Smart Data Center Tech Refreshes
Flexible Fiber Networks for 40G and 100G

Data centers everywhere are moving quickly to address ever-increasing bandwidth demands. While switch-to-switch connections of 40G and 100G accounted for 8 percent of data center infrastructure speeds in 2014, those combined speeds will jump to 26 percent by the end of 2016, according to research organization BSRIA.

In 2010, when the IEEE 802.3ba standard for 40G and 100G was published, few active equipment options were available to support the new standard. But today there is a wide and ever-growing selection of switches to deliver 40G/100G. Arista, Cisco, Juniper, and other manufacturers are introducing transceivers that address demands for higher bandwidth, as well as greater density, farther reach, and improved cost. Many of these new options have already outpaced the specifications in existing IEEE standards.

There are at least nine different 40G optical transceiver options currently available, using the QSFP+ form factor. And there are even more transceiver options for 100G, with a range of form factors, including QSFP28 (with the same footprint as QSFP+), CFP2, CFP4, and Cisco's proprietary CPAK. As you can see in the chart below, the number of transceiver types available for 100G keeps growing, with new options introduced seemingly by the month.

CPAK 10x10GBASE-LR Transceiver

QSFP+ LR4 Transceiver

QSFP+ SR4 Transceiver

	100G Transceivers	Form Factor	IEEE Standards Compliant	Fiber Type	Distance
1	100G-SR10 MXP (Arista)	Embedded optics	No	OM3 / OM4	100 m / 150 m
2	100G-SR10	CFP2	Yes	OM3 / OM4	100 m / 150 m
3	100G-SR4 - NEW	QSFP28	Yes	OM3 / OM4	70 m / 100m
4	100G-xSR4 (tbd) Est. Q1 2016	QSFP28	No	OM3 / OM4	300 m (tbd)
5	100G-LR4	CFP2	Yes	OS2	10 km
6	100G-LR4 - NEW	QSFP28	Yes	OS2	10 km
7	100G-LR4	CPAK	No	OS2	10 km
8	100G-LRL4 - NEW	QSFP28	Yes	OS2	2 km
9	10x10-LR - NEW (Cisco)	CPAK	No	OS2	1 km
10	100G-PSM4 - NEW	QSFP28	No	OS2	500 m
11	100G-CWDM4 Est. Q4 2015	QSFP28	No	OS2	2 km

For example, the **100GBASE-SR4 standard** was just approved in February 2015, and became available in late April. This standard, created by the IEEE 802.3bm Task Force, reduces the lane count for 100GbE from 10 lanes at 10GbE to four lanes at 25GbE. This greatly reduces the amount of fiber required for delivering 100GbE from the core to top-of-rack switching, and uses the exact same cabling that is required for 40GBASE-SR4. A separate standard to define 25GbE to the server is currently under development by the 802.3by Task Force, and expected to be ratified by late 2016.

Choose an infrastructure that can adapt

With so many port types and form factors available, it is important for data center infrastructure managers to develop a cabling design that can be flexible to handle this rapidly changing landscape. In many cases, network engineers will decide on the type of transceiver and active equipment, and it is then up to the infrastructure manager to react quickly to ensure the physical layer is designed and connected in the most efficient way, while anticipating future tech refreshes.

Regardless of the switch or port type for 40G or 100G fiber, a 24-fiber MPO/MTP® cabling system is the most flexible and scalable solution to support this rapidly changing landscape. Leviton introduced the first full 24-fiber MTP System in 2011, and since then other cabling manufacturers have followed. Today we have reached the point where the latest active equipment requires a 24-fiber interface.

There are several key reasons for using a **24-fiber solution**:

A Simpler Network Migration

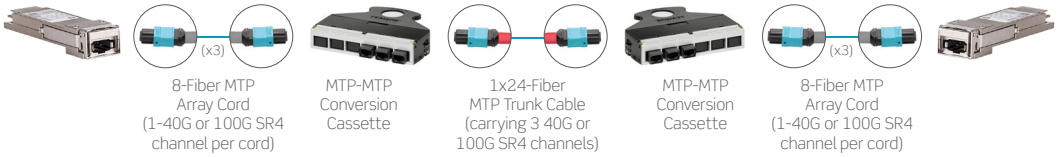
With fewer connectivity components to be replaced or added when upgrading, a 24-fiber system simplifies migration and reduces costs for both components and installation. For example, when a 24-fiber backbone trunk cable is installed in a 10G network, that backbone stays in place when upgrading to 40G and 100G networks. A single cablethat can support a 1G, 10G, 40G, or 100G channel will simplify network upgrades immensely. When equipment is upgraded, only cassettes and patch cords are exchanged for the appropriate new MTP® components.

24-fiber

Better Fiber Utilization

24-fiber MPO/MTP connectivity is more efficient than 12-fiber solutions when it comes to taking advantage of existing and emerging applications. For example, say you want to support twelve 100G channels using the recently ratified 100GBASE-SR4 standard, which defines 4 lanes of multimode fiber at 25G per lane. This 4x25 solution would only require 8 fibers (4 transmit, 4 receive), so a 12-fiber connector could support a single 100G channel. But with 12-fiber MPO/MTP systems you would need to install 12 connectors, or 144 fibers total, with 33% of the fiber wasted. However, when supporting 12 channels with a 24-fiber MTP system, only 4 backbone trunks would be required, using 96 fibers total at 100% fiber utilization.

40GBASE-SR4 or 100GBASE-SR4 Channel with 24-fiber MTP Trunk Cabling



8-Fiber MTP Array Cord (1-40G or 100G SR4 channel per cord)

MTP-MTP Conversion Cassette

1x24-Fiber MTP Trunk Cable (carrying 3 40G or 100G SR4 channels)

MTP-MTP Conversion Cassette

8-Fiber MTP Array Cord (1-40G or 100G SR4 channel per cord)

The 24-fiber MTP system allows the use of the existing 100GBASE-SR10 (10x10) 20-fiber technology today, while at the same time maximizing the installed infrastructure investment in the event of the 4x25G upgrade in the future. Choosing a 12-fiber connector strategy simply does not accomplish this: it drives down return on investment and subsequently increases the total cost of ownership. This is the exact opposite of the design intent of a data center infrastructure system.

Higher Density and Space Savings

Since fewer cables are required as a result of 100% fiber utilization, and 24-fiber reduces the number of cables by half over 12-fiber cable, infrastructure managers can greatly reduce cable congestion in pathways and create more rack space for active equipment in racks and cabinets. Leviton's 24-fiber MTP system uses Berk-Tek MDP cable in its trunks, which offers the smallest outside diameter available, and in-turn creates even greater capacity and space savings in cabling pathways.

In short, a 24-fiber higher-speed Ethernet MTP system will support multi-generational changes, lower the cost of ownership, and maximize your return on infrastructure investment.

It is critical to understand the impact of new technology and standards, and build flexibility into your network when migrating to 40G, 100G, and beyond. It is also important to get assistance from experts who understand the evolution of the data center environment and the latest network technology. Leviton works closely with many leading equipment manufacturers, is active in all next-generation standard developments, and can advise customers on their best possible migration strategy.

Learn more at Leviton.com/datacenter

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