

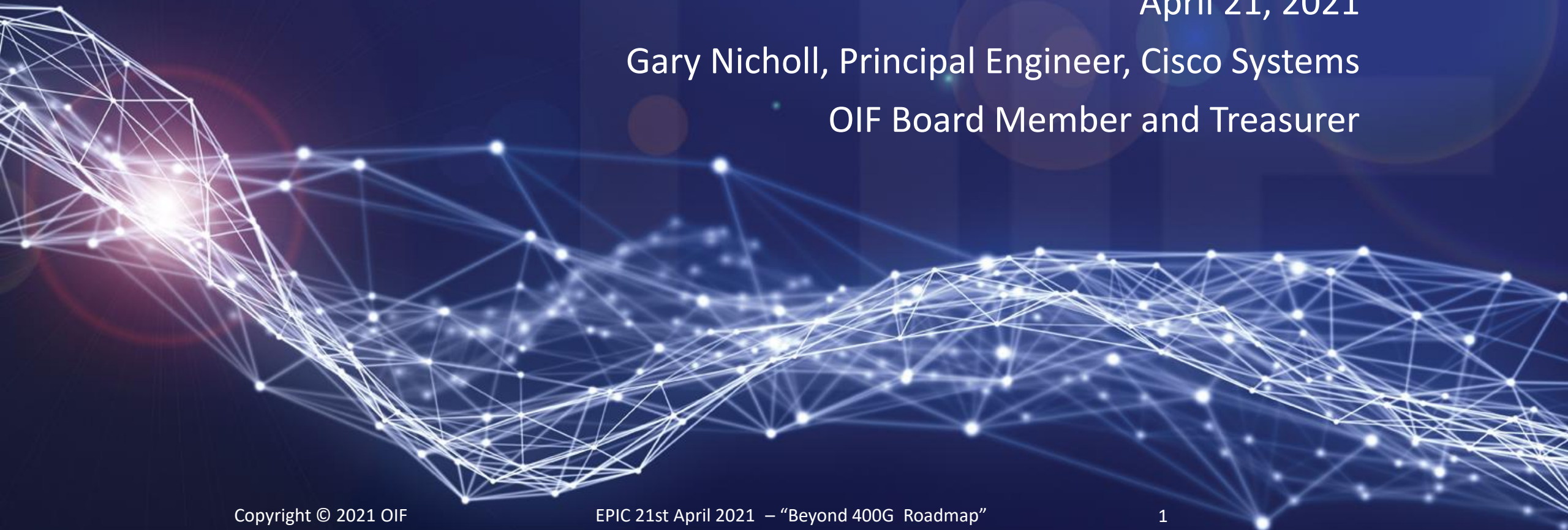


# B400G – An OIF perspective

April 21, 2021

Gary Nicholl, Principal Engineer, Cisco Systems

OIF Board Member and Treasurer



# What is the OIF ?

An international consortium that since 1998, has brought together industry groups from the data and telecom worlds

Mission: To foster the development and deployment of interoperable products and services for data switching and routing using optical networking technologies.

Our 100+ member companies represent the entire industry ecosystem:

- Network operators and network users

- Component and systems vendors

- Testing and software companies

Our goal is to support vendor innovation while:

- Preserving interoperability - Maximizing performance - Minimizing cost

<https://www.oiforum.com/>



# Outline

## Common Electrical I/O (CEI)

- CEI-112G to CEI-224G – can't get started without electrical

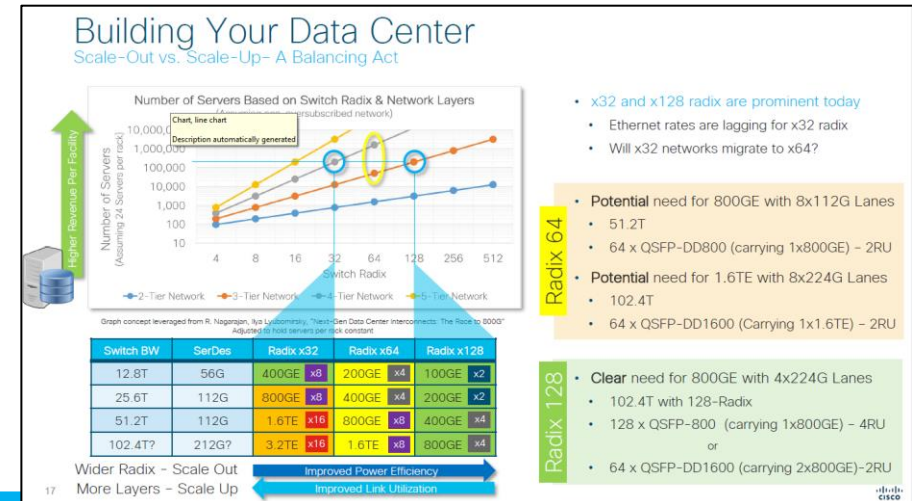
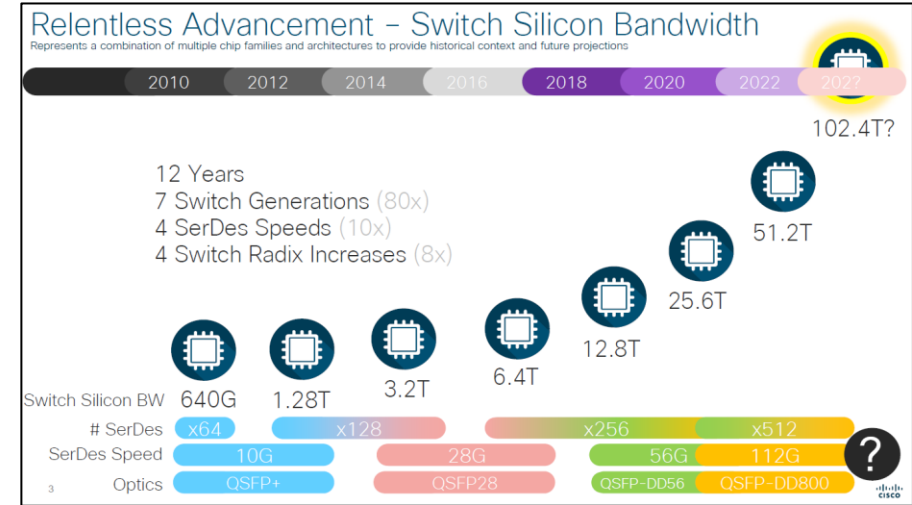
## 800G Coherent

- Build on our success on 400ZR

# A System Vendors Perspective

A couple of excellent presentations on system requirements and challenges for beyond 400G, from Rakesh Chopra, Fellow, Cisco Systems:


- oif2020.415.01
- [https://www.ieee802.org/3/B400G/public/21\\_02/chopra\\_b400g\\_01\\_210208.pdf](https://www.ieee802.org/3/B400G/public/21_02/chopra_b400g_01_210208.pdf)
- <https://ethernetalliance.org/blog/2021/02/24/looking-beyond-400g-a-system-vendor-perspective/>



# A System Vendors Perspective


Power is THE Problem to Solve


Apollo 13 - Universal Pictures



- ✘ Limits what we can build
- ✘ Limits what can be deployed
- ✘ Limits what our planet can sustain

“Power is Everything”\*  
John Aaron- Apollo 13 Flight Controller

Adopt a power first design and deployment methodology 

6 \* - Thanks to Kraig Owen for the reference 

Call to action: We are at an inflection point in the industry where the pace of bandwidth growth and innovation isn't slowing down, and power is growing at an unsustainable rate.



# OIF's CEI Has Been a Significant Industry Contributor

Name	Rate per pair	Year	Activities that Adopted, Adapted or were influenced by the OIF CEI
CEI-112G	112Gbps	2021 (projected)	Five channel reach projects in progress, IEEE, <a href="#">InfiniBand</a> , T11 (Fibre Channel), Interlaken, ITU.
CEI-56G	56Gbps	2017	IEEE, <a href="#">InfiniBand</a> , T11 ( <a href="#">Fibre Channel</a> ), Interlaken, ITU
CEI-28G	28 Gbps	2012	<a href="#">InfiniBand EDR</a> , 32GFC, SATA 3.2, SAS-4, 10GBASE-KR4, CR4, CAUI4, Interlaken, ITU
CEI-11G	11 Gbps	2008	<a href="#">InfiniBand QDR</a> , 10GBASE-KR, 10GFC, 16GFC, SAS-3, <a href="#">RapidIO v3</a> , Interlaken, ITU
CEI-6G	6 Gbps	2004	4GFC, 8GFC, <a href="#">InfiniBand DDR</a> , SATA 3.0, SAS-2, <a href="#">RapidIO v2</a> , <a href="#">HyperTransport 3.1</a> , Interlaken, ITU
SxI5	3.125 Gbps	2002-3	Interlaken, FC 2G, <a href="#">InfiniBand SDR</a> , XAUI, 10GBASE-KX4, 10GBASE-CX4, SATA 2.0, SAS-1, <a href="#">RapidIO v1</a> , ITU
SPI4, SFI4	1.6 Gbps	2001-2	SPI-4.2, <a href="#">HyperTransport 1.03</a>
SPI3, SFI3	0.800 Gbps	2000	(from PL3)



# OIF 224G Project Started in August 2020

## Project Inputs from Members and SME

Reaches & architectures required

Power pJ/b

Transmission media

Modulation/FEC

Channel sims

Test challenges

Working Group  
discussion/  
debate/analysis



White paper  
summarizing  
consensus  
findings

## Anticipated Project Starts

Die to OE

Chip to module

Chip to chip

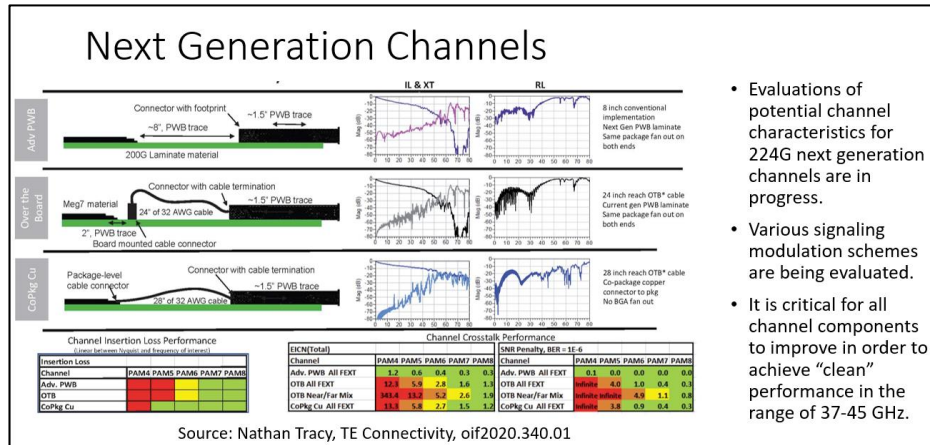
Hybrid backplane

New applications???

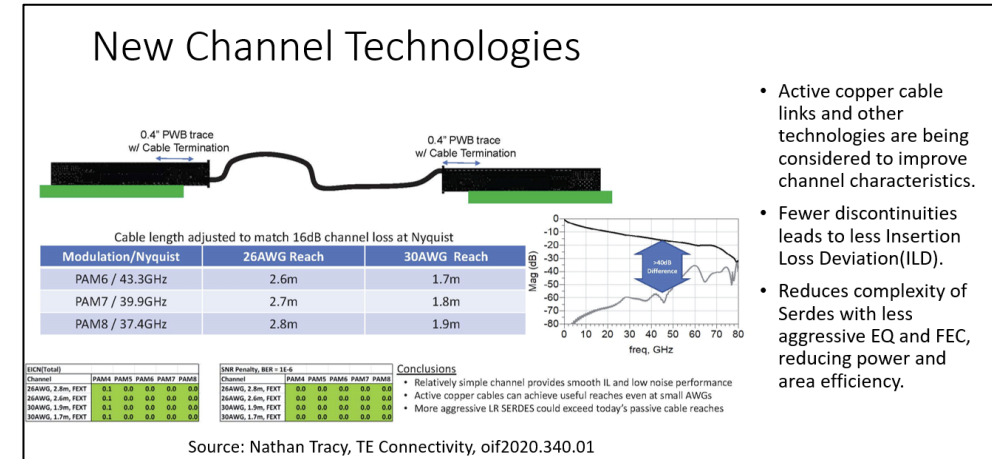
The intended output of this project is a number of project starts for specific reaches/architectures that will become future CEI clauses



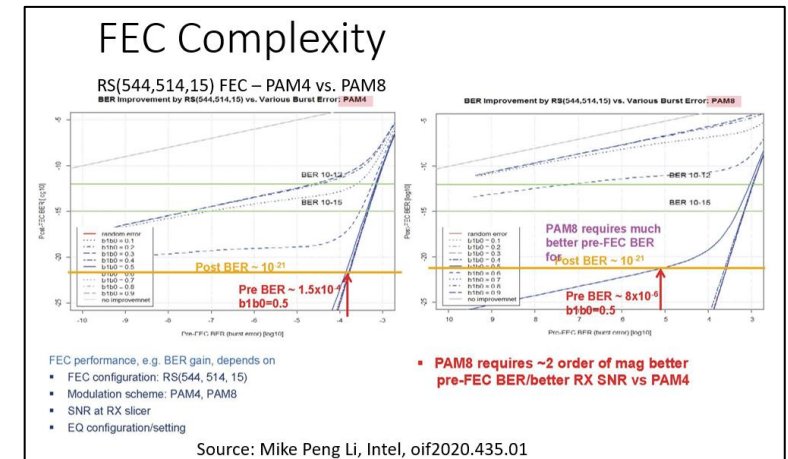
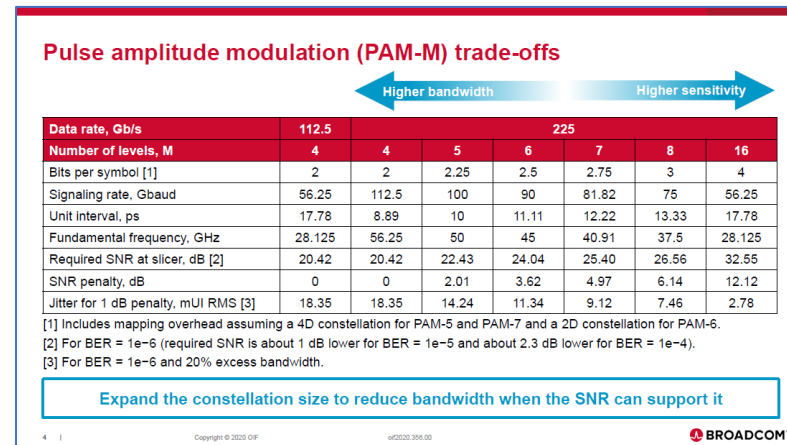
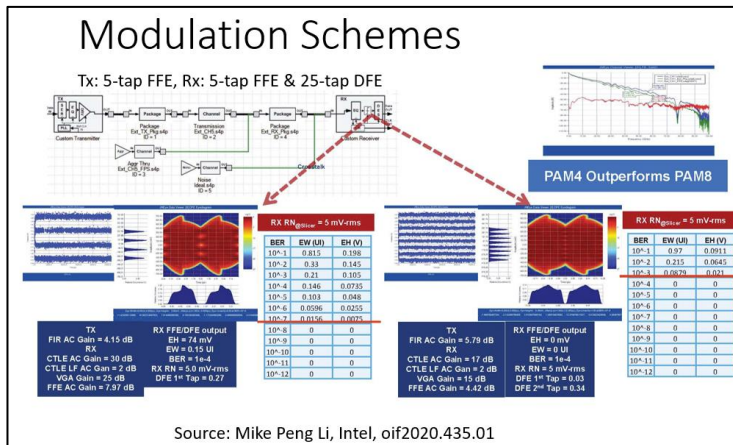
# A lot of detailed technical contributions



- Evaluations of potential channel characteristics for 224G next generation channels are in progress.
- Various signaling modulation schemes are being evaluated.
- It is critical for all channel components to improve in order to achieve "clean" performance in the range of 37-45 GHz.



- Active copper cable links and other technologies are being considered to improve channel characteristics.
- Fewer discontinuities leads to less Insertion Loss Deviation (ILD).
- Reduces complexity of Serdes with less aggressive EQ and FEC, reducing power and area efficiency.



# Summary on 224 Gbps Electrical Work

OIF has only just begun to explore all the key issues around this next industry rate:

- Modulation study
- Equalization proposals
- Material analysis
- New architecture trade-offs
- Channel simulations
- Power comparisons
- Test expectations

Anticipate significant consensus-based progress early in 2021

Come join the discussions in the OIF !



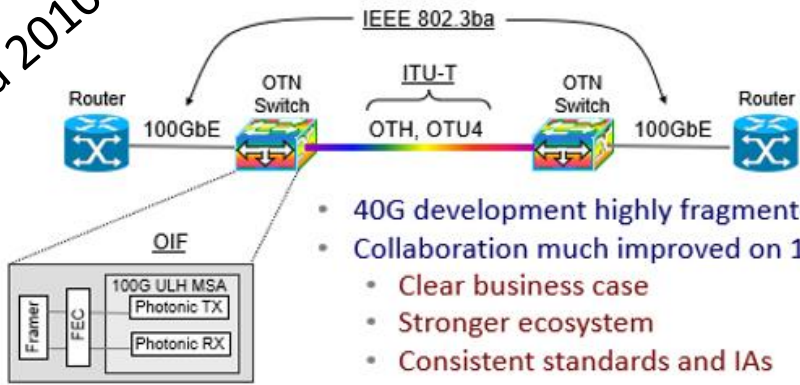


# OIF

800G COHERENT

# 800G Coherent – OIF Coherent History

Circa 2010



- 40G development highly fragmented
- Collaboration much improved on 100G
  - Clear business case
  - Stronger ecosystem
  - Consistent standards and IAs

Provides a holistic solution

- ✓ Components
- ✓ System envelope
- ✓ Thermal mgmt.
- ✓ Mgmt interface
- ✓ Interoperability

100G Coherent



400ZR Coherent  
IC-TROSA



# 800G Coherent Project

New project start (11/2020):

Define a single-lambda 800G coherent line interfaces for two applications:

- Single-span amplified up to 80-120km DWDM link (e.g. data center interconnect applications)
- Unamplified 2-10km fixed wavelength link (e.g. campus applications)

Support Ethernet client(s) (minimum 100GE) up to 800G aggregate bandwidth

- Multiplexing (8x100GE, 2x400GE, etc)

Define specifications of line side signals for interoperability

- Symbol rates; modulation formats; FECs; DSP framing; symbol mapping, etc.

Define optical specifications for both Tx and Rx, along with Informative Tx/Rx module requirements





“Let's work the problem people. Let's not make things worse by guessing.” – Gene Kratz, Apollo 13

“Never underestimate the ability of smart engineers to come up with solutions.” – Mark Nowell, Cisco

