

Storage Fundamentals

Course Outline:

– Basic Concepts

- Networks vs. Storage
- Capacity
 - Network Links
 - Storage
 - Servers
 - Network Devices
- DAS, NAS, SAN, FAN & Hybrids
- External vs. Internal SANs
- Blocks, Files & Objects Overview

• Storage

– Storage Concepts

- Hard Disk Drive (HDD)
- Solid State Drive (SSD)
- Tape
- JBOD
- Storage Arrays
 - LUN Presentation
 - LUN Aggregation
 - Dynamic LUN Expansion
 - Thick & Thin Provisioning
 - Persistent Binding
- RAID levels
- Combined RAID Levels
- MAID

– Storage Technologies

- SCSI Storage Overview
- P-SCSI
- SAS
- SATA

• Networks

– Fibre Channel Technologies

- FC Overview
- FC Topologies
- FC Names & Addresses
- FC Names & Addresses NPIV
- FC Architecture
 - FC Architecture Overview

- FC-0
- FC-1
- FC-2
- FC-Services
- FC-3
- FC-4 SCSI & IP

– Fibre Channel Components

- HBAs and CNAs
- FC Hubs & Loop Switches
- FC Bridges, Routers & Gateways
- FC Fabric Switches
 - Switches
 - Switch Fabric Design
 - Switch Fabric Pathing
 - Switch Fabric Zoning & LUN Masking
 - Switch Fabric Router
 - Switch Virtual Fabrics
- FC Animations

– IP Storage & iSCSI

Technologies

- Storage Networking & IP
- IP over FC (IPFC)
- Internet Fibre Channel Protocol (iFCP)
- Metropolitan Fibre Channel Protocol (mFCP)
- Fibre Channel over IP (FCIP)
- Internet SCSI Protocol (iSCSI)
- Data Center Networks – Converged Enhanced Ethernet and Data Center Bridging (CEE & DCB)
- Data Center Networks – Fibre Channel over Ethernet (FCoE)

– Networking Concepts

- Introduction to Networking
- What is a layered stack?
- Data Structures
- Physical Transport Networks
- Simplex and Duplex
- Network Models
- Circuit & Packet Switch
- Bus, Loop & Expanse
- Connection-Oriented vs. Connectionless
- Bit Rate, Bandwidth, Latency and Throughput

- Ports and PHYs
- Names & Addresses
- Flow Control
- Segmentation & Offload

– System Interface Technologies

- PCIe
- InfiniBand

– Storage Network Performance

- Performance Prelude
- Flow Control
- FC Arbitrated Loop
- FC Fabric
- Fragmentation
- Tools

– Troubleshooting

- Storage Networking Troubleshooting
- Storage Networking Environmental
- Storage Networking Troubleshooting Tools
- Applications

– Data Protection

- Backup & Recovery Overview
- Technologies Overview
- Methods & Levels
- Snapshots & Replication
- Networking
- Virtual Tape Library (VTL)
- Continuous Data Protection (CDP)
- Data DeDuplication

– Information Lifecycle Management (ILM)

– Tiered Storage

– Storage Virtualization

– Storage Management

– Continuity Management & High Availability

– Storage Networking Security

– Storage Networking Applications

– Green Storage

– Green Data

– Cloud Storage

– Storage Network File Systems

- Additional Information

- **Storage Networking Resources**

- Futures
- Web Links
- Bibliography
- SearchStorage.Com online Quizzes
- Practice Test

- **Storage Networking Lab**

- Description
- Equipment
- FC Labs
- iSCSI Labs
- DAS Labs
- NAS Labs
- SAN Labs