In-Depth Arbitrated Loop

This two-day in-depth seminar familiarizes you with the Fibre Channel Arbitrated Loop as it is described in the standard. It then takes you beyond the standard to help you understand how it works and why specific decisions were made. You'll go through detailed scenarios and look at actual 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. When you get back to work, you'll find yourself taking the reference manual with you to the lab to help you solve that tough problem.

Course Outline

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
- Reclaim current AL_PA
- Claim a new AL_PA
- 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 (OPNyy)
- Replicate mode
- Broadcast (OPNfr)
- Multicast (OPNyr)

Flow Control
- Buffer-to-buffer (BB) credit
- Alternate BB Credit model
- Use of zero BB_Credit
- 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

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