

Article Overview

Co-Packaged Copper (CPC) and Co-Packaged Optics (CPO) are emerging technologies that integrate high-speed interconnects directly with ASICs, reducing reliance on traditional pluggable optical modules while improving bandwidth, energy efficiency, and system density.

Overview of CPC and CPO

Traditional data center networks use pluggable optical modules connected to switches via high-speed electrical interfaces, which introduces latency, insertion loss, and power inefficiencies. CPC and CPO technologies address these limitations by integrating the interconnects--copper or optical--closer to the ASICs, minimizing trace lengths and improving signal integrity . CPC specifically uses high-density copper connections to link chips or modules, while CPO integrates silicon photonics with ASICs for optical transmission .

How CPC Replaces Optical Modules

CPC replaces traditional pluggable optical modules by providing direct chip-to-chip or chip-to-system connectivity using co-packaged copper connectors. For example, Amphenol's XtremePass(TM) CPC platform combines copper interconnects with optical transceivers in a unified architecture, enabling high-speed data transfer without relying on separate pluggable modules . This approach reduces insertion loss, improves signal integrity, and allows for higher bandwidth density in dense server and accelerator designs.

Benefits of CPC Integration

- o **Energy Efficiency:** By shortening the electrical path and reducing conversion overhead, CPC systems consume less power compared to traditional pluggable optics .
- o **Bandwidth Scaling:** CPC supports ultra-high-speed signaling, such as 224 Gb/s per lane across multiple lanes, enabling rack-level bandwidths up to 204.8 Tbps .
- o **Reduced Latency and Loss:** Co-locating copper interconnects near the ASIC minimizes PCB trace lengths, reducing insertion loss and crosstalk while preserving eye openings .
- o **Serviceability and Density:** CPC allows pluggable or modular designs that are easier to maintain than fully bonded optical engines, while maximizing substrate density .

Comparison with CPO

While CPC uses copper for short-range interconnects, CPO integrates optical engines directly with ASICs, offering higher energy efficiency and bandwidth for longer distances . Both approaches aim to replace traditional pluggable optical modules, but CPC is often favored for short-reach, high-density chip-to-chip connections, whereas CPO is optimized for high-bandwidth optical links in hyperscale data centers.



CPC replaces optical module

Practical Implications

Adopting CPC reduces dependency on pluggable optical modules, lowers power consumption, and enables faster deployment of high-speed networks. It is particularly relevant for AI training clusters, hyperscale data centers, and next-generation networking systems where rack-level bandwidth and energy efficiency are critical. CPC also supports heterogeneous chip collaboration and scalable interconnects, complementing technologies like NVLink and PCIe in modern architectures. In summary, CPC replaces traditional optical modules by integrating high-speed copper interconnects directly with ASICs, offering a scalable, energy-efficient, and high-performance alternative for modern data center networks.

Like FireFly and Halo, SiFly HD CPX brings optics and copper together, but instead of a

To address these challenges, Arista Networks, together with an ecosystem of more than 45 industry partners, introduces eXtra

Co-Packaged Optics (CPO) Solutions Co-Packaged Optics (CPO) Solutions Today, data centers use a separate approach for optics

CPC products are not seen as particularly competitive products to co-packaged optical

Compare CPO, NPO, and XPO optical modules for 800G/1.6T data centers. Evaluate power efficiency, integration,

Optical modules are electrostatic-sensitive components; therefore, you must take ESD protection measures when replacing optical

Enter Co-Packaged Optics (CPO), a transformative architecture where the optical engine moves inside the switch ASIC

1.3. Introduction The CPO JDF plans to release three documents focused on different elements of Co-Packaged Optics (CPO): the

Newer Mercedes-Benz vehicles (as well as all pre-2019 E-Class) are equipped with a Central Powertrain Controller

The Weistec CPC is a complete replacement for the original CPC module meaning your original CPC remains

Choosing the right optical packaging strategy is no longer academic -- it shapes power bills, rack density, operational procedures

CPC replaces optical module

The CPC4 powertrain controller helps drivers be safer. It communicates with all the modules in the truck, and if it

Co-Packaged Optics is no longer a theoretical concept, but its future is still unfolding. While early demos and

Discover how co-packaged optics (CPO) are transforming high-speed interconnects, offering a five-fold bandwidth increase and

Known as co-packaged copper (CPC), or co-packaged cables in some circles, the basic idea is to take a copper cable

The NRS CPC (Computer Powertrain Control) Module upgrade is a complete replacement for the OEM

Web: <https://www.millstraining.co.za>

