Network Convergence Solutions

Fiber network convergence refers to the delivery of residential, business, and wireless services over a common fiber network infrastructure. In particular, wireless networks are experiencing rapid growth – as driven by technologies like Cloud RAN (CRAN), Wi-Fi, DAS, small cells, and 5G. These deployments will require new and extensive fiber networks to meet high bandwidth, low latency performance requirements. With converged networks, a service provider can more efficiently and more quickly deliver a wider range of services, adopt new business models, innovate new services and enter new markets.

This brochure highlights a set of products and solutions for building converged networks – from the cell site, through the outside plant, to the central office/headend. They have been selected with flexibility, scalability, and density in mind, which will be critical qualities for a network as 5G technologies and architectures rapidly evolve.
Central offices and headends are evolving in response to several trends:

- New wireless technologies such as 5G, small cells, and Centralized and Cloud radio access networks (CRAN) fronthaul
- Bandwidth hungry new access technologies including next generation PON, DOCSIS 3.1, and G.fast
- The emergence of data center technologies: SDN/NFV, virtualization, cloud computing, service orchestration, and CORD (Central Office Re-architected as a Datacenter).

The expanding fiber connectivity infrastructure—with its termination, splicing, patching and storage demands—grows increasingly difficult to manage. Space is limited while port count increases, driving up equipment and optical density.
Architectural Evolution: Is it an edge data center, central office/headend, CRAN hub, or all-in-one?

To be more agile, software-defined network (SDN) and network function virtualization (NFV) are being adopted to bring new services online faster, and save on both CapEx and OpEx through efficiencies. Convergence of wireline and wireless networks, and the need for higher bandwidth with lower latency is driving these technologies to the edge and access networks. Central offices are typically on the network edge as that is where the access network (fiber optic cables) terminate, and thus are prime locations for an edge data center. Because cloud computing and SDN/NFV technology is constantly evolving, the edge cloud computing environment design and supporting fiber infrastructure must take into consideration what the future may bring and how this new environment or “edge data center” might take advantage of this.

To gain maximum benefit of cloud computing and software-defined networking/network function virtualization (SDN/NFV), the physical layer of the edge data center must be seriously examined. Since the lifecycle of most SDN/NFV equipment is far shorter than that of access equipment, planning of the physical layer infrastructure to support future technology and connectivity is essential.
1A Fiber Entrance Cabinet (FEC)

The Fiber Entrance Cabinet (FEC) provides splicing, administration and storage for outside plant and intra-facility cables and is typically the demarcation point between outdoor and indoor cable. The cabinets are designed for deployment in a building equipment area. The FEC offers a cost-effective, space-saving alternative to splicing on the fiber frame.

1B NG4access® Optical Distribution Frame (ODF) Platform

Frame

The NG4access ODF frame is Telcordia® GR-449-CORE, Issue3 compliant and designed to meet today's high-density network needs. The frame emphasizes superior cable management and ease of use, including features such as ample trough space for cable and jumpers, front and rear access to cable and connectors and storage for jumpers. The frame sections are shipped from the factory fully equipped with all cable management hardware including integrated jumper slack storage. The frame will hold six universal chassis.

Chassis

The universal chassis supports configurations up to 576 terminations with LC adapter packs or 288 terminations with SC adapter packs. Each chassis includes 24 access trays that can hold adapter packs, cabled modules, MPO modules, or a combination of each. Craft friendly design, the chassis features the same interface on the front and back side of the unit.

Adapter Packs

Adapter packs are available in LC-12 and SC-6 pack configurations. Two adapter packs snap into a single access tray. Each chassis can be loaded with up to 48 adapter packs. Adapter ports are staggered for easy connector insertion/removal, and help to clearly identify individual adapter ports. A single adapter pack will promote universal applications, including singlemode and multimode, and angled and ultra-polished connectors.

Cabled Modules

LC and SC cabled modules enable the routing of fiber cable to the frame, where multiple connectors are terminated to the frame with a single click. Cabled modules with integrated connectors ensure the cables are kept in sequential order, and help prevent accidental fiber breakage or disruption to adjacent fiber's during installation. Cabled modules are available in a pigtail version for splicing on frame or pre-terminated to 24-fiber micro cable or conventional IFC cable.

Value-Added Modules

NG4access VAMs help enhance optical transport systems by providing flexible, easy to incorporate optical components into the network for increasing fiber capacity, troubleshooting, or distributing signals to multiple subscribers, to support a wide range of ICT applications, including G-PON, NGPON2, CPRI TAPS and course & dense wavelength division multiplexing (CWDM, DWDM).
**1C FACT Optical Distribution Frame (ODF) Platform**

**Frame**
The FACT ODF system is designed for use with CommScope’s legacy FIST-GR3 frame, enabling you to increase the return on your CapEx investment. Lightweight and compact, the FIST-GR3 modular frame can be customized to optimize your available floor space. Exiting patchcords are routed over spools in the back of the frame to minimize bending. A fully loaded FIST-GR3 frame holds up to 56 FACT elements for 2,688 fiber connections.

**Elements**
The building blocks of the FACT ODF are its splicing and/or patching elements. Each element offers 48 LC connections and measures 30.95 mm tall, 30-percent less than the standard HU (44.45mm). FACT elements can be deployed individually or similar elements can be combined into high-density modules.

Four elements snap together to create one 3HU module that can support 192 LC connections. Six elements combine into 288 ports that can fit in a 5HU slot. Each FACT element features two hinged trays providing full front access to both sides of all connections and clear visibility of all ports. The element trays secure the fiber’s in place during manipulation to ensure optical performance and eliminate transient signal loss.

**Adapter packs and modules**
All FACT elements—except for Splice-Only solutions—can be custom configured with a variety of adapters, splicing and passive optical components. Add Standard Connectors (SC) and Small Form Connectors (LC), with ultra-polished contacts (UPC) and angled physical contacts (APC).

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**1D FiberGuide Optical Raceway**
FiberGuide is a comprehensive raceway solution designed to protect and route fiber optic patch cords and multi-fiber cable assemblies to and from fiber splice enclosures, fiber distribution frames and fiber optic terminal devices.

As an integrated portfolio, the FiberGuide system consists of software-based design tools, modular components—horizontal and vertical runs and elbows, downspouts, junctions, flexible exit kits—and dozens of deployment options.

The result is a single raceway system that is easy and fast to deploy, highly flexible and ensures total off-frame protection of one of your most valuable investments.
**1E High Speed Migration Platform**

**High-Density (HD) & Ultra-Density (UD)**
CommScope’s HD and UD panels feature a unique split tray design for open access to all fibers and connections. This design enables changes to individual fibers and connections while ensuring the existing live circuits are not disturbed. A more reliable fiber routing system ensures all cables remain ordered, visible and accessible as they exit the front and rear of the panel. HD panels offer 48 duplex LC or 32 MPO ports per rack unit while the UD panels feature 72 duplex LC or 48 MPO ports per RU. Both support singlemode, OM4 and OM5 multimode and utilize the SYSTIMAX G2 fiber module. A full line of G2-compatible modules and adapter packs enable deployment across multiple shelf platforms.

**MPO Connectivity Options**
For high-density, low-loss trunking, our 24-fiber MPO connectors ensure lowest “first cost” duplex deployment.

MPO connectivity options also include eight-fiber MPO configurations, which support high-density QSFP technology. The high speed migration platform supports parallel optic configurations—4x10, 4x25, 4x50, etc.—providing flexible, scalable options for fabric links and breakout server attachments. CommScope’s 12-fiber MPO connectivity enables seamless expansion of your legacy infrastructure, helping extend and preserve your existing 12-fiber network.

**LazrSPEED® OM5 WideBand fiber**
CommScope is the first to offer OM5 multimode fiber cabling solutions, recently standardized for wideband multimode (WBMM) fiber. Pioneered by CommScope, LazrSPEED OM5 WideBand enables simultaneous transmission of four wavelengths on the same fiber. OM5 opens the door to a number of emerging applications, like short wavelength division multiplexing (SWDM), which enables 4x capacity using low-power, low-cost VCSEL technology—greatly increasing the value to your multimode fiber infrastructure.

**Ultra low-loss fiber solutions**
CommScope’s ultra-low-loss fiber solution consists of high-bandwidth multimode fiber and factory preterminated ultra-low-loss connectivity. The result is excellent loss performance. Used throughout the channel, our ultra-low-loss solutions enable longer link spans and/or more complex topologies while supporting the physical layer design you need to achieve guaranteed operational availability.

For singlemode applications including hyperscale deployments, CommScope’s G.657.A2 fibers offer the lowest bend losses for macro- as well as micro-bending—while still being fully compatible with G.652.D fibers.
Service providers are deploying more and more fiber in the outside plant for residential broadband, enterprises, and wireless backhaul/fronthaul services. Key challenges include:

- Maximizing speed of deployment in a competitive landscape
- Increasing fiber capacity to support higher bandwidths
- Network migration: what combination of evolutionary and disruptive approaches work best?
- Flexibility and agility: where will the market be in two or five years? Should you over-engineer or build as the demand materializes?

The outside plant fiber network is a key convergence platform for connecting customers and delivering services. A single network will provide efficiencies of scale, plus a common set of equipment and deployment practices that drive CapEx and OpEx reduction.
2A Fiber Cable

Outside plant fiber-optic cables are suitable for applications such as direct burial in trenches, preinstalled in conduit, lashed to aerial utility poles and messenger options for self-supporting features or installation in pavement.

One innovative example is CommScope’s LightScope ZWP cable, designed for use with wavelengths between 1260 nm and 1625 nm, including the formerly off-limit wavelengths in the E-band. This fiber cable provides superior attenuation performance, including a lower attenuation at 1383 nm compared to 1310 nm. This results in lower cabled attenuation across the entire spectrum, thus providing maximum network reach and greater design flexibility.

2B Fiber Distribution Hub (FDH 3000)

The FDH 3000 facilitates rapid connections and reconfiguration between fiber optic cables, optical splitters, and C/DWDM modules via fiber patching. PON and wavelength multiplexing topologies, point-to-point or multipoint, can be quickly implemented or changed. This outdoor passive optical network and fiber cross-connect cabinet is available in 144, 288, 432 and 864 fiber capacities.

2C Fiber Distribution Hub (FDH 4000)

In response to aesthetic and concealment challenges faced by municipalities deploying urban FTTX, CommScope has designed the FDH 4000. The FDH 4000 delivers a very high connection density in a compact footprint and can be installed below grade – eliminating many longstanding deployment issues. To achieve this, CommScope leverages its expertise in underground closures—we’ve delivered more than one million units that can operate in the harshest environments around the globe—and industry-leading high-density and craft-friendly cable management. The FDH 4000 is a big solution delivered in a small package.

2D C/DWDM and Optical Splitters for the FDH

C/DWDM modules and plug-and-play splitters are a product of CommScope’s experience designing the industry’s leading optical distribution frames. The splitter modules come with integrated connectors to ensure that cables are kept in sequential order and help prevent disruption to adjacent fiber’s during installation. Modules are designed to accept singlemode, multimode, angled, and ultra-polished connectors, and an innovative staggered design makes for easier fiber identification and access. Moreover, using 1.2 mm fiber cable simplifies fiber management while maintaining the performance of traditional fiber.

2E FOSC® 450 Fiber Optic Splice Closure

FOSC 450 fiber optic splice closures are used in all outside plant fiber splicing applications. Utilizing compressed gel cable sealing and a quick release dome-to-base clamp for fast access to the splicing area, there are a variety of sizes to choose from. Each closure is capable of handling a range of cable styles and sizes and incorporates such features as hinging splice trays. FOSC closures are accompanied by a full line of accessories, including optical taps, PON splitters, and C/DWDM modules.
2F  FOSC® 600 Fiber Optic Splice Closure

The FOSC 600 C and D splice closures have up to 16 separate cable entry ports, accepts cables up to 35mm in diameter, and have a capacity of 1728 splices. They are rugged and versatile platforms that can be deployed anywhere in the outside plant for a multitude of functions including the splicing of most any type and size of cable, the housing of connectorized distribution and demarcation points, and the deployment of passive optical modules.

2G  Fiber Terminals

Multiport Service Terminals (MST)

The Multiport Service Terminal (MST) incorporates hardened connector technology that is designed to withstand the rugged outside plant environment. These uniquely designed hardened connectors are factory-terminated and environmentally sealed for use in optical drop cable deployments.

Available in single fiber and multi fiber outputs enable to enable the plug and play connectivity of a wide range of devices on the network edge.

Flexible Service Terminals (FST)

The Flexible Service Terminal (FST) is a hardened multi-fibre breakout cable assembly pre-terminated with hardened single and multi-fiber tails for distribution to wireless radios. The flexible structure plus very small branching unit allows the FST to be installed in constrained spaces like a congested pit or within a light pole. Quick installation plus durable and reliable service connection makes this a simple but innovative product that can greatly reduce or even avoid civil works and construction costs.

Compact Multiport Service Terminal (MST-04)

The Compact Multiport Service Terminal has been designed to allow for installation in space constrained street furniture, concealment solutions and cabinets. It incorporates single and multi-fiber hardened connector technology that is designed to withstand the rugged outside plant environment with plug-and-play adapter ports to ensure rapid cable installation in the outside plant access section of the network.

2H  Drop Cables

CommScope’s range of fiber drop cables are designed to meet all outdoor drop cable requirements of a converged network. Available in both single and multi-fiber versions and wide range of connector types to allow for simple and efficient plug and play connection of customer premise and wireless network devices.

2I  Compact WDM

The OCC1C module allows simple integration of passive C/DWDM technology into fiber optic splice closures and terminals. Wavelengths from multiple small cell radios using CRAN fronthaul can be multiplexed onto a single fiber strand to increase cable capacity.
Cell Site Solutions

Designed for operational efficiency and scalability, CommScope’s fiber convergence solutions simplify network installation, maintenance and management from the radio access network (RAN) through to the central office/headend. We have solutions for cells sites of all sizes, from complex macrocells to small cells where simplicity is key.
3A Powering Solutions

Powered Fiber Cable Systems
The Powered Fiber Cable System simplifies the addition of new small cells, Wi-Fi access points and IP cameras by distributing power and fiber within the same cable. This allows network operators to locate remote devices anywhere they can run fiber cable. What’s more, by providing the necessary DC power alongside optical fiber signals, the Powered Fiber Cable System allows networks to deliver reliable DC power from a centralized source without the need of installing extra conduits, transformers or remote uninterrupted power supplies (UPS).

Powershift™
Upgrading powering for higher power requirements is an increasingly expensive proposition, but it doesn’t have to be. PowerShift gives you back the balance of power by delivering the most efficient voltage to your RRUs in real time automatically—regardless of power supply, distance, conductor size or RRU power requirements. That optimization enables you to decrease the cost of network rollouts and upgrades, and start earning a greater return on investment from day one. PowerShift also offers the system design flexibility you need to create an agile, future-ready network.

3B Outdoor Enclosures
CommScope’s field-proven and environmentally-rugged outdoor enclosures deploy quickly and offer reduced OpEx and a small footprint. Our broad portfolio features aesthetically-pleasing cabinets for power and battery, battery backup, macro cell site and micro cell site use. CommScope’s outdoor enclosures help accelerate your ROI while ensuring performance you can trust.

3C RF Connectivity

D-Class® SureFlex® cable assemblies
Compact and flexible to bring big performance to tight spaces, SureFlex cable assemblies are now available in 1/4” and 3/8” diameter cables with 4.3-10 connectors. Much lighter and smaller than previous generation connectors and cables, these assemblies enable more connections in tighter spaces. Dynamic PIM testing (which replicates IEC recommended tests) ensure that SureFlex D-CLASS jumpers meet or exceed IEC PIM standards of -162 dBC. Each SureFlex D-CLASS jumper is individually tested under these dynamic conditions, with test results available 24/7 on your computer or smartphone through the CommScope WebTrak and C-Trak app.

SureGuard® weatherproofing to protect performance
For the ultimate protection against the elements and maximum reliability, SureFlex assemblies are available with our patented SureGuard® weatherproofing system—a factory-installed molded boot that seals connector junctions between jumpers, antennas, RRUs and amplifiers. SureGuard is ideal for tight spaces or on multiport devices and installs in seconds with no special tools. They are also reusable, unlike traditional weatherproofing solutions.
3D Fiber To The Antenna (FTTA)

HELIAX® FiberFeed Direct is a virtual plug-and-play hybrid breakout system that directly connects the RRU to the baseband unit. The hybrid power-fiber cable eliminates the need for a junction box while accommodating a multitude of RRU interfaces through a radio matching fiber tail and where required a power jumper kit.

Configurations are scalable and can accommodate 18 or more RRUs and ease future RRU upgrades. And, by eliminating the need for multiple cable runs and a junction box, HELIAX FiberFeed reduces weight and wind load burdens while reducing tower leasing costs.

3E Cable Management Accessories

SnapStak® Plus adjustable hangers
Traditional hangers and diameter-specific grommet combinations complicate installations, making it difficult to secure cables from wind and vibration which can cause PIM problems. SnapStak® Plus adjustable hangers eliminate clumsy hanger-grommet assemblies, reducing the parts installers must handle and making hanger installation two to three times faster. The small form-factor hangers self-adjust to grip a range of cable diameters and are stackable to enable high-density cable management.

SnapStak® Plus adapters
Bring the versatility of SnapStak® Plus hangers to any mounting structure. Whether it’s an angled or round tower member, a unistrut or a wood pole, CommScope has an adapter for every situation that are compatible with our full line of snap-in hanger products for proper cable management and support.

Universal grounding kits
Compatible with corrugated coaxial cables, braided coaxial cables and armored hybrid fiber cables, the Universal Grounding kit for 1/4" through 5/8" cables help protect network equipment by properly grounding cables.

Cold shrink weatherproofing
Cold shrink kits are available for 3/8" cable with 4.3-10 connectors. They provide additional weather protection and keep connections in new condition in spaces too tight for other types of weatherproofing.
3F Structural Supports

Our structural support solutions deliver stability, durability and precision at cell sites around the world. They reinforce your structure and optimize antenna performance. Our broad line of support systems are designed for use on virtually any kind of tower, monopole, roof top structure or water tower and are manufactured in our AISC certified manufacturing facility to ensure quality and reliability.

G2® Series Tower Mounts

The G2® Series Tower Mounts were designed to address the industry’s biggest concerns of current and future EPA requirements, mount loading capacity, and assembly time. The G2® Series was designed from the ground up with an innovative vision that started with a blank slate then focused on each bend, weld, support, and even the alloy composition of each material used.

The solution features an innovative tubular V Stand-off design that lowers the EPA of the mount while increasing its load bearing capabilities and even reducing assembly time. The G2® family offers tower and monopole mounts with loading capacity of up to 10,000 pounds per sector to address even the most challenging site requirements.

Radio Mounts

The most significant change to recent wireless network architectures is the deployment of RRUs at the top of the tower. This change brings many benefits to network performance, but also can create issues if not properly mounted using products designed to support the weight of RRH/RRUs under harsh environmental conditions.

Our mounts are designed to securely support RRUs to ensure proper performance. The brackets mount securely to a wide range of round or angled members to enable mounting to the tower sector frame along with options that enable mounting directly to the tower. We even offer rooftop, H-frame, and ring mount versions.

Cable Support Brackets

One of the most commonly reported problems in the field is performance issues caused by lack of proper cable support at the antenna and RRH on the tower. The ACS antenna and RRU cable support brackets are designed to securely support cables and prevent outdoor elements from affecting equipment connections.

The stand-off distance can easily adjust for direct alignment with the antenna or RRU ports to ensure proper cable support and prevent undesired strain on the cable from affecting network performance.

Equipment Platforms

Our solutions provide rugged protection and design flexibility for equipment at the tower base, while saving time and money during installation. They are designed to assemble quickly, easily and without the need for a cement pad. No permitting, no need for cement forms or rebar. No wasted time spent waiting for the pad to cure. Should cabling beneath the platform need to be moved, there is no need to dig up the pad and re-pour— simply re-route as needed. The base equipment platform features grating, platform and all the hardware needed. Options enable you to tailor the platform size, footings, canopy type and more to the requirements of the job. Additional add-ons—like power telco racks, handrails, steps and climbing ladders—let you create a flexible platform solution that can adapt to the specific needs of each site as the network and site requirements evolve.
3G Metro Cell Concealment Solutions

The data demands of your urban customers continue to rise, yet zoning restrictions and site acquisition costs have made traditional macro cell site deployment in dense, urban environments more difficult. We can help.

Metro Cell Concealment Solutions are fully integrated outdoor systems that boost network capacity and service coverage, alleviating regional zoning and site acquisition issues. Available in a variety of modular designs for the ultimate in flexibility, they facilitate:

- Increase capacity and coverage with minimal aesthetic impact
- Avoid zoning and other community approval challenges
- Are suitable for a variety of applications, including monopoles, street poles, rooftops, flagpoles and radome/headframe sections
- Available with independent RET on high and low bands

All are customizable in various heights, power outputs, sectorizations and radomes and deliver an aesthetically pleasing, low-profile presence that integrates cleanly into city landscapes with a minimal footprint. Units come factory integrated, tested and ready for installation. And the new Integrated Metro Cell solution offers a combined cabinet and pole in one unit.

The result? A more effective, energy efficient, and less expensive alternative as compared to the traditional cell site expansion approach.
Everyone communicates. It’s the essence of the human experience. How we communicate is evolving. Technology is reshaping the way we live, learn and thrive. The epicenter of this transformation is the network—our passion. Our experts are rethinking the purpose, role and usage of networks to help our customers increase bandwidth, expand capacity, enhance efficiency, speed deployment and simplify migration. From remote cell sites to massive sports arenas, from busy airports to state-of-the-art data centers—we provide the essential expertise and vital infrastructure your business needs to succeed. The world’s most advanced networks rely on CommScope connectivity.