



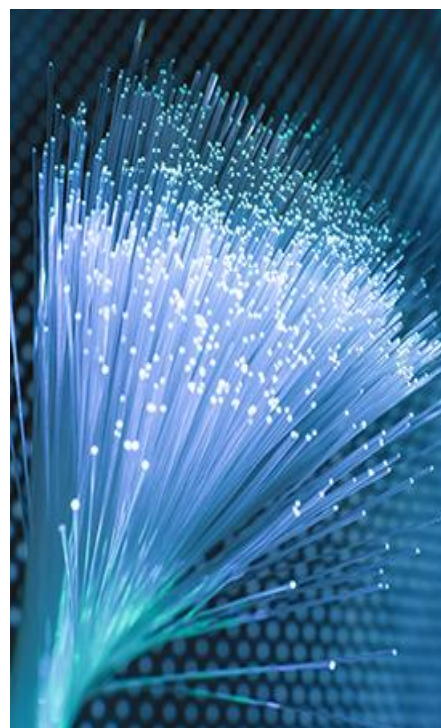
www.pipelinepub.com

Volume 21, Issue 3

How Fiber Optic Networks are Driving Digital Transformation Across Key Industries

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Fiber optic networks are more vital to the digital economy than ever. Innovations in high-definition (HD) video, IoT (Internet of Things), Machine Learning (ML) and AI (Artificial Intelligence) applications are placing increasing demands on the network infrastructure. In addition to the increasing capacity demands, enterprises are requiring more scalability, security and low latency performance to run their cloud applications. The drivers of fiber connectivity growth extend across data center and multi-cloud networking, edge computing, smart appliances, telecommuting, telemedicine, remote learning, e-commerce, and other applications. Meanwhile, enterprises are under increasing pressure to reduce costs, increase efficiencies, lower carbon emissions, and ensure the enterprise is protected from malicious actors.



As digital strategies reach a more mature phase of evolution, IT leaders are encountering a new wave of bandwidth intensive applications largely driven by the steep adoption curve of cloud IT and AI. Over the last 20 years, they have been fine tuning their network infrastructures to enable IaaS, SaaS, PaaS, UCaaS and other as-a-service applications. Looking ahead, they are trying to grasp the networking

requirements for emerging cloud services such as AI-as-a-Service (AlaaS) and GPU-as-a-Service (GPUaaS). According to the industry research firm, OMDIA, monthly [enriched AI network traffic is forecast to grow 120 percent CAGR](#), from 0.6 exabytes to 148 exabytes, during the 2023 to 2030 period. These trends in data networking have significant implications for the capacity requirements to connect data centers as well as enterprise locations, devices, and clouds with fiber optic network infrastructure playing a key facilitating role. At the infrastructure level, [IndustryArc estimates](#) that the dark fiber market will grow globally at 13.1 percent CAGR between 2024 and 2030.

The Advantages of a Fiber Optic Network Infrastructure

Fiber connectivity is the underpinning of an enterprise's digital platform. It offers numerous [advantages](#) compared to other facilities-based networking technologies. Its high-speed capabilities drive increased worker productivity. Fiber optic transmission is inherently more reliable, offering enterprises up to 100% network availability guarantees. The signal strength of fiber is less susceptible to degradation, enabling higher quality transport of applications. The higher bandwidth and low latency capabilities more easily facilitate the transmission of bandwidth intensive applications such as HD video, file sharing, voice, and web conferencing, helping improve worker collaboration, supply chain efficiencies and the customer experience. Fiber networks are more difficult to penetrate and less vulnerable to hacking. The superior scalability of fiber optic networks is another advantage that is especially critical to supporting an enterprise's cloud strategy and business objectives.

Fiber Connectivity to the Data Center

Data centers and fiber optic networks combined form the backbone of our digital infrastructure, enabling enterprises to meet the growing demands for data storage and transmission. High performance computing (HPC) and graphics processing unit (GPU) clusters have become common parlance for today's IT leaders as AI applications ramp up. The increased capacity requirements of this new generation of servers have placed greater demands on the enterprise network infrastructure. Scaling the operational infrastructure and meeting the increased energy consumption needs in an environmentally friendly manner are key challenges to AI adoption. The large-size AI data flows generated in dense GPU clusters can lead to significant latencies and prolong workload completion times, which results in compromised application performance and user experiences. In addition to the emerging AI applications, data center interconnects need to be precisely calibrated to efficiently transport cloud computing, big data, IoT, and other bandwidth

intensive applications. As optical switching technology advances to speeds of 800G and 1.6T to meet the capacity and scalability required for the proliferation of data center and enterprise WAN applications, coupled with fiber facilities containing increasingly higher strand counts, state-of-the-art fiber optic networks provide the performance and efficiency characteristics to cost effectively transport this widening array of applications.

Key Industry Applications – Fintech, Healthcare, and Education

The network has become a more critical component of an enterprise's IT strategy and operational platform across all industries. Enterprise dependence on reliable and secure connectivity became especially pronounced during the Covid-19 pandemic. This trend, coupled with AI and other forms of technological innovation, has given fiber connectivity a heightened value in today's businesses. [According to estimates produced by OpenVault](#), upstream usage on broadband networks has grown 153 percent over a five-year period between 2018 and 2023, with commercial users generating over 70 percent more upstream data than residential users. The factors contributing to this difference included businesses' reliance on data-intensive applications such as file transfers, video conferencing, and cloud-based applications. The [Fintech industry](#) is illustrative of how fiber connectivity delivers considerable benefits. Financial services companies and trading platforms rely heavily on fast data transmission. Fiber's high-speed capabilities enable the processing of large volumes of data quickly with applications such as real-time PoS transactions and other forms of digital payments, clearing house and settlement platforms, and online banking. Dedicated, ultra-low latency fiber connections are a competitive necessity with high frequency trading platforms, in which a millisecond advantage can drive substantial profits. Increasingly, fiber connections will play a vital role enabling blockchain technology and connecting cryptocurrency exchanges.

The scalability and security advantage of fiber optic transmission is also of critical importance to Fintech. With cyber threats on the rise, data security is essential to providing on-line finance services. Fiber optic networks provide superior security features, making it difficult to intercept data without detection which is a crucial factor that contributes to the protection of financial transactions. As security operations adopt more AI-enabled correlation techniques and analytics to assess risk and detect fraud, the speed of fiber networks will be essential to processing massive amounts of data. The reliability of fiber optic network infrastructure also helps ensure the financial services ecosystem is continuously operating 24x7 given its vital role underpinning the global economy. Overall, fiber connectivity is essential to the efficient functioning of the global financial system, enabling the

industry's numerous real-time applications as well as helping its participants meet the industry's stringent security and regulatory compliance requirements.

High speed networks have revolutionized the [healthcare industry](#), which started with early forms of telemedicine. Big data, cloud IT, and AI have widespread application in the healthcare industry, with the protection of privacy of paramount importance, resulting in an even greater need for the performance capabilities of fiber optic networks. The power of AI improves the accuracy, speed, and efficiency of medical diagnostics. Predictive analytics enabled by AI is driving significant advancements in early detection of potentially life-threatening illnesses. AI-enabled automation enhances the accuracy and efficiency of record keeping, ensuring that patient information is readily accessible while also safeguarding adherence to HIPAA compliance requirements. The increased use of GenAI in the healthcare industry improves workflows and leads to more efficient time management of scarce personnel, resulting in higher quality patient care. At the heart of these technology-driven improvements to medical science, patient care, and administrative processes are fiber optics networks which transport large volumes of data reliably, securely, and speedily.

The criticality of fast, reliable, and secure connectivity in the education sector became particularly acute during the Covid-19 pandemic. The role of fiber optic networks became paramount during this scenario. The reliance on network infrastructure of [educational institutions](#), including K-12 schools, universities, and other academic and research organizations straddles a variety of applications from e-learning, collaboration and accessing resources stored in the cloud to administrative systems and record keeping. The high-speed capabilities of fiber optic transmission enable students to participate in virtual classroom environments using high quality video and web conferencing methods, simulating the in-classroom environment in a more realistic manner, thereby enhancing the student's ability to learn and collaborate. The inherent stability of fiber-based connectivity ensures an uninterrupted learning cadence, in contrast to the less reliable performance capabilities of other transmission modalities which can be disruptive to the learning experience. The latency advantage of fiber connectivity also enables faster downloads of educational materials, providing students and teachers with more efficient access to vital resources.

Deployments of fiber connectivity to serve school communities typically entail the building out of MANs, especially in urban areas. Innovations in fiber optic technology, such as micro ducts and microfiber systems, have made such deployments more efficient. Additionally, the strand count of single mode optical networks has increased, as new systems are able to accommodate upwards to 864

fiber strands. The result is the ability to deploy fiber networks more cost efficiently with a high degree of scalability, while also helping future proof the overall technology platform.

The Benefits Outweigh the Challenges

The deployment of fiber infrastructure to enable these key industry applications is not without its challenges. Building out a fiber network requires substantial investment capital. Above ground fiber optic lines are exposed to weather induced damage. The digging of subterranean fiber networks poses risks to other buried infrastructures. In instances of subsea fiber infrastructure, fishing vessels and even sharks can cause damage to the cables. Securing regulatory permissions to build a fiber optic network can also be time consuming and onerous. When partnering with municipal governments, fiber connectivity providers can encounter complexities and constraints with public funding and revenue sharing arrangements. But the benefits of fiber facilities far exceed the hurdles. As AI begins to transform the conventions of business operations across all industries to drive greater efficiency, the fiber optic infrastructure imperative becomes even more compelling.