Fiber Optics

Now's the Time for 400G Migration

By Koby Reshef, CEO of PacketLight Networks

Figure 1:
PL-4000M: 400G Muxponder

The optical fiber community is anxiously awaiting the benefits that 400G capacity per wavelength will bring to existing and future fiber optic networks. Nearly every business wants to leverage the latest in digital offerings to remain competitive in their respective markets and to provide support for fast and ever-increasing demands for data capacity. 400G is the answer. Initial challenges are associated with supporting such project and upgrades to fulfil the promise of higher-capacity transport.

Upgrading to 400G capacity per wavelength requires consideration of the unique challenges associated with 400G technology. For example, 40G, 100G and 200G capacities do not require special infrastructure changes, as their wavelength spectral bandwidth is the same. 400G capacity over a single wavelength has a high baud rate, which is spectrally too wide to pass through 50GHz channel-spaced filters and fixed 50GHz grid ROADMs (reconfigurable optical add-drop multiplexers). A new "runway" is required to accommodate these higher rates.

Another point to consider is the costs and power consumption associated with the new 400G pluggable optics. Traditional integrated 400G optics are expensive as only a few vendors offer these solutions, and they require much higher power to operate than 200G optics.

These challenges will be resolved with the introduction of the new generation of transponders and muxponders using CFP2-DCO and QSFP-DD 400G pluggable modules.

Current Solutions and Technologies

The foundation of optical networking infrastructure includes coherent optical transceivers and digital signal processing (DSP), mux/demux, ROADM, and optical amplifiers, all of which must be able to support 400G capacity. Today's 400G transceivers and DSP are power-hungry, do not support the latest multi-source agreement (MSA) standards, and are developed by different vendors using their proprietary technology.

The next-generation DSP, which will be available for mass-market use in Q1 of 2021 is based on low power, low cost 7-nm technology and

Germany & Other Countries
Laser Components Germany GmbH
Tel: +49 8142 2864 – 0
Fax: +49 8142 2864 – 11
info@lasercomponents.com
www.lasercomponents.com

supports standard forward error correction (FEC) modes for interoperability. Next-generation 400G CFP2-DCO and QSFP-DD standards-based pluggable modules sourced by multiple vendors, will lead to mass deployment and cost reduction.

The network management system (NMS) controlling the ROADM devices, which are tasked to block, pass or redirect wavelengths across the network, have also been updated to accommodate the 400G bandwidth restrictions and complex flex grid spectrum management.

400G networks will have higher amplification requirements to meet the link budget, which accounts for the gains and losses from the transmitter through the fiber to the receiver. 50GHz channels spacing mux/demux is standard for 40/100/200G networks but is not compatible with 400G.

Prior to 400G, optical fiber original equipment manufacturers (OEMs) created products that reduced rack space and optimized power to keep OPEX and CAPEX low. The introduction of the next generation transponders and muxponders based on pluggable 400G optics, ensures that future upgrades to 400G capacity will maintain the flexibility, modularity, and power-saving capabilities many network operators and enterprises are accustomed to.

Use cases both large and small

There are many opportunities for 400G technology vendors. Enterprises with hyperscale facilities are likely to be building new data centers or upgrading existing facilities to 400G. In addition, DCIs have great incentive to jump on the 400G train to take advantage of the increased service level agreements (SLAs) they can offer the "residents" of their data centers.

400G technology is here and will reach mass production with the new 7-nm DSP and 64G baud optics in 2021. Early adopters of 400G standards-based OTN muxponders and transponders can expect low-power consumption solutions, flexibility, small footprints, standardization, and lower cost.

Germany & Other Countries
Laser Components Germany GmbH
Tel: +49 8142 2864 – 0
Fax: +49 8142 2864 – 11
info@lasercomponents.com
www.lasercomponents.com