

In-Depth Arbitrated Loop

**Solution
Technology**



This two-day in-depth seminar builds on our 3 day Comprehensive Fibre Channel course and takes a significantly deeper examination of Fibre Channel Arbitrated Loop. You'll go through detailed scenarios and look at real life traces in order to understand how Initialization, Arbitration, Fairness and Loop Circuits work. You'll look at performance factors to help you understand the tradeoffs present in an Arbitrated Loop environment.

Each student takes with them a detailed reference manual written by Robert Kember; one of the architects of the Fibre Channel Protocol. This is recognised as one of the most in depth resources in detailing and solving Fibre Channel issues.

What is Arbitrated Loop?

Background
Arbitrated Loop Applications
Configurations
Loop vs. Other Fibre Channel Topologies
Loop Port Types

Arbitrated Loop Concepts

Loop Initialization
Arbitration and Fairness
Opening a Loop Circuit
Closing a Loop Circuit
Transferring a loop circuit
Loop Addressing
Arbitrated Loop physical address (AL_PA)
Addressing limitations
AL_PA assignment

New FC-AL Ordered Sets

Arbitrate (ARB)
Open a loop circuit (OPN)
Close a loop circuit (CLS)
Dynamic half-duplex (DHD)
Loop Initialization (LIP)
Loop port enable (LPE)
Loop port bypass (LPB)

Loop Port State Machine

Purpose of the LPSM
LPSM operation

Loop Initialization Process

Purpose of Initialization
Initialization flow &
Select Initialization Master
Address assignment
Loop port position map

Arbitration and Fairness

Fill word substitution
How Arbitration works
The fairness protocol
Prioritizing loop devices
Optimizing Arbitration
Arbitration protocol overhead

Opening a Loop Circuit

Full-duplex open (OPNyx)
Half-duplex open (OPNy)z
Replicate mode
Broadcast (OPNfr)
Multicast (OPNyr)

Flow Control

Buffer-to-buffer (BB) credit
Alternate BB_Credit model
Dynamic credit signaling
Zero credit overhead

Closing a Loop Circuit

The closing protocol
Enhancing performance with transfer
Closing protocol overhead

Port Considerations

Where is the processor?
Where is the memory?
Full-duplex or half-duplex
What is full-duplex really?
Zero or non-zero BB_Credit?

Performance Estimating

SCSI command behavior
How many loop circuits?
SCSI command trace
Key performance factors
Performance example
Loop round-trip time
Write command times
Throughput vs. Bandwidth
I/O's per second
Utilization vs. latency
Queue depth
Arbitration wait time

High Availability Loops

Strategies for robustness
Port bypass circuit
Dual loop approaches
Arbitrated Loop hubs
Unmanaged hubs
Managed hubs

Who Should Attend: This seminar is intended for those who require an in-depth understanding of the Fibre Channel Arbitrated Loop. The audience includes product architects, development team hardware, firmware, software, and test engineers, product planners, managers, or others involved in the planning, implementation, analysis, or testing of Arbitrated Loop products.

Prerequisites: Attendees should have a sound working knowledge of Fibre Channel or have previously completed the "Comprehensive Introduction to Fibre Channel" seminar.

Course Length: 2 Days