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**SMART SOFTWARE
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COLOCATION FIBER INFRASTRUCTURE DESIGN—

THE KEY TO ACHIEVING A CONNECTED WORLD

By Manja Thessin

Our connected world abounds with smart devices, and never-before-seen volumes of data are being produced, processed, stored, and consumed. It is no secret that enterprises need to process and deliver data at unprecedented speeds, and increasingly, organizations are turning away from traditional data center strategies to solutions like hybrid cloud to keep up with consumers' expectations. Gartner predicts that by 2025, 85% of infrastructure strategies will integrate on-premises, colocation, cloud, and edge delivery options, compared with just 20 percent in 2020.¹

In addition to the acceleration of moving off-premise, enterprise companies who previously built and operated their own data centers are realizing that they do not want to be in the data center operations business. Colocation offers significant cost, technology, and management benefits when compared to an on-premise data center. The idea of accessing an already-built data center facility, with access to high levels of connectivity, flexibility, and space to expand, seems attractive and considerably less costly than going it alone. Colocation data centers are usually located in or near a major city, serving a significant population. This makes them an attractive target for edge computing, an evolving concept with the basic principle of moving compute power closer to where the data is for faster responsiveness. Their location in first- and second-tier markets makes them a convenient vehicle to deliver the required infrastructure with the promise of reduced latency.

NOT ALL COLOCATION IS CREATED EQUAL

Colocation data centers host hundreds of different types of customers and achieve great economies of scale—sharing everything from cooling to power, operations, and maintenance expenses. Not all colocation business models and facility types are the same, however. Expected to register the highest growth rate in the next five years,² wholesale data centers are facilities where businesses with large footprint requirements rent space and power, bringing everything else with them, such as IT staff, hardware, carriers, and cloud connectivity. Customers are generally cloud providers or large enterprises who are outsourcing their infrastructure needs. Alternatively, retail colocation is focused on small customer deployments, enabling companies to rent a portion of space within a multi-tenant data center. These facilities often have dense interconnection requirements and lease anywhere from two to 50 cabinets to a customer per data center. This model offers flexibility when managing small volumes of data or when infrastructure is needed only for a limited time. This segment dominated the market in 2021 with a share of over 70 percent and is estimated to retain the leading position over the next five years.³ Some providers also offer a range of services in addition to just floor and rack space, such as access to cloud-based applications, managed hosting and storage, business resiliency, and more.

A CHALLENGING FRONTIER

Colocation is a complex, competitive market. Tenants demand the ability to add capacity on demand, the capability to scale networks globally, and the agility to make high-speed connections with cloud and service providers as and when required. For colocation providers to compete, the physical layer must provide flexible, scalable, high-performance optical fiber infrastructure designed to support ever-increasing demanding applications and customer requirements.

Colocation data centers are the frontier where hyper-scale, cloud, telecommunications, and enterprise worlds interconnect. If not properly maintained, a colocation optical fiber network can quickly become difficult to manage. Effective infrastructure for a colocation provider means that they can cross-connect quickly,



save on labor costs and time, generate revenues faster, and provide the agility to offer a variety of cost-generating services to their customers. As storage and data management requirements grow, colocation providers need to reduce latency and downtime while simultaneously increasing connectivity density and bandwidth capability.

The network infrastructure needs to be designed for multi-carrier and multi-hall campus scenarios, with built-in redundancy and resiliency in the physical layer so that the network not only delivers a consistent service that meets growing demands, but is dependable in the face of external threats and risks.

Network downtime has more than just a financial impact. Even a small lag in network response time creates a lack of consumer trust, damaging the colocation provider's image, integrity, and reliability. Availability relies on redundancy for maximum effectiveness. Infrastructure redundancy and a network's physical characteristics are often the last lines of defense against internal or external threats. Providers who offer true cable route diversity can assure their customers that they will have a better chance of remaining operational in the event of a fiber cut or similar impact. Pathway redundancy is crucial to maintaining network speeds and integrity. For latency-sensitive applications, having multiple paths to access the same locations mitigates slow network speeds during periods of high-traffic volumes.

EXPANDABLE, FLEXIBLE, ACCESSIBLE FIBER INFRASTRUCTURE

The physical layer of the core colocation network—from the outside plant cable to the customer cage—must be designed with a redundant structured cabling architecture that can scale quickly and reliably. At the core of such an architecture are high-fiber-count cables and easy-to-use, fast-to-deploy, modular, and scalable connectivity infrastructure (Figure 1).

Colocation clusters can range from being next door to one another to being hundreds of miles apart. This requires careful consideration given to the design of the cable that links them together. To ensure suitable future bandwidth—optical fiber density, optical fiber type, cable construction, distance, and installation method—all need to be considered. Maximizing the port capacity in splice and patch frames and selecting the maximum optical fiber count available ensures the delivery of a future-proof solution in terms of density and bandwidth. The effort and complexity required to deploy the solution must be kept at a minimum. Keep it simple for the installer. Consider cabling installation time and ease of splicing and handling. Distribution areas are often space constrained. Thus, it is important to keep an eye on the footprint requirements of splice and patch frames.

Spearheaded by the hyperscale data center campuses, the data center interconnect application has emerged as an important segment in the network landscape.

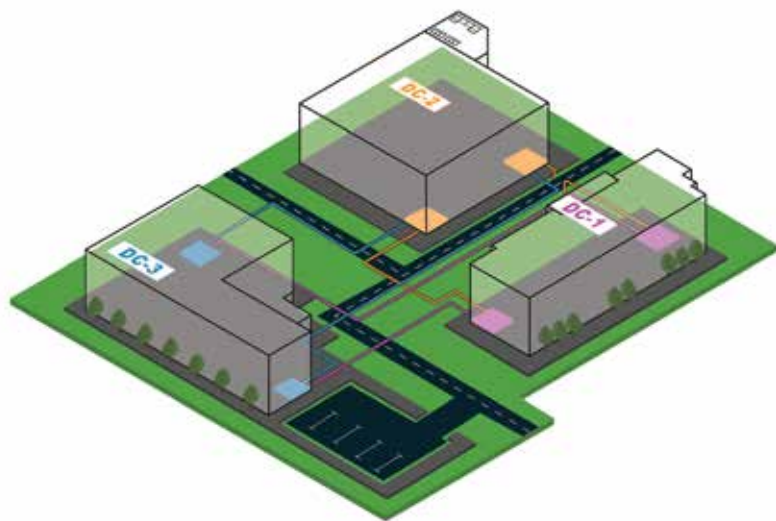


FIGURE 1: Graphical Representation of Colocation Campus Interconnect.

Optical fiber strand counts within data centers are now being increased from 864 to 1,728, or even higher, on and between campus sites. Higher capacity and smaller diameter cables are essential for the rollout of this inter-campus connectivity, delivering a better ROI for data centers on installation and termination time. This demand is met by new modern, flexible optical fiber ribbon cables that provide significant improvements in cable density, along with a reduction in overall cable diameter and weight when compared to traditional ribbon-based or loose tube optical fiber cables. The innovative ribbon optical fiber design allows the cable to be mass fusion spliced just like conventional optical fiber ribbon. This design enables the installer to easily identify, separate, and splice individual optical fibers within an optical fiber bundle. The ultra-small diameter maximizes pathway utilization, and the smaller reel size required significantly reduces freight and transport costs, effectively supporting green construction and sustainability efforts.

New air-blown variants, used in combination with micro ducts, are becoming available in the market that further optimize pathway space utilization. Micro ducts are small plastic conduits that sub-divide internal duct space into smaller compartments, inside of which micro cables are installed by blowing, jetting, or pushing. Micro ducts are a great “pay-as-you-grow” model for colocation campuses and data center interconnects. In addition to enabling extreme interconnection densities, micro ducts are of interest to colocation providers because they allow physically separate pathways for each tenant, allowing them to scale flexibly as they bring new customers online. Micro ducts also facilitate easier and faster decommissioning, greatly reducing the risk of disruption or downtime. Faster decommissioning means that the empty duct space can be repurposed quickly.

A CASE FOR SPACE

A meet-me-room (MMR), also referred to as an external network interface (ENI), is often used as a base area to control access to large colocation data center backbone interconnectivity. It is a relatively small but

very important space inside the data center where internet service providers, telecommunications carriers, and cable companies converge to interconnect or cross-connect with one another and connect cabling to other areas of the building. Here, performance and long-term reliability are vital. Therefore, to ensure long-term consistency and performance with minimal signal loss, splicing is the only termination method to consider.

In typical backbone applications, 144-fiber to 864-fiber cables are routed through walls or between floors. This includes cables to connect the MMR with customer racks directly or routed through other distribution areas—such as the main, intermediate, or horizontal—and creating connections between those areas. These optical fiber cables must offer sufficient capacity, density, and flexibility to support a multitude of applications. Bend-optimized optical fiber cable construction is paramount to guarantee pathway space efficiency and ease of handling. The design must provide for redundancy and should be scalable.

The infrastructure in the main distribution area (MDA) impacts the ability to cross-connect and the time it takes to bring a customer online. This is a very dense space with lots of connections. High-density cable management solutions are key to reducing the MDA footprint, increasing the available white space for customers. There are several options available to terminate the data center backbone in a manner most suited to the MDA space. The mass-fusion splicing method remains the most cost-efficient option here, but it requires significant time to deploy. This option also requires a dedicated space for patch and splice infrastructure. As an alternative, a pre-terminated solution is faster to deploy and has fewer space requirements. This option, however, requires additional time on the front end to determine fixed trunk lengths, and that often means longer lead times for procurement.

In the customer area, the main challenges for colocation providers to address are how quickly the space generates revenue and how well the infrastructure is set for the future. With customers being billed on space and power, solution density is top-of-mind. Looking at the passive infrastructure specifically, the goal is to maximize rack space so there is less space

being taken up and, therefore, less real estate to be charged for in the cage. However, higher densities often have the downside of being less flexible to accommodate changes. The ideal solution should maximize density while maintaining ease of use, as well as deliver power savings. It is possible to densify the infrastructure while saving on power by deploying a port breakout solution, for example. This offers a reduction in the cost-per-port deployed and results in less power consumed due to requiring fewer chassis and line cards.

In addition to the various cable and space requirements to consider, one must not forget that optical fiber management infrastructure is equally important. Efficient optical fiber management has become a critical consideration with respect to data center architecture. Proper implementation of optical fiber management presents numerous benefits to colocation operators, with cost reduction being one of the more significant and desirable. Large-scale optical fiber cable installations can quickly become untidy and pose a source of risk to the network if proper protection and management are not in place. Without suitable and effective cable management, damage could be caused to vital link connections and networks could be at risk of being interrupted. There is a wide range of optical fiber management solutions available to support both splicing and patching inside panels and to manage external connections between panels (Figure 2).

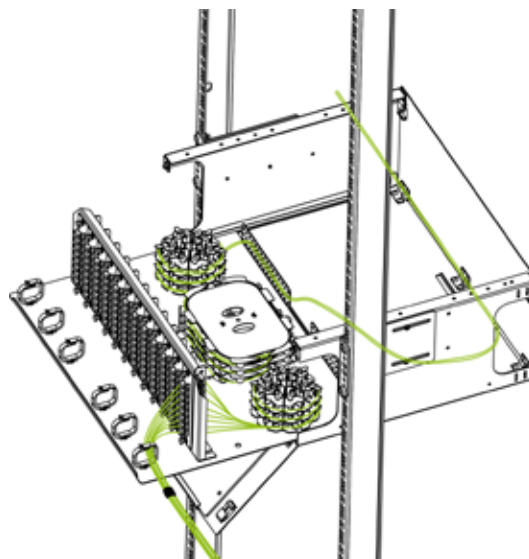


FIGURE 2: Example of an Efficient Optical Fiber Management Solution.

High-density cable management solutions are key to reducing the MDA footprint, increasing the available white space for customers.

In the colocation space, from the outside plant cable to the customer cage, it is important to deploy flexible solutions for all types of applications. Future trends, such as edge computing and 5G, which are pushing the bandwidth needs of all customer segments, will reward the colocation providers that offer interconnection-oriented facilities as new applications change the way we create, collect, process, and analyze data. By allocating the right amount of cage space and anticipating the optical fiber counts that their customers will ultimately require, colocation providers can differentiate themselves from their competitors.

The companies that will stand out and gain market share are the ones who proactively invest in their optical fiber cabling infrastructure. This will become increasingly important as enterprises and service providers create new strategies to grow and expand their digital business capabilities in their quest to achieve a connected world.

AUTHOR BIOGRAPHY: Manja Thessin, RCDD/RTPM serves as enterprise market manager for AFL, leading strategic planning and market analysis initiatives. Manja has 21 years of ICT experience in the field, design and engineering, and project management. She has managed complex initiatives in data center, education, industrial/manufacturing, and healthcare. Manja earned a master's certificate from Michigan State University in strategic leadership and holds RCDD and RTPM certifications with BICSI®.



REFERENCES:

1. Costello, Katie. "The Everywhere Enterprise: A Gartner Q&A with David Cappuccio," *GARTNER*, 8 Oct. 2020.
2. "Data Center Colocation Market Size, Share & Trends Analysis Report by Colocation Type, by End-use, by Enterprise Size, and Segment Forecasts, 2021-2028," *GRAND VIEW RESEARCH*, Apr. 2021.