



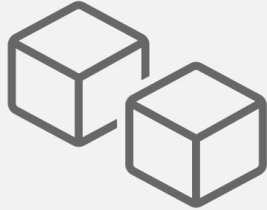
Update on Coherent P2MP Technologies, Ecosystem and Standardization

Dave Welch, Ph.D.

Founder and Chief Innovation Officer

OFC 2023

XR Compatible Pluggables – Intelligent Optical Networking



Similar to ZR and ZR+

- Operations
- Management

P2MP



P2P ZR/ZR+

Flexible

- Broadcast and narrow cast
- Host managed and Independent optical layer management (IPM)

Software-Configurable



Wide Application Scope

- PON overlay
- DCI
- Metro and Long Haul P2P

OPEN XR
FORUM

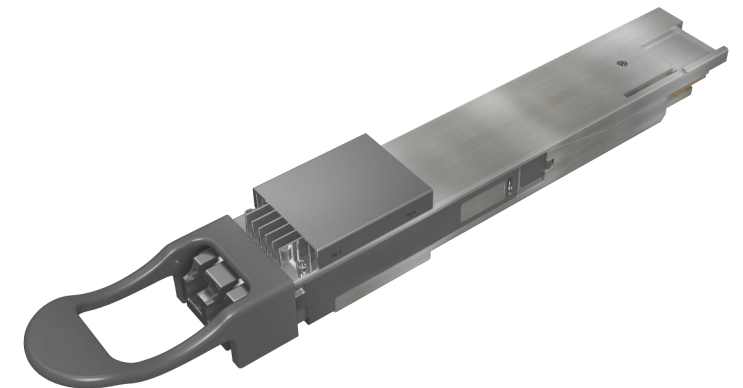
MSA

- Broad Industry MSA group
- Not in competition but in cooperation with existing MSA and Standards bodies



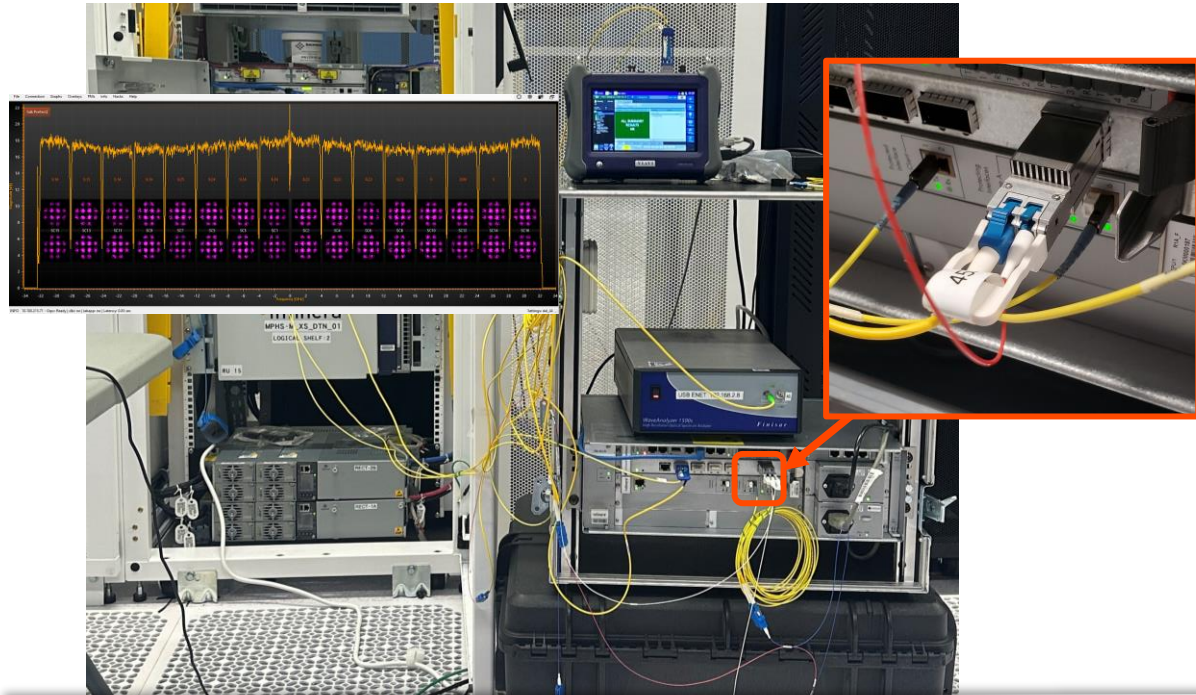
Standard-based

- Standardize technologies that accelerate highest value to the network



ZR/ZR+ mode of operation

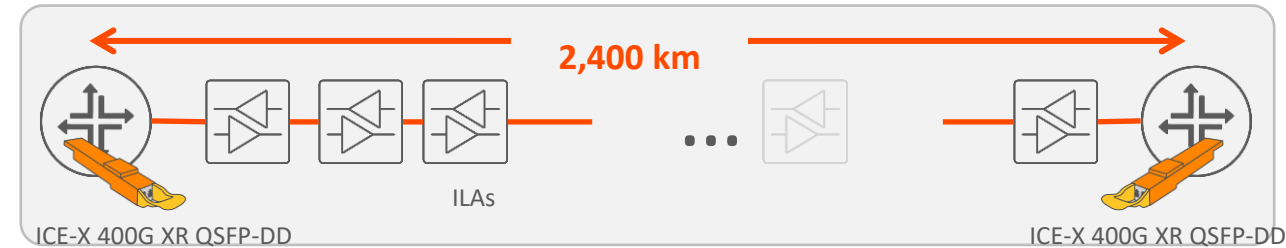
Arelion field trial



- Dallas \leftrightarrow Memphis (loopback)
- QSFP-DD operating 400G over **1,800 km**
- Live network, SMF-28 Fiber

OFC 2023 Demo

OFC



ufiSpace

DRIVENETS



2,400 km

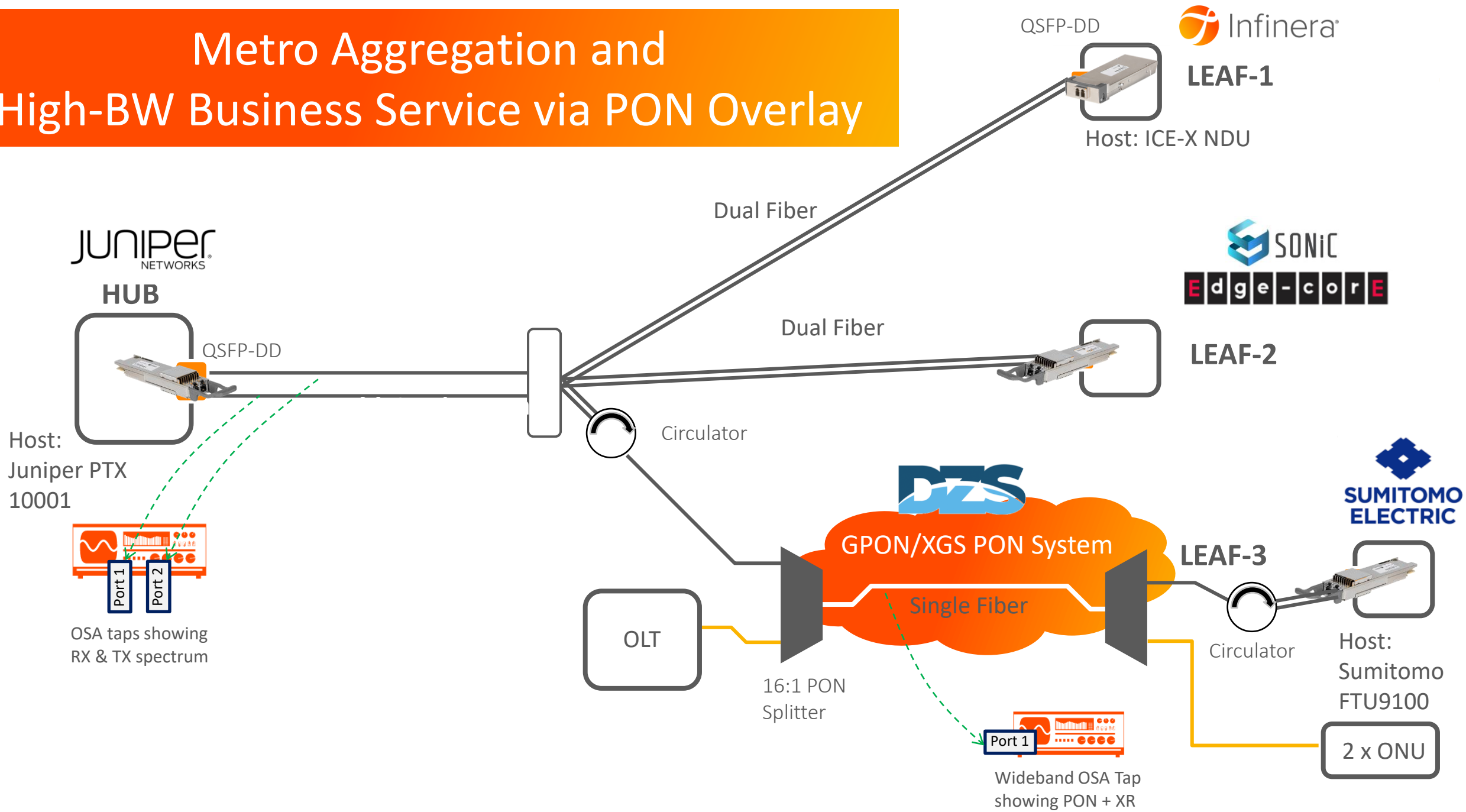
ufiSpace

DRIVENETS



- QSFP-DD operating 400G over **2,400 km**
- Corning Fiber TFX
- UfiSpace/DriveNets as hosts

Metro Aggregation and High-BW Business Service via PON Overlay



Achievements Open XR

OPEN XR FORUM LAUNCHES WITH
TIER 1 NORTH AMERICAN AND
EUROPEAN SERVICE PROVIDERS



June 2021

Today

5 MEMBERS



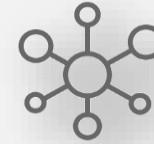
30 MEMBERS



17 Network Operators

9 NEMS

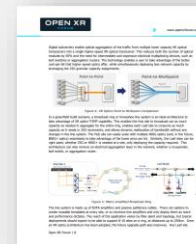
4 Component OEMs



Numerous PoCs



Management Specifications and Roadmap



Published technical Papers



Working Groups

Open XR Proof of Concepts

- **P2P Performance and Host Independent Management**

- **P2P performance with host independent management:**

- 1435km of Corning® SMF-ULL fiber at 400G 16QAM modulation.
- 1060km of LEAF fiber at 400G 16QAM modulation.

Participants: Lumen, Infinera

Status: PoC completed, report available on Open XR Forum website

- **Host-Independent Management and Disaggregated Hosts**

- **Dual Management (host independent) demonstrated for:**

- 400G P2P (100GHz&112GHz LS), 100G&200G (50 GHz LS),
- 2x100G P2MP (100GHz LS)

5 Participants: Carrier, NEMs

Status: phase 1 complete, phase 2 planning (more cases, more partners)

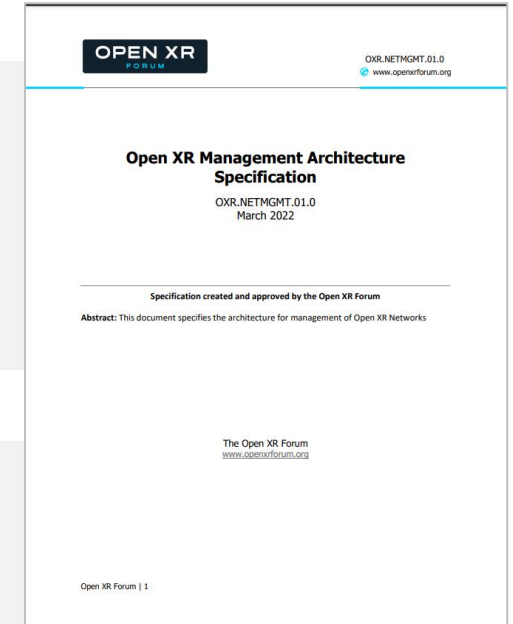
- **Point-to-Multipoint Data Center Interconnect and Edge Compute**

- **Regional to Edge Data Center connectivity and Management enabling Edge Compute**

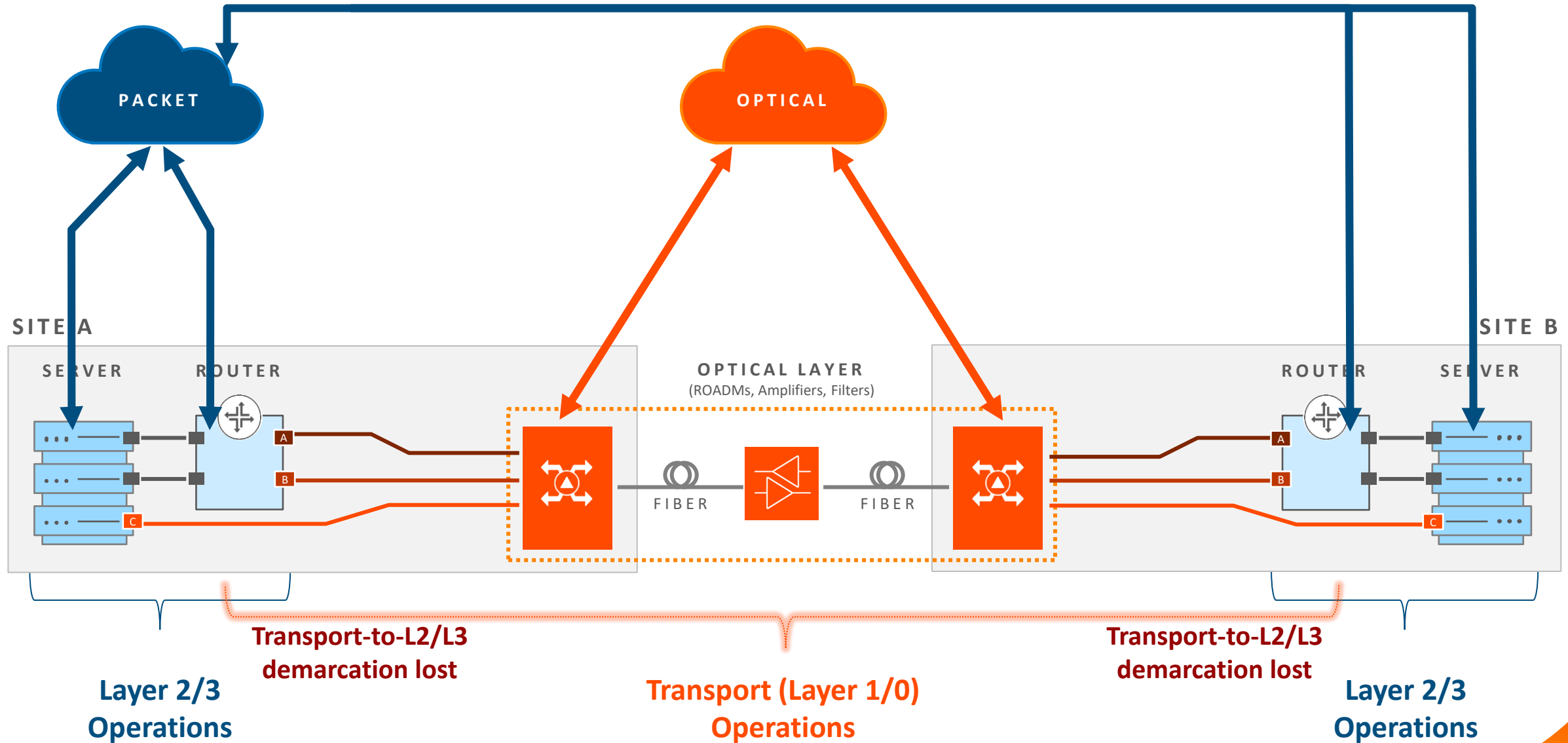
- XR pluggables in a P2MP live network enabling Edge Compute
- Multi-tenancy use cases connecting edge and regional datacenters

3 Participants: Carrier, NEM and Component Supplier

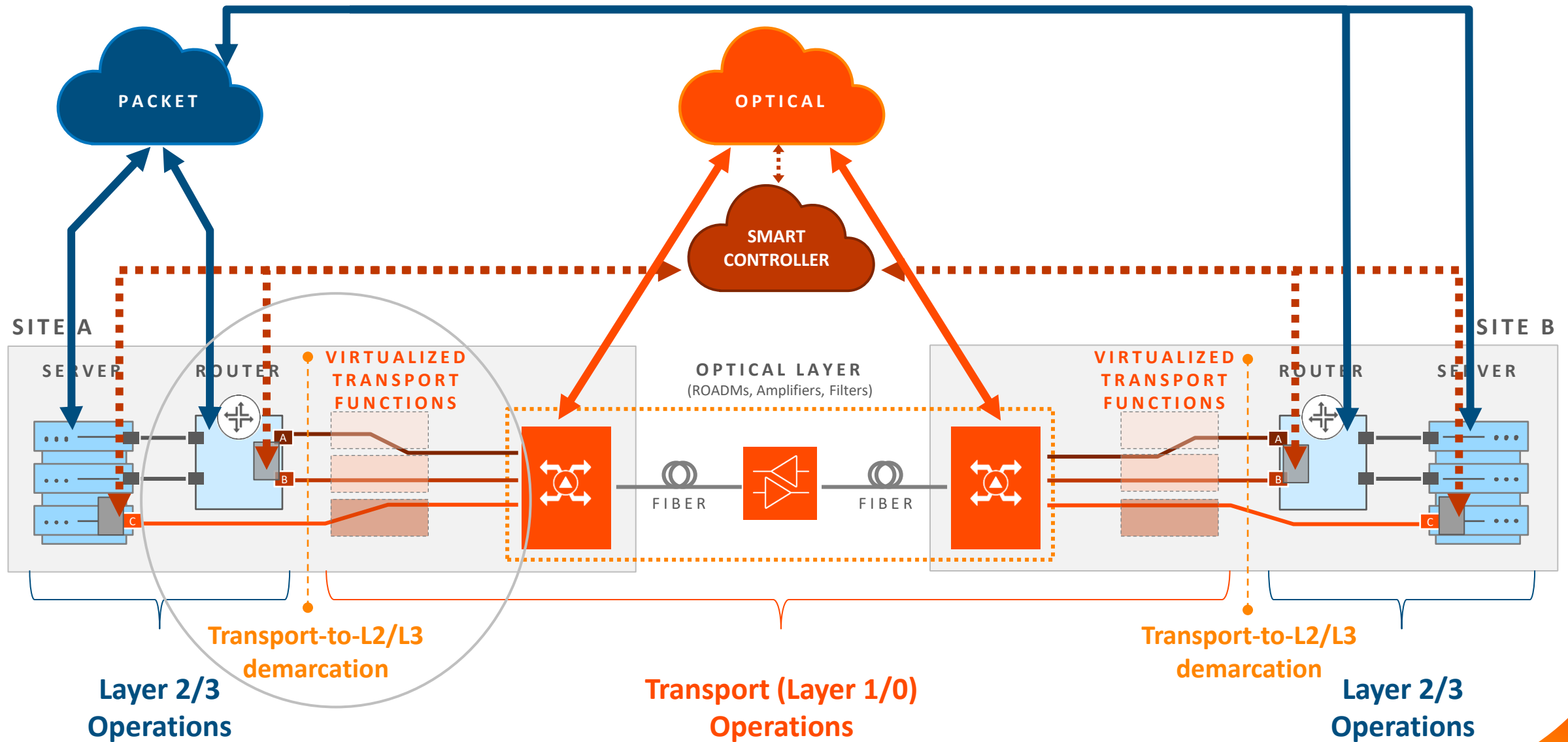
Status: planning phase



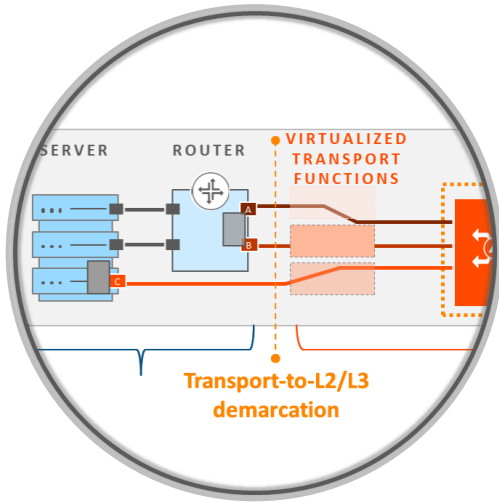
IPoDWDM Point-to-Point Deployment



IPoDWDM Point-to-Point Deployment



A Host Independent Architecture for IPoDWDM Management



VIRTUALIZED TRANSPORT DEMARCATION ENABLED BY SMART CONTROLLER INTERFACING TO SMART PLUGGABLES

**VIRTUALIZED TRANSPORT
FUNCTIONS**



**DIFFERENT MANAGEMENT PATHS FOR DIFFERENT USE-CASES:
ALIGNS RESPONSIBILITIES WITH ORGANIZATIONAL EXPERTISE AND TOOLS**



**ALIGN IP AND OPTICAL OPERATIONS WITH ORGANIZATIONAL STRUCTURE:
A CHOICE TO MERGE OR KEEP DOMAINS SEPARATE**



**DEPLOY AND BENEFIT FROM NEW SMART COHERENT OPTICS AND
APPLICATIONS WITHOUT WAITING FOR INTERFACE STANDARDIZATION**



**DECOUPLE DEVELOPMENT TIMELINES FOR PLUGGABLES AND HOSTS:
ACCELERATE TIMELINES IN A DIVERSE HOST TYPE REALITY**



**ENSURE OPERATIONAL AND MANAGEMENT CONSISTENCY
ACROSS ALL HOST PLATFORMS**

**HOST INDEPENDENT
MANAGEMENT**

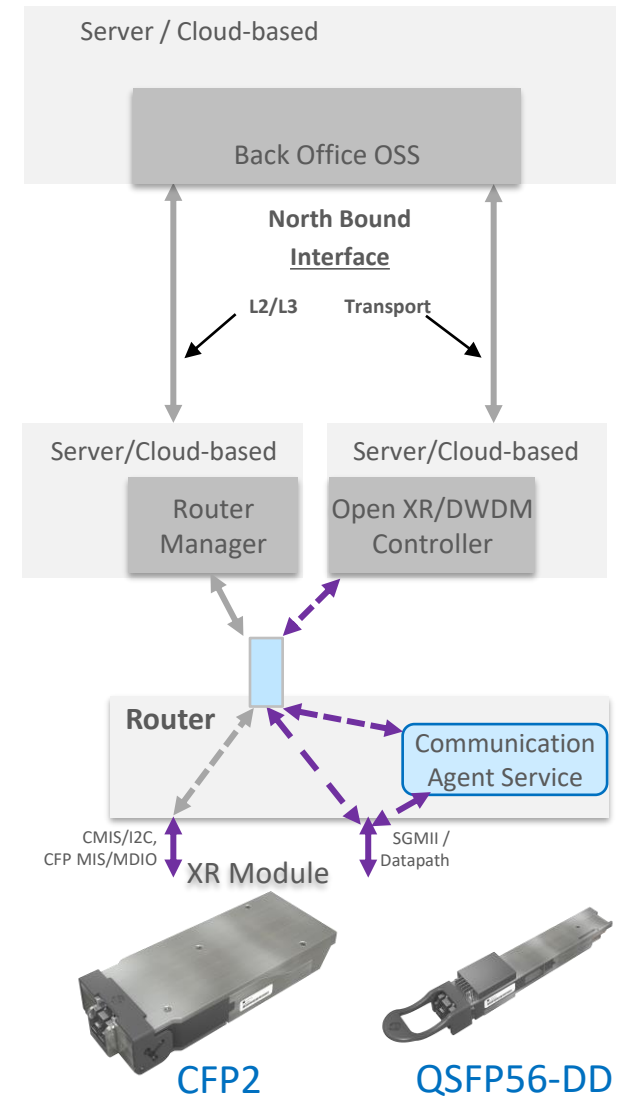
Standardization Work driven by Open XR Forum / Members

• Management

- Management Architecture (Open XR) **Completed**
- Subcarrier integration in CMIS (OIF) **Introduced for CMIS 5.3**
- PreCMIS5.3 Service-ID Configuration (Open XR) **Completed (in final reviews)**
- Communication Agent Specification (OpenXR) **2023**
- North Bound Controller Interface Definition (Open XR) **2023**
- Open XR controller Southbound Interface (Open XR) **2024**

• Transceiver

- Transceiver Specifications (Open XR) **Draft Completed (working group established)**
- Link Budget Pt-Pt, P2MP (Open XR) **Ongoing (working group established)**
- Spectrum Allocation for PON overlay (Open XR) **Ongoing (working group established)**
- Specifications for Mid-Span Meet(Open XR) **2024**
- TROSA Specifications for subcarrier modulation(Open XR) **2024**



Overview Other Coherent P2MP Standardization Activities

- **ETSI ISG F5G**

- Contributions referencing Open XR in use cases and technology landscape documents

- **CableLabs – 100G CPON – Coherent PON project**

- 100 Gbit/s coherent PON
- Ongoing project

- **IOWN**

- Discussion on Next Generation Networks

- **ITU/FSAN/IEEE**

- Multiple Contributions to ITU-T in September 2022

- **OIF**

- Contribution to add P2MP Cross-Connect Table for CMIS 5.3



Why Standardize?

LOWER
COST



GUARANTEED
PERFORMANCE



LARGER
VOLUME



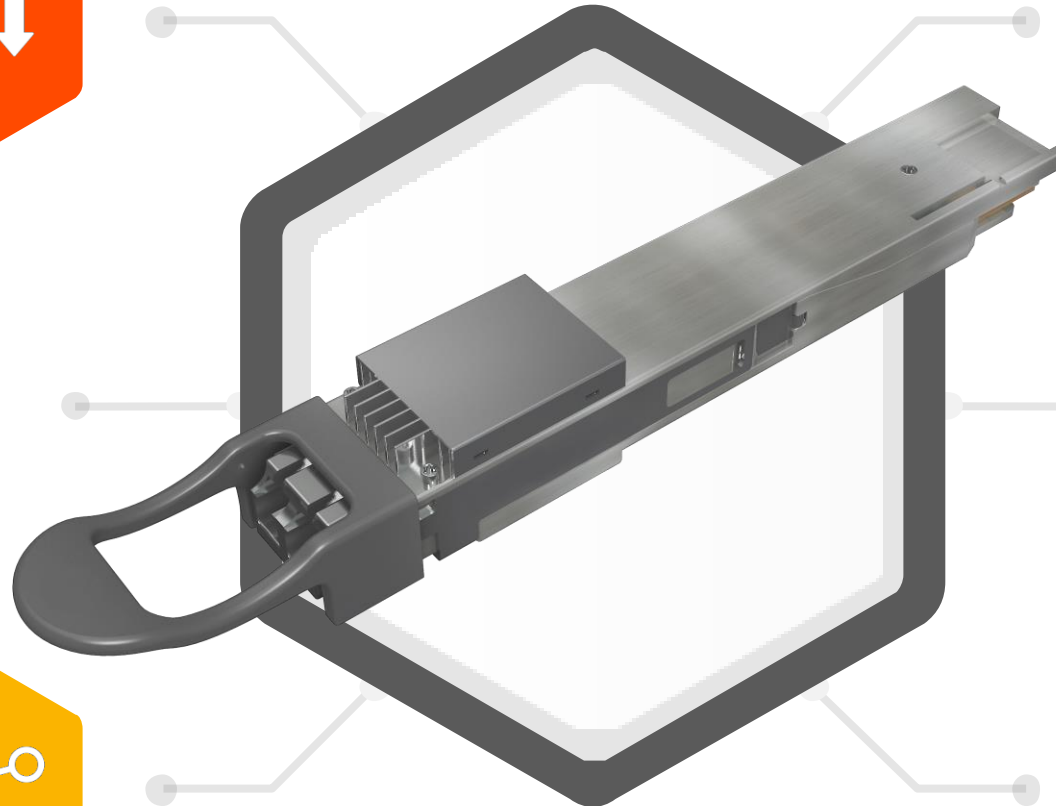
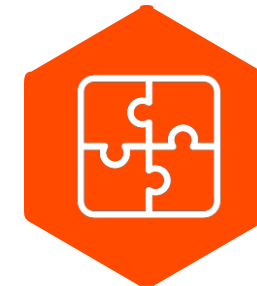
MULTI SOURCE
AVAILABILITY



BROADER
APPLICATION SET



INTEROPERABILITY





Thank You