# Cable Management Becomes More Critical

**As data volume and dependency increase, managers and installers must strengthen networks with sound cabling practices**

## Introduction

Businesses are relying on online transactions, Big Data and analytics like never before. Network topographies are evolving, and data center managers and installers need to deploy cabling structures that support massive throughput while enhancing manageability and flexibility.

## 1. Data Moves the Business

Data processing has achieved tremendous prominence for businesses everywhere. New organizational models centered on online transactions, Big Data and analytics are tying top-line business objectives to data center performance like never before.

For cable installers and network managers, the implications are profound. Data centers are no longer obscure corners of the organization. They now power applications that form the essential connection between businesses and customers and manage complex interactions with outside cloud environments.

Organizational leadership is watching. The C suite is demanding high performance and availability with high expectations for availability and latency. As always, IT conceives performance regarding processing power, but structured cabling must provide a strong backbone that will outlast several technology iterations.

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## 2. Speed and Capacity Increase

As online transactions proliferate and companies leverage the Internet of Things (IoT) to automate the monitoring and management of physical assets, data streams are exploding in size. New network architectures are targeting throughputs of 40 Gigabits (40G), 100G and higher, and cabling systems must incorporate their advanced designs that can support these massive throughputs.

### Networks and Topographies Evolve

Networks are growing dramatically to support these data-intensive operations. IT is answering the need for scalability and agility by pooling processors in virtualized environments for servers, applications, storage and other network resources. Either through network virtualization (NV) or software defined networks (SDNs), IT is enabling dynamic reallocation of resources and altering the relationship between the physical network and the applications it supports. These approaches rely on high performance and bandwidth supported by a versatile cabling infrastructure that enables multiple data paths.

### Data Centers Are Reconfiguring

Many organizations are leveraging public clouds, software as a service (SaaS), and edge processing, which send data flowing in new patterns. Traditional tree topologies are being replaced with “leaf-spine” designs that minimize latency and scale easily. In leaf-spine, access switches are closely meshed to spine switches, links can be either switched or routed, and paths are shortened.

One notable characteristic of leaf-spine architecture is the huge amount of cable it requires. Every spine is connected to every leaf, and scaling up the network increases the cable count significantly due to the potentially huge number of interconnections. Data centers must be designed with a location of spine switches in mind, and there is a premium on cable management.

### Density Increases

As data centers pack more processing power into each rack and port counts grow, installers and managers need to understand the architectures and scale requirements and build highly organized cable structures and subsystems.

Higher densities also change the way racks are configured and managed. Top-of-rack (ToR) architecture using in-rack network switches is a popular design in new data centers running at 10G and above. Cabling between racks is minimized, and preconfigured racks can be added, which simplifies scaling. With End-of-Rack (EoR) switching, every server in a rack is connected to an aggregation switch instead of being networked to the other servers within the rack. Some organizations choose to stay with EoR to preserve existing cable plants.

## 3. Fiber Takes Over

The use of fiber optic cable throughout data centers and networks has taken off in recent years as companies move to higher densities. Organizations that recently considered 1 Gigabit Ethernet (1G) or 10G sufficient are moving to 40G, 100G, 200G and beyond, and fiber optic is the best medium to support those speeds. Fiber also provides longer runs than copper with lighter cable weights, resists electromagnetic interference (EMI), and deters hacking.

Even horizontal cabling within the data center is increasingly fiber optic. Copper is gaining capacity with Cat 7 and the soon-to-come Cat 8, but Cat 7 and Cat 7a top out at 10G, and that becomes a bottleneck for organizations that are looking to move data at 100G or faster. As such, fiber optic structured cabling infrastructure is widely seen as a solid long-term investment because it can outlast multiple generations of processing equipment.

## 4. Choosing the Right Cables

Choosing the right cables means striking a balance between cost and capacity. Higher-capacity cables such as Cat 6a, Cat 7 and fiber optic cost more than Cat 5e or Cat 6, but they provide capacity advantages that may be indispensable. If the organization is expecting a data center to support high-capacity processing or minimize latency, cable capacity is more important than cost. Installers and managers need to gain a clear sense of the organization's priorities during any data center construction or rebuild.

Plan to install cable that exceeds today's known capacities and can meet the scalability requirements for years to come. Prepare to justify the procurement costs by referencing the technology roadmap. If there is a lower bid or a budgetary pushback, back up your recommendation by explaining how the higher bandwidth will benefit the organization — and highlighting the business risks of cutting corners on cable costs.

## Know Your Fiber

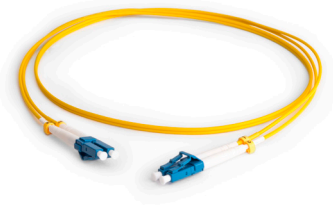
In many installations, fiber optic cable is a better choice than copper due to its superior speed and capacity, but all fiber is not created equal. There is a critical differentiation (if feasible here, link to the Hyperline white paper on Fiber Optic Cable) between Single Mode Fiber (SMF) or Multi-Mode Fiber (MMF). SMF cabling uses laser light and is more expensive than MMF due to higher costs for both cable and components, but it can carry signals for up to 10,000 meters, making it the essential choice for many runs between data centers. MMF uses LED light, and transmissions are limited to 600 meters. SMF can be the better choice for server and backbone connections, but some network designers are choosing SMF for those connections to enable huge data flows. Laser lights draw a lot more power than LEDs do, and power draw must be considered when choosing a fiber type.

Optical Fiber Nonconductive Plenum (OFNP) cables are intended for vertical runs between floors as part of a fiber backbone. Optical Fiber Nonconductive Riser (OFNR) cables are intended for horizontal runs. OFNP cables can be used as replacements for OFNR.

The two main types of fiber connectors are SC and LC. SC connectors are square-shaped and use a locking tab to affix a single fiber in a 2.5mm ferrule. They are ideally suited for datacoms and telecoms applications, including point-to-point and passive optical networking. LC connectors have a 1.25mm ferrule and a smaller footprint than the SC and use a latch, which works well in datacoms and other high-density patch applications.

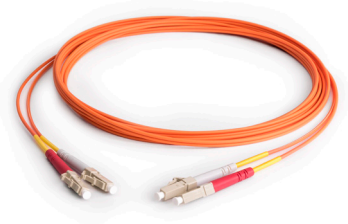
**The most widely used fiber optic cables are OM1, OM2, OM3, and OM4.**

### OM1



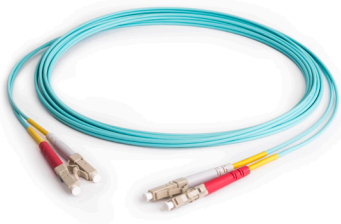
- Supports 1G up to 275 meters
- Supports 10G up to 33 meters.

### OM2



- Supports 1G up to 550 meters
- Supports 10G up to 82 meters.

### OM3



- Supports 10G up to 300 meters
- Supports 40G/100G up to 100 meters.

### OM4

- Supports 10G up to 550 meters
- Supports 40G/100G up to 150 meters.

## 5. Cable Management Procedures

Sound cable management practices help data centers function smoothly and reliably. Managers can implement a variety of procedures to minimize data center inefficiencies, such as slow troubleshooting and interruptions due to the unplugging the wrong equipment.) Well managed cable supports server performance and throughput, minimizes disruptions and downtime, and safeguards the integrity of cables and ports.

One solution for complex networks is the use cable management systems (CMSs). There are many products and services available that managers can use to document cable subsystems and paths, plan migrations and expansions, and track moves, adds and changes (MACs). The software requires manual entry of cable connections and types, and users must make updates for each move or change to keep documentation accurate. Some CMSs can model data center equipment and migrations and generate task lists for migration.

### Horizontal and Vertical Management

Where Main Distribution Areas (MDAs) connect to Horizontal Distribution Areas (HDAs) and then to Equipment Distribution Areas (EDAs), managers need to deploy sturdy, reliable components that support high density, are easy to install, provide adequate spacing between ports, and can handle heavy cable bundles. The horizontal cable manager units are made of metal or heavy plastic. Choose pieces that are best-suited for the cable types and quantities within each rack. Dust covers are appropriate if there is little likelihood of MACs but can get in the way during re-cabling.

When choosing vertical management components, plan for ease of access and allow room for both patch cable slack and future increases in cable density. Use vertical and horizontal components that allow for acceptable bend radiuses, so that cables and ports are not damaged over time.

### Cabinet Selection

Network or telecommunications cabinets can simplify monitoring and troubleshooting by making switches and patch panels easy to view. Cabinets come in different heights (typically 6U to 15U) to accommodate multiple layers of 19-inch equipment and are wall-mounted to support heavy equipment. They typically include the wall-mount section and the cabinet itself, which is attached to the wall mount and has a Plexiglas front that allows monitoring without opening the cabinet. Doors are reversible to improve usability in tight spaces.

When setting up a cabinet, installers should populate the bottom sections first and add panels upwards from there. There should be sufficient openings to enable airflow, and fans should be added as needed. Locking options are available for secure installations, and there are options to add shelves and/or drawers.

### Allowing for Airflow

Cabling choices should always account for airflow within the data center. As cable quantities increase, managers and installers must manage cable bundles, so they do not hinder ventilation of the server racks and cause cooling units to work harder. Cable trays and overhead racks should also be placed with care to allows for maximum airflow. Overhead trays should be placed close to the IT cabinets, and underfloor trays should be placed under cabinets or hot aisles.

In networks that use Power Over Ethernet (POE), the cables themselves can be heat sources, and bundle sizes must be managed to prevent excess heat buildup that can damage the cables and cause data loss.

### Prevent Interference

Copper Ethernet cables are subject to electromagnetic interference (EMI) and radio-frequency interference (RFI) that can cause data loss and even equipment failure. Check all areas where cable is running, and use shielded Ethernet cable everywhere there is copper that could be exposed to interference. Fiber optic cables do not require shielding because optic signals are not affected by interference.

### Use Names, Labels, and Colors

Managers and installers can simplify troubleshooting and MACs by making it easy to identify cables. When using a CMS, use name and number conventions for cables, so it is easy to understand what's what. Use labels on ports, and choose different colors for various cable types.

## Conclusion

Data center cable management becomes more important every year because businesses are becoming more dependent on IP-based communications while moving ever-growing quantities of data. Capacity, speed, and reliability are critical to the market, and cable plants must be sufficiently robust and manageable to carry higher volumes and enable increases in data center density. By building sound cable infrastructures that support flexible resource allocation, installers can help businesses transform and scale continuously with greater agility.

Installers and managers can look to Hyperline for a full range of cabling solutions, including Ethernet and fiber optic cable, cable managers, patch panels, patch cords, racks, and network cabinets. As a manufacturer of cables and components, Hyperline can ship without delays and help contractors minimize project lead times. A contractor who partners with a highly reliable manufacturer can purchase all the products for their job, giving them more control over the workflow.

For more information, please visit hyperline.com

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