New Potential Fibers for DC/AI Applications

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02/24/2026

New fiber types can offer value for existing and emerging DC/AI/high speed applications

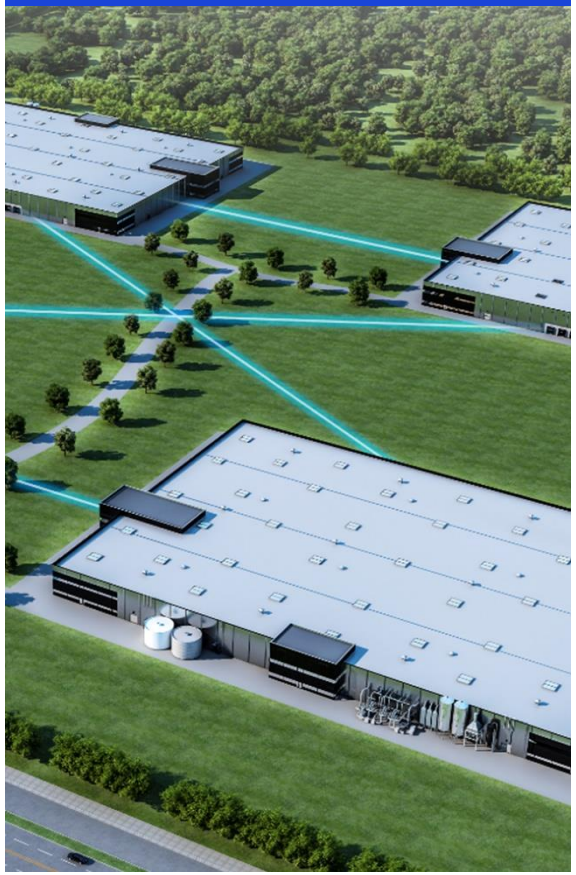
- Weakly coupled Multicore fiber (WC-MCF)
- Hollow core fiber (HCF)
- New multimode fiber variants

Weakly Coupled Multicore Fiber for Intra- and Inter-Datacenter Applications and Beyond

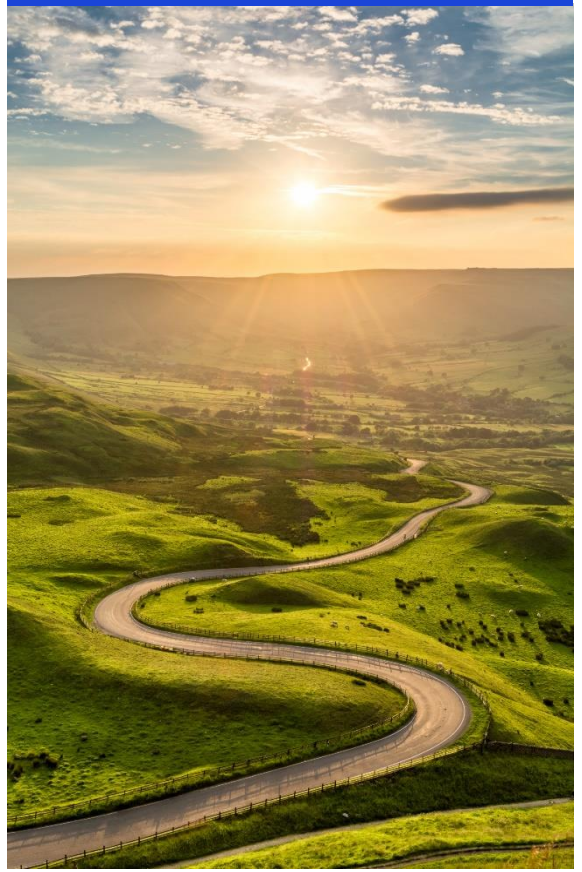
From the data center to the ocean, dense fiber optic cable innovations are needed to serve increased bandwidth requirements

Inside the Data Center

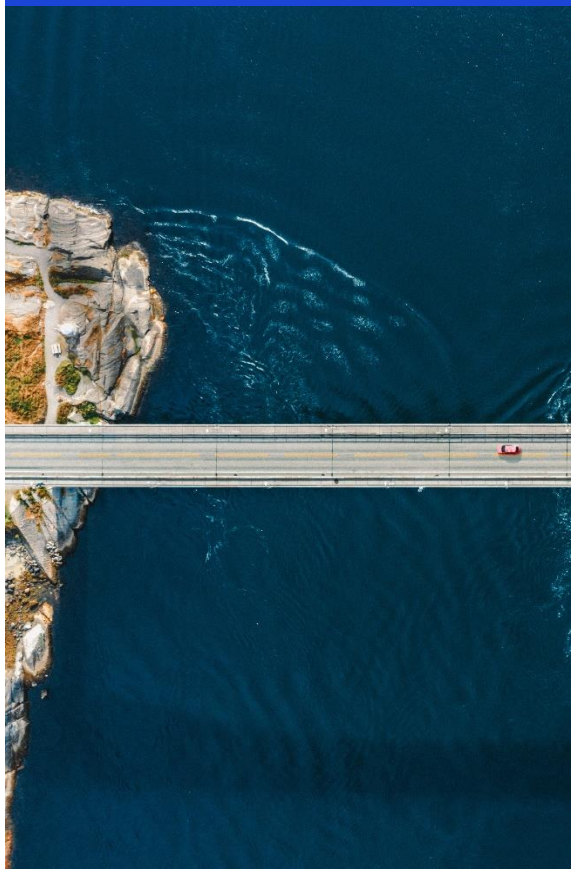
Data Center Interconnects



Terrestrial Core Networks



Subsea Networks



Evolution of fiber density in data centers

Cloud: Single-digit Enterprise growth pre-Gen AI

32 GPU Node: 4x more fiber than Cloud

72 GPU Node: 4x more fiber than 32 GPU node (16x more than cloud)

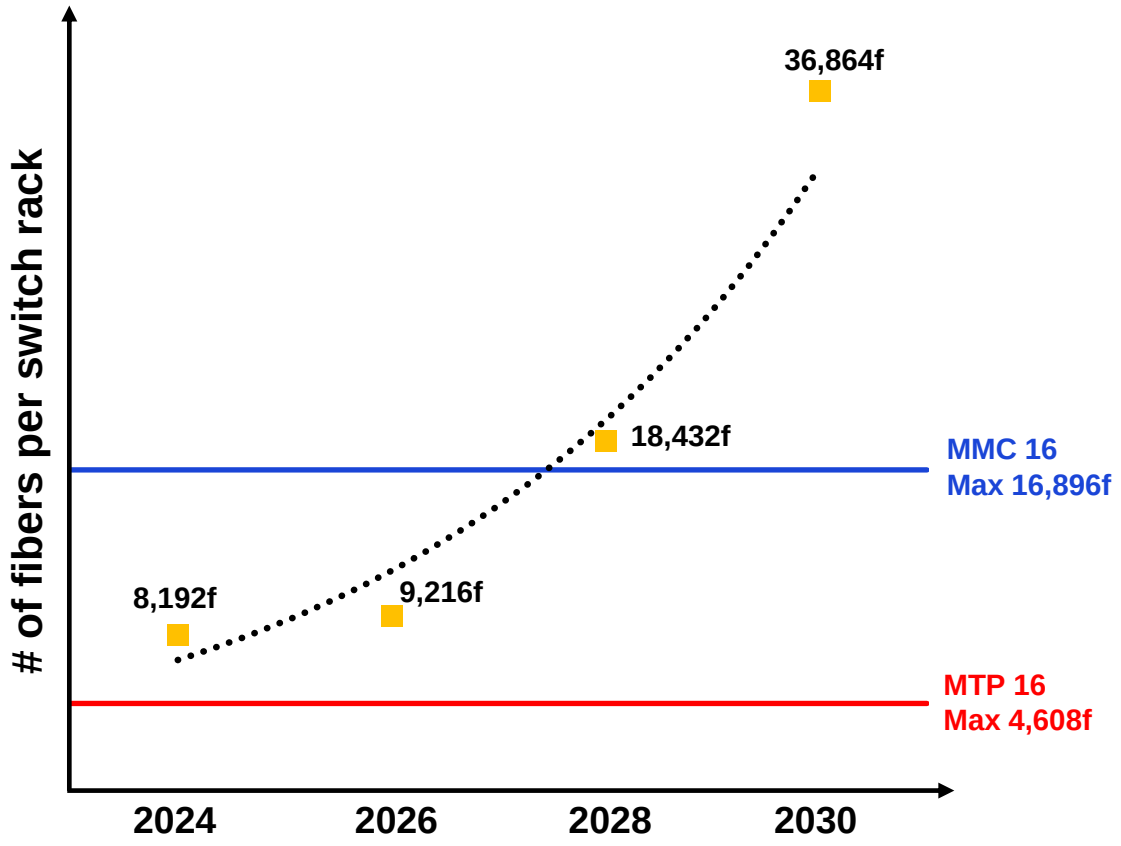
Continued scale-up & scale-out of AI networks creates density, installation, & sustainability problems that MCF solutions can address

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

Step change in infrastructure requirements

AI datacenters require more connectivity → larger facilities that require more cable trays, steel, concrete, and labor

High-density solutions will be required

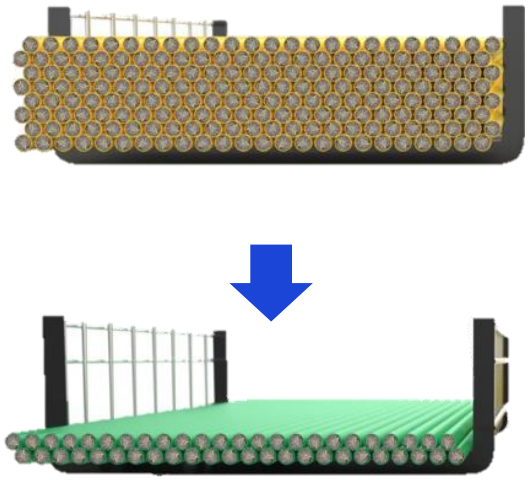


Inside the data center MCF enables scalable, high-density solutions with significant material reduction & deployment efficiency

Density	Deployment Efficiency	Sustainability

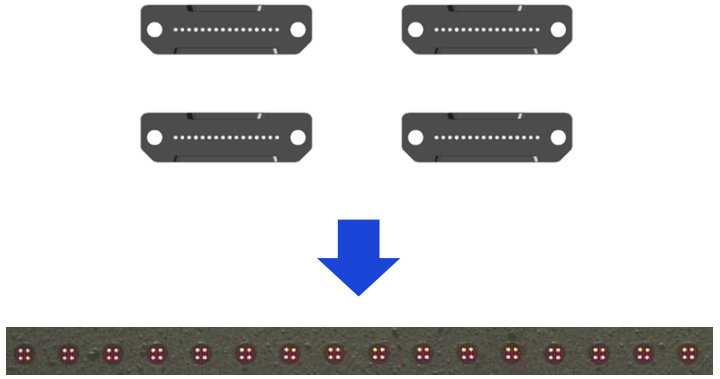
Up to 75% lighter & smaller

Ease civil engineering requirements



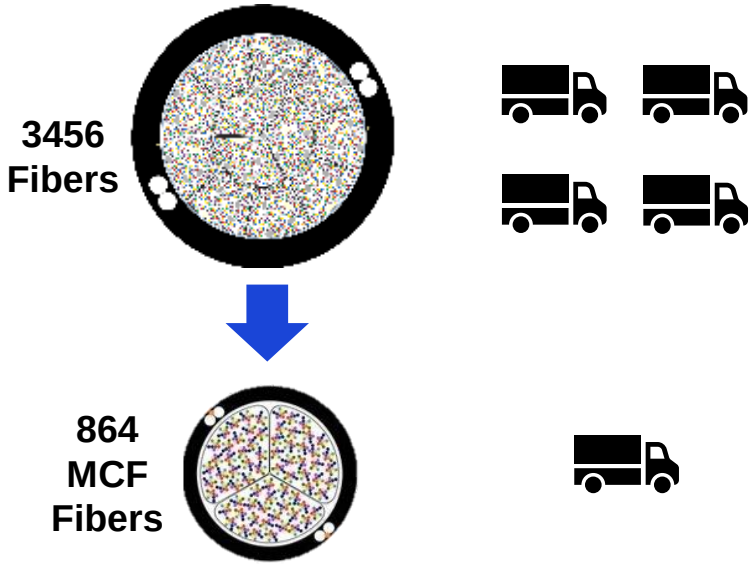
75% fewer connections

Reduce end-to-end link installation time by over 50%



Less material

Enhance supply chain resilience and environmental sustainability

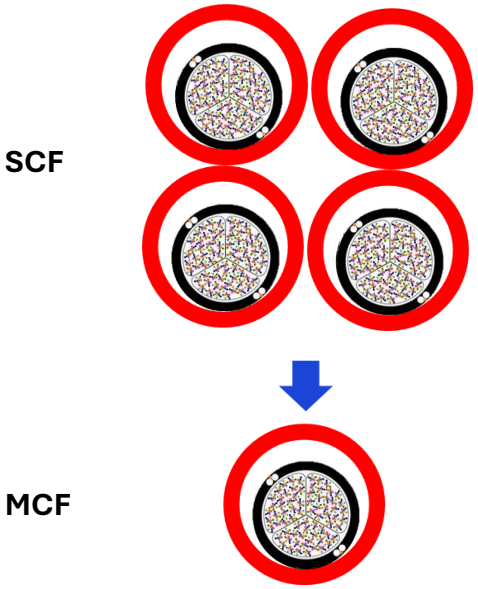


Outside the datacenter, MCF enables high-density, cost-efficient deployment, and future proofing

Maximize dens → **Cost efficiency** + **Future proofing**

Up to 75% lighter & smaller

Alleviate duct constraints



Deployment and operation

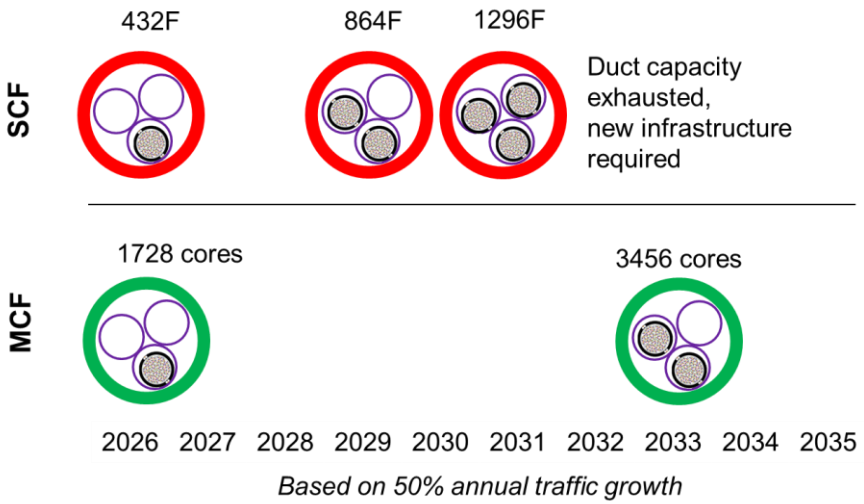
Reduced infrastructure and installation costs

- Install fewer cables, less splicing, utilize fewer ducts
- Can enable fewer amplifier huts and reduce infrastructure costs

Long-term ROI

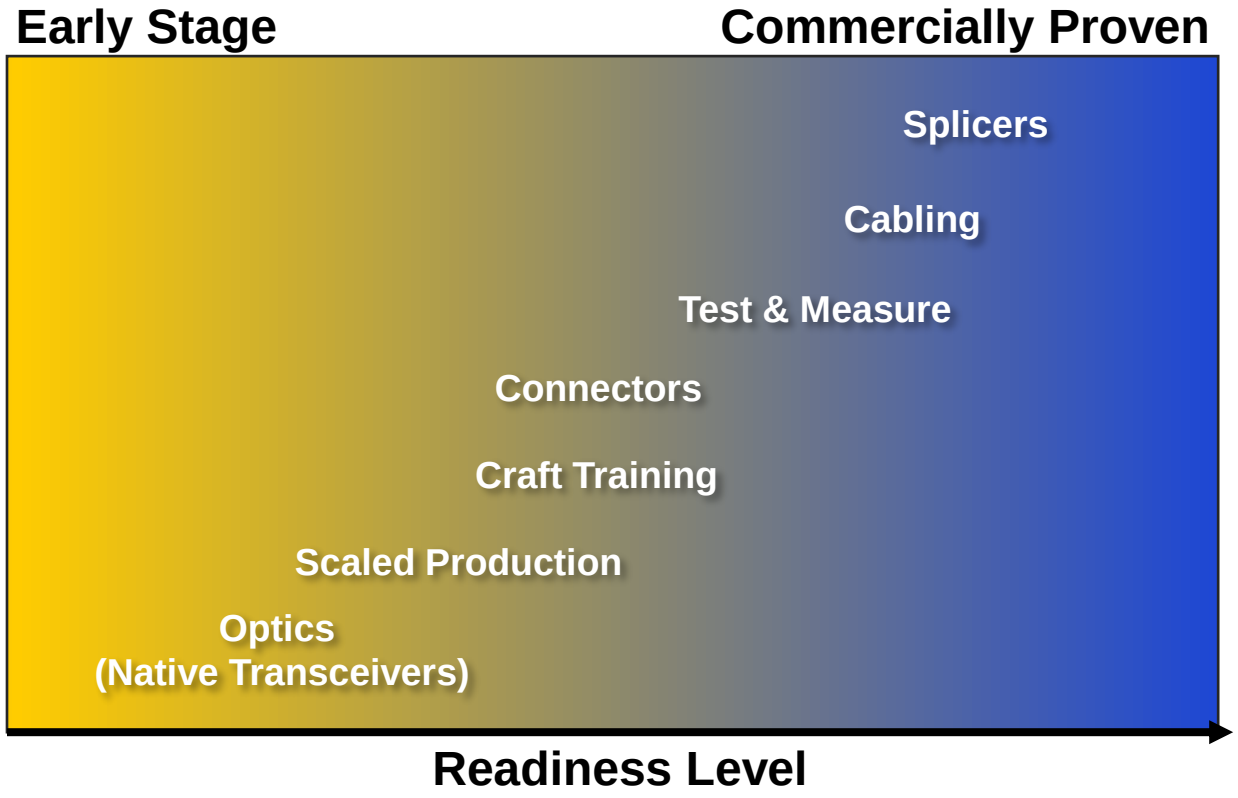
Delay need for new greenfield duct infrastructure by several years

Example: 432F microcable in a 32mm conduit



The MCF ecosystem is steadily advancing, and Corning expects technology readiness & commercial adoption in the next 3-5 years

Corning's Current Assessment of MCF Ecosystem & Technology Readiness Level



- Initial MCF solution adoption expected in backend aggregation links up to ~500m and between campus buildings up to 2km using standard optics
- Multiple optical fiber & cable vendors globally have been investing in MCF product development over the past 5-10 years and are poised to scale production
- The biggest hurdle to MCF adoption inside the data center is large-scale availability of MCF native transceivers
- Leading transceiver vendors are seeking enabling components to provide seamless MCF connection at the MTP/MMC transceiver interface and to the chip inside

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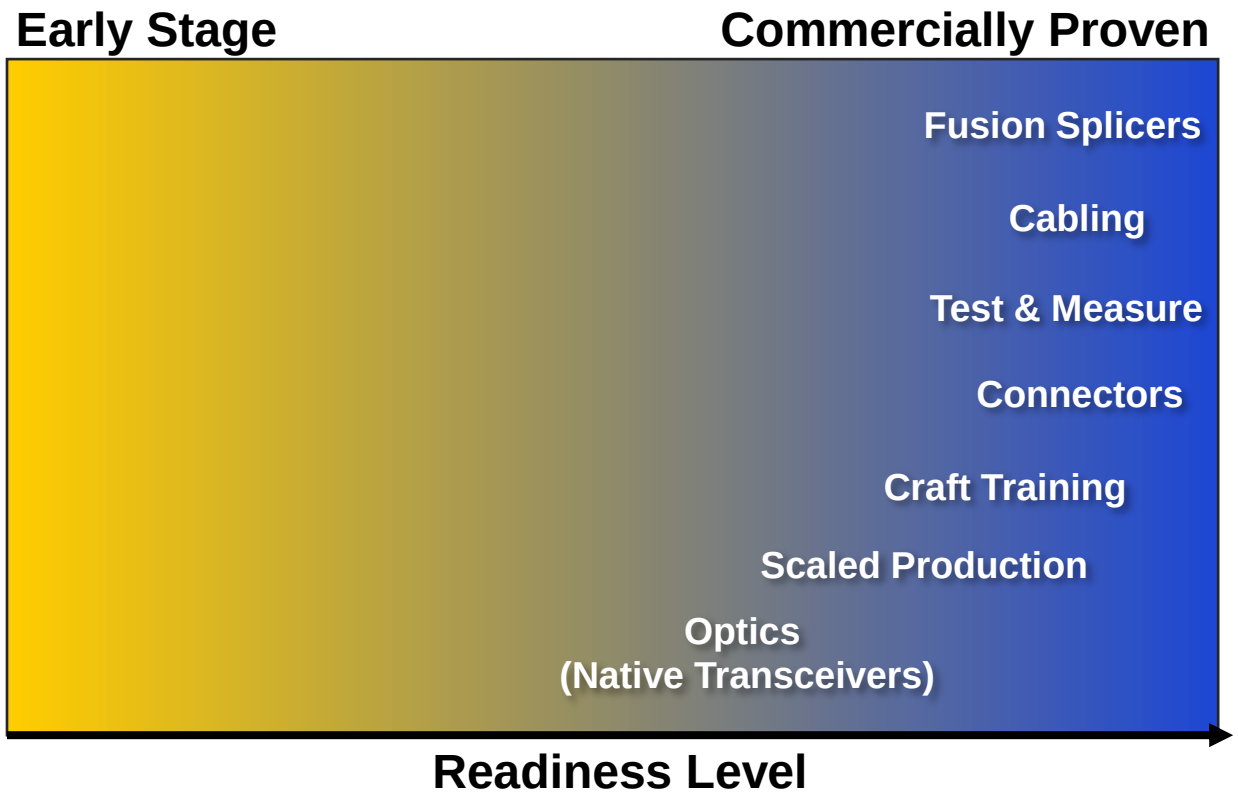
MCF Ecosystem & Technology Readiness Level by 2028-2030



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Status of >100 Gbps per Wavelength Solutions

- Technical decisions have not yet been made on 400G per lane solutions
  - 100 Gbps per wavelength are being deployed today
  - 200 Gbps per wavelength are expected in the next 2 years (802.3dj expected to be published in 2026)

- If MCF is chosen, system vendors will have to take into account potential penalties associated with crosstalk in their link designs
  - Standardization approaches for measuring crosstalk underway
  - Crosstalk for installed links also must be analyzed and measurement methods may be different for fiber compared to a deployed cable fiber

- Only informative guidance is available for Polarization Mode Dispersion (PMD) for short lengths as current specifications focus on long link applications (> 40 km).
  - MCF cabled fiber PMD needs to be evaluated WRT current protocol to verify performance

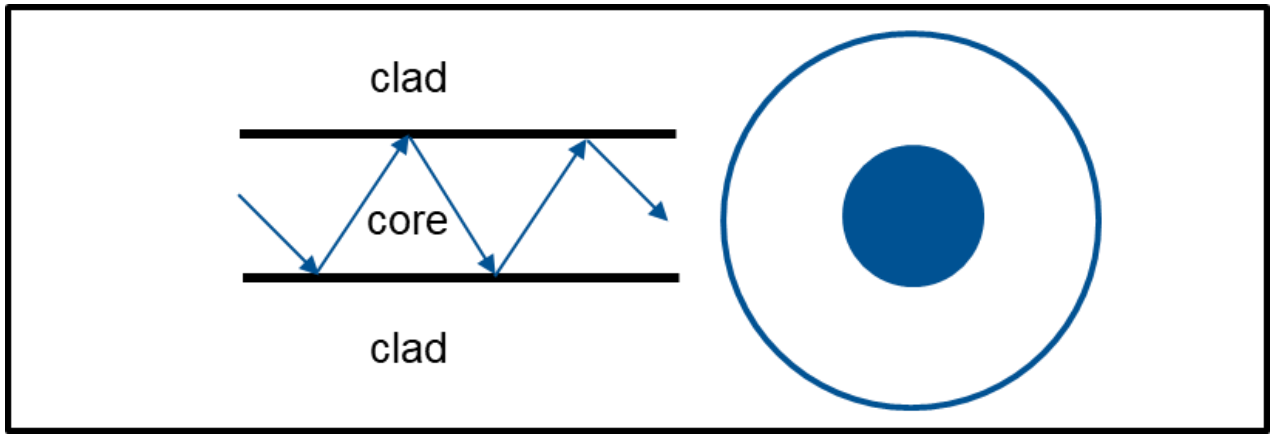
- ITU-T WC-MCF standardization timeline is currently targeting the end of 2028.

Hollow Core Fibre for Intra- and Inter-Datacenter Applications and Beyond

What is hollow-core fiber?

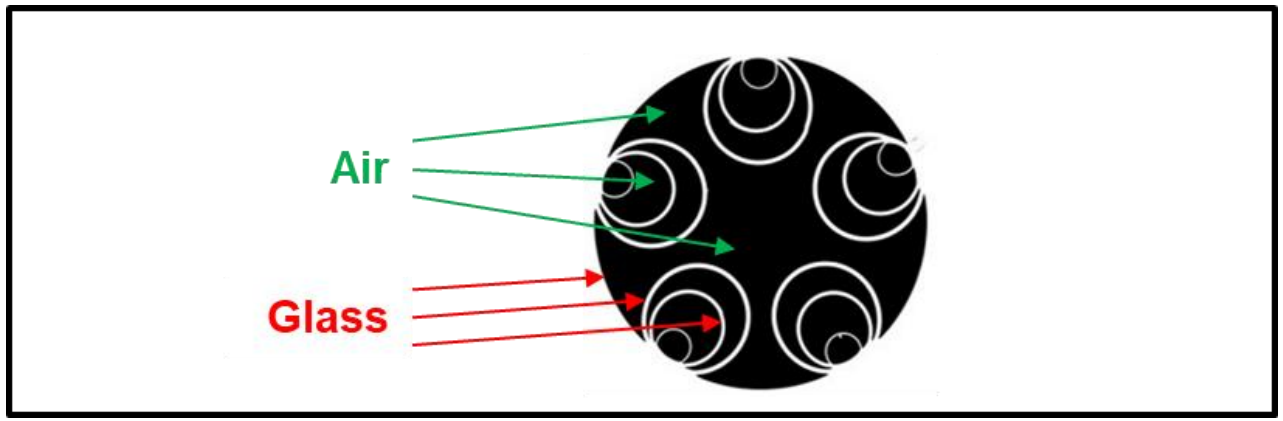
Light is guided in air and confined within the core using complex microstructures

Silica Fiber



- **Core:** Silica doped with Germania
- **Cladding:** Silica and sometimes with a fluorine doped trench (ring of lower refractive index)

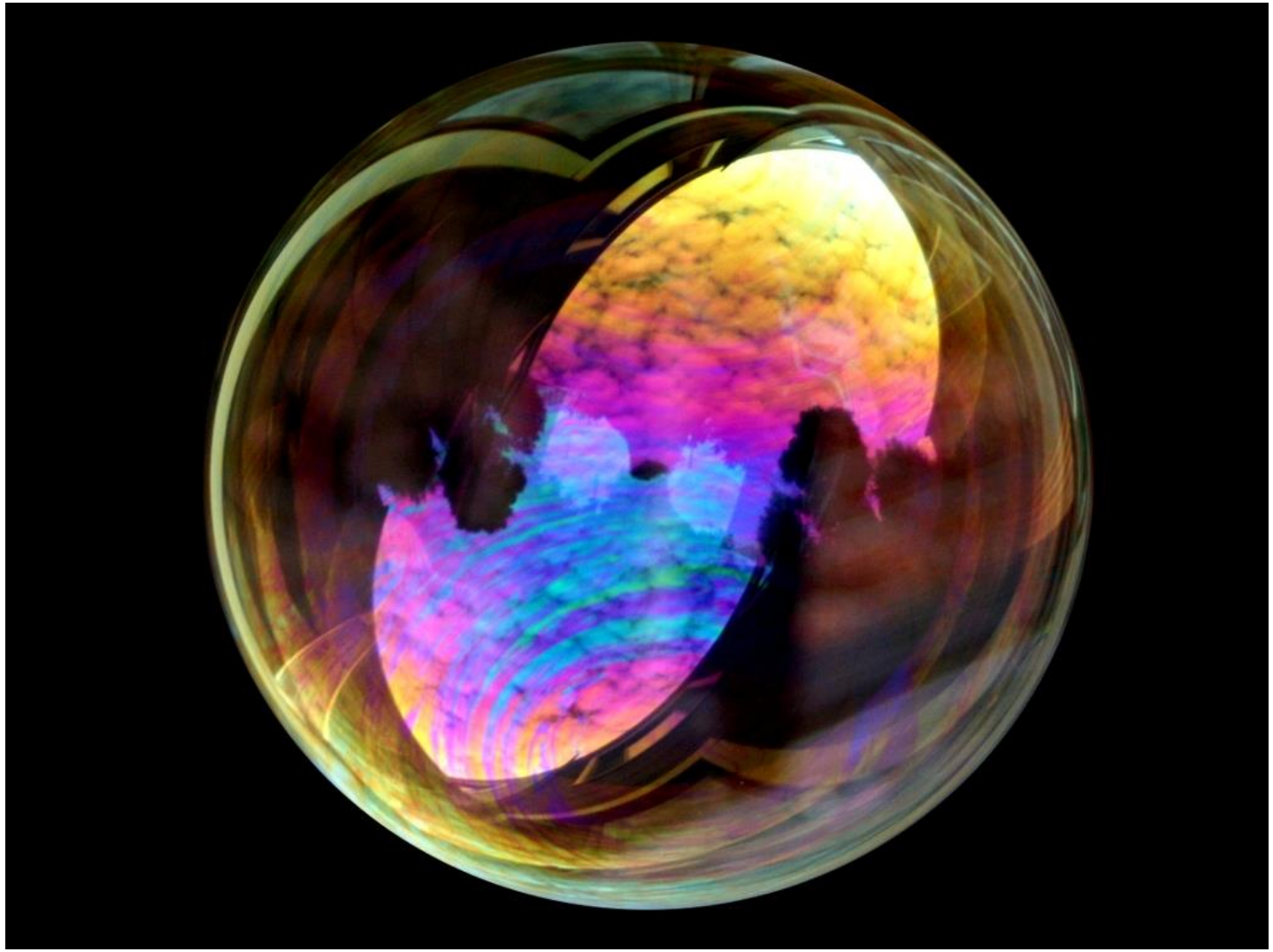
Anti-resonant (AR) Hollow Core Fiber (HCF)



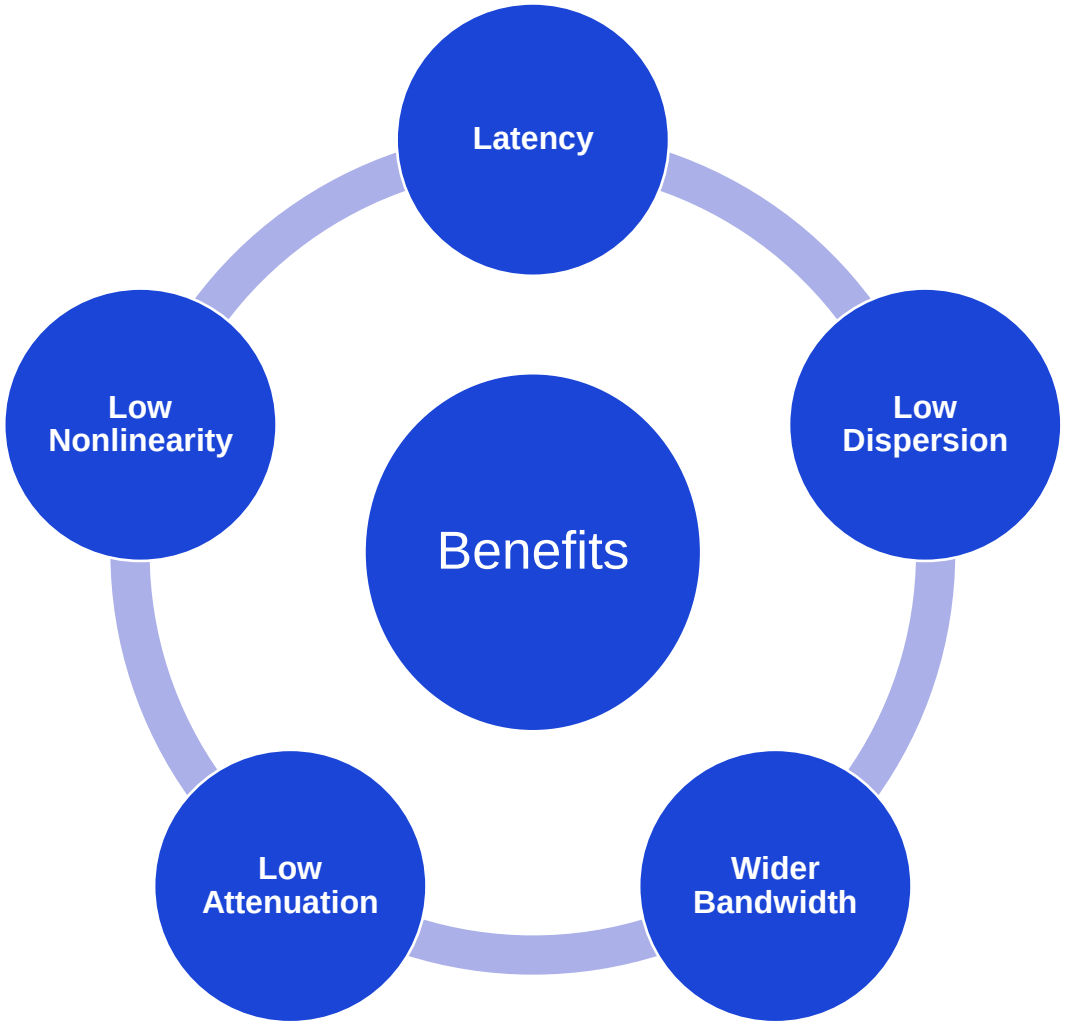
- **Core:** hollow (air) core surrounded by a set of glass capillaries that create light confinement
- **Cladding:** formed by limited reflecting interfaces

… Idea somewhat analogous to a soap bubble

Light colors are highly reflected from a thin membrane



Main benefits of hollow-core fibers



Why is there interest in hollow-core fiber?

High-Frequency Trading
(Latency)

- Gain competitive advantage via arbitrage
- Use case is niche

AI Training
(Latency)

- Faster training of AI models in scale-across architecture
- Less GPU hours, faster time to revenue

Core Networks
(Loss, Nonlinearity)

- Longer distance between amplifier huts (fewer huts)
- Lower power and $

DCI Availability Zone
(Latency)

- Availability zone increase
- Spead DCs further away for cheaper land and better access to power

AI Inference
(Latency)

- Better user experience on the inference side with next-gen AI architectures (e.g. mixture of experts)

Subsea
(Latency)

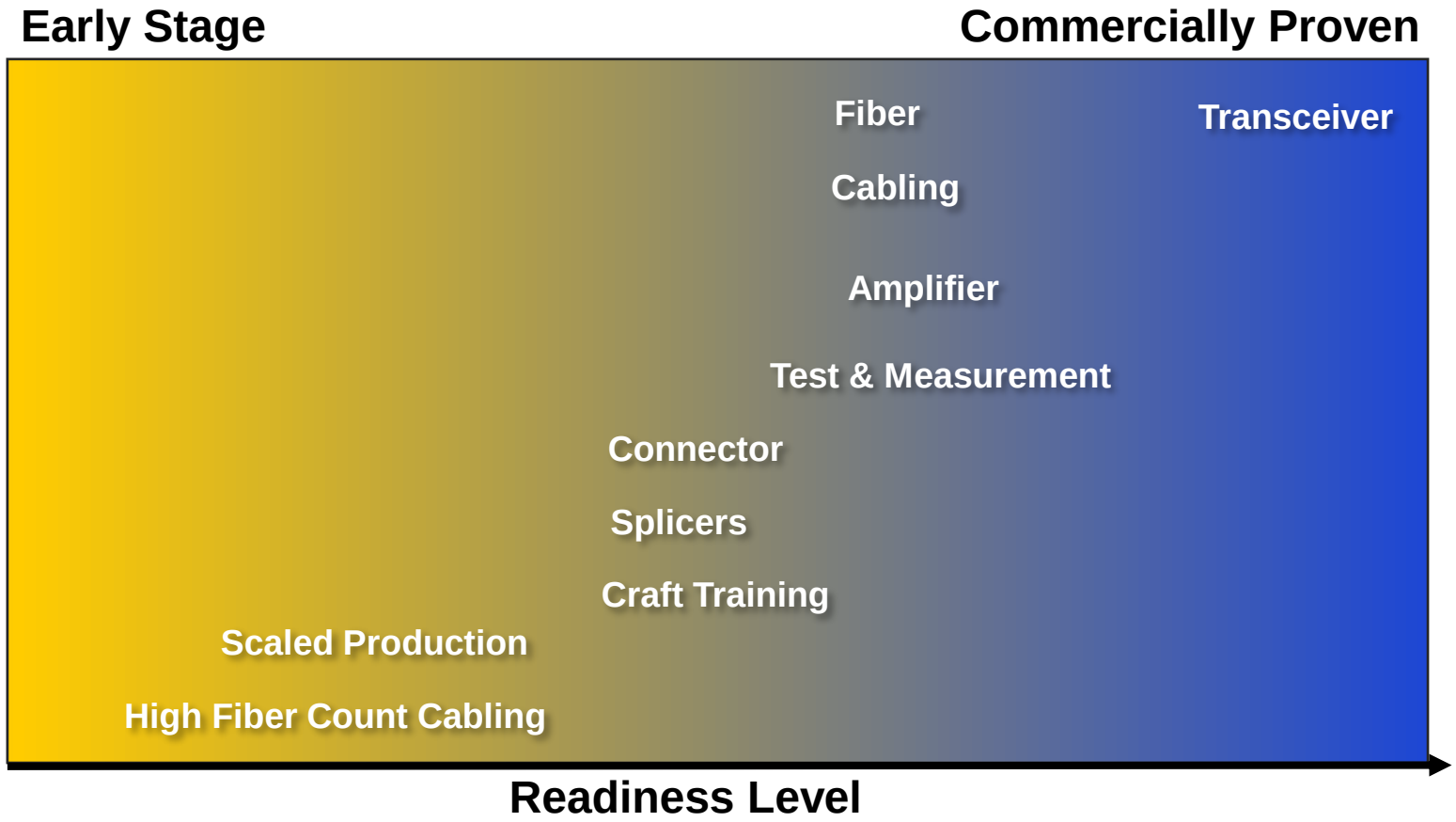
- Lowest latency transatlantic route on the market
- Opportunistic in nature

Proven

Emerging

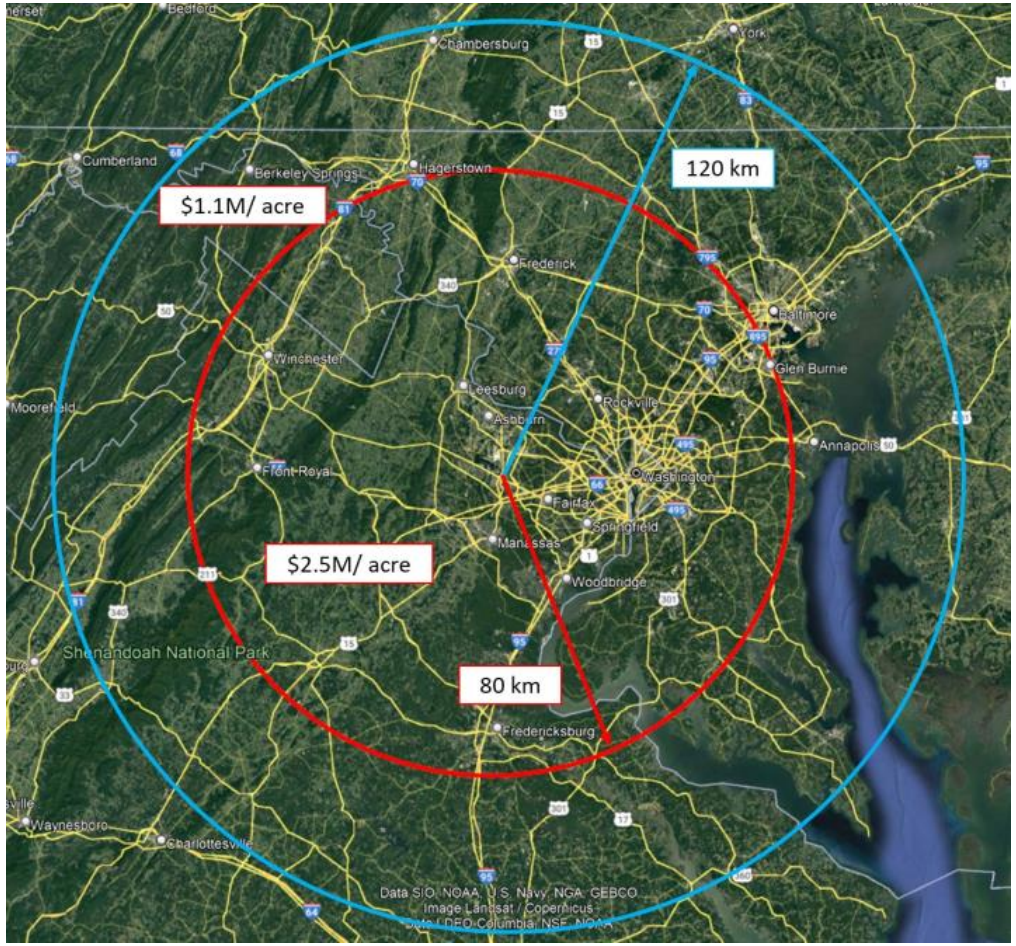
HCF ecosystem is still developing with many required building blocks before volume grows. It's also early in the Standards process

Current Assessment of HCF Ecosystem & Technology Readiness Level



ITU-T is being asked to start an informative Technical Report in their upcoming July Plenary

Hollow-core fiber can increase DC availability zone area while maintaining the existing latency requirements

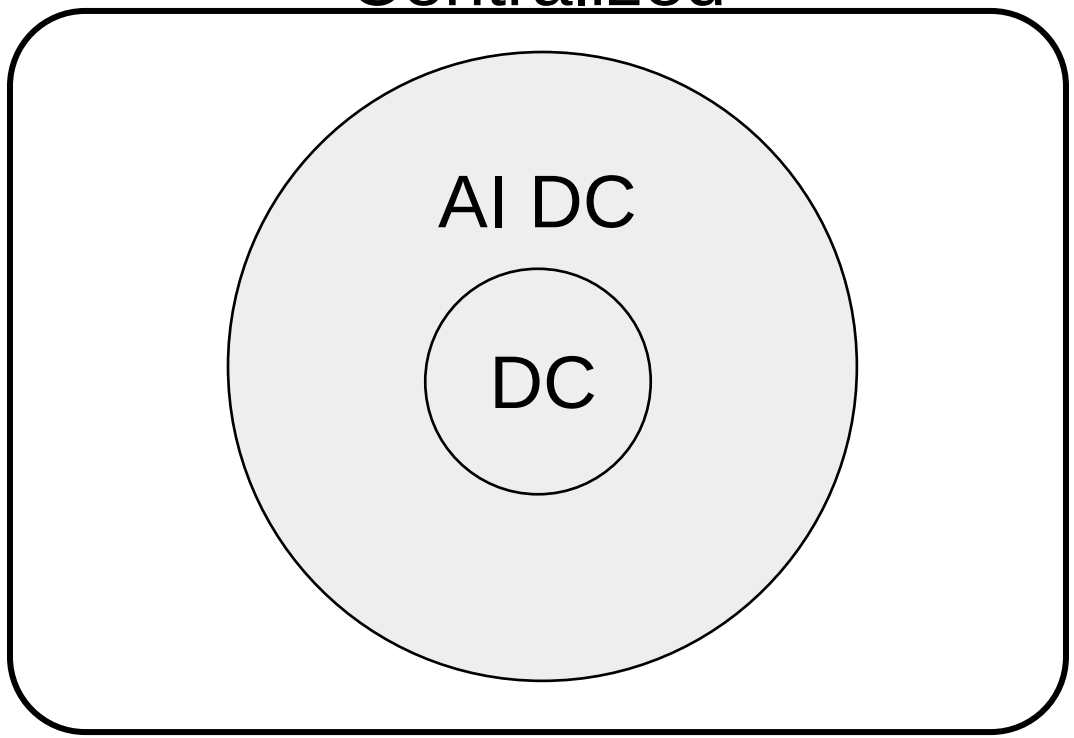


Source: Corning

- **~33% lower latency** with HCF
- **Larger availability zones** by trading latency savings for distance, while meeting the same latency targets
- **Greater siting flexibility** to access lower-cost land, power, water, and renewable energy sources
- **Enables geo-distributed AI**

Hollow-core fiber could allow for a reduction in AI model training time in a geo-distributed architecture

Centralized

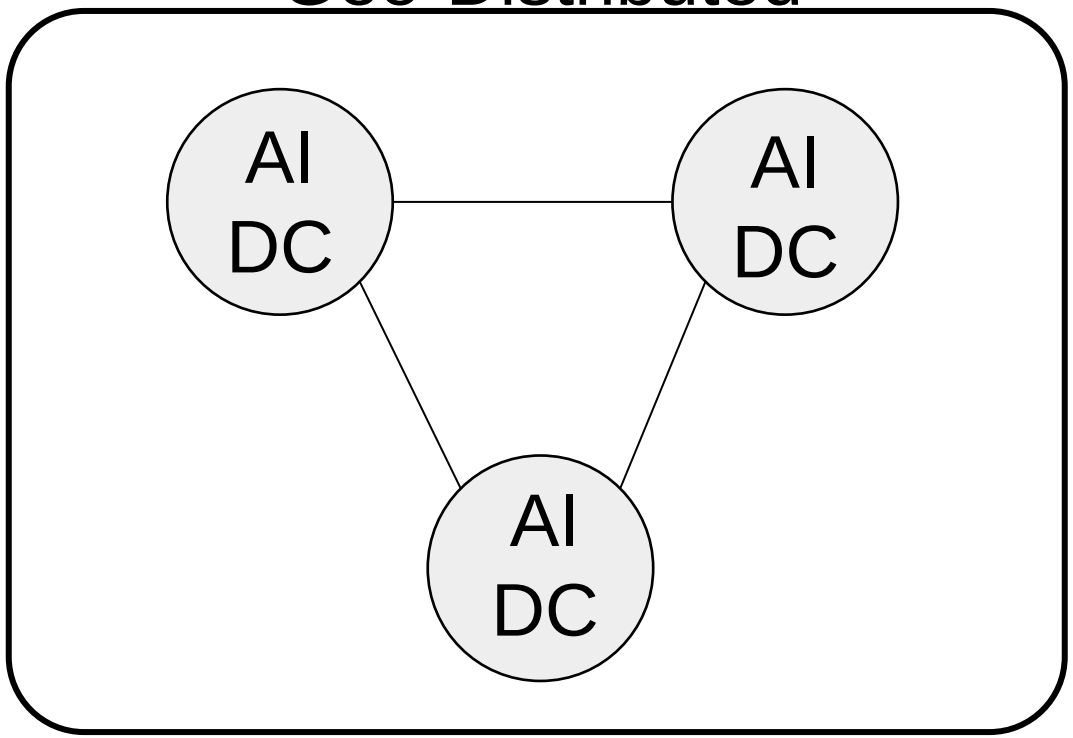


(+) Lower latency = faster AI model training

(-) Land and Power Availability (nuclear reactors)

(-) Engineering challenges (e.g. weight)

Geo-Distributed



(+) Can achieve the same (or bigger) compute power using the existing DC locations

(+) Faster time to market

(-) Need to mitigate the additional latency impact

Potential New Multimode Fibers for Intra-Datacenter Applications

New multimode fiber variants are being investigated to meet higher speed AI/DC requirements

- Multimode 200 Gbps per lane solutions for up to 50 meters are being developed
  - IEEE P802.3ds 200 Gb/s per Wavelength MMF PHYs Task Force is underway
  - Higher multimode fiber bandwidth requirements are being considered to achieve 50 m reach using the ~850 nm wavelength range
  - New 1060 nm wavelength-optimized fiber is also being investigated

- Greater than 200 Gbps per lane capability may also influence market acceptance

- More to follow as 802.3ds progresses

Summary: New fiber types can offer value for existing and emerging applications

- Market acceptance and industrialization will require creation of a robust ecosystem
- New fibers may have different dispersion attributes which may require amending existing and emerging IEEE standards
- Scalability of these new fibers will also be a significant factor in their adoption in order to address the large forecasted growth of DC/AI applications