

Multi-Port Implementations of 50/100/200GbE

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5/16/16

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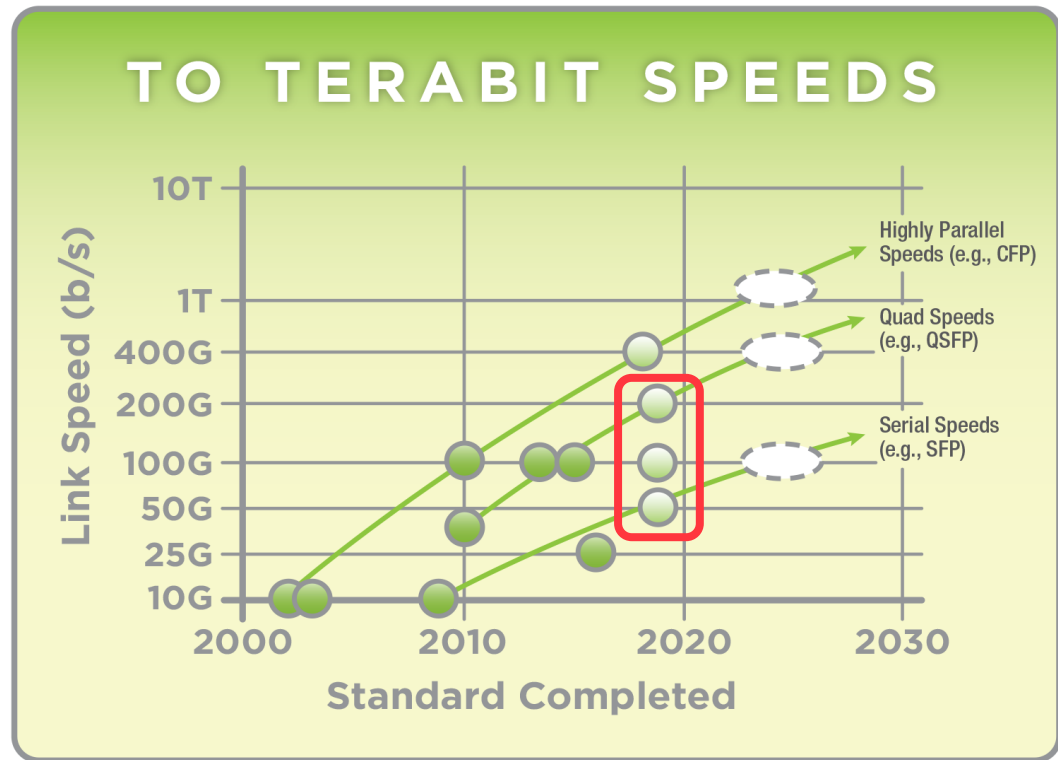
Supporters

- Doug Coleman, Corning
- Steve Swanson, Corning

The 2016 Ethernet Roadmap

- Source:

www.ethernetalliance.org/roadmap



Ethernet Speed



Speed in Development



Possible Future Speed



ethernet alliance



- 17 (or 18) New Ethernet Interfaces Shown in Green
- At least 14 in the 802.3cd project

ETHERNET INTERFACES AND NOMENCLATURE

	Electrical Interface	Backplane	Twinax Cable	Twisted Pairs	MMF	Parallel SMF	2km SMF	10km SMF	40km SMF
10BASE-				T					
100BASE-				TX	FX			LX	
1000BASE-		KX	CX	T	SX			LX	
2.5GBASE-		KX		T					
5GBASE-		KR		T					
10GBASE-	SFI, XFI	KX4, KR	CR	T	SR			LR	ER
25GBASE-	25GAUI	KR	CR	T	SR			LR	ER
40GBASE-	XLAUI	KR4	CR4	T	SR4		FR	LR4	ER4
50GBASE-	50GAUI (-2?)	KR	CR		SR		FR	LR	
100GBASE-	CAUI10 CAUI4 CAUI-2	KR4, KR2 KP4	CR10, CR4, CR2		SR10 SR4 SR2	PSM4	10X10 CWDM4 CLR4	LR4 10X10	ER4 10X10
200GBASE-	200GAUI-4	KR4	SR4		SR4	DR4	FR4	LR4	
400GBASE-	CDAUI-16 CDAUI-8				SR16	DR4	FR8	LR8	

Gray Text = IEEE Standard

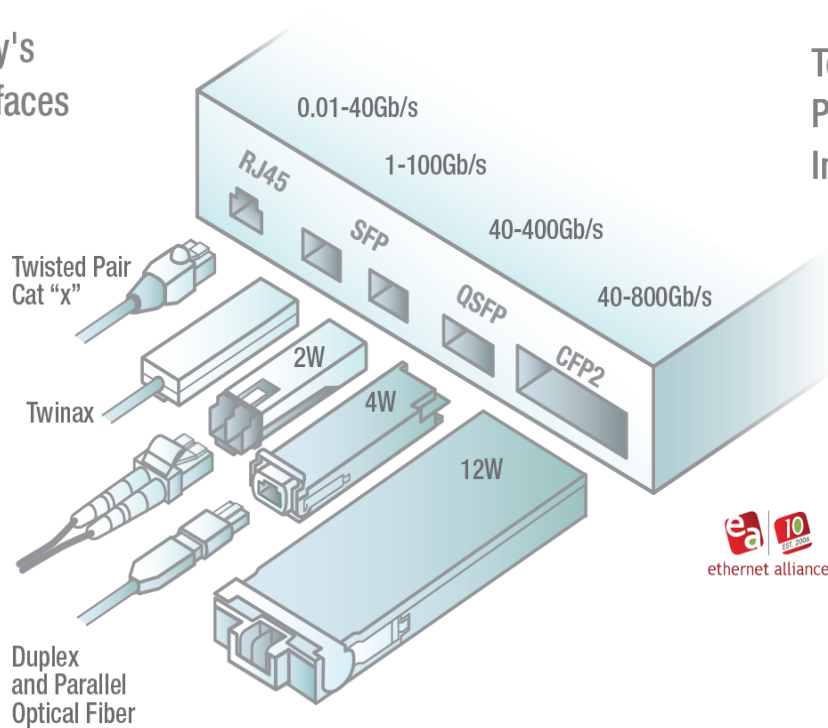
Red Text = In Standardization

Green Text = Under consideration in IEEE

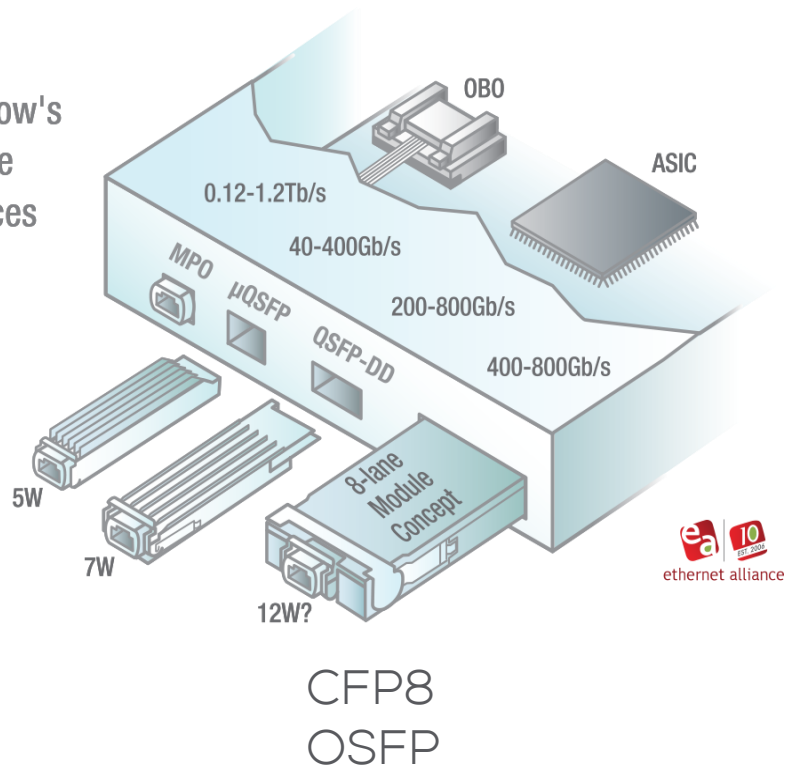
Blue Text = Non-IEEE standard but complies to IEEE electrical interfaces

Form Factors Considered

Today's Interfaces



Tomorrow's Possible Interfaces



Ethernet Fragmentation at 50/100/200GbE

Form Factor	CR	SR	DR	FR	LR
SFP56	50	50	50	50	50
QSFP56 and uQSFP	4 X 50 2 X 100 1 X 200	4 X 50 2 X 100 1 X 200	4 X 50 2 X 100 1 X 200	2 X 100 1 X 200	2 X 100 1 X 200
QSFP-DD and OBO-8	8 X 50 4 X 100 2 X 200	8 X 50 4 X 100 2 X 200	8 X 50 4 X 100 2 X 200	2 X 200	2 X 200

Blue Text = No current IEEE objective

50/100/200GbE Potential

Demonstrated at
Ethernet Alliance
booth at OFC

- 200G Port and OBO should support:

Electrical Interfaces:

50GAUI

100GAUI-2

200GAUI-4

Modules:

QSFP

microQSFP

QSFP-DD

OBO

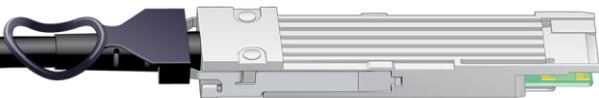
Network Interfaces:

50GBASE-CR/SR/DR/LR

100GBASE-CR2/SR2/DR2/LR2

200GBASE-CR4/SR4/DR4

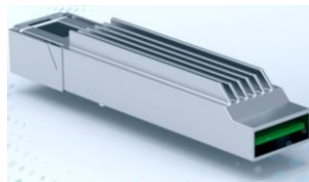
200GBASE-FR4/LR4



QSFP-DD



QSFP



microQSFP

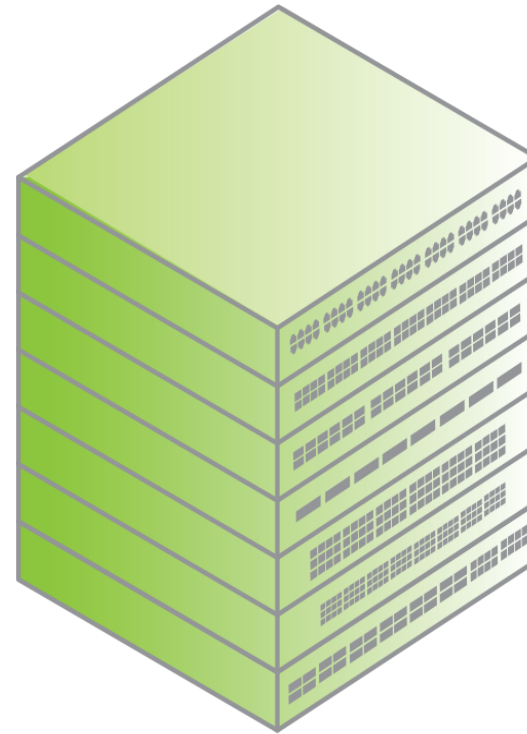


On Board Optics (OBO)

Blue Text = No current IEEE objective

Switch/Router Configurations

- Each switch vendor needs to select between module form factors and switch configurations
- This shows 1U switches while module switches and routers have more flexibility
- QSFP-DD same as QSFP



Port Density Comparison

- ← 56 RJ45s/1U
- ← 56 SFP/1U
- ← 36 QSFP/1U
- ← 8 CFP2/1U
- ← 72 μ QSFP/1U
- ← 100 OBO/1U
- ← 24QSFP +16 OBO

OBO = On Board Optics

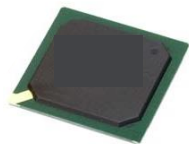
GRAPHICS AVAILABLE AT
WWW.ETHERNETALLIANCE.ORG/ROADMAP



ethernet alliance

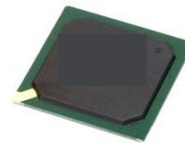
Possible Next Generation Switches

128 Port 50G Switch ASIC



6.4Tb/s ASIC

256 Port 50G Switch ASIC



12.8Tb/s ASIC

32 200G QSFP56 Port Switch



1X4
Copper Breakout

Optical Breakout



 2X50GbE SFP56 Server

32 400G QSFP-DD Port Switch



1X8
Copper Breakout

Optical Breakout



 2X50GbE SFP56 Server

Multi-Port Copper Breakout

25GbE Consortium already has a 50GbE (2X25G) Interface Defined

- Breakout to single Lanes

QSFPxx capable of running at 4X 10GbE, 25GbE or 50GbE
– xx = +, 28 or 56



To 10GbE, 25GbE or 50GbE SFP Ports

- Breakout to Dual Lanes

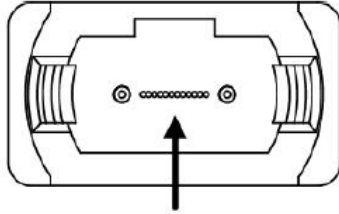
QSFPxx capable of running at 2X50GbE, or 100GbE
– xx = +, 28 or 56



To 50GbE (2X25G) or 100GbE (2X50GbE) QSFP Ports

Multi-port Optics to 10/25/50GbE

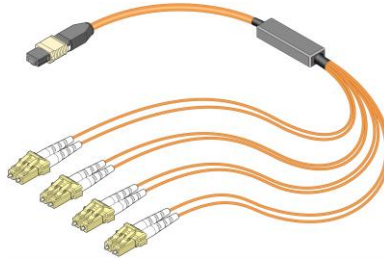
Figure 20 — QSFP Optical Receptacle and Channel Orientation



Fiber Number: 12 11 10 9 4 3 2 1

Transmit Channels: 1 2 3 4

Receive Channels: 4 3 2 1



QSFP56 running at 10,
25 and 50GbE per lane



25GbE Server



50GbE Server



10GbE Server

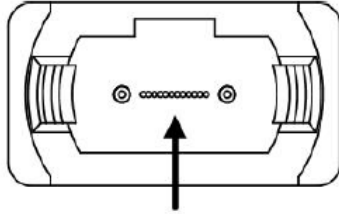


50GbE Switch

Multi-Ports to 50GbE and 100GbE

Optical Breakout

Figure 20 — QSFP Optical Receptacle and Channel Orientation



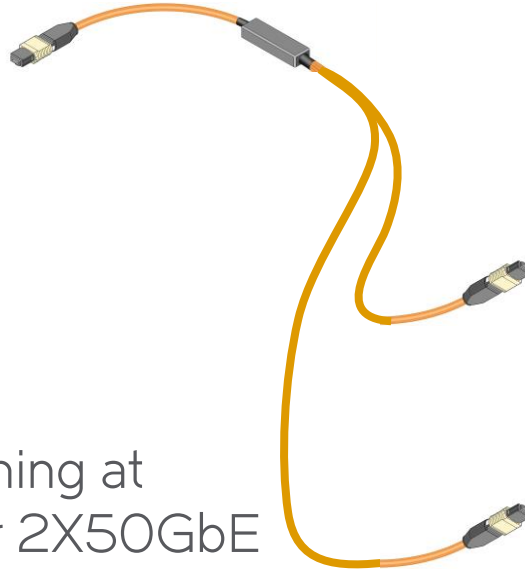
Fiber Number: 12 11 10 9 4 3 2 1

Transmit Channels: 1 2 3 4

Receive Channels: 4 3 2 1



QSFP56 running at
2X100GbE or 2X50GbE



100GbE Server
(2X50G)

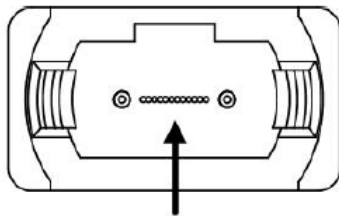


50GbE Server
(2X25G) – Not
IEEE Standard

One Port of 200GbE or 100GbE

Optical Breakout

Figure 20 — QSFP Optical Receptacle and Channel Orientation



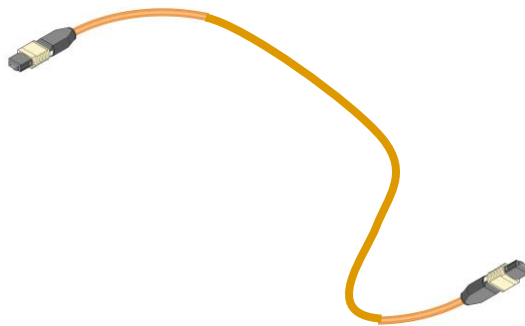
Fiber Number: 12 11 10 9 4 3 2 1

Transmit Channels: 1 2 3 4

Receive Channels: 4 3 2 1



QSFP56 running at
1X100GbE or 1X200GbE



200GbE Module
(4X50G)



Possibly
100GbE Module
(4X25G) at
reduced speed

Highly Configurable Port and Module

One Module – 3 Cabling Configurations

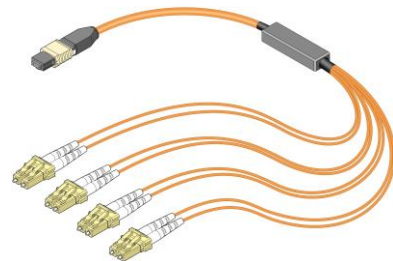
- Industry can reach high volume by using 1 module with different cabling
 - Applies to parallel solutions like CR, SR and DR
- Higher volume equals lower cost



One Module

3 Cabling Configurations

1. 4X50GbE Breakout



2. 2X100GbE Breakout



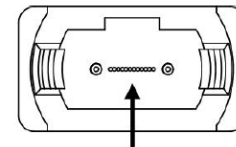
3. 1X200GbE



Cabling and Fiber Lanes Summary

3 Configurations

- Duplex LC – 2 fibers



- New Quadplex MPO – 4 fibers



- Octalplex MPO – 8 fibers



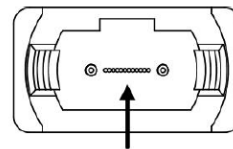
QUADPLEX AND OCTALPLEX
ARE NAMES I MADE UP

100GBASE-SWDM2 and LR2 Limitations

100GBASE-SWDM2 has two wavelengths over one MMF

- μ QSFP, QSFP56 and QSFP-DD can't support two Dual LC connectors without compromising density, so it will probably use MPO
- MPO would be in Quadplex configuration and would only connect to two other multi-port modules

- Quadplex MPO – 4 fibers



100GBASE-SWDM2 Limitations

100GBASE-SWDM2 has two wavelengths over one MMF

- If the task force develops 100GBASE-SWDM2 instead of 100GBASE-SR2, then the solution will have less configurability – It can only be SWDM2
- A server with a QSFP56 that only uses two lanes is suboptimal or a custom module
- New breakout cables will be needed with 2 dual LCs or fiber will be wasted
- SWDM2 is only supported in a multi-port module like QSFP56 (2X100GbE) or QSFP-DD (4X100GbE) – No SFP56



THE ORANGE FIBERS !
AQUA TO REPRESENT OM3/4

100GBASE-SWDM2 vs 100GBASE-SR2

	Pros	Cons
100GBASE-SWDM2	Requires half the fiber	Less Configurable Requires new breakout cables Requires mux and demux – higher power lasers
100GBASE-SR2	Highly configurable Higher volumes	Requires double the fiber

Conclusion

Multi-Port Switch Implementations will be widely deployed

- CR/SR/DR modules can support multiple configurations of 50/100/200G by changing the cabling
- This port configurability will lead to higher volume and thus lower cost
- SWDM Ports can't be broken out,
- New Quadplex (4-fiber) cabling infrastructure is needed to support a 4-lane module that only uses two lanes
- Legacy 100GbE (4X25G) ports can be supported with new ports running at 25G instead of 50G
- Multi-Port implementations do need different cabling and this could affect the MDI
- No gearboxes or FEC in the module are needed for these solutions and we should keep it that way

Thank you!