

Optical modules for RoCE networking



Overview

RDMA over Converged Ethernet (RoCE) Explained: What Is RoCE Optical Transceivers and Cables in RoCE Networks In RoCE networks, optical transceivers and cables are essential components for enabling high-speed, low-latency data transfers between servers and storage arrays.

Key Takeaways

Optical modules for RoCE networking enable high-speed, low-latency data transfers in data centers, supporting various packaging types and interconnect standards to ensure compatibility and performance.

RoCE (RDMA over Converged Ethernet) is a protocol that combines Remote Direct Memory Access (RDMA) with Ethernet, allowing ultra-low latency and high-bandwidth communication between servers and storage arrays. RoCE v1 operates at the Ethernet link layer, while RoCE v2 is routable at the IP layer, making it suitable for larger, multi-subnet networks. These networks are widely used in AI model training, high-performance computing (HPC), and cloud data centers due to their efficiency and reduced CPU overhead.

Types of Optical Modules

Optical modules for RoCE networks come in various form factors and speeds to match different switch and network card interfaces:

- QSFP28: Supports 100G Ethernet, commonly used in modern data centers.
- QSFP56: Supports 200G Ethernet, providing higher bandwidth for AI and HPC workloads.

- QSFP-DD: Supports 400G Ethernet, ideal for ultra-high-speed interconnects .
- OSFP: Another 400G form factor, often used for compatibility with specific switch designs .
- DAC/AOC Cables: Direct Attach Copper (DAC) and Active Optical Cables (AOC) provide flexible connectivity with customizable lengths and connector types . Vendors like NADDOD and FS offer optical modules with multi-encapsulation support, ensuring interoperability between different switches and network cards, such as Cisco QSFP-DD switches and NVIDIA ConnectX-7 QSFP112 adapters . These modules are tested for compatibility with over 140 vendors to guarantee reliable operation in complex data center environments .

Deployment Considerations

When deploying RoCE optical modules, consider the following:

- Latency and Bandwidth: Choose modules that match the required link speed (100G, 200G, 400G, or higher) to maintain low-latency RDMA performance .
- Switch and HCA Compatibility: Ensure the module supports the encapsulation type of both the switch and the host channel adapter (HCA) to avoid interconnection issues .
- Cable Type: DAC is suitable for short distances, while AOC is preferred for longer runs and higher flexibility .
- Network Topology: RoCE v2 allows routing across subnets, so modules must support the required Ethernet standards and VLAN tagging for priority flow control .
- Testing and Certification: Modules should be tested in environments that replicate the intended deployment to ensure interoperability and performance .

Summary

Optical modules are critical for high-performance RoCE networks, providing the necessary speed, low latency, and compatibility for AI, HPC, and cloud applications. Selecting the right module involves considering form factor, link speed, cable type, and vendor compatibility, with options like QSFP28, QSFP56, QSFP-DD, and OSFP widely used in modern data centers . Proper deployment ensures that RoCE networks achieve their full potential in accelerating data-intensive workloads.

Article Content

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Optical Transceivers and Cables in RoCE Networks In RoCE networks, optical transceivers and cables are not merely

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RDMA over Converged Ethernet

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Typical optical transceivers deployed in RoCEv2-based GPU clusters include: 400G DR4/FR4 optical modules — widely used for

RDMA over Converged Ethernet

Both InfiniBand and RoCE are comprehensive network standards, not an individual protocol. However, InfiniBand specifies the

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