

Application Information for Optical Module at Data Center

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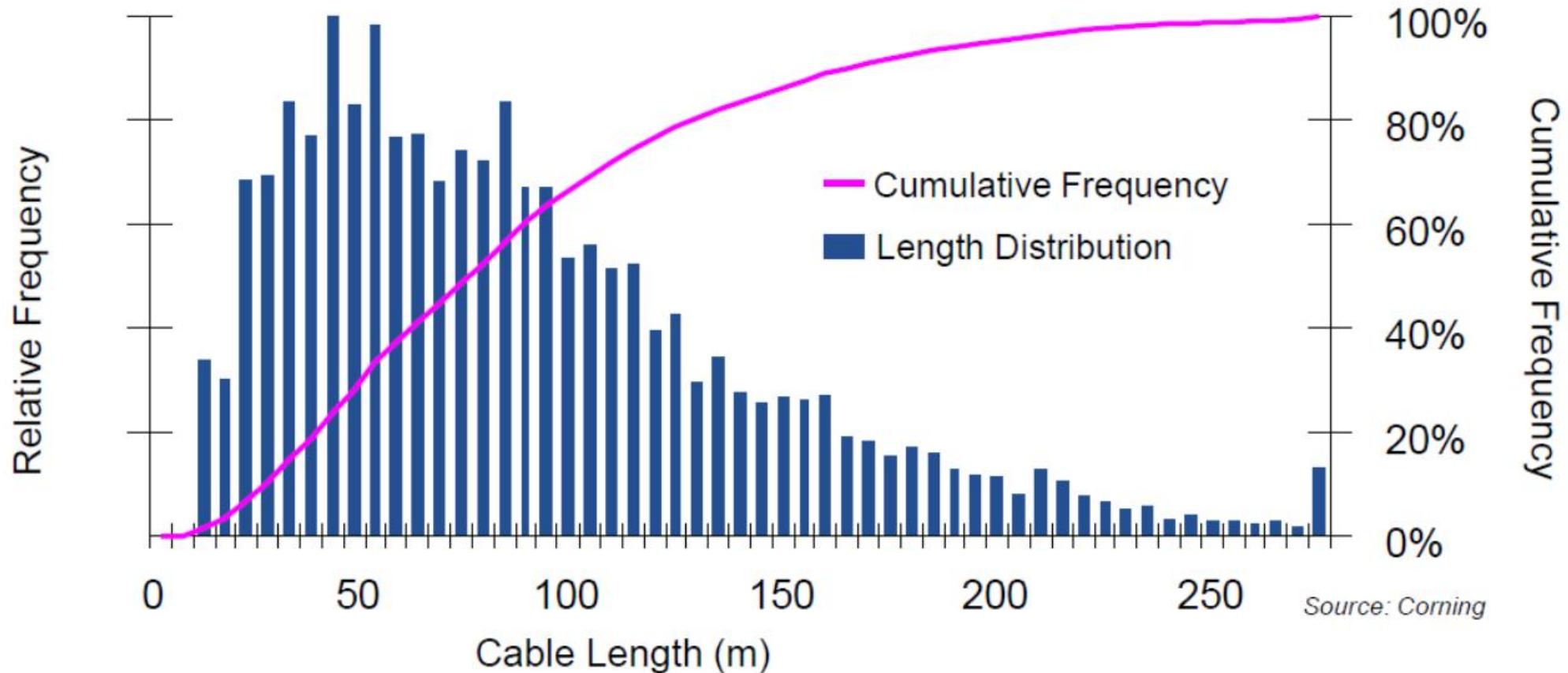
Background

- At the Salt Lake City meeting, lots of debate on application requirements for single mode fiber (SMF) in DC networks occurred on the following topics:
 - Reach distribution
 - Link loss
 - Fiber structure
- The following slides are an extract from the LightCounting report at <HIGH-SPEED ETHERNET OPTICS> 9th Edition, March 2019.
- Thanks to Lightcounting to permit sharing the follow information.

Datacenter Fiber Optic Link Length

Corning Cable Systems, the largest cabling infrastructure provider for data centers, shows their shipments of datacenter links in a histogram shown in Figure 2-16. This is probably a good representation of the market.

Figure 2-16: Corning Shipments of Datacenter Links



Source: Corning presentation at Photonics for Disaggregated Data Centers Workshop, March 2015

Single Mode Fiber for Large Data Centers

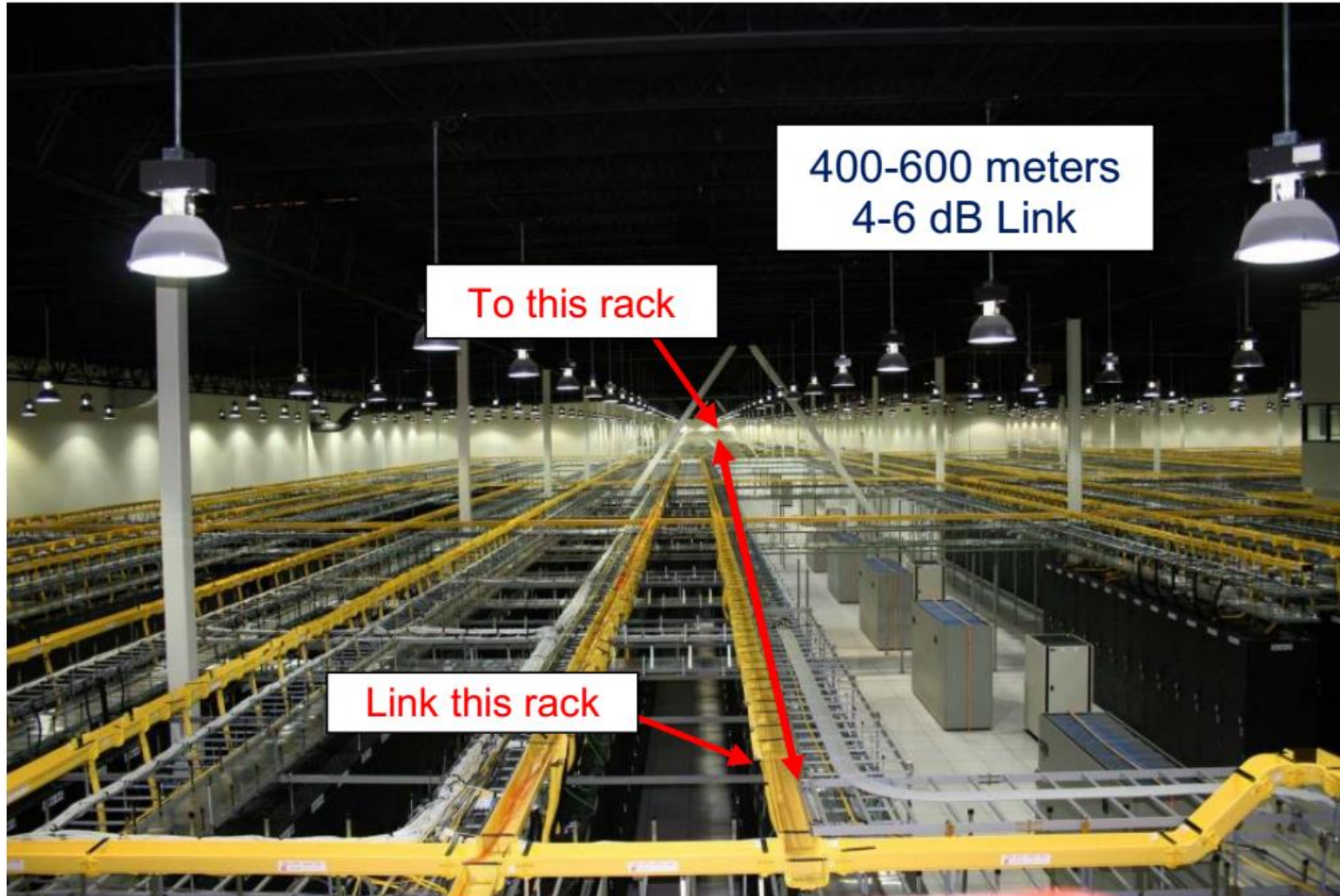
We noted that many modern data centers are getting larger and larger. Maximum reach needs for Switch-to-Switch/Router Connections:

- Medium data centers need 250-300m reaches
- Large data centers need 300-400m reaches
- Mega-datacenters need 400-500m reaches

Mega-datacenters can be astonishingly large. Yet the reach across them is rarely more than 400 meters (e.g. Figure 2-17). This is the reason for an industry focus on 500-meter single-mode reach in several MSAs and in the IEEE. Where 2km single-mode reaches are needed, it is often the result of desiring a duplex fiber solution. Where 10km reaches are required, it is often a means to a higher (6dB) link budget rather than actually running 10km. Of course both 2km and 10km links can connect buildings in a campus.

Single Mode Fiber for Large Data Centers

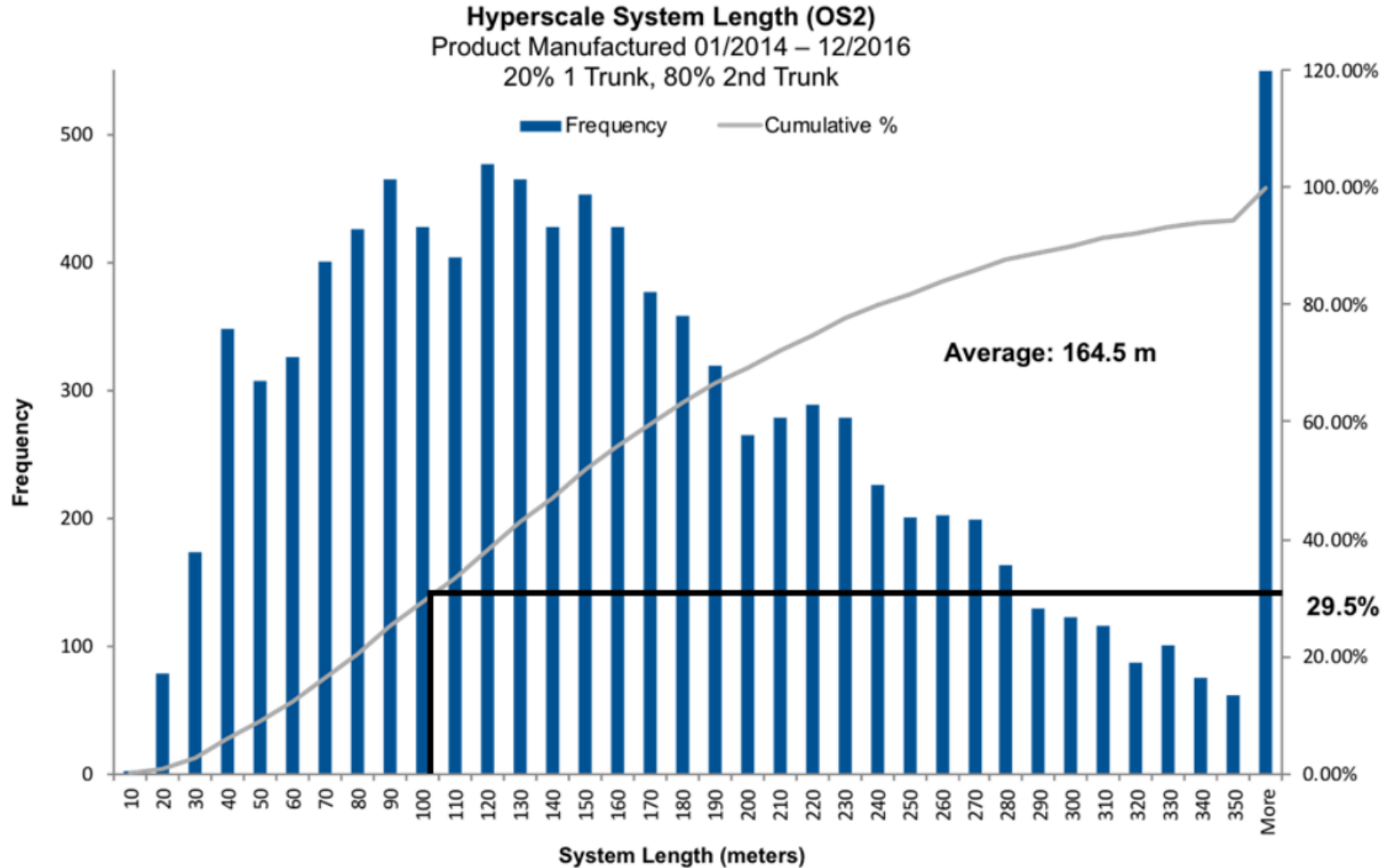
Figure 2-17: Mega-datacenter and Optical Reach



Source: PrimeCare Technologies Data Center

Single Mode Fiber for Large Data Centers

Figure 2-18 Single-Mode Fiber Trunks in Hyperscale Data Centers (2014-2016)



SINGLE-MODE FIBER 100G TRANSCEIVERS

While the 100G-SR4 QSFP28 module quietly establishes its traditional place in the 100GbE market, the majority of discussion around 100G is in >100m datacenter solutions on single-mode fiber. By “data center” we mean that the reach does not need to support campus or metro connections.

In Chapter 2 we showed that data centers over 50,000 sq. ft. will need to span reaches of >150 meters where single-mode fiber has generally been needed.

What is confusing many in the industry is the use of this term “reach” where the real discussion is often with the optical link budget in a data center environment. 4-5dB optical link budget is “equivalent” to a 1.2-2 Km reach on SMF and “reach” is the most often used term in transceiver talk. Even the biggest data centers today are <400-600 meters diagonally at their longest reach.

So the reach/cost gap will be filled with an intermediate reach, single mode fiber solution where ‘intermediate reach’ equates to 500 m.

However, there is still debate about the needed link budget. Some maintain 6dB is needed in a data center where multiple patch panels and in some cases technicians untrained in optical technologies who are likely to clean connectors on their shirt, can cause significant optical losses. Others maintain 4-5 dB is sufficient and would aid in lowering power consumption, costs, and enable use of the smallest form factor while still meeting the power budget of the MSA.

