

Microsoft 100G/400G Coherent use case

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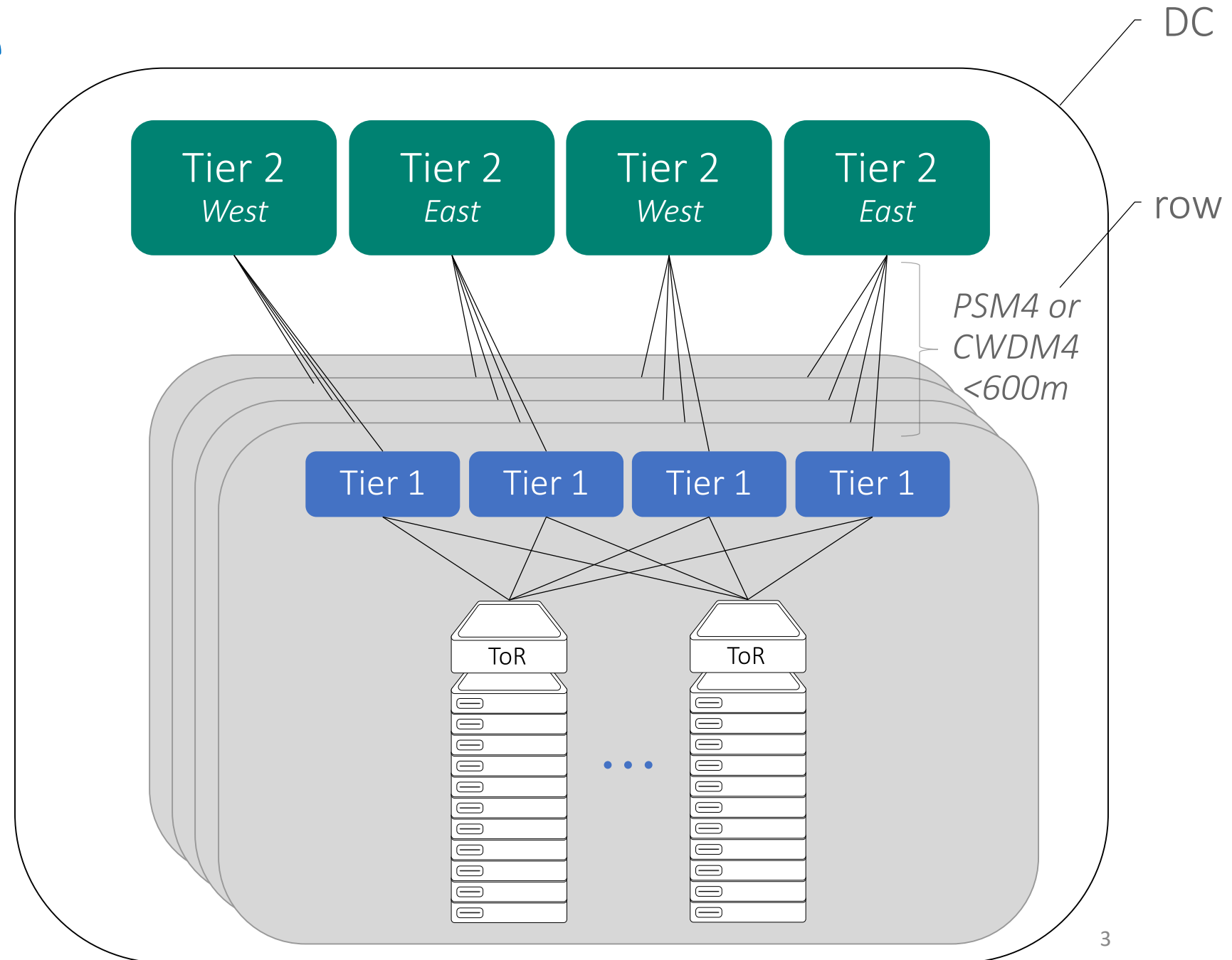
Supporters

- Katharine Schmidtke, Facebook

DC architecture

Datacenter

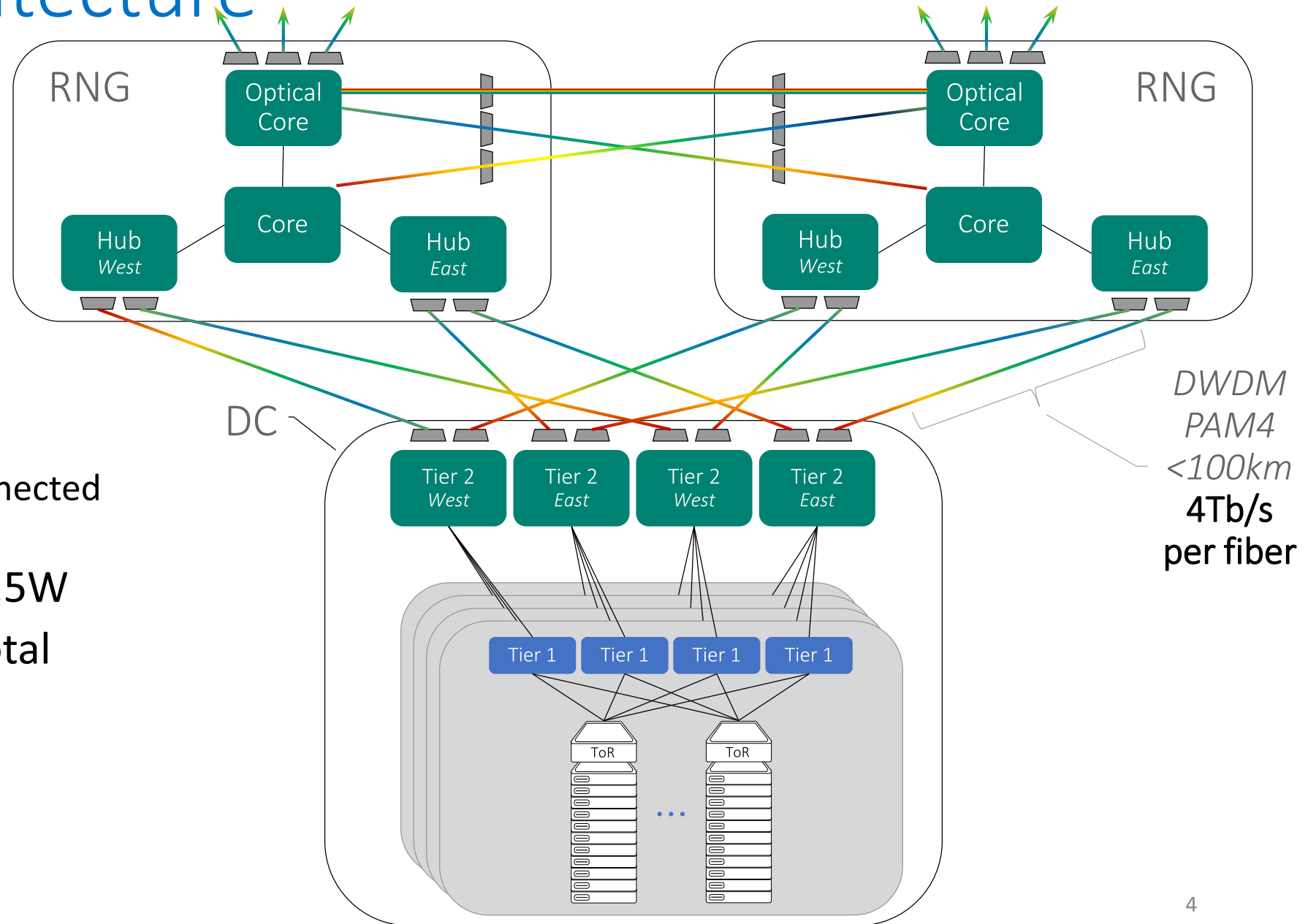
- “lots” of rows / DC
- Tier 1 to Tier 2 connected < 600m with parallel fiber via PSM4
- Legacy builds with duplex via CWDM4
- massively parallel Tier 2
- 100G PSM4 / CWDM4 power = 3.0 – 3.5 W



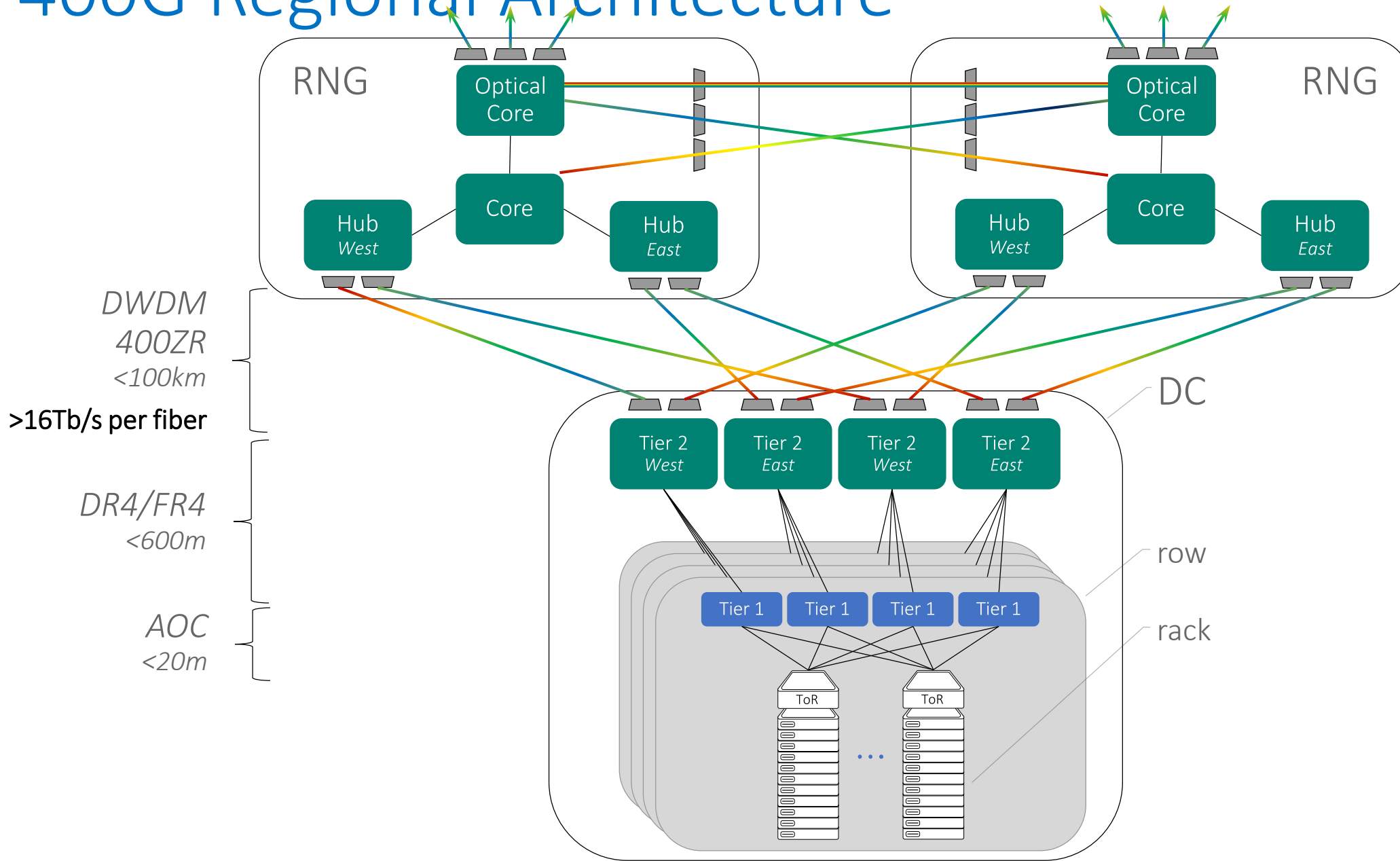
Regional architecture

Region

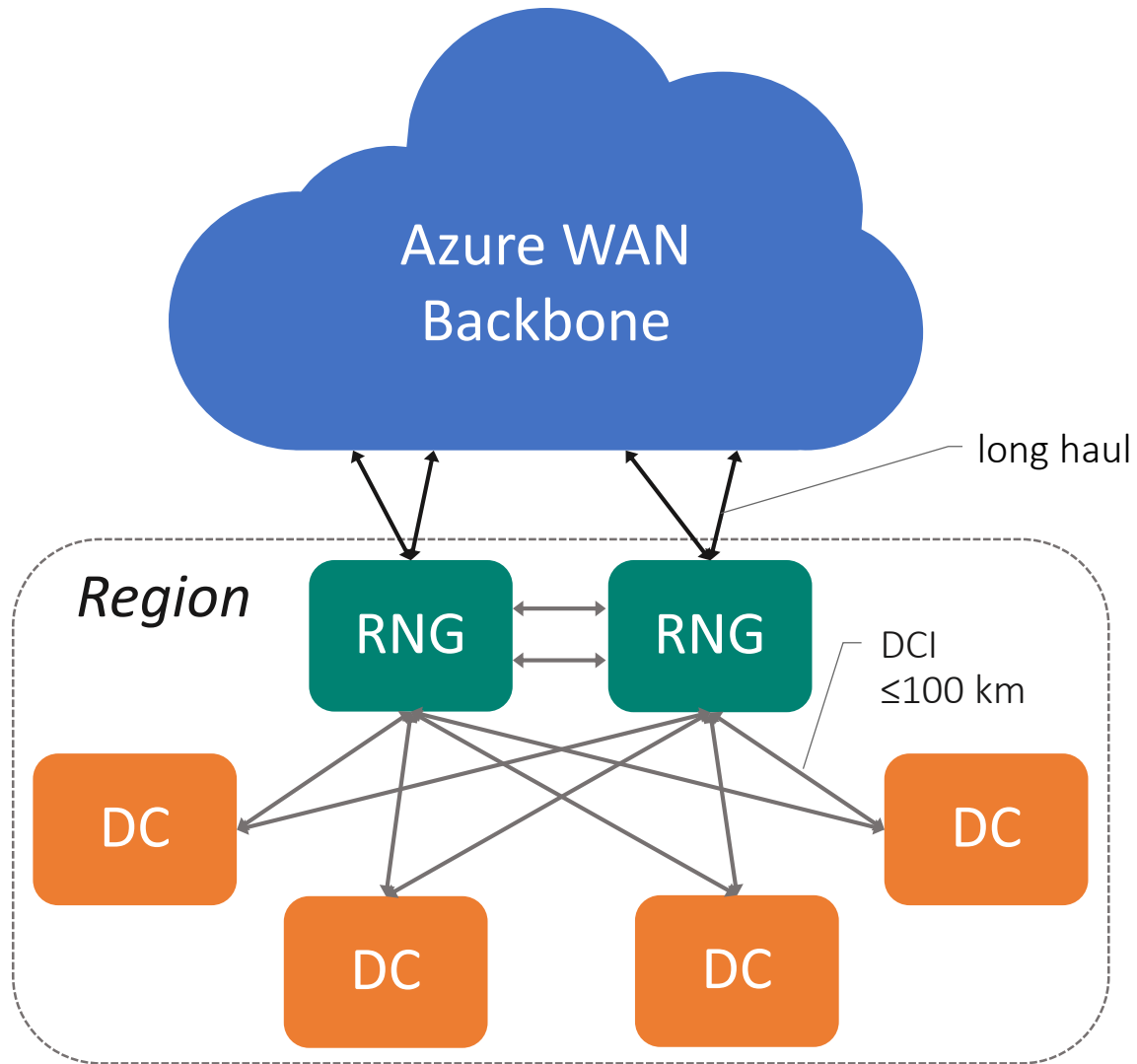
- “lots” of DCs / region possible
- RNG = Regional Network Gateway
- DC-RNG and RNG-RNG connected $\leq 100\text{km}$ via DWDM PAM4
- Some campus builds connected via bulk fiber ($< 2\text{km}$)
- 100G PAM4 power = 4.5W
- single percentage of total server BW in DCI



400G Regional Architecture



Regional architecture

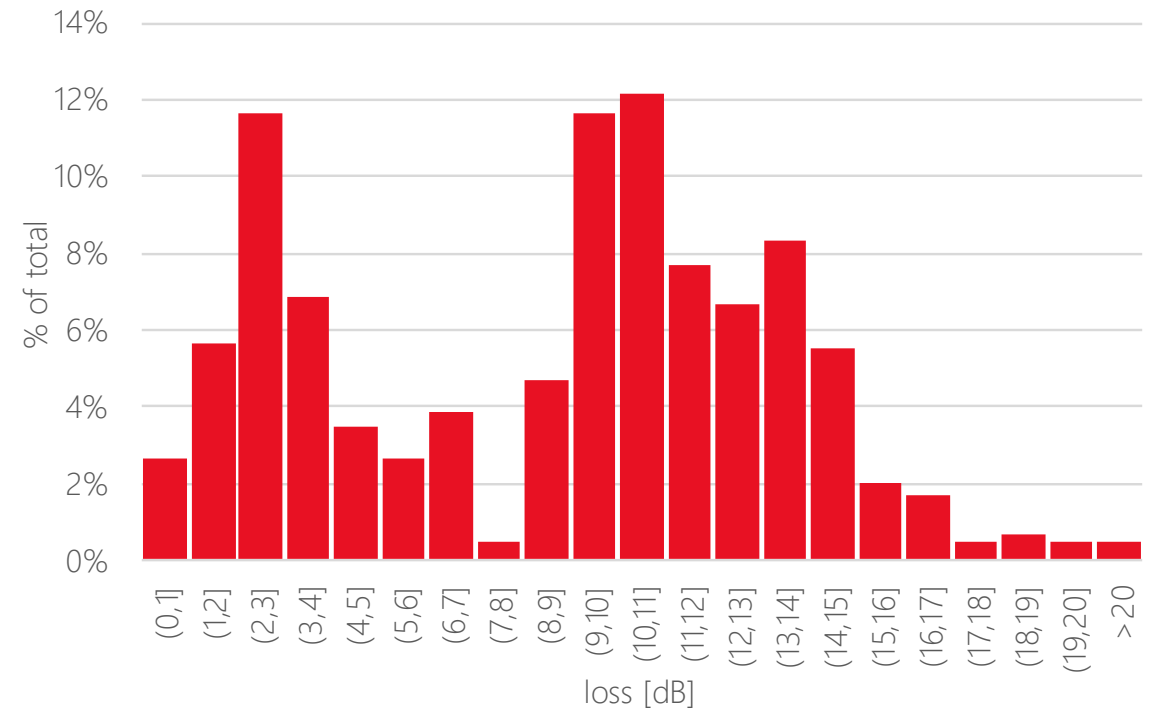
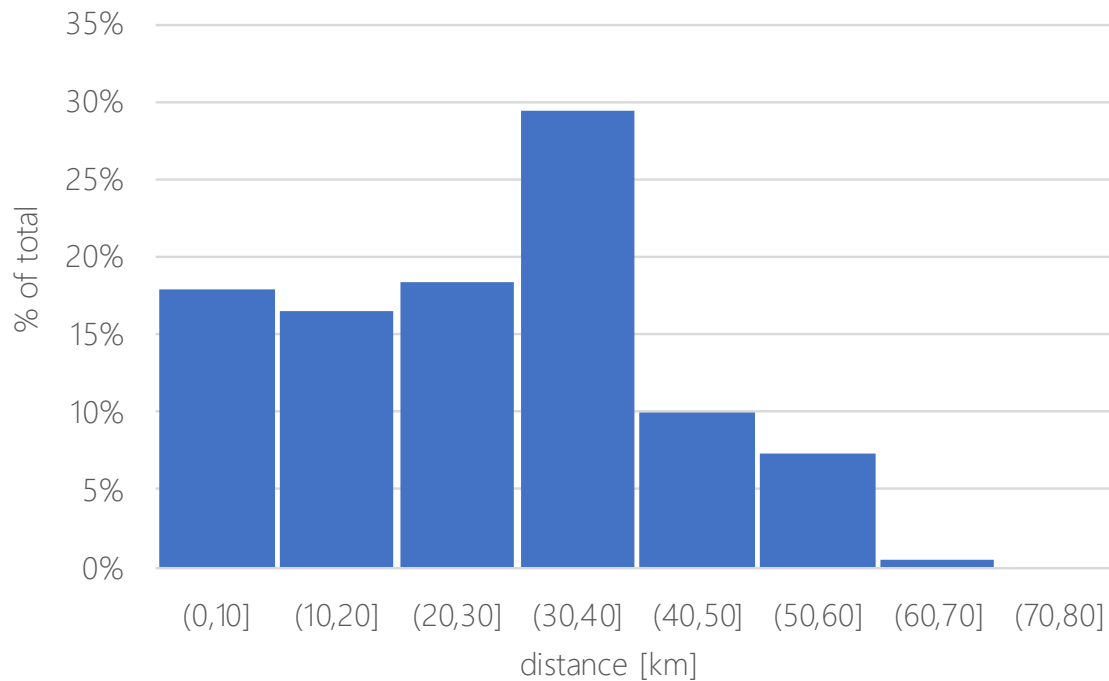


- distributed data center model
- massively parallel and highly resilient
- latency SLAs constrain maximum fiber distances
- need focused, cloud-friendly solutions for these application spaces

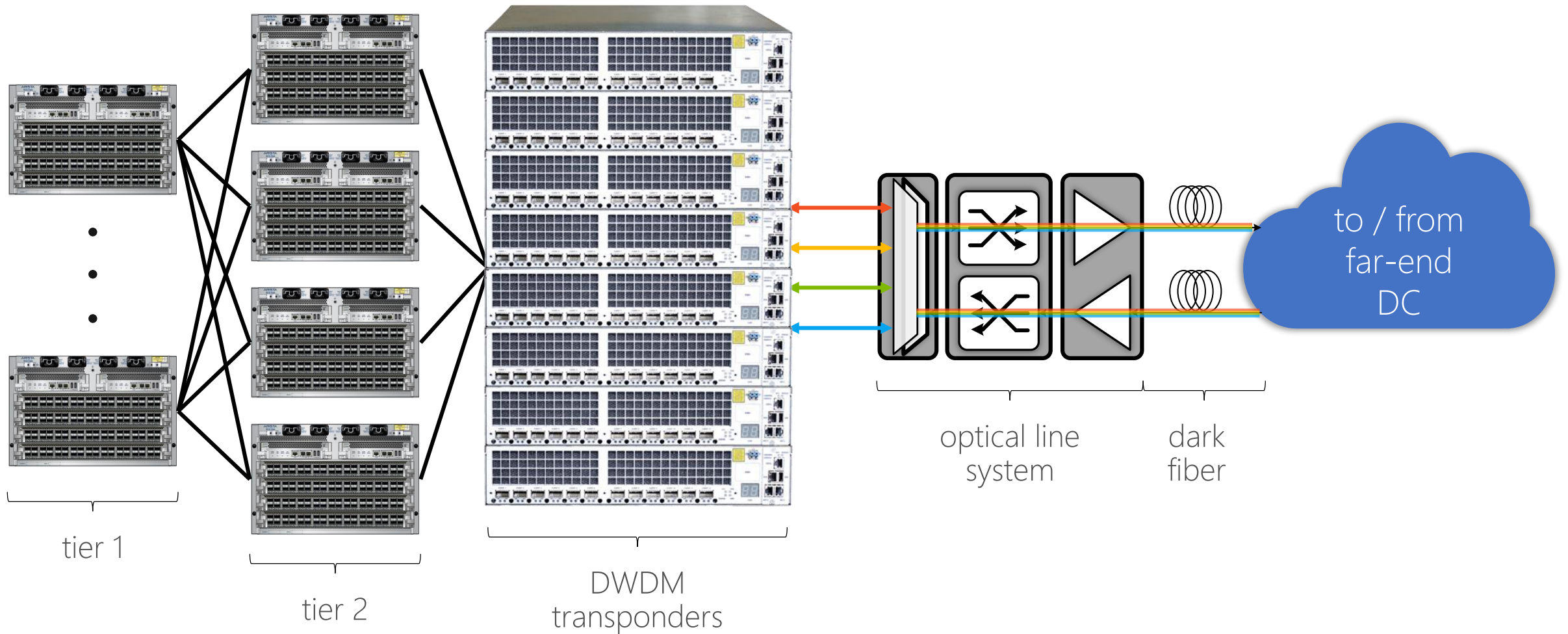
DCI drivers: regional installed fiber plant

- Today this application space is covered by DWDM PAM4
- Narrowly-focused coherent technology ideal for 400G DCI

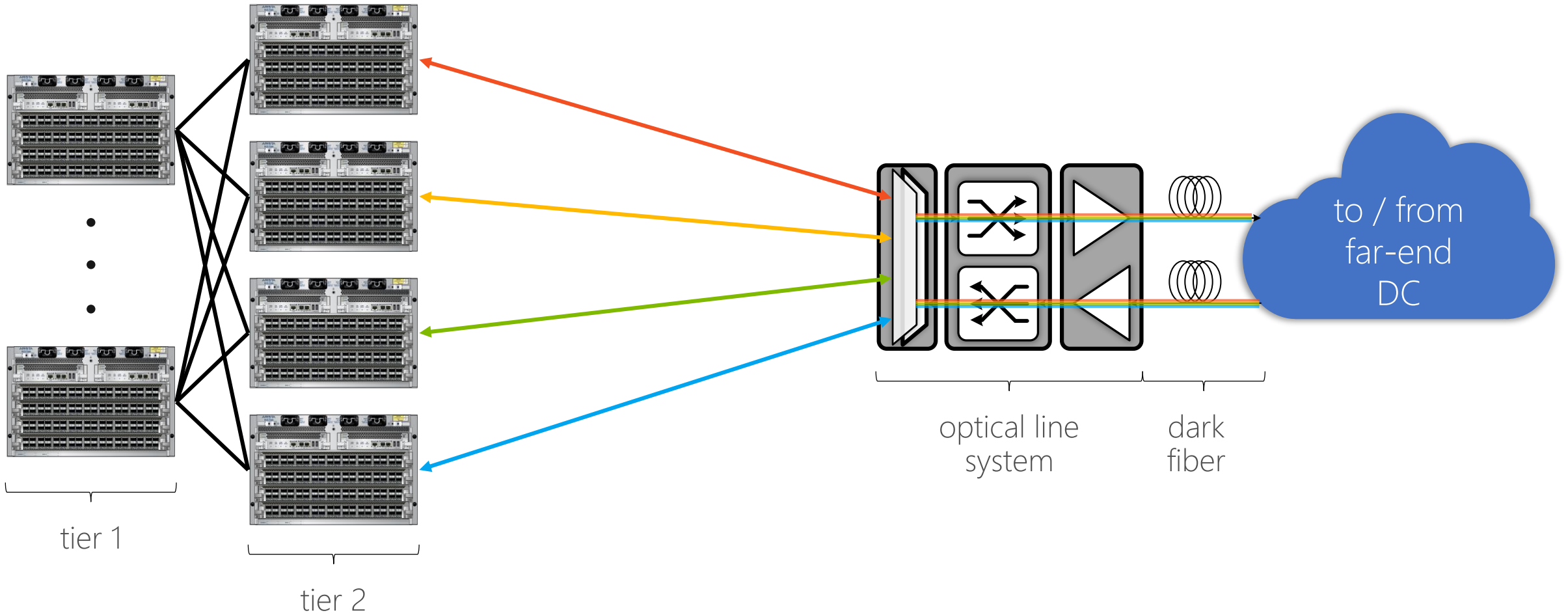
Microsoft DCI fiber plant distance and loss distributions as of 03/2018



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!”

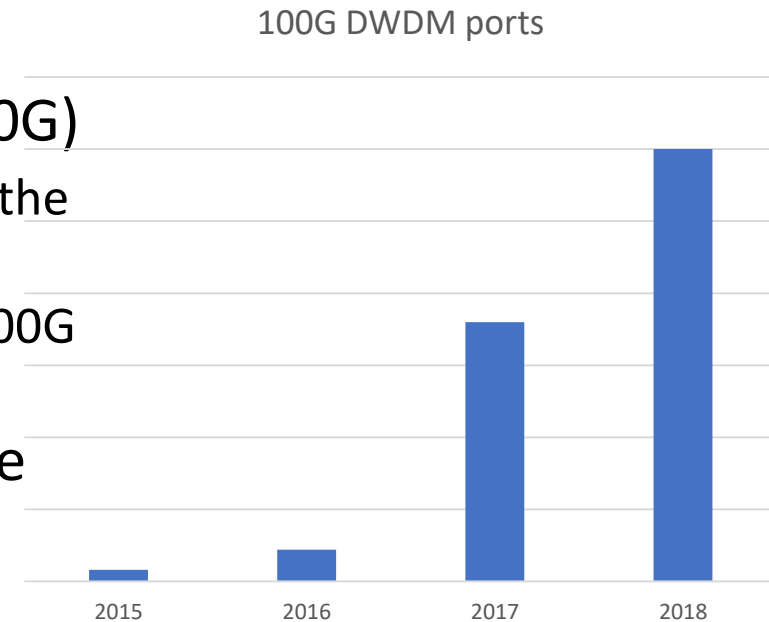
- Coherent works every time

1. Better OSNR sensitivity
2. Better RX power sensitivity
3. Works at 80km over any fiber type

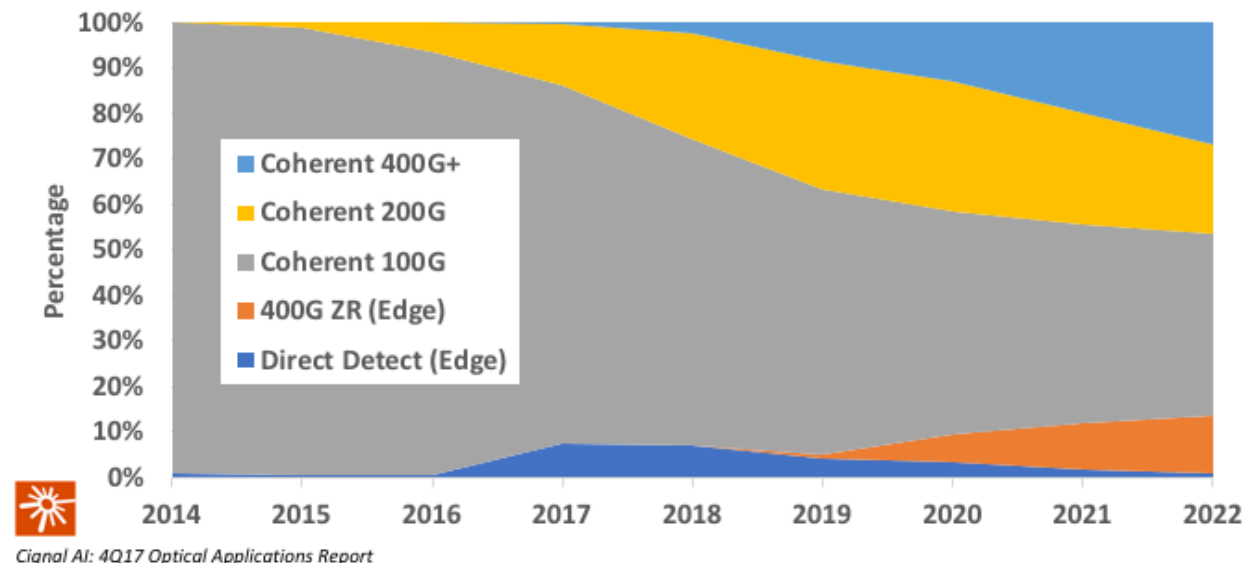
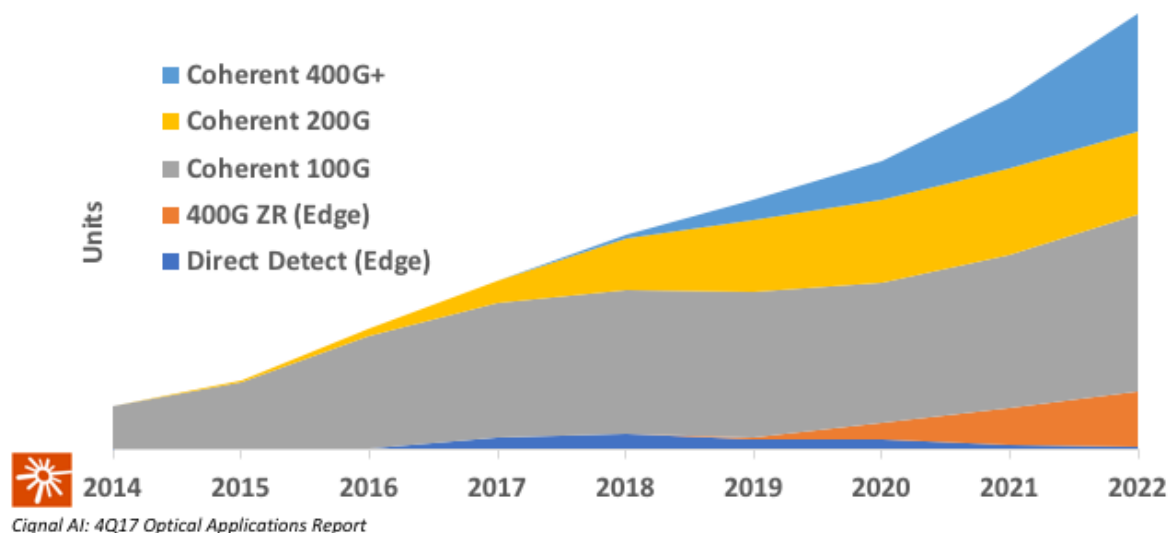


DCI deployment growth

- 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 out 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

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)