

OPEN XR OPTICS FORUM



There are two distinct types of traffic patterns in optical transport networks. In the network core, including submarine, long-haul, and metro core networks, the traffic patterns are primarily a mesh of point-to-point demands. At the network edge, including mobile, residential, and business services, traffic patterns are almost exclusively point to multipoint, with traffic that is aggregated from numerous lower-speed edge points into a smaller number of aggregation and hub locations. While existing optical transmission technology is well suited to support point-to-point traffic demands, there has been a significant misalignment between the traffic patterns at the network edge and the technology used to transport that traffic since the inception of optical networking. Traditional optical connectivity solutions use strictly point-to-point technology, where each end of the connection is required to operate at the same speed (1G, 10G, 25G, 100G, etc.). For the multipoint traffic demands at the network edge, the result is an inefficient transport architecture that requires large numbers of bookended transceivers, as well as numerous intermediate aggregation devices to “up-speed” traffic flows.

XR optics is the next major inflection point in optical transceiver technologies. In addition to supporting traditional point-to-point applications, XR optics is the first optical technology capable of connecting multiple lower-speed interfaces to a few higher-speed interfaces through aggregation in the optical domain, without the need for electrical aggregation devices. XR optics utilizes digital signal processing to subdivide the transmission and reception of a given wavelength spectrum into a series of smaller-frequency channels called digital subcarriers. These digital subcarriers can be independently modulated, managed, and assigned to different destinations, enabling the industry’s first scalable point-to-multipoint, direct low-speed to high-speed optical transceiver connectivity. A single 400G XR optics hub module generates 16 x 25 Gb/s digital subcarriers. Digital subcarriers can be assigned individually or combined in 25 Gb/s increments to provide the required bandwidth to a specific destination. XR optics also enhances deployment flexibility, as the same coherent pluggable can be seamlessly software-configured to operate in point-to-point or point-to-multipoint configurations.

FLEXIBLE SUBCARRIER-BASED SUITE OF PLUGGABLE OPTICAL SOLUTIONS



Figure 1: Point-to-point optics vs. hub-and-spoke traffic

XR optics transceivers are designed to be used in a wide range of networking equipment, including Ethernet switches, routers, wireless baseband processing systems, cable/MSO aggregation platforms, packet switch ports, passive optical network (PON) headend aggregation systems, and data center servers and switches.

BENEFITS OF XR OPTICS

- MINIMIZE** the number of optical transceivers with the ability to aggregate multiple spoke devices onto a single hub transceiver
- MAXIMIZE** router efficiency, density, and simplicity by replacing large numbers of low-speed ports with far fewer high-speed ports, and with the ability to use these same high-speed ports as both aggregation and network interfaces
- ALIGN** CapEx with actual bandwidth requirements while still maintaining the ability to quickly adapt to changing bandwidth demands and traffic patterns
- ELIMINATE** intermediate packet aggregation stages while leveraging larger, more efficient switching devices at centralized sites
- REDUCE** OpEx in terms of power consumption, footprint, the number of aggregation sites, product support costs, and truck rolls



- 2023 LIGHT READING LEADING LIGHTS
- 2022 DT GREEN FUTURE BEST PRACTICE AWARDS
- 2021 LIGHTWAVE INNOVATION REVIEW 4.5/5.0
- 2021 NGON & DCI WORLD BEST NEW GAMECHANGER OR INNOVATION
- ECOC 2020 MOST INNOVATIVE PRODUCT

XR optics also meets common MSA standards for coherent pluggable optics form factors (e.g., QSFP-28, CFP-2, QSFP56-DD, OSFP) and module management.

XR optics enables a transformative architecture and delivers major advantages in access, aggregation, and metro optical networks. Benefits include a significant reduction in total cost of ownership by as much as 70+% in some cases, dramatic network simplification, and an unprecedented level of network flexibility.

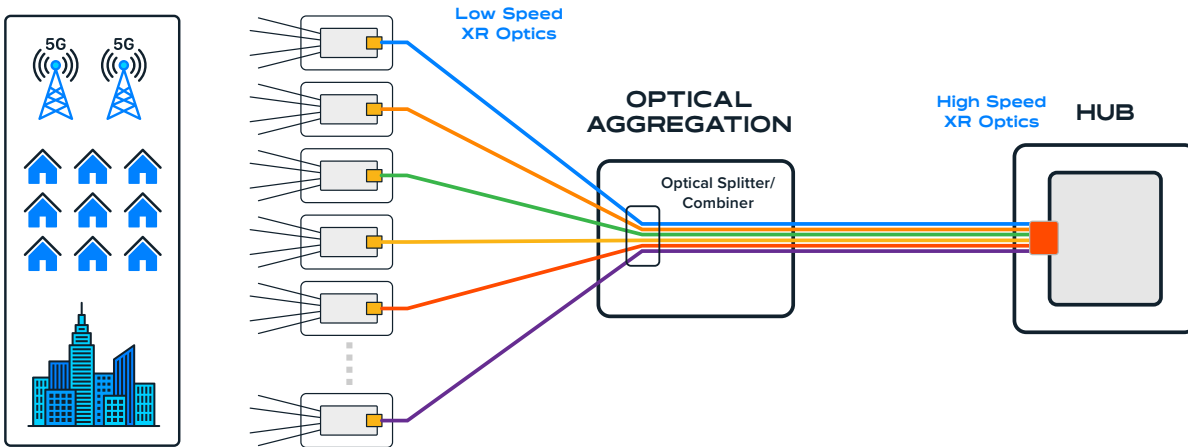


Figure 2: Point-to-point optics vs. hub-and-spoke traffic

XR Optics game-changing benefits include:

- Instant reduction in transceivers by ~50% or more
- Dramatic cost reduction – 50-80% in CapEx and OpEx (space and power) and 70+% in total cost of ownership
- Significant reduction in upgrade costs enabled by high-speed to low-speed transceiver compatibility
- Dramatic network simplification through the elimination of intermediate aggregation sites, thereby reducing power and space requirements
- Dynamic and software-enabled capacity allocation that eliminates truck rolls
- Flexible deployment model – point-to-point and point-to-multipoint applications, fiber pair and single fiber, fixed and flexible grid, cascaded ROADMs
- Flexible bandwidth management enabled by dynamic, automated, remote bandwidth allocation from a single hub to multiple spokes
- Standards-based pluggable form factors that can be plugged into existing equipment like switches and routers, eliminating the need for dedicated optical transponders
- For the first time in the industry, XR optics allows intergenerational network compatibility, decoupling node upgrades from network-wide upgrades.

THE OPEN XR OPTICS FORUM

The Open XR Optics Forum is the multi-source agreement (MSA) working group for XR optics, the industry's first point-to-multipoint coherent pluggable transceiver technology. The Open XR Optics Forum's mission is to foster collaboration that will advance development of XR optics-enabled products and services, accelerate adoption of intelligent coherent point-to-point and point-to-multipoint network architectures, and drive standardization of networking interfaces to ensure ease of multi-

vendor interoperability and an open, multi-source solution ecosystem. Open XR Optics Forum members include industry-leading network operators, network equipment vendors, and component suppliers. Open XR Optics Forum members will work to ensure the products and services developed align with existing standards and operational models by driving the standardization of network interfaces and electro-mechanical hardware interfaces, demonstrating interoperability, establishing multi-sourcing potential, and developing and publishing new specifications as needed. This will accelerate the wide adoption and deployment of XR optics' innovative technology by a broad spectrum of network operators in a wide variety of applications. The Open XR Optics Forum's focus points are:

- To define compatibility requirements with host devices
- To establish interoperable network and hardware interfaces
- To enable software-configurable bandwidth
- To demonstrate interoperability
- To advance open management interfaces
- To establish a supply chain ecosystem that provides assurance of supply and serves diverse applications and geographic markets
- To enable technology licensing programs

A wide cross-section of the optical networking industry, including network operators, equipment vendors, and component vendors, can benefit from XR optics. **Network operators** benefit from the Open XR Optics Forum through XR optics' seamless deployment in the network and interoperability. Moreover, the accelerated innovation cycle of XR optics, fueled by the constant contribution of the active members of the Open XR Optics Forum, enables a faster positive impact on network operators' business and operational processes. Network operators also benefit from multi-sourcing purchasing schemes, avoiding vendor lock-in and ensuring business continuity through dual-supplier agreements.

Network equipment vendors benefit from the Open XR Optics Forum by enhancing their product capabilities with open XR optics transceiver compatibility with minimal R&D investment, delivering improved port utilization and the ability to better meet end-customer requirements without the cost and risk of rip-and-replace upgrades. Equipment providers will benefit from differentiated value-add services for the next generation of smart coherent optical pluggables, inclusive of XR optics.

The Open XR Optics Forum benefits **component vendors** by expanding the application space and hence the total market size for coherent transceivers by driving coherent optics to the access edge. The Open XR Optics Forum reduces the cost of new product development and accelerates time to market by providing access to enabling technology building blocks that are compatible with existing transceiver designs and optical components. Furthermore, the Open XR Optics Forum extends product life cycles and enables smooth industry transitions to higher data rates by enabling the ongoing use and sale of transceivers with lower data rates that are compatible with new generations of higher-data-rate transceivers.

The Open XR Optics Forum facilitates the collaboration between its members to accelerate the adoption and the growth of XR optics, so network operators around the globe can benefit from the transformative aspect of this innovative technology in the era of 5G, fiber deep networks, and cloud connectivity.