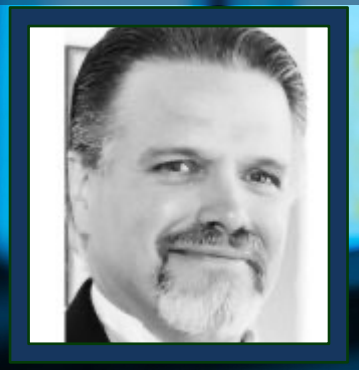
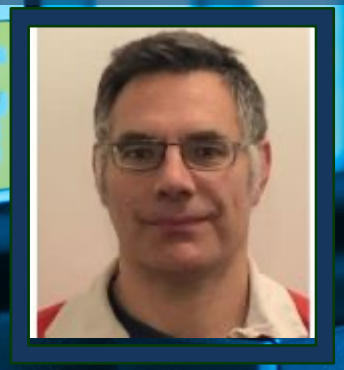
How will Ethernet Speeds Coexist in the Datacenter? 100Gb Ethernet and Interoperability with Legacy Networks

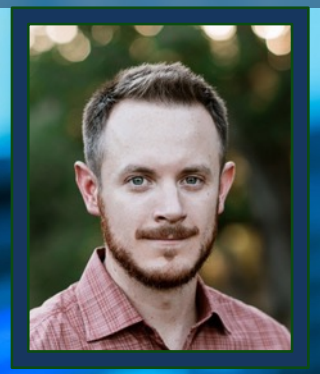
Moderator: David J. Rodgers, EXFO, Ethernet Alliance Events Chair

Panelist: Paul Brooks, Viavi, Director – Lab & Production strategy

Panelist: Sam Johnson, Intel, Ethernet Alliance HSN Subcommittee Co-Chair







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Presentation Disclaimer

The views expressed in this panel presentation are those of the presenters and not of the Ethernet Alliance.

About Ethernet Alliance

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The Ethernet Alliance

Global Community of End Users, System Vendors, Component Suppliers & Academia

Our Mission

- **To promote** industry awareness, acceptance and advancement of technology and products based on, or dependent upon, both **existing and emerging IEEE 802 Ethernet standards** and their management.
- **To accelerate industry adoption** and remove barriers to market entry by providing a cohesive, market-responsive, industry voice.
- Provide resources to establish and **demonstrate multi-vendor interoperability.**

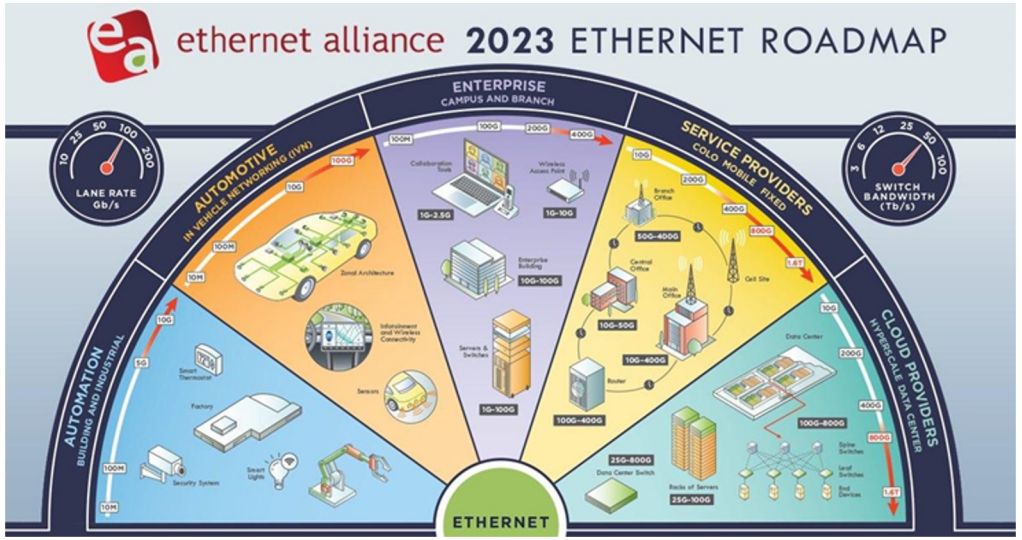
Ethernet Alliance Strategy

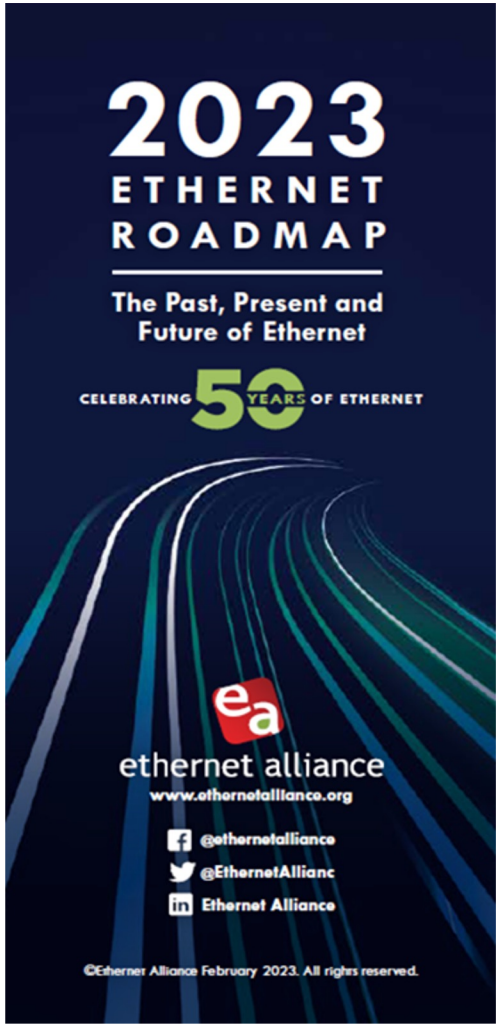
Expanding the Ethernet Ecosystem, Supporting Ethernet Development

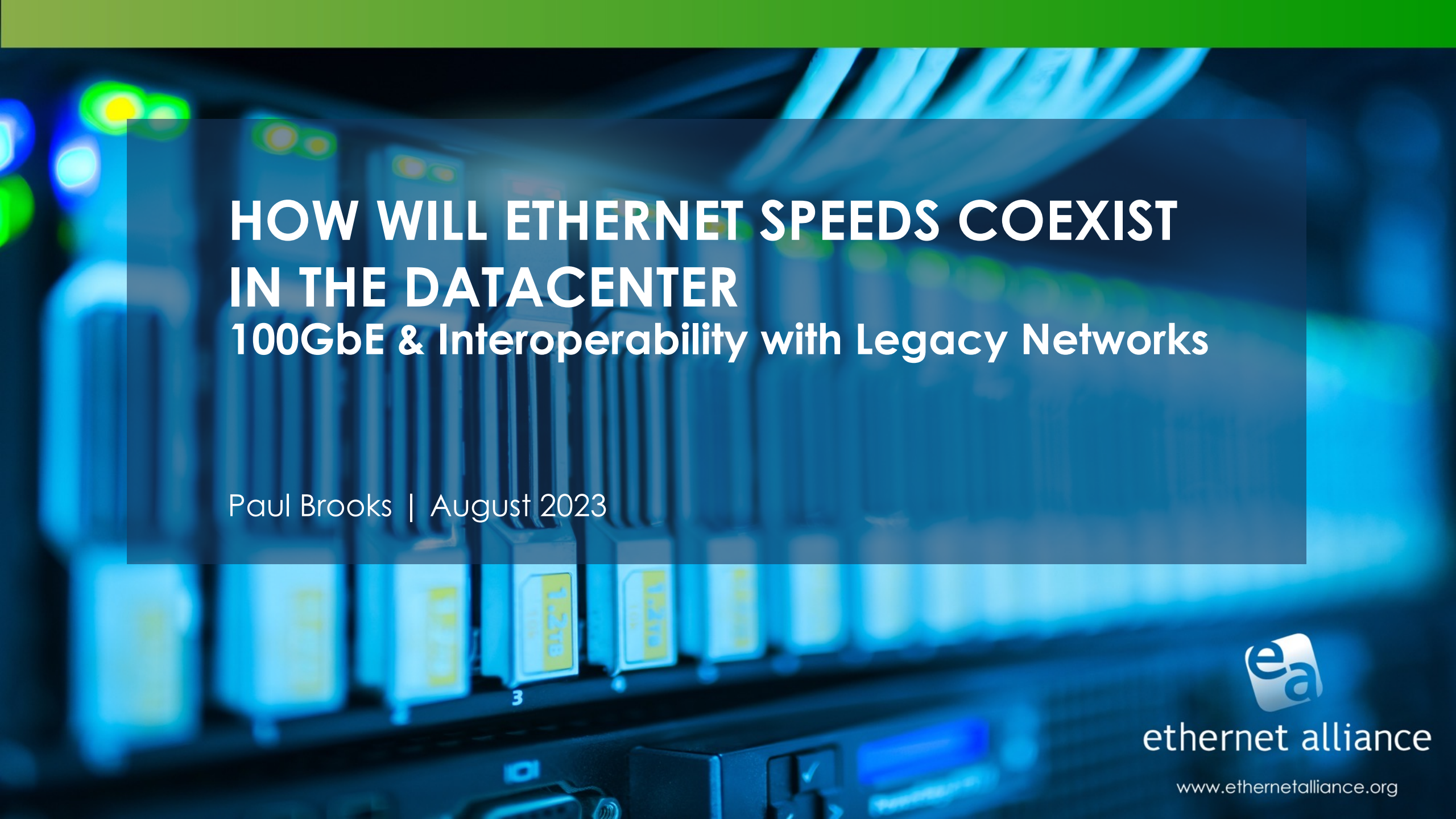
- **Facilitate interoperability testing & assurance**
  - Industry Plug fests supporting member and technology initiatives
  - PoE Certification Program
- **Global outreach and collaborative interaction with other industry organizations**
  - Worldwide Membership
  - Multiple SIGs, applications and MSAs
  - Industry consensus building
- **Thought Leadership**
  - EA-hosted Technology Exploration Forums (TEFs)
  - Technology and standards incubation
- **Promotion of Ethernet**
  - Media and industry analysts outreach
  - Education
  - Marketing (trade shows & panel presentations, white papers, blogs & social media)

2023 Ethernet Roadmap

- **Digital copies & graphics** published via Alliance's website
- **Print copies** available at OFC 2023 and other events this year
- Included in the "**Ethernet Alliance in the Box**" for members
- Digital version **regularly updated** to capture latest advancements







HOW WILL ETHERNET SPEEDS COEXIST IN THE DATACENTER

100GbE & Interoperability with Legacy Networks

Paul Brooks | August 2023

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Ethernet is Predictable!

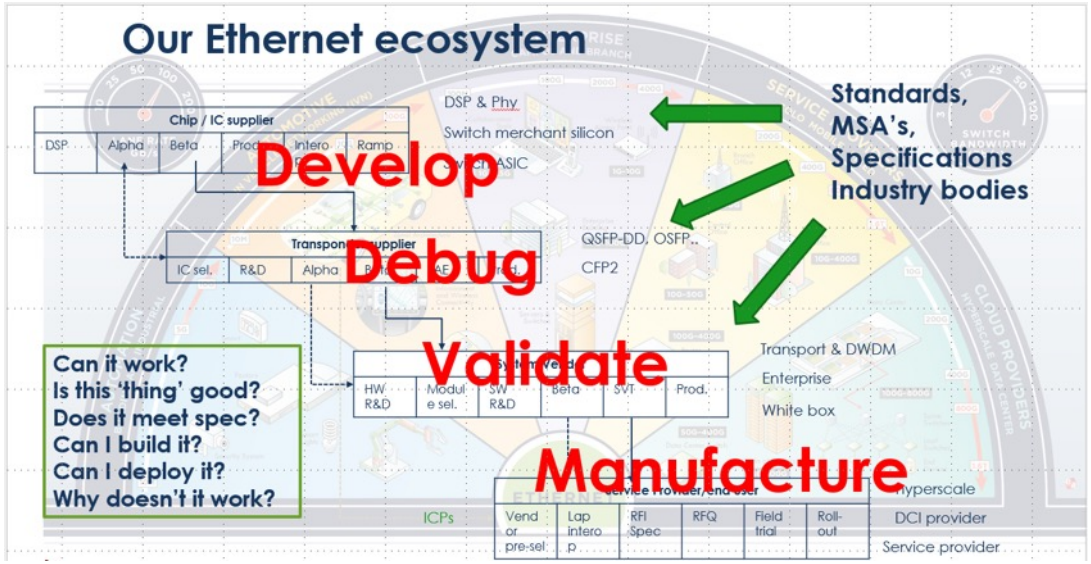
It just works, and that's exactly the way we want to keep it!

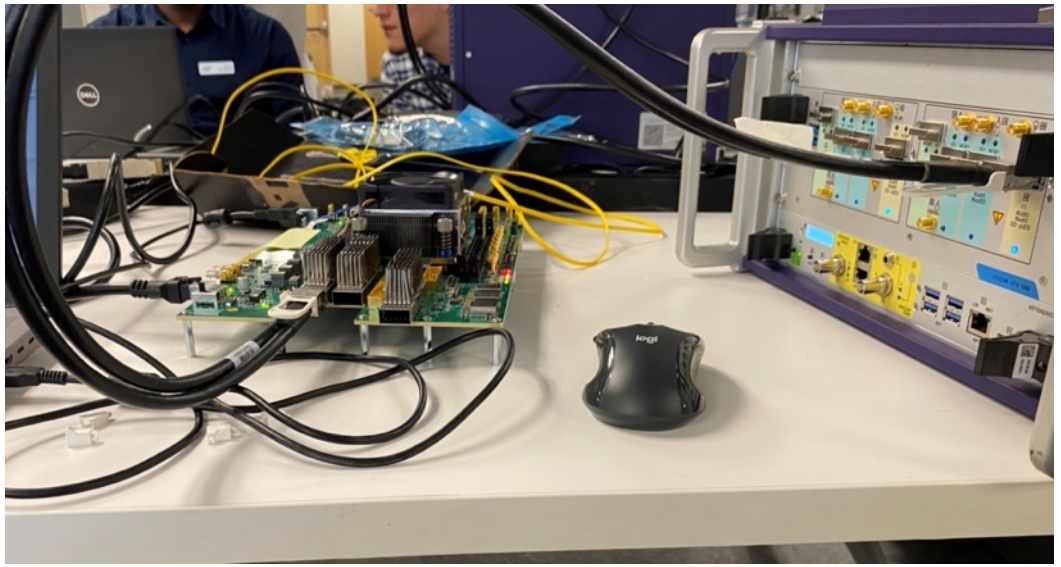
The commitment to seamless interoperability over multiple generations, from 1GbE to 400GbE and beyond is the key to success

Keeping it uneventful (for the end user at least!)

Todays' datacenters deploy a huge range of speeds, from 10GbE NICs through 400GbE in switches and DCI with 800Gb already in the validation phase!

Test & measurement during development, debug and validation is critical. Inter-ops accelerate this process and drive confidence in the ecosystem,





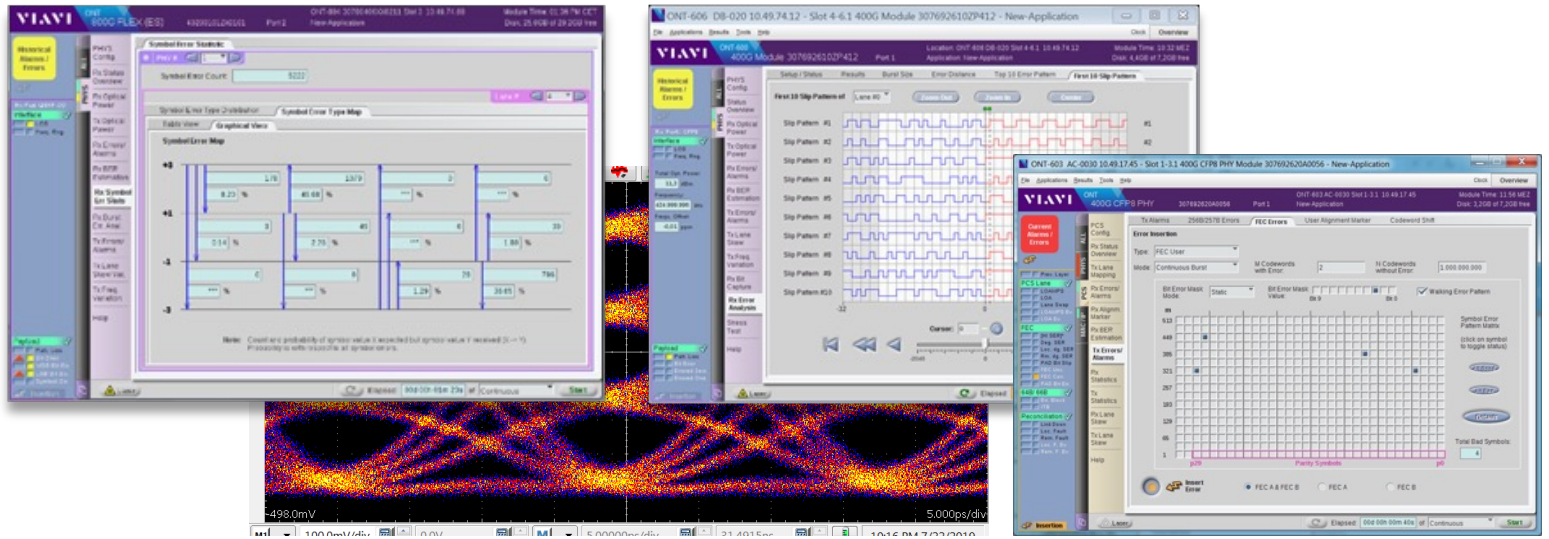
Interoperability & Plugfests are Key

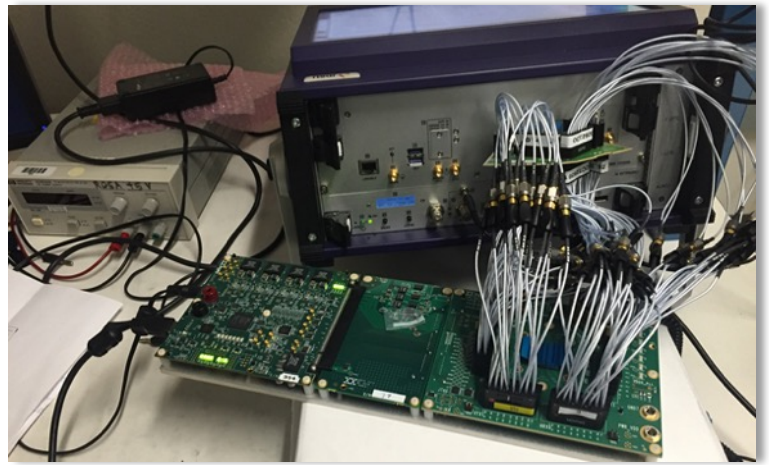
The Ethernet standards, MSAs and specifications are built with rigor and technical thoroughness.

The ‘right’ test applied at the right time is the key factor in the ease of use and broad appeal of Ethernet.

Plugfests facilitate the right environment for all stakeholders to come together and validate all elements in the ecosystem.

At UNH we leveraged the ability to view Ethernet in multiple domains to collaborate and resolve issues.





A Recent EA event at UNH

Participants from across the whole ecosystem, from silicon IP through FPGAs, interconnects from passive copper to AEC & ACC and a wide spread of hosts in T&M, NICs and switches.

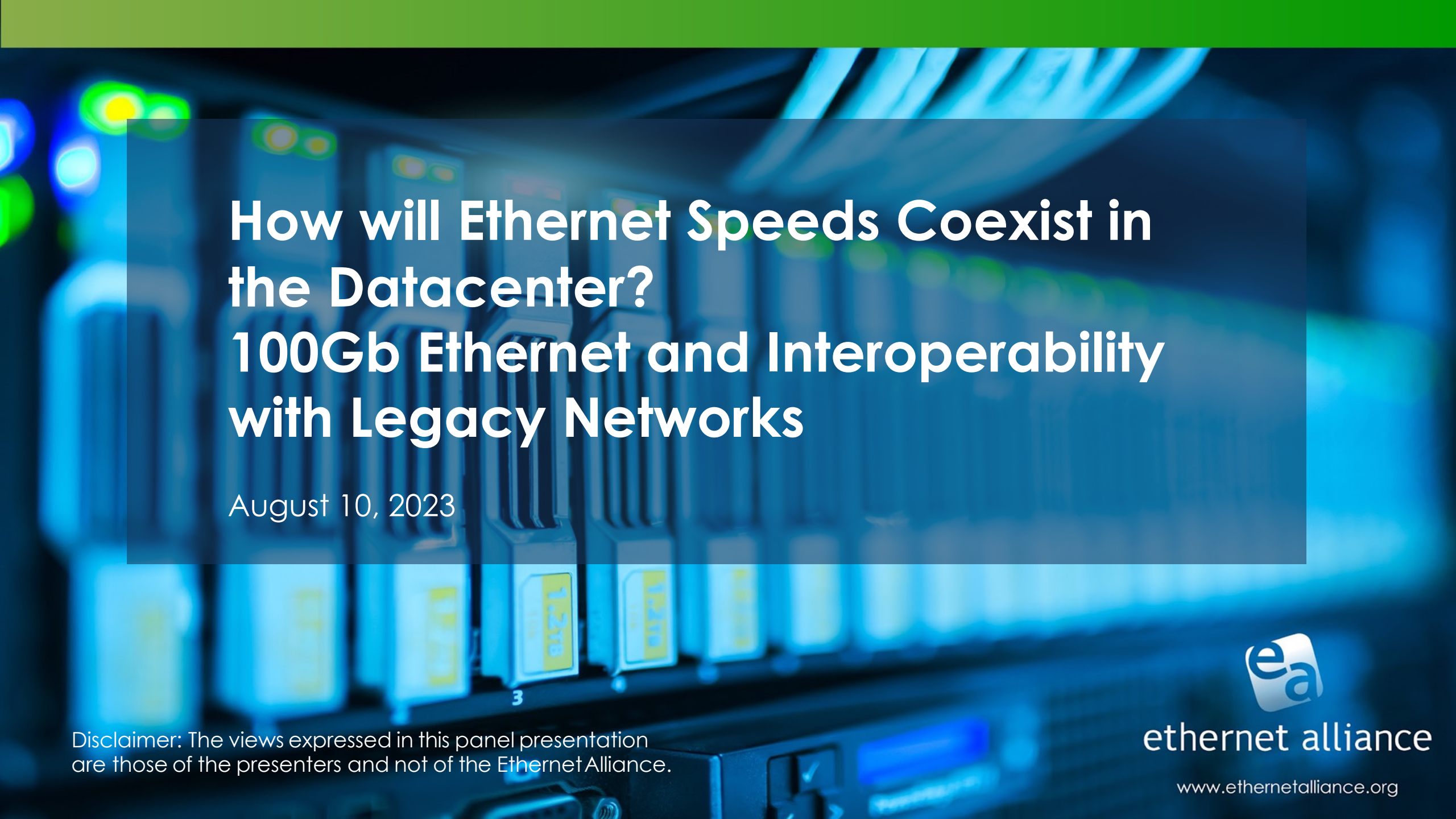
Equipment covering PHY and protocol and multiple port speeds backed by domain experts allowed vendors to determine a solid view on 100G SERDES based ports & interconnect.

100G and beyond

Ports (and interconnects) are becoming far more complex and this is reflected in the deeper inter-op needs.

100G can be many things

- **a distinct 100G from a QSFP28 or an n x 100G from a QSFP-DD or OSFP.**
- **It can be optical or copper, it might require ANEG/LT, the port might be managed by SFF or CMIS.**
- **It must work with NIC and switched and other devices from different vendors over many generations**



How will Ethernet Speeds Coexist in the Datacenter? 100Gb Ethernet and Interoperability with Legacy Networks

August 10, 2023

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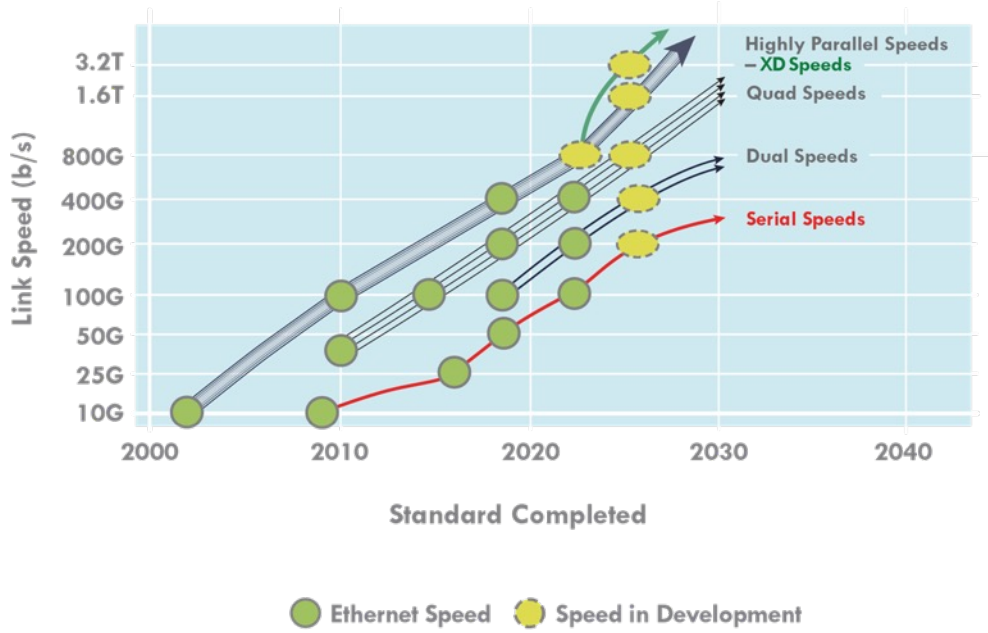
EA Plugfest History

EA adds High Speed Ethernet focus (2006)

First plugfest: 10G SFP+ (2008)

HSN officially formed (2018)

Plugfests from 10G to 800G



All images from EA or UNH Plugfest content unless otherwise noted

How will speeds coexist?

Copper vs. Optical

The rising importance of Auto Neg Link Training

	Backplane	Twinax Cable	MMF	500m PSM4	2km SMF	10km SMF	20km SMF	40km SMF	80km SMF	Electrical Interface	Pluggable Module
25GBASE–	KR1 KR	CR1 CR/CR-S	SR			LR EPON -BR10-D/U	EPON -BR20-D/U	ER -BR40-D/U		25GAUI	SFP
50GBASE–	KR2 KR	CR2 CR	SR		FR	EPON LR -BR10-D/U	EPON -BR20-D/U	ER -BR40-D/U		LAUI-2/50GAUI-2 50GAUI-1	SFP/QSFP
100GBASE–	KR4 KR2 KR1	CR10 CR4 CR2 CR1	SR10 SR4 SR2 VR1 SR1	PSM4 DR	CWDM4 FR1	LR4 4WDM-10 LR1	4WDM-20	ER4/ 4WDM-40	ZR	CAUI-10 CPPI CAUI-4/100GAUI-4 100GAUI-2 100GAUI-1	SFP/SFP-DD QSFP/QSFP-DD OSFP
200GBASE–	KR4 KR2	CR4 CR2 CR1	SR4 VR2 SR2	DR4 DR1	FR4 FR1	LR4		ER4		200GAUI-4 200GAUI-2 200GAUI-1	QSFP/QSFP-DD SFP-DD
400GBASE–	KR4	CR4 CR2	SR16 SR8/SR4.2 VR4 SR4	DR4 DR2	FR8 FR4 400G-FR4 DR4-2	LR8 LR4-6 400G-LR4-10		ER8	ZR	400GAUI-16 400GAUI-8 400GAUI-4 400GAUI-2	QSFP/QSFP-DD OSFP
800GBASE-	ETC-KR8 KR8	ETC-CR8 CR8 CR4	VR8 SR8	DR8 DR4	DR8-2 DR4-2 FR4	TBD		TBD		800GAUI-8 800GAUI-4	
1.6TBASE-		CR8		DR8	DR8-2					1.6TAUI-16 1.6TAUI-8	QSFP/QSFP-DD OSFP/OSFP-XD

Table 73–5—Priority Resolution

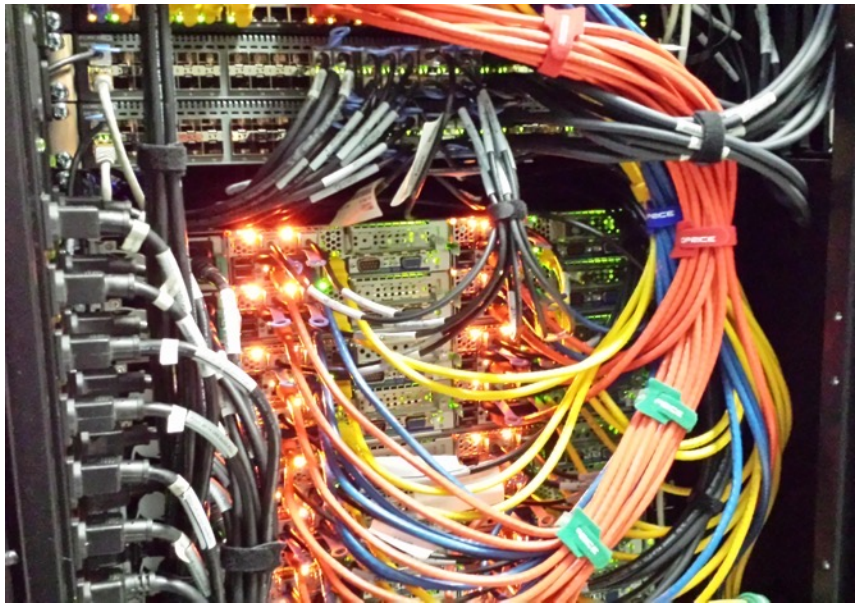
Priority	Technology	Capability
1	400GBASE-KR4 or 400GBASE-CR4	400 Gb/s 4 lane, highest priority
2	200GBASE-KR2 or 200GBASE-CR2	200 Gb/s 2 lane
3 ~~1~~	200GBASE-KR4 or 200GBASE-CR4	200 Gb/s 4 lane~~, highest priority~~
4	100GBASE-KR1 or 100GBASE-CR1	100 Gb/s 1 lane
5 ~~2~~	100GBASE-KR2 or 100GBASE-CR2	100 Gb/s 2 lane
6 ~~3~~	100GBASE-CR4	100 Gb/s 4 lane
7 4	100GBASE-KR4	100 Gb/s 4 lane
8 ~~5~~	100GBASE-KP4	100 Gb/s 4 lane
9 ~~6~~	100GBASE-CR10	100 Gb/s 10 lane
10 ~~7~~	50GBASE-KR or 50GBASE-CR	50 Gb/s 1 lane
11 ~~8~~	40GBASE-CR4	40 Gb/s 4 lane
12 ~~9~~	40GBASE-KR4	40 Gb/s 4 lane
13 ~~10~~	25GBASE-KR or 25GBASE-CR	25 Gb/s 1 lane
14 ~~11~~	25GBASE-KR-S or 25GBASE-CR-S	25 Gb/s 1 lane, short reach
15 ~~12~~	10GBASE-KR	10 Gb/s 1 lane
16 ~~13~~	10GBASE-KX4	10 Gb/s 4 lane
17 ~~14~~	5GBASE-KR	5 Gb/s 1 lane
18 ~~15~~	2.5GBASE-KX	2.5 Gb/s 1 lane
19 ~~16~~	1000BASE-KX	1 Gb/s 1 lane, lowest priority

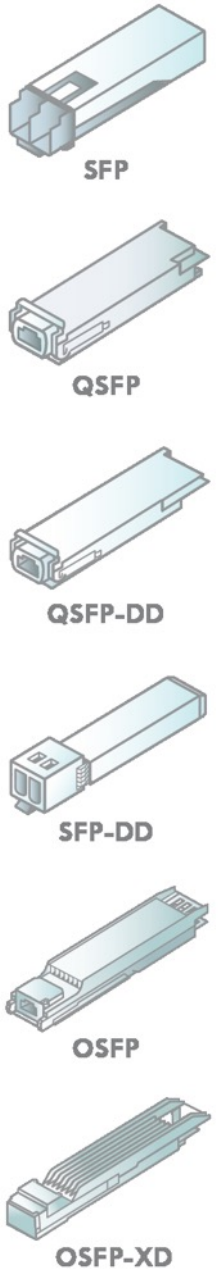
Interoperability Challenges

Technical Complexity: Speed, SI, encoding, optical modulation…

Configuration Options: Breakouts, form factors, multi-speed…

Conflicts: Competing specs, device behaviors…





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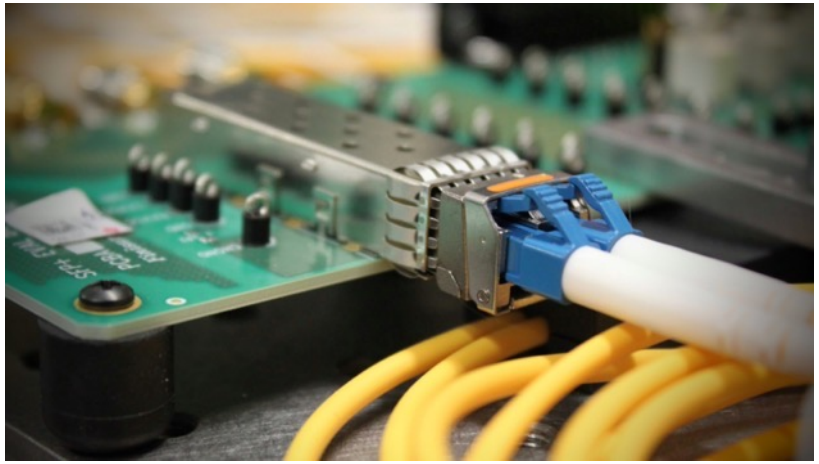
For example…

SFP: 2008

- 1G or 10G?
- Limiting or linear?



SFP: Now

- 1G or 2.5G or 5G or 10G or 25G or 50G or 100G?
- SGMII or AN73 or AUI?
- FEC: Disabled/KR/RS528/RS544/ Interleaved/Inverse RS?
- Linear, cable length?
- SFF or CMIS?

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Multi-Vendor Plugfest Test Events

Protocol Interop:

Test inter-device functionality

Solve problems early

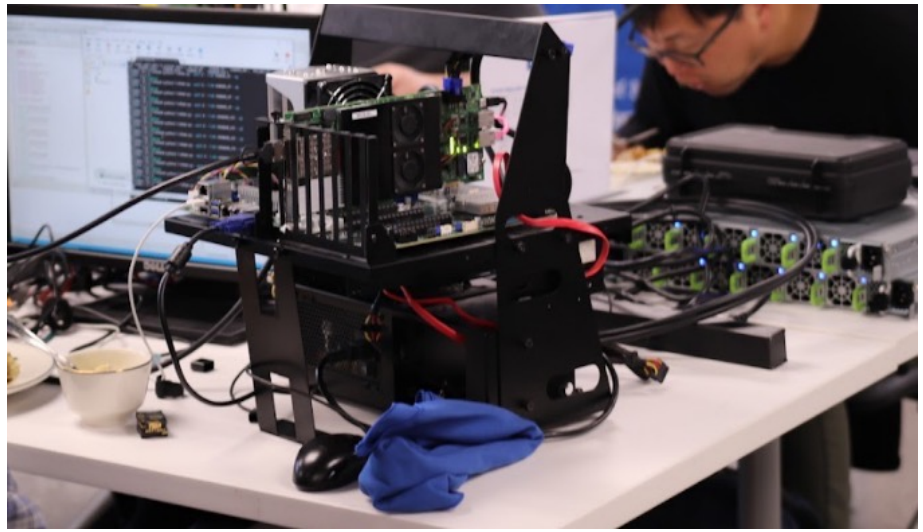
Ecosystem alignment

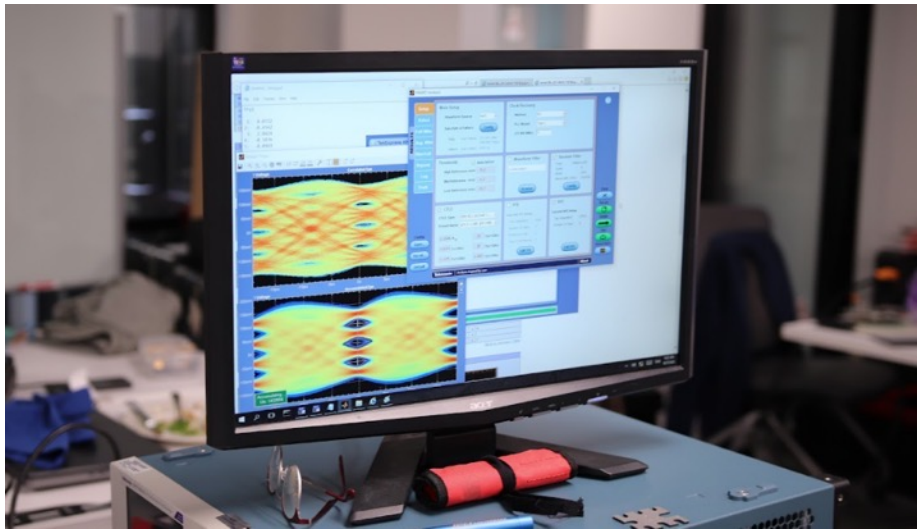
Conformance:

Testing methodologies

Multi-vendor correlation

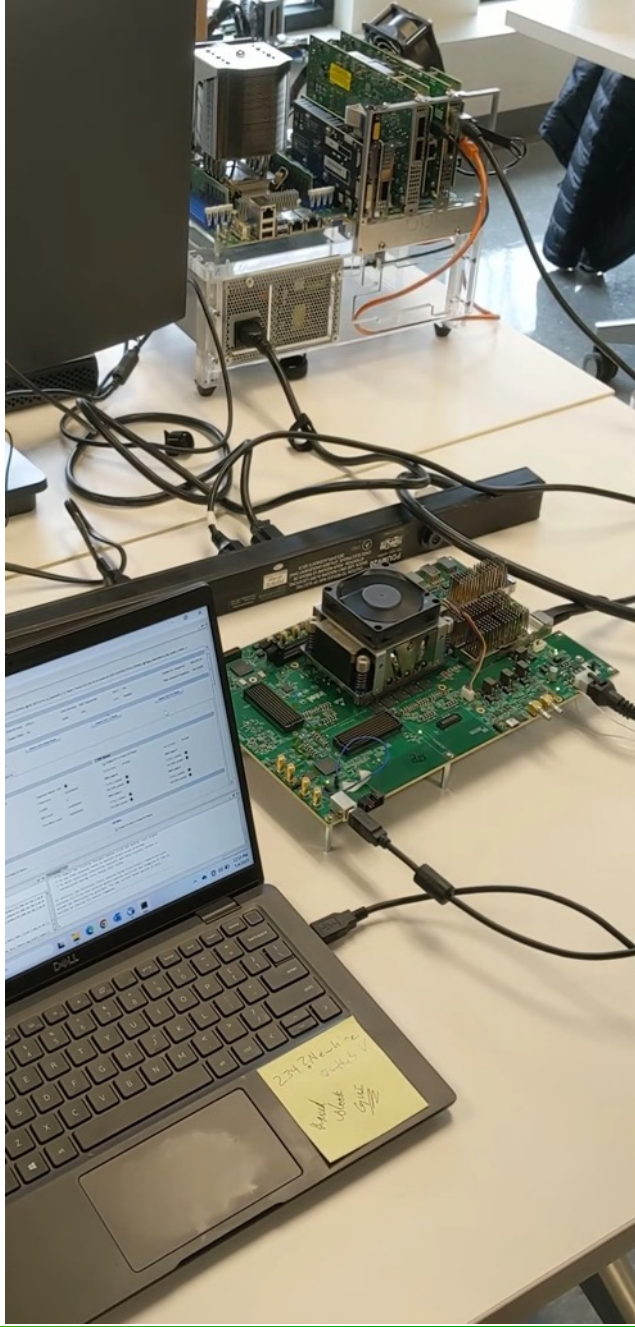
Product testing





Spring ‘23 Event: Interop Summary

- 30 host devices, 10 system vendors
- Captured link status/type, FLR/traffic, TTL, and reset tests
- 11 devices reported AN/LT support for 100G/lane protocols
- Link established on 90 out of 110 cables/modules from six vendors
- Link up 173 out of 213 attempts (80% success rate)
  - Only eight 100G/lane links using AN/LT



Goals for Future Plugfests

1 to 2 events per year

Technology and participant driven

Comprehensive and focused events

Increased focus on key areas of influence

Proposal for Next Plugfest

Call for Interest out now!

- **Event Focus:** Auto Negotiation and Link Training
- **Devices:** Ethernet end points, test equipment, passive/linear cables
- **Target date:** Dec 4 to 8, 2023
- **Proposed location:** Intel, Hillsboro campus
- **Invitees:** EA Member and non-members

If you have any questions or comments, please email **admin@ethernetalliance.org**

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