

Key Considerations for a SAFER Fiber Network in your Data Center White Space

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Introduction

The exponential growth and adoption of cloud computing is having a significant impact on the white space infrastructure of hyperscale and colocation data centers. As more and more companies switch to hyperscale cloud computing for its speed, reduced downtime losses, easier management and scalability based on demand, the demand for data center space is skyrocketing. According to [Gartner by 2026 global cloud spending will exceed \\$1 trillion](#) and will outperform all other areas of IT spending, putting great pressure on cloud hyperscalers to deliver on their promises of cost effectiveness and reliability to the market, whilst still effectively managing their own requirements, with sustainable practices, in a cost-effective way.

The result of this increased demand has driven data center technologies to offer ever increasing compute, network and storage resources in much smaller physical footprints, leveraging virtualization and automation technology to deliver highly efficient resource utilization, higher levels of redundancy and a high degree of workload mobility. This requires that data centers implement cabling solutions that are offering higher bandwidth density in increasingly smaller footprints, more efficient cable runs and ever-increasing degrees of modularity, enabling the underpinning white space infrastructure within these environments to meet the growing demands placed upon it, in terms of flexibility, future-proofing and non-disruptive operation.

Essentially, white space infrastructure is becoming increasingly complex to manage through traditional methods, and data centers are looking for new and innovative solutions to manage this complexity and ensure the reliability and scalability of their networks.

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SUSTAINABLE | ACCESSIBLE | FLEXIBLE | EXPANDABLE | RELIABLE

Delivering SAFER networks

The SAFER methodology is a comprehensive approach to designing and building white space infrastructure in data centers and offers a guiding set of principles through which data center operators can evaluate their current infrastructure state, whilst guiding planning and decision making as to how they make their infrastructure choices going forward; It stands for Sustainability, Accessibility, Flexibility, Expandability and Reliability.

Sustainability: The design, build and operation of data centers with an emphasis on energy efficiency, minimising waste and the general reduction of environmental impact. This can be achieved using energy-efficient equipment and the implementation of recycling and waste reduction programs. Getting the data center physical layer right will assist sustainability by supporting multiple speed migrations even if active equipment is changed or updated.

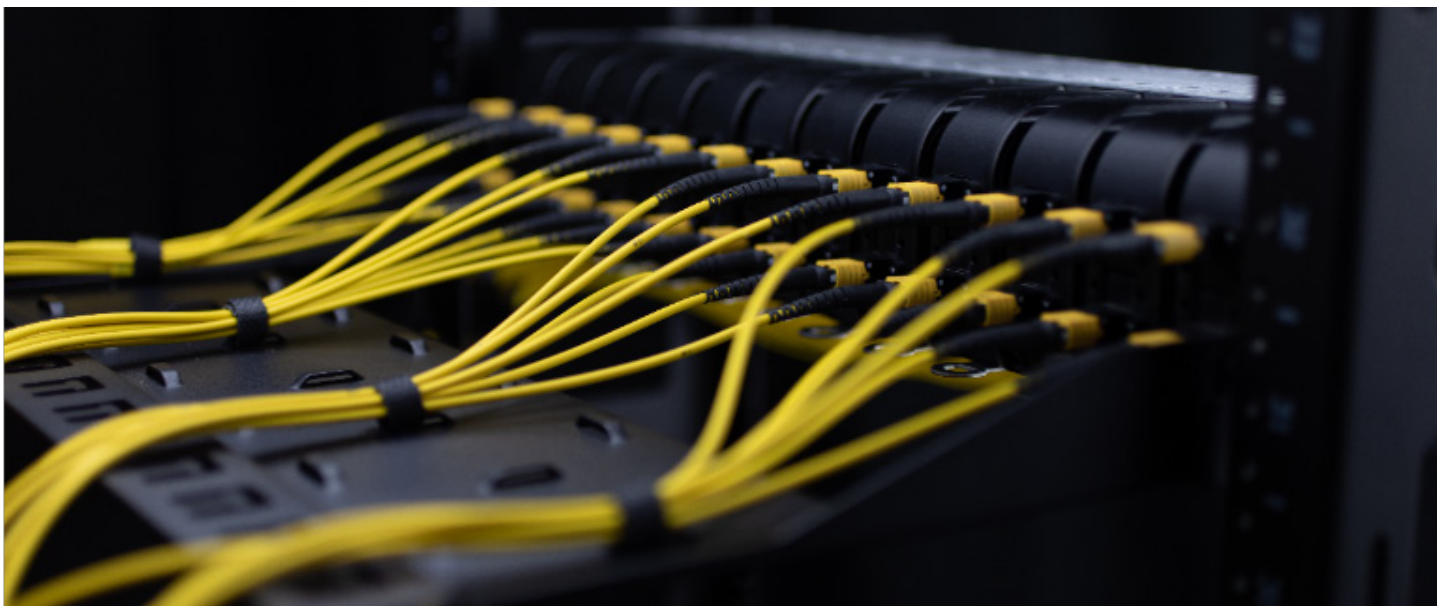
Accessibility: Ease of access to the data center's infrastructure, including the ability to easily service and maintain equipment. This can be achieved through the use of modular connectivity and labelling of equipment, as well as the use of innovative patch cord latching and uniboot assemblies.

Flexibility: This refers to the ability to easily add, remove and reconfigure equipment without disrupting existing connections. This can be achieved using high-density network areas and on-rack and off-rack housing options.

Expandability: This pertains to the ability to easily expand the data center's infrastructure as needed. This can be achieved through the use of high-fiber count cable technology and modular connectivity platforms in high-density network areas.

Reliability: This pertains to the ability of the data center's infrastructure to withstand potential disruptions and maintain continuity of operations. This can be achieved through the use of redundant systems and the implementation of disaster recovery plans.

By utilizing the SAFER methodology, data centers can ensure that their white space infrastructure is designed and built to be energy-efficient, easily accessible, flexible, expandable and reliable.



Sustainability

Sustainability is a critical consideration for any modern data center. With the increasing focus on reducing energy consumption and carbon footprint, it is important for data centers to have a comprehensive approach to sustainability that goes beyond just power and cooling. One key area to consider is the passive network infrastructure and supply chain.

A sustainable data center starts with selecting a proactive strategic partner. This means selecting a supplier that not only delivers products on time and at a cost, but also has a strong commitment to sustainability. This includes not only short-term initiatives but also long-term strategies to reduce environmental impact.

When selecting a white space infrastructure supplier and evaluating their pro-activity in sustainable practices. There are two key categories we should evaluate:

"Cradle to gate" refers to the upstream environmental impact of a product from the point of its raw materials extraction, through its manufacturing. This includes the energy and resources used in the production of the product, as well as the emissions and waste generated during that process.

"Gate to grave" refers to the downstream environmental impact of a product, including its use and disposal. This includes the use of resources and energy while the product is in use, as well as the end-of-life disposal methods and the impact of those methods on the environment. This aspect of sustainability focuses on ensuring products can be recycled or disposed of safely and responsibly, rather than ending up in landfills or causing pollution. It's a holistic view of the product life-cycle.

For example, sourcing materials from environmentally friendly suppliers, reducing packaging materials and eliminating single-use plastics from products are all examples of this process. Additionally, the development of modern flexible ribbon technology allows for high-density fiber optic cables that use less materials and have a smaller carbon footprint during transportation.

Another important aspect of sustainability in the data center is product optimization to aid sustainable practices when in operation. This includes designing products that have a longer lifespan and can be easily repaired instead of replaced. High-density modular platforms with interchangeable fiber cassettes, for example, can support multiple technology life cycles, reducing the need for hardware replacement.

By implementing sustainable practices in the supply chain and product design, data centers can not only reduce their environmental impact but also save money in the long-term. Additionally, as more and more businesses become environmentally conscious, investing in sustainability can also improve public perception and increase brand loyalty.



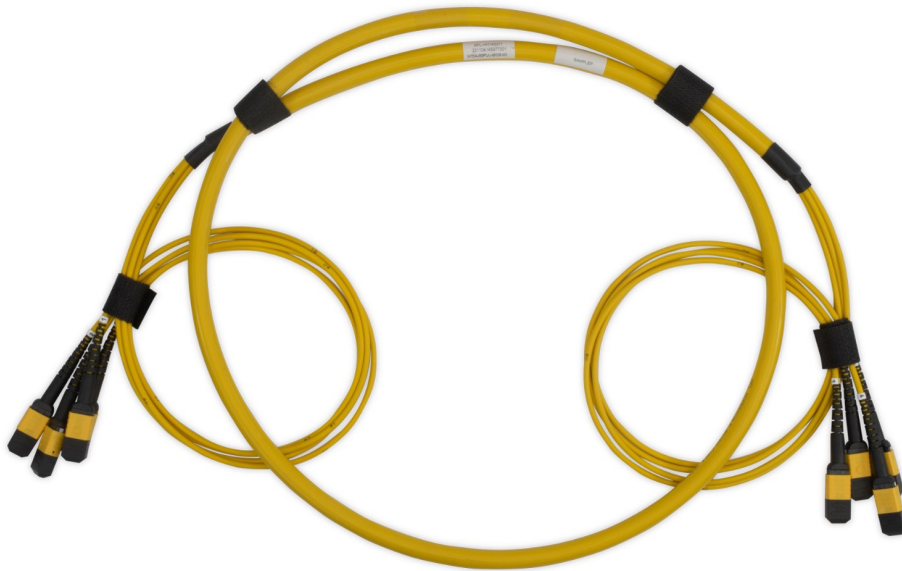
Accessibility

Accessibility refers to the ease of access to different components and systems within the data center, such as cabling, servers, and other equipment, and it plays a crucial role in ensuring the reliability, scalability and sustainability of data centers.

One of the key considerations for accessible white space cabling infrastructure is effective cable management systems. These systems allow for easy identification and access to cables, as well as organization and routing of cables to minimize clutter and improve airflow. This not only improves the overall performance of the data center, but it also makes it easier to diagnose and repair any issues, reducing the need for costly downtime and maintenance.

Another important consideration is the use of color-coding, labeling and other identification methods to easily identify and locate specific cables. This ensures that any issues can be quickly and efficiently resolved, minimizing downtime and improving the overall reliability of the data center. Additionally, adequate space and pathways for cable runs, including the use of cable trays, ladders and other cable management solutions, are necessary to ensure cables are properly supported and protected.

In order to ensure the long-term sustainability, reliability, and scalability of data centers, it is also important to use modular and scalable cabling solutions such as patch panels, which can easily be added or removed to accommodate changes in infrastructure or future upgrades. High-density cabling solutions that allow for more cables to be run in smaller spaces, while still ensuring proper performance and signal integrity, are also a must.



Flexibility

As data centers continue to evolve and adapt to the ever-changing technology landscape, one thing remains constant—the need for flexibility. With the pace of adoption of technologies such as AI, Big Data and heavily virtualized and automated workloads, organizations must be able to quickly and easily adapt to changing demands, whether it's adding capacity for more complex computing tasks, improving network reliability, or reducing downtime.

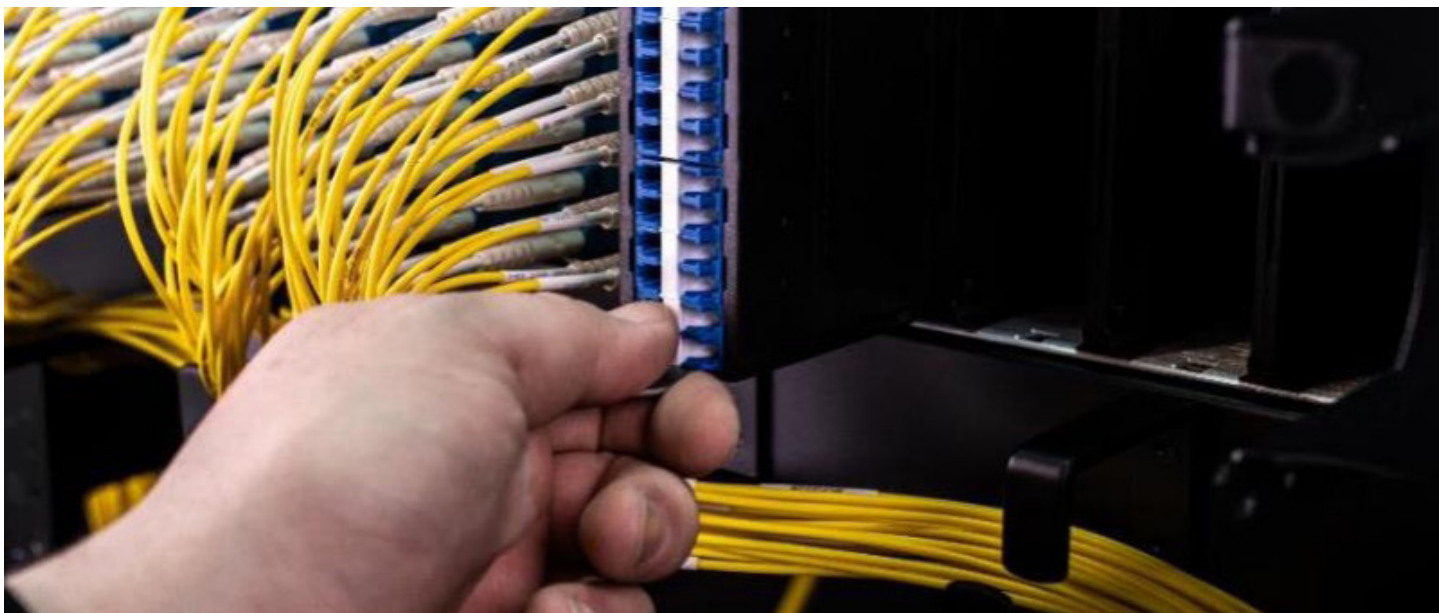
Increasing levels of commoditization of cloud services mean cloud providers are offering ever increasing degrees of flexibility for on demand services at ever decreasing costs. It is essential to have the ability to easily add capacity and move workloads around within the data hall to ensure the right workloads are being serviced by the right infrastructure at the right time to ensure optimal cost of service delivery. This is where a flexible white space infrastructure cabling approaches come into play, enabling data center operators to ensure they have a high performance and flexible foundation to enable high degrees of workload mobility.

Modular housings that accept different cassettes for different applications or technology improvements ensure that this foundation is minimally impacted by compatibility issues when having to address technology options or cabling form factors. For example, choosing housing that facilitates easy changes and adaptations of different cassettes as networks speed change allows organizations to scale up or down as needed, without the need for additional investments in hardware.

The ability to operate a data hall that is tidy and clutter free also relies on the ability for data centers to have high degrees of flexibility in the length and termination options with respect to cabling options. There also needs to be the ability to specify customized cable and assembly lengths from suppliers to suit specific requirements. This includes high-fiber assemblies with distribution options to push rich fiber interconnectivity across the data hall.

Leveraging small form factor connectors such as MPO or single fiber connectors facilitate high degrees of flexibility whilst ensuring improved density and connectivity speeds that can support both new and existing networking technologies, allowing organizations to easily adapt to new technologies as they emerge. Couple this with the use of highly modular components such as that use of modern flexible ribbon that allows for changes to the number of fibers' connected, data center operators can build a network today with the confidence that they can adjust it as future demand patterns change.

Flexibility is a crucial aspect of any white space infrastructure cabling solution. By choosing a solution that offers modular housings, custom cable and assembly length, small form factor connectors, and highly modular components, organizations can easily adapt to changing demands, improve network reliability, and reduce downtime.



Expandability

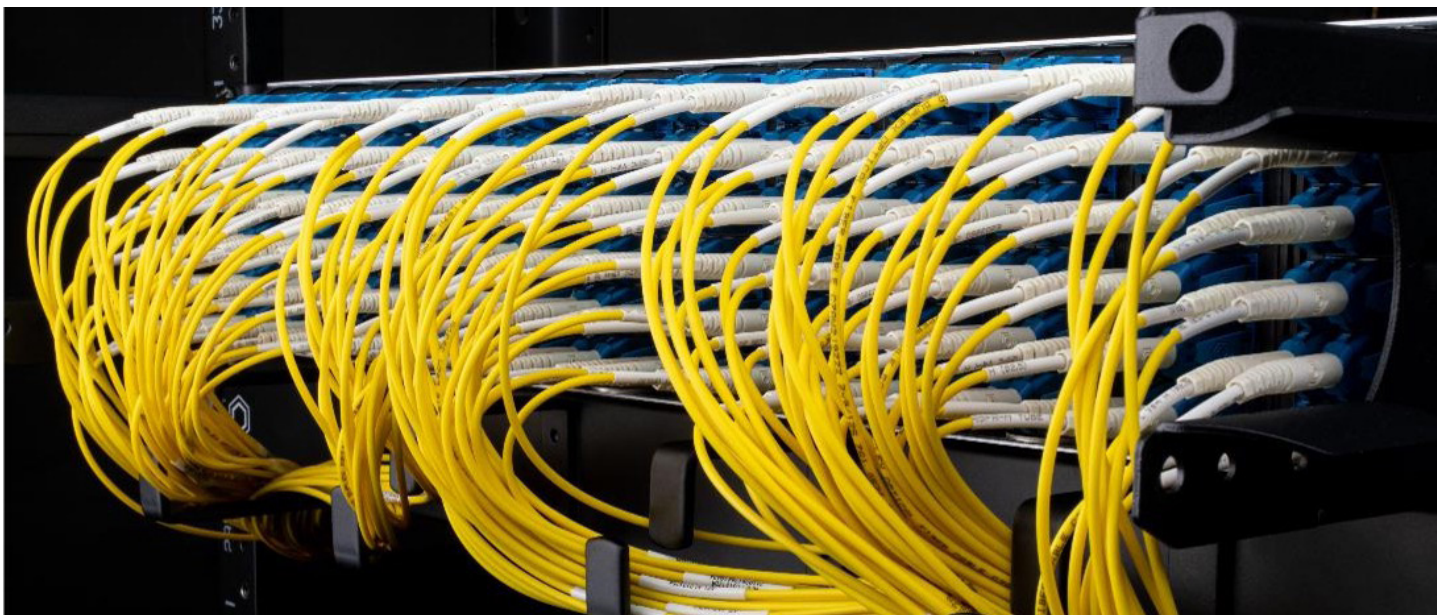
The ability to expand and to do so non-disruptively is becoming increasingly vital within the modern data center. You never know when a new emerging technology is going to disrupt the market and drive a hungry new workload which drives the need to expand your infrastructure capacity. Forward thinking is crucial when considering expandability and is key to being adaptable in the face of new and often unpredictable workloads and with minimal disruption to existing workloads.

There are a few key factors when considering expandability, primarily those factors include modularity and space optimization. Modularity is a big factor in future-proofing white space infrastructure and the ability to leverage modular housing and cassettes to support increased fiber densities and higher throughput is a critical part of optimizing rack space when expanding capacity to support new and demanding workloads on the network. Optimal use of real estate can be also aided through the use of cables and connectors that deliver reduced physical dimensions, reducing their footprint in cabinets and racks, thus allowing data centers to ensure available space can be reserved for future cabling expansion.

In practical terms, this essentially includes all of or combinations of smaller form factor cable termination such as single cable termination or MPO which allows for higher fiber density within the same footprint as traditional LC termination, reduced diameter jumper cabling where possible and deploying technologies such as MPO Base-16 which can consolidate multiple lower throughput connections over high bandwidth 16 fiber trunk cabling, in doing so, allowing for rack and cabinet interconnectivity of up to 1.6 TB/s within vastly reduced cabling overheads.

Modern cabling solutions with flexible ribbon allow data centers to provide the highest amount of ribbon fibers in the smallest space possible, resulting in more fibers deployed in the same splice frames, cabinets, and racks. This ensures that organizations can add more fiber than they need.

These measures enable data center operators to ensure they are capable and ready when dealing with the ever-increasing demands on network performance without the runaway complexity of managing a reactive, non-optimized architecture that isn't future-proofed and expandable by design. When it comes to data center infrastructure, the ability to expand and scale quickly is essential. By using a scalable white space infrastructure cabling approach, organizations can easily add capacity, accommodate new customers and services, and be ready for future growth.



Reliability

Reliability is a crucial aspect when designing for white space cabling infrastructure in the data center. With the increasing adoption of technologies such as AI, Big Data and highly virtualized and automated workloads, organizations must ensure that their data center networks can remain available even in the face of unexpected disruptions, attacks, outages, hardware failures and human errors.

Not only this, as we see higher degrees of virtualization and automation in the data center, we move ever closer to the reality of AI powered and orchestrated data centers leveraging software defined infrastructure at all levels, all this innovation is rendered useless if the interconnecting fabric that is the white space cabling is the weak link in the chain.

One key consideration for achieving reliability in white space cabling infrastructure is to build in network redundancy. This can be achieved by using multiple redundant paths for data transmission and by using high-density cabling solutions that can accommodate large numbers of fibers within a small footprint. By doing so, organizations can ensure that their data center networks remain available even in the event of a failure or disruption, without causing any loss of service.

Another important consideration for ensuring reliability in white space cabling infrastructure is the use of test and inspection equipment. This equipment is essential for ensuring that everything is clean and tested correctly after initial network commissioning, to ensure a reliable service. By using advanced test and inspection equipment, organizations can identify and address any issues before they lead to network failures or disruptions.

Also consider the use of high-performance cabling solutions in white space cabling infrastructure. These solutions should be high-density yet low-loss, supporting high fiber counts in data center environments while reducing insertion losses. Additionally, by selecting solutions that have been rigorously tested and certified by industry standards organizations, organizations can have the confidence that their data center networks will meet the high-performance requirements of today and in the future.

Data center operators should ensure cabling and connectivity products have been certified to the highest industry standards and also ensure clean and reliable cabling installation practices are followed for peace of mind.

Summary

The future of data center infrastructure is closely tied to the growth of technologies such as AI, cloud computing and workload virtualization. Organizations must be able to adapt to these changing requirements in a timely manner to ensure the continued availability of their networks. The SAFER methodology provides a comprehensive approach for organizations to plan, operate, deploy and maintain their white space cabling infrastructure to meet these future demands. It enables organizations to deploy flexible and scalable architectures, avoid costly disruptions, and to do so with sustainability in mind. In order to stay ahead of the curve and meet the ever-evolving needs of data center infrastructure, it's crucial that organizations partner with innovative cabling solution providers that continuously develop advanced, scalable solutions using sustainable practices. Choosing a partner that innovates will ensure you deliver a SAFER network.

Author

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