



100G DWDM pluggable transceivers – PAM-4 or Coherent?

Until recently, coherent CFP/CFP2 DWDM optical transceivers had been the technology of choice for transporting 100G traffic over long distances or as part of a DWDM network. But now there is a new kid on the block: PAM-4, the technology behind the latest QSFP28 DWDM technology. So, which is the right choice? Well, that comes down to the application. Using pluggable transceivers for embedded DWDM, where the DWDM functionality is in the transceiver and not a separate DWDM converter platform, offers the ultimate solution in terms of cost and simplicity. They are all suited to this approach. They can be used for embedded DWDM networking or as part of an existing DWDM installation. All provide the usual advantages of pluggable networking: simple installation, easy spares handling, lower cost of ownership and quick ROI.

QSFP28 PAM-4 (Pulse Amplitude Modulation)

Switch vendors who have used the QSFP form factor for the advantages of increased port density previously had the disadvantage that no long distance or DWDM QSFP28 transceivers were available. The introduction of a QSFP28 DWDM transceiver to the market is a significant step forward in overcoming the difficulties of DWDM networking in their equipment. Customers who want to build an embedded DWDM network can use this transceiver directly in the switch. A very simple and cost-effective solution, but one that comes with a tradeoff: it needs amplification to get out of the blocks and dispersion compensation to go beyond 5-6km. A separate DWDM multiplexer with an amplification system and dispersion compensation is therefore required to connect data centers together. And if being added to an existing DWDM network, then the network must have already been prepared for this with the right DCM and amplification already in place. Otherwise, the design will require alterations if a DWDM QSFP28 is later added.

CFP DCO (Digital Coherent Optic)

The largest of the 100G transceiver family, and with good reason. The CFP has a high-speed DSP (Digital Signal Processing) chip built in. This is what differentiates the CFP from the CFP2 (ACO) and QSFP28. It means that CFPs do not require separate DCMs (dispersion compensation modules). Instead, they have electronic dispersion compensation built in that significantly increases the reach between amplification sites. The DSP requires more power and adds cost to the component, but, means that switch vendors do not need to add DSPs to their equipment.

It is the DSP that makes the coherent CFP a real workhorse. It provides the electronic dispersion compensation that removes the need for separate dispersion compensation and therefore increases line distances. Coherent CFPs enable transmission distances of >1000km between sites.

DWDM CFPs enable those switch vendors using CFP cages to offer long-distance support on their equipment, when previously only SR4/LR4 options were available. Being able to provide DWDM connectivity in a CFP transceiver is an important feature enhancement and removes this dependency on additional third-party transmission systems for transporting 100G traffic over long distances. Coherent DWDM transceivers actually cost less than ER4 and ZR4 CFP transceivers, which means longer distances with DWDM support at a lower price point.

CFP2 Coherent ACO (Analog Coherent Optic)

The CFP2 ACO is half the width of the CFP, so when talking about 41mm instead of 82mm this is a significant amount of real estate. Today's CFP2 coherent DWDM transceivers are analog and require a separate DSP on the host board to take full advantage of the coherent features. This is suited to those switch vendors who have fitted such a DSP, but it adds extra cost and power consumption to the board.

CFP2 Coherent DCO (Digital Coherent Optic)

Due for release in 2017-18, the CFP2 DCO offers the same coherent functionality as the CFP2-ACO but with built-in DSP. This component will open up to all switch vendors using CFP2 without DSP. Since DWDM is only required in a fraction of installations, customers only pay for what they need when they need it. Another advantage of coherent detection is that it can scale to speeds beyond 100G and CFP2 DCO is able to handle 200G line speeds for even better wavelength utilization.



Source: 2016 ACG Research

Distances

This really depends on the application and the needs of the data center operators.

Transceivers and assemblies:

For distances <40km, standard single-channel ITU transceiver and cable assemblies are available and can be converted from QSFP or CFP to DWDM for longer distance or DWDM networking.

PAM-4 QSFP28:

An amplifier is required for distances up to 5-6km and dispersion compensation for distances up to 80km.

Coherent:

A metro variant provides connectivity up to 80km and a long-haul version for >1000km.

Popular, pluggable approaches for 100G transceivers

Data centers and enterprises can utilize pluggable transceivers and transponders in any combination depending on their specific requirements. The popular embedded DWDM approach is being extended to 100G line speeds, helping keep costs and complexities out of Datacom networking. In contrast to sub-10G services where passive multiplexers enabled multi-channel C/DWDM networks, the multiplexer for 100G will be DWDM and have an amplification element. The other beauty of having pluggable 100G transceivers is that it enables enterprises to enjoy the full benefits of flexible open line networking.



OSI Optics: Your Optical Technology Partner

As the market for fiber optical networking solutions continues to evolve, enterprises are exploring better value alternatives to OEM offerings for their higher bandwidth, mission critical network and data center needs. We're proud to be setting the pace with our branded OSI Optics transceivers, cables and accessories.

In addition to providing expert pre-sales consultation and technical support, our in-house Optical Engineers will evaluate your end-to-end optics requirements and develop a deeply discounted, bundled approach for you today. Your choice of optics vendor is a key factor in optimizing your IT budget and maximizing the performance of your infrastructure. **Let's get to work.™**

For immediate product and pricing information, call 1-866-602-4674.



For more information, call 1-866-602-4674 or visit www.osihardware.com

For immediate product and pricing information, call 1-866-602-4674.

Worldwide Headquarters:

606 Olive Street
Santa Barbara, CA 93101

Offices:

San Francisco • Los Angeles • Phoenix • Dallas • Amsterdam • Denver • New York • Sacramento