

Serbian Supercomputing Center Uses Linear Drive Pluggable Optical Low-Noise Computing

Article Overview

The Serbian Supercomputing Center leverages Linear-drive Pluggable Optics (LPO) and pluggable optical low-noise computing to achieve ultra-low latency, high bandwidth, and energy-efficient interconnects for AI and HPC workloads.

Overview of LPO Technology

Linear-drive Pluggable Optics (LPO) is an advanced optical transceiver architecture that eliminates the traditional DSP chip, which is typically responsible for signal equalization, retiming, and error correction in high-speed optical modules . Instead, LPO relies on high-linearity driver chips and transimpedance amplifiers (TIAs), while shifting signal equalization and compensation to the host switch or xPU's SerDes (Serializer/Deserializer) ASIC . This analog, linear approach reduces power consumption by 30-50% per module, lowers latency from ~80 ns to less than 1 ns, and decreases the overall cost by removing expensive DSP components .

Benefits for HPC and AI Clusters

- o Ultra-Low Latency: By removing DSP processing, LPO minimizes the number of signal processing steps, which is critical for tightly coupled AI training clusters where microsecond delays can impact overall performance .
- o High Bandwidth and Signal Integrity: LPO supports high-speed short-reach connectivity, enabling dense east-west traffic patterns typical in HPC and AI workloads, with speeds of 400G to 800G and beyond .
- o Energy Efficiency: Eliminating DSPs significantly reduces power consumption, which is crucial for large-scale supercomputing centers where interconnects contribute substantially to total energy usage .
- o Cost Reduction and Maintainability: LPO modules have a simpler architecture, reducing the bill of materials and allowing for easier hot-swapping and maintenance compared to co-packaged optics (CPO) solutions .

Pluggable Optical Low-Noise Computing

Pluggable optical low-noise computing refers to the integration of optical interconnects with minimal signal distortion, achieved by shortening the electro-optical conversion path and using high-linearity analog components . This approach reduces bit error rates and improves signal integrity without relying on power-hungry DSPs. In HPC clusters, this translates to more reliable, high-speed communication between GPUs, NPUs, and storage nodes, which is essential for AI model training and large-scale simulations .

Implications for the Serbian Supercomputing Center



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By adopting LPO and low-noise optical computing, the Serbian Supercomputing Center can:

- o Scale AI and HPC workloads efficiently with reduced energy and cooling requirements.
- o Achieve higher throughput for inter-node communication, critical for large-scale simulations and AI training.
- o Maintain modularity and serviceability, as LPO modules are pluggable and independently replaceable, unlike tightly integrated CPO solutions . In summary, the use of Linear-drive Pluggable Optics and pluggable optical low-noise computing allows the Serbian Supercomputing Center to optimize performance, energy efficiency, and operational flexibility, positioning it to handle next-generation AI and HPC workloads effectively.

Its core concept is to remove digital processing units such as DSPs and CDRs from the module, constructing a purely

Exploring optical interconnects for AI data centers: LPO for low-power, short-distance links,

Synopsys is carving a path toward more efficient linear pluggable optics using co-simulation techniques to develop

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Enter LPO (Linear-drive Pluggable Optics) -- a transformative technology poised to reshape how AI clusters

LPO (Linear-drive Pluggable Optics) is a new optical module architecture designed to reduce power consumption and

LPO (Linear-Drive Pluggable Optics) optical modules utilize linear drive technology to

Linear Pluggable Optics are a low-power pluggable module interface that eliminates DSP chips, creating a linear

To address power consumption and cost challenges while meeting demands for high-speed, high-density optical

Linear Drive optics can offer data center providers various benefits, namely reducing power by eliminating DSP functions from optics.



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This makes the module simpler, more efficient, and lower in latency than traditional optics. A new technology built for

LPO transceivers cut power use, lower latency, and boost reliability in data centers, making them ideal for high-speed,

FS, Inc. has launched its 800G Linear Pluggable Optics (LPO) module. Designed for AI/ML applications, this advanced

Discover the advantages of Linear Pluggable Optics (LPO) for AI and data centers,

One of the most groundbreaking network innovations driving transformations of data centers

LPO (Linear-drive Pluggable Optics) is a new optical module architecture designed to

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