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**ETHERNET ALLIANCE  
TECHNOLOGY EXPLORATION FORUM  
“THE ROAD TO ETHERNET 2026”**

**Are Standardized Ethernet Optics  
Obsolete?**

**Chris Cole, Finisar, Moderator**

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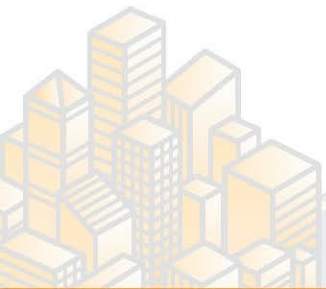
**September 29, 2016**



**ethernet alliance**



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# PANELISTS

- Chris Cole, Finisar, Panel Moderator  
*Ethernet Optics History*
- Dale Murray, LightCounting, Market Research  
*Analyst Data*
- Nathan Tracy, TE Connectivity, OIF Rep.  
*Electrical Interfaces, Always Standardized, and now Standardizing 100 Gb/s*
- Scott Kipp, Brocade, EA President  
*Healing the Fractured Ethernet Market*



# Ethernet Optics History

- Case Study: Duplex SMF (LW) Optics
  - 10G
  - 40/50G
  - 100G
  - 400G
- Classification categories:

Telecom Standard

Ethernet MSA Standard

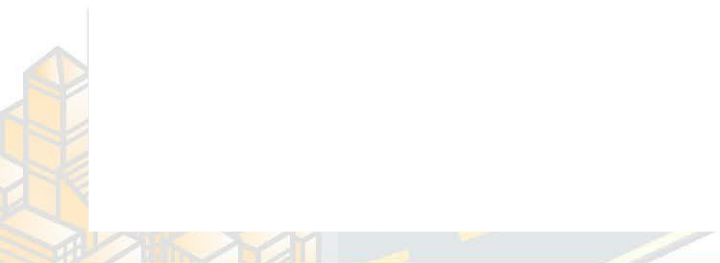
Ethernet IEEE Standard



# 10G Duplex SMF Optics



Data Rate	Attribute	Gen 1	Gen 2	Gen 3	Gen 4
10G	Form Factor	300-pin	XENPAK/X2	XFP	SFP
	Electrical I/O	16x 622M	4x 2.5G	1x 10G	1x 10G
	Optical Interface	1x 10G	4x 2.5G 1x 10G	1x 10G	1x 10G





# 40G/50G Duplex SMF Optics

Data Rate	Attribute	Gen 1	Gen 2	Gen 3	Gen 4
40/50G	Form Factor	300-pin	CFP	QSFP	SFP
	Electrical I/O	16x 2.5G	4x 10G	4x 10G	1x 50G
	Optical Interface	1x 40G	1x 40G, 4x 10G	4x 10G	1x 50G

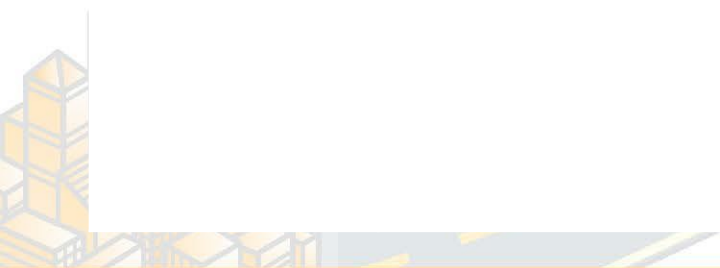


# 100G Duplex SMF Optics



Data Rate	Attribute	Gen 1	Gen 2	Gen 3	Gen 4
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100G	Form Factor	CFP	CFP2/CPAK	CFP4/QSFP	DSFP
	Electrical I/O	10x 10G	4x 25G	4x 25G	2x 50G
	Optical Interface	4x 25G	4x 25G	4x 25G	1x 100G
		10x 10G		4x 25G	2x 50G





# 400G Duplex SMF Optics



Data Rate	Attribute	Gen 1	Gen 2	Gen 3	Gen 4
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400G	Form Factor	CFP8	OSFP/CFP16	QSFP-DD	QSFP
	Electrical I/O	16x 25G	8x 50G	8x 50G	4x 100G
	Optical Interface	8x 50G	8x 50G 4x 100G	8x 50G 4x 100G	4x 100G





# Duplex SMF Optics



Data Rate	Attribute	Gen 1	Gen 2	Gen 3	Gen 4
10G	Form Factor	300-pin	XENPAK/X2	XFP	SFP
	Electrical I/O	16x 622M	4x 2.5G	1x 10G	1x 10G
	Optical Interface	1x 10G	4x 2.5G 1x 10G	1x 10G	1x 10G
40/50G	Form Factor	300-pin	CFP	QSFP	SFP
	Electrical I/O	16x 2.5G	4x 10G	4x 10G	1x 50G
	Optical Interface	1x 40G	1x 40G, 4x 10G	4x 10G	1x 50G
100G	Form Factor	CFP	CFP2/CPAK	CFP4/QSFP	DSFP
	Electrical I/O	10x 10G	4x 25G	4x 25G	2x 50G
	Optical Interface	4x 25G	4x 25G	4x 25G	1x 100G
		10x 10G		4x 25G	2x 50G
400G	Form Factor	CFP8	OSFP/CFP16	QSFP-DD	QSFP
	Electrical I/O	16x 25G	8x 50G	8x 50G	4x 100G
	Optical Interface	8x 50G	8x 50G	8x 50G	4x 100G
			4x 100G	4x 100G	



# Duplex SMF Optics Standards

- Form Factor
  - All rates: MSA
- Electrical I/O Ethernet
  - 10G: MSA & IEEE
  - 40/50G, 100G, (200G), 400G: IEEE
- Optical Interface Ethernet
  - 10G, 40G/50G, (200G): IEEE
  - 100G, 400G: MSA & IEEE
- So is there anything different today?



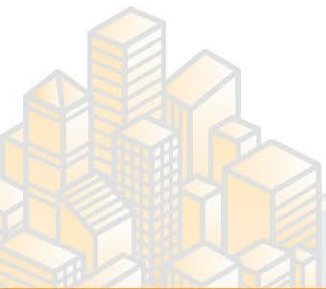
# Optics Development Start

Data Rate	Attribute	Gen 1	Gen 2	Gen 3	Gen 4
10G	Form Factor	300-pin	XENPAK/X2	XFP	SFP
	Year	1998	2000	2001	2005
40/50G	Form Factor	300-pin	CFP	QSFP	SFP
	Year	2001	2007	2009	2015
100G	Form Factor	CFP	CFP2/CPAK	CFP4/QSFP	DSFP
	Year	2007	2010	2012	2016
400G	Form Factor	CFP8	OSFP/CFP16	QSFP-DD	QSFP
	Year	2015	2015	2015	????



# What's Different

- 10G, 40/50G, and 100G successive optics generations were developed sequentially over multiple years
- 400G successive optics generations are being developed simultaneously



If you have any questions or comments,  
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