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

IEEE 802.3df
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.
CPO Today

25.6T CPO Switch: 64x400G-FR4

51.2T CPO Switch: 128x400G-FR4

Both use host integrated SERDES


www.Broadcom.com/info/optics/cpo

IEEE P802.3dj 200Gb/s, 400 Gb/s, 800 Gb/s, and 1.6 Tb/s Ethernet Task Force

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Power Benefit

• **Pluggable Optics**: Moderate (but non-trivial) reduction in optics/system power when operating without inner FEC ~ 5-10%

• **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

Over 50% power savings possible with CPO/LPO

Note: Additional CPO/LPO savings expected from power delivery and cooling
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