

Hands-on Fibre Channel Lab

This course is intended to educate the student on Fibre Channel's protocol and hardware and its relationship to the Storage Area Network (SAN). This course will take the student from the lowest possible depths of the Fibre Channel hardware, to the transport layers of the architecture, up to and including the construction of a real SAN with real Fibre Channel hardware. You will learn details about the Fibre Channel architecture and how to analyze both loop and switch initialization sequences and protocols using real Fibre Channel analyzers. You will learn how to troubleshoot SAN designs, including FCP SCSI, large loop designs with multi-clients and shared storage, and switched networks containing both Fibre Channel and Ethernet hardware. This course mainly concentrates on the Fibre Channel aspects of the SAN and how to design, troubleshoot, analyze, and integrate the Fibre Channel hardware of the SAN.

Course Outline

Introduction, Concepts & Terminology

The need for a new interface
Performance trends
Storage trends
Parallel I/O limitations
Serial interface alternatives
Technology assumptions
Key Fibre Channel objectives
I/O and Network convergence

FC-0: Physical Interface

Physical interface concepts
Optical interfaces
Electrical interfaces
Fibre Channel connectors

FC-1: Data Link Control

8B/10B encoding/decoding
Ordered sets
Frame delimiters
Primitive signals
Primitive sequences
Link Level Protocols

FC-2: Transport Protocol

Transport protocol concepts
Exchange management
Exchange multiplexing
Sequence management
Segmentation/reassembly
Sequence initiative

Frame structure
Frame header description
Optional headers
Frame data field
Error detection (CRC)
Link Control frames
Flow control
Link level (buffer-to-buffer)
Source to destination (end-to-end)
Classes of service

FC-3 Fibre Channel Services

Common services
Basic link services
Extended link services
Session management
Login services
World-wide names
Service parameters
Port login trace example
The name server

FC-4: Protocol Mappings

Protocol mapping concepts
Information sets
Protocol information units
SCSI-3 architectural model
SCSI protocol data objects
SCSI protocol functions
SCSI Fibre Channel Protocol

SCSI-3 mapping concepts
Command information set
Transfer ready information set
Data information set
Response information set
FCP information units
FCP command flowchart
Inquiry command trace
Write command trace

Topology Overview

Topology concepts
Common characteristics
Topology comparison
Point-to-Point
Arbitrated Loop (FC-AL)
FC-AL characteristics
Loop initialization
Arbitration
Opening & closing loop circuits
Is the loop fault tolerant?
Switched Fabric
Fabric functions
Frame routing techniques
Fault tolerant fabrics
Addressing methods

Who Should Attend: This seminar is focused on those responsible for designing, developing, deploying, or maintaining Fibre Channel products. Upon completion of this workshop, you will have an in-depth understanding of the details of how Fibre Channel integrates into the SAN.

Prerequisites: An understanding of current computer interfaces or networks is desirable, although not necessary.

Course Length: Approximately 4½ days with up to 16 hours hands-on lab.