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# Moving into the data centre of the future

Thursday 19th May 2022

**Alastair Waite**

Global Data Center Market Development

# Data Center of the Future

# web 3.0

# Web 3.0 Applications

# metaverse

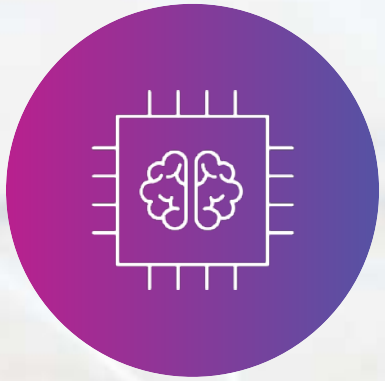
Web 3.0
Applications

# industry 4.0

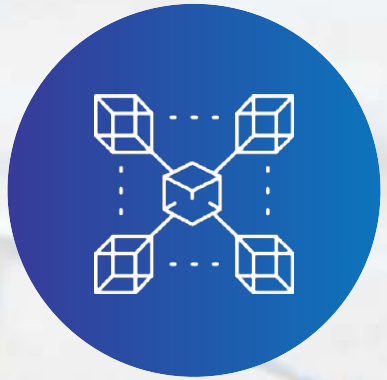
 

# Tools for web 3.0


5G



Artificial Intelligence



Blockchain

Edge Data Centers


Internet of Things

Augmented & Virtual Reality

# Data Center Structure Required


**CORE** | **MTDC** | **EDGE**

**…Living in Harmony**

CONNECTED

# What will the Data Centers require?

Network Architecture

Network Speeds

Optical Connectivity

Deployment Speed

*SPEED*

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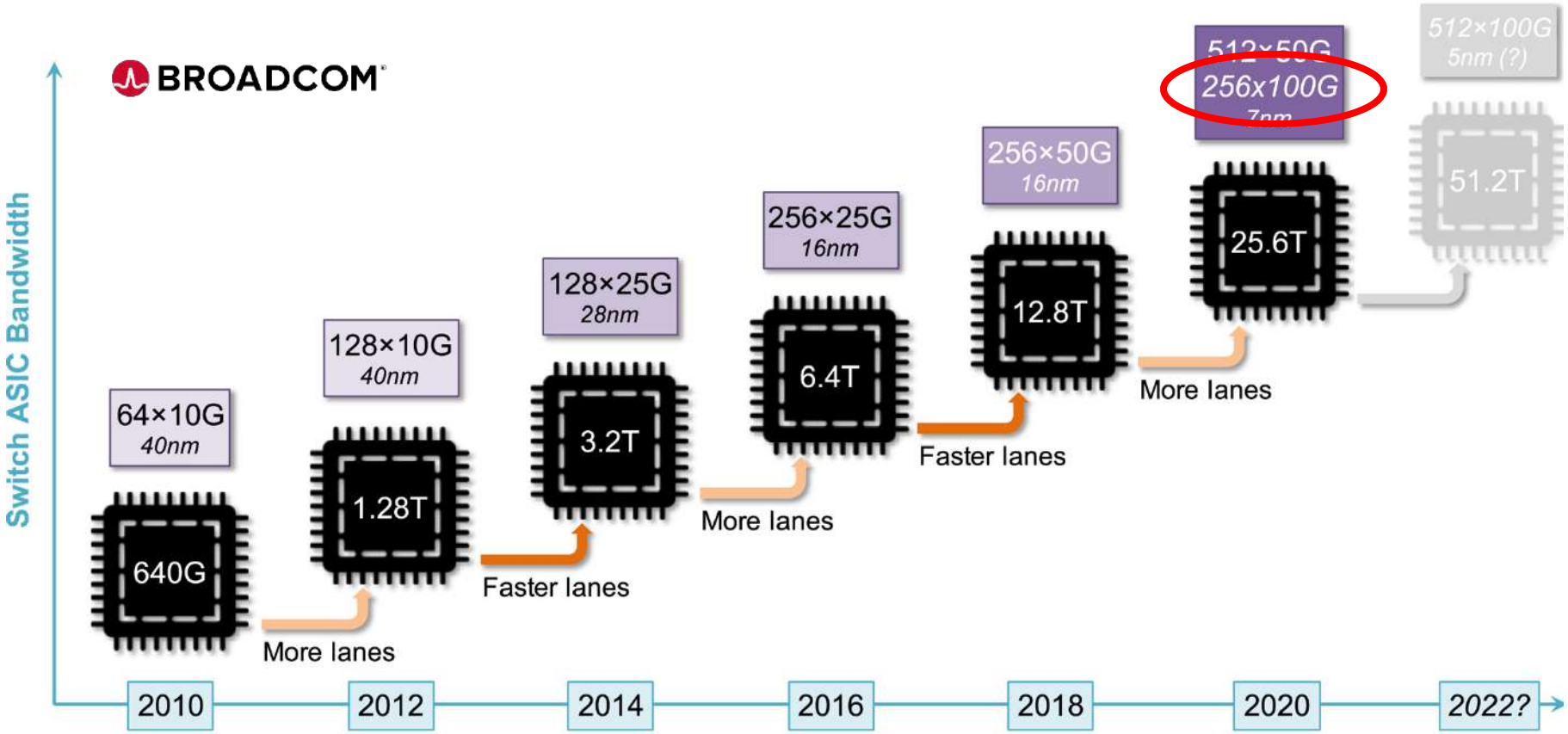
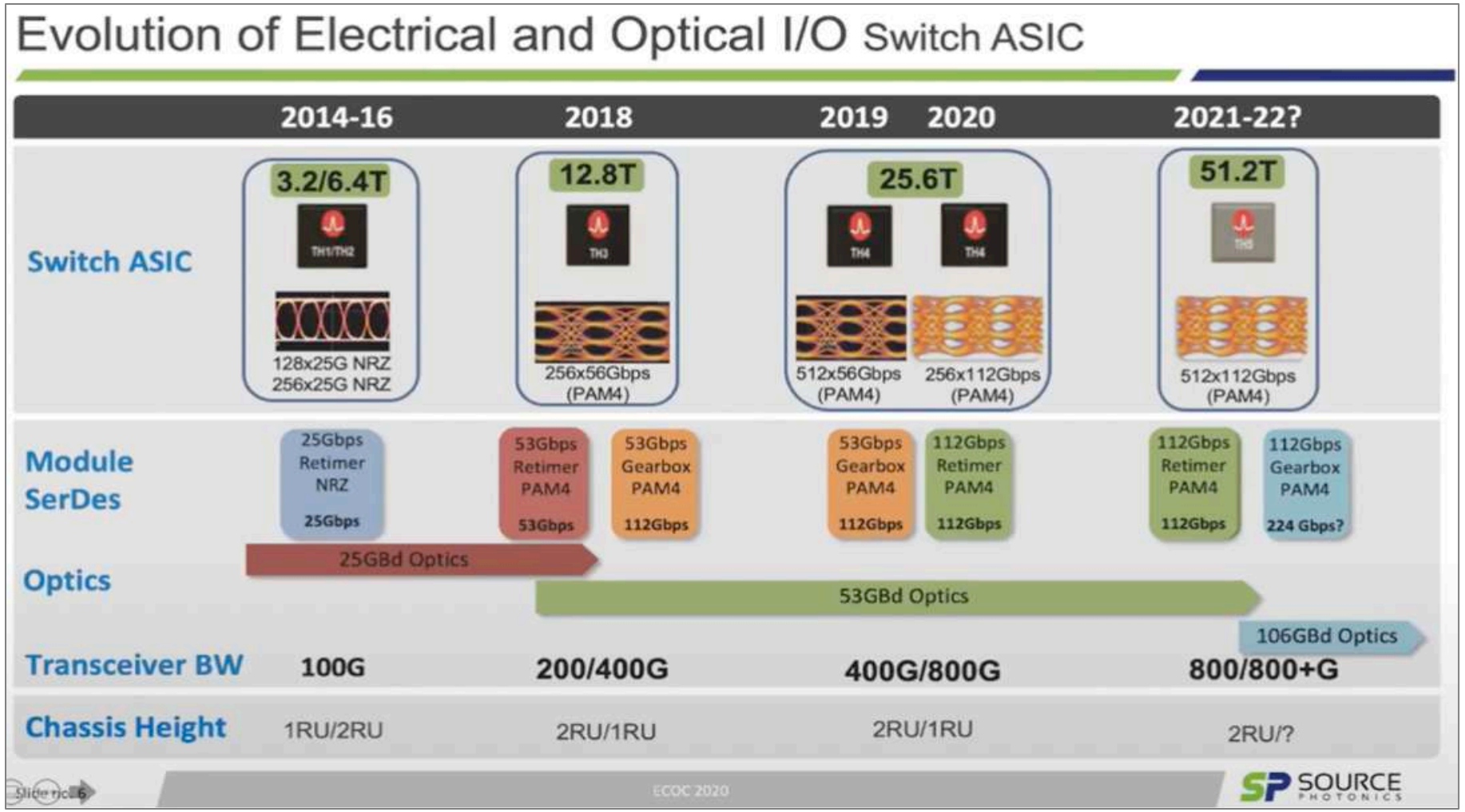
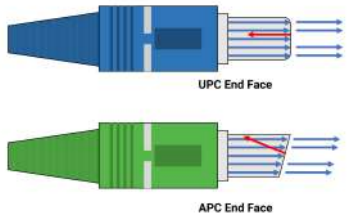
# Rate of Technology Change

## *Outpacing Moore's Law*






**PAM-4 can be more sesnsitive to reflected optical “noise”**

**Hyperscale industry examining APC connectivity for MMF**

# 100, 400 and 800 GbE

# Rate of Technology Change

## *Outpacing Moore's Law*

**Disruptive Improvements in Cost, Power, and Complexity**

**REDUCTION IN LINKS**

- Cooler-running networks
- Less switch-to-switch links required

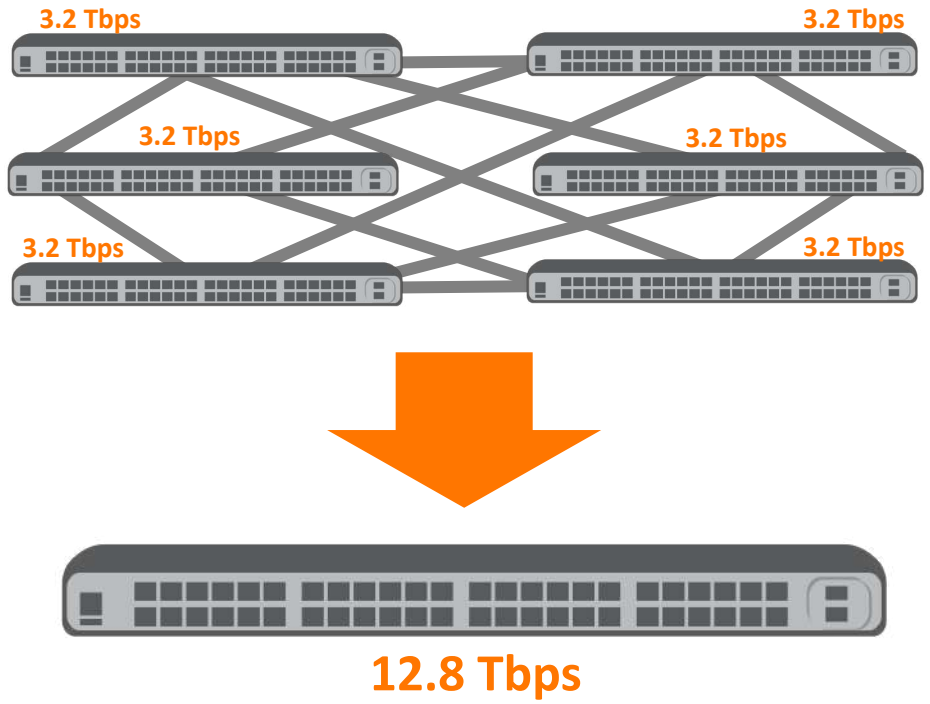
**REDUCTION IN POWER**

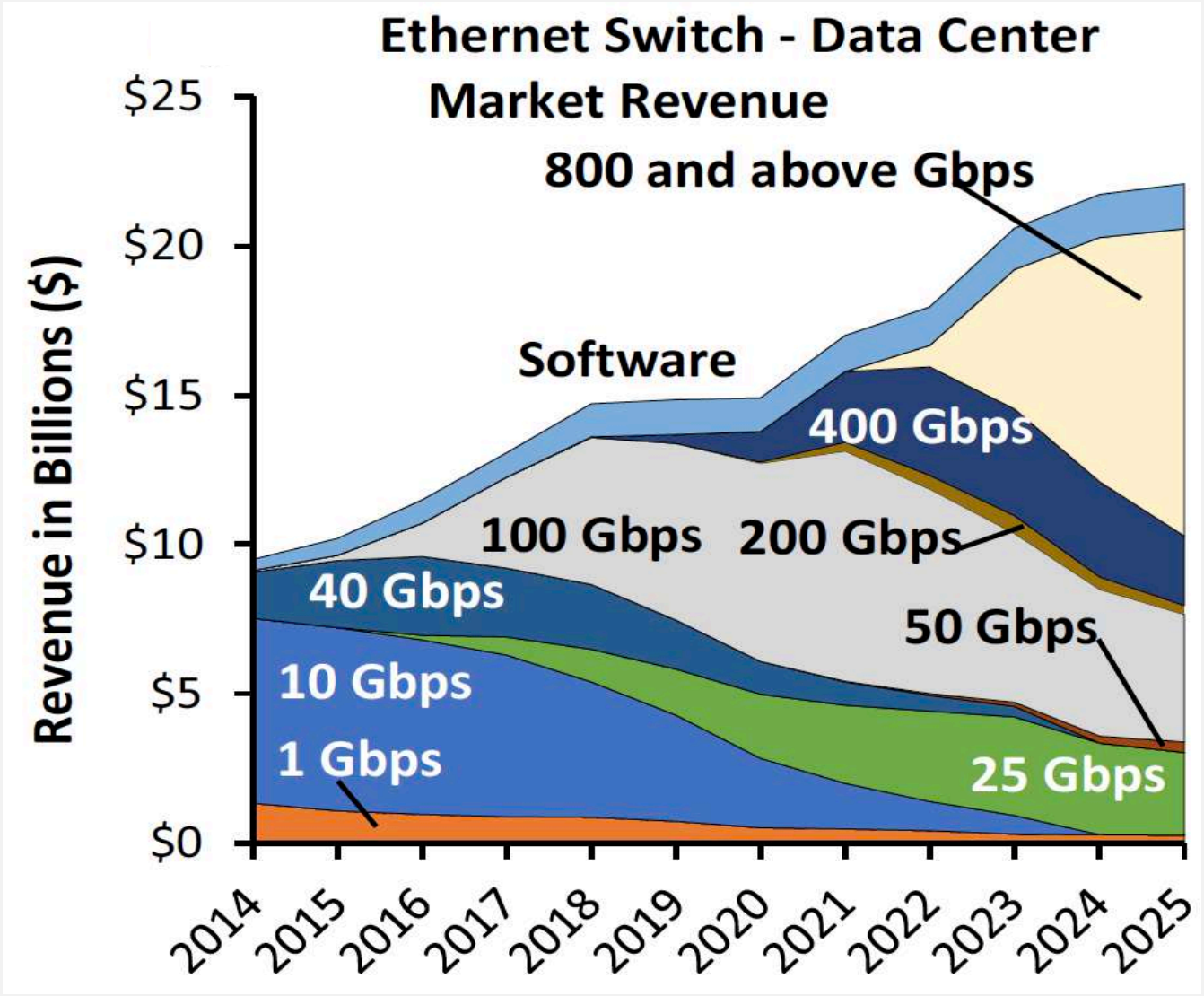
- Power per solution lower
- Lower power per Gb of bandwidth

**REDUCTION IN COST**

- Switch list price saving in excess of $40K
- Additional Cable/Fiber savings

Source: 650 Group (2022)






Source: 650 Group (2022)

# Evolving Data Rates – 800/400/100 Will Dominate

MM Duplex < > MM Parallel

| | 50m | 100m | 150m | 500m | 2,000m | 10,000m | 40,000m |
|---|---|---|---|---|---|---|---|
| 1.6T | | | | DR8 (2025) | TBD (2025) | | |
| 800G | | | | | TBD (2025) | | |
| | | | | DR4 (2025) | TBD (2025) | | |
| | VR8 (2025) | SR8 (2025) | | DR8 (2025) | FR4 (2025) | TBD (2025) | TBD (2025) |
| 400G | VR4 (2022) | SR4 (2022) | | | | | |
| | | SR4.2 | SR4.2 (OM5) | | | | |
| | | SR8 | | DR (2025) | | | |
| | | SR16 | | DR4 | FR8 | | |
| 200G | VR2 (2022) | SR2 (2022) | | DR (2025) | | | |
| | | SR4 | | DR4 | TBD (2025) | | |
| 100G | VR (2022) | SR (2022) | | | | | |
| | | SR2 | | | | | |
| | | SR4 | | | | | |
| | | SR10 | | DR | | LR4 | ER4 |
| 50G | | SR | | | FR | LR | |
| 40G | | | SR4 | | FR | LR4 | ER4 |
| 25G | | SR | | | | | |

SM Duplex < > SM Parallel

# IEEE 802.3 Ethernet Standards – PMDs and reaches

MM Duplex < > MM Parallel

| | 50m | 100m | 150m | 500m | 2,000m | 10,000m | 40,000m |
|---|---|---|---|---|---|---|---|
| 1.6T | | | | 16 | 16 | | |
| 800G | | | | | 16 | | |
| | | | | 8 | 8 | | |
| | 16 | 16 | | 16 | 2 | 2 | 2 |
| 400G | 8 | 8 | | | | | |
| | | 8 | 8 (OM5) | | | | |
| | | 16 | | 2 | | | |
| | | 32 | | 8 | 2 | | |
| 200G | 4 | 4 | | 2 | | | |
| | | 8 | | 8 | 2 | | |
| 100G | 2 | 2 | | | | | |
| | | 4 | | | | | |
| | | 8 | | | | | |
| | | 20 | | 2 | | 2 | 2 |
| 50G | | 2 | | | 2 | 2 | |
| 40G | | | 8 | | 2 | 2 | 2 |
| 25G | | 2 | | | | | |

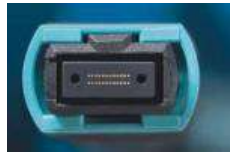
SM Duplex < > SM Parallel

LC Duplex



MDC® Connector


MPO 8-12 MPO16



MPO24

# IEEE 802.3 Ethernet Standards – Number of fibers per link

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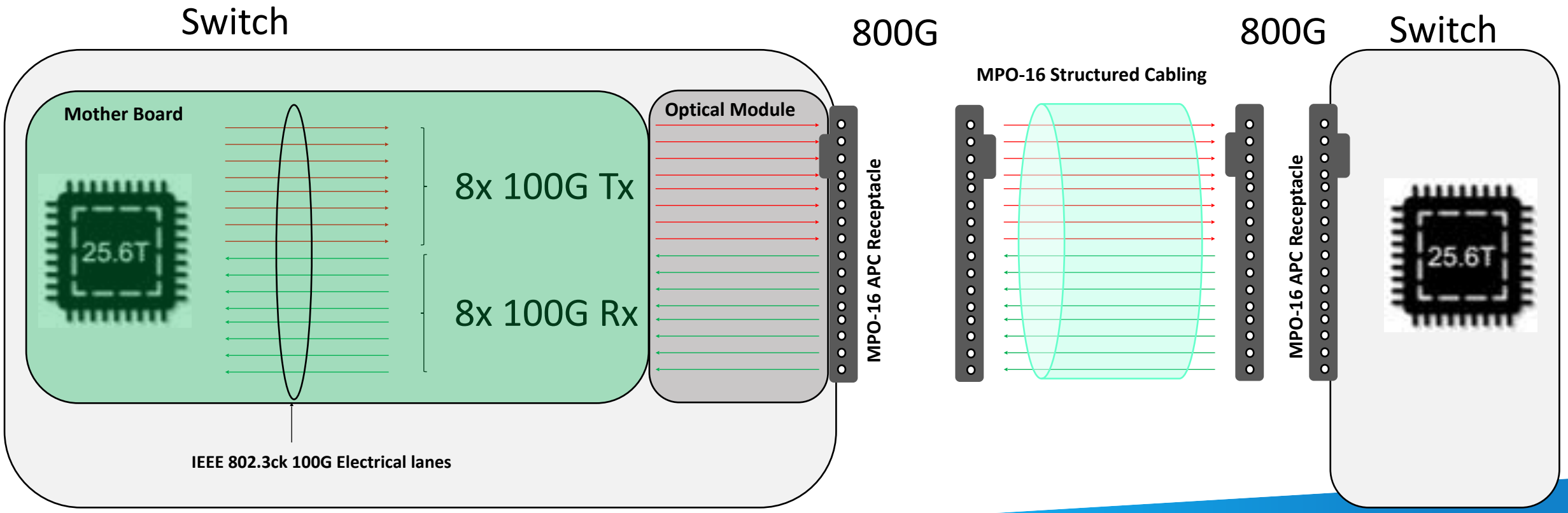
# 800G Native Link



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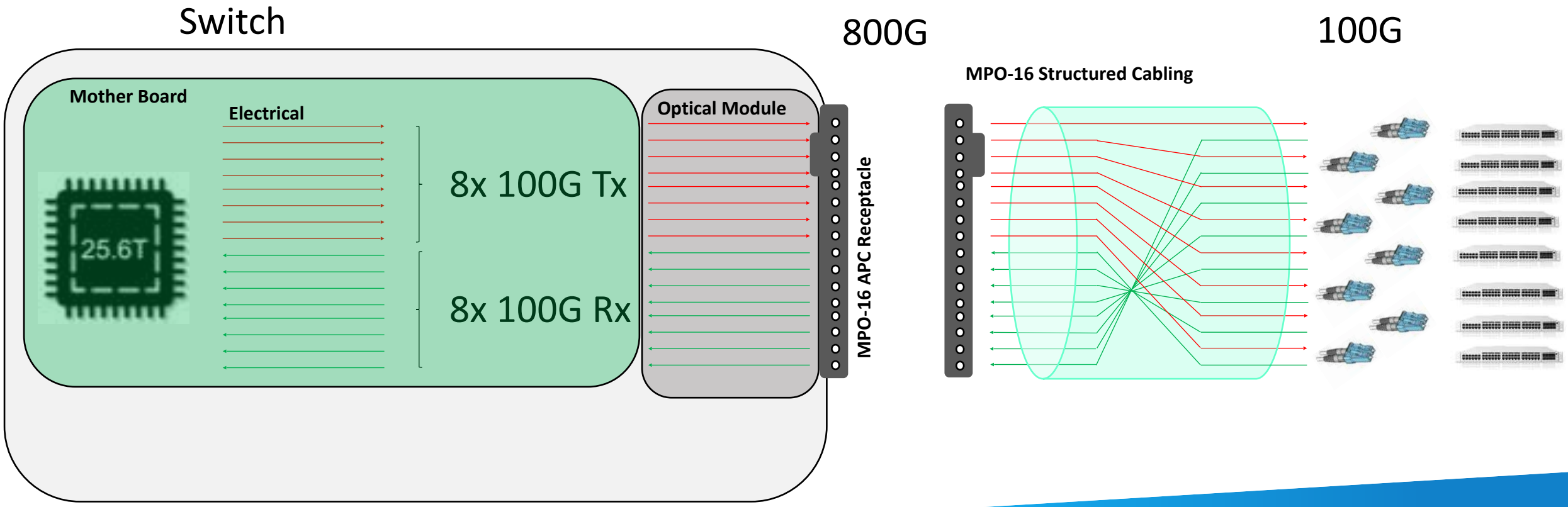
# 800G To 8x 100G Switch Port Break Out



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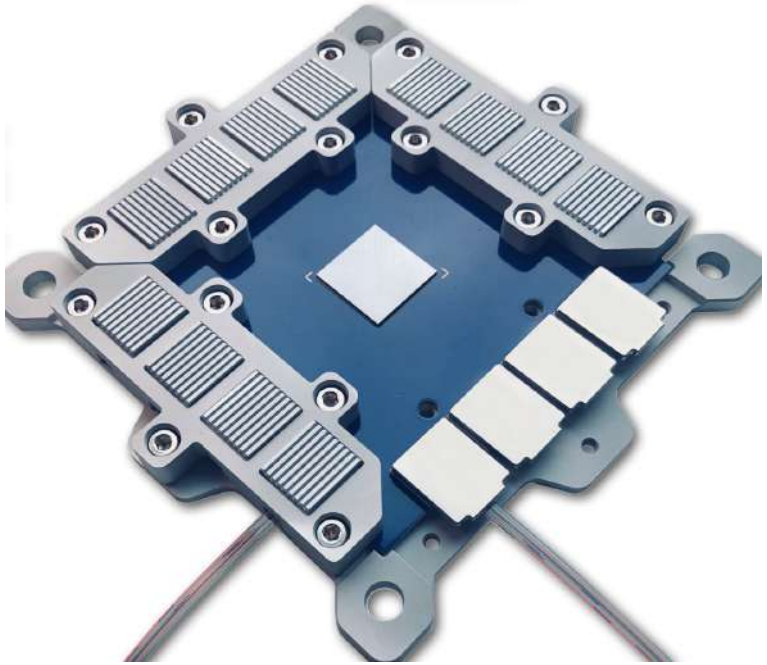
# 1.6 and 3.2 Terabit



**CPO**

**IEEE Beyond 400 Gb/s Study Group 1.6 Tb objectives**

- 100 Gb/s lanes over singlemode and multimode (WDM and parallel optics)

**MSAs are working on 16-lane pluggable transceivers**

- OSFP-XD – Maintains pluggable transceiver preference and ecosystem
- Power consumption is a big concern

**Co-packaged optics (CPO) are also in development**

- Switch assembly surrounded by multiple optics assemblies
- Brings optics closer to the switch chip to reduce power by up to 30%
- Potential for cost savings and provides a path to 3.2 Tb
- Must overcome industry preference for pluggable transceivers

**A 200 Gb/s PAM4 bit rate will reduce the number of lanes and cost**

- Will be extremely challenging and further impact SNR and require shorter distances
- Could eventually enable 4-lane 800 Gig, 8-lane 1.6 Terabit, and 16-lane 3.2 Terabit

## Waves of Speed Migrations

400G Port

400GBase-SR8 (8x50G)

400G

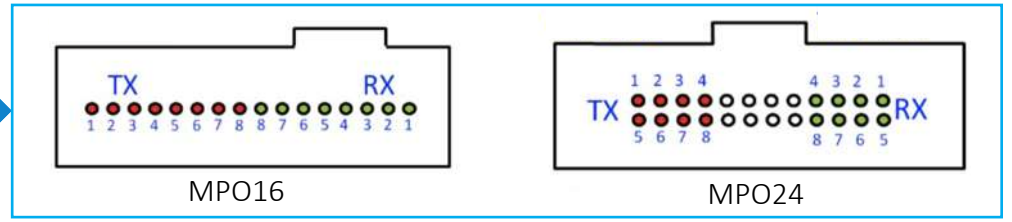
400GBase-DR4 (4x100G)
400GBase-SR4.2 (4 x 2x50G)

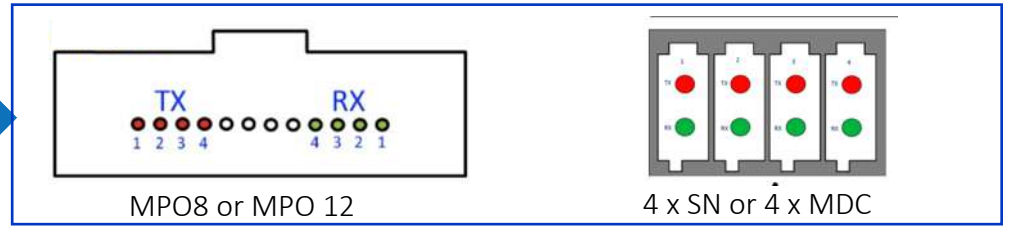
800G Port = 8x100G Lanes

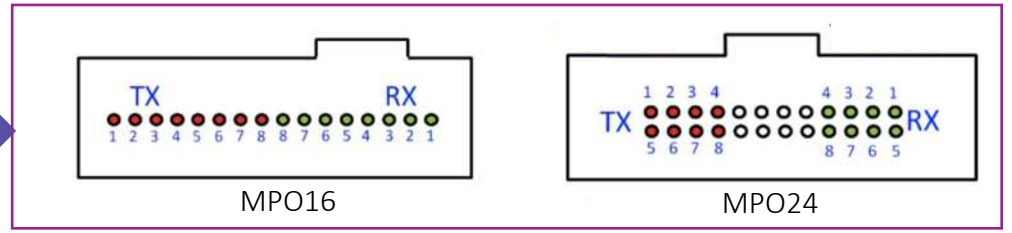
800GBase-DR8
800GBase-SR8

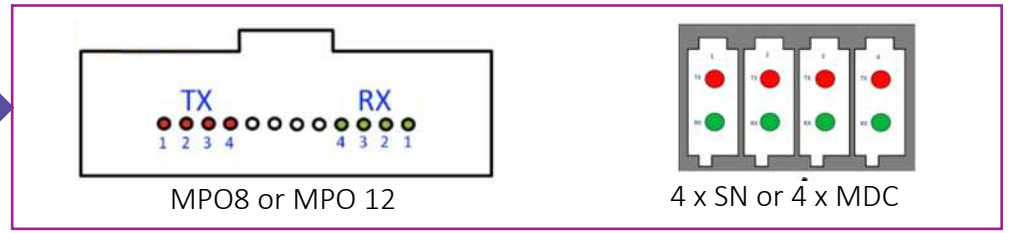
800G Port = 4x200G Lanes

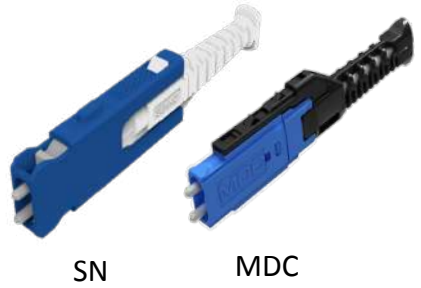
## Connectivity Needs to Support

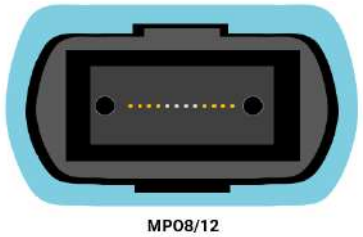


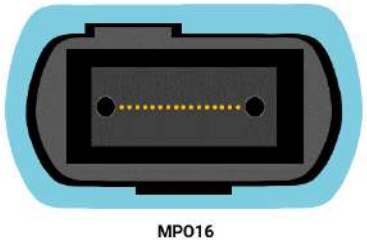




# SERDES Speeds Will Drive Future Connectivity Needs

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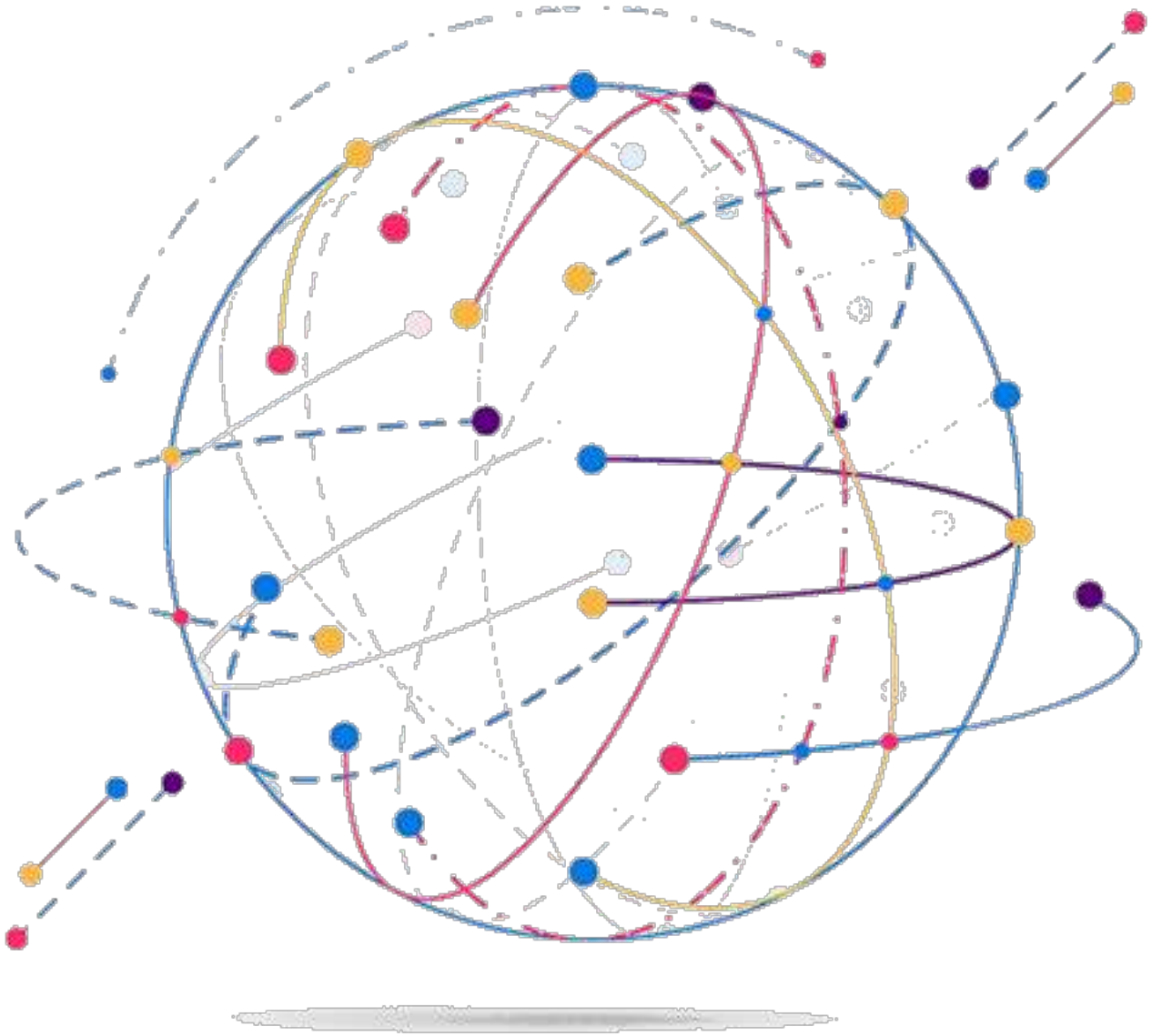
# Time to Market is key

- Speed of Deployment
- Reduce Total Cost of Ownership
- Reduce onsite product installation
- Build or upgrade 20+ global sites at the same time
- Sustainability



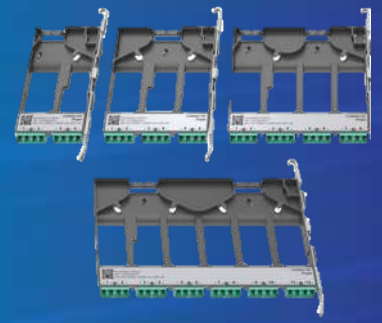
# Propel™

**Panels**

- 1U, 2U, & 4U sliding
- 72 duplex LC/MPO per RU
- 144 SN per RU

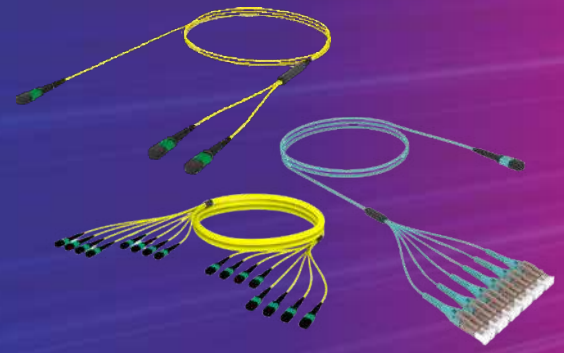
**Modules**

- MM: LC, MPO8/12/16/24
- SM: LC, SN, MPO8/12/16



**Adapter Packs**

- LC, SN, MPO



**Cable Assembly**

- MPO8, MPO12, MPO16, MPO24 (MM only), SN, and LC Uniboot cable assemblies

Propel™

# Leading with fiber in the enterprise

Most efficient multipair building block for trunk applications

End-to-end APC multimode or singlemode provides application insurance benefits compared to UPC

Enable cost effective backbone switch/breakouts

Supports migrations whether duplex or multipair 4, 8, or 16 fibers; multimode & singlemode

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# Thank you!

Alastair Waite

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