Get Ready for 800G

800G interfaces and 800G-capable routers are becoming available—and the market need is immediate.

Publication date: February 14, 2025

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Sponsor: Juniper Networks

The formalization of an 800GbE standard with IEEE 802.3df (published in March 2024) and the publication of OIF's 800ZR implementation agreement for coherent 800G pluggable optics in October launched the 800G market in earnest for both short-reach and long-reach applications.

Use cases

Market demand is immediate, and Heavy Reading sees interest across multiple use cases:

- **Intra-data center connectivity:** Artificial intelligence (AI) training compute demands have increased 275x every two years since the introduction of transformer models, according to NVIDIA. This rapid growth has driven massive GPU unit shipments as well as interconnect capacity requirements for chip-to-chip within racks, connecting racks, and connecting AI clusters. 800GbE optical interfaces will be used to connect racks and connect clusters. Work is already underway to standardize 1.6TbE—as hyperscalers do not expect demand to slow down.
- **Data center interconnect (DCI):** History shows that traffic generated within the data center also drives traffic demand between data centers (i.e., DCI). Communications service providers (CSPs) surveyed by Heavy Reading report that DCI will be the number one driver for 800G adoption in the WAN as hyperscalers and cloud providers move from 400G data rates to 800G.
- **Core and metro:** CSPs surveyed also expect metro and core applications to be significant drivers of coherent 800G pluggables. Historically, high data rate applications over long-haul distances have favored embedded optics versus pluggables, but 400G pluggables are already moving into historically embedded territory. Heavy Reading research suggests 800G coherent pluggable optics will do the same.
- **Peering:** Peering allows service providers to exchange network traffic directly in data centers, on an internet exchange, or remotely and includes both public and private peering arrangements. Unified communications, video, and gaming all drive peering bandwidth and performance requirements.

Benefits of 800G pluggable optics

- **Scale/capacity:** An 800G pluggable optic provides 2x the capacity of a 400G optic within the same QSFP-DD or OSFP footprint. But the system that houses the optics must also support the increased capacity to ensure systems-level capacity gains. Within the data center, those systems are routers filled with 800GE optics. For wide area connectivity, those systems are increasingly routers as well, filled with coherent optics. Modern routers support full density of 800G interfaces, including 800ZR.
- **Power consumption/sustainability:** For hyperscalers and CSPs, efficient power consumption is as high a priority as capacity. 800G lowers power consumption per bit compared to 400G at the chip, module, and system levels. Juniper, for example, claims a 54% reduction in watts/Gbps when comparing its 800G-built modular routers to its previous generation routers. New switching ASICs in routers are the primary contributor to power efficiency gains, but the optics also contribute.
- **Capex and opex savings:** At a network level, IPoDWDM architectures deliver capex and opex savings. Early CSP adopters report capex and opex savings greater than 50% in both areas with 400ZR/ZR+. Significantly, 800ZR standardization and an ecosystem of more than two dozen 800G module suppliers ensure that the IPoDWDM architecture has a migration path from 400G to 800G.
- **Multi-rate/multi-reach functionality:** Flexible module formats are key for metro and core/backbone applications, as 800G connectivity may not always be required. An operator can use 800G optics to deliver 2x400GE services to customers in a metro. Or they can dial down to 8QAM modulation for 600Gbps capacity for regional or long-haul reaches. Alternatively, operators can lower the data rate to 400Gbps and transmit over ultra long-haul distances (e.g., ~2,000km).

Conclusion

The standardization of 800G optics modules for both short-reach and long-reach applications, combined with a large supplier ecosystem of suppliers, means 800G is here today. Finnish operator Elisa Oyj's November announcement of the world's first deployment of 800GbE services over 800ZR optics is a proof in point. In the WAN, 400G and 800G will coexist for many years, and 800G pluggable optics will play a key role in delivering both 800GE and 400GE services.

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