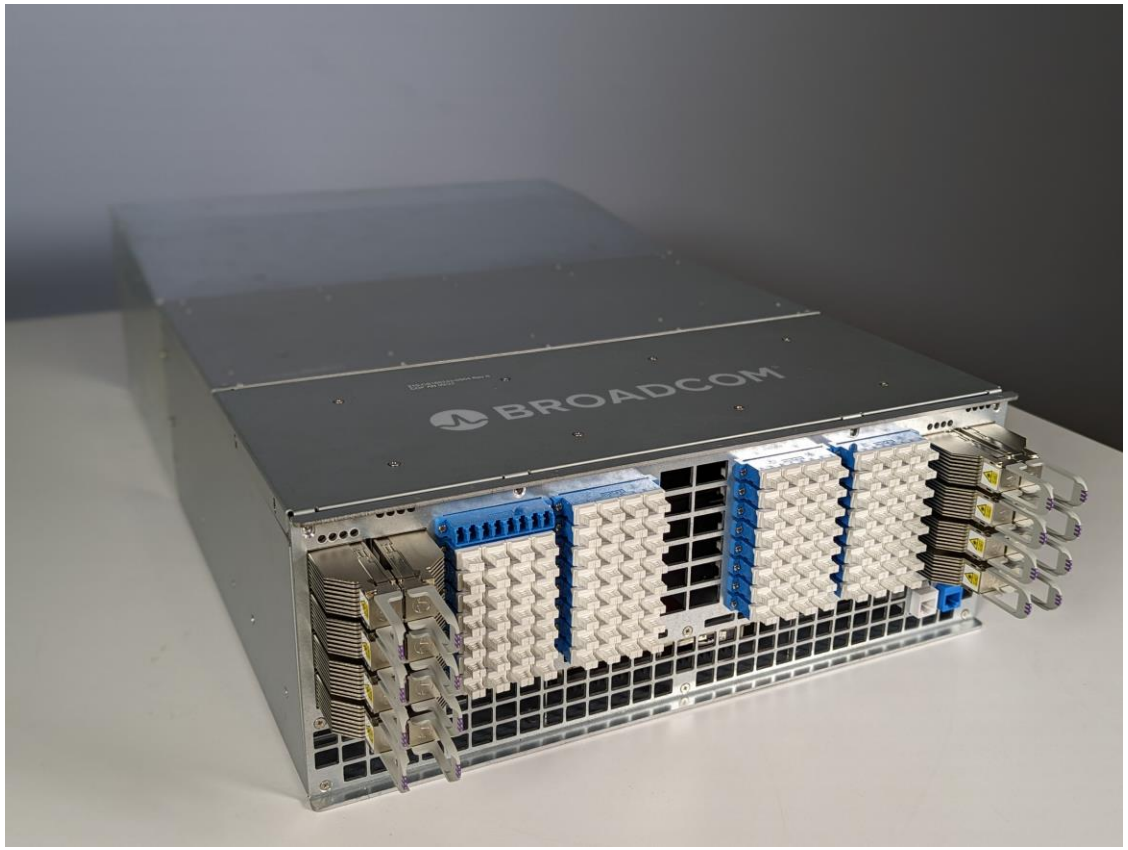
Both use host integrated SERDES

CPO Today

25.6T CPO Switch: 64x**400G-FR4**

https://blogs.cisco.com/sp/co-packaged-optics-and-an-open-ecosystem

51.2T CPO Switch: 128x**400G-FR4**



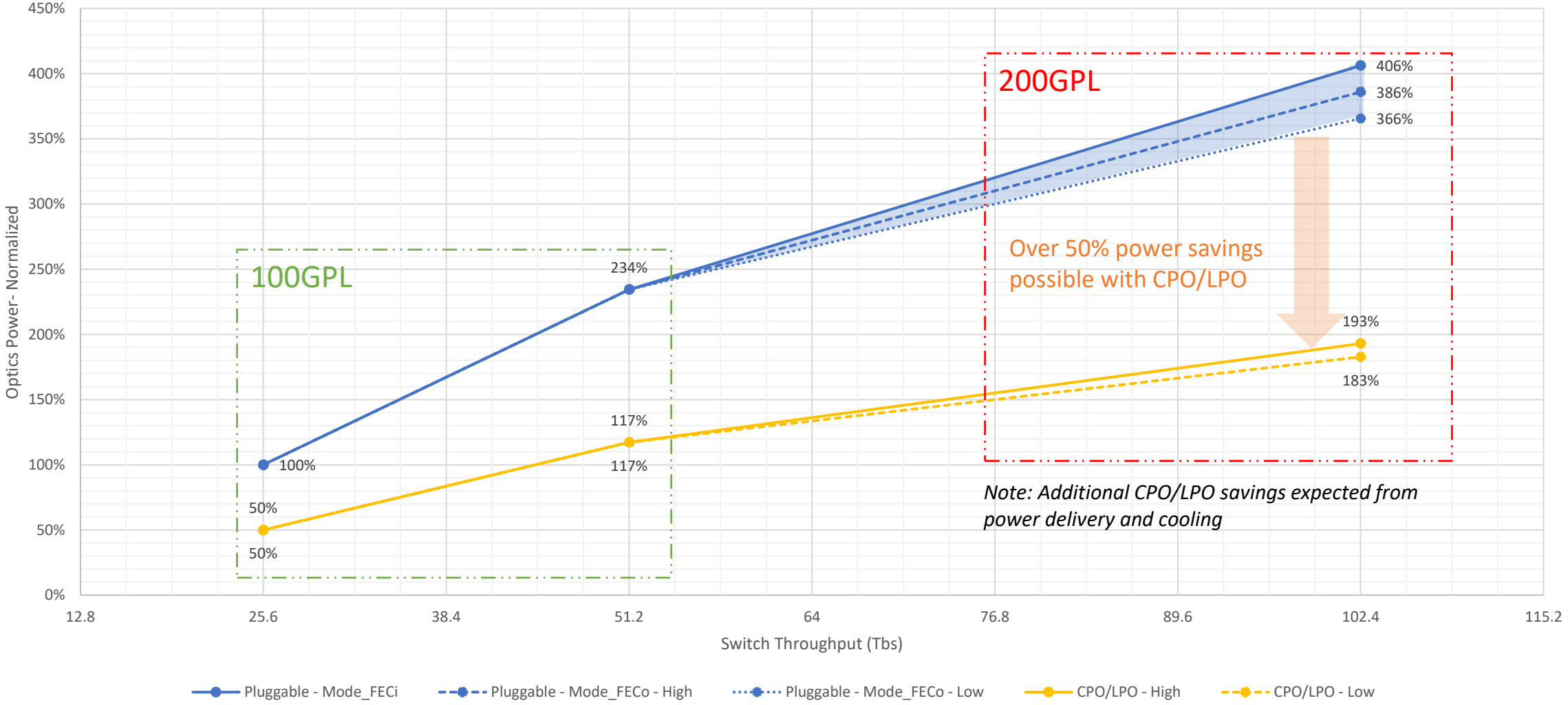
www.Broadcom.com/info/optics/cpo

Power Benefit

- **Pluggable Optics**: Moderate (but non-trivial) reduction in optics/system power when operating without inner_FEC ~ 5-10%
  - https://www.ieee802.org/3/dj/public/23_07/welch_3dj_04a_2307.pdf

- **CPO/LPO**: Considerable reduction on optics/system power by enabling CPO/LPO architectures > 50%
  - Elimination of up to two ADC+DSP interfaces from link architecture

Power Benefit



Summary

- 800G-FR4 has a need to operate without an inner FEC for certain markets.

- This solution would yield latency, power, and integration benefits compared to 800G-FR4 solutions that use an inner FEC

Thank You