

Copper and Fiber Connectivity in the Data Center

Research Report P-675-22
July 2022

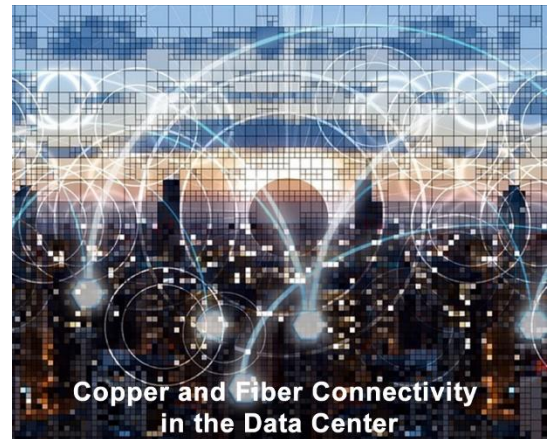


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The data center has grown from its original concept as a central location for computing and storage hardware to the data center of today that is at the epicenter of connection of nearly every aspect of our digitized lives. Data centers have evolved from single client on-premises facilities that were isolated from the world to multi-acre hyperscale facilities that contain thousands of servers and act as nodes in a globally connected high-speed network.



The past 30 years have seen massive adoption of new computing technologies including virtualization that enabled dynamic adaptation to support constantly changing resource demands. Widespread adoption of the Internet and the literally millions of subsequent applications together with the advent of streaming video has driven Internet traffic to incredible levels. The transition to software defined and managed data centers increased the efficiency of modern data center infrastructure and ushered in the cloud and edge computing revolution, but we are only at an early stage in what will be required to support the workload expected in the near future. Looming on the horizon are emerging technologies including artificial intelligence, fully autonomous transportation, 8K video, Industry 4.0, and artificial reality that will demand incredible computing power delivered with nearly zero latency. The potential demands that the metaverse could add to the level of data center traffic is unimaginable. The infrastructure of the global data center network will be tasked with efficiency supporting these demands while addressing challenges in power and heat reduction, and improved reliability, while assuring absolute security. High-speed data links, both copper and fiber optic will play critical roles in achieving each of these objectives.

Copper based circuits have been the primary media choice for high-speed electronic signals within the data center since its beginning years. Copper conductors in printed circuit boards (PCB), wire and cable assemblies have a proven track record of reliability over many years. The technology is well developed and supported with decades of manufacturing experience available from a universe of global vendors.

Fiber offers multiple technical advantages including, near unlimited bandwidth, low signal loss and distortion over long distances, reduced size and bulk, as well as isolation from electromagnetic interference (EMI) and electrostatic discharge (ESD). Early glass fiber was extremely fragile, difficult to terminate and costly. Components required to perform the electro-optic conversion process at both ends of a link added to the power and heat budget, consumed valuable space as well as added cost. Fiber optic links filled a limited niche in long-haul telecommunication applications that could extend for hundreds or thousands of miles. To use copper cables in lengths that long would require many expensive amplifiers, making copper impractical especially in undersea cables.

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In addition to the data center, emerging applications of fiber will initially be concentrated in select industries including high performance computing (HPC), military and avionic. As experience is gained and component prices decline, commercialization will allow the migration of fiber into more mainstream equipment including embedded computers. Fiber to the home (FTTH) has already brought the advantages of increased bandwidth to millions of residents. It is possible in the future that as homes and offices in the past were wired with Ethernet cable, fiber will become a universal backbone of high-speed residential data distribution in the future.

This 275-page market research report identifies and compares the leading trends that are driving the consideration of fiber optic communication in an expanding range of applications that have traditionally been served by copper electrical circuits. Advances in optical hardware including connectors as well as transmission technology is discussed along with how future advances will enable support of evolving network traffic demands.

The long-predicted demise and replacement of copper circuitry by fiber optic alternatives, remains just that, but as bandwidth demands continue to rise, optical transmission will continue to offer a cost-effective alternative in a gradually increasing number of applications. Make

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What's New ?

Bishop & Associates has recently completed several new research reports about the worldwide connector industry. A table of contents for each report can be found at <https://store.bishopinc.com>.

- Report P-675-22** **Copper and Fiber Connectivity in the Data Center (July 2022) NEW**
- Report F-2022-01** **Connector Industry Forecast (June 2022) NEW**
- Report T-800-22** **2022 North American Cable Assembly Manufacturers (May 2022) NEW**
- Report M-1010-22** **World Automotive Connector Market (April 2022) NEW**
- Report M-700-22** **World Connector Market Handbook (March 2022) NEW**
- Report P-420-22** **IC Sockets – Systems & Connector Forecast 2020-2030 (January 2022) NEW**
- Report P-520-21** **The World I/O Rectangular Connector Market 2021 (October 2021) NEW**
- Report P-430-21** **World Circular Connector Market 2021 (September 2021) NEW**
- Report M-121-21** **2021 Top 100 Connector Manufacturers (August 2021) NEW**
- Report M-310-21** **Instrumentation Market for Connectors (June 2021)**
- Report P-799-21** **World Cable Assembly Market (May 2021)**
- Report P-410-21** **Computer Server Market Trends and Connector Use 2020 – 2030 (May 2021)**
- Report M-607-21** **World Industrial Market for Connectors (April 2021)**
- Report M-510-21** **World Telecom Connector Market 2020-2025 (January 2021)**
- Report M-1601-20** **Top 50 Medical Interconnect Solutions Companies (December 2020)**
- Report M-980-20** **5G Infrastructure – How 5G is Impacting Infrastructure Hardware and Connector Buying Trends (September 2020)**
- Report M-1501-20** **Medical Electronics Market for Interconnect Solutions (July 2020)**

THE BISHOP REPORT - CONNECTOR INDUSTRY YEARBOOK

An annual corporate subscription to [THE BISHOP REPORT](#) (12 issues) is available for \$2,950, which includes an unlimited number of subscribers and one PDF version of the *Connector Industry Yearbook* report (normally \$1,500).

The Bishop Report subscription includes access, through Bishopinc.com, to prior issues of The Bishop Report, 30-40 yearly News Briefs, Industry Financial Benchmarks, and various connector industry indices.

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