NetApp Portfolio: Exploring SAN Architectures and Configurations (SANARCH)

Module 1: NetApp SAN Architectures

Lecture Length: 60 minutes
Exercise Length: 30 minutes
Module Objective #1: Explain the difference between SAN and NAS
Module Objective #2: Describe how SCSI protocols are used within SAN
Module Objective #3: List the SAN supported procucts in the NetApp portfolio

Module Topics:

The NetApp Portfolio
- Platforms
- Hardware Universe (HWU)
- Interoperability Matrix Tool (IMT)

NAS and SAN Protocols
- NAS and SAN
- Protocols used by NetApp
- SCSI

SAN Terms
- Basic terms (Host=Initiator, Storage=Target, LUN)
- Adapters (Initiator and Target)

FC SAN
- Nodes (WWNN)
- Ports (WWPN)

IP SAN
- Nodes (IQN)
- Ports (portal groups)

Connectivity
- Direct
- Switched
- Considerations (Ethernet network, fabric)
- FC Zoning

Multipath I/O
- ALUA
- Path Selection
- Failver considerations

NetApp Hybrid SAN Portfolio

- FAS with Data ONTAP
- E-Series with SANtricity
- Hybrid Flash Technologies

NetApp All-Flash SAN Portfolio

- AFF with Data ONTAP
- EF-Series with SANtricity
- FlashRay with Mars

Exercise – Using the Interoperability Matrix Tool (IMT)
Knowledge Check

Module 2: NetApp Storage Architectures

Total Lecture Length: 60 minutes
Total Exercise Length: 10 minutes
Module Objective #1: Describe storage architectures for Data ONTAP, SANtricity, and Mars operating systems
Module Objective #2: Describe the Data ONTAP, SANtricity, and Mars operating system design points that are optimized for differing data workloads
Module Objective #3: List the management and data protection software available for Data ONTAP, SANtricity, and Mars operating systems

Module Topics:

Storage Architecture

- Data ONTAP
  - Storage Architecture Stack (disks > RAID groups > aggregates > FlexVol volumes > LUNs)
  - Aggregate: pool on RAID
  - Unified Storage Architecture (dynamic)
  - RAID Levels: RAID-DP and RAID-4
- SANtricity
  - Traditional RAID
    - Storage Architecture Stack (disks > volume groups > volumes/LUNs)
    - Storage Architecture (static)
    - RAID Levels: 0, 1, 10, 5, 6 (also 3)
  - Dynamic Disk Pools
    - Storage Architecture Stack (disks > DDP > volumes/LUNs)
    - DDP: RAID in the pool
    - Storage Architecture (dynamic)
    - DDP key concepts (D-Stripes, D-Pieces, volumes, reconstruction)
  - Traditional RAID vs DDP
- Mars OS
  - Storage Architecture Stack (disks > extent store > LUNs)
  - Extent store: RAID in the pool
  - Storage Architecture (dynamic)

Performance

- What is performance?
  - IOPS
  - Throughput
- Data ONTAP
- SANtricity
- Mars

Management Software

- Data ONTAP: CLI, OnCommand Suite, AutoSupport
- SANtricity: SMcli, SANtricity Storage Manager, AutoSupport
- Mars: CLI, FlashRay System Manger

Data Protection

- What is Data Protection?
- Data Protection Solutions
- Protecting SAN data

Exercise – Login to the lab environment
Knowledge Check

Module 3: FAS SANs

Lecture Length: 60 minutes
Exercise Length: 0 minutes
Module Objective #1: Describe the FAS configurations and architecture
Module Objective #2: Discuss failover and giveback in FAS SAN environment
Module Objective #3: Discuss SAN software and tools
Module Objective #4: Describe ONTAP Features
Module Objective #5: Briefly describe data protection and disaster recovery features

Module **Topics:**

FAS Architecture:

- Configurations: Single-node, Multi-node, Metrocluster for Clusters
- WAFL
- Data Access

FAS failover and giveback

- Path Failure
- Node Failure
- Giveback
- Path change (LUN Mobility)

SAN software and tools

- OnCommand Software Suite
- Host Utilities
- Data ONTAP DSM
- SnapDrive and Snap Manager

Data ONTAP Features

- Thin Provisioning
- Deduplication

- Compression
- LUN Mobility

Data Protection and Disaster Recover software

- Snapshot Technologies
- SnapVault
- SnapMirror
- FlexClone

Knowledge Check

Module 4: FAS SAN Implementation Overview

Module Length: 45 minutes
Exercise Length: 60 minutes
Module Objective #1: Describe the configuration steps to configure a FAS SAN
Module Objective #2: Install the Data ONTAP simulator

Module Topics:

Describe steps to implement SAN for Data ONTAP (both clustered ONTAP and 7-Mode)

- Licensing or verifying the protocol
- Creating or designating a data aggregate
- Creating or designating a storage virtual machine (SVM)
- Creating, configuring, or designating ports and logical interfaces (LIFs)
  - Broadcast domain and subnet review
- Configure the fabric (if applicable)
  - zoning
- Creating or designating a data volume
- Creating a LUN
  - Recommended Volume and LUN configurations
- Creating or designating an initiator group (igroup)
- Mapping the LUN to an igroup
  - SLM
- Finding the LUN on the host and preparing the disk

Data ONTAP Simulator

- Installing
- Capabilities and Limitations

Exercise (Windows 2012 R2, two-node cluster, iSCSI)
Knowledge Check

Module 5: SANtricity SANs

Module Length: 60 minutes
Exercise Length: 0 minutes
Module Objective #1: Briefly describe the E-Series configurations and architecture
Module Objective #2: Discuss failover and giveback in E-Series SAN environment
Module Objective #3: Discuss SAN software and tools

Module Objective #4: Describe SANtricity Features
Module Objective #5: Briefly describe data protection and disaster recovery software

Module Topics:

E-Series architecture and configurations

- Simplex and Duplex Configuration
- Host and drive side
- Use of disks
- Volumes and LUNs
- Host and drive side write and read request
- Active/Active on host side with LVM
- Scale capacity

Failover and Failback

- Multipath Drivers (RDAC/TPGS/ALUA)
- Explicit and Implicit failover modes
- Alternate controller detection
- Failback

SAN software and tools

- SANtricity Storage Manager and components
  - SANtricity DSM
- Application Integration
- Provider, APIs and Utilities
  - Host Utilities

SANtricity Features

- Thin privisioning
- SSD Cache

Protection Features

- Data Assurance
- Encrypted Drives
- Snapshot Copy
- Volume Copy
- Remote Mirroring

Knowledge Check

Module 6: SANtricity Implementation Overview

Module Length: 45 minutes
Exercise Length: 60 minutes
Module Objective #1: Describe the configuration steps to configure a E-Series SAN
Module Objective #2: Install the SANtricity simulator

Module Topics:

Configuring an Array Overview

- Licensing premium features (if applicable)

- Configuring interfaces
  - Onboard and HICs
- Configure the fabric (if applicable)
  - FC Zoning
- Creating or designating a disk pool or volume group (VG)
- Creating a volume
  - Peferred Controller
- Creating storage partitions
  - Hosts and Host Groups
- Mapping the volume to a host or host group
- Discovering the LUN on the attached host

Simulator

- Installing
- Capabilities and Limitations

Exercise with SANtricity simulator
Knowledge Check

Module 7: FlashRay with Mars "Preview"

Total Lecture Length: 30 minutes
Total Exercise Length: 0 minutes
Module Objective #1: Briefly describe the FlashRay configurations and architecture
Module Objective #2: Describe Mars Features
Module Objective #3: Describe the configuration steps to configure a FlashRay SAN

Module Topics:

FlashRay architecture and configurations

- Single node
- 16-Gb FC
- Service Disk – PCIe Slot 1

FlashRay Software
Mars Features

- Thin Provisioning
- Inline Deduplication
- Inline Compression

Configuring an Array Overview

- Configure the fabric (if applicable)
  - FC Zoning
- Create a LUN
- Creating or designating an initiator group (igroup)
- Mapping the LUN to an igroup
- Discovering the LUN on the attached host

Exercise – case study or simulator if available
Knowledge Check

Module 9: NetApp SAN Solutions

Module Length: 30 minutes
Exercise Length: 60 minutes
Module Objective #1: Describe target workloads for FAS, E-Series, EF-Series and FlashRay SANs
Module Objective #2: Discuss Positioning information for FAS, E-Series, EF-Series and FlashRay SANs
Module Objective #3: Describe basic sizing tools
Module Objective #4: Explain basic data migration and tools available for SAN environments

Module Topics:

The NetApp Portfolio

- Positioning
  - FAS/Clustered Data ONTAP
  - E-Series/SANtricity
  - Flash Arrays: AFF, EF-Series, FlashRay
- Differenciating
  - Data ONTAP vs E-Series
  - E-Series vs Flash
- Use Cases
  - FAS/Data ONTAP
  - E-Series/SANtricity
  - Flash
- Customer Requirements
- When To Deploy

Sizing

- SPM information
- E-Series Power/Cooling Calculator
- Flashray?

Data Migration Considerations

- Terms and workflow
- Homogeneous (7-mode to cDOT 8.3)
  - 7MTT
- Heterogenous (3rd-party or E-Series to cDOT 8.3)
  - Appliance-based (FLI and DTA2800)
  - Host-based

Exercise – Case Study
Knowledge Check

Appendix A: V-Series and FlexArray SANs

NOTE: Combines V-Series modules for Architecting SAN
Module Objective #1: Describe the V-Series and FlexArray Virtualization Software solutions
Module Objective #2: List the supported arrays and topologies
Module Objective #3: Describe the NetApp recommended best practices for fabric and array maintenance

Module Objective #4: Discuss deployment strategies for V-Series and FlexArray

Module Topics:

V-Series Overview
- Unified Multivendor Storage
- Benefits
- Supported Arrays

Storage Arrays
- Components
- Array Types
- Topologies

V-Series and E-Series
V-Series Pre-Installation Planning
V-Series Deployment
Knowledge Check

Appendix B: Data Migration for SAN

Module Objective #1: Describe 7-mode to cDOT SAN migrations
Module Objective #2: Describe Foreign LUN Import feature

Module Topics:

- 7-mode to clustered Data ONTAP 8.3 Data Migration
  - 7MTT 2.0
- Foreign LUN Import (FLI) in clustered Data ONTAP 8.3
  - Supported arrays
  - Offline migration
  - Online migration (future)

Knowledge Check