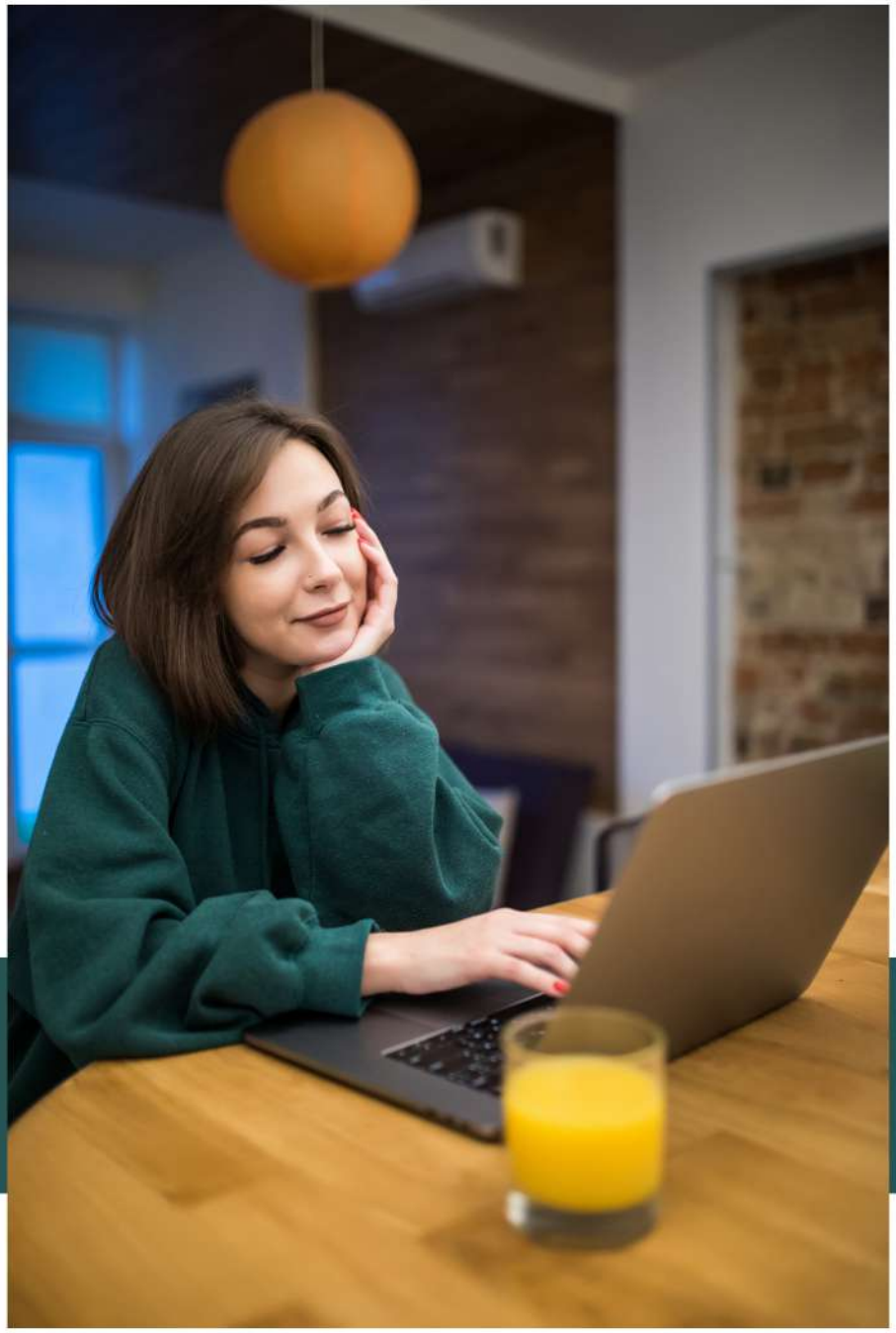
SNIA Storage Network Foundations



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Course Modules

1. **Recognize basic Storage Networking Technology Components**

- Describe Networking Concepts vs. Storage Concepts
  - Define protocols & infrastructures commonly used for DAS, SAN..
  - Differentiate session vs connection vs link
  - Differentiate names vs addresses
  - Differentiate payload integrity and error recovery approaches
  - Define full duplex vs half duplex

- Review Networking Concepts
  - Define the difference between the function of a router vs switch
  - Describe the technical advantages of SAN over DAS
  - Describe flow control (credit-based vs retrospective)
  - Define bit rate vs bandwidth vs throughput
  - Describe the functional differences of infrastructure components
  - Define data structures (e.g., message, segment, packet, frame)
  - Define segmentation and fragmentation

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- Define the differences in disk technologies
  - Define fragmentation/defragmentation
  - Differences between ATA and SCSI upper layer protocols
  - Identify diffrncs among ATA/SATA, SCSI, iSCSI, FC, Infiniband, SAS
  - Define protocols and infrastructures commonly used
  - Identify industry-based connectors
  - Identify symbology of industry-standard connectors
  - Describe the use of printers and scanners as Storage devices
  - Describe half duplex and full duplex transport protocols
- Describe features of Disk Controllers (cache, protection)
- Compare and contrast the electrical and mechanical differences
- Compare and contrast how the disk technologies of Fibre Channel
  - Describe differences between serial and parallel approaches
    - Define serial approaches (SATA, SAS, FC, Ethernet)
- Define RAID technology (e.g., levels)
  - Technical charctrstcs of host-based RAID vs non-host based RAID
  - RAID levels commonly used data protection & trade-offs relative

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- Describe SCSI technology
  - Define the structure of SCSI standards
    - Describe SCSI-3 architecture model
  - Identify SCSI I_T_L_Q Nexus addressing concepts
  - Define SCSI command protocol
  - Describe QUEUEing concepts
- Explain iSCSI
  - Define iSCSI in its relation to the protocol stack
  - Compare and contrast iSCSI and NAS (i.e., block level vs file level)
  - Identify concepts of gateways to existing SAN infrastructures
  - Define Ethernet oversubscription
  - Define FCIP and long-distance fabric links
- Describe HBA/NIC technology
  - Explain partial toe, full toe, non-toe for iSCSI
    - Differente between using non-dedicated non-TOE iSCSI initiator
  - Describe the impact of single-ported and multi-ported HBAs
  - Impact of software/firmware/drivers on HBA performance

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- Describe Fibre Channel (FC) SAN
  - Characteristics of Fibre Channel that make it appropriate for SAS
  - Define the distance and speeds available in FC SAN (e.g., distance)
  - Describe topologies and the connectivity implied
  - Describe FC protocol layers
  - Describe FC classes of service
  - Describe FC addressing
  - Define the function of Fabric services in Fibre Channel (e.g., name)
  - Describe Fabric enabled technologies (e.g authentication)
  - Identify fabric extension technologies (e.g., FCIP, iFCP, WAN)
- Describe Array Technology/Virtualization
  - Define array as a collection of disks with controller(s)
  - Define Storage Virtualization (e.g., abstraction, transparency)
  - Identify technical advantages and disadvantages of Virtualization
  - Define Storage Virtualization Taxonomy elements (i.e., Block)
  - Describe LUN Mapping (UNIX vs Linux vs MS Windows)
- Define SAS technology
  - Define common SAS link speeds
  - Describe SAS narrow vs wide ports
  - List the SAS protocols (SMP, SSP, STP)
  - Define a SAS expander
  - Describe SAS support for SATA devices (e.g., connectors, STP)

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- Define SATA technology
  - Define a SATA port multiplier
  - Define SATA link speeds and distances
- Describe NAS concepts (e.g., filing, components, O/S)
  - Identify technical advantgs and disadvantages of NAS technology
  - Define NAS OS characteristics
  - Define NAS Gateway or NAS Head approaches
- Describe the SNIA Shared Storage Model
  - Identify the layers and components of each layer
  - Describe block aggregation

2. Perform Storage Networking Administration

- Identify HBA configuration parameters
- Define troubleshooting methodologies and tools
  - Isolate faults and conditions (e.g., volumes of disks not visible)
- Identify the distance limitations between long-wave 7 short-wave
- Create/modify zone sets
  - Describe best practices for zoning
- Identify the possible zoning conflicts that could cause fabric segmnt
- Identify tradeoffs in costs, scalability, and redundancy
  - Identify implications and decision points
- Create storage layouts using partitioning, protected data, security
  - Identify the use of partitioning, protected data, security
- Define and compare uses of connectivity protocols

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3. Manage Storage Networks

- Describe storage management components
  - Define capacity, configuration, LDM, Storage Network Managers
  - Define Reportg, Analysis, Monitorg, SRM, Error Statistic Analysis
- Determine port assignments
- Define & compare Storage Device Management to Storage Netwrk
  - Discriminate betwn the components, characteristics & functions
- Describe Configuration Management Elements
  - Define Host (HBA, Device, File System), FabricIP Storage, Storage
  - Open Systems Storage Management (Path Managers, HBA)
  - Define Virtual HBA (e.g., iSCSI, VN_PORT)
  - Define Virtual OS technology concepts (e.g., virtualized host)
- Describe requiremnts or modificatns needed to implement SMI-S
  - Define the "client" and the "provider" in the SMI-S process model
- Apply Data Management Concepts
  - Define Data Management Concepts (e.g. Backup Recovery, Info)
  - Compare backup techniques (e.g., Network, LAN-free, Snapshot)
  - Diffrntit among backup methodologies as they relate to Scalabilty
  - Identify how policy-based mngmnt can be a technical advantage
  - Describe the use of replication technology to migrate data
  - Identify risks associated with Virtualization technique

- Change Management Process (ITIL) (Appld Fibre Channel Protocol)
- Identify common blocking problems to fabric merges
- Identify ISL technical advantgs and disadvantages over-subscription
- IDistance limitations between long-wave & shortwave Fibre

4. Perform Storage Networking Backup and Recovery

- Define Backup and Recovery Technologies (e.g., tape)
- Differences between virtual tape libraries (VTL) & disk to disk (D2D)
- Compare backup approaches (i.e., differential vs. increment)
  - Describe performance and compression/compaction of the diff
  - Identify steps to restore data from backup
  - Describe a restore from cumulative differential, perpetual diff
- Identify methods in using high availability and disaster recovery
- The role of infrastructure resolution in backup recovery & disaster
- Describe the different back-up and restore configurations
  - Technical advantages and disadvantages of each configuration
  - Identfy external requirements tht are uniquely satisfd by servrless
- Analyze potential backup problems (e.g., open file, out of space)
- Identify steps to track error logs within the operating system
  - Locate error messages, etc.

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Components that must be in place to do a back-up & operatnal rcvry

- Define Data Security
  - Authentication
  - Key Management
  - Encryption
  - Data Destruction
- Describe the purpose of securing fabric

5. Implement Storage Networks

- Differentiate SAS/SATA implementation parameters
  - Identify the configuration characteristics of SAS/SATA
  - Identify compatibility characteristics of SAS/SATA
  - The performance (capacity, speed, etc.) charactrstcs of SAS/SATA
- Define the differences between PCI-X and PCI-e
- Identify the RAID levels & implementatn (e.g., hardware, software)
  - Describe technical benefits & limitations of the different RAID lvls
- Differentiate Fibre Channel (FC) implementation parameters
  - Identify industry-known port names

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- Using Switch Technology
  - Identify Core/Edge, Cascaded and Mesh designs
  - Identify the causes of a zone merge failure
  - Define hard zones, soft zones, overlapping zones, port zoning
  - Identify the subscription rate for a sample fabric
  - Identify concepts of fan-in and fan-out ratios
  - Define the dual independent fabric concepts & technical benefits
  - Define multipathing (e.g., NIC teaming vs. MPxIO/MPIO)
- Using HBA technology
- Implementing Virtualization
  - Describe the technical advantage of LUN masking over zoning
  - Technical advantgs of usg both LUN masking & zonng concurrntly
  - Describe how VSAN/LSAN is implemented recognize the concept
- Implementing NAS
  - Share, use, mount resources
  - Differentiate between NFS and CIFS (i.e., stateful/stateless)
  - NDMP
- Rqurmts or modifications needed to implemnt SMI-S based storage

Monitor Storage Networking Performance

Assess a Customer's Storage Network

Plan and Design a Storage Network

6. Provide Storage Networking Business Continuance

- Define Continuous Data Protection
  - Define Consolidation and Capacity Utilization
    - Define technical administrative benefits
  - Define clustering and Failover
  - Define Data Protection (RAID)
  - Define high availability (host, fabric, and storage)
- Identify business case for implementation of Continuity Managmnt
  - Define levels of Disaster Recovery
  - Define tiered storage
  - Define compliance
  - Define security (e.g. encrypt, authenticate)
- Describe archiving/nearline
  - Define Content Addressable Storage (CAS) (e.g., hand offs)

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