

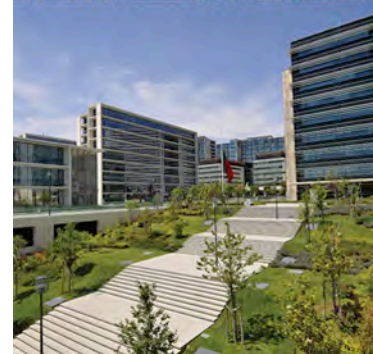
CORNING

Optical Trends in the Data Center

Romeo Lazar

Sales Manager, Eastern Europe
Corning Optical Communications EMEA

September 2016



Agenda

- Agenda
- Corning overview
- Data Center Server and Switch Trends
- Standards Trends
- EDGE8 Cabling System for Datacenters
- Passive Network Monitoring with Optical Taps
- New Products From Corning
 - New Multimode Fiber
 - High Fiber Count Trunks
 - High Density Fiber Frame
- Summary

Corning Incorporated

Founded:

1851

Headquarters:

Corning, New York

Employees:

34,800 worldwide

2015 Sales:

9,8 billion

Fortune 500 Rank (June 2015):

297

- Corning is one of the world's leading innovators in materials science. For more than 160 years, Corning has applied its unparalleled expertise in specialty glass, ceramics, and optical physics to develop products that have created new industries and transformed people's lives.
- Corning succeeds through sustained investment in R&D, a unique combination of material and process innovation, and close collaboration with customers to solve tough technology challenges.



Corning Market Segments and Additional Operations

 Display Technology	 Optical Communications	 Environmental Technologies	 Life Sciences	 Specialty Materials	 Other Products and Services
• LCD Glass Substrates • Glass Substrates for OLED and high-performance LCD platforms	• Optical Fiber and Cable • Optical Connectivity Solutions • Wireless Distributed Antenna Systems • Optical Cables for Consumer Networks • Copper Connectivity Components	• Emissions Control Products – Light-duty gasoline vehicles – Light-duty and heavy-duty on-road diesel vehicles – Heavy-duty non-road diesel vehicles – Stationary	• Cell Culture and Bioprocess • Drug Discovery • ADME/Tox • Genomics • Chemistry • Microbiology • General Laboratory Products	• Corning® Gorilla® Glass • Display Optics and Components • Optical Materials • Optical Systems	• Emerging Innovations • Equity Companies – Cormetech, Inc. – Dow Corning Corp. – Eurokera, S.N.C. – Samsung Corning Advanced Glass, LLC (SCG)

Data Center Trends

Server and Switch Trends



High Level Server Trends

Scale UP and Scale OUT

IBM Z13
Mainframe



Clusters of 10-20k Server



Scale
UP

Scale
Out

Server - Switch Connection Speeds

Network Location	2014	2016	2018
Mega Cloud Server Access	10GE → 40 GE	40GE → 25/50 GE	25/50 GE → 50/100 GE
Tier 2/3 cloud server access	1GE→ 10GE	10GE→ 25GE	25GE→ 50GE
Enterprise server access	1GE→ 10GE	1GE→ 10GE	1GE→ 10GE

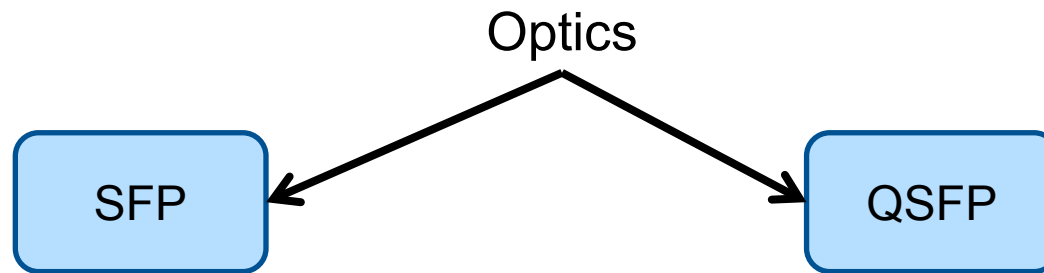
- Increasing **server** speeds drive demand for 40/100/200G **switch** uplinks



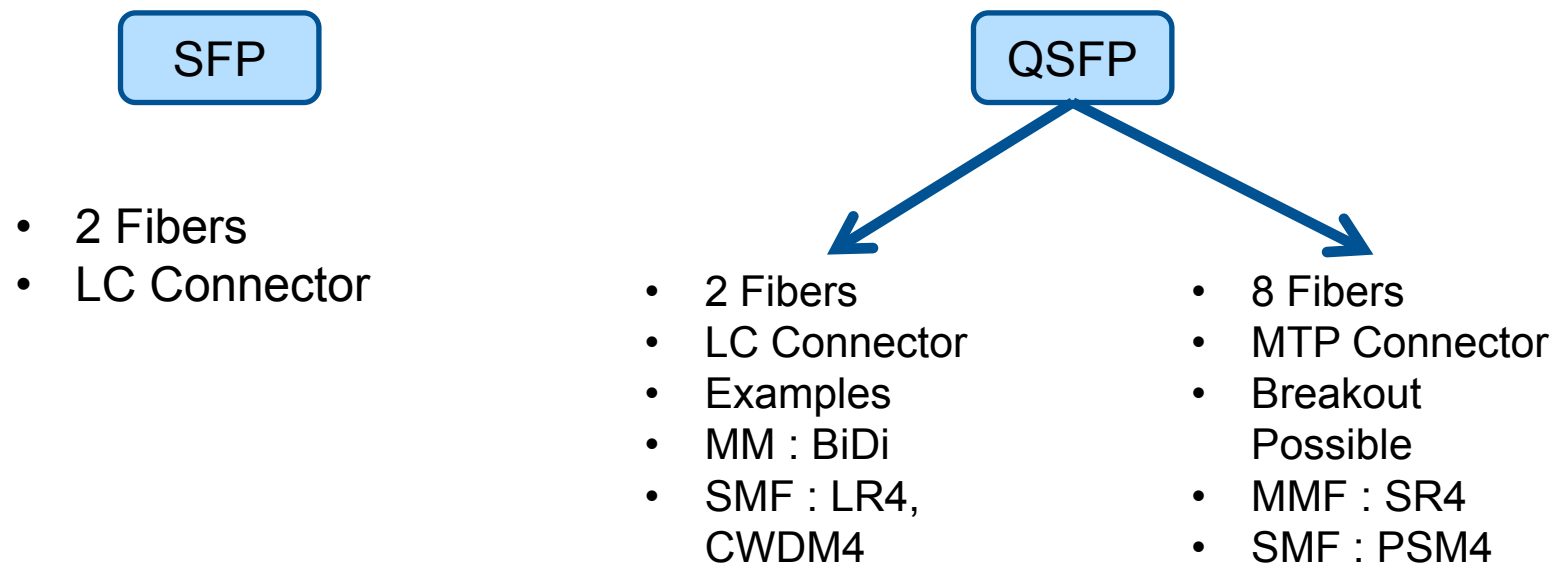
New Switches New Possibilities

Cisco Nexus 9000 portfolio 10/25/40/50/100G

Source: Cisco



Optics 2f vs. 8f



Standards Trends

Ethernet and Fiber Channel Roadmaps



Do you know these guys?



Ethernet Man

Speed	Lane Count
10 Gigabit	Duplex
25 Gigabit	Duplex
40 Gigabit	Parallel
50 Gigabit	Duplex
100 Gigabit SR10	Parallel
100 Gigabit SR4	Parallel
200 Gigabit	Parallel
400 Gigabit	Parallel



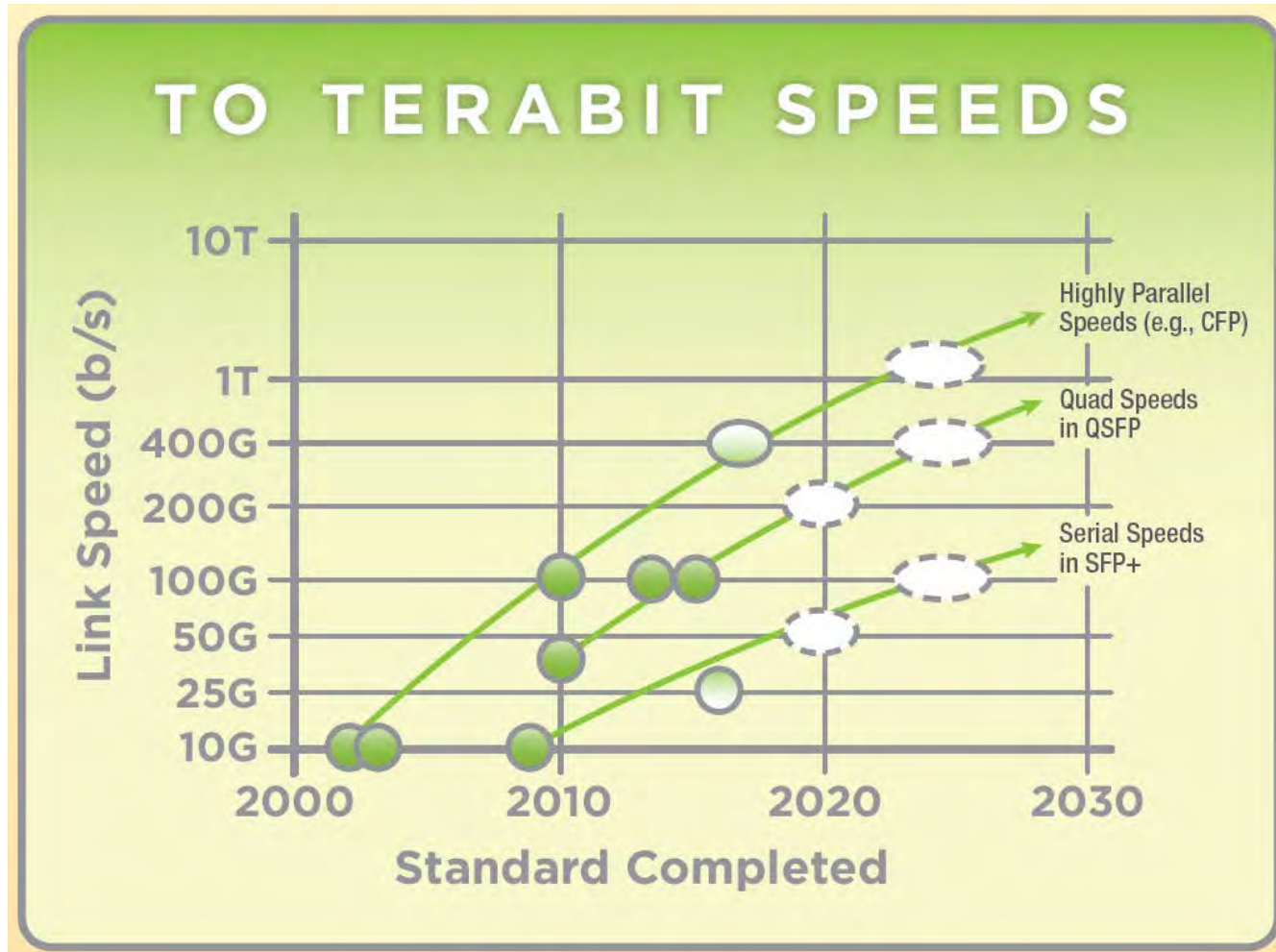
Fiber Channel Lady

Speed	Lane Count
8GFC	Duplex
16GFC	Duplex
32GFC	Duplex
128GFC	Parallel
64GFC	Duplex/Parallel
256GFC	Parallel

***Parallel Transmission is in the Roadmaps of both Ethernet and Fiber Channel.**

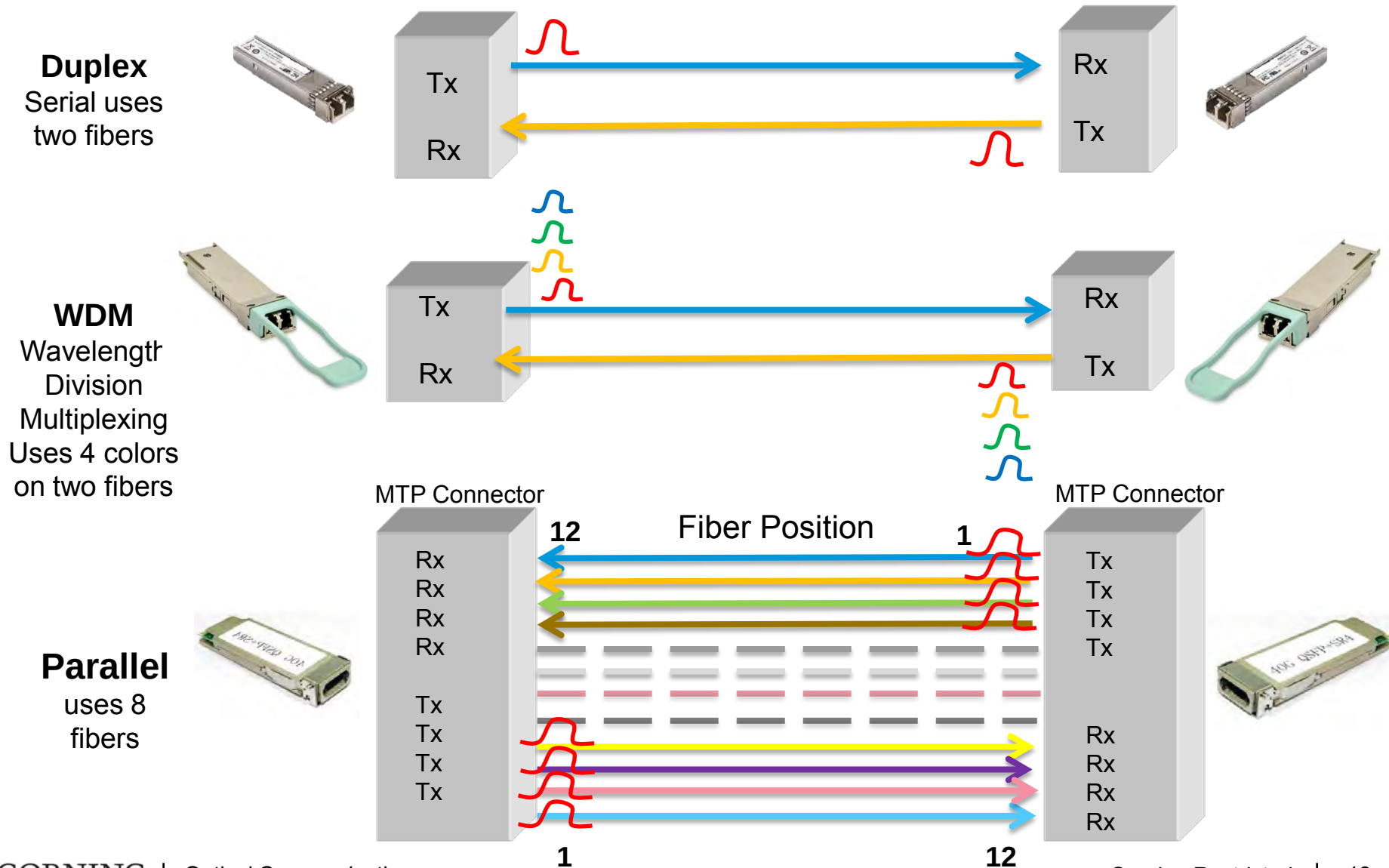
Ethernet Speed Map

We can see three different paths to get to higher speeds



Source : Ethernet Alliance

What does Serial vs. WDM vs. Parallel Transmission look like?



“All Roads Lead to 2F and 8F Technologies”



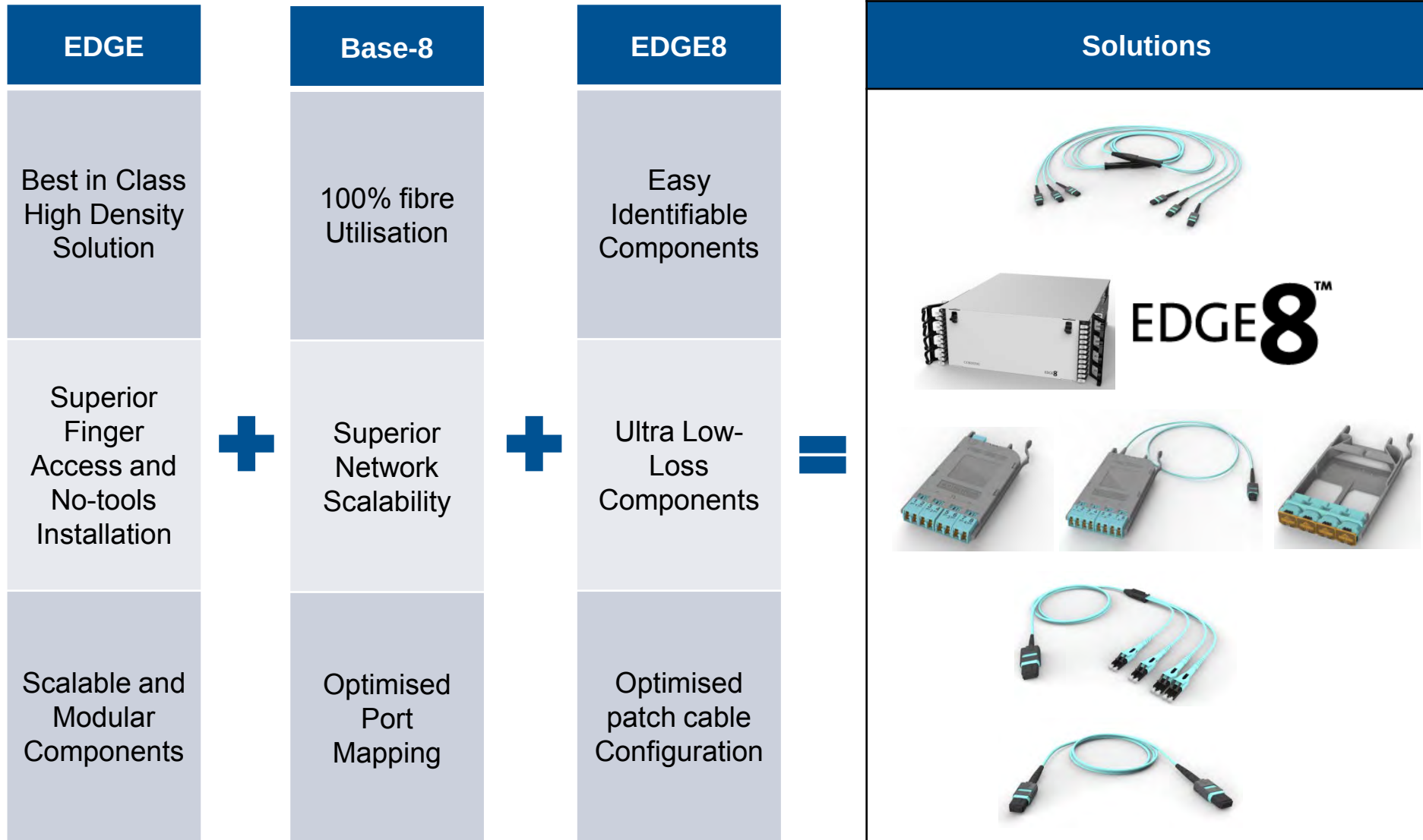
Takeaway : Transceiver technologies for both Ethernet and Fibre Channel have clear roadmaps to duplex (2f) and parallel (8f) solutions.

EDGE8 Structured Cabling System for Datacenters

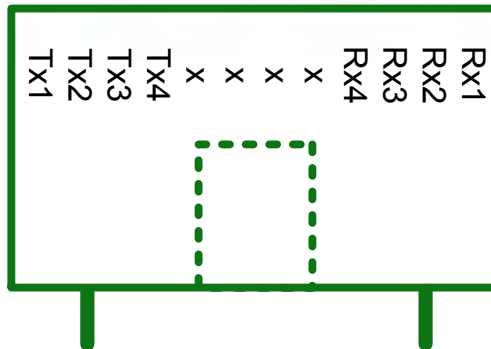


EDGE8™ Solutions

Solution Set is comprised of 3 Sets of Value Creation



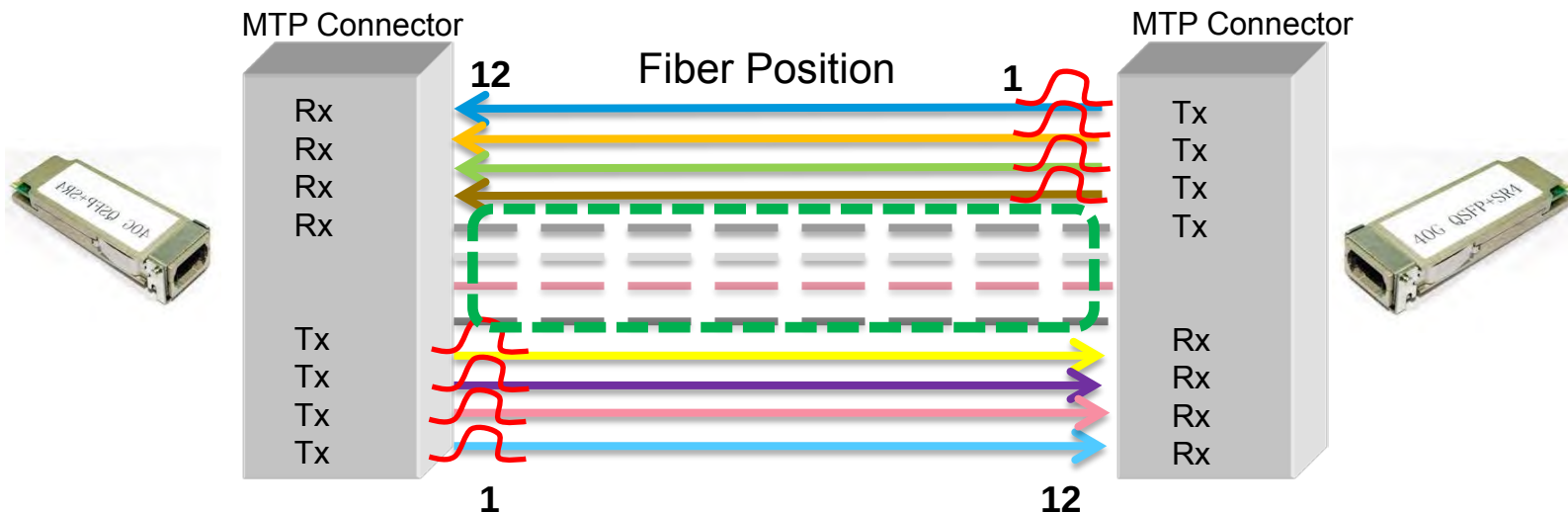
40/100Gig QSFP SR4 Transceivers use 8 fibers



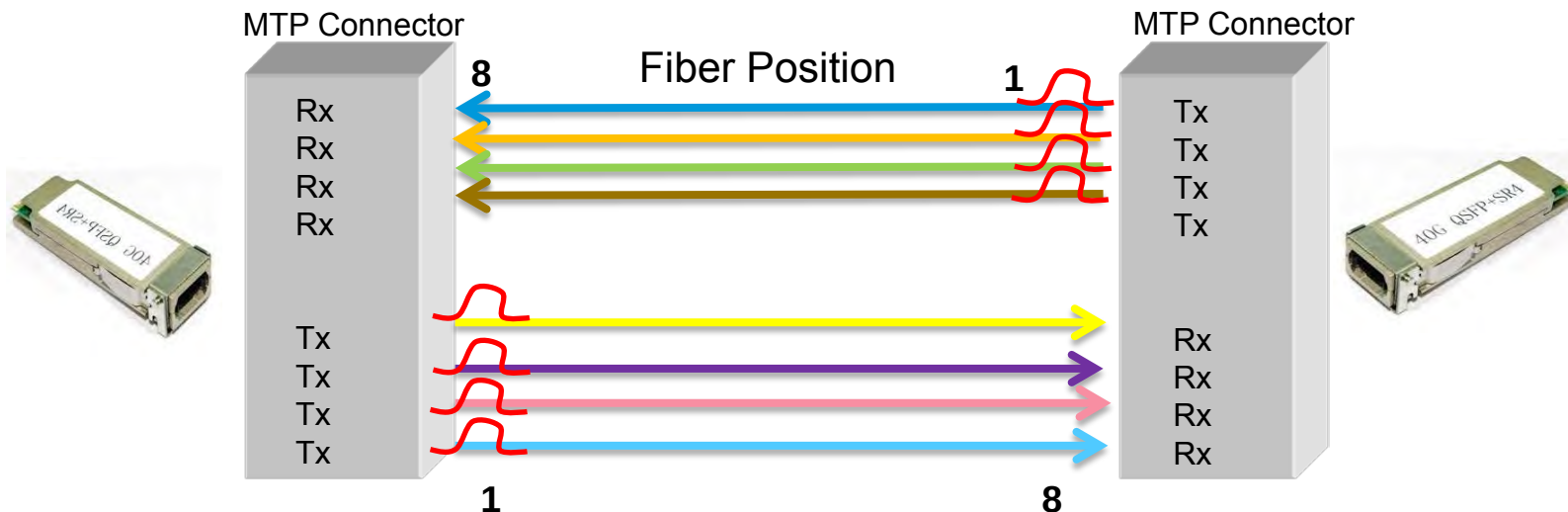
EDGE8 Benefits

Ability to use 100% of fibers for parallel transmission

Parallel
Optics
with
Base 12
System



Parallel
Optics
with
Base 8
System



Connectivity 40/100Gig QSFP Ports

EDGE8 MTP
Adaptor Panel



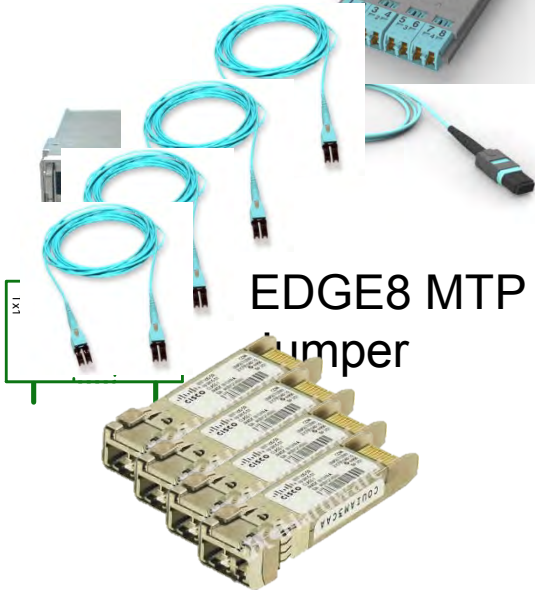
EDGE8
Trunk
with 8 fibre
MTP Legs



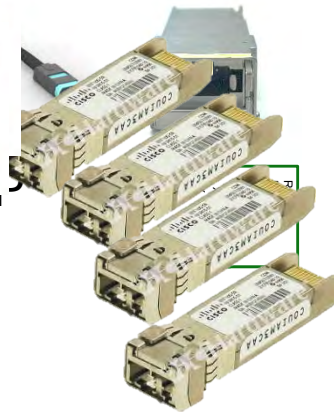
EDGE8 MTP
Adaptor Panel



EDGE8 MTP
Dumper



EDGE8 MTP
Dumper



EDGE8™ Solutions

Outstanding value in all areas of structured cabling

	Benefit	Value
Link Cost Savings	15-25% Savings	100% fibre utilisation without the need for conversion modules, result in 30% less MTPs in the link
Migration	100% fibre utilisation	Allows 100% fibre utilisation for 4-channel (SR4, PSM4 , etc) and 8-channel (SR8, LR8)
Patch Cable Complexity	67% Reduction in Inventory	Pinning the trunks allows for a single pinless patch cable deployment for all installations , reducing stocking and deployment complexity.
Port Mapping	Optimised Port Breakout	With 8f pigtailed modules all 4-channel parallel protocols (SR4, PSM4, etc) are now mapped cleanly to a single port
	Optimised Harness Mapping	Allows for 24, 32, 36, 48-port blades on large chassis switches to be cabled with 8f harnesses without having to deal with unutilised fibre/connectors.
Reduced Link Attenuation	50% Reduction in Parallel Link	By eliminating the Conversion Modules, we cut the link attenuation in half resulting in longer SR4 link distances
	30% Reduction in Duplex Link	Standard MTP-LC EDGE8 module has a loss of 0.35dB as compared to 0.5dB for standard MTP-LC EDGE modules.

Security

Network Monitoring with Optical Taps



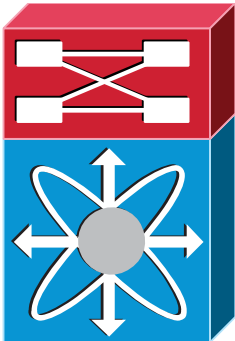
Background

- What is monitoring looking for?
 - Security threats
 - Performance issues
 - Optimization (I/O bottlenecks)
- Network layer data must first be extracted in order to apply the analysis tools
 - SPAN (mirroring) Ports (active)
 - Port TAP (passive for optical)

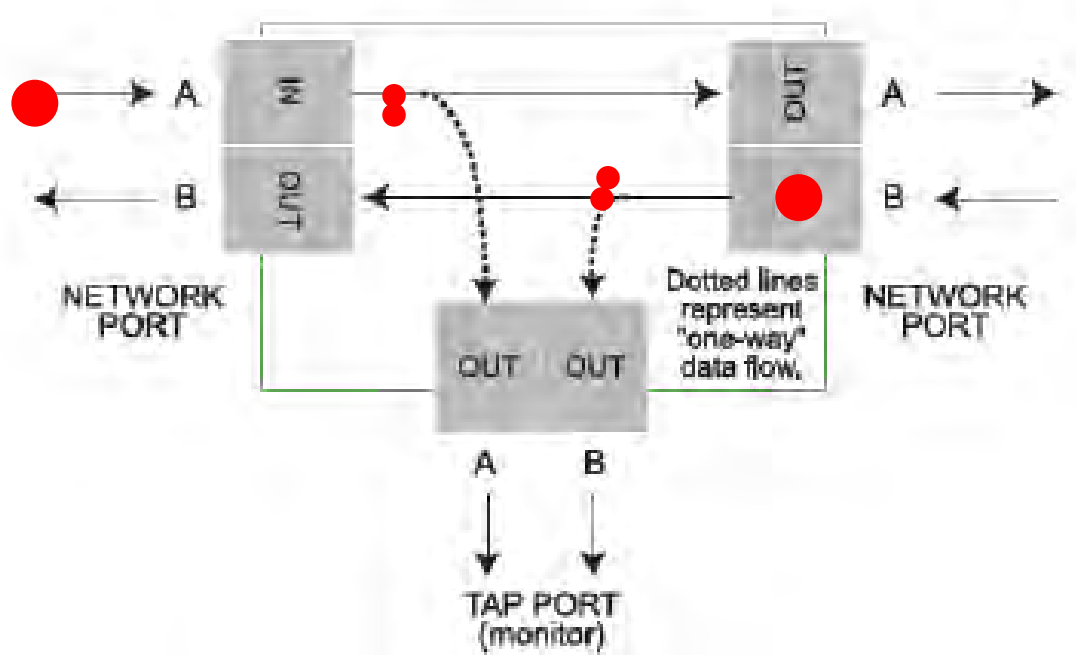
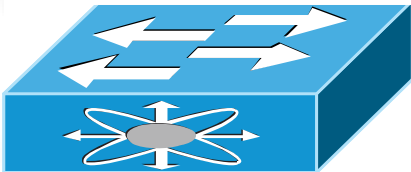


Optical Taps for Data Extraction

Core Switch

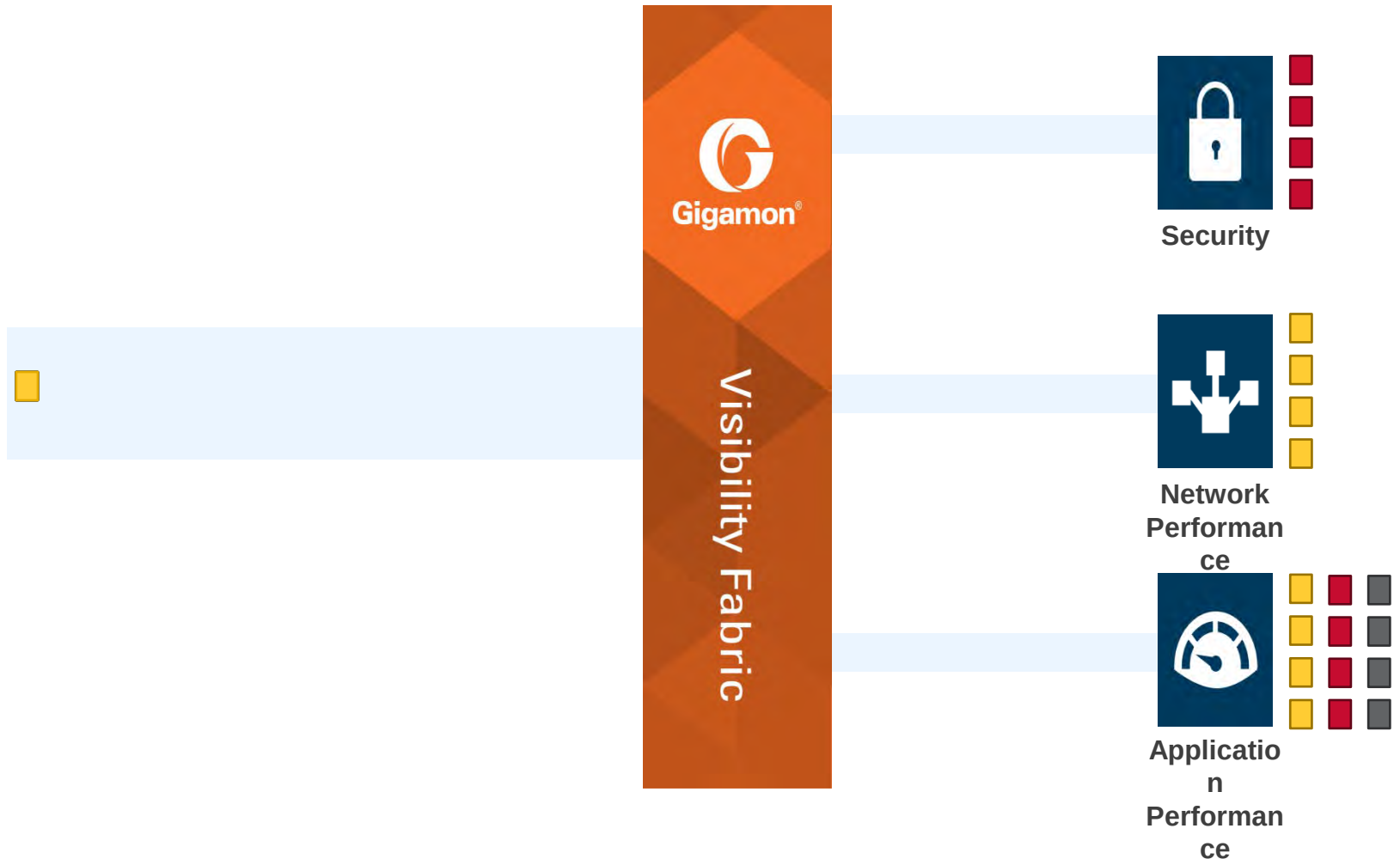


Distribution Switch

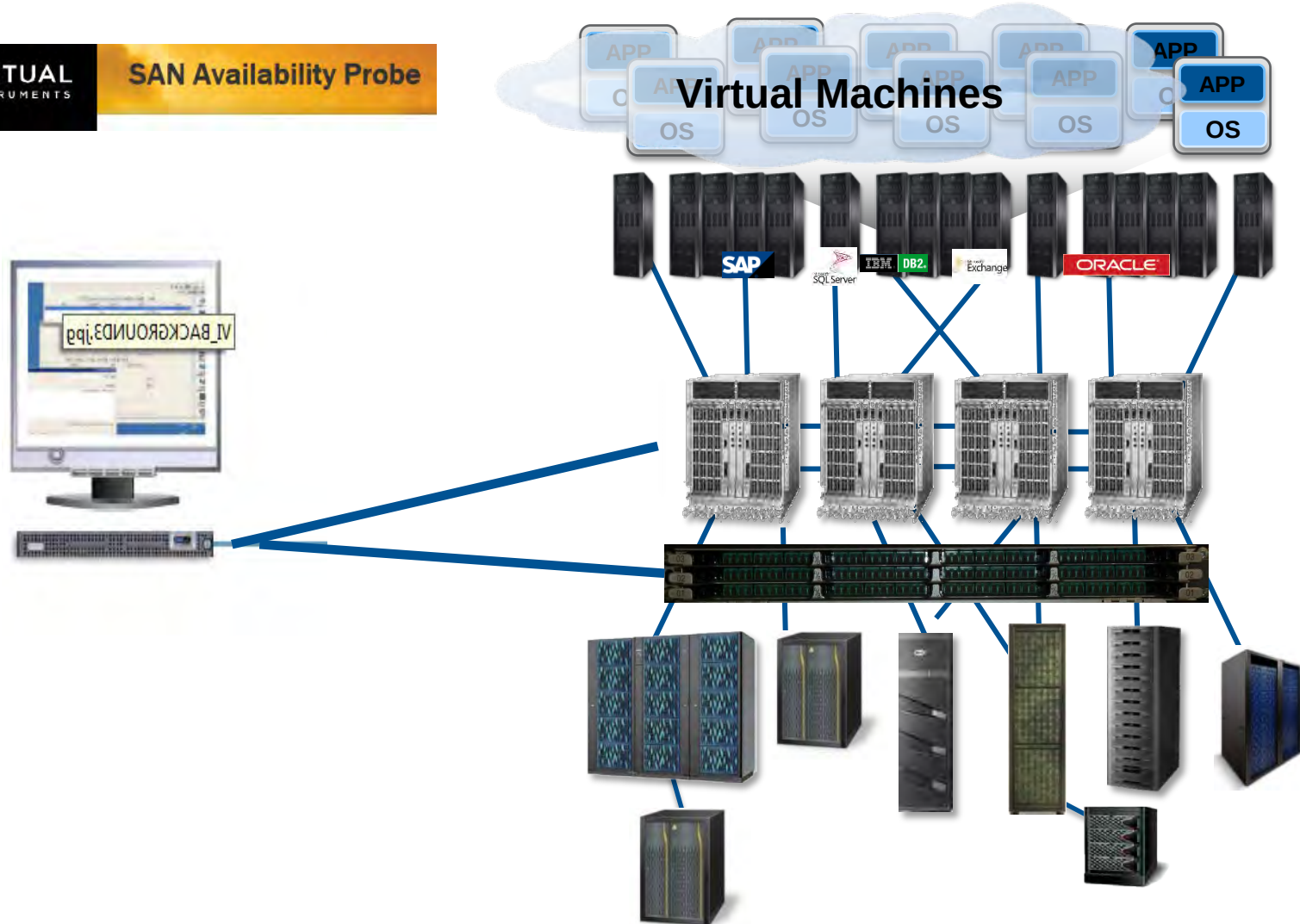


Corning Taps with Gigamon Probe

TRAFFIC DELIVERED TO THE CORRECT TOOLS



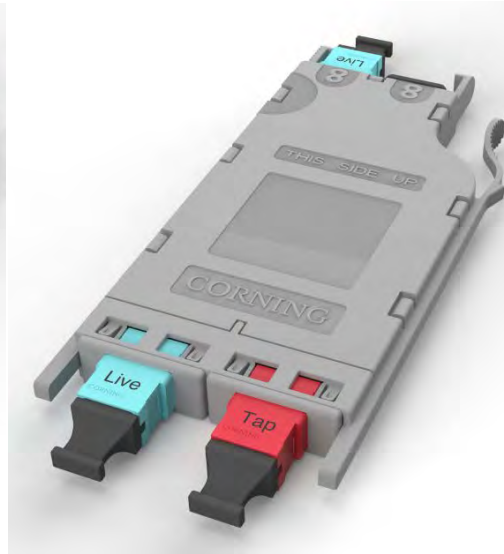
Corning Taps with Virtual Instruments PRobes



Corning EDGE8 Port Tap Products



Configuration B
Integrated
MTP®/LC/MTP



Configuration C
Integrated
MTP/MTP/MTP



Configuration A
Non-Integrated
LC/LC/LC

New Development From Corning

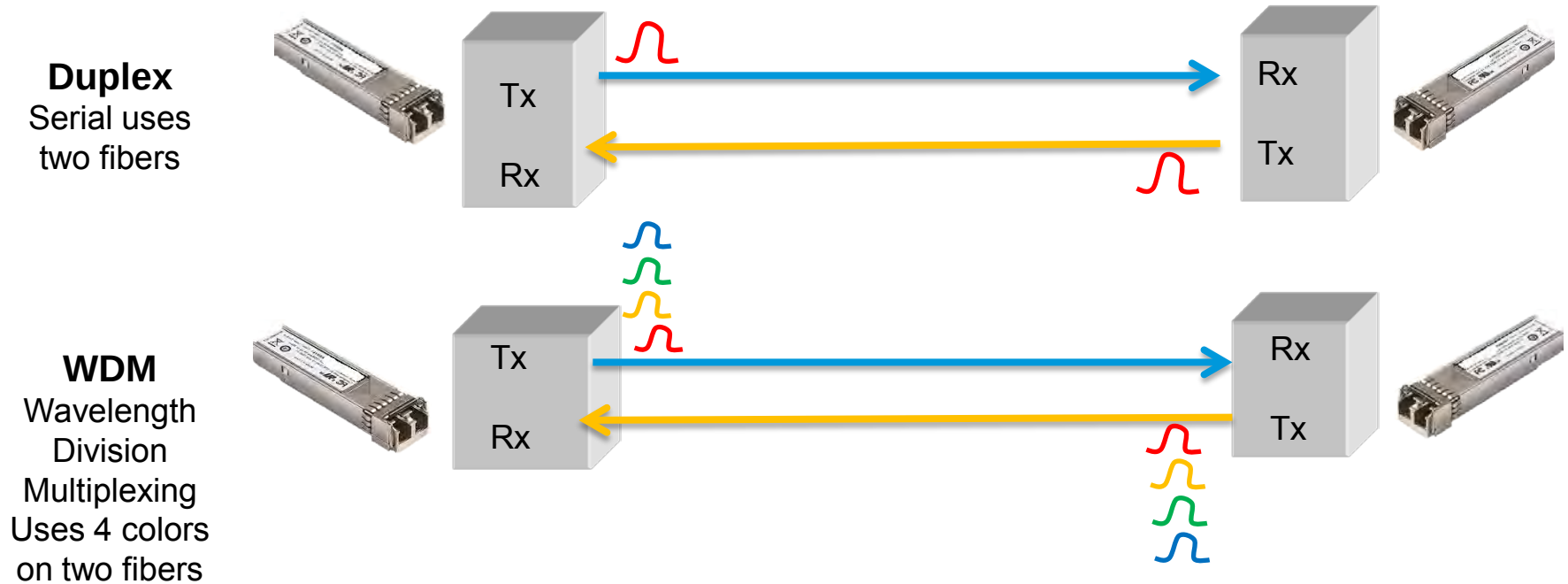
Wideband Multimode Fiber

High Fiber Count Trunks

EDGE Frame

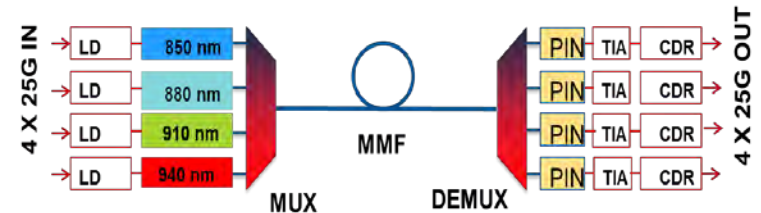


What does Serial vs. WDM vs. Parallel Transmission look like?

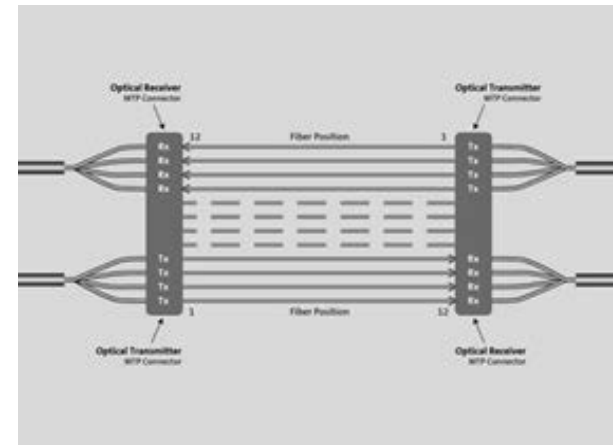


WB MMF Standards Activities

- WBMMF – laser optimized 50/125um (New Class of OM4)
- TIA Work Group Formed October 2014 to Develop Wide Band MMF Specification
- Wavelength Consideration
 - ~100 nm range between 850 nm - 953 nm
 - 2-4 wavelengths
 - VCSEL Transceivers
- Transmission Rate:
 - $\geq 28\text{G}/\text{wavelength}$, $\geq 100\text{G}/\text{fiber}$
- Will be useful for 400Gig
- Distance: $\geq 100\text{m}$
- **Standard Published : June 2016**



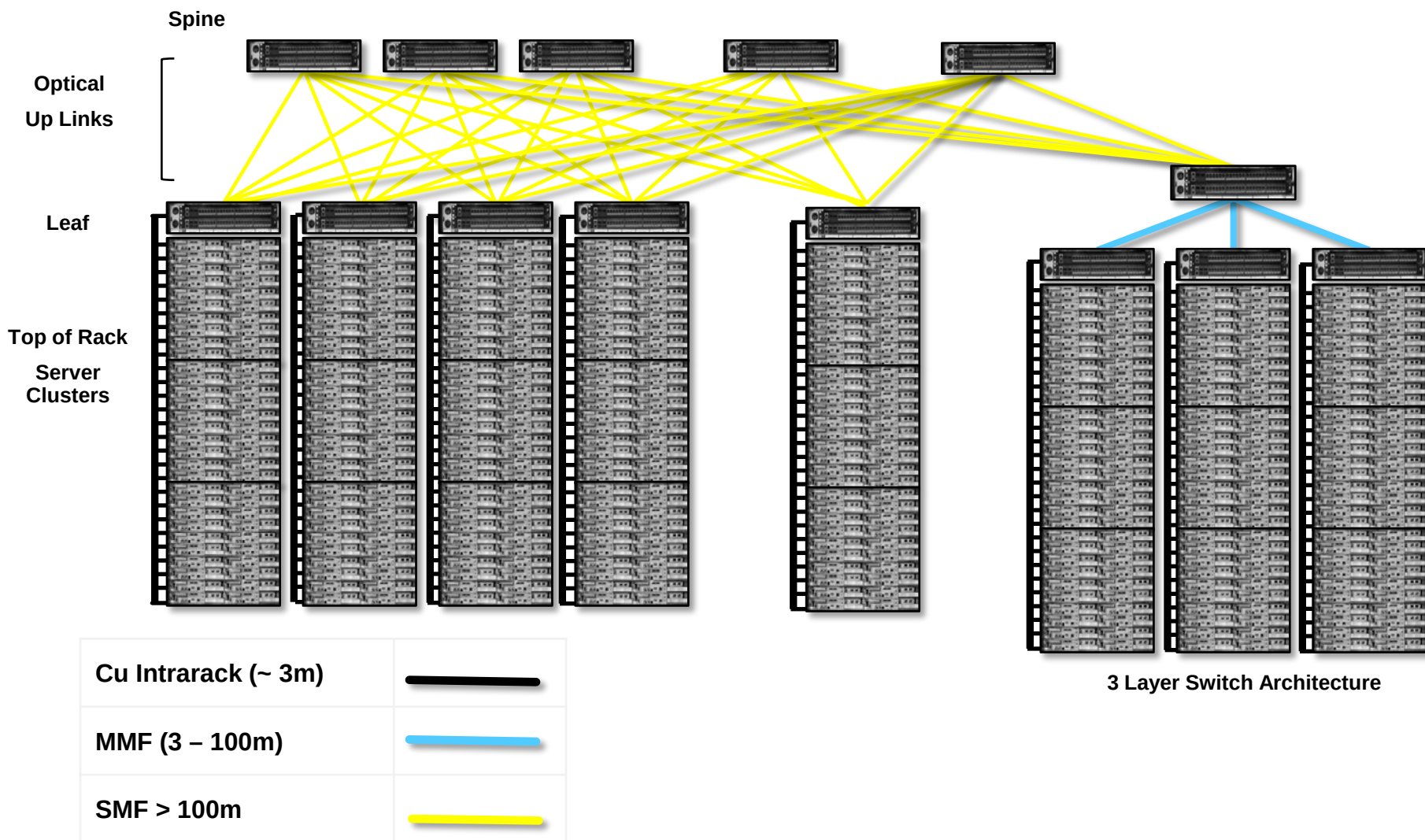
Wave Division Multiplexing: 2 Fibers



Parallel Optics: 8 Fibers

Cloud Scale Networks

New products For Spine and Leaf Architecture



Source: Broadcom



High Density Fiber Solutions

Indoor EDGE High Fiber Count Trunks

Overview

- Extends EDGE MTP Trunk fiber count to 576F
- 192, 216, 288, 384, 432, 576F : Available
- LSZH

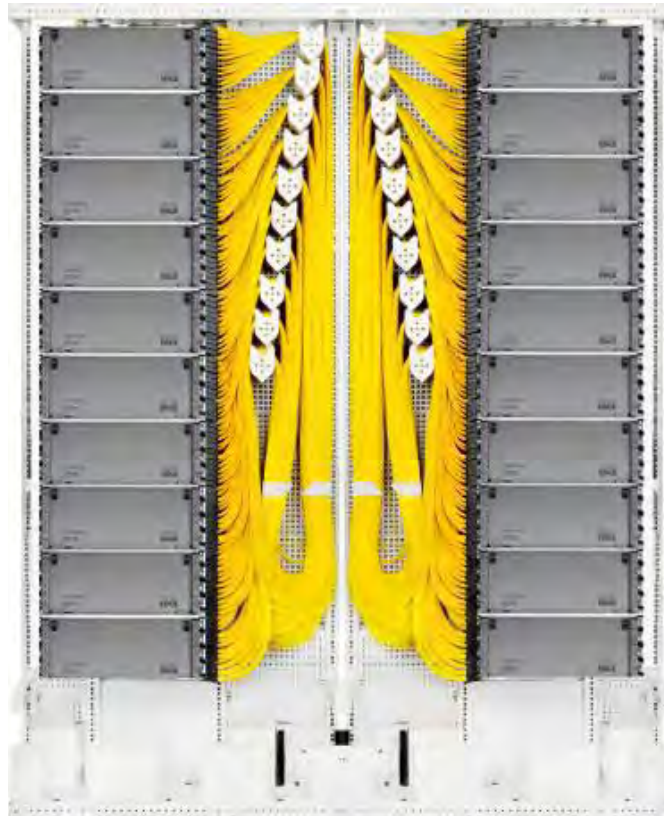


HFC Trunk (576F)

High Density Fiber Solutions

High Density EDGE Frame

- EDGE Frame Solution High density(5760LC) optical cross connect
- Uses single length (4m) Jumpers



Long Story Short

SUMMARY



Summary

- We will see a transition from 10Gig to 25Gig for server uplinks in the coming future which means 100G for switch uplinks.
- Future transceiver technologies either utilize 2 fibers or 8 fibers for connectivity
- EDGE8 provides makes it easier to adapt either duplex or parallel technologies by utilizing 100% of your fiber infrastructure
- Need for high density requires new products such as trunks up to 864 fibers and specialized hardware to manage this density.
- WBMMF promises high speed duplex solutions in the mid term in line with SWDM technology.
- Optical Taps provides invisible mode monitoring in networks without putting any additional pressure on the switch processor.

Thank you very much for your time



NOW ACCEPTING

PERSONAL QUESTIONS

RANDOM QUESTIONS

ODD QUESTIONS

CREEPY QUESTIONS

ANY KIND OF ASK :)



CORNING