

High-precision optical switches for intelligent computing centers



Overview

This article provides an overview of optical switch architectures for next-generation data center and high-performance computing (HPC) networks. Traditional Electrical Packet-Switch (EPS) fabrics increasingly struggle with congestion, power consumption, and scalability constraints as. Valencia, Spain - March 31, 2025 - iPronics, a leader in software-defined photonics, today launched its Optical Networking Engine, ONE-32, the world's first Optical Circuit Switch (OCS) product based on silicon photonics. Tailored for AI workloads and energy-efficient cloud infrastructure, the. This paper first summarizes the topologies and traffic characteristics in data centers and analyzes the reasons and importance of moving to optical switching.



Article Content

May 13, 2026

Ultrafast optical circuit switching for data centers using integrated ...

Here, the authors report Si₃N₄ microcomb based ultrafast photonic switching to provide enhanced performance for data center applications.

Dec 09, 2025

(PDF) Optical Switching Data Center Networks

Recent techniques related to the optical switching, and main challenges limiting the practical deployments of optical switches in data centers

Dec 31, 2025

Networking chips and modules for AI data centers:

Ethernet back-end networks offer a big opportunity for Arista Networks, which builds switches using Broadcom chips. In the past two years, AI data

Dec 27, 2025

Optical Interconnection in High Performance Computing

JD Optical Interconnection Architect Chen Cheng shared a keynote speech on “Optical Interconnection in High-Performance Computing Networks” at

Jun 23, 2026

iPronics Unveils World's First Silicon Photonics Optical

The company presents the first Optical Circuit Switch able to offer low latency, low cost and low power to accelerate optical transformation of AI cluster

Nov 30, 2025

Nanosecond optical switching and control system for data center ...

The authors report an optical switching and control system to synergistically overcome these challenges and provide enhanced performance for data center applications.

Jun 20, 2026

Optical switching in AI clusters

Multi-node AI/HPC applications rely on large networks and are highly susceptible to crashing when network elements fail. Resilience using OCS Matrices relies on the addition of OCS between the

May 25, 2026

Integrated Photonics for Computing and Artificial Intelligence

As a result, analog optical computing chips are designed for applications that do not require high precision, e.g., neuromorphic computing tasks. Based on the mechanism of integrated photonic

Jun 03, 2026

Emerging Optical Interconnects for AI Systems

Optical circuit switching is a powerful technology to achieve reconfigurability in datacenters. To be competitive with electrical packet-switching technologies, an ideal optical circuit switch (OCS) should

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Prospects and challenges of optical switching technologies for intra ...

This paper explores how optical switching technologies can innovate future intra data center networks. The effectiveness of applying large-port-count optical switches is clarified by

Sep 21, 2025

Photonic Switches and Networks for High-Performance Computing and Data ...

The accelerated growth in performance of microprocessors and the emergence of chip multiprocessors, which are now widely leveraged in current data centers and high-performance computing (HPC)

May 29, 2026

A Comprehensive Survey on Integrated Photonic Switch Fabrics:

Emerging applications such as Artificial Intelligence (AI), the Internet of Things (IoT), and Big Data are significantly increasing data traffic within data center networks and high-performance

Nov 03, 2025

Optical Switching Data Center Networks: Understanding Techniques

In this paper, we present a review of optical switching techniques capable of meeting the requirements of the next generation of large-scale data center networks.

Sep 16, 2025

Optical switching for data centers and advanced computing systems ...

We explore optical switching to extend network programmability to the physical layer and discuss applications of a Layer-1 software-defined network (SDN) in AI/HPC clusters. In this context we

Jan 03, 2026

Software-defined Optical Circuit Switches in AI Networking and

Fiber optic links are widely used in datacenters with EPS, optical-electro-optical conversion necessary to connect such links are power hungry and very inefficient.

Jul 18, 2025

OPTICAL CIRCUIT SWITCHING FOR AI AND

Optical Circuit Switching is presented as a fundamentally efficient alternative to traditional Electrical Packet Switching (EPS) for selected data-center and AI networking use cases.

Feb 12, 2026

A Practical Approach to Optical Switching in Data Centers

Optical switching can address the energy and bandwidth scaling challenges facing data center networks, but its adoption is impeded by the cost and complexity of associated hardware and control

Apr 18, 2026

The Transformative Role of Optical Circuit Switches in Modern Data

Discover how Optical Circuit Switch (OCS) is transforming data center networks by overcoming electrical switch bottlenecks, reducing power and latency, and enabling scalable AI and ML workloads.

Apr 01, 2026

Photonic switching in high performance datacenters

Abstract: Photonic switches are increasingly considered for insertion in high performance datacenter architectures to meet the growing performance demands of interconnection networks. We provide an

Aug 09, 2025

Flexible and Scalable Optical Interconnects for Data Centers: Trends ...

The future trends and challenges of optical interconnects in data centers are discussed from the aspects of optical transmission technology, optical switching technology, and optical

Sep 12, 2025

OCS All-Optical Switching: Trends and Technologies in Optical ...

In the AIGC era, data center optical interconnections confront a dual challenge of "two highs and two lows": high bandwidth and high reliability, coupled with low power consumption and low latency.

Jul 04, 2025

Optical Switches Market Size | Share Analysis Report,

The optical switches market was estimated at USD 7.6 billion in 2025 and is expected to grow at a CAGR of 12.6% between 2026 and 2035, due to

Jan 07, 2026

Data Center Networks colocation network optical circuit switch ...

Traditional data center switching architectures have limited scalability and cannot keep up with growing intra-data center traffic demands. Ethernet routers and traditional Optical-to-Electrical-to-Optical

Jul 26, 2025

How optical interconnect and optical processing are

Optical communication has the advantage of high bandwidth, low latency, and low energy loss. Although it was initially used for facilitating traffic to

May 12, 2026

Optical Switches for Next Generation Data Center

This article provides an overview of optical switch architectures for next-generation data center and high-performance computing (HPC) networks.

Sep 29, 2025

Optical switching will innovate intra data center networks [Invited ...

Reflecting the recent slow-down in Moore's law and the proliferation of artificial intelligence/machine learning workloads, the performance and energy consumption of networks are becoming barriers in

May 09, 2026

Optical Circuit Switch for Data Centers

Coherent will hold a first-of-its-kind demo at OFC 2024 of a 300x300-port optical circuit switch, revolutionizing data center networks for AI deployments.

Nov 24, 2025

Design of high speed optical switches for intelligent optical networks ...

Traditional optical networks are gradually evolving towards intelligent optical networks due to the need for faster bandwidth provisioning, protection and restoration of the network, which can be

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