Why should you migrate to OM4 fiber optic cabling?

Bandwidth will never stop increasing. Industry surveys point out that total Internet demand is growing 40% per year, especially thanks to Netflix, Amazon among other streaming services and Internet mobile access from mobile devices, which gives us the opportunity of consuming videos anywhere, anytime.

According to Cisco's White Paper Global Mobile Data Traffic Forecast Update, 2015–2020 mobile data is expected to grow 30.6 exabytes per month by 2020, with a Compound annual growth rate of 53% by that year.

A study made by Aryaka, a high-performance WAN solutions company, shows that manufacturing and software enterprises also have a big responsibility on the bandwidth increasing demand, which makes sense as businesses deploy more applications and workloads increase.

Speed requirements

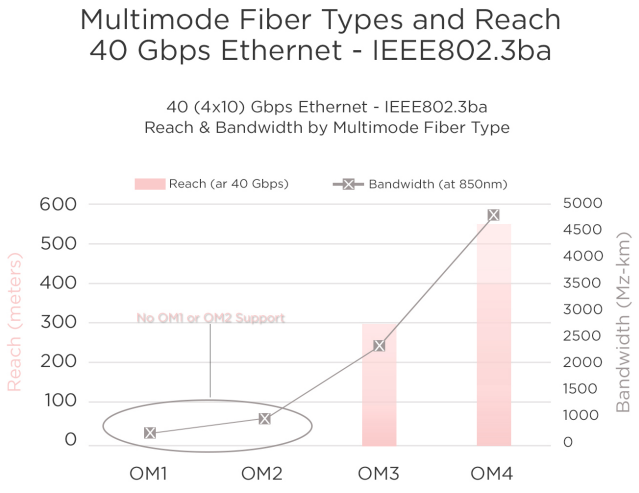
Many experts assure that currently deployed fiber optics are obsolete, since 1G and 10G are no longer suitable for future data demands. Bandwidth demand in data center is exponentially increasing, so you can't plan your whole structure just thinking about 10Gb protocol, you have to guarantee your data center evolution to 40G and 100Gb standards.

The explosion in bandwidth demand for enterprises is causing a crucial need for higher Ethernet networks speeds. To meet current and future data requirements, 4G and 100G standards, cabling must be reliable, scalable and flexible.

And laser-optimized multimode fiber is known to be the medium of choice to support these high-speed data networks, meaning OM3 and OM4 fiber. This has its reasons:

Bandwidth

OM3 and OM4 fiber are the only fibers specified Institute of Electrical and Electronics Engineers (IEEE) 802.3ba 40/100G Ethernet Standard, because they are optimized for 850 nm transmission. OM3 has a minimum effective modal bandwidth of 2000 MHz-km, while OM4 4700 MHz- km. If you compare it OM1 and OM2 maximum EMB of 500 MHz-km, you can notice the obvious advantages of OM3 and OM4 fiber.



Graphic 1: Multimode fiber types and reach. Source: Next Generation Multimode Fiber. Retrieved from: Bicsi: OM4 Fiber – The Next Generation of Multimode.

Optical Characteristics			
Attenuation at 850 nm	≤ 2.2 dB/km		
Attenuation at 1300 nm	≤ 0.6 dB/km		
Minimum Bandwidth Specification		FLEX 550 (OM4)	FLEX 300 (OM4)
	Laser EMB @ 850 nm	4700	2000
	Laser EMB @ 1310 nm	500	500
	Overfilled @ 850 nm	3500	1500
	Overfilled @ 1300 nm	500	500
Attenuation at 1380 nm minus attenuation at 1300 nm	≤ 1.0 dB/km		
Attenuation Uniformity/Point Discontinuities at 850 and 1300 nm	≤ 0.08 dB		
Numerical Aperture	0.200 ± 0.010		
Zero Chromatic Dispersion Wavelength (0)	1295 to 1315 nm		
Zero Chromatic Dispersion Slope (S0)	< 0.101 ps/(nm²·km)		
Group Refractive Index at 850 nm	1.483		
Group Refractive Index at 1300 nm	1.479		
Backscatter Coefficient at 850 nm	-68.4 dB		
Backscatter Coefficient at 1300 nm	-75.8 dB		

Table 1: Beyondtech's OM4 fiber optical characteristics.

Transmission distance

Transmission distance of fiber optic cables influences the whole data center structure. OM3 and OM4 fiber have a longer transmission reach when compared with OM1 and OM2 fiber. OM3 fiber can run 40G and 100G for 100 meters, while OM4 fiber manages 40G and 100G at 150 meters.

OM3 and OM4 fiber have longer transmission reach when compared with OM1 and OM2.

850nm Ethernet Distances				
	1gb	10gb	40gb	100gb
OM3	1000m	300m	100m	100m
OM4	1000m	500m	150m	150m

Table 2: OM3 and OM4 transmission reach.

Lower Insertion Loss

This a crucial aspect in data center installations. According to Corning's Data Center Design for 40/100G, total connector loss in a system channel impacts the capability of a system over the maximum supportable distance for a given data rate.

Single mode vs OM3 and OM4

It is pretty clear that OM3 and OM4 offer incredible advantages over older multimode fiber types. But they also offer an amazing advantage over single mode cable: reduce overall installation cost.

(continued)

Single mode fiber cables are significantly more inexpensive than OM4 cables, but the electronic devices that light up multimode fiber (transceivers and lasers) are considerably much more expensive that the ones used with OM3 and OM4 fibers.

Single mode active devices prices increases with broadband requirements too. Installing this kind of fiber is expensive and increases the Total Cost of Ownership.

Of course, every data center is different and unique. Therefore, structure requirements need to be studied before making a choice.

For very long runs 10G applications, let's say over 500 meters, single mode is the right choice. But if your data center's longest distance is 300 meters, OM3 and OM4 cables will suit your needs. For 40G and 100G applications, single mode fiber is still the choice for 300 meters runs, but for 100 and 150 meters distances OM3 and OM4 would be perfectly suitable.

OM3 or OM4?

The first thing to keep in mind is that OM3 and OM4 fiber work with the same connectors and transceivers (850 nm Vertical-Cavity Surface Emitting Lasers), its terminations and fiber core size are identical and both are Laser Optimized. Therefore, OM3 and OM4 fiber can be perfectly matched between each other.

OM3 and OM4 fiber are laser-optimized and work with the same connectors and transceivers.

Despite OM4 fiber is promoted as a new fiber type, it has been available in the market since 2005 as extended bandwidth OM3, optimized OM3 or OM3+, but it wasn't until 2009 that it was standardized as OM4 fiber by the Telecommunications Industry Association and Electronic Industries Alliance.

What's the main difference between OM3 and OM4 fiber then? The way the fiber optic is constructed. OM4's internal 50/125 core construction allows the fiber to work at a much higher bandwidth with 850
nm transceivers.

Therefore, OM4 fiber allows to deploy richer networks and provides longer lengths for 10G, 40G, 100G Ethernet applications as well as InfiniBand and Fiber Channel.

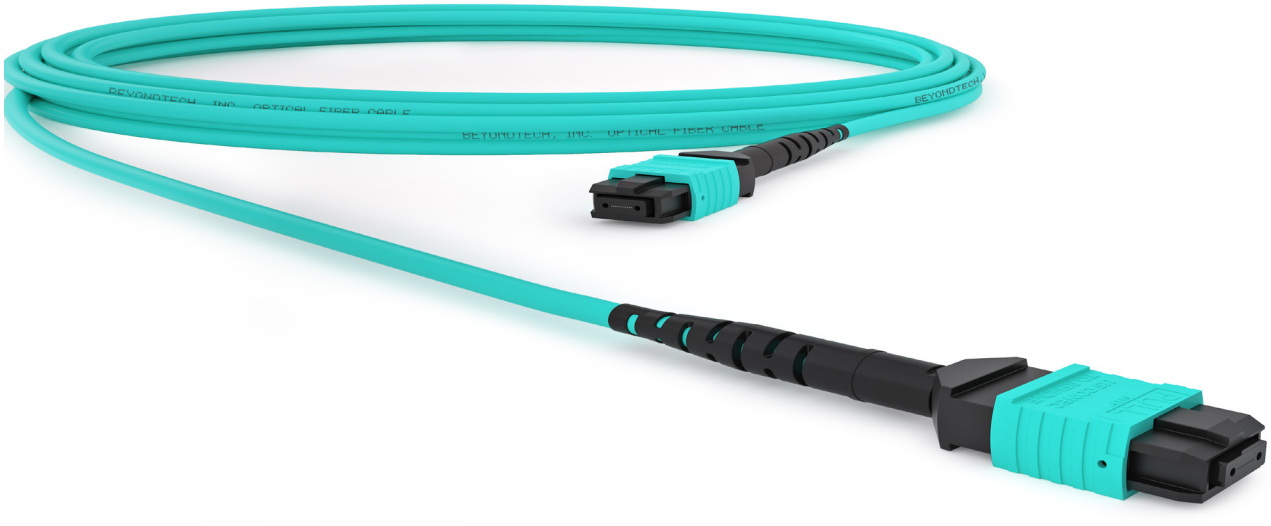
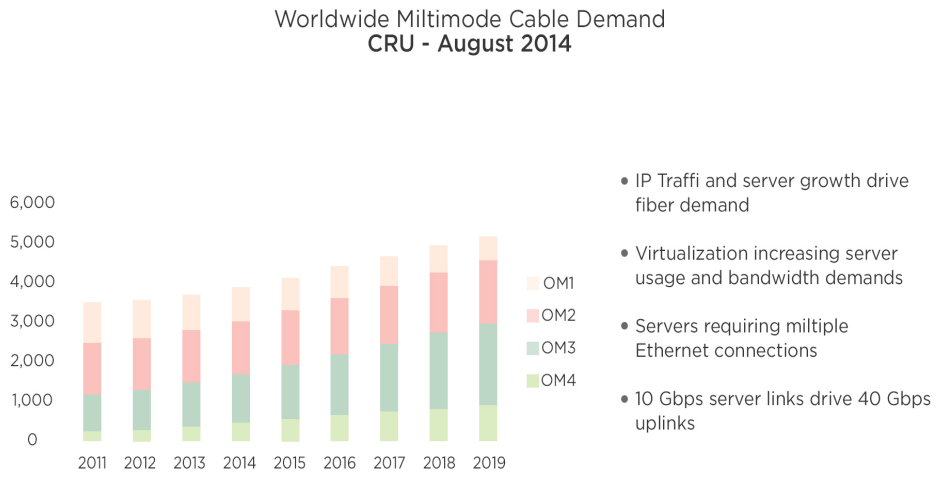


Figure 1: Beyondtech's MPO-MPO OM4 Patch Cord

Physical Characteristics	
Core Diameter	50 ± 2.5 µm
Core Non-Circularity	≤ 5 %
Clad Diameter	125 ± 0.8 µm
Clad Non-Circularity	≤ 0.7 %
Core/Clad Concentricity Error (Offset)	≤ 1.0 µm
Coating Diameter	242 ± 5 µm
Coating Non-Circularity	≤ 5 %
Coating-Clad Concentricity Error (Offset)	≤ 8 µm
Tensile Proof Test[1]	100 kpsi 0.69 GPa
Coating Strip Force Range	≥ 0.9 < 4.4 N ≥ 0.2 lbf ≤ 1.0 lbf

Table 3: Beyondtech's OM4 physical characteristics.

Of course, these advantages cause OM4 fiber cables to be more expensive than OM3 cables due to the manufacturing process. And this is why OM3 is more broadly used than OM4 fiber, but as 40G and 100G standards are adopted, OM4 demand is expected to increase in data centers and enterprises.



Graphic 2: Multimode cable demand. Retrieved from: Bicsi: Next Generation Multimode Fiber.

And yes, OM3 fiber can also support 40G and 100G applications, but when the time comes, you need to be prepared with the best product of the market. OM4 fiber allows for high-capacity fiber optic links to be installed 75% faster in data centers. In these spaces, about 15% of distances between equipment are longer than 100 meters, and just OM4 is able to support those lengths.

When planning to deploy new cables in your data center, you have to select the ones that provide data rate applications for the future. Investing in an OM4 infrastructure means future-proofing your network for tomorrow, while making it able to work with current and older applications and giving it the longest range possible over multimode fiber.

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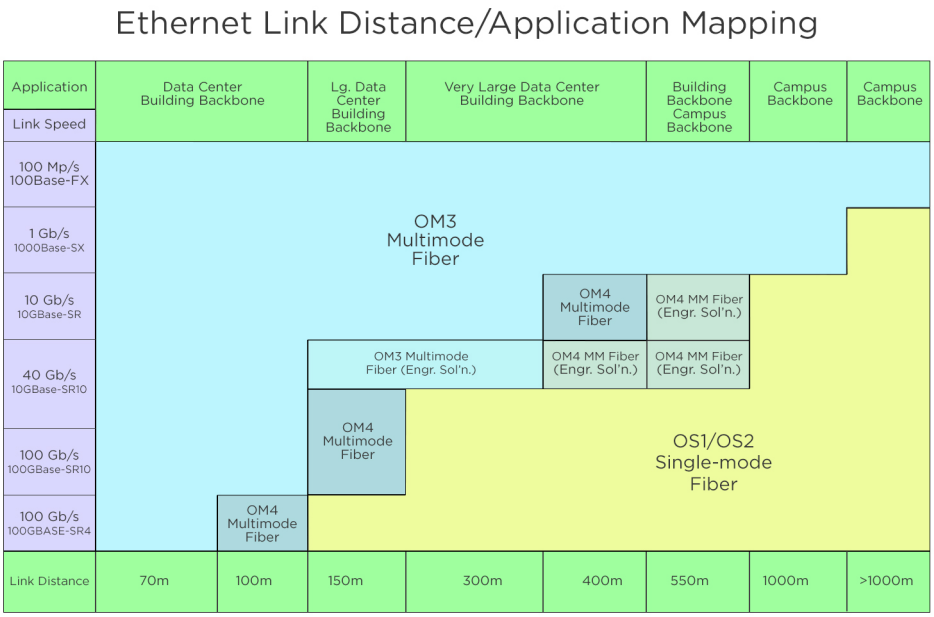

Graphic 3: Fiber optic reach for Ethernet applications. Retrieved from: Bicsi: Optical Fiber and Cabling Standards for Tomorrow's Data Center

How to improve your network for the future?

Due to the 850 nm VCSEL transmission limitations, OM3 and Om4 laser-optimized multimode fibers use parallel optics transmission instead of serial transmission, which uses a parallel optical interface that transmits and receives data simultaneously over multiple fibers.

40G signals are transmitted and received over four pairs of 10G fibers, likewise 100G signals are transmitted over 10 pairs of 10G fibers.

But that doesn't mean 8 cables are needed for 40G transmission or 20 cables are required for 100G transmission, 8 fibers can be easily accommodated in a 12 fibers MPO connector and 20 fibers in a 24 fibers MPO connector, respectively.

OM3 and Om4 laser-optimized multimode fibers use parallel optics transmission.

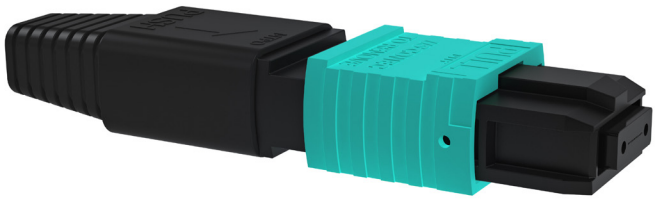

Figure 2: Beyondtech's MPO connector.

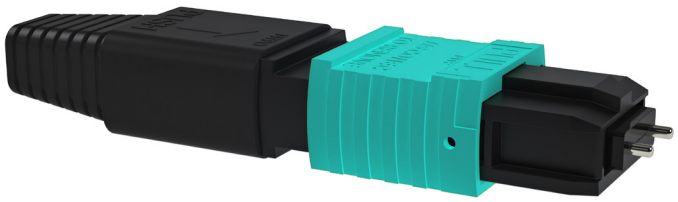

Figure 3: Beyondtech's MPO connector.

Therefore, for your enterprise data center to suit the future's needs, MPO-based connectivity with OM4 fiber is the perfect solution, since they can be simply installed and used in today's applications while easily starting the migration path for future higher-speed 40G and 100G Ethernet.

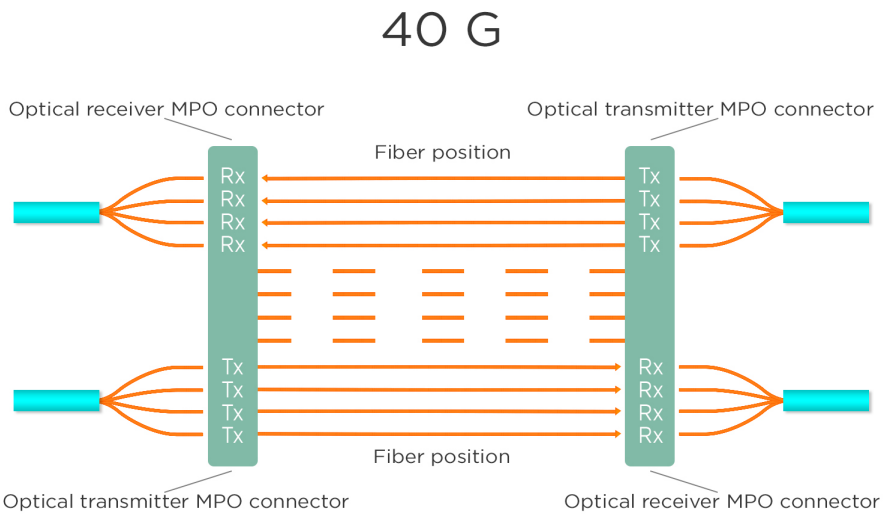

Figure 4: 40G Ethernet Pararell Tansmission.

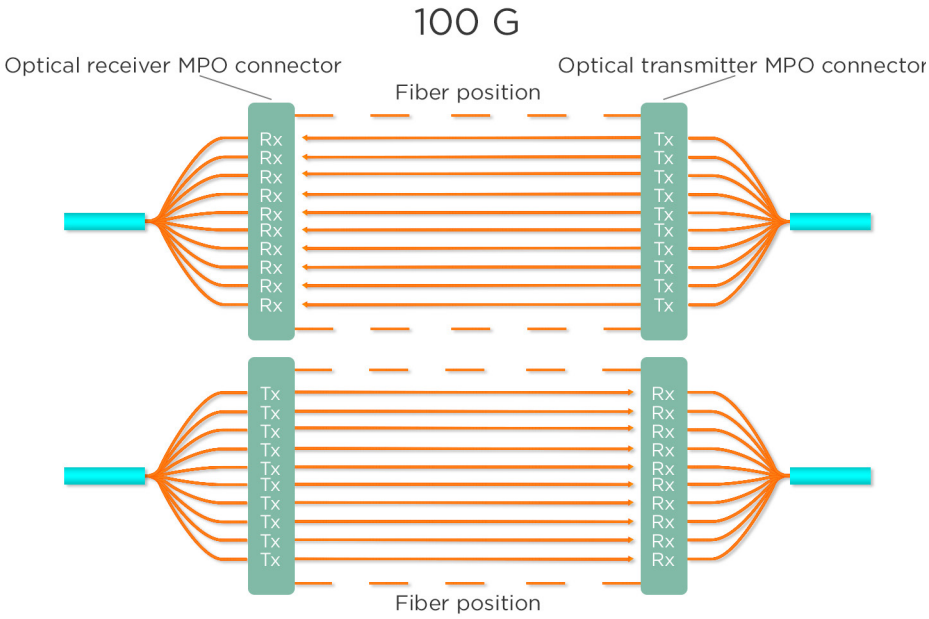

Figure 5: 100G Ethernet Pararell Tansmission.

Nonetheless, parallel transmission makes it possible to transmit 40G and 100G signals over a fiber network originally designed for 10G transmission with OM4 fiber. If it is imperative to use LC fiber patch panels, four duplex LC patch cords would be needed to connect the transceivers. Then, to connect the LC patch panels to the 40G or 100G ports, MTO-LC breakout cables would be needed at both ends.

But running parallel signals through separate fibers could have a great cost. It is important to keep in mind that the lower the volume of cable deployed, the lower the containment cost, which will traduce in better return of investment.

When deciding if installing OM4 fiber in your data center or you have to consider several factors, but the most important one is the way bandwidth demand is going to keep growing and OM4 MPO based connectivity is the most efficient and cost-effective solution.

Bandwidth demand is going to keep growing and OM4 MPO based connectivity is the most efficient solution.

Future-proof your network

Beyondtech manufactures, stocks and offers an extensive optical OM4 fiber product line, using very highquality components in order to achieve accurate, precise and reliable data transmission and connections.

Our products are certified with all international standards and are cables suitable for your current and future applications in Data Centers, High Performance Computing Centers, LAN, SAN and Central Offices. OM4 patch cords are available for immediate shipping from 0.5 to 20 meters with SC, LC and MPO connectors.

We are aware current and future telecommunication technologies demand efficient performance in every enterprise and we are ready to provide solutions with excellent performance products.

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