



# High Speed Migration

## 100G & Beyond

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# BANDWIDTH GROWTH

Mobile Data



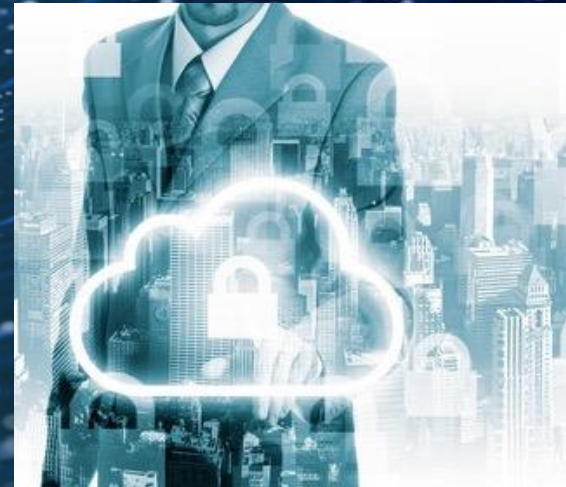
CAGR: 50%+

IP Video



CAGR: 35%+

Global Cloud IP Traffic



CAGR: 30%+

Global IP Traffic



CAGR: 20%+

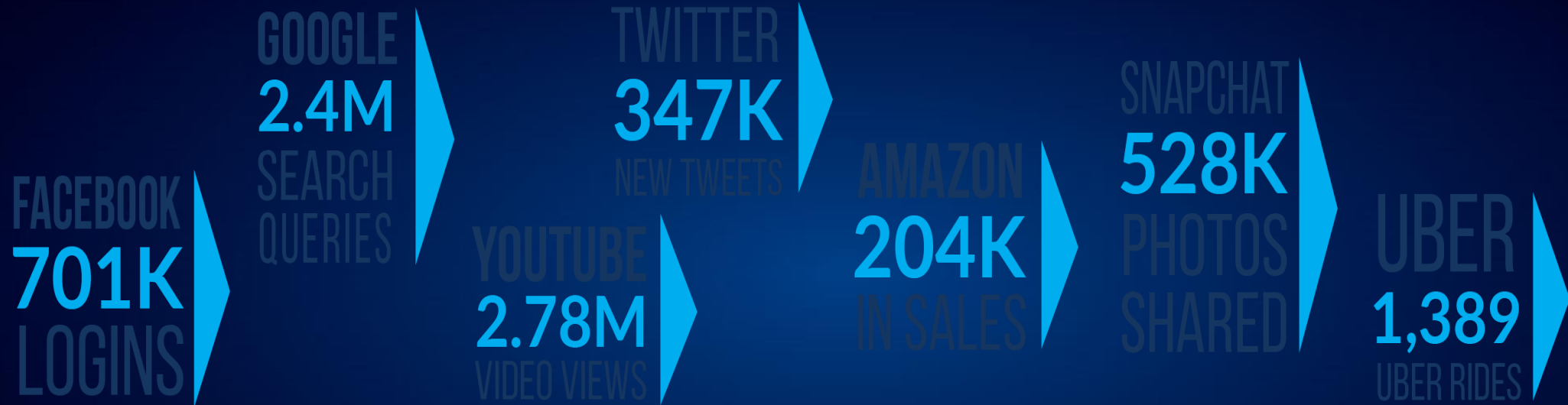
Source: CISCO

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& AFRICA



# The reality—

*2016: What happens in an internet minute?*



ONE INTERNET MINUTE

# The challenge

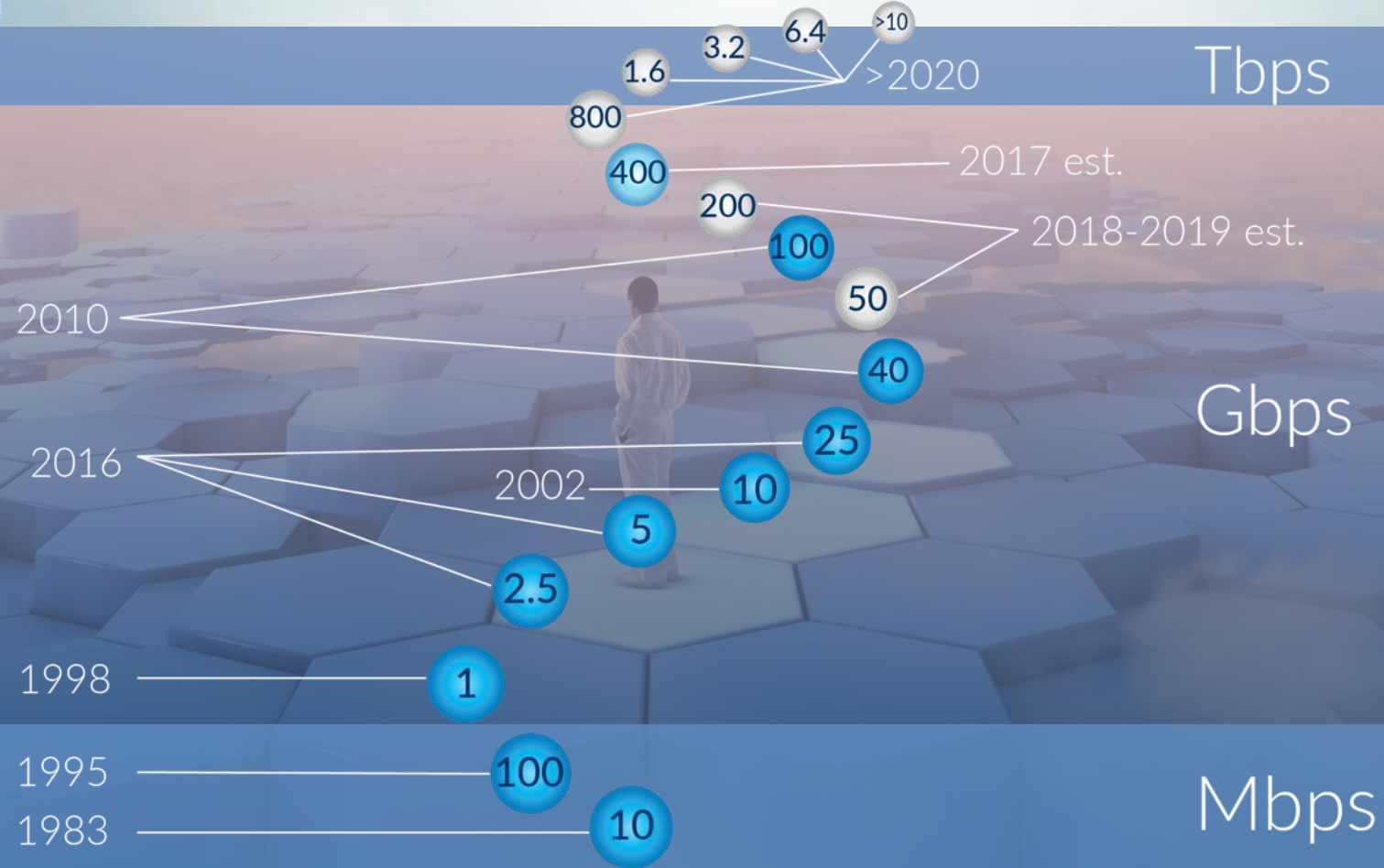
## **Adapt your data center infrastructure in order to:**

- Increase equipment port count and fiber density
- Support faster lane capacities
- Reduce latency
- Prepare to migrate to higher speeds



# A roadmap exists...

*...but the path forward is anything but straight*



● Ethernet speed

● Speed in development

● Possible future speed



# Ethernet Roadmap and Transmission Initial Standards (2010)

Parallel



40GBASE-SR4

100GBASE-SR10

10GBASE-SR  
10GBASE-LRM  
10GBASE-LX4

Duplex



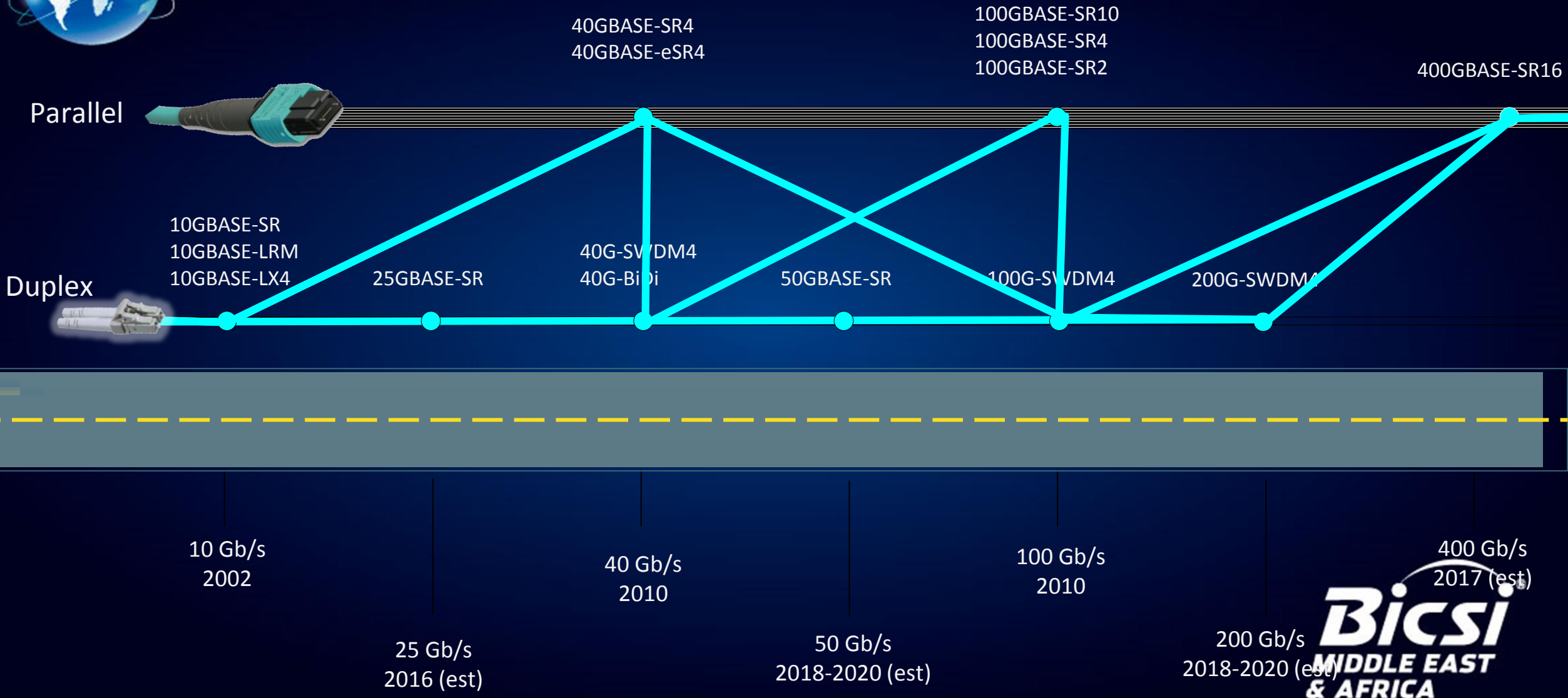
10 Gb/s  
2002

40 Gb/s  
2010

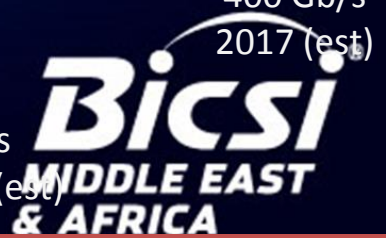
100 Gb/s  
2010



# Ethernet Roadmap and Transmission Future - SWDM



Many options for moving between duplex and parallel



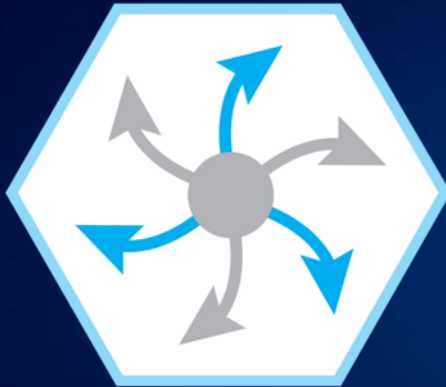
# Which way?

- 8-fiber, 12-fiber, 24-fiber...which MPO?
- 25G/50G is in—40G is ?
- Optics: duplex, parallel or both?
- WBMMPF, a game changer

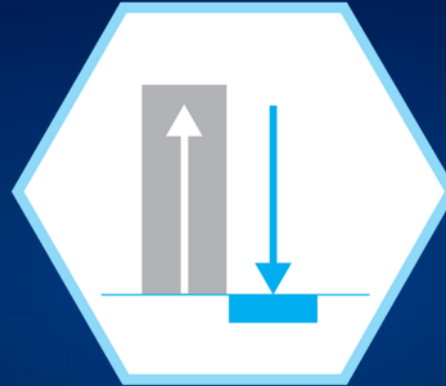




Your network infrastructure must be:



Agile & Flexible



High Density & Ultra-Low  
Loss



Cloud Friendly

# Agile, flexible and future ready

- ***Respond to sudden and unexpected changes*** with easy to use panels, modules, fiber and connectors
- ***Support emerging applications with optimal fiber configuration*** with a complete portfolio of single and multimode fiber and connector options for all major MPO fiber configurations

MPO-24

MPO-8

MPO-12

# Higher speeds - minimal redesign

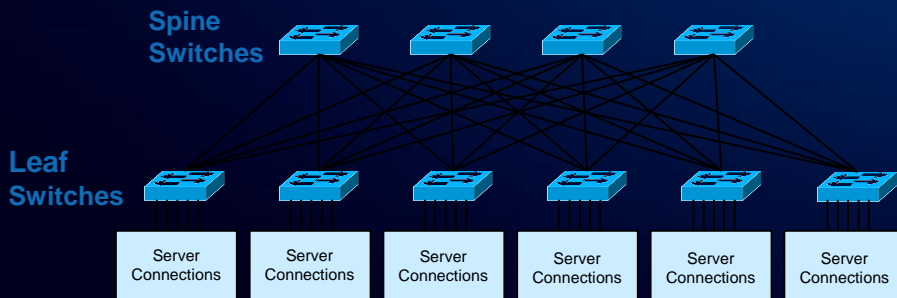
- ***Evolve at your own speed with singlemode or multimode optics***—modular components support 25-, 40-, 50-, 100-, 400 Gbps and beyond
- ***Support advanced, attenuation-sensitive technologies***—end-to-end links with multimode ultra-low-loss fiber solutions
- ***Increase scalability***— OM5 WideBand (MMF) quadruples capacity while maintaining legacy duplex multimode fiber architectures





# Higher density - easier management and lower costs

- **Support the fiber and equipment port density required** for leaf-and-spine networks with high- and ultra-high density fiber panels that keep link connections accessible and manageable
- **Reduce the time, cost and risk of moves, adds, and changes** with pre-terminated connectivity and plug-and-play installation







# Blueprint for a long-term migration strategy

Create an agile, manageable and fiber-dense infrastructure that can support higher-speed applications and technologies as they continue to evolve—scaling easily with minimal disruption.



# HIGH-SPEED MIGRATION COMPONENTS

Fiber panels, cables and connectors

- **High-density (HD): 48 duplex LC or 32 MPO ports per RU**
- **Ultra-high density (UD): 72 duplex LC or 48 MPO ports per RU**
  - Both support singlemode, OM4 and OM5 multimode
  - G2 compatible modules and adapter packs
- **OM5 WideBand multimode:** Enables shortwave division multiplexing and increases capacity by a factor of four
- **Ultra-low loss pre-terminated cable:** Supports longer link spans and the infrastructure design needed for guaranteed operational availability
- **G.657.A2 singlemode:** Delivers lowest bend losses—for macro- as well as micro-bending
- **Wide range of MPO configurations:** 8-, 12- and 24-fiber
- 24-fiber MPO ensures lowest “first cost” duplex deployment



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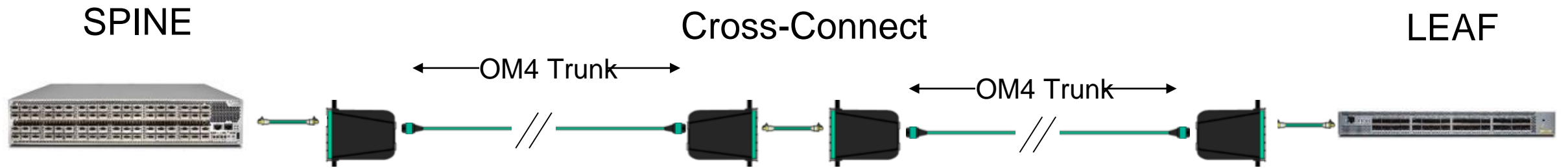
*Automated Intelligent Management*

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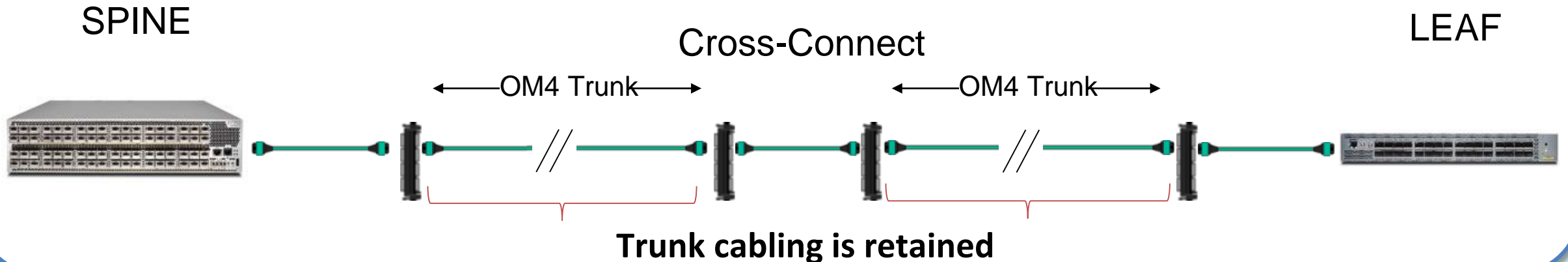


# Example Migration from Duplex to Parallel – OM4

## 10GBASE-SR – 2 fibres



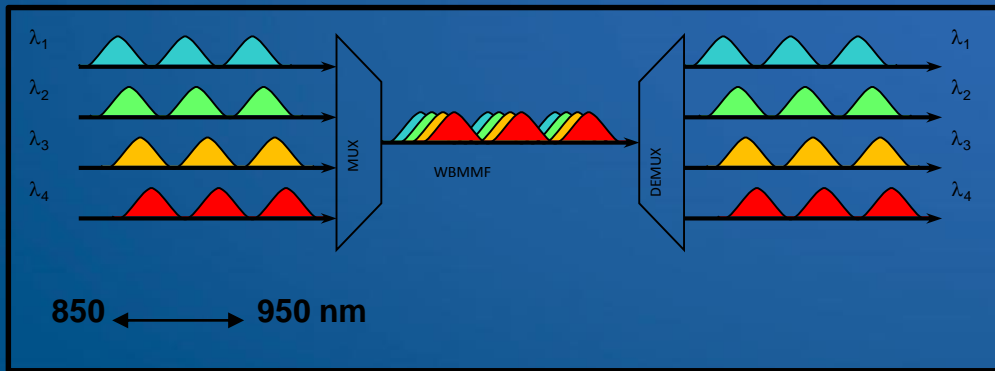
## 100GBASE-SR4 – 8 fibres



# Multimode Fiber Evolution OM5 – Wave Division Multiplexing



- Multiple wavelengths reduce # of fibers
- Need sufficient BW over spectrum
  - 4 wavelengths over a single fibre
  - 25nm spacing for low-cost WDM



40G

100G

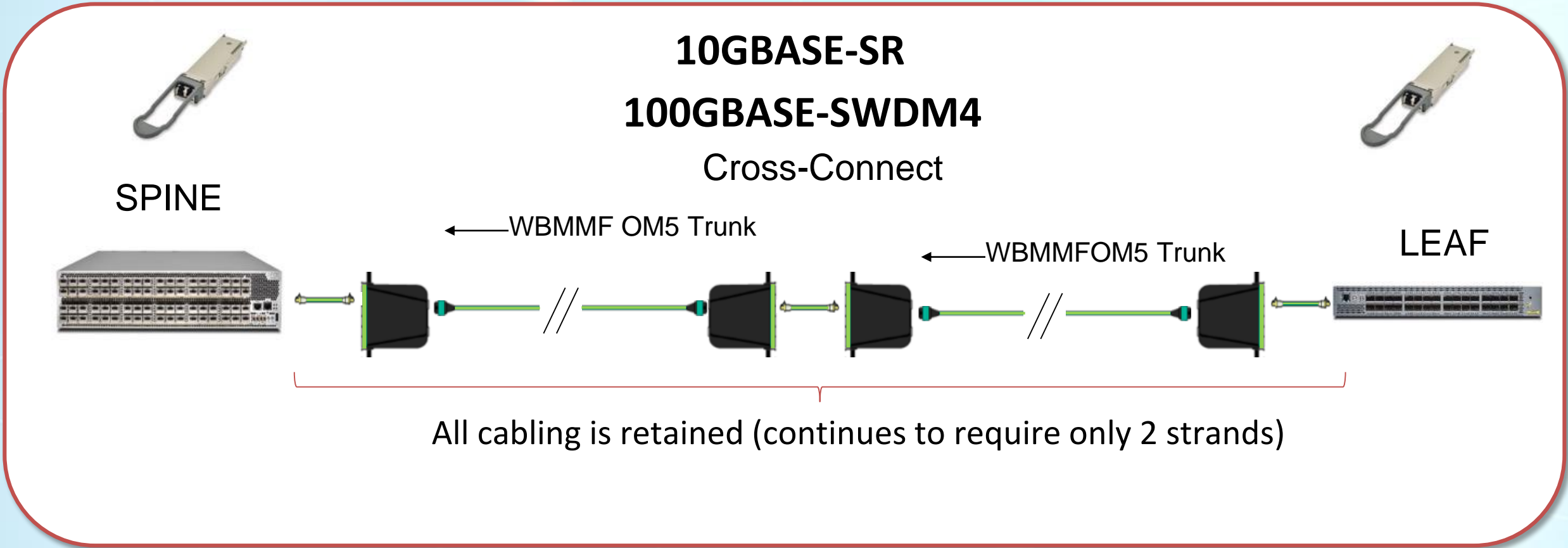
400G

SPEED	10G Parallel		25G Parallel		25G Parallel w/ WDM	
	TX	RX	TX	RX	TX	RX
40G			N/A	N/A		
100G						
400G	N/A					





# Migration from 10G to 100G with SWDM and WBMMF OM5





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