Microsoft 100G/400G Coherent use case

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Supporters

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DC architecture

**Datacenter**
- "lots" of rows / DC
- Tier 1 to Tier 2 connected < 600m with parallel fiber via PSM4
  - Legacy builds with duplex via CWDM4
- massively parallel Tier 2
- 100G PSM4 / CWDM4 power = 3.0 – 3.5 W
Regional architecture

Region

• “lots” of DCs/region possible
• RNG = Regional Network Gateway
• DC-RNG and RNG-RNG connected ≤ 100km via DWDM PAM4

  • Some campus builds connected via bulk fiber (< 2km)
  • 100G PAM4 power = 4.5W
  • single percentage of total server BW in DCI
400G Regional Architecture

- DWDM 400ZR <100km
- >16Tb/s per fiber
- DR4/FR4 <600m
- AOC <20m

DC

row
rack
Regional architecture

- distributed data center model
- massively parallel and highly resilient
- latency SLAs constrain maximum fiber distances
- need focused, cloud-friendly solutions for these application spaces
DCI drivers: regional installed fiber plant

- Today this application space is covered by DWDM PAM4
- Narrowly-focused coherent technology ideal for 400G DCI
Legacy transponder optical architecture
DWDM PAM4/Coherent DCI optical architecture
DWDM considerations

- Requirements / challenges:
  1. Clean outside fiber plant
  2. Powerful line systems
  3. Dispersion compensation

  “Coherent is easy. PAM4 is hard!”

- Coherent works every time
  1. Better OSNR sensitivity
  2. Better RX power sensitivity
  3. Works at 80km over any fiber type
DCI deployment growth

• Data center demand continues growing

• Capacity will be met by:
  • Increasing throughput of links (100G → 400G)
    • Many of our deployments are running close to the 4Tb/s capacity per fiber on day 1
    • These links will max our at 16Tb/s during the 400G technology refresh
  • Adding more data centers in a regional zone
100 Gb/s and 400 Gb/s Coherent Market

- 400 Gb/s market starts in 2019
- Coherent edge (100G and 400G) represents ~ 35% of whole coherent market in 2022
  - Edge applications expected to be dominated by Ethernet

Courtesy of Andrew Schmitt, Cignal AI
Microsoft desire for 100G/400G Coherent

• 100G coherent makes sense for Microsoft:
  • As a second source
  • For spans where loss is out of range for PAM4 DD
  • Give us experience with setting up Coherent links in our SDN

• 400ZR enables Data Center upgrades
  • Starts from the links connecting data centers to RNGs
  • 400G links in the data center follow (DR4, FR4, AOC, DAC)