

More Fiber Connections are Coming: Are You Prepared?

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Overview

Imagine spending just one day without wired or wireless connectivity. No WiFi access on your devices. No wireless access points providing connectivity to the cameras, screens and other devices in your building. No email or chat functions for communication.

Mobile and wireless coverage have become as vital as a utility – just as important in our daily lives as water, electricity and gas. Downtime isn't an option because, without connectivity, it's hard to live our lives – and many systems won't work properly.

In the future, connectivity demands will only increase. As they do, new capabilities and infrastructure will be needed to support them. For this reason, more fiber cable is being deployed to support our world's bandwidth-intensive technology and the new experiences it offers.

Belden has noticed infrastructure transformation in three key areas: stadiums and entertainment venues, broadcast environments and data centers. These applications are beginning to deploy fiber more than ever before to ensure reliable, always-on wired and wireless connectivity.



New Technology in Data Centers

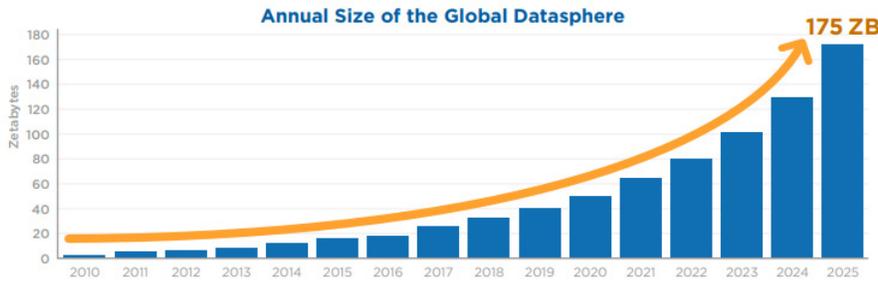
Today's data centers need to be fast, dense, scalable, cost effective and energy efficient. The push to handle high data volume and data rates is skyrocketing as Internet traffic inside data centers grows. According to IDC, data creation has doubled every two years since 2005 (topping out in 2020).

As data center speeds go up, cable performance becomes increasingly critical to ensure link quality.

For these reasons, data center speeds are transitioning from 40G to 100G and emerging 400G Ethernet technologies.

Fiber cabling is the only network infrastructure solution that can support data rates of 50G and beyond; therefore, the equipment responsible for transporting and carrying signals will rely on fiber.

Fiber is becoming the go-to for data center architecture because it offers greater bandwidth and error-free transmission over longer distances and is immune to noise (EMI/RFI). Its smaller size and weight (as compared to copper cables) require less space in cable trays, raised floors and racks, allowing for maximized usage of space inside the data center.



Source: Data Age 2025, sponsored by Seagate with data from IDC Global DataSphere, Nov 2018

New Technology in Stadiums

As IoT continues to take hold in stadiums, arenas and entertainment venues, wireless networks connect growing numbers of people and the devices they carry (which connect users to unlimited data). Fans now expect to stream media, download and upload content, and interact with people inside and outside the venue when they're in a stadium environment. As a result, bandwidth demands have gone through the roof.

There's another layer of connectivity at work in these venues as well: Devices that aren't controlled or managed by people (PoE LED lighting fixtures, POS systems, surveillance cameras and digital displays, for example). These devices connect directly to the network and operate without manual intervention. Embedded sensors within the devices capture and relay data over networks in real time. That data is used to make adjustments to improve processes and experiences, such as:

- Improved guest services with real-time information about inventory levels and availability at concessions and retail shops
- More efficient maintenance, with smart waste and recycling receptacles that send alerts when they need to be emptied
- Faster emergency response times and direct communication with onsite first responders through localized data, notifications and intelligence

5G is another driving force of change in stadiums. Its capabilities are set to significantly improve data capacity and throughput, bringing faster speeds, better performance and more reliable mobile service. It will enhance employee and customer experiences, improve safety and streamline building operations.



But 5G will also place huge demands on wired infrastructure – along with the increase in device connectivity we mentioned earlier. These demands require a robust fiber network that can accommodate a densely packed, data-hungry venue.

Although users will experience 5G through their wireless devices (smartphones and wearable technology), the capabilities of these devices depend on behind-the-scenes fiber connections. 5G simply can't exist without a high-performance, reliable, robust fiber backbone.

New Technology in Broadcasting

As stadiums and arenas focus on creating the ultimate fan environment, they also want to give viewers at home and outside the stadium an immersive experience. Shifting viewing habits have led to on-the-go, customized interactivity enabled by sophisticated mobile solutions. Even fans attending games are using mobile devices in new ways, interacting with broadcasted content displayed on devices as a complement to what they're watching live.

For example, the MLB is using augmented reality to let fans "follow" players around bases or across the field by holding personal devices toward the field from their seats. Device users can see the selected player's picture, real-time data and even video footage of famous plays. This technology also gives fans the opportunity to interact one-on-one with stats and data.



Photo: Santiago Mejia, The Chronicle

Broadcasters are also bringing in more cameras to offer never-before-seen views and augmented reality experiences. If you've watched an NFL broadcast lately, for example, you've likely noticed the 360-degree camera shots that display plays from every angle. To make this happen, four fiber drops are required for each camera location. When you add up those numbers alone, you can see how quickly fiber connections are growing in the world of broadcasting.

The shift from high definition to 4K content is putting fiber at the forefront, too. NBA games, PGA tours and NHL games have all been broadcast in 4K. A few college football games can be added to this list as well.

Increased bandwidth and connectivity requirements for ultra-high-definition (UHD) content – along with audio and video being delivered over the Internet to mobile devices – have taxed SDI capabilities. As a result, the broadcast world is in the midst of an IP (Internet protocol) migration to support live production and professional television. To provide seamless content distribution, traditional SDI broadcast infrastructure is being replaced by IP systems as standards allow for true interoperability and efficiency.

To deliver on-demand, real-time content to viewers, broadcast control rooms are starting to look more like data centers, featuring rows of cabinets that house IP-connected servers instead of traditional master control operations and task-specific hardware.

These broadcast innovations – from IP migration to 4K content – all rely on fiber connections for performance and uptime.

Challenges of Increased Fiber Connections

In these applications – entertainment venues, broadcasting and data centers – the increased use of fiber cable means an increase in fiber connections. Many large data centers now support tens of thousands of fiber links, with stadiums and arenas not far behind.

As these fiber connections grow, effective management – and taking advantage of all available ports – is vital to ensure uptime and efficient maintenance. Otherwise, things can become overwhelming very quickly (and get very messy as well).

High-density solutions that can support high fiber counts while also providing scalability (the ability to support more fiber connections in the future) are critical to maintain reliability and operations.



Managing High Fiber Densities with Optical Distribution Frames

When dealing with large numbers of fiber connections in a data center or broadcast studio, centralizing connections in a large fiber cross connect (also known as an optical distribution frame, or ODF) offers several benefits – but also comes with challenges.

Benefits

- The replication of switch ports on the equipment side of the fiber cross connect, increasing network flexibility (any server connects to any switch port) and improving security (switch access can be locked)
- The replication of all servers and storage ports on the distribution side of the cross connect, which eases moves, adds and changes (MACs) and helps you keep up with fast-changing technology
- Improved management efficiency and lower operations costs; a smartly designed ODF can be operated with one patch cord length, accelerating the connection of new services with reduced inventory costs
- Signal integrity protection; bend radius of fiber cables are well controlled and protected, and connections at the switch and server sides are permanent

Challenges

- Additional fiber connections (two per channel in the ODF) take up computer-room floor space, so choosing a high-density system is important
- Increase in termination numbers can sometimes reduce access to cables (for maintenance) and patch cords (for MACs) and even hinder signal integrity
- Extra fiber connectors add to the channel loss budget and create issues in demanding applications, so selecting the right optical components and appropriate termination methods is crucial
- Some ODF systems are very complex and use numerous components to support various termination techniques (a splice box at the bottom of the cabinet for fusion splicing, for example)

Belden's New ODF Solution: DCX Optical Distribution Frame

Manage high numbers of fiber connections and support high density without compromising on ease of use with Belden's new DCX Optical Distribution Frame. It optimizes the ROI of your fiber infrastructure, offering lower total cost of ownership in terms of capital and operating expenses.

Designed to handle extreme high density, DCX can support nearly unlimited numbers of fiber connections for unrestricted growth potential and maximum ROI. In fact, it offers the highest density available in the marketplace: 55% higher than other systems if you compare the number of terminations per square foot (4,608 fiber terminations in three square feet – the cabinet has a 12 in by 36 in footprint). It offers this density without compromising on anything else.

As your fiber connections increase, DCX's modular frames act as building blocks; you can easily add cabinets and cable management accessories as needed to support new fiber connections.

DCX System components include:

- Customizable cabinets (left-to-right or right-to-left) with different options for top panels, bottom panels, sides, doors and cable management
- Customizable 4U housing (left-to-right) with 576 fibers, designed to take up only half of a data center floor tile; they feature a front-access design with 12 trays that pull out for easy access to cables and built-in cable and patch cord management
- Modular adapter frames, pre-terminated MPO cassettes and splice cassettes



What DCX Offers that Other ODFs Can't

From top to bottom, the DCX Optical Distribution Frame is designed for easy access and ease of use while maintaining high density. It helps integrators, consultants, installers and end-users achieve successful cable management, handle high numbers of fiber connections and add density to the ODF.

The small number of components needed to configure the system simplifies bills of materials (BOMs) and makes it easy to design and configure large fiber cross connects. Customizable cabinets with built-in cable management translate to time savings that helps integrators and installers stay on schedule. The pull-out trays feature plenty of labeling space near connector ports to help end-users achieve efficient cable management.

Its most valuable benefits include:

1. Highest Density in a Small Footprint

DCX can manage nearly unlimited numbers of fiber connections – and the highest density available in the marketplace. Its density is 55% higher than other systems if you compare number of terminations per square foot (for a total of 4,608 fiber terminations in three square feet).

A front-access design is ideal for tight spaces and allows for multiple configurations. Cabinets can be placed against the wall or back to back, making service and management easy.

Each one takes up a space no larger than 12 in by 36 in.



2. Maximum Signal Integrity

By protecting incoming and outgoing cables, they won't be bent or crushed – and performance issues won't occur as a result.

From the time the fiber cable enters the DCX frame, it's routed and protected until the patch cord exits the other side. This level of protection helps maintain signal integrity for high performance and effective transmission.

You can connect one point to any other point inside a cabinet – or between the front and back of the cabinet – with a single 3.5 m patch cord. This patch cord length also works for side-by-side and back-to-back configurations. The system is easy to manage by minimizing the number of patch-cord lengths needed. Patch cords no longer need to be custom measured to create lengths between 1 m and 4 m. This eliminates extra work and extra space to maintain and store patch cords of different lengths; it also simplifies your bill of materials.

The system has built-in slack management that handles patch-cord slack vertically between frames as well.



3. Simple Maintenance and Access to Patch Cords

Moveable, pull-out trays provide easy access to the DCX frame, patch cords and cassette backs. Connected trunk cables are protected when trays are opened. A cover that controls bending also protects patch cords. Fingers can easily grasp them for easy connection and disconnection.

Port-level labeling is done right next to each port instead of farther away. This ensures connection and disconnection of the right cord, decreasing the potential for human error and connection issues. It also makes MACs faster and smoother.

DCX pre-terminated cassettes are modular and follow a design rule of one MPO connector per cassette (as opposed to multiple MPO connectors in fixed-size cassettes). This means that only four or six ports need to be taken offline when performing system maintenance.



4. Futureproof Functionality and High ROI

When the time comes to migrate from Base-12 to Base-8, Base-16 or Base-24 connectivity, you don't need to invest in new infrastructure. You can continue to build on your initial investment instead of starting from scratch with new housing and cabling. Simply install what you need inside your housing to connect the new equipment and leave the rest of the components undisturbed.

If a data center begins migration to 40G or 100G, for example, and needs to install Base-8 equipment, Base-8 cassettes can be installed alongside Base-12 cassettes without losing any real estate. Cassettes can be mixed and matched without losing density or requiring a change to the housing infrastructure.



5. System Scalability

Extremely scalable, the DCX ODF takes a modular approach to system expansion. If you have fewer than 4,608 fiber connections in your system, you can simply build your cross connect in a single DCX cabinet.

As your need for fiber connections increases, you can grow your fiber cross connect by stacking DCX cabinets side to side and back to back. Cable management accessories route patch cords horizontally between cabinets in the row, maintaining management flexibility from any port to any port inside the ODF.



6. Flexibility of Termination Methods

This system was designed for ease of use, including the flexibility to use any termination method: MPO trunk cables, multi-fiber trunk cables with LC connectors, fusion splicing with pigtails or splice-on connectors. Any of these fiber termination methods can be selected to meet specific project requirements (quick deployment, tight loss budget, budget constraints, etc.) and used in the system – and even in the same housing. There's no need for special accessories – just pick the correct connector interface module.



Future DCX Features to Watch For

As the DCX System rolls out, you'll quickly find that it's a single platform designed to cover all applications. In the future, not only will DCX serve as a high-density fiber cross-connect solution, but also as a Top of Rack (ToR) solution.

Watch for additional configuration options in the future as well, including standard 19 in, rack-mount panels and Open Compute Project (OCP-compatible) panels.

To learn more, call **1.800.BELDEN.1**
(1.800.235.3361) or visit
www.belden.com/dcx

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