



Coherent Optics in the Datacenter ECOC 2024

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OIF - Where the optical networking industry's interoperability work gets done

Who:

- 150+ member companies
 - Network operators
 - System vendors
 - Component vendors
 - Test & measurement vendors
 - Academia & research

What:

- Identify needs, gaps
- Develop interoperable optical, electrical, and control solutions
- Publish Implementation Agreements and White Papers
- Interoperability Demos

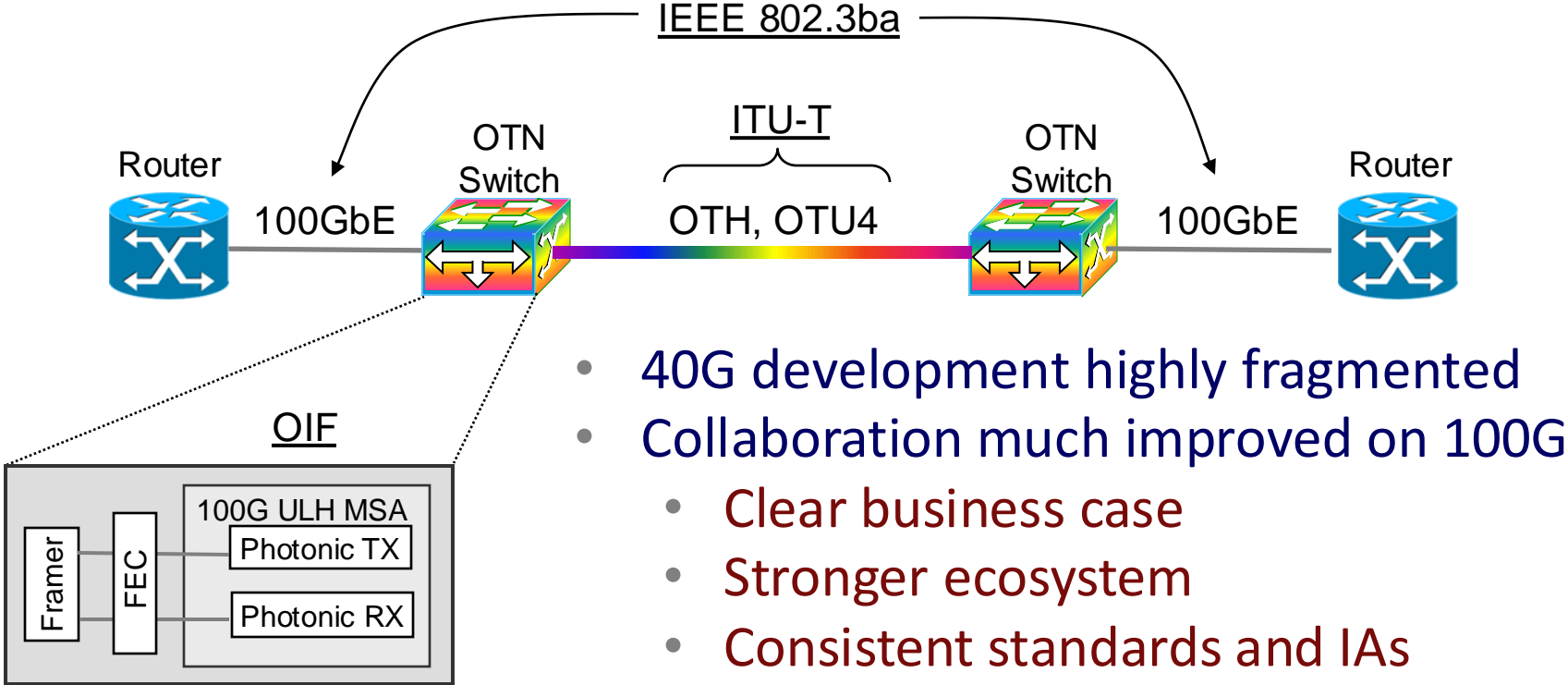
Why:

- Accelerate adoption of advanced technology to connect a global, open networked world

Challenge: Support innovation while preserving interoperability, optimizing performance and cost

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

How OIF Accelerated 100G



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

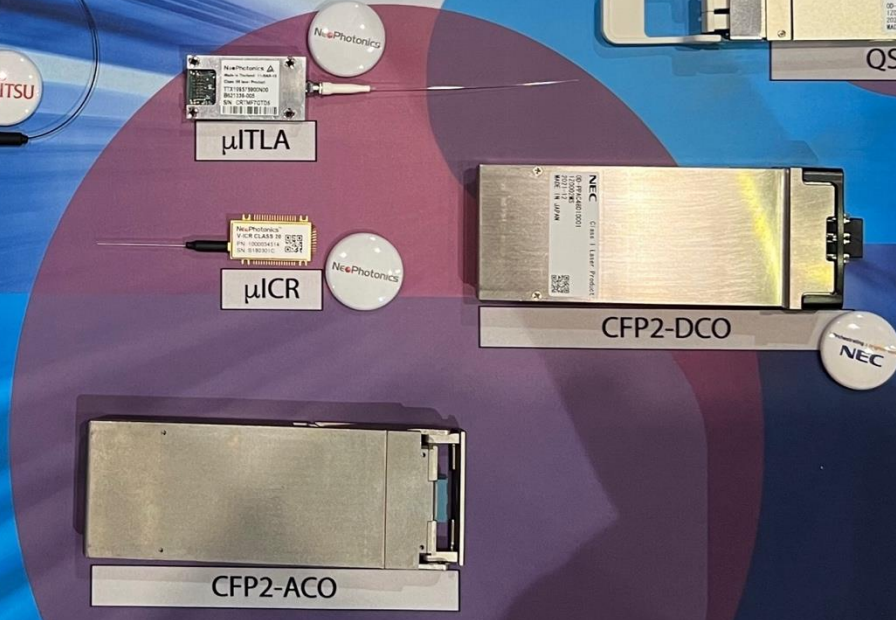
- OIF work on 100G DWDM transport united the industry around
 - An overall framework including a modulation format
 - Detailed IA's including photonics Tx/Rx modules

OIF

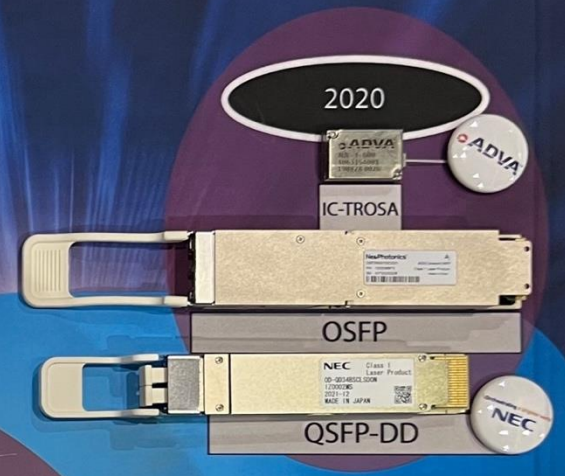
BUILDING BLOCKS FOR COHERENT



2010



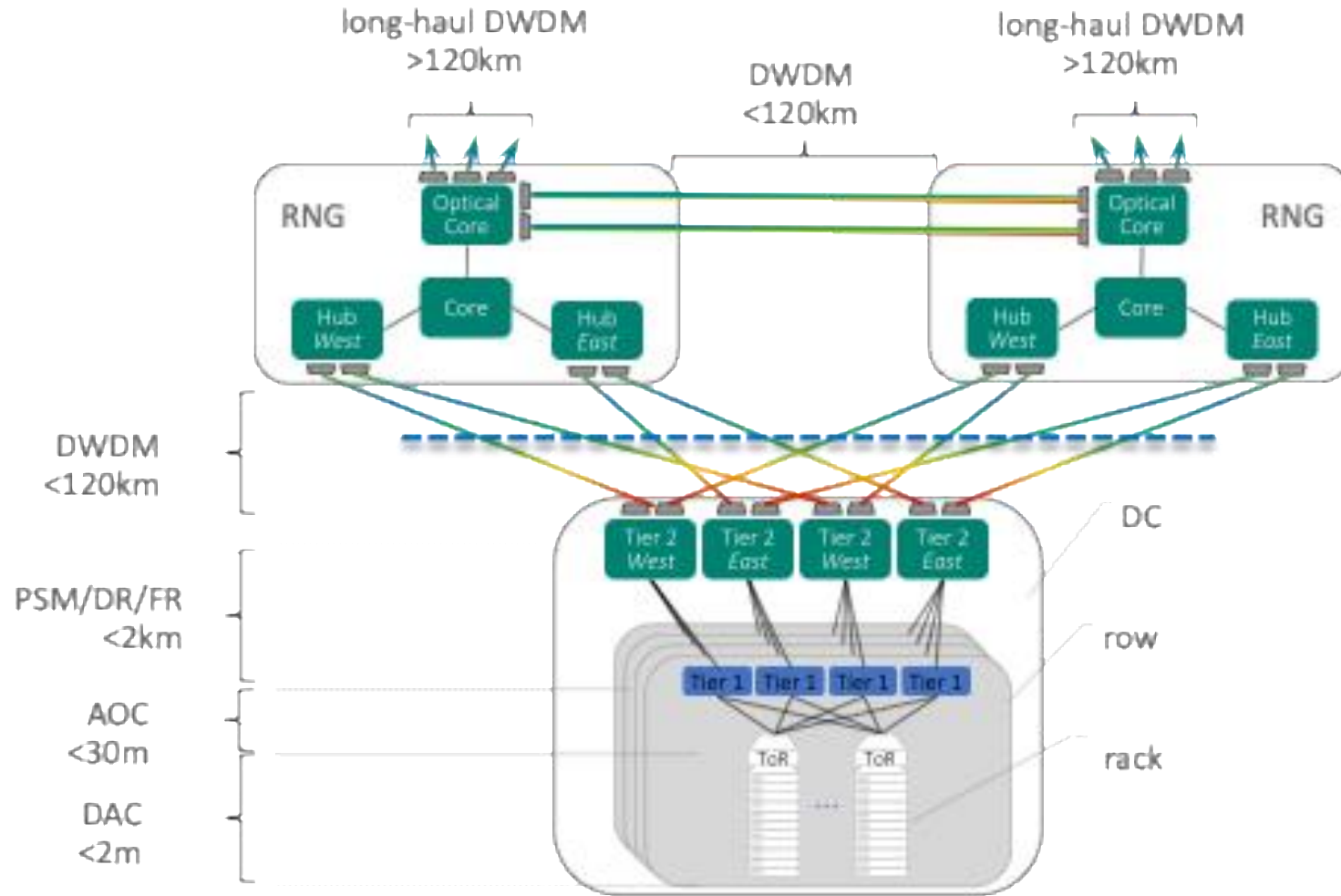
2016



2020

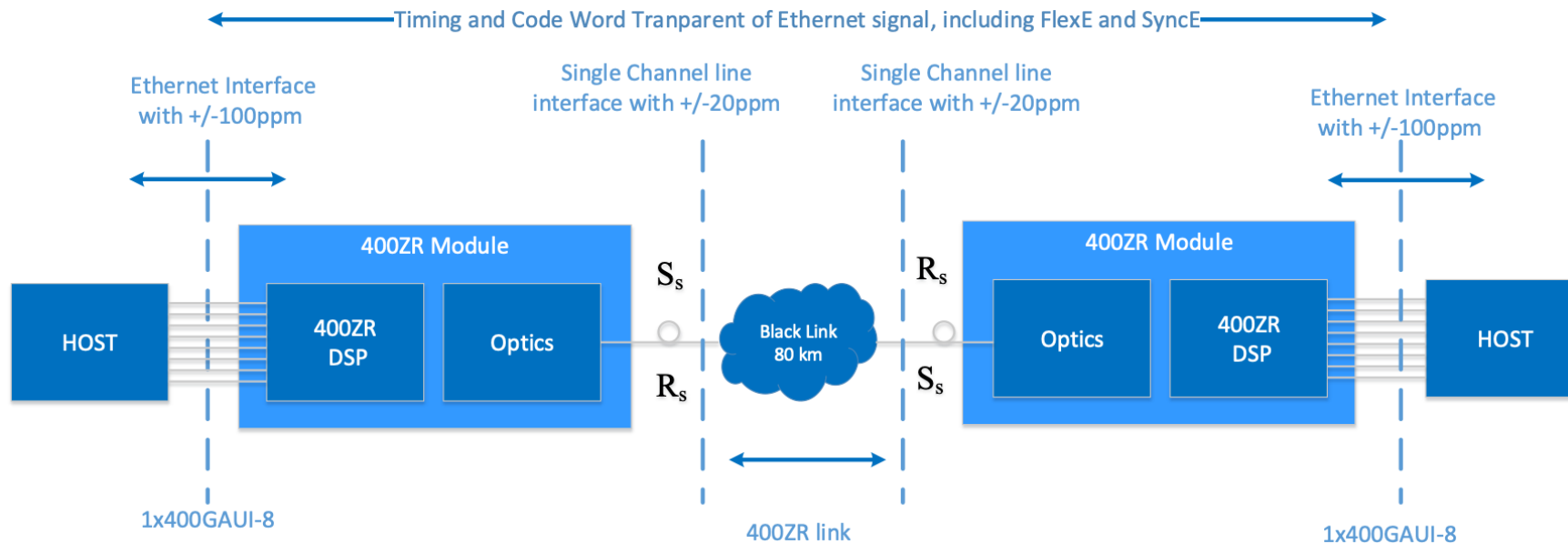
400G

Original 400ZR Application



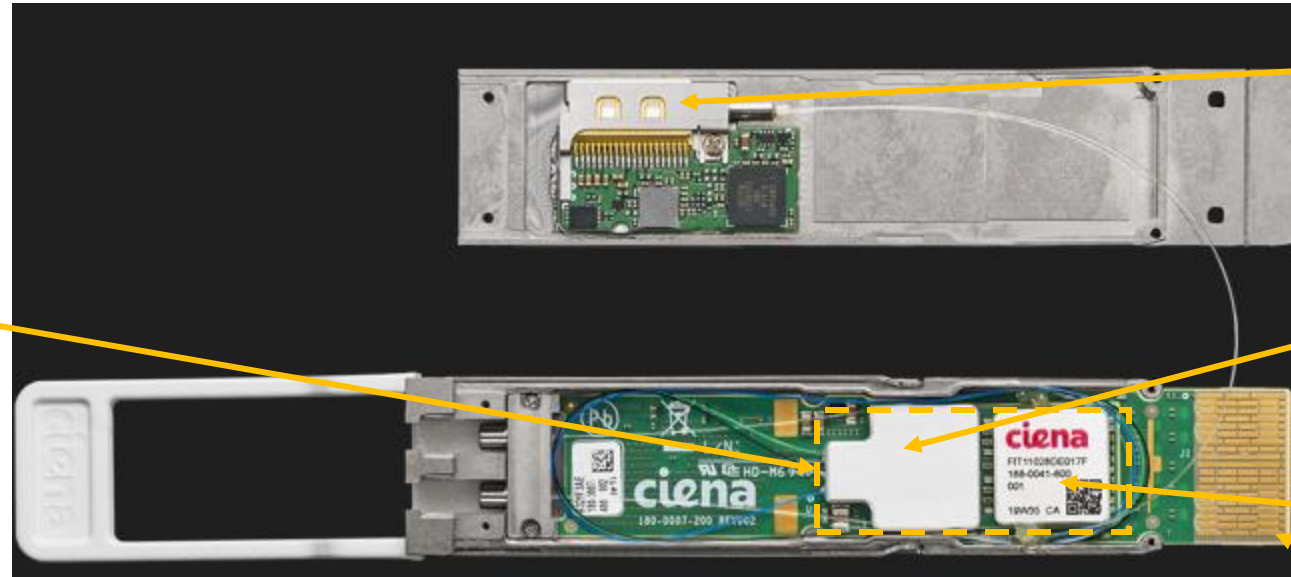
What is 400ZR?

- 400ZR is an interoperable, cost-effective, 400Gb/s interface based on single-carrier coherent DP-16QAM modulation, low power DSP supporting absolute (Non-Differential) phase encoding/decoding, and a Concatenated FEC (C-FEC) with a post-FEC error floor $<1.0E-15$. $>80\text{km}$. Form-factor agnostic.



Anatomy of a 400ZR QSFP-DD

Transceiver-on-chip (ToC)
 Optimized coherent modem for pluggable form factors combining DSP & COSA on common chip substrate



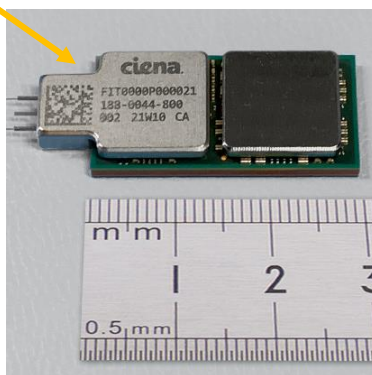
Laser

Coherent Optical Sub-Assembly (COSA)
 Silicon photonics modulator/demodulator, driver, TIA

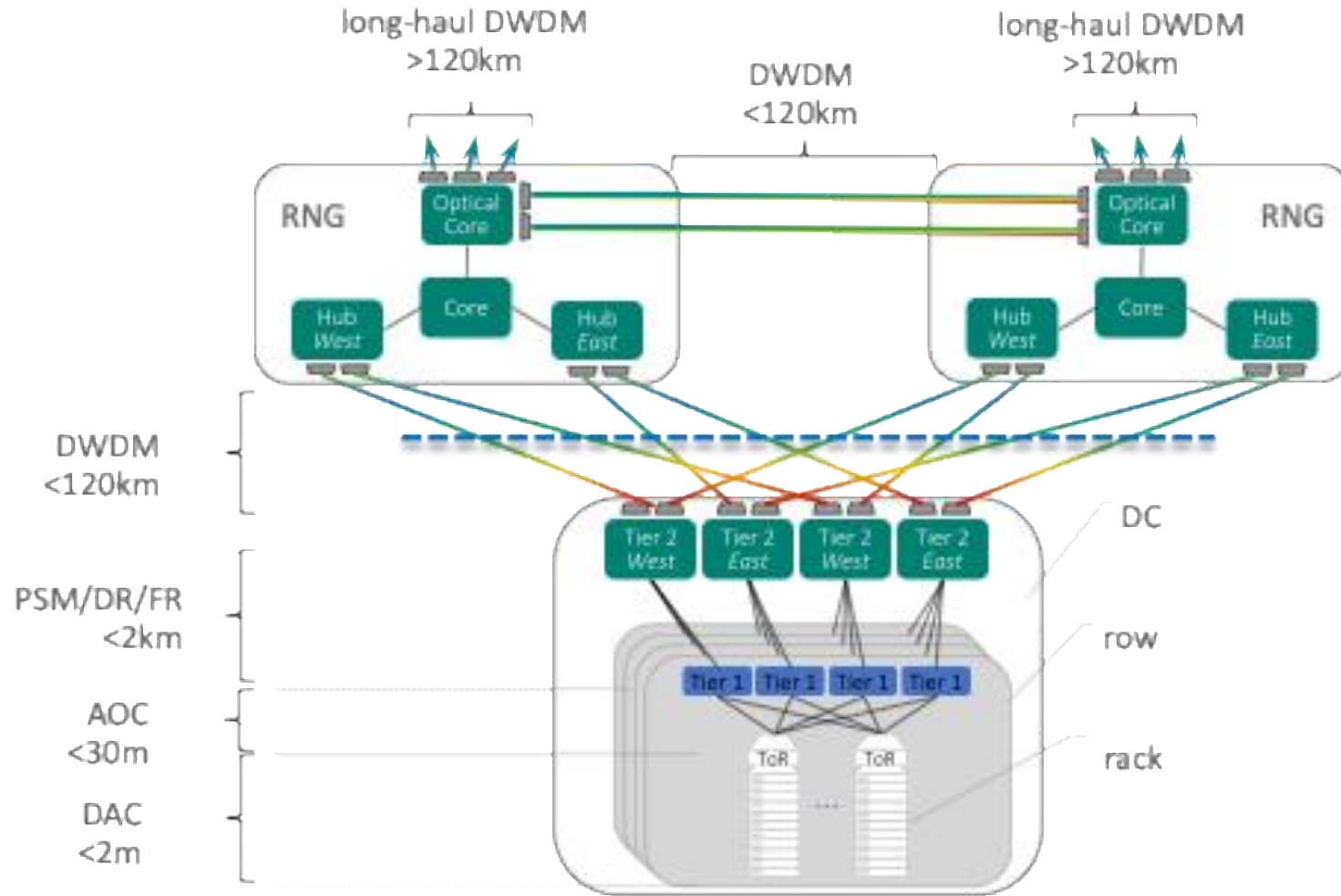
7nm coherent DSP

Host connection

External heat sink
 Optimized for both front-back and transverse cooling

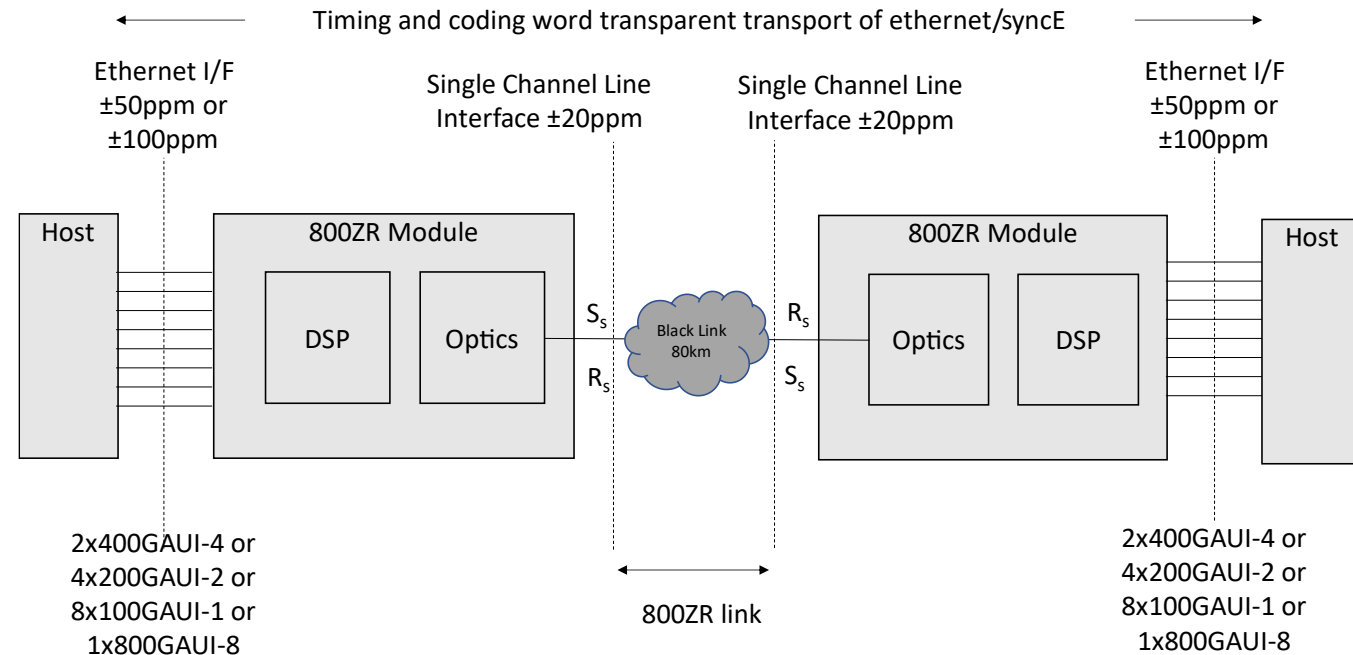


Original 800ZR Application



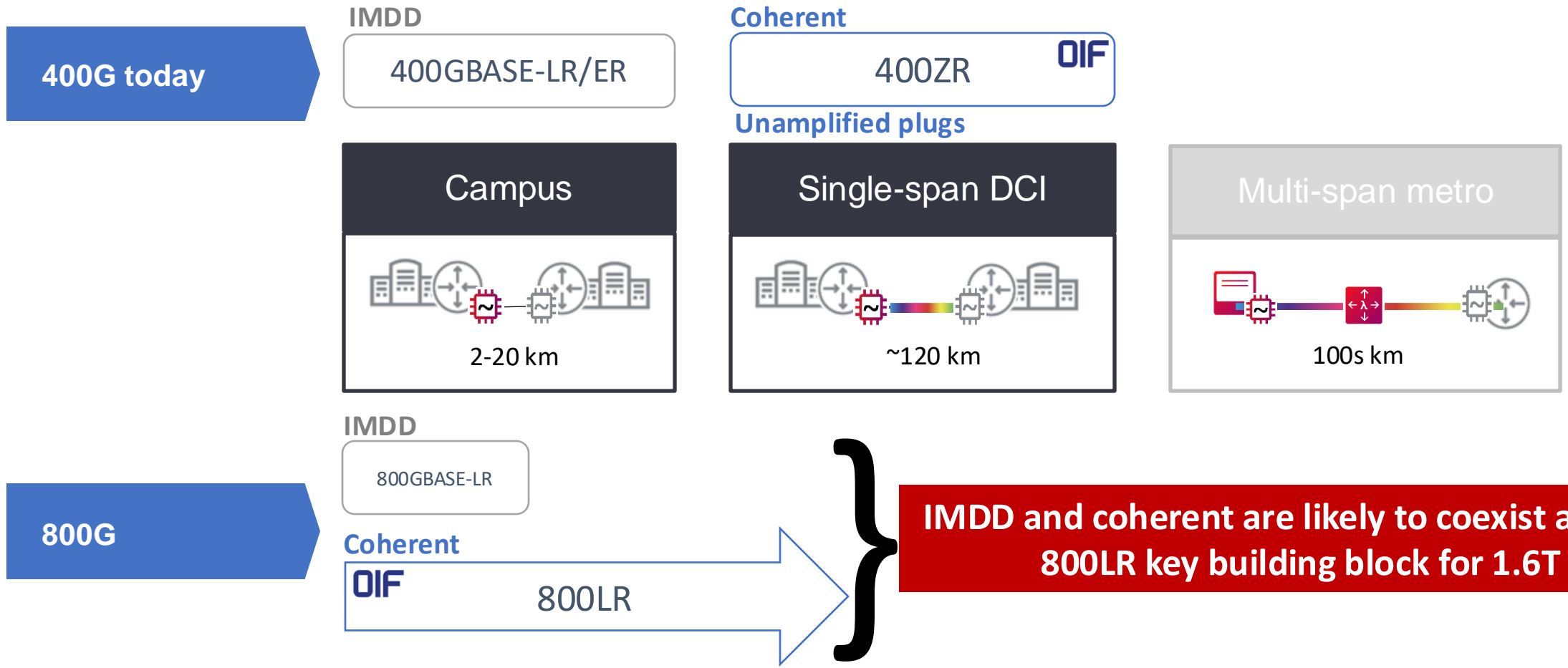
What is 800ZR?

- 800ZR is an interoperable, cost-effective, 800Gb/s interface based on single-carrier coherent DP-16QAM modulation, low power DSP supporting non-differential phase encoding/decoding, and OFEC with a post-FEC error floor $<1.0E-15$. >80 km. Form-factor agnostic.



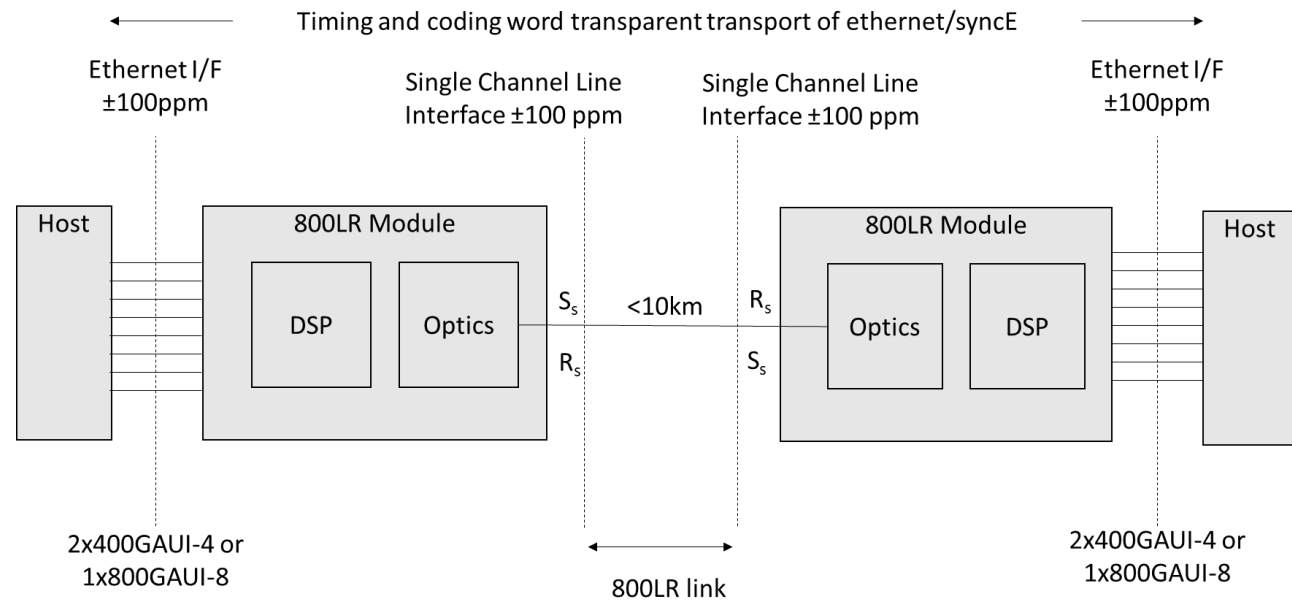
800LR Applications

Addressing the expanding campus

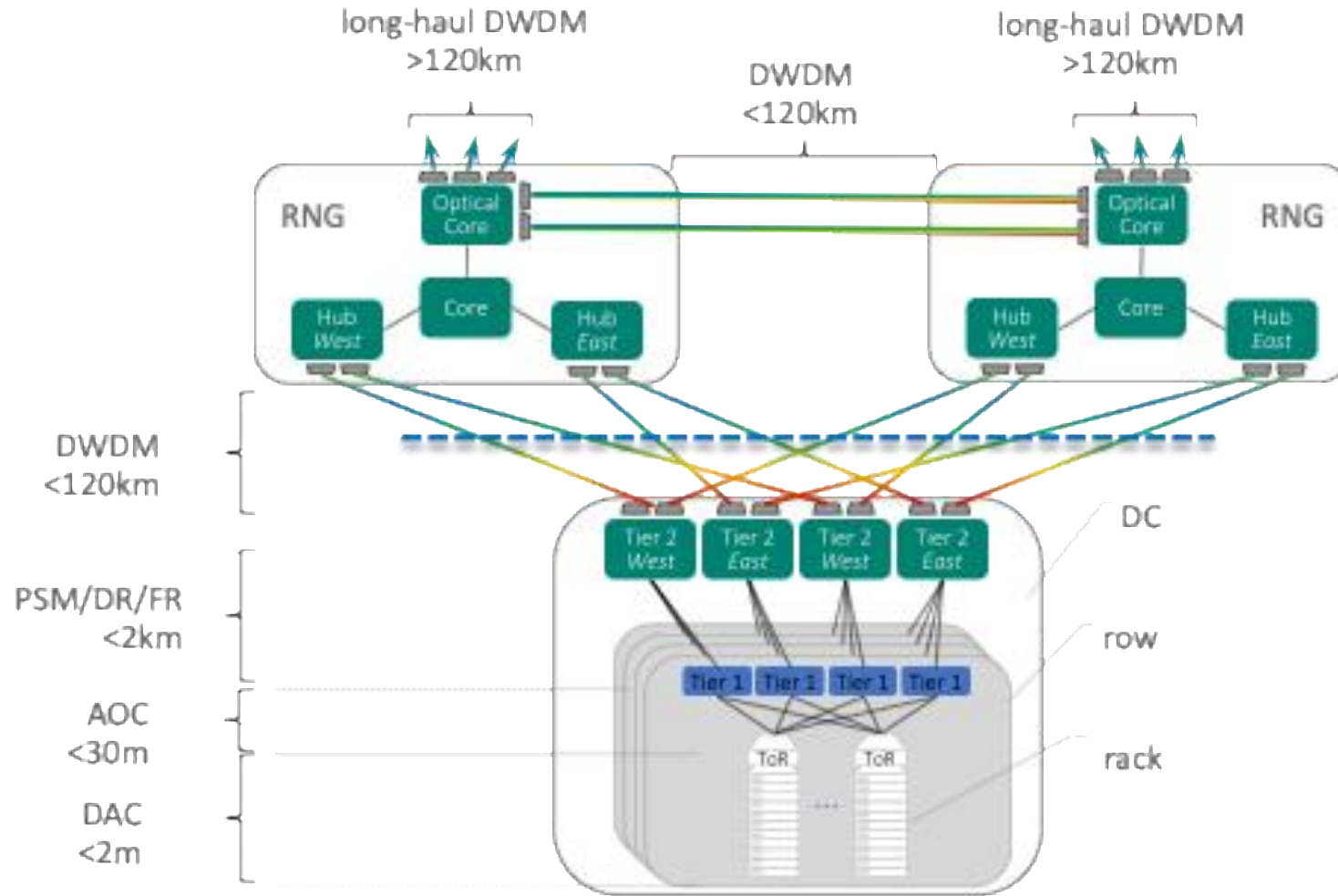


What is 800LR?

- 800ZR is an interoperable, cost-effective, 800Gb/s interface based on single-carrier coherent DP-16QAM modulation, low power/latency DSP supporting non-differential phase encoding/decoding, and concatenated forward error correction scheme of KP4 + BCH. O-band and C-band applications. <10km. Form-factor agnostic.



Original 1600ZR Application



General Upgrade Path (backward compatibility)

Case #	T1	T2	RNG routers
Ref	400/100G	400G	400G
1	400/100G	1600G	400G
2	400/100G	1600G	400G
3	400/100G	1600G + bulk fiber	400G
Green Field	1600G	1600G	1600G

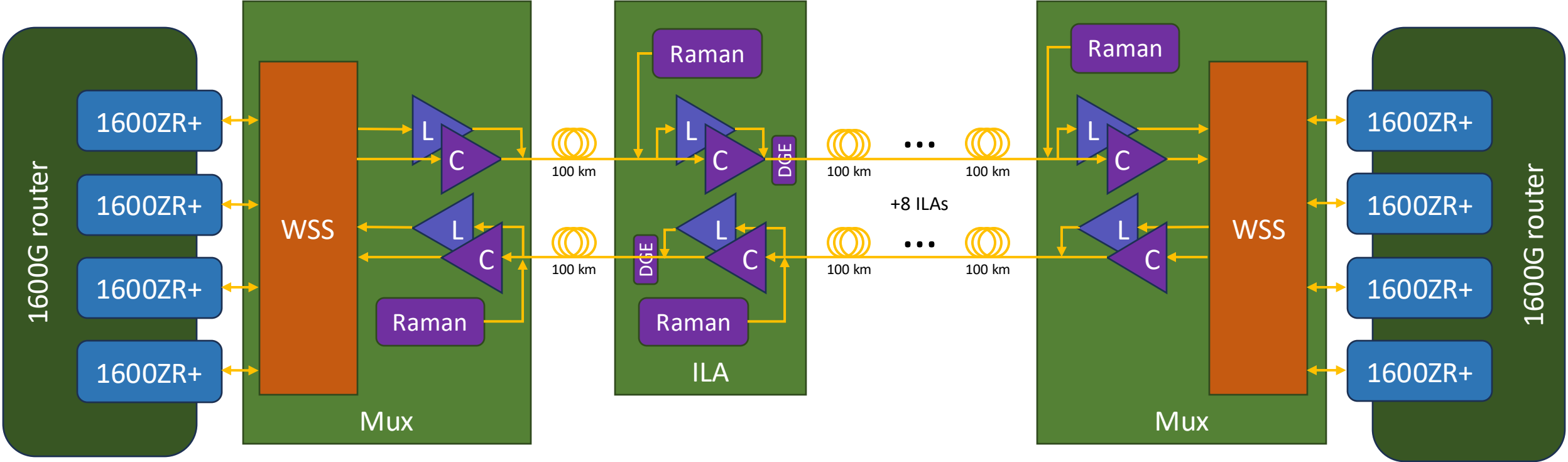


1600GE router with
1600ZR module
running 400ZR
application

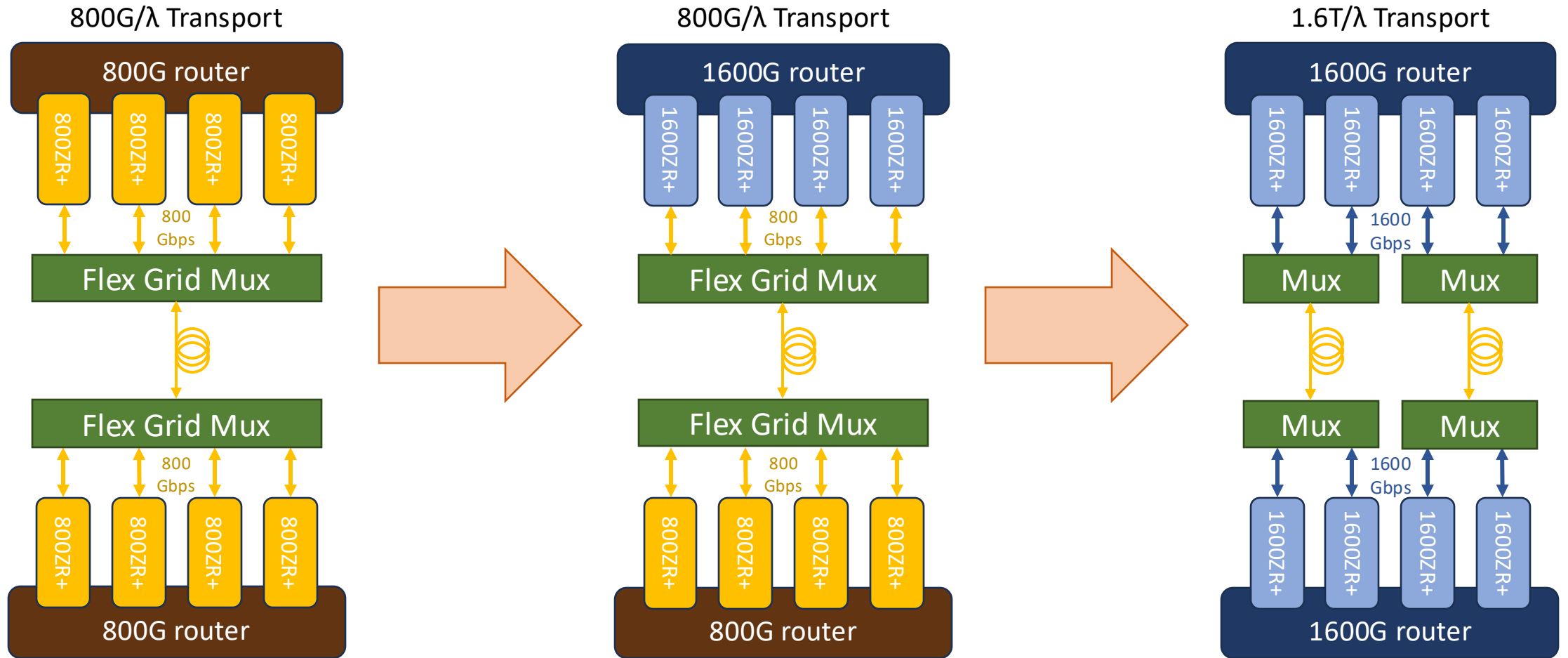
1600ZR Progress

- Straightforward extension of the 800ZR frame to 1600ZR
- Straightforward extension of the 800ZR client mapping procedure to the 1600ZR frame
- Straightforward extension of the OFEC to 1600ZR
- C-band only

1600ZR+ Reference Link (1000km)



General Upgrade Path (backward compatibility)

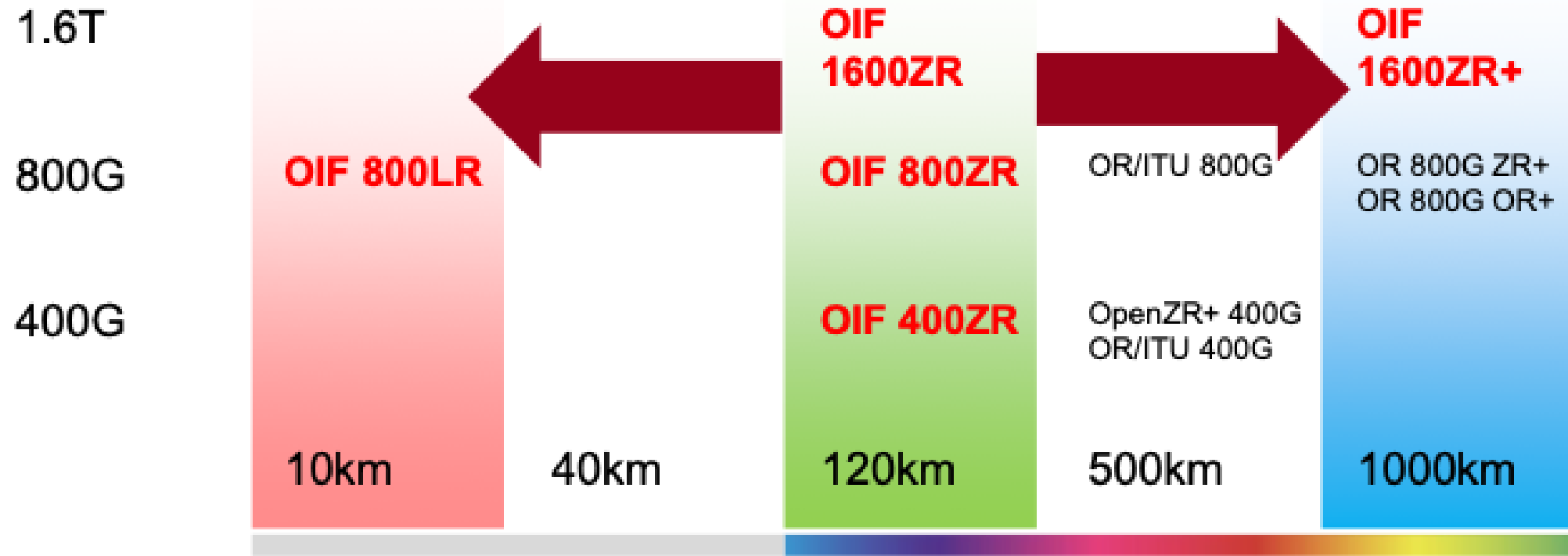


Optical interface backward compatibility needed to modes deployed in volume in Meta network

1600ZR+ Progress

- ZR/FlexO-xe frame format with 16x 100G ZR instances
 - Client adaptation Aligned to OTN ITU-T FlexO-16e
 - GMP mapping as per 800ZR and G.709.1
 - OFEC
-
- Interest in 1600ZR+ PCS schemes beyond simple modifications to the publicly published OpenROADM LUT method

OIF Scope has Expanded



Goal is to complement other Standards Bodies and Forums

150+ Member Companies

Identifies Industry Needs and Gaps

Develops Implementation Agreements (specifications)

Performs Interoperability Demonstrations

OPTICAL

Multi-vendor Interoperability in Client Form Factors

1600ZR+

- <1000km multispan Coherent DWDM

1600ZR, 800ZR, 400ZR

- >80km Coherent DWDM

800LR

- <10km Coherent Point-to-Point

ENERGY EFFICIENT INTERFACES

- Next Generation Low Latency Interfaces for AI/ML & Data Centers (RTL, COI)
- Co-Packaged Modules (3.2T)
- External Laser Sources (ELSFP)

PROTOCOL

FlexE

- More Efficient
- Agile Networking

MANAGEMENT

Common Management Interface Specification (CMIS) and Coherent CMIS

- Common
- Flexible
- Extendable

ELECTRICAL

Common Electrical I/O (CEI)

- High-Speed Building Blocks
- 448G, 224G, 56G, 28G
- Protocol Agnostic Link Training

NETWORKING

Transport SDN APIs

- Automation, Programmability

Enhanced Network Operations

- Artificial Intelligence
- Digital Twin
- Awareness Between Application and Optical Layers

OIF

- Member Driven Global Organization
- 25+ Years of Service
- 150+ Member Companies
- 80+ IAs (specifications)
- 50+ Interop Demos

