400G Optical Allows Providers to Deliver More With Less

Offering high performance at a relatively low cost, the advent of 400G ZR/ZR+ pluggables could be the next disruption in IP in the optical networking market.

By Bruce McClelland / *Ribbon Communications*

Ask any communications service provider what it looks for from a network upgrade, and the answer will usually be more speed and more capacity. Service providers likely want more of everything, except cost. Delivering more for less is a challenge the latest optical network technology can help service providers overcome.

LESS IS MORE
Network planners across the U.S. seem to be convinced that the answer to the country's future network needs is to create a vast highway of standardized 400G "lanes." The industry is coalescing around the concept of building this network of roads capable of cost-effectively transporting today's 100 Gigabit Ethernet (GbE) client traffic and is poised to embrace the 400GbE clients of tomorrow.

Today, a new optical technology answer is in town: pluggable, industry-standard 400G ZR/ZR+ modules that come in various form factors tailored for different applications. This technology shows that less can be more – *and* it can be more cost-effective. The 400G ZR/ZR+ pluggable solutions are standards-based, are built on the latest silicon fab technology by industry-leading ASIC developers, consume less power, and provide higher density than alternative solutions. These small form-factor pluggable optical interfaces, which can go directly into a switch or a router, are fully interoperable,

creating a new set of configurable building blocks that rewrite the economics of optical network construction and operation.

Performance optimized to 400G, these pluggables can work solo or in combination to meet all requirements for the 400G network of lanes. For example, two new 400G ZR+ pluggable units working in tandem deliver markedly better performance, transmitting clients over longer distances than one supposedly higher-specified 800G embedded module.

IMPROVING PERFORMANCE, REDUCING COSTS
Service providers are not the only ones who see the advantages of 400G ZR+. According to Ian Redpath, transport and components practice leader for market research firm Omdia, 400G ZR+ offers numerous benefits compared with existing embedded solutions, including lowering the cost per bit, reducing power consumption, and simplifying network sparing.

To understand why two 400G ZR+ units can deliver a better performance than one 800G module, it's important to understand and consider how the laws of physics dictate the ways different units operate. Put simply, 800G modules work at a fast symbol rate of 95Gbaud. That, in turn, requires a dense modulation of more than 5 bits per symbol; dense modulation affects the strength of the signal's propagation. Over a certain distance,

the signal will weaken and no longer maintain the quality required. This weaker propagation means it needs a shorter distance between what might be called "repeaters."

On the other hand, the new 400G ZR+ units operate at a lower symbol rate (64Gbaud), meaning the modulation required is a lot less dense, at less than 4 bits per symbol. This, in turn, means the signal propagation doesn't weaken as quickly, achieving a more significant overall distance. The result is that two 400G ZR+ units deliver better performance than a single 800G embedded module, with equivalent or better economics.

The trend will be to configure routers with integrated 400G ZR units for metro networks and short hops between data centers and deploy 400G ZR+ units for regional networks to deliver much-improved network economics, both in terms of upfront unit costs and ongoing operational expense. What's more, because these units conform to open industry standards, operators can adopt a multi-vendor strategy, benefit from competitive market pricing, and easily swap out the units as the technology continues to advance.

In comparison, 800G solutions rely on costly proprietary technology, so having standards-based interoperable technology is another significant benefit because operators continually are not required to change out expensive single-vendor equipment.

The new 400G ZR/ZR+ family of pluggables proves that less can be more for network performance. When it comes to delivering on the ideal of the standardized 400G lane network, this disruptive technology is the most cost-efficient way to optimize traffic across all layers of the optical transport network.

SERVICE PROVIDER INTEREST RISES

One example of a forward-thinking operator taking advantage of this new optical technology is Rogers Communications. Rogers recently selected 400G ZR+ technology to add increased capacity across its national

footprint. As one of the first Tier-1 service providers in North America to deploy 400G ZR+ technology, Rogers can maximize the efficiency and performance of its telecommunications network. Rogers' deployment represents a significant step forward for the industry.

Though 400G ZR/ZR+ technology is still in its early stages, it is expected to be adopted rapidly, driven by data traffic growth that's increasing by more than 30 percent every year, according to market researchers.

During the COVID-19 pandemic, data usage has grown even more than expected. An increased number of devices, including computers, tablets and smartphones, facilitate remote work, learning and other network-reliant activities at home. With more users and applications driving demand for increased bandwidth, 400G is quickly becoming a network

requirement. As demand for 400G continues to accelerate, 400G ZR/ZR+ will become an even more appealing option for service providers. ❖

Bruce McClelland is the CEO of Ribbon Communications, which makes software, IP and optical networking solutions for service providers, enterprises and critical infrastructure sectors.