Pal Bjoerndalen
Sales Manager Enterprise Networks, Scandinavia
Corning Optical Communications

24th November 2022

Our Way of Working

Voice of Customer + **Voice of Technology** + **R&D** = **Future Ready**

- Hyperscale
- MTDC
- Enterprise

- CISCO
- ARISTA
- DELL EMC
- BROADCOM

- EDGE™
- EDGE8®
- Clean Advantage™
- EDGE™ Rapid Connect
- EDGE™ MDC

- TCO
- 10G
- 40G
- 100G
- 200G
- 400G
- 800G

Beyond

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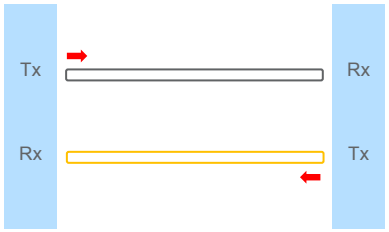
Current and Future Developments in Optical Transmission per Fiber

1GbE, 10GbE, 25GbE

40GbE, 100GbE, 200GbE, 400GbE, 800GbE and Beyond

Single Channel, Serial



LC Duplex connectivity and a single wavelength per fiber is king

WDM

New technologies could allow to have up to 16 wavelengths (λ) per fiber

Parallel Optics

Connectivity could bring up to 16F or up to 32F, utilizing single or multiple connectors

DRAFT	Transceiver Speed / Fibers used for Transmission							
Wavelength (λ) Speed	10G	25G	40G	100G	400G	800G	1.6T	3.2T
10G	2F		2F, 8F					
20G			2F, 8F					
25G		2F		2F, 8F				
50G				2F, 4F	2F, 8F, 16F			
100G				2F	2F, 8F	4F, 16F		
200G						2F, 8F	2F, 4F, 16F	2F, 8F, 32F

- available
- SMF avilable / MMF available soon
- in development for SMF/MMF

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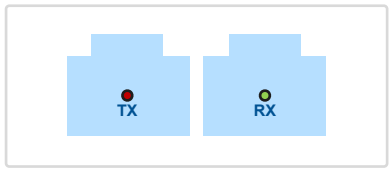
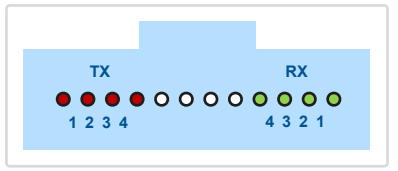
40G QSFP+ is Mature

LC Duplex



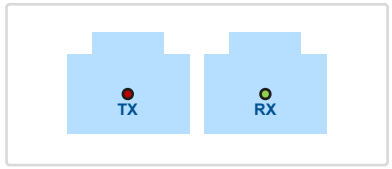
MPO-12



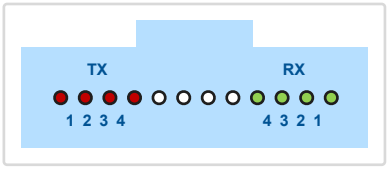
Data Rate	Electrical Form Factor	Transmission	MMF	SMF	Optical	Connector Type
40G	**QSFP+ (4x10G)**	**Duplex**	BiDi (150m)		2λ @ 20G	2F, LC
			SWDM4 (350m)	LR4 (10km) FR4 (2 km)	4λ @ 10G	2F, LC
		Parallel	SR4 (150m) eSR4 (400m)	PLR4 (10km) PLRL4 (1km)	1λ @ 10G	8F, MTP

100G QSFP28 is Mature

LC Duplex



MPO-12

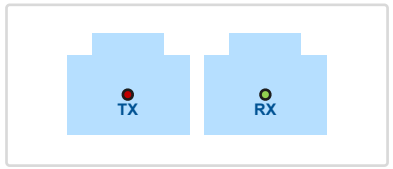


Data Rate	Electrical Form Factor	Transmission	MMF	SMF	Optical	Connector Type
100G	**QSFP28 (4x25G)**	**Duplex**	BiDi (100m)		2λ @ 50G	2F, LC
			SWDM4 (100m)	CWDM4 (2km) LR4 (10km)	4λ @ 25G	2F, LC
		Parallel	SR4 (100m) eSR4 (300m)	PSM4 (500m)	1λ @ 25G	8F, MTP

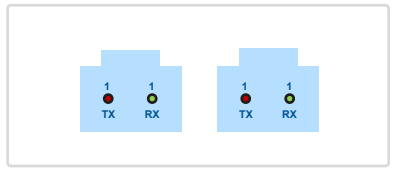
DRAFT

400G QSFP-DD/OSFP Introduced in the Market

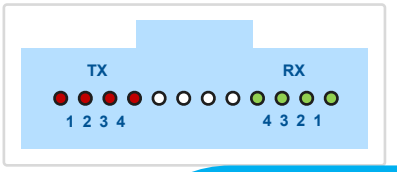
LC Duplex



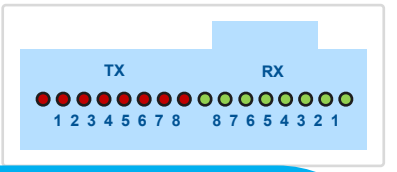
Dual CS



MPO-12



MPO-16

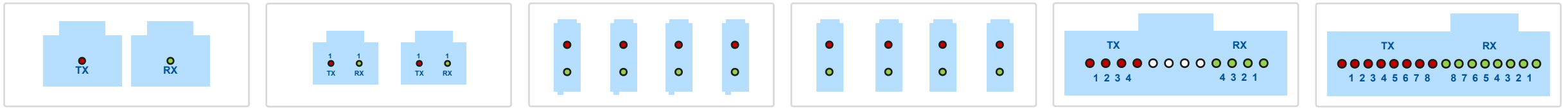


Data Rate	Electrical Form Factor	Transmission	MMF	SMF	Optical	Connector Type
400G	**QSFP56-DD or OSFP56 (8x50G)**	**Duplex**		LR8 (10km) FR8 (2km)	8λ @ 50G	2F, LC
				2x 200G-FR4 (2km)	4λ @ 50G	2x 2F VSFFC 2x 2F Mini LC
		Parallel	SR4.2 (100m)		2λ @ 50G	8F, MTP
			SR8 (100m)		1λ @ 50G	16F, MTP

DRAFT

800G In Early Stages

LC Duplex | Dual CS | Quad SN | Quad MDC | MPO-12 | MPO-16

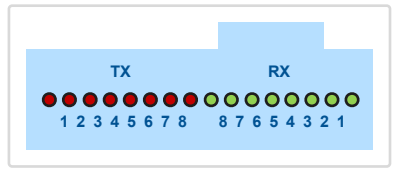


Data Rate	Electrical Form Factor	Transmission	MMF	SMF	Optical	Connector Type
800G	QSFP112-DD or OSFP112 (8x100G)	Duplex		2x 400G-LR4-6 (6km) 2x 400G FR4 (2km)	4λ @ 100G	2x 2F Mini LC 2x 2F VSFFC
		Parallel	2x 400G-VR4 (50m) 2x 400G-SR4 (100m)	DR8 (500m) 2x 400G-DR4 (500m)	1λ @ 100G	16F, MTP 2x 8F, MTP 8x 2F VSFFC

Current work on development of 100G Lambda is bringing changes in 100G and 400G transceivers

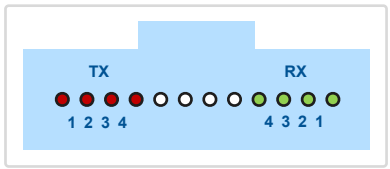
Future development (~2024) of a 200G Lambda could lead to implement SMF WDM 800G-LR4, 800G-FR4 and Parallel 800G-DR4 versions

1λ @ 100G per fiber



800G in 16F

1λ @ 200G per fiber



800G in 8F

800GPluggable MULTI-SOURCE AGREEMENT

QSFP-DD800

OSFP

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Technology Roadmap

Voice of Technology



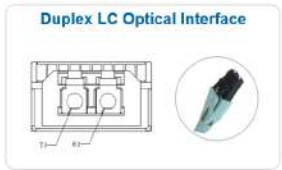
● 10G ● 40G ● 100G ● 200G ● 400G ● 800G

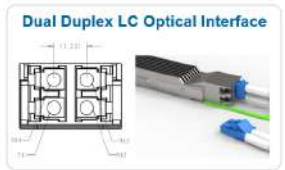
Transceiver Manufacturers

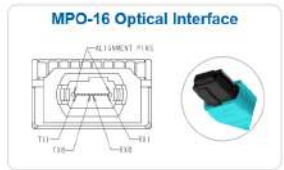
Current and Future Developments in Optical Transmission per Fiber

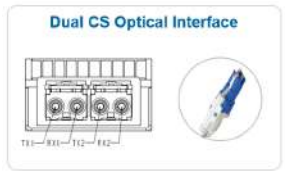
10G/λ → 20G/λ → 25G/λ → 50G/λ → 100G/λ → 200G/λ

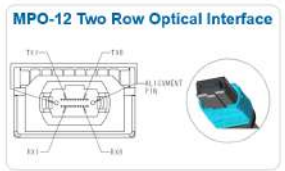
2 Fiber Connectivity	8 Fiber Connectivity	16 Fiber Connectivity











Deployment Flexibility is given by Base-8 Solutions

Why?

- Not all shown interfaces will **materialize** into an actual transceiver
- Some major transceiver manufacturers think most **customers will attach to existing footprints** (LC and MPO-8)
- **Breakouts** to lower data rates will still happen and will be done to either 2 or 8 fibers
- **Past behavior** predicts future actions. We have seen this before (100GBASE-SR10 24F transceivers)
- 16F connectivity could migrate to 8F connectivity with **200G/λ developments**

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Technology Roadmap

Voice of Technology

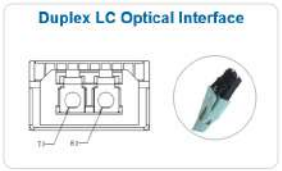


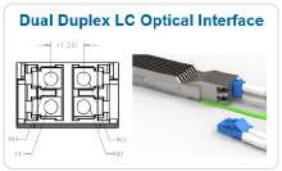
10G 40G 100G 200G 400G 800G

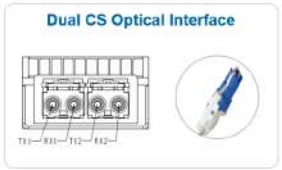
Current and Future Developments in **Optical Transmission per Fiber**

10G/λ → 20G/λ → 25G/λ → 50G/λ → 100G/λ → 200G/λ

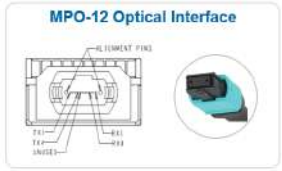
2 Fiber Connectivity

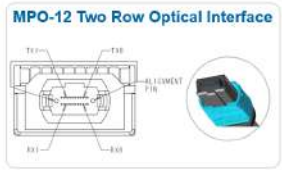




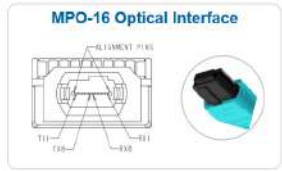


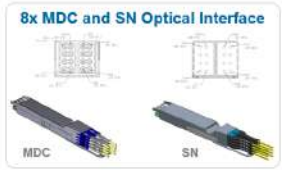
8 Fiber Connectivity





16 Fiber Connectivity





Deployment Flexibility is given by Base-8 Solutions

- The best option supporting **migration** from 10G to 800G and beyond
- Supports Base-2, Base-8 and Base-16 connectivity with **duplex and parallel architecture**
- Supports port **breakout solutions** to save space, power and cooling
- Supports **network monitoring** without adding separate space consuming hardware
- Supports keyed connectivity for **secure solutions**
- Supports **latency sensitive** applications

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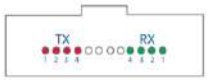
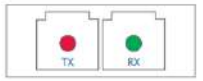
Base-8: Interconnecting MDA to EDA

Example: MPO-12 to LC Duplex Across the Data Center With Trunk

MPO-12



LC Duplex



Near End Optic (Left)		Far End Optic (Right)		Reach
QSFP-400G-DR4	single-mode	4x QSFP-100G-DR	single-mode	500 m
QSFP-400G-XDR4	single-mode	4x QSFP-100G-FR	single-mode	2 km
QDD-400G-DR4	single-mode	4x QSFP-100G-DR	single-mode	500 m
QDD-400G-XDR4	single-mode	4x QSFP-100G-FR	single-mode	2 km
QSFP-100G-PSM4	single-mode	4x SFP-25G-LR	single-mode	500 m
QSFP-40G-PLRL4	single-mode	4x SFP-10G-LRL	single-mode	1 km
QSFP-40G-PLR4	single-mode	4x SFP-10G-LR	single-mode	10 km

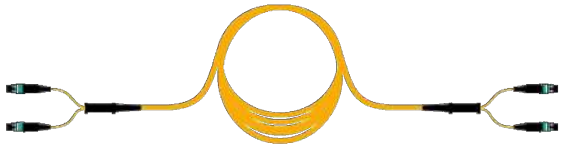
Near End Optic (Left)		Far End Optic (Right)		Reach
QSFP-100G-SR4	multimode	4x SFP-25G-SR	multimode	100 m
QSFP-100G-XSR4	multimode	4x SFP-25G-SR	multimode	100 m
QSFP-40G-SR4	multimode	4x SFP-10G-SR	multimode	150m
QSFP-40G-XSR4	multimode	4x SFP-10G-SR	multimode	150m

EDGE8 4-Port MTP Connector Panel

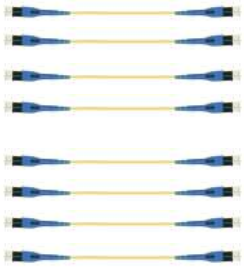
EDGE8 Module, LC Duplex to MTP, 8 F

Spine Switch

EDGE8 MTP to MTP, 8F Patch Cord



EDGE8 16F MTP Trunk, 2x 8F, MTP-MTP



2F LC Uniboot Patch Cord

Leaf Switch

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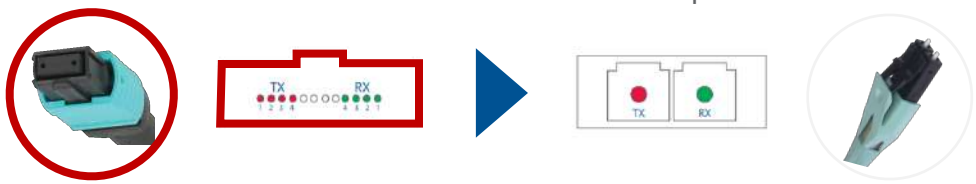
Base-8: Interconnecting MDA to EDA

Example: MPO-12 to LC Duplex Across the Data Center With Trunk



MPO-16 One-Row

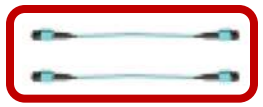
Near End Optic (Left)		Far End Optic (Right)		Reach
QSFP-100G-SR4	multimode	4x SFP-25G-SR	multimode	100 m

Near End Optic (Left)		Far End Optic (Right)		Reach
QSFP-400G-SR8*	multimode	8x SFP-50G-SR	multimode	100 m
QSFP-400G-SR8'	multimode	8x SFP-25G-SR	multimode	100 m
QDD-400G-SR8*	multimode	8x SFP-50G-SR	multimode	100 m
QDD-400G-SR8'	multimode	8x SFP-25G-SR	multimode	100 m

EDGE8 4-Port MTP Connector Panel

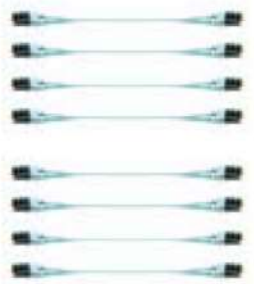
EDGE8 Module, LC Duplex to MTP, 8 F

Spine Switch



EDGE8 MTP to MTP, 8F Patch Cord

EDGE8 16F MTP Trunk, 2x 8F, MTP-MTP



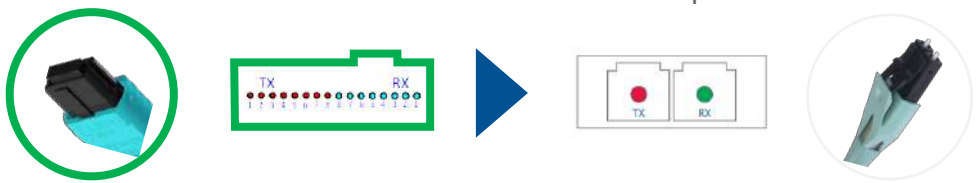
2F LC Uniboot Patch Cord

Leaf Switch

CORNING

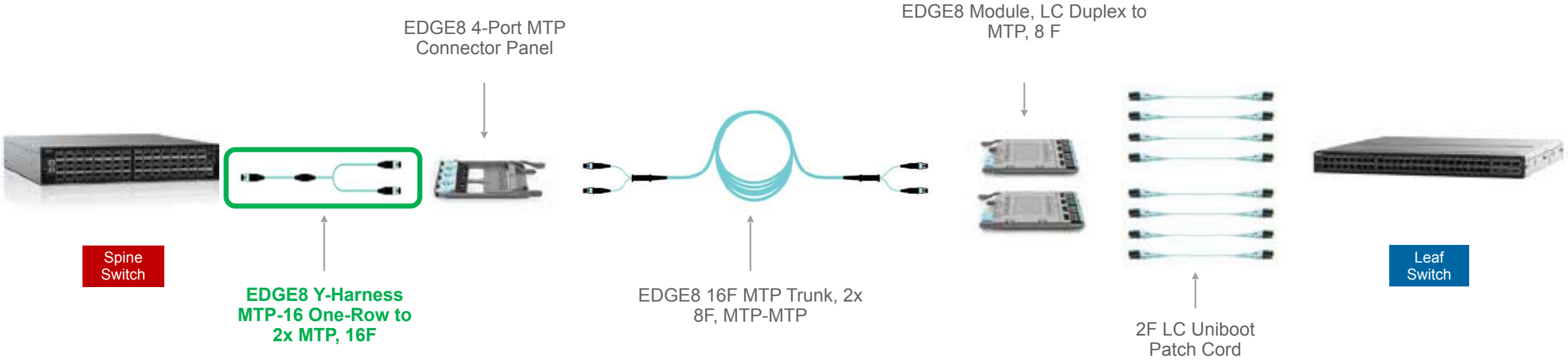
Base-8: Interconnecting MDA to EDA

Example: MPO-16 APC One-Row to LC Duplex Across the Data Center With Trunk



Near End Optic (Left)		Far End Optic (Right)		Reach
OSFP-400G-SR8*	multimode	8x SFP-50G-SR	multimode	100 m
OSFP-400G-SR8†	multimode	8x SFP-25G-SR	multimode	100 m
QDD-400G-SR8*	multimode	8x SFP-50G-SR	multimode	100 m
QDD-400G-SR8†	multimode	8x SFP-25G-SR	multimode	100 m

*Refer to Arista 400G FAQ for supported breakout modes.
†Configured to work as 2x 100G. Refer to Arista 400G FAQ for supported breakout modes.



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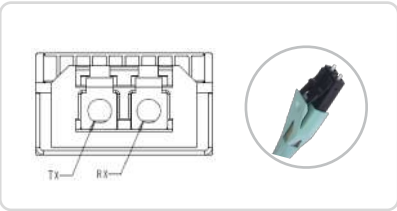
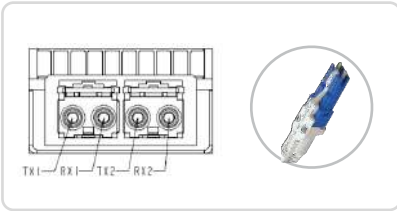
Base-8 Solutions

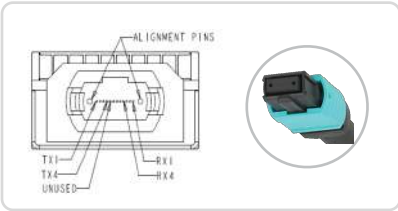
Duplex LC Optical Interface



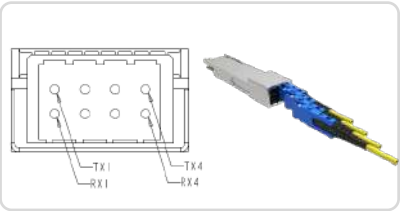
Dual CS Optical Interface



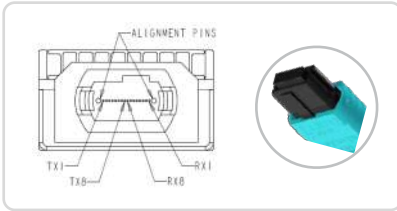
MPO-8/12 Optical Interface



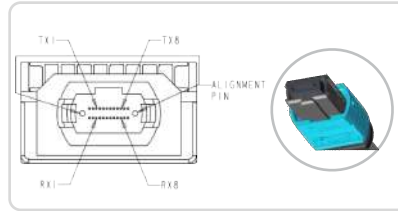
Quad SN Optical Interface

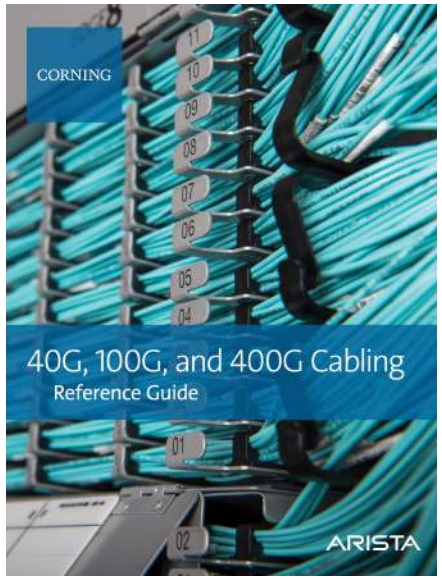


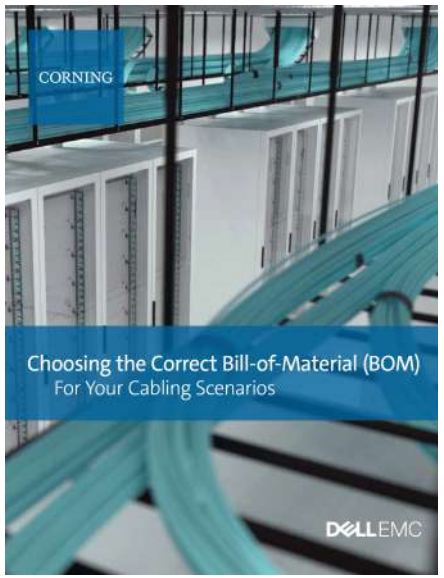
MPO-16 Optical Interface

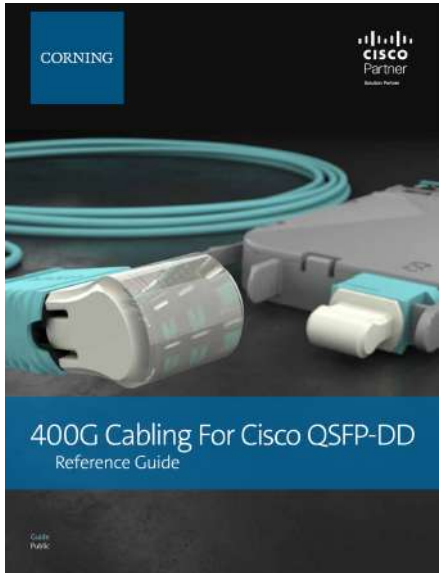


MPO-12 Two Row Optical Interface









CORNING