

NetApp – Storage Networking Concepts

Data ONTAP

- Overview
 - WAFL
 - Modes
 - 7-Mode
 - Cluster Mode
 - Architecture
 - Aggregate
 - Plex
 - RAID Group
 - RAID4
 - RAID-DP
 - Disks
 - Data
 - Parity
 - Double-Parity
 - LUNs
 - Volumes
 - Root
 - Traditional
 - Flexible
 - Qtrees
 - RBAC
 - Networking
 - Interfaces
 - Ethernet
 - e0M
 - RLM (Service Processor)
 - Interface Groups
 - Jumbo Frames
 - Flow Control
 - VLAN
 - Routing
 - Deduplication
 - Snapshots
 - Volume SnapMirror

- Qtree SnapMirror
 - SnapVault
 - Synchronous SnapMirror
 - SnapRestore
 - MetroCluster
 - Data Fabric Manager
 - Volume copy
 - FlexClone volumes
 - HA Pair
 - VMware
 - Multistore
 - Compression
 - Snapshots
 - Volume SnapMirror
 - Qtree SnapMirror and SnapVault
 - Cloning
 - Snapshots
 - Snapshot reserve
 - Snapshot directory
 - Snapshot autodelete
 - Thin Provisioning
 - Aggregate
 - Volume
 - LUN
 - Space management
 - Space guarantee
 - Volume
 - File
 - None
 - Space reservation
 - Auto-grow
 - Fractional reserve
 - AutoSupport
- Configuration
 - Initial Setup
 - Licensing
 - CLI
 - System Manager

- Aggregate
 - CLI
 - System Manager
 - 32bit/64bit
 - Enable/Disable Snapshots
- Plex
 - CLI
 - System Manager
 - Verify
- RAID Group
 - CLI
 - System Manager
 - Add RAID4 group to existing aggregate
 - Add RAID-DP group to existing aggregate
 - Expand RAID Group
 - Add Disks to RAID Group
 - Single Disk
 - Specific Disk
- Disks
 - CLI
 - System Manager
 - Identify Data/Parity/Double-Parity/Spare
 - Disk Sanitation
 - Assign Ownership
 - Auto
 - Manual
- Volumes
 - CLI
 - System Manager
 - 32bit/64bit
 - Attributes
 - Root
 - Create/Copy/Modify/Move
 - Traditional
 - Create/Copy/Modify/Move
 - Flexible
 - Create/Copy/Modify/Move
- LUNs

- CLI
- System Manager
 - Configure igroup for LUN connectivity/Add LUN to igroup
 - Create/Expand/Delete/Rename/Move LUN
 - Discuss Geometry issues with LUNs
- Qtrees
 - CLI
 - System Manager
 - Create/Copy/Modify/Move
 - LUN/Volume
- RBAC
 - CLI
 - System Manager
 - Local
 - Users/Groups/Roles/Capabilities
 - Active Directory
 - Users/Groups/Roles/Capabilities
 - NIS
 - Users/Groups/Roles/Capabilities
- Networking
 - CLI
 - System Manager
 - /etc/rc
 - Interfaces
 - e0M
 - Interface Groups
 - Single/Static Multimode/Dynamic Multimode
 - Second-level
 - Jumbo Frames
 - Flow Control
 - VLAN
 - Routing
 - Fast Path
 - Routing Table
 - Routed
 -
- Deduplication
 - CLI

- System Manager
 - Scheduling
 - Before/After
 - Compression
 - CLI
 - System Manager
 - Scheduling
 - Before/After
 - Snapshots
 - CLI
 - System Manger
 - Snapshot Reserve
 - Snapshot directory
 - Snapshot autodelete
 - Scheduling
 - Aggregate
 - Volume
 - Thin Provisioning
 - CLI
 - System Manager
 - Flexible Volumes
 - LUN
 - Space Management
 - CLI
 - System Manager
 - Space Guarantee
 - File
 - Volume
 - None
 - Space Reservation
 - Auto-Grow
 - Fractional Reserve
 - AutoSupport
 - CLI
 - System Manager
 - Enable/Disable
- Administration
 - System Manager

- CLI
- Performance
 - Sstat
 - Stats
 - Perfstat
 - Netstat
 - Ifstat
- Security
 - RBAC
 - Users
 - Groups
 - Roles
 - Capabilities
- Troubleshooting
 - Is
 - Pktt
 - Ethereal
 - netmon

SAN

- Overview
 - Initiators
 - Targets
 - Logical Unit Numbers
 - Masking
 - Zoning
 - WWN/WWPN
 - Block vs. File
 - Multipathing
 - ALUA
 - Connectivity
 - iSCSI
 - MS Initiator
 - SnapDrive
 - Fibre Channel
 - Types
- Configuration
 - Licensing

- Fibre Channel
 - Licensing
 - High Availability
 - CFMode Types
 - Designs
- iSCSI
 - Licensing
 - High availability
 - Designs
- Provisioning
 - Windows
 - Linux
 - Autogrow
 - AutoDelete
- Capacity Management
- Administration
 - System Manager
 - CLI
 - SnapDrive
 - SnapManager
- Performance
 - Network Speed testing
 - Workload balancing
 - Partition Alignment
 - iSCSI
 - Single Session
 - Multi Session
 - CLI
- Security
 - FC
 - Masking
 - Zoning
 - Soft
 - Hard
 - iSCSI
 - Masking
 - VLANs
 - Passwords

- Encryption
 - System Manager
 - CLI
- Troubleshooting
 - ONTAP CLI
 - Switch CLI

CIFS

- Overview
 - Usage
 - Windows Sharing
 - Unicode
- Configuration
 - Licensing
 - Shares
 - Windows
 - Workgroup
 - Quotas
 - Users
 - Local
 - Domain
 - Workgroup
 - Groups
 - Local
 - Domain
 - Workgroup
 - Permissions
 - Access-based enumeration
- Administration
 - System Manager
 - CLI
 - Useradmin
 - /etc/registry
 - /etc/passwd
 - Access control
 - Volume
 - Qtree
 - Directory

- Windows authentication
 - Workgroup authentication
- Quotas
- Performance
 - Cifs stats
 - Cifs stop
 - Sysstat
 - Stats
 - Statit
 -
- Security
 - Sessions
 - Permissions
 - Shares
 - Mandatory File Locking
- Troubleshooting
 - Ping
 - Testdc
 - Ifstat
 - netdiag

Multiprotocol

- Overview
 - CIFS and NFS configured
 - UNIX and Windows permissions
 - File system operations and permissions
 - Qtrees
 - WAFL credential cache
- Configuration
 - UNIX, NTFS, Mixed Style
 - Qtree
 - File permissions
- Administration
 - System Manager
 - CLI
- Performance
 - Should be the same methods as NFS and CIFS
- Security

- Should be the same methods as NFS and CIFS with combination of both on the same object at the same time
- Troubleshooting
 - NAS troubleshooting is the same
 - TCP
 - Ping
 - UDP
 - Permissions
 - Ifstat
 - Testdc
 - wcc

NFS

- Overview
 - File vs. Block
 - Versions
 - PC-NFS
 - WebNFS
 - Resource list
 - Identification
 - Authorization
- Configuration
 - Licensing
 - /etc/exports
 - Volume
 - Qtree
 - Directory
 - File
- Administration
 - Persistent mounts
 - In-memory mounts
 - System Manager
 - CLI
 - Exportfs
 - /etc/exports
 - Volume
 - Qtree
 - Directory

- File
- Performance
 - Nfsstat
 - Nfs_hist
 - Netapp-top.pl
 - Time mkfile
 - Time dd
 - Time cp
- Security
 - AUTH_SYS
 - Kerberos
- Troubleshooting
 - RPC
 - NFS daemons
 - Mount points
 - Showmount -e
 - Nfsstat -d
 - Ping
 - exportfs

Snapshot Technology

- Overview
 - Benefits
 - Associated technologies
 - Inodes
 - Snapshot process
 - WAFL interaction
 - Locking
 - Min/Max
 - Reserve
 - Aggregate/Volume/CIFS
 - FlexClone
 - SnapManager Products
- Configuration
 - Licensing
 - Taking snapshot
 - CLI
 - System Manager

- Scheduling
- Restoring
- Snapshot directory
 - Linux
 - Windows
- FlexClone
 - CLI
 - System Manager
 - Volume Splitting
- Space Usage/Monitoring
 - CLI
 - System Manager
- Administration
 - CLI
 - System Manager
- Performance
- Security
 - Visibility of Snapshot directory
- Troubleshooting
 - Inconsistent file system
 - Objects within volumes

SnapRestore Technology

- Overview
 - Technology
 - What can be reverted
 - SnapMirror integration
 - Usage
 - Rules
- Configuration
 - Licensing
 - SnapRestore
 - Volume
 - File
 - Aggregate
 - Root Volume
- Administration
 - CLI

- Performance
 - Restoring file performance hits
- Security
 - File
- Troubleshooting
 - Active users during restoration
 - Stale File Handle
 - Best practices

SnapMirror Products

- Overview
 - Requirements
 - Async
 - Sync
 - Semi-Sync
 - Qtree/volume
 - Requirements/Limitations
 - Advanced features
 - Multiple Path
 - Fibre Channel
 - Tape
 - Cascading Volumes
 - SnapVault vs. SnapMirror differences
- Configuration
 - Licensing
 - Snapmirror.conf
 - Qtree
 - Volume
 - Snapmirror.log
 - Throttling
 - Space guarantees
 - CP and NVLOG forwarding
 - Replica to Writable conversion
 - Resync
 - Break
 - Migration
 - Volume Cascade
 - Snapmirror.allow

- Administration
 - CLI
 - System Manager
 - Monitoring
 - Space guarantee
 - Transfers
- Performance
 - Replication type
 - Qtree
 - Volume
 - Throttling
- Security
 - Snapmirror.allow
- Troubleshooting
 - Snapmirror.log

SnapVault Feature

- Overview
 - Requirements
 - Usage
 - Volume
 - Qtree
 - SnapMirror vs. SnapVault
 - Application-Consistent Snapshot
 - Preservations
 - SnapDrive for Windows
 - LUN Clone backups
- Configuration
 - Licensing
 - Primary/secondary
 - Scheduling/Manual
 - Deduplication
 - Updating Vaults
 - Application-Consistent Snapshot
 - Preservations
 - Restore
 - File
 - Qtree

- Volume
 - Nondisruptive
 - LUN Clone
 - Restart/Release
- Administration
 - Transfers
 - Vault lists
 - Volume
 - Qtree
 - SnapVault Logs
 - /etc/logs/snapmirror
 - Restart/Release
- Performance
 - Initial copy
 - Scheduling
- Security
 - Explicit controller access
- Troubleshooting
 - /etc/logs/snapmirror

Open Systems SnapVault (OSSV)

- Overview
 - Requirements
 - Usage
 - Coordination with SnapVault
 - Management
 - Open File Manager
 - Volume Shadow Copy Service
 - Block Level Incremental
 - OSSV Database
- Configuration
 - Licensing
 - Windows installation
 - Unattended
 - Attended
 - Firewall
 - Primary

- Licensing
 - Secondary configuration
 - Restore
 - Resync
- Administration
 - Windows installation
 - Svconfigurator
 - UNIX installation
 - NetApp Protection Manager
 - Restore
 - Resync
 - Monitoring Transfers
 - Windows Commands
 - Log files
 - /usr/snapvault
 - C:\Program Files\netapp\snapvault\etc
 - /etc/log/snapmirror
- Performance
 - Backup streams
 - Initial copy
 - Scheduling
- Security
 - Explicit controller access
- Troubleshooting
 - Log files
 - /usr/snapvault
 - C:\Program Files\netapp\snapvault\etc
 - /etc/log/snapmirror
 - OSSVINFO
 - LREP

High-Availability Configuration

- Overview
 - Requirements
 - Active/Active
 - Features
- Configuration
 - CLI

- System Manager
- Licensing
- Cf commands
 - Option commands
- Matching node options
- Takeover/giveback
- Negotiated Failover
- Administration
 - CLI
 - System Manager
- Performance
 - ALUA
 - MPIO
- Security
 - Identical node configurations
- Troubleshooting
 - Shelf cabling
 - Node configurations

MetroCluster and SyncMirror

- Overview
 - Requirements
 - Limitations
 - Stretched
 - Fabric Attached
 - Site Failover and Recovery
- Configuration
 - CLI
 - Site1
 - Site2
 - Cf commands
 - Mirrors
 - FC Zoning
 - Virtual Channels
 - Cabling
 - Traffic Isolation
- Administration
 - CLI

- Cf commands
- Performance
 - Site connection performance
- Security
 - Identical controller configuration
- Troubleshooting
 - Communication disruption
 - Split-Brain
 - RAID group failures