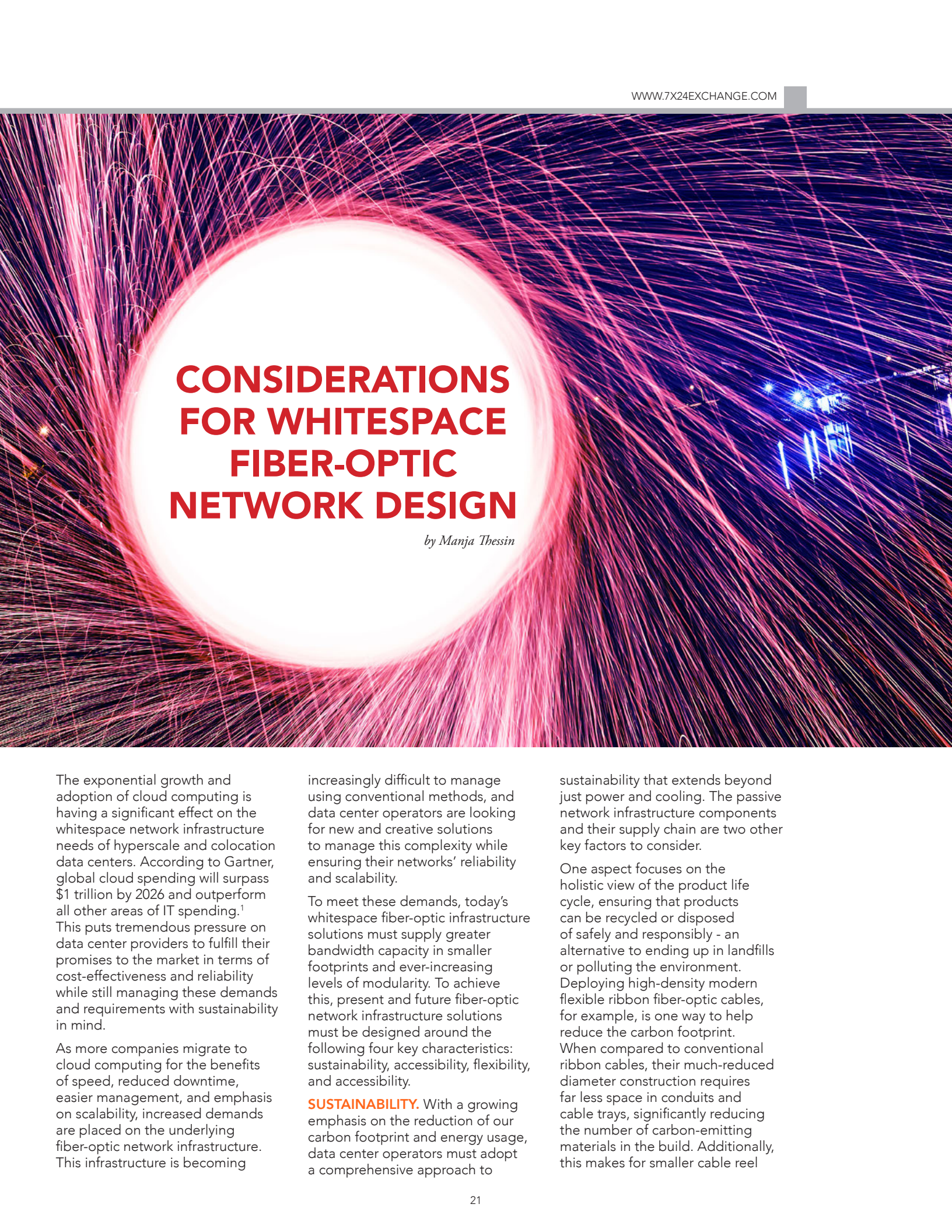




# CONSIDERATIONS FOR WHITESPACE FIBER-OPTIC NETWORK DESIGN

*by Manja Thessin*

The exponential growth and adoption of cloud computing is having a significant effect on the whitespace network infrastructure needs of hyperscale and colocation data centers. According to Gartner, global cloud spending will surpass \$1 trillion by 2026 and outperform all other areas of IT spending.<sup>1</sup> This puts tremendous pressure on data center providers to fulfill their promises to the market in terms of cost-effectiveness and reliability while still managing these demands and requirements with sustainability in mind.

As more companies migrate to cloud computing for the benefits of speed, reduced downtime, easier management, and emphasis on scalability, increased demands are placed on the underlying fiber-optic network infrastructure. This infrastructure is becoming

increasingly difficult to manage using conventional methods, and data center operators are looking for new and creative solutions to manage this complexity while ensuring their networks' reliability and scalability.

To meet these demands, today's whitespace fiber-optic infrastructure solutions must supply greater bandwidth capacity in smaller footprints and ever-increasing levels of modularity. To achieve this, present and future fiber-optic network infrastructure solutions must be designed around the following four key characteristics: sustainability, accessibility, flexibility, and accessibility.

**SUSTAINABILITY.** With a growing emphasis on the reduction of our carbon footprint and energy usage, data center operators must adopt a comprehensive approach to

sustainability that extends beyond just power and cooling. The passive network infrastructure components and their supply chain are two other key factors to consider.

One aspect focuses on the holistic view of the product life cycle, ensuring that products can be recycled or disposed of safely and responsibly - an alternative to ending up in landfills or polluting the environment. Deploying high-density modern flexible ribbon fiber-optic cables, for example, is one way to help reduce the carbon footprint. When compared to conventional ribbon cables, their much-reduced diameter construction requires far less space in conduits and cable trays, significantly reducing the number of carbon-emitting materials in the build. Additionally, this makes for smaller cable reel





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Product optimization is another important aspect of introducing sustainable practices into data center network builds. This entails manufacturing products that can be easily repaired rather than replaced, thus designing network infrastructure to have a longer lifespan. High-density modular platforms with swappable fiber cassettes, for instance, can support multiple technology lifecycles, minimizing the need for frequent hardware replacement.

Going green is beneficial for both the environment and business. Data center operators can reduce their environmental impact and ultimately save money by introducing solutions designed with environmentally friendly products and in concert with a sustainable supply chain.

**ACCESSIBILITY.** After installation, access to and management of the fiber-optic network infrastructure are crucial. In this context, accessibility refers to technicians' ability to access and make essential network changes without risking disruption.

Deploying an effective cable management system is one of the most important components of accessible whitespace fiber-optic cabling infrastructure. These systems enable easy identification and access to cables, cable organization and routing, reducing clutter and improving airflow in racks and cabinets. This not only improves the data center's overall performance but also makes it easier to diagnose and repair problems, significantly reducing costly downtime and maintenance. Also important are

modular and scalable connectivity solutions, such as patch panels, which can be easily added or removed to accommodate infrastructure changes. These are important considerations for future upgradability.

**FLEXIBILITY.** As data centers continuously evolve and adjust to the ever-changing technological landscape one thing remains constant: the need for flexibility. Here, a flexible fiber-optic network infrastructure ensures that data center operators have a high-performance and adaptable foundation to support a high degree of mobility. Modular fiber housings that accept a variety of cassette options supporting diverse applications, technology iterations, or cabling form factors, ensure that compatibility issues are minimized when dealing with architecture changes. For example, selecting a patch housing that allows the simple interchanging of cassettes and adapter modules allows organizations to scale up or down with network speed demands, without added hardware investments. Furthermore, using highly modular components such as those compatible with modern flexible ribbon fiber solutions provides substantial flexibility in the number of fibers connected, allowing data center operators to build a network today with confidence that they can adjust it as demands change in the future.

**EXPANDABILITY.** A network's capacity to handle increased traffic and more connection points in the future is referred to as expandability. The simplest solution to that today is to deploy more fiber. There are several factors to consider when it comes to expandability, the most important of which are modularity and space

optimization. Solutions that deliver reduced physical dimensions, requiring less space in cabinets and racks, ensure that available space is reserved for future expansion, thus improving costly whitespace real estate usage. In practice, this can be realized by deploying small form factor connectors, such as single cable termination using array-style connectors, which enable higher density within the same footprint when compared to traditional duplex connectors. Reduced diameter fiber-optic patch cabling is aided by deploying 16-fiber MTP/MPO cables that use the same external connector footprint as traditional 12-fiber ferrules. This enables aggregation of multiple 8-fiber parallel transceivers and coupling directly to emerging 16-fiber parallel fiber links such as 400G QSFP-DD and OSFP, vastly reducing cabling overheads. These are just a few measures that data center operators can deploy to fit more fiber in the same space, at a minimal incremental cost, ensuring their network with future expandability.

Success in implementing high-density, high-fiber count cabling solutions effectively requires new and innovative solutions that solve the problems of managing and connecting ever-increasing fiber counts. Data center operators can no longer afford to disregard the dynamic nature of their physical access network requirements if they want to ensure their data centers' capability and readiness to meet the growing demands on performance. The pace of change and the potential to capitalize on future opportunities relies on a whitespace fiber-optic network that is designed with sustainability, accessibility, flexibility, and expandability in mind.

#### References

<sup>1</sup> Gartner predicts robust cloud computing market till 2027. (2022, December 9). Retrieved from TechRepublic: <https://www.techrepublic.com/article/gartner-predicts-robust-cloud-market/>