

# Pushing the Limits

The Signature Core™ Fiber  
Optic Cabling Systems

OM4 / **SIGNATURE CORE™**

OM5 / **SIGNATURE CORE™**

Fiber Future and Beyond

**PANDUIT®**

infrastructure for a connected world



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## Pushing the Limits

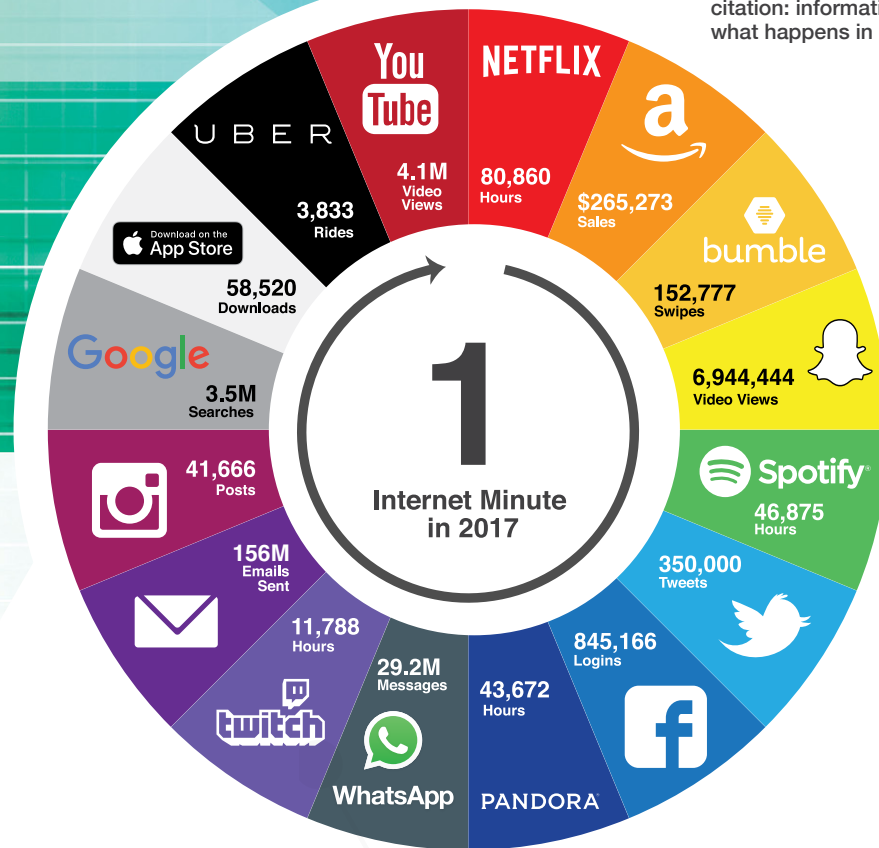
Delivering the Ultimate in Reach and Performance

Our aptitude to design optical systems to Push the Limits is key to ensuring our customers' network performance is leading edge, ahead of the competition, and seamlessly accelerates their network infrastructure into the future.

Panduit's Signature Core™ Fiber Optic Cabling Systems are revolutionary advancements of multimode fiber communication, surpassing many fiber optic vendors in reach and reliability.

## What Happens in an Internet Minute?

citation: information taken from excelacom, what happens in an Internet minute?\*



## Level Set Your Network Performance

Ensuring optimal network performance is critical to your organization. As the foundation of your network infrastructure, your fiber optic cabling system cannot be taken for granted.

The demand to increase high speed data transport supporting the explosive growth of IoT continues to place stress on network infrastructure, especially the physical layer. According to an IHS report<sup>†</sup>, nearly 27 billion IoT devices were 'connected' in 2017, increasing to 125 billion by 2030. The need to specify the highest bandwidth fiber cable plant solutions in the face of this information is paramount.

\*Source: Abraham, Yossi. Excelacom. *What Happens in an Internet Minute?*, May 7, 2015.

†Source: IHS Market. *Number of Connected IoT Devices Will Surge to 125 Billion by 2030, IHS Market Says*, October 24, 2017.

## Are you prepared to handle future data rate and capacity demands?

- Is your network experiencing downtime risks from latency challenges?
- Are you able to shrink 'time to service' in an increasingly dynamic environment?
- Can you beat bandwidth bottlenecks with a strong migration path (to support future Ethernet/Fibre Channel)?
- Are you able to seamlessly and cost efficiently scale your network with current and legacy channels?

We can help strengthen the foundation and performance of your network infrastructure to ensure reliability and successful migration paths for the future.

## Conquer Wavelength Speed Variances in Multimode Fiber

What is wavelength speed variance? The technical identification is Chromatic Dispersion. Chromatic Dispersion is caused by the spreading of light due to slightly different colors or wavelengths of light that make up the optical signal. The speed the light travels through the fiber depends on the wavelength. Therefore, the individual wavelength components of light emitted from a Vertical Cavity Surface Emitting Laser (VCSEL) travels at different speeds, with the shorter wavelengths traveling at slower speeds compared to the longer wavelengths.

This difference in speed results in unequal transit times, thus creating signal distortion that creates a challenge interpreting data for the receiving end. This reduces reach and increases Bit Error Rate (BER). The negative effects of higher chromatic dispersion are strengthened as data rate and/or channel length is increased, resulting in irregularities in performance of the channel.

How did we conquer this? Our optical fiber research team was the first to discover the interaction between chromatic and modal dispersions, which affects the overall performance of multimode fiber channels. For data rates greater than 10 Gb/s, the effect is significant and can reduce the maximum channel reach of standard OM3 and OM4 fibers by as much as 25%. Standards specified OM3, OM4, and OM5 fibers do not consider the interaction between modal and chromatic dispersions, and consequently, the total channel bandwidth is inaccurate. Signature Core™ multimode fiber is specially selected from the population of manufactured fibers to have unique dispersion compensating characteristics that when connected to the optical transceiver, the total channel bandwidth increases.

Our intensive multimode fiber research coupled with our active participation in standards committees propelled us to proudly offer the next progression in high performance multimode optical fiber, the OM4 and OM5 Signature Core Fiber Optic Cabling Systems.

A hand is holding a white smartwatch. The background is a blurred office scene with a person in a suit. A large teal triangle is overlaid on the right side of the image. A network diagram with various device icons is overlaid at the bottom.

nearly **27** billion

IoT devices were 'connected' in 2017,  
increasing to 125 billion by 2030<sup>†</sup>

# Pushing the Limits of SWDM Reach, Standards-based Ethernet and BiDi

The OM4 and OM5 Signature Core™ Fiber Optic Cabling Systems comply with the reach requirements of the [SWDM Multisource Agreement](#) and are fully compliant and interoperable with standards-based OM3, OM4 and OM5 solutions deployed in SWDM channels (Table 1, Figure 1).

**Table 1 - 40G/100G SWDM Link Distance**

PMD	OM3	OM4	OM5	OM4 SC	OM5 SC
40GBASE-SWDM4	240m	350m	440m	<b>440m</b>	<b>485m</b>
100GBASE-SWDM4	75m	100m	150m	<b>150m</b>	<b>185m</b>

Assumes 1.5 dB Connectivity Loss (IL) Budget

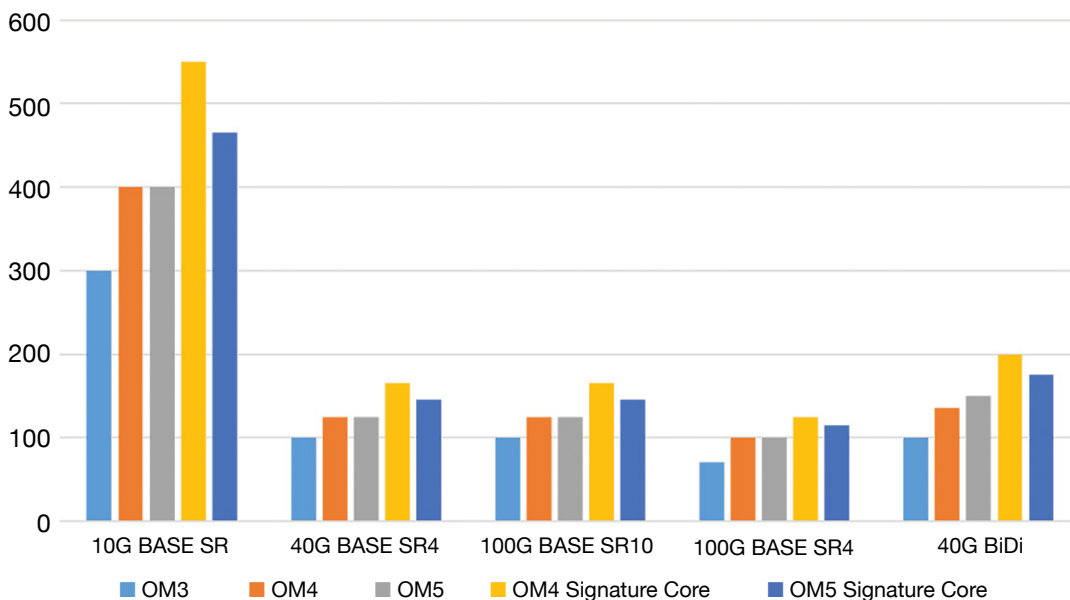
Push the limits of your network to extend reach and stabilize performance

- OM4 Signature Core Cabling extends reach on average by 20% compared to standard OM4
- Both OM4 and OM5 Signature Core Cabling support all 850nm applications (SR4/SR10 & BiDi) at extended reach compared to their standards-based counterparts
- As data rates accelerate, OM4 Signature Core Cabling will remain relevant providing a cost-effective path to 100G Ethernet/128G Fibre Channel and beyond with the highest performance
- OM5 Signature Core Cabling outperforms the standard OM5 fiber for any SWDM applications, providing on average 15% extended reach while maintaining high and reliable performance

## IEEE 802.3 and Cisco 40G BiDi Link Distance

Assumes 1.5dB connectivity loss (IL) budget

Figure 1 - Meters



# Tackle Bandwidth Concerns

The optimal foundation to tackle bandwidth challenges is a fiber solution specially engineered to reliably handle information carrying capacity over a distance. Channel bandwidth can be optimized with OM4 or OM5 Signature Core™ Fiber Optic Cabling Systems, depending on your overall reach demands versus deploying standard multimode fibers.

**Table 2 - Modal Bandwidth of Multimode Optical Fibers**

	<b>OM3</b>	<b>OM4</b>	<b>OM5</b>	<b>OM4 SC</b>	<b>OM5 SC</b>
Bandwidth (Mhz. km) @ 850nm	2,000	4,700	4,700	5,500	4,700

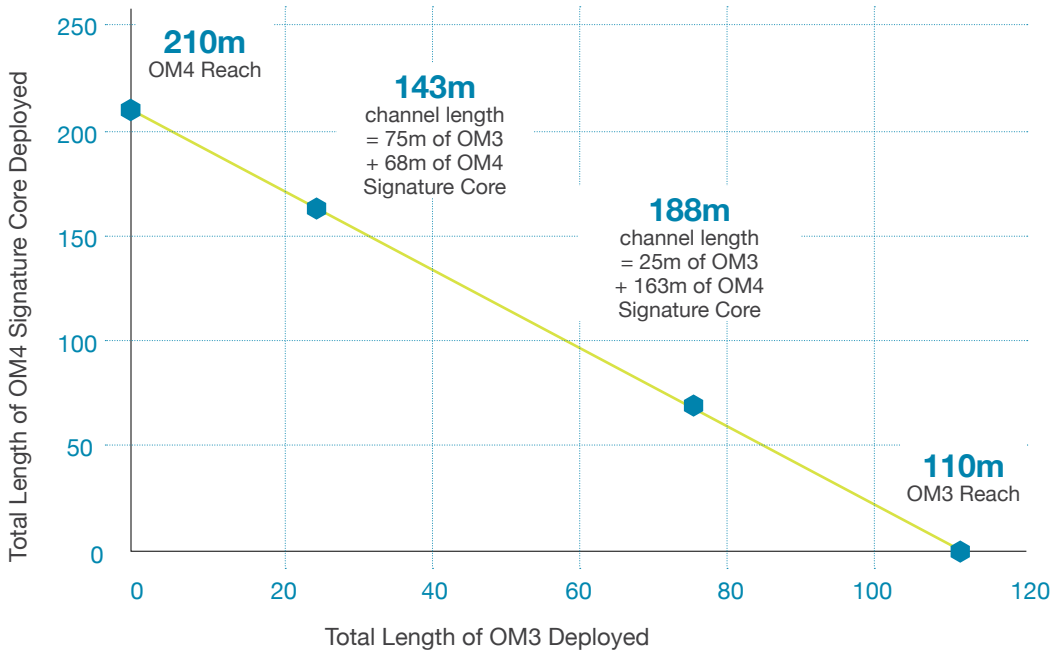
- Any expectation of longer reach with standards defined OM5 and OM5 Signature Core Cabling versus OM4 Signature Core Cabling does not hold true
- The modal bandwidth of OM4 Signature Core Cabling at 850nm is superior to the modal bandwidth of both OM5 and OM5+ solutions (Table 2)

# Push the Reach of Legacy Channels

Deploying the Signature Core™ Fiber Optic Cabling Systems is fast, easy and straight forward. Some applications may need to use a Signature Core Solution in conjunction with existing standard OM3 or OM4 multimode fibers and, in many cases, can serve to extend the useful life of the lower bandwidth cable plant.

## Mixture of OM3 and OM4 Signature Core™ Cabling for 40G BiDi

at 1.0dB of Total Connector Loss



Mixing OM4 and OM5 Signature Core Cabling with standard OM3 or OM4 fiber will push the channel reach beyond that of a similarly constructed channel using only OM3 or OM4. The more Signature Core Fiber deployed in 'hybrid' channels, the longer the channel will be. In the two 'hybrid' scenarios shown above (25m and 75m of legacy OM3), we can extend the channel length beyond 110m (for a pure OM3 channel) for 40G BiDi to 188m and 143m, respectively.

Mixing various fiber types with different bandwidths can have a negative impact on the channel performance due to the inclusion of lower bandwidth multimode fiber. To obtain the optimum performance with 40G BiDi optical modules (for example, Cisco 40GBASE-SR-BD), the OM4 Signature Core Fiber Optic Cabling System is the ideal choice and ensures a 210m native reach for a standards-based two connector channel.

When considering 'hybrid' channel deployment, you should:

- Make sure your standards-compliant networks deploy consistent fiber types and grades throughout individual channels (e.g., OM4 fiber)
- Remember that for some applications, it is either impractical or cost prohibitive to replace existing low bandwidth cabling with higher performing options



# Fiber Future and Beyond

## The Signature Core™ Fiber Optic Cabling Systems

The addition of the OM5 Signature Core Fiber Optic Cabling System is just one example of how high data rates can be supported using advanced multimode fiber technology. The OM4 Signature Core Fiber Optic Cabling System will continue to



be highly relevant in terms of supporting higher data transmission rate applications that are using both 850nm and multiple wavelengths. OM5 Signature Core Fiber Optic Cabling goes further to extend reach beyond minimum standards-based OM5 fiber, thus providing the ultimate reach performance for many SWDM applications. These future-focused fiber solutions are:

- Highly agile and scalable to simplify migration efforts
- Superior in channel reliability/headroom
- Designed to be extremely flexible for ease of deployment (deploy with many connectors in the channel)
- Highly stable maintaining signal integrity beyond 10/40/100 Gb/s Ethernet and 8/16 Gb/s Fibre Channel standards requirements
- Profound in generating results reducing latency and improving throughput by conquering Packet Error Rate challenges

Careful consideration must be made in terms of return on investment to determine which fiber grade provides 'best value' as a transmission medium to support both current and future needs of your physical layer infrastructure. Specifying the latest multimode fiber grade (OM5) is no longer a guarantee of best performance or best value. The ultimate multimode fiber grade selection is now more application dependent than ever before. Consult Panduit as your trusted advisor for more information.

Since 1955, Panduit's culture of curiosity and passion for problem solving have enabled more meaningful connections between companies' business goals and their marketplace success. Panduit creates leading-edge physical, electrical, and network infrastructure solutions for enterprise-wide environments, from the data center to the telecom room, from the desktop to the plant floor. Headquartered in Tinley Park, IL, USA and operating in 112 global locations, Panduit's proven reputation for quality and technology leadership, coupled with a robust partner ecosystem, help support, sustain, and empower business growth in a connected world.

For more information

**[www.panduit.com/signature-core](http://www.panduit.com/signature-core)**

Contact Panduit North America Customer Service by email: [cs@panduit.com](mailto:cs@panduit.com) or by phone: 800.777.3300

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PANDUIT US/CANADA  
Phone: 800.777.3300

PANDUIT EUROPE LTD.  
London, UK  
[cs-emea@panduit.com](mailto:cs-emea@panduit.com)  
Phone: 44.20.8601.7200

PANDUIT SINGAPORE PTE. LTD.  
Republic of Singapore  
[cs-ap@panduit.com](mailto:cs-ap@panduit.com)  
Phone: 65.6305.7575

PANDUIT JAPAN  
Tokyo, Japan  
[cs-japan@panduit.com](mailto:cs-japan@panduit.com)  
Phone: 81.3.6863.6000

PANDUIT LATIN AMERICA  
Guadalajara, Mexico  
[cs-la@panduit.com](mailto:cs-la@panduit.com)  
Phone: 52.33.3777.6000

PANDUIT AUSTRALIA PTY. LTD.  
Victoria, Australia  
[cs-aus@panduit.com](mailto:cs-aus@panduit.com)  
Phone: 61.3.9794.9020

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