



▶▶ **Advanced Data Center Solutions**

APPLICATION & PRODUCT GUIDE

Data Center Infrastructure That You Can Trust

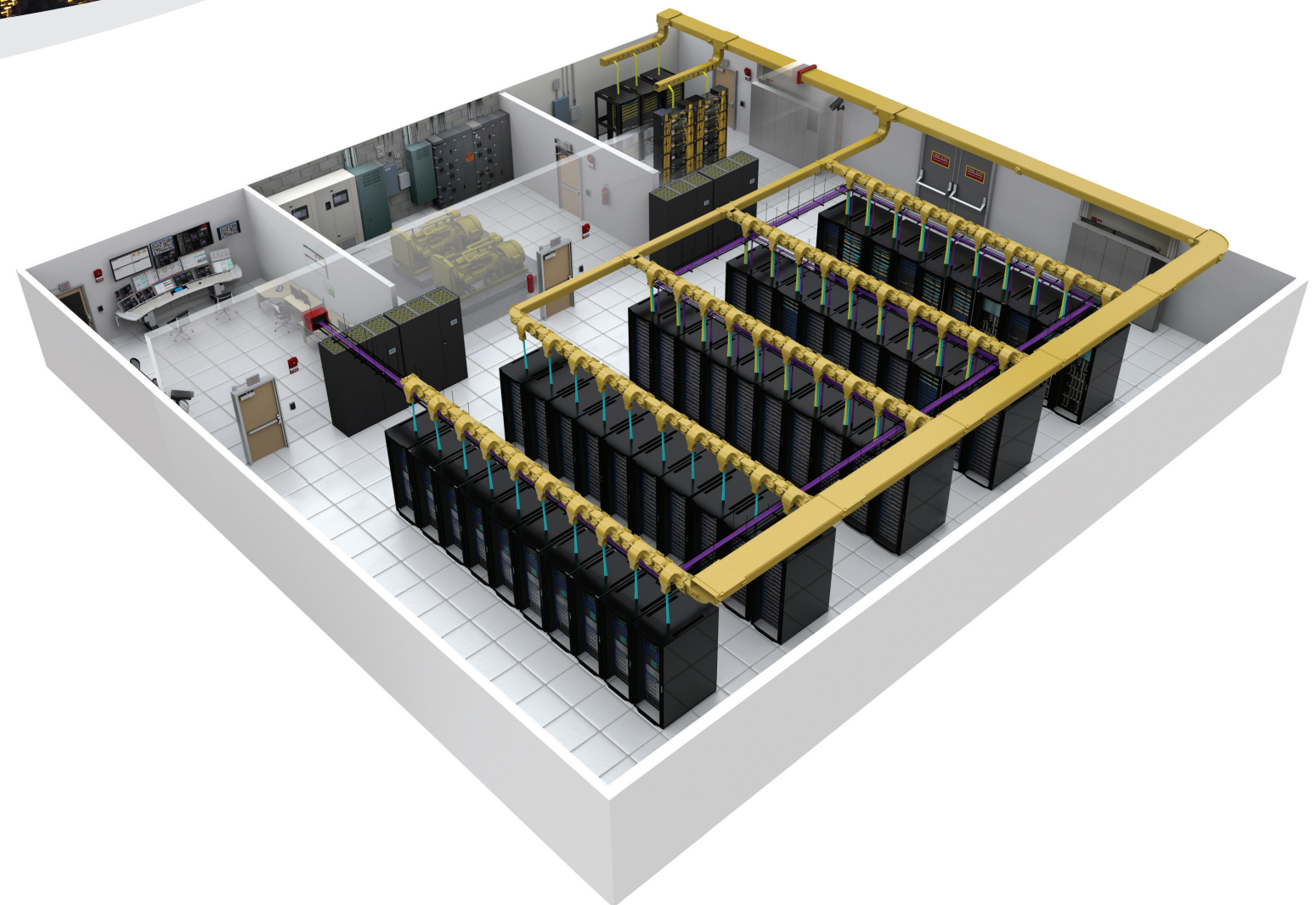


Connecting Today's Data Centers to a Higher Standard

Data centers have become the fulcrum for critical operations for organizations around the world. As technology continues to advance and drive demand for greater bandwidth, low-latency transmission, compute and storage that places ever-increasing requirements on data center environments, it's more important than ever to have the correct physical infrastructure in place.

Whether it's an enterprise organization embarking on a Digital Transformation project or a cloud provider looking to migrate to next-generation 400G / 800G speeds to support emerging applications and meet consumer demand, data centers need trusted infrastructure that delivers top-level availability, performance and scalability.

At Siemon we pride ourselves on our engineering heritage, innovation and our data center pedigree. We've taken this passion and focused it into our portfolio of Advanced Data Center Solutions which have been designed from the ground up to support your data center requirements for now and the future. All backed-up by Siemon's industry-leading quality, performance and reliability they combine to help you reduce risk, maximize uptime and successfully deliver new applications and services.



▶▶ The Evolving Data Center Landscape

The rise of connected technologies and the changing patterns of our day-to-day lives is driving significant change in the data center landscape. As data centers of all types and sizes evolve to support the ever-increasing demand and volume of data, the industry is experiencing the following key trends:

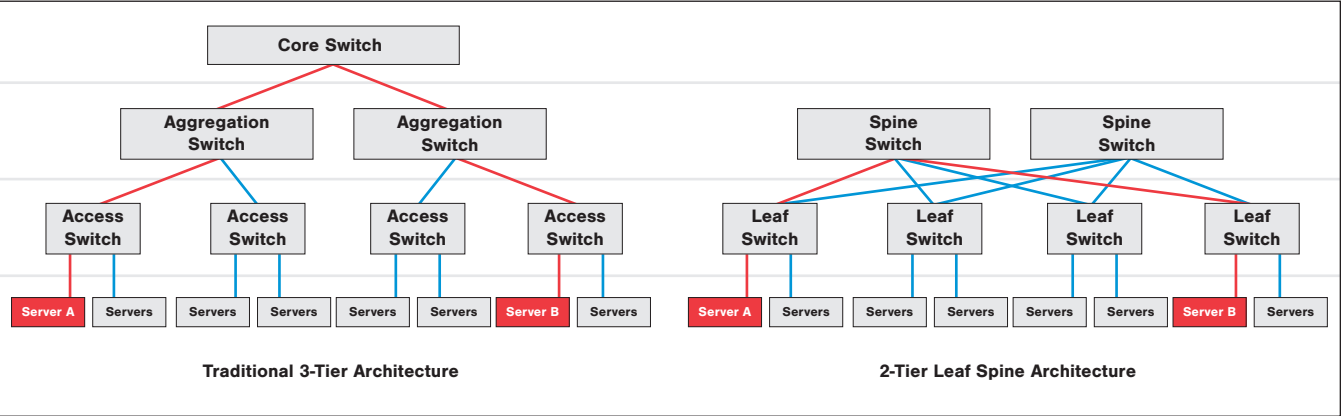
- ▶ Increased cloud adoption, hyperscale investment, and the growth of colocation and managed services provision.
- ▶ Implementation of data center interconnect (DCI) technology, distributed cloud and full-mesh switch fabric architecture in highly-virtualized environments.
- ▶ Migration to 400/800G Ethernet with low-latency 50/100G per second (Gb/s) server connections and cost-effective aggregation.
- ▶ 5G and Edge data center buildouts on premises, at access/cellular sites and within central offices and colocation spaces.
- ▶ Greater focus on reducing costs and improving operational efficiency, sustainability and security via a range of innovations such as: white-box networking, software-defined networking and automation.



Data centers are constantly evolving and adapting to support more efficient operations; and there is no end in sight.

Growing Adoption of Spine-Leaf Architectures

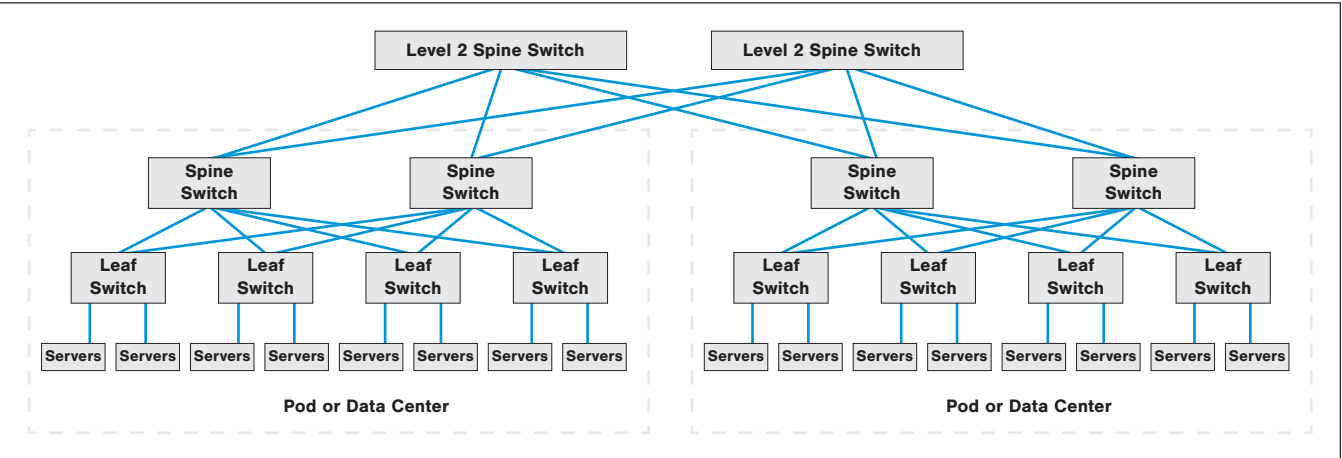
To improve performance, resource availability and reduce cost, data centers are becoming increasingly virtualized with compute resources able to reside anywhere. Virtualization combined with the need to reduce latency are fueling a rapid migration from traditional three-tier switch architecture to leaf-spine full mesh switch fabrics.



Unlike a traditional hierarchical architecture, where data transmits in a north-south direction through multiple switch tiers that adds latency, leaf-spine is a 2-tier architecture that's better for more east-west network traffic between servers than north-south traffic between switches. A spine-leaf aids this by ensuring traffic is always the same number of hops from its next destination, so latency is lower and predictable. This approach keeps the topology consistent, avoiding unnecessary paths. It also better supports scalability as additional leaf or spine switches can easily be added to support additional hosts, devices or bandwidth requirements as needed without changing the underlying design.

Cloud Providers Adopting Super-Spine Designs

In large cloud data centers, multiple spine-leaf networks (i.e., pods) can be interconnected via second level spine switches. This optimized super-spine architecture is used to create separate functional areas within a single data center or data center interconnects where multiple dispersed data centers are connected via high-speed fiber links.



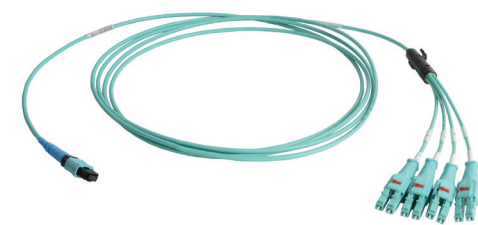
As super-spines build upon the modular approach utilized in spine-leaf, they are easily replicated in a modular manner, which allows them to be highly scalable and enable faster turn-up to meet exploding demand for services while retaining a consistent design throughout.

An Increase in High-Density Complex Fiber Links

Increasing data, compute resources and bandwidth demand have significantly increased the number of fiber links in the data center.

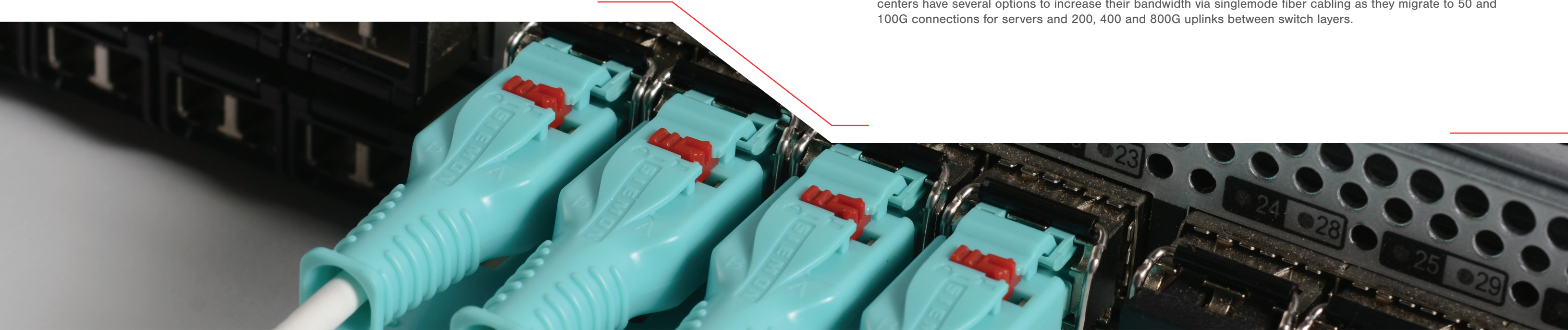
Other factors increasing density and complexity of fiber links include:

- ▶ **Leaf-Spine Architecture** - More fiber links are required to connect every leaf switch to every spine switch and ensure a non-blocking architecture.
- ▶ **Aggregated Links** - Aggregation that optimizes port utilization and space, such as connecting a single 100G switch port to four 25G servers with a hybrid fiber breakout assembly, further increases fiber density.



As a result, managing these critical fiber connections and accessing individual fiber ports in these tight spaces calls for specialized solutions, including:

- ▶ **Smaller Diameter Cables and Assemblies** - these save pathway space in and between racks and enable smaller bend radius while also maximizing airflow.
- ▶ **High-Density Fiber Enclosures** - Offering easy front and rear access to connections and support higher capacities while maintaining proper fiber bend radius and manageability.



Increased Migration to 100G, 400G and 800G

Trends in Digital Transformation and bandwidth-intensive applications has led hyperscale and large cloud providers to migrate to next-generation 400 and 800G speeds. These speeds are made possible via advancements in four-level pulse amplitude modulation (PAM-4) encoding technology that supports higher bit rate than previous encoding technology, enabling 25, 50 and 100 Gb/s electrical lanes that offer the following benefits:

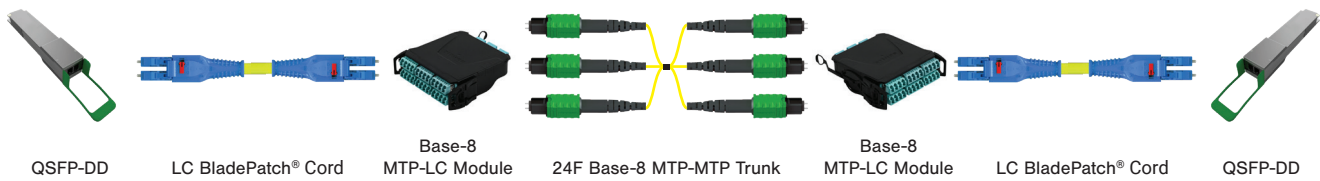
- Reduces the number of electrical lanes and associated cabling
- Leverages existing MPO connectivity and fiber cabling technology
- Offers a more efficient gigabit migration path: 25-50-100-200-400-800G
- Enables cost-effective aggregation schemes

	Enterprise Data Centers		Cloud Data Centers	
	Server	Uplinks	Server	Uplinks
Current	↓ 1/10G	↑ 10/40G	↓ 25/50G	↑ 100/200G
Future	↓ 50G	↑ 200G	↓ 100G	↑ 400G
	↓ 100G	↑ 400G	↓ 200G	↑ 800G

Many enterprise data centers are already beginning to migrate to 25 and 50G speeds for server connections and 100 and 400G speeds for uplinks between leaf and spine switches over multimode fiber cabling. Cloud data centers have several options to increase their bandwidth via singlemode fiber cabling as they migrate to 50 and 100G connections for servers and 200, 400 and 800G uplinks between switch layers.

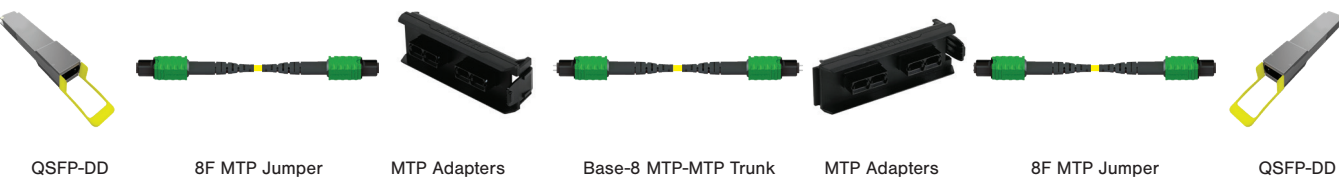
Switch-to-Switch Example of 400G-FR4 Channel:

2-fiber singlemode channel will support 10G, 40G, 100G & 400G



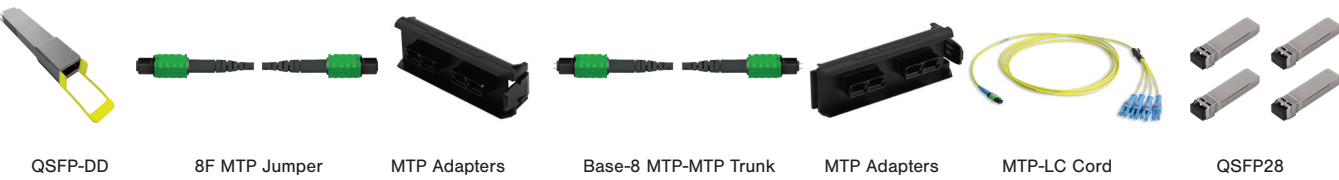
Switch-to-Switch Example of 400G-DR4 Channel:

8-fiber singlemode channel will support 40G, 100G & 400G



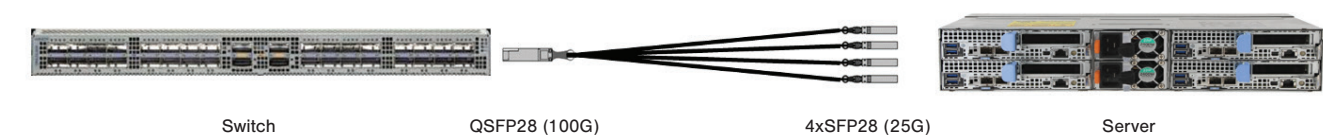
Switch-to-Switch Example of 400G-DR4 to 4x100G-DR Channel:

8-fiber singlemode channel will support breakout to 10, 25, 50 & 100G lanes



Switch-to-Server Example of Downlinks for 100G to 4x25G Channel with DACs:

QSFP28 to 4xSFP28 passive direct attach cable copper assemblies



Current Standards-Based 400G Options

Several IEEE standards for both multimode and singlemode fiber have already been defined for 400G data center applications using 50 or 100 Gb/s per lane PAM-4 technology, with 400GBASE-DR4 and 400GBASE-FR4 showing most market potential for cloud data centers and 400GBASE-SR8 and 400GBASE-SR4.2 showing solid potential for enterprise data centers. At the time of this publication, there is still a large amount of standards activities going on for 400 & 800G applications. Below is a list of the commercially available options, plus a couple that are expected in the near term.

Transceiver	Standard	Available from Leading Switch Manufacturers	Form Factor	Breakout Option	Fiber Type	Distance (m)	Number of Fibers	Connector
400G-FR4	802.3cu	Yes	QSFP-DD, OSFP	No	OS2	2000	2	LC
400G-DR4	802.3bs	Yes	QSFP-DD, OSFP	Yes	OS2	500	8	MPO-12/APC
400G-XDR4/4x100FR	MSA	Yes	QSFP-DD, OSFP	Yes	OS2	2000	8	MPO-12/APC
400G-SR8	802.3cm	Yes	QSFP-DD, OSFP	Yes	OM3/OM4	70/100	16	MPO-16/APC†
400G-SR4.2 (BD)	802.3cm	Yes	QSFP-DD, OSFP	Yes	OM3/OM4/OM5	70/100/150	8	MPO-12/UPC
400G-VR4	802.3db	No	QSFP112	Yes	OM3/OM4	30/50	8	MPO-12/UPC
400G-SR4	802.3db	No	QSFP112	Yes	OM3/OM4	60/100	8	MPO-12/UPC
800G-2XDR4	MSA	Yes	QSFP-DD, OSFP	Yes	OS2	2000	16	2xMPO-12/APC
800G-2FR4	MSA	Yes	QSFP-DD, OSFP	No	OS2	2000	4	2xLC

† = not commonly used connector
Note: List does not include applications over 2km reach.
The above table is up-to-date as of June 2023.

A Format for Future Growth

Base-8 MPO plug and play fiber that has long supported 8-fiber 40 and 100G applications now also supports 400G multimode and singlemode applications.

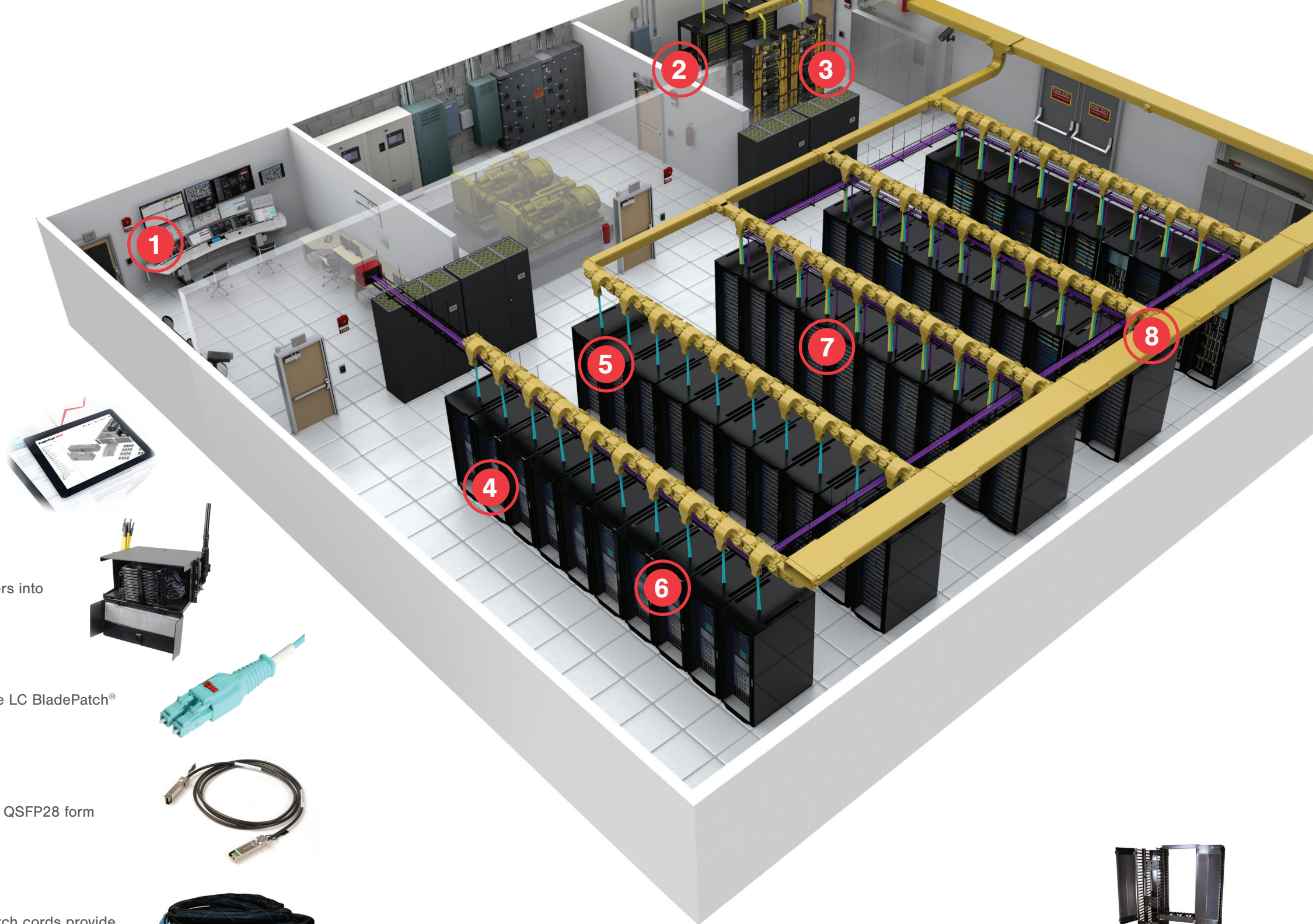
As encoding technology advances to 100 and future 200 Gb/s electrical lanes to reduce the number of fibers, Base-8 connectivity is expected to eventually support 800G and 1.6 Terabit applications.

To provide an easy migration path and take advantage of 400G technologies, it is recommended that enterprise data centers deploy familiar Base-8 MPO OM4 cabling solutions. Cloud data centers will likely continue to deploy Base-8 MPO singlemode cabling solutions for easy migration to 400 and 800 Gb/s speeds and beyond. Siemon offers a wide range of multimode, and singlemode Base-8 plug and play MPO solutions using elite US Conec MTP® connector technology.



High Quality Solutions for Data Centers

- 1 Automated Infrastructure Management (AIM)**
 The MapIT® G2 AIM solution, powered by our innovative EagleEye Red® software, enables remote monitoring and real-time view of data center connections and tracks available switch and copper and fiber patch panel ports.
- 2 High-Density Splicing Solutions**
 Fiber Splice Enclosures handle up to 1,728 fibers from Service Providers into the entrance facility.
- 3 Fiber Cross-Connects**
 High-density fiber patching and cross-connect spaces utilize low-profile LC BladePatch® cords with push-pull access.
- 4 Direct Attach Cables and Active Optical Cables**
 High speed interconnect assemblies available in SFP+, SFP28, QSFP+, QSFP28 form factors for switch-to-server downlink connections.
- 5 Category 6A Shielded Twisted-Pair System**
 Category 6A shielded patch panels, pre-terminated assemblies and patch cords provide flexibility for 10 gigabit server or console management connections in end-of-row and middle-of-row configurations.
- 6 Pre-Terminated Fiber Solutions and High-Density Patching**
 Base-8 and Base-12 singlemode and multimode MTP/MPO trunks, modules (Plug and Play), adapters, and MTP/MPO jumpers with ultra-high-density LightStack® and LightStack8, as well as high-density LightVerse® fiber enclosures that support uplinks from leaf-to-spine and server connections.



- 7 Racks & Cable Management**
 2- and 4-post racks and range of horizontal and vertical cable management options to support.
- 8 Fiber Pathways and Routing***
 The LightWays® Fiber Routing System is manufactured from halogen-free, flame-retardant UL94/V0 plastic and includes a toolless joiner, revolutionary waterfall outlet as well as a variety of duct, elbows, tees, crosses and reducers ideal for protecting and routing your fiber cabling.

*LightWays is available in limited geographies. Visit www.siemon.com/lightways for availability.



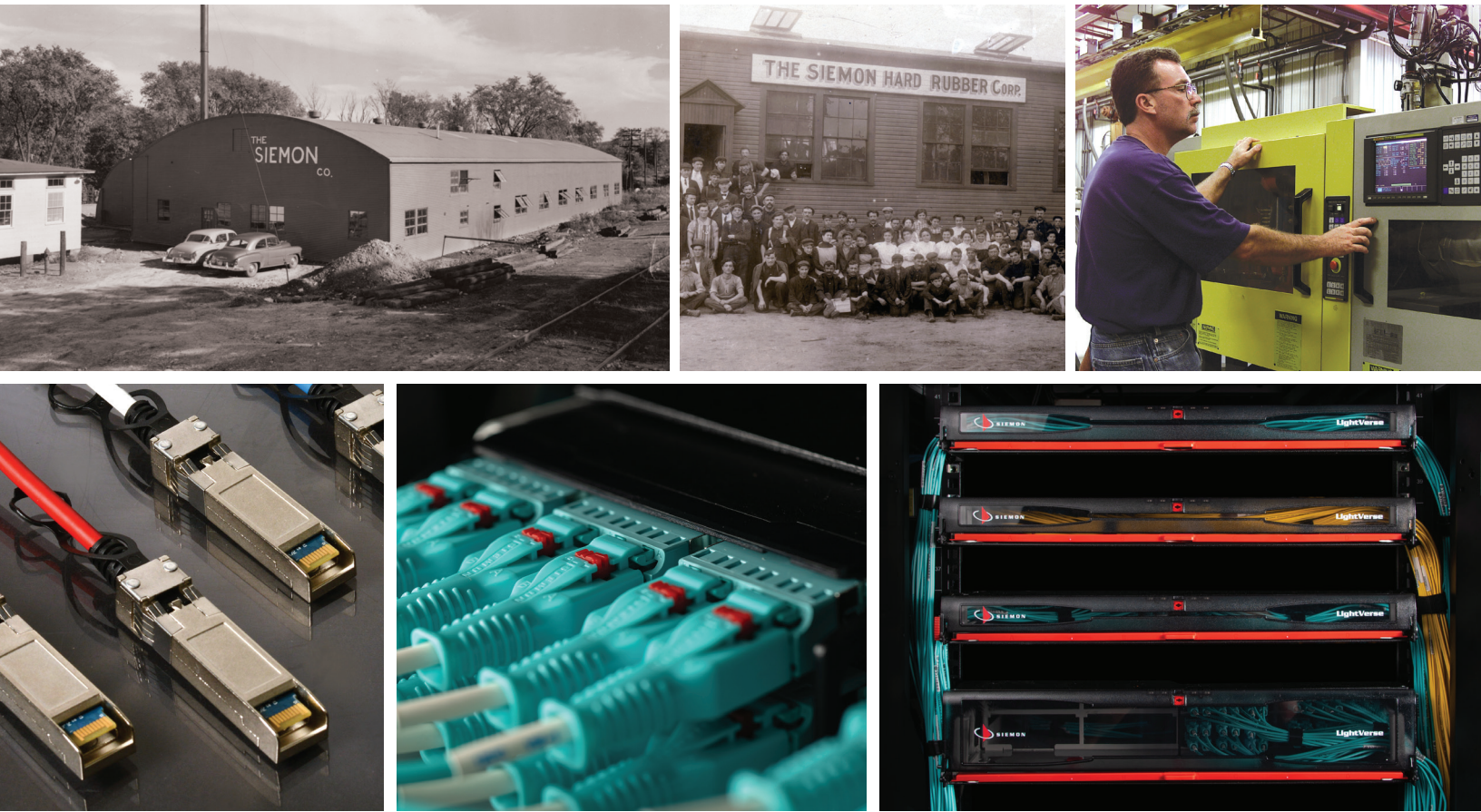
▶▶ **A True Data Center Leader**

At Siemon we pride ourselves on our engineering heritage, innovation and our data center pedigree. We've taken this passion and focused it into our portfolio of Advanced Data Center Solutions which have been designed from the ground up to support your data center requirements for now and the future. All backed-up by Siemon's industry-leading quality, performance and reliability they combine to help you reduce risk, maximize uptime and successfully deliver new applications and services.

A Rich History of Innovation

Every year, Siemon develops innovative new solutions for data centers and smart buildings - spanning customer-focused product advances; elevating installed system performance; application standards and testing updates; educational resources; and much more. With over 400 patents specific to structured cabling and world class ISO-certified manufacturing, Siemon invests heavily in research and development, underlining our company's long-term commitment to our customers and the industry. But we don't just innovate for innovation's sake - voice of customer drives every facet of our operations. Within the past 5 years alone, we have released hundreds of new products to fit customer needs and applications across the globe. We are a global leader in IT infrastructure solutions, and that leadership is built on Siemon innovation.

Connecting the World to a Higher Standard Since 1903



▶▶ **Committed to Industry Leadership**

As a Technology Leader Siemon is focused on driving the industry forward, and as a result we continue to be active participants in many of the world's largest industry standards bodies for structured cabling. These alliances allow us to continually design and deliver quality solutions that are ready to support our customers' needs today, while also providing a foundation for the future.



Global Manufacturing, Installation and Logistics Support

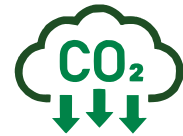
As a truly global organization we have manufacturing capabilities around the world, which are all ISO 14001 certified. These locations combine with our comprehensive network of Certified Installers and logistics capabilities to allow us to deliver for our clients consistently, keeping their projects on budget and on time from design through implementation and delivery.





►► The Siemon Sustainability Pledge

As part of Siemon's ongoing global commitment to help build a more sustainable future, we pledge to adhere to the following principles through our policies, processes, and most importantly, our actions. Each and every Siemon product, system, and service is designed, built, and delivered according to this promise.



Reduce our carbon footprint



Minimize all forms of waste



Eliminate pollution and support biodiversity



Produce and deliver safe products



Share, listen and act

SIEMON
SUSTAINABILITY
PLEDGE



►► Our Sustainability Credentials

At Siemon, we prioritize credibility and transparency. We value the opinions of third-party accreditations to validate our claims and assure our customers of our unwavering commitment to ESG standards. By undergoing the rigorous process of obtaining third-party accreditation, we stand by our words aim to provide our customers with the utmost confidence in our ongoing commitment to sustainability.



Siemon formally committed to the SBTi in July 2022. That means cutting our emissions in half by 2030 and going net-zero by 2050.



Siemon prioritizes safe working conditions, worker respect, environmental responsibility, and ethical business operations, aligning with the Responsible Business Alliance Code Of Conduct.

WE SUPPORT



Siemon is a proud member of the United Nations Global Compact initiative — a voluntary leadership platform for the development, implementation and disclosure of responsible business practices.

ENGINEERED FOR EXCELLENCE

BEAUTIFUL BY DESIGN

LightVerse® not only looks state-of-the-art, it is state-of-the-art. With sleek, molded plastic components, scratch-resistant transparent doors, and a high-quality steel enclosure, LightVerse is designed to support your network needs and looks good doing it.

LightVerse is also **the industry's first truly 400G-ready solution** and has been third-party verified by Intertek to its exacting standards.

Available with ultra-low loss connectivity and support for multiple industry recognized polarity schemes, LightVerse modules and adapter plates combine with Siemon's award-winning line of Plug and Play trunks, traditional LC duplex jumpers, and innovative LC BladePatch® fiber jumpers to deliver a complete end-to-end ecosystem that unlocks the potential of your high-density fiber installations in data center and LAN spaces.

Are you looking for industry-leading performance as a standard?
Think LightVerse.

intertek
Total Quality. Assured.



▶▶ **Siemon Data Center Services**

Supporting organizations to harness the true potential of their data center environments.

Whether you're a service provider entrusted with multiple clients' IT and delivering on SLAs, or an organization investing in Digital Transformation to accelerate your business, your ability to thrive and grow is only as good as your data center's underlying network infrastructure.

Your data center's cabling infrastructure is at the very core of meeting internal and external customer expectations for top-level availability and performance. Your teams also need worry-free uptime, reliability and scalability assurance so they can focus not on what it takes to become digital, but on what it takes to be successful.

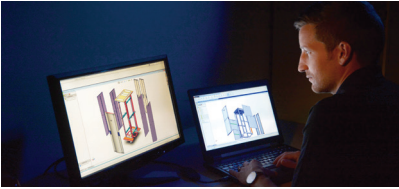
How Can We Support You?

We've focused our data center expertise into a global service network, designed to guide you through the process of selecting and designing the underlying physical infrastructure you need to realize the full potential of your data center, while offering you the on-going support you need to respond quickly to changing needs, prevent downtime and maintain peak performance.



Data Center Cabling Audits

Get a comprehensive snapshot of your current cabling infrastructure strategies, as well as detailed analysis and guidance on improvements that can be made and potential savings that can be achieved.



Data Center Design Services

Are you looking to design, deploy or upgrade a data center space and need expert advice and assistance to help you through the process? Our team of DC Design experts are ready to support you.



Technical Support Services

Our expert technical support teams are available around the world to support our clients throughout their Siemon experience. Whether its day 1, or 3,001 our teams are with you every step of the way.

▶▶ **Supported by Industry Leading Partnerships**

Over the years we've developed an ecosystem of data center partners who are all specialists in what they do. Siemon prides itself on partnering with global leaders that provide complementary products and services which combine with our own best-in-class IT infrastructure solutions to deliver additional value and support to our customers.



▶▶ **The World's Leading Organizations Rely on Siemon**

Some of our customers:



"By working with Siemon to deliver innovative products, IBM has been able to provide clients with a flexible and efficient data center solution, closer to clients, manufacturing sites and remote operations."



"Testing revealed that the Siemon solution performed far better than the competition, so the technological decision was easy. When we considered other factors, such as experience, warranty, field support, and simplicity of maintenance, we came to the conclusion that Siemon offered the best overall value for CSFB's network infrastructure."



"100 Gb/s is our standard today and we are looking to migrate more of our services from 10 to 100Gb/s. Siemon's high-performance cabling solutions have certainly enabled us to achieve this."

THE BEST OF BOTH WORLDS

Now more than ever, available space for your network infrastructure is at a premium. This has presented a challenge for users to effectively manage their fiber and copper connectivity within the same rack area.

We have the solution.

Siemon's industry leading LightVerse® cabling system now includes an intuitive copper/fiber combo patch panel which provides users with a fast and economical format for deploying their critical connectivity in space-sensitive application environments.

Are you looking for an easy way to manage your high-performance fiber and copper connectivity?
Think LightVerse Combo.

Explore Further

www.siemon.com/LVCombo

▶▶ **Siemon Advanced Data Center Solutions**



High-Density Fiber Enclosures

Siemon's high-density LightVerse® Fiber Optic Cabling System includes high-density enclosures including Core, Plus & Pro options as well as MTP-to-LC modules, MTP and LC adapter plates to support singlemode and multimode fiber patching, and two different fiber splice options - all designed to support network deployments of 400G and beyond.

go.siemon.com/LightVerseSystem



Splice Cassettes

The LightVerse splice cassettes are constructed from a translucent material making testing and verification easier and have a pull tether for quick removal. All splice cassettes arrive pre-loaded with adapters allowing faster on-site deployment.

go.siemon.com/LightVerseSystem



Ultra High-Density Plug and Play System

The LightStack® Ultra High-Density (UHD) enclosure with Base-8 or Base-12 singlemode or multimode modules or adapter plates supports 144 LC fibers or 864 MTP fibers in 1U with superior port access and cable management.

*LightStack UHD is available in limited geographies.
Discover more at: www.ecatalog.siemon.com*

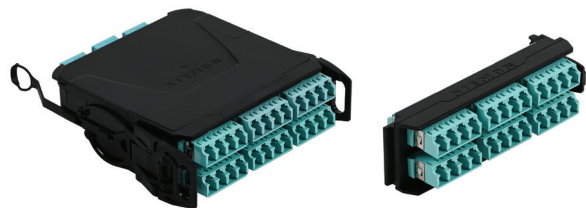
go.siemon.com/DCUltraHighDensity



Fiber Splice Enclosure

Siemon's Fiber Splice Enclosure offers one of the highest fiber densities in the industry with a capacity of 1,728 fibers in a 5U footprint. The enclosure can handle incoming high fiber count ribbon fiber cables of 864 & 1,728 that are transitioning to lower count cables.

go.siemon.com/DCFiberSplice



Modules and Adapter Plates

The Siemon family of Plug and Play modules support MTP/MPO to LC/SC fiber transition, allowing for quicker and easier deployment of up to 24 fibers in a single module. The LightVerse adapter plates are designed for simple one-handed installation from the front of the enclosure and can be passed from the rear to the front and back again without leaving the enclosure.

go.siemon.com/LightVerseSystem



High-Density Fiber Jumpers

Siemon's LC BladePatch® singlemode and multimode duplex jumpers offer a unique solution for high-density fiber optic patching environments with a revolutionary push-pull UniClick™ boot design to control the latch, enabling easy access and removal in tight-fitting areas.

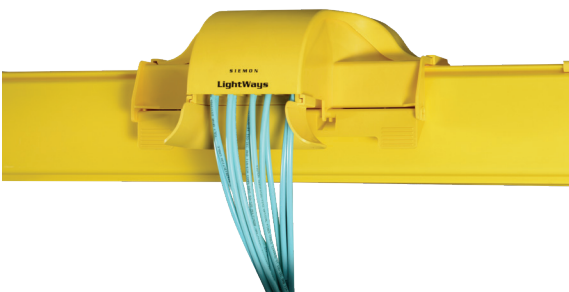
go.siemon.com/DCFiberJumpers



Plug and Play Fiber Trunks and Assemblies

Siemon's wide range of singlemode and multimode plug and play trunks and assemblies include Base-8 or Base-12 MTP to MTP, MTP Pro® to MTP Pro or MPO to MPO trunks in a variety of fiber counts, hybrid MTP-to-LC trunks, MTP/MPO conversion cords, MTP, MTP Pro or MPO jumpers and LC or SC duplex and simplex breakout assemblies.

go.siemon.com/DCTrunks



Fiber Routing System

Manufactured from halogen free, flame-retardant UL94/V0 plastic and available in four different sizes. LightWays® is easy to assemble and includes a wide variety of straight duct, elbows, tees, crosses, reducers and innovative outlets ideal for designing a system that meets the precise needs of your data center space.

*LightWays is available in limited geographies.
Visit www.siemon.com for availability.*

go.siemon.com/DCFiberRouting

▶▶ Siemon Advanced Data Center Solutions



Copper/Fiber Combo Patch Panels

LightVerse® Copper/Fiber Combo patch panels are designed to allow users to easily mix their high-performance fiber optic and copper connectivity within the same 1U of rack space. Available in flat or angled configurations, the LightVerse Copper/Fiber Combo patch panel supports both singlemode and multimode fiber, or shielded category 6A and unshielded category 6A/6 copper connectivity.

go.siemon.com/DCCabinets



High-Density Copper Patch Panels

Available in flat and angled versions, TERA-MAX® patch panels provide outstanding performance and reliability in a modular solution for equipment rooms. Shielded and UTP Z-MAX modules can be easily configured in the TERA-MAX and Z-MAX panels.

go.siemon.com/DCPanels



Direct Attach Cables

Ideal for high-speed direct attach connections (DAC) in the AV equipment room, Siemon High Speed Interconnects and active optical cables (AOC) are available in a variety of QSFP28, SFP28, QSFP+, SFP+ form factors, and they come in half meter increments from 0.5m to 10m and in multiple colors.

go.siemon.com/DCHighSpeedAssemblies



Active Optical Cables

With lengths up to 100 meters, Siemon's multimode fiber AOC cable assemblies are ideal for longer reach, point to point connections in data centers, cabinets and equipment outside of the rack. The energy efficient design requires less power than transceiver assemblies with smaller bundles promote better airflow and lower cooling costs.

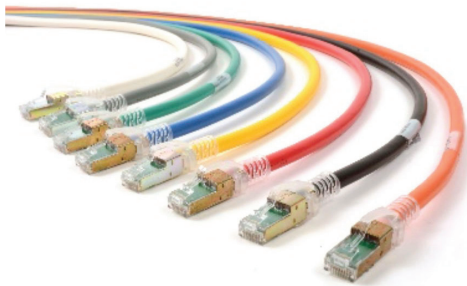
go.siemon.com/AOCs



Category 6A UTP and Shielded Outlets

Z-MAX® Category 6A shielded and unshielded outlets combine exceptional performance with best-in-class termination time. All Z-MAX products features PowerGUARD® technology to prevent erosion due to arcing when a plug is unmated while under DC remote power load.

go.siemon.com/DCOutlets



Category 6A Modular Patch Cords

Ideal for connections to surveillance cameras from a service outlet, or for patching in the telecommunications room, Siemon Z-MAX Category 6A UTP and shielded cords offer the unparalleled performance of an exclusive PCB-based smart plug, alien crosstalk resistant construction and a host of innovative end-user features.

go.siemon.com/DCZMAX



Automated Infrastructure Management (AIM)

Developed specifically to eliminate the complexity seen with other AIM solutions, Siemon's MapIT® G2 solution integrates smart patch panels, singlemode and multimode fiber enclosures, user-friendly master and distribution control panels with EagleEye Red® software.

go.siemon.com/DCAIM



Racks and Cable Management

Siemon offers a wide range of racks, vertical and horizontal cable management and accessories to meet a variety of data center needs.

go.siemon.com/DCRacks

EXPAND YOUR POSSIBILITIES

With superior best-in-class features, Siemon's LightStack® ultra-high-density fiber Plug and Play system offers users the ideal footprint for managing your critical network connections in even the densest application environments.

Offering superior density (up to 144 fibers within 1U), improved port access and simplified cable management all within a sleek, modern enclosure, LightStack easily supports today's high-performance data center or enterprise networking environments and provides a fast, seamless footprint for migrating to higher gigabit applications.

For more information about this game-changing solution, and to register for early access information, please visit: www.siemon.com/LightStack

LightStack®

LightStack®

Want to Learn More About our Data Center Solutions?



For more information visit:
go.siemon.com/DCSolutions



Find your local Siemon distributor:
go.siemon.com/DCDistributors



24/7 Customer Support:
customer_service@siemon.com

