

Session 4: Potential Fibers for AI

- **Moderators:** Kazuhide Nakajima, NTT & Vince Ferretti, Corning
- **Vince Ferretti**, Corning - *Potential new fibers being considered for AI applications*
- **Guangcan Mi**, Huawei - *The Need for Optical Link Models for new Fiber Applications*
- **John Johnson**, Broadcom - *Chromatic dispersion constraints on 400G/lane PAM4 PMDs*
- **Dr. Sergejs Makovejs**, Corning - *Impact of PMD at 200G & 400G/lane for Short, Medium, and Long-Reach Transmission*
- **Takashi Matsui**, NTT – *From SMF/MMF to Upcoming MCF/HCF: Fiber Standardization Updates*

Potential Fibers for AI

**Unprecedented AI growth requires potential new
fiber technologies to realize its potential**

*Vince Ferretti, Corning Incorporated
IEEE 802.3 Fiber and cable expert
ITU-T SG15 Q5 Associate Rapporteur*

AI is driving a transition toward high-density, fiber-rich, low-latency network architectures capable of supporting unprecedented scale and bandwidth

High Interconnect Density

Massive GPU-to-GPU Connectivity

- Thousands of GPUs connected within AI clusters
- More fiber links per rack and per server
- Increased demand for high-density cabling solutions

Faster Data Transmission

Bandwidth Growth

- Migration from 100G/400G to 800G and 1.6T networks
- Accelerates movement of training data
- Supports larger AI models and faster training cycles

Ultra-Low Latency

Real-Time Data Exchange

- Minimizes communication delays between accelerators
- Essential for distributed training performance
- Supports responsive AI inference applications

Energy Efficiency

More Performance per Watt

- Optical interconnects reduce power consumption
- Helps control escalating AI infrastructure energy demands
- Improves overall data center sustainability

Scalable Architectures

Designed for AI Expansion

- Enables growth from thousands to hundreds of thousands of GPUs
- Supports modular AI factory deployments
- Simplifies future capacity expansion

AI growth will also be determined by the industry's ability to secure power, land, water, and scalable infrastructure at unprecedented scale

Power

Grid Capacity & Energy Supply

- AI clusters require unprecedented electrical loads
- Utility interconnection and transmission upgrades can delay projects
- Growing competition for available power in key markets
- Increasing need for reliable and renewable energy sources

Land

Suitable Site Availability

- Large AI campuses require hundreds of acres near major power infrastructure
- Limited inventory of development-ready sites
- Zoning, permitting, and environmental reviews can extend timelines
- Rising land costs in strategic data center markets

Water

Cooling Resource Constraints

- Advanced cooling systems can require significant water resources
- Water availability is becoming a critical site-selection criterion
- Community concerns increasing scrutiny of new developments
- Industry shift toward water-efficient cooling technologies

Space

Data Center Capacity & Scalability

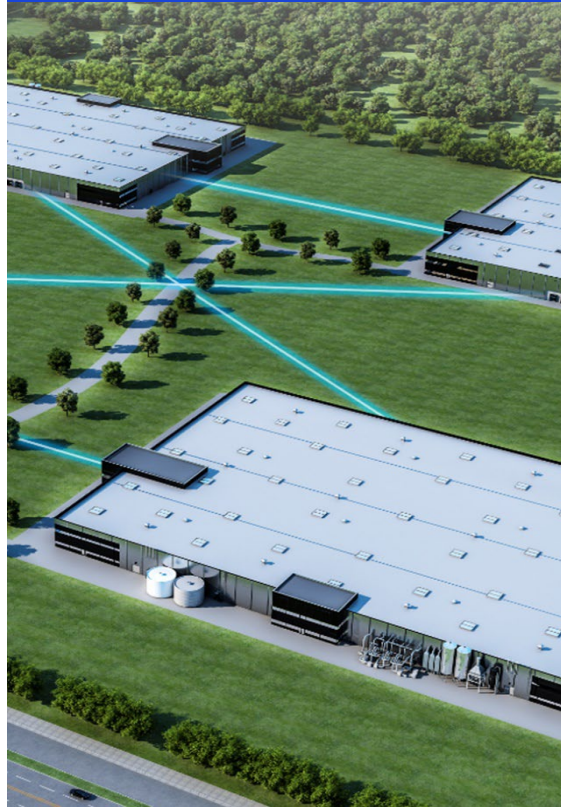
- AI deployments require larger buildings and higher-density infrastructure
- Demand for AI-ready facilities exceeds supply in many regions
- Mechanical and electrical infrastructure footprints continue to grow

Dense optical fiber and cable innovations are needed to serve increased bandwidth requirements in AI networks

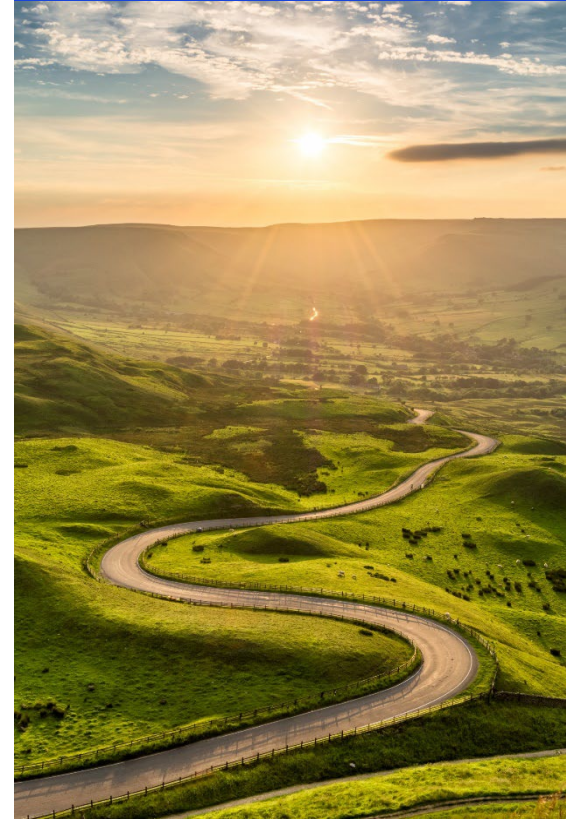
Inside the Data Center
Scale Up and Scale out



Data Center Campus
Scale Across

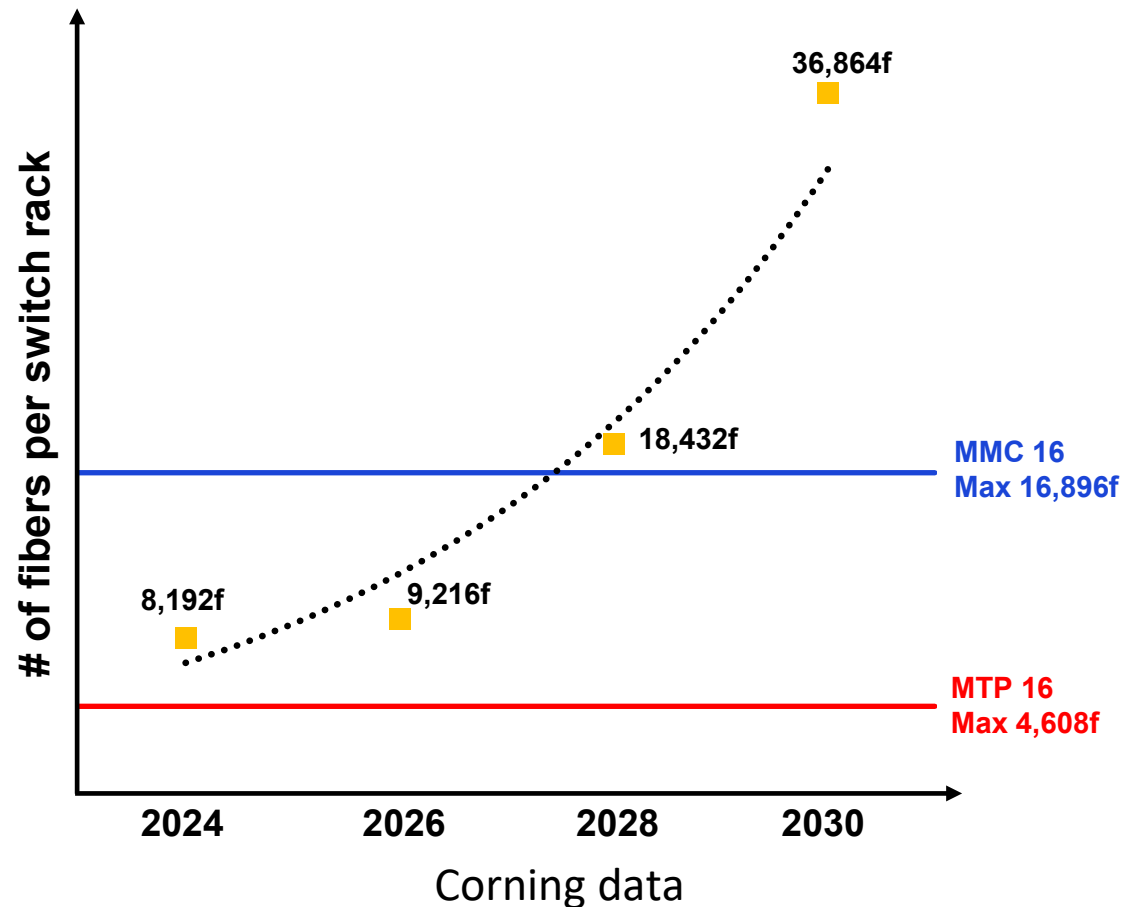


Terrestrial Network
Legacy DCI and Scale Across



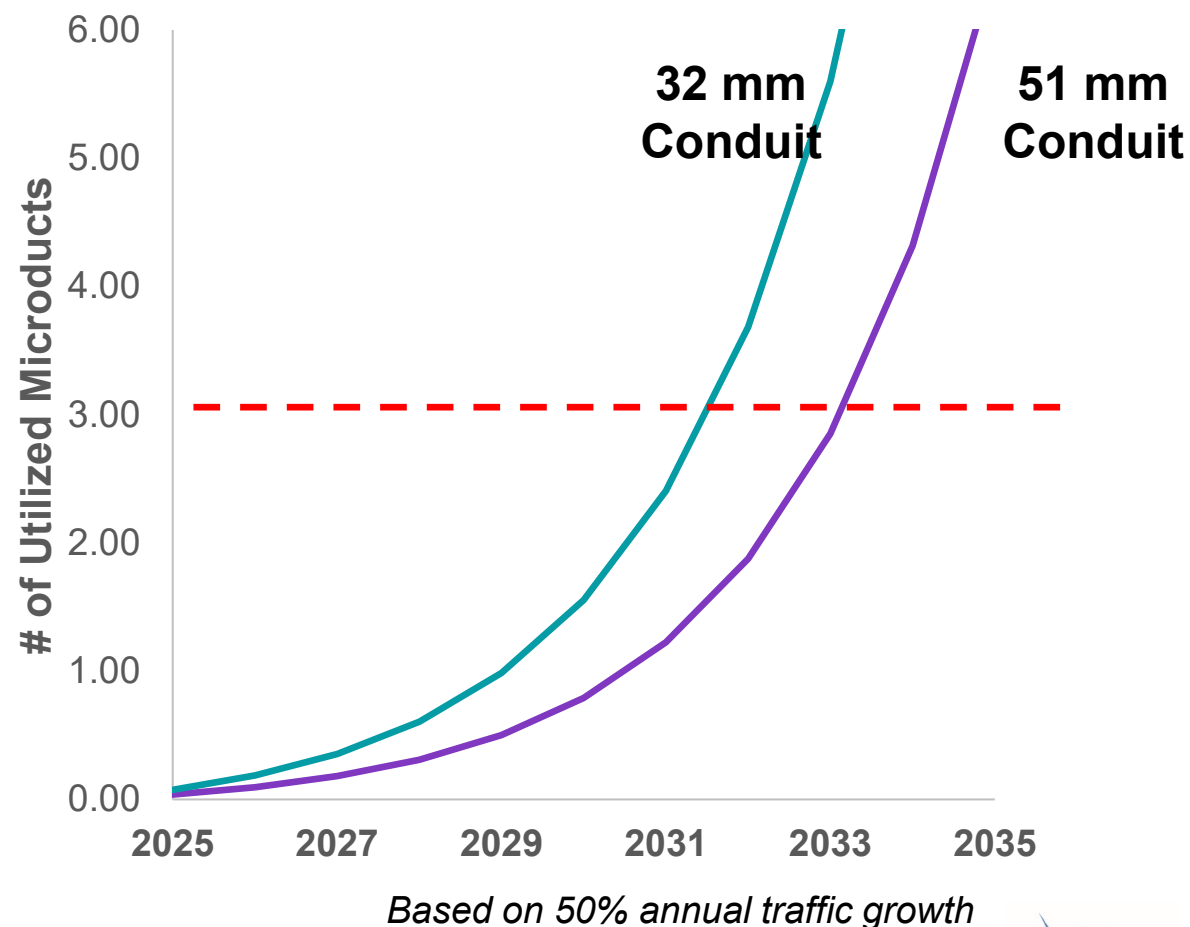
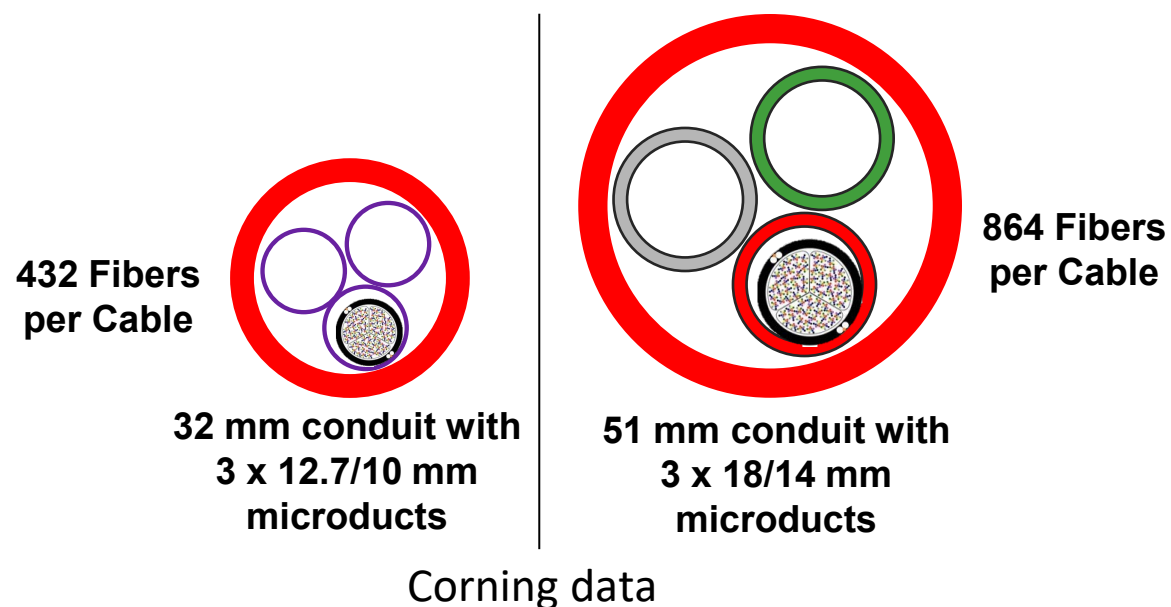
Increasing cable volume and complex connections are driving increased costs, longer installation times, and delaying AI compute

High-density solutions will be required



Outside the datacenter traffic growth will exhaust brownfield OSP duct infrastructure

- Legacy conduits will be exhausted before 2031-2033 with standard single-core fibers



New fiber & cable solutions are being developed to overcome limitations of current fiber solutions

Potential new fibers being investigated include:

- Reduced cladding (RCF) and reduced fiber coating diameter fibers (RCDF)
- Chromatic and Polarization Mode Dispersion constrained SM fibers
- Weakly coupled Multicore fiber (WC-MCF)
- Hollow core fiber (HCF)
- New multimode fiber (MMF) variants

The AI era is challenging our industry in unprecedented ways

- Fiber and cable development has not been asked to innovate this fast or in so many applications in over 30 years if ever.
- Many solutions will be tested:
 - CPO, NPO, LPO, Silicon photonics, VCSELs, microLED, etc
- Which will be adopted remains the big question
- Each may require new fiber and cable innovations at scale
- “One size fits all” will probably not be sufficient

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