

Fibre Channel Card Machine Interconnection



Overview

The Fibre Channel physical layer is based on serial connections that use fiber optics to copper between corresponding pluggable modules. The modules may have a single lane, dual lanes or quad lanes that correspond to the SFP, SFP-DD and QSFP form factors. Fibre Channel does not use 8- or 16-lane modules (like CFP8, QSFP-DD, or COBO used in 400GbE) and there are no plans to use these expensive and comple.

Key Takeaways

Fibre Channel cards interconnect servers and storage devices in a SAN using ports, switches, and inter-switch links to provide high-speed, lossless, in-order data transfer.

Overview of Fibre Channel Interconnection

Fibre Channel (FC) is a high-speed protocol primarily used to connect servers to storage in Storage Area Networks (SANs) within data centers, supporting data rates from 1 Gbps up to 128 Gbps, with backward compatibility across generations. Interconnection is achieved through Fibre Channel Host Bus Adapters (HBAs) or FICON/FCP adapter cards, which provide the physical and logical interface for servers to communicate with storage devices.

Ports and Topologies

Each Fibre Channel card implements one or more ports, which are logical entities capable of sending and receiving frames. The main port types include: N-Port (Node Port): Connects a server or storage device to a switch.

E-

Port (Fabric Port): Connects an N-Port to a switch in a fabric.

E-

Port (Expansion Port): Connects two switches via an Inter-Switch Link (ISL) for high-speed core connectivity. Fibre Channel networks can use three primary topologies: Point-to-Point: Direct connection between two devices using N-Ports. Arbitrated Loop: Devices connected in a loop, sharing bandwidth.

Switched Fabric: Devices connect through switches, forming a scalable, high-performance fabric.

Inter-

Switch Links (ISLs) ISLs are multi-lane, high-speed connections between switches that aggregate bandwidth from multiple edge ports. They are critical for non-edge, core connections and ensure efficient data flow across the SAN. Modern deployments often use DWDM (Dense Wavelength Division Multiplexing) to transport multiple Fibre Channel links over long distances, supporting rates up to 64GFC or higher.

Data Flow and Buffer Management

Fibre Channel ensures lossless, in-order delivery using a credit-based flow control mechanism. Each transmitting device is allocated buffer-to-buffer credits (BB_Credits), indicating how many frames it can send before the receiving device signals readiness (R_RDY) to accept more frames. This prevents buffer overruns and maintains deterministic delivery without routing delays.

Fibre Channel Adapter Cards

Fibre Channel cards, such as FICON or FCP adapters, provide the interface for servers to access storage devices. They can operate in different modes: FCP mode: Access SCSI devices through single or multiple switches.

FICO

N mode: Access IBM mainframe ECKD devices via point-to-point or switched connections. Advanced cards may include onboard processing, DDR memory, and FPGA-based interfaces to handle high-throughput traffic, protocol offloading, and real-time monitoring. They support multiple ports, full-duplex communication, and can operate in simulation, analyzer, or monitoring modes.

Data Center Interconnect Considerations

When connecting multiple data centers, Fibre Channel SANs may be extended using SAN extension technologies. These solutions must account for latency, distance, and protocol compatibility, as Fibre Channel cannot natively traverse IP networks without encapsulation.

DWDM and OT

N systems are commonly used to transport Fibre Channel frames over long distances while preserving low bit error rates and deterministic delivery.

Summary

Fibre Channel card machine interconnection relies on a combination of adapter cards, ports, switches, and ISLs to create a high-speed, lossless SAN fabric. Proper configuration of port types, buffer credits, and inter-switch links ensures reliable, in-order data delivery. Advanced adapter cards provide processing and monitoring capabilities, while DWDM and SAN extension technologies enable inter-data center connectivity for enterprise-scale storage networks.

Article Content

PowerPoint Presentation

Deployment of DWDM networks for Data Center Interconnect is largely driven by the transport of Ethernet and Fibre Channel, but operators must also interconnect using other protocols

Cisco UCS Fabric Interconnects and Fabric Extenders

Manage all Unified Computing System (UCS) chassis, modular servers, and rack servers from a single management domain in a converged unified fabric. Extend

Fibre Channel

OverviewMedia and modulesEtymologyHistoryCharacteristicsTopologiesLayersPorts

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Fibre Channel Modules with a Difference

AIM's Fibre Channel test, simulation and analysis modules use our field proven Common Core hardware design giving you the best performance, best feature set and highest functional integration on the

FICON and FCP storage adapters

These storage adapter cards are FICON Express features, which enable multiple concurrent I/O operations at various data transmission rates in gigabytes-per-second (Gbps), using Fibre Channel

4 Port Fibre Channel Host Bus Adapter (HBA) design

Pericom Semiconductor Corp. has a broad selection of PCI and PCI-X bridges including the PI7C21P100, PI7C8150B, and the PI7C8154B. This application note discusses the use of the

Fibre Channel Fundamentals

Implementing Fibre Channel requires components already familiar to IT professionals: host cards, cables, and driver software, with optional switches, hubs, and bridges, combined in network-like

IBM Z Connectivity Handbook

The most common attachment to an IBM Z I/O channel is a storage control unit (CU), which can be accessed through a Fibre Channel connection (IBM FICON®) channel.

Fiber Channel Card

The fiber channel card enables a direct fiber channel connection to an external storage array. This card is available as a factory-installed option for the Multiservices Platform Series.

Hardware - Fibre Channel Industry Association

The physical layer consists of copper and fiber-optic cables that carry Fibre Channel signals between transceiver pairs. Interconnect devices, such as hubs, switches, and directors, route Fibre Channel

Fibre Channel

Fibre channel does not have a regular topology such as in Token Ring or FDDI but uses instead a "fabric" which all users can attach to. Fibre channel can thus work point to point between

Understanding Fibre Channel Terminology

To understand the Fibre Channel (FC) and Fibre Channel over Ethernet (FCoE) capabilities, you should become familiar with the terms defined in Table 1.

Fibre Channel architecture

The switched-fabric topology provides the underlying structure that enables the interconnection of multiple nodes. The distance can be extended by thousands of miles by using routers and other

Storage Networking 101: Understanding Fibre Channel

Storage Networking 101: Understanding Fibre Channel As we dive deeper into SAN technology, it's Fibre Channel's turn to be examined. Fibre Channel, or FC, is the underpinning of all SAN

What is a Fibre Channel switch? | Definition from TechTarget

Learn about Fibre Channel switches, how they work and their benefits. Examine how FC switches differ from Ethernet switches and use cases for both.

Hardware - Fibre Channel Industry Association

Fibre Channel hardware interconnects storage devices with servers and forms the Fibre Channel fabric. The fabric consists of the physical layer, interconnect devices, and translation devices. The physical

Fibre Channel Option Card: User's Guide

This User's Guide provides step-by-step installation instructions and information required for ongoing use and maintenance of the IBM® Fibre Channel Option card.

Chapter 2: Understanding How a SAN Works

The Basics The Fibre Channel SAN Fabric Fibre Channel is the power behind the SAN. Fibre Channel allows for an active intelligent interconnection scheme, called a fabric, to connect devices. In the

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