NetApp NCSA-HC

Cloud Computing. What it is? Why?

Cloud Review(Security & Risk), Hybrid, Public, Private models. ITaaS(IT, Consumption, Business)

**NIST** – Branch for US department of Commerce. Responsible for developing Information security for federal assets.

AltaVault

Problems with Backup, Archive, and DR

* Too Slow
* Too Expensive
* Too Risky
* Too Complex

Benefits

* Simple
  + Provides a NAS interface with SMB, OST (Open Storage), NFS
  + Store up to 384 TB per appliance.
  + Snapshots
  + AVA400/AVA800
  + Deduplicated cache released has to be restored from the cloud
* Efficient
  + Stored on local cache
* Open
  + Integrate with the cloud (public/private)
* Secure
  + SSL 3/TLS 1
  + AES-256
  + FIPS 140-2 Level 1
  + KMS, SSO

Use Cases

* Backup Modernization
* Cold Storage Target
* Adding Cloud-Integrated Backup
* Archive Storage Target
* Disaster Recovery

**NTASP**

**Data Fabric**

* Data is becoming more distributed, dynamic, diverse.
  + Know where it is located, unstructured/structured data.
  + Digital transformation
    - Enable new points of contact with customers
    - Create innovative business opportunities
    - Optimize operations
  + Holistic Approach
    - Security
    - Efficiency – automate orchestrate
    - Future-Proof solutions
    - Data Management options
* Data Fabric – Harness (Cloud resources), Build (Next-gen DC), Modernize (data management)
  + Benefits
    - Optimizes protection
    - Simplifies Design
    - Offers a range of choice
    - Uses new technology
* NetApp Partnership
  + Trusted Data Management Advisor
  + New Business Opportunities
  + Simpler Selling Process.
* Cloud Backup Data Fabric Solution
  + AFF or FAS SnapMirror Alta Vault with SnapCenter
  + Flash to disk to Cloud

**Product Portfolio**

* Customer Challenges
  + Pressure to manage a large amount of data
  + Need to create value across the organization
  + Limited time, skills, and budget
* Bare-Metal Data Center -> Virtualized Infrastructure -> Cloud Data Services
* Deployments
  + On-Premises
  + Off-Premises
* Customer Goals
  + Modernize infrastructure without creating silos
  + Eliminate performance bottlenecks
  + Deploy emerging applications through enterprise-grade data services
  + Redically change the economics of the data center
  + Rapidly integrate new technologies
  + Freely move data to where it runs optimally
  + Use one set of tools to manage and protect data where it resides

**ONTAP 9**

* Using the Power of the Hybrid Cloud
* Simplify data management
* Accelerate and protect data across the hybrid cloud
* Eliminate planned downtime with non-disruptive data movement
* Maintain operations during system interruptions with zero data loss
* Cost-effectively protect against regional disasters
* Secure data with software-based, data-at-rest encryption on any volume and any disk.
* Receive instant, built-in backup and recovery
* Protect data against multiple disk failures
* Integrates and supports emerging applications
  + Openstack integration
  + Connector for Hadoop
  + Connector for Docker
  + Certification for MongoDB
  + Uses common infrastructure for existing and new applications
  + Provides enterprise-grade data services
* Future-proof the data infrastructure and scale environments to future needs
* Use Cases
  + Common Data Management across architectures – blocks or files on flash, disk or cloud
  + Across Deployment models – engineered storage arrays to commodity servers
  + Across applications – from enterprise to emerging applications
* Products that can be covered by ONTAP 9
  + All Flash FAS or FAS
  + Converged infrastructure/Flexpod
  + Flex Array
  + ONTAP Select on SDS
  + Near-Cloud
  + Cloud
* Deployment Modes
  + FAS
    - Increases speed
      * Up to 200% greater performance
      * NVMe Flash Cache included in all models
      * High-performance connectivity
    - Enhances availability and security
    - Reduces TCO
    - FAS9000 – business-critical workloads
    - FAS8200 – enterprise workloads
    - FAS2600 – small enterprises,
  + All FLASH FAS
    - AFF8000
    - AFF8040
    - AFF8080
    - AFF8080EX
    - AFFA200 – faster and more compact
    - AFFA300
    - AFFA700s
    - AFFA700
* Features
  + Storage Efficiencies
    - Inlined Data Reduction (compaction, compression, deduplication)
      * Expanded inline deduplication – adds inline aggregate deduplication which complements existind deduplication, compression, and compaction
      * Up to 30% more efficiency
      * Supports All Flash FAS
      * Opportunities – database copies, multiple VM across volumes
    - Thin provisioning – optimize existing storage
    - Snapshot technologies
  + FabricPool Technology
    - Tier cold data to the cloud
    - Connect to AWS or StorageGriD private cloud
    - Reduce storage costs by 40%
    - Tiers inactive data from primary snapshot copies and secondary systems
    - Supported on All Flash FAS and all -SSD FAS aggregates
  + FlexGroup
    - Scalable NAS container
    - Supports computation-intesnive workloads and massive data repositories
      * Oil and gas, high-tech, EDA
    - Delivers linear scale up to 20 PB
    - Uses one mount point with automated load and space distribution
    - Consistent low latency and high performance
    - Resiliency on FAS clusters by using ONTAP nondisruptive operation
  + QOS and Balanced Placement
    - QOS to protect the performance of business-critical workloads
      * Sets minimum resource levels
      * Enables service classes
      * Supports SAN on all Flash FAS
    - Uses balanced placement to simplify the loading of new workloads on clusters
      * Automate provisioning of LUNS
      * Balances use across clusters
* Positioning
  + FAS and ONTAP
    - Performance -drive environments
    - Application acceleration
    - Cloud-ready enterprises
    - Ready to modernize and reduce costs
    - Massive NAS demand
    - Cost-effectivy security
    - Consolidate workloads in shared environments
  + ONTAP Select
    - Leverage commodity server hardware
    - Low-risk method for testing ONTAP
  + ONTAP Cloud
    - Cloud-ready enterprise
    - Hybrid cloud environments with on-premises and hyperscale
* Qualifying questions
  + Is your current environment too complex to manage and integrate different parts of your storage solutions?
  + Can you respond quickly to business changes on-premises or in the cloud?
  + Do your enterprise applications need high performance and rish data management?
  + Do your all-flash solutions create silos?
  + Can your storage infrastructure incorporate future flash and storage technology?
  + How might your business benefit if all your workloads were always accessible?
  + Have you incorporated cloud or do you plan too?
* Benefits
  + Simplify transition to cloud-ready data center
  + Modernizes the infrastructure with flash and cloud without creating silos
  + Deploys emerging applications with enterprise-grade data services
  + Radically changes the economics of the DC
  + Freely move data to where it runs optimally, flash, disk or cloud
  + Uses current infrastructure and personnel
  + Manages and protects data with one set of tools, wherever the data resides

**ONTAP Select**

* + SDS (Software Defined Storage) on Commodity servers
  + Deploys in DC and remote offices
  + Flexible capacity-based license
  + Supports multiple configurations up to 4-node HA
  + Enterprise NAS and block services for DAS
  + 9.2 New vNAS solution and 2-node support with 90 day evaluation available

**ONTAP Cloud**

* + SDS in the cloud
  + AWS/Azure
  + PAYU
  + SSD or HDD with HA
  + Ideal for DevOps and DR
  + Enhances cloud storage with NAS, snapshot copies, clones
  + Minimizes the cloud footprint by using advanced data reduction methods
  + Enables easy data movement between on-premise and cloud locations
  + Software storage solution for AWS/Azure
  + Targets
    - DevOps
    - Cloud DR
    - Data Management in the cloud
    - Cloud strategy
  + Use Cases
    - Data Protection
      * AltaVault – disk to disk to tape onsite offsite
      * Cloud Control
    - DR
      * NPS
      * ONTAP Cloud
    - DevOps
      * ONTAP Cloud
    - Analystics
      * Cloud Sync
      * NPS

**E-Series and SANtricity**

* Market Dynamics
  + Enterprise servers hold pent-up performance
    - systems out of balance, where storage performance is the bottleneck.
    - Opportunity to drive higher CPU use, improve efficiency
  + New databases demand new levels of storage performance
    - SQL Server 2014
    - Oracle and SAP upgrades that are performance-sensitive
  + Third platform is driving faster analytics
    - Commodity servers with internal storage that can’t keep up with requirements
    - Need for consistent low-latency performance as scale increases
* E-Series Focus Areas (performance, costs and reliability, ease-of use
  + Data Protection
  + Physical and Cyber Security/Video
  + Technical Computing
  + Big Data Analytics
* Storage Systems
  + E2700 -> E2800 (All Flash array)
  + E5600 - High performance and high compacity
  + EF560 – low latency for block based applications/performance
    - All Flash – low latency, simplicity, reliability
* SANtricity OS
  + Utilized by E and EF series
  + Performance optimized data path through controller in only 38 microseconds
  + Complete set of data management features: Snapshot copies, mirroring, replication, encryption
  + Minimal impact on resources
  + Storage manager
    - Intuitive UI
  + System Manager
    - Browser-based UI
    - Streamlined interface on E2800 11.30v
  + Cloud Connector
    - Cost-effective backup and recovery to the hybrid cloud from an ESeries or EF Series
    - Integrates with NetAPP Data Fabric
    - Ideal for customers who need simple cloud backup capabilities instead of a complex backup and DR infrastructure
* Benefits
  + IT infrastructure that lowers TCO by 33%
  + Improved performance by more than 50%
  + RAS (Reliability, Availability, and Serviceability)
  + Maximum density – 600 TB in 4U
  + Fast recovery
* Customer Conversations
  + What are your IOPS per TB requirements?
  + What are your SLA’s
  + Where do you want to spend your money?
  + What does consistent latency mean to your business?
  + How rapidly is your data changing?
* Core Values
  + FAST, SIMPLE, RELIABLE

**Building a Next-Generation DC**

* Collection of resources that are agile, scalable, automated, and predictable (SDDC, Infrastructure 2.0, Cloud computing, Private cloud, Third platform)
* SolidFire
  + Doesn’t require RAID, SDS All Flash
  + Similar to AWS
  + Element X is the OS
    - Automation
    - Self-Healing
    - Guaranteed Performance
    - Global Efficiency
    - Scale-Out
* Benefits
  + Accelerate time to production
    - Simple to configuration
    - Deep integration with CloudStack, OpenStack, VMware
  + Simple scaling
    - Node by node scaling
    - Nondisruptive configuration
    - Speed/flexibility
    - Performance/capacity alignment
    - Linearity of scale
  + Reduce operational management and operational expenses
    - Uses of APIs to incorporate SolidFire into existing new workflows
  + Economic benefits of shared infrastructure
    - Guaranteed performance for every workload

**HyperConverged Infrastructure**

* Increased horsepower, improved performance of flash storage, expanded use of flash into the DC, deep integration with virtualization platform software
* Works:
  + Software that joins components together to provide resiliency
  + Virtualized servers, storage, networking
  + Granular, platform-based storage management
  + Single infrastructure stack that runs on elastic pool of x86 resources
* What is it?
  + 2-RU, 4 node building block
  + ONTAP File Services so customers can access file and block services
  + SolidFire perform the base (Integrated Data Services, Data Fabrice Services, Third-Party Services)
  + VM EXSI hypervistor
* Value Propositions – solve IT predictability problems with unique QoS limits
  + Guaranteed Performance
    - Provide granular control
    - Consolidate mixed workloads
    - Predictable performance
  + Flexibility and Scale
    - Optimize and protect
    - Eliminate the 10% to 30% HCI tax
    - Scale compute and storage independently
  + Automated Infrastructure
    - NDE (netapp deployment engine)
    - Deploy rapidly
    - Automate and streamline management
    - Simplify by using comprehensive APIs

**FlexPod Portoflio (CI)**

* IT Trends /Challenges
  + High Service levels
  + Establish cloud strategy to meet business demands
  + Legacy infrastructures were not designed to hanle the unique challenges
  + Business needs technology solutions that simplify and automate processes
* Portfolio
  + Cisco Unified Computing System
    - Unified management & programmable infrastructure
  + Cisco Nexus switches
    - Unified fabric
    - Next-generation performance with cloud scale
  + NetApp storage
    - ONTAP
    - NetApp SolidFire Tech
  + Centralized management with automation
    - Open API
    - Cisco UCS Director and orchestration support
* Products
  + FlexPod Express
    - Small business can consolidate infrastructure on an easy to manage platform
  + FlexPod DC
    - Shared virtual infrastructure/medium large/service providers
    - One storage software
  + FlexPod Select
    - Big data analytics – dedicated workloads.
  + FlexPod SF
    - Solidfire storage, predictable performance
      * All Flash storage
      * Global efficiencies
      * Cloud-like resource utilization
      * Advanced scale-out
      * Guaranteed performance
      * Automated management
      * Data Assurance
    - Cooperative support system
    - SF9608 with C220 Node UCSB series node and UCS manager. Cisco ACI
    - Devops, Line of business leaders, Cloud architects,
    - Web-native applications, scale-out databases, end-user computing
    - Service providers and telecommunications, next-generation enterprises
    - Market opportunities
      * New buyers – cloud architects
      * Infrastructure buyers
      * Build next-generation DC
      * Find new revenue sources
* Benefits
  + Cost Efficiency
    - Lower by 20%
  + Operational simplicity
    - Best-in-class preconfigured integrated solution
    - Less time configuring
  + Proven Scalability
    - Support for 60^ more virtual desktops
* Validated Designs
  + 140 – Cisco & Netapp
  + Infrastructure, storage, network
  + Single Sku & Validated Designs (Netapp)
  + Cisco – validated designs
  + Microsoft – fast track validations & technical reports
  + NetApp – verified architectures
* Cooperative Support
  + Direct Access between vendors
  + Coordinated Support – cross training
  + FlexPod Expertise – Cooperative Support LAB. Pretest labs to identify solutions
* Target Customers
  + 500 users and limited IT staff
  + Consolidate applications
  + Smaller workloads and smaller customers
  + Expanding small and midsize organizations
  + Upgrading to Microsoft application versions such as Exchange 2013
  + VDI deployments in Windows Server 2012
  + Remote branch offices

**NetApp Products for the Cloud**

* Data stimulates insights
* Data outlives generations of hardware and software
* Data is reproducible but not replaceable
* Cloud amplifies data management challenges
* Provide control and choice
* Improve efficiency
* Accelerate innovation
* Cloud Connected Services
  + AltaVault
    - Cloud based – no secondary DC, low cost protection
    - Physical – scalable 32 – 384 TB of local cache. Deployed in DC
    - Virtual – medium sized businesses/enterprises
    - Connects to any backup software or direct database dumps to the appliance and caches locally
    - Deduplicates, compresses, and encrypts
    - Benefits
      * Simple, Efficient, Open, Secure
      * 2 TB – 57 PB in the cloud
      * Migrate data from other clouds to another
      * Data at rest/Data in transit. FIPS level 1/ SSL encryption, Encryption keys managed locally.
  + NPS (Private Storage)
    - Can connect to multiple public clouds and can change at any time.
    - Data sovergnity.
    - Low latency (2ms) 10GbE
    - Dedicate storage that is installed in an Equinix cabinet connected to Equinix Cloud Exchange
    - Use Cases
      * File Services
      * DR
      * SaaS
      * Test and Development
      * Data protection
      * Hybrid analytics
* Cloud Data Services
  + Cloud Sync
  + Cloud Control
  + ONTAP Cloud

**StorageGRID Webscale**

* Object Storage – data is stored as objects in containers
* Large content repository for big, unstructured data
  + Billions of datasets
  + Dozens of PB
* Consumption of global content
  + Policy-controlled datastores at each site
* Provides intelligent data classification and access
  + Metadata-based managements
* Positioning
  + Rich content services
  + Video, images, PDFs, large throughput
  + Scalability, automated data distribution
  + Secondary that need secure archive, automated tiering.

**Strategy**

* Challenges
  + Deliver cloud services from different cloud environments
  + Predictable service levels
  + Increase speed of IT operations
  + Simplify operations and risk
* Concerns
  + CIO, CSO, VP or Director – Do we have a defined cloud strategy?
  + IT Manager, Cloud architect, or Line-of-Business Owner – What are we delivering to business units?
  + Cloud Architect or Application Developer – How does the process of transitioning to the cloud work, and how much time does the process take?
  + Storage Manager – How do we run and maintain the new environment?
* Data authority for the hybrid cloud
  + Data Fabric solution – help traditional infrastructure buyers realize business objectives
  + Help CIOs, cloud and enterprise architects
* Buyers
  + Traditional Infrastructure buyers
  + CIO, Coud and Deveops/Enterprise Architects

**Resources**

* NetApp University – learning center
* PartnerEdge – Salesorce.com + QuoteEdge
* Field Portal – learn what’s new
* Capital Solutions – NCS

**NSEP, ONTAP**

**ONTAP ABC’s**

* Delivers
  + Simplicity
  + Consolidate data management
  + Deliver performance
  + Robust & Cost-effective
* Value Proposition
  + Simplicity
    - Deploy new solutions in fewer than 10 minutes
    - Reduce the storage footprint & costs
    - Centrally manage data from a single pane of glass
    - Simple to Buy
      * Improves processes
    - Simple to Setup
      * Fast provisioning templates
    - Simple to Manage and Monitor
      * OnCommand Performance Manager
      * Mobile AutoSupport
      * Headroom
    - Simple to Extend
      * ONTAP Cloud
      * ONTAP Select
  + Agility
    - Deploy both SAN and NAS workloads on a unified storage architecture
    - Increase flexibly to cluster flash & disk nodes
    - Provision storage in seconds
  + Power
    - Increase performance up to 60%
    - Provide continuous availability to eliminate downtime
    - Protect and rapidly restore data with integrated backup and disaster recovery
    - ONTAP is the same data management software.
    - Inline data compaction
    - RAID-Tec
    - MetroCluster software
    - 15 TB drives included
* Architectures
  + Outages
  + Price Competition
  + Merger & Acquisitions
* From 7-mode from 8.3
* Questions
  + Who is your customer?
  + What is the target workload?
  + Is it the right time?
  + Who is the best contact?

**Technical Positioning of Clustered Data ONTAP 8.3**

* Hardware and Features
  + Unified Architecture
    - 64 bit data is supported in ONTAP 8.3
    - Delete 32 bit before upgrading
    - Doesn’t support FAS/V 6080, 6040, 3170, 3160, 3140, 3210 on 8.3
    - 8.2 introduced 2 node switchless cluster doesn’t require a cluster interconnect switch but requires management network.
      * Up to 12 nodes but may require a larger switch. RLM to be hosted on a different switch.
    - Protocols
      * FC
      * FCoE
      * SMB (Server Message Block)
      * NFS
      * pNFS (parallel NFS)
      * iSCSI
    - Scalability
      * Performance scaling
      * Capacity scaling
      * Operational scaling
    - Storage Efficiency
      * Deduplication
      * Compression
      * Thin provisioning
      * Cloning
    - Cost & Performance
      * Flash Cache
      * SSD
      * Flash Pools
      * SAS & SATA
    - Management & Ecosystem integration
      * Unified management
      * Secure multi-tenancy
      * Multivendor virtualization
    - Integrated Data Protection
      * Snapshot copies
      * Asynchronous mirroring
      * Disk-to-Disk and disk-to-tape backup
* Cloud ONTAP
  + OnCommand Cloud Manager is needed to provision ONTAP Cloud.
* Benefits (Value Prop)
  + Nondisruptive Operations (Performance)
    - HA
    - LIF (Logical Interface migration and failover
    - DataMotion for Volume software
    - MetroCluster – continuous availability after an outage
    - Scale Up/Scale Out
    - Performance Augmentation
    - System Agnostic
  + Proven Efficiency (Operational)
    - FlexClone
    - Multi-tenancy
    - FlexArray
    - **OnCommand** – Manages the device level for clusters with single or multiple node. Branch Cache, Access, AB, Kerbos
      * Out of the box for 7mode.
      * Unified Manager – Monitors the availability, capacity, and protection of ONTAP resources to provide a single view of NetAPP storage health.
        + Combines with workflow manager & performance manager
      * Performance Manager – provides automated performance monitoring and root-cause analysis of clustered Data ONTAP
      * Workflow Automation – enables automation of simple to complex storage processes.
      * Insight – provides multivendor storage configuration, performance, and capacity management and enterprise reporting for capacity planning.
  + Seamless Scalability (Capacity)
    - SAN scaling
* Transitioning
  + 8.3 removes 7-Mode. Customers can use **7-mode transition tool** CLI/GUI to transition to ONTAP. Uses Snapmirror to seed cluster with flexvault volumes and replicate information til it is current.. Grabs IP information and then applies it to the SVM.
    - 7-Mode transition tool 2.0 allows MetroCluster and SAN migrations. Copy based transition process. FC or Attached Metrocluster and done at the volume level.
    - Customer would need to update host files.
  + NetApp RapidData – Hardware appliance which allows NFSv3 with 7 mode transition to clustered data ONTAP.
  + NetApp DTA2800 Appliance – block data migration to clustered Data ONTAP prior to 8.3
  + Application tools – specific to customers environment.
  + Host-based tools – specific to customers environment.
* Licensing
  + POS is a license entitlement record
  + License keys are tied to controller serial number
  + License keys are locked to nodes and software is unlocked on the controller
  + License keys are 28 characters
* Questions
  + Do you want to spend less time and fewer resources running your most critical workloads?
  + Do you want to achieve confidence through nondisruptive operations (NDO)?
  + Do you want seamless scalability to meet changing application needs?
  + Do you want to move data seamlessly between the cloud and the data center?
* Business Needs
  + Traditional storage architectures don’t keep up with infrastructure demands
  + Application based silos was the traditional approach in DC design.
  + IT leaders are being asked to use a service oriented architecture
  + Hybrid cloud uses 2 or more clouds that are separate or can be used in combination
  + SVM – Storage virtual machine allow data to be moved around the cluster in containers
  + ONTAP 8.3 main enhancements – secure multi-tenancy, pooled virtual resources, efficient data transport (Insight, Unified Manager)
* Customer Challenges
  + Cost – Answer: VST (Virtual Storage Tier), Flash Cache/Flash Pool, Unified Manager, FlexArray
  + Data Protection – Answer: SnapRestore, SnapMirror, SnapVault, MetroCluster
  + Security – Answer: SVM, cluster admin by AD,
  + Storage Efficiency – Answer: FlexArray, FlexClone, deduplication
  + Scalability – Answer:HA, multi-tenancy, Unified Manager, DataMotion
  + Cloud – Answer: SnapMirror, DataMotion, Unified Manager
  + NDO – Answer: NDU, Multipathing, MetroCluster, SMB, NDO. 99.999%
  + Virtualization – Answer: Hyper-V over SMB, SVM, Unified Manager
  + Performance – Answer: VST, FC, Flash Cache, Flex Pool, QOS, pNFS(decrease interconnect traffic)
  + Capacity – Answer: SATA disk, Thin provisioning, Infinite volumes.
* Assessment of Customer Needs
  + NetApp customer?
  + Primary workload?
  + Virtualization?
  + Performance Requirements?
  + Third-Party Storage?
  + Staffing concerns?
  + Namespace required?
  + Boundaries to ONTAP
    - Bandwidth > 5 Gbps?
    - Volumes > 20 PB?
    - Files > 16 TB?
    - One Directory > 2 billion files?
    - Data ONTAP 8.3 won’ be a fit go with E-Series, Storage GRID
* Positioning
  + Speed customer response to business changes
  + Removes IT constraints
  + Revolutionizes storage software
  + NetApp people, technology, and services
  + Availability and performance for business-critical applications
  + NetApp cloud strategy
  + NetApp leadership in SDS and flash
  + CEO
    - Decrease time to market and seize opportunities
    - Enable your business to better server your customers
  + CFO
    - Reduce your operating budget
    - Increase productivity per employee
  + CIO
    - Spend less time and fewer resources running your business-critical workloads
    - Accelerate innovation and change without risk
  + Director of IT
    - Achieve confidence with NDO
    - Improve operational efficiency
  + IT Architect
    - Improve application availability by changing host and storage configurations without downtime
    - Response to dynamic application needs and keep operations running while providing seamless scaling
* Resources
  + Competitive Portal
    - HP
    - IBM
    - Dell/EMC
    - Hitachi
    - Oracle
  + System Performance Modeler (SPM)
    - Unified tool for FAS sizing, what if, detail of storage performance requirements
    - Forward and reverse sizing
  + IKM Portal (Information, Knowledge, Methodology)
    - POC, Professional Services, Deployment
    - <http://sharepoint.corp.netapp.com/sites/IKM>
  + POC lab team
    - Request submission/qualification call/Discovery call
    - Definition/implementation/demonstration/evaluation
    - Deliverables – test plan, POC review, completed Test Plan, deployed and tested environment.
    - 4-5 business days
    - <http://cpoc.netapp.com/index.shtml>
  + Proposal Center
    - Field Portal
  + Help
    - VoD – Video library on the main website
    - Main website
    - Field portal

**Clustered Data ONTAP 8.3: New Features**

* Introduction to Data ONTAP 8.3
  + New Technologies
  + Complex Operations
  + Time and Budget Constraints
  + All-flash FAS
    - Optimized random read operations
    - Higher read I/O throughput
    - Consistent and predictable read performance
  + Support for scale out FAS
    - FAS8000
    - FAS2500
* Lesson 1 – Provider of Wireless Communication Services
  + MetroCluster – provides business continuity and continuous availability beyond a DC
    - HA
    - Ability to share ISL (inter-switch links) to consolidate two metro cluster to one instances
    - NDO
    - Better performance from FAS8000
    - Near-zero RPO
    - Supports up to 4 nodes
    - Takeover and giveback
    - Unified Manager
    - SAN Configuration Advisor Data Collector Tool
    - Less than 200 km(125 miles) apart between DC
    - Tech details:
      * Identical pair
      * NVRAM is mirrored.
      * Synchronous replication to remote site (aggregate level with 2 plexs)
      * Replication over cluster-peering IP
      * Read operations performed locally
      * Write are done local and offsite
      * Must be same controller type
      * Must mirror aggregate plus root
      * Switchover done at the cluster level. Fabric attached storage only.
      * Single command can activate a switchover to the remote site.
      * 7-mode
        + Requires newly configured controllers, storage, and fabrebridge and then migrated into the cluster
        + Brocade 6510/Cisco 9710/9148 switches can be reused in 7-Mode
      * Data ONTAP
        + In-place transitions not supported
        + Use SnapMirror Software.
* Lesson 2 – Provider of Cloud Services: OS
  + Support for VVol (VMware Virtual Volumes)
    - * LUN mapped to volumes
      * Allows VVol to map to the VM and manage independent
  + IPspace feature
    - Allows 2 different network to utilize different SVM’s
    - Allow companies with the same subnets to still use the cluster without any traffic conflict.
    - 2 IPspaces crated automatically
    - System SVM carries cluster ipspaces traffic between nodes of a cluster on the internal private cluster network.
    - System SVM carries default ipspace management traffic for the cluster and nodes including intercluster traffic
    - System SVM for a customer IPspace carries management traffic for that SVM.
    - Network ipspace create -ipspace XYZ
    - 2 broadcast domain created automatically
      * Default one is used to transport data
      * Cluster: cluster management and cluster data.
    - If the cluster requires multiple IP address ranges, multiple broadcast domains need to be created.
    - Broadcast domain contain their set of IP addresses.
    - When LIF’s are removed, subnets go back to the subnet pool.
    - Default route to the gateway is created and tied to the SVM
    - Each broadcast domain can contain multiple subnets
    - Network ipspace show -ipspace XHS
    - Network ipspace delete -ipspace XSH
  + Easy manage and move virtual disks
    - * Instant access to the new location when blocks are moving with ESXi
      * Can make copies with ESXi
      * Complete instant virtual disk restores from a SnapVault backup solution
  + SnapMirror compression and expanded SnapMirror fan-in and fan-out
    - Asymmetric snapshot copies
    - Version flexible replication
    - Network compression enhancements
    - 255:1 fan-in
    - 1:16 fan-out
    - Enable recovery from corruption at primary site by failing over older Snapshot copies
    - Eliminate need for separate DR and backup Snapshot copies.
    - Eliminate disruptions during upgrades (version-flexible)
    - Default SnapMirror relationships can be converted to version-flexible without rebaselining.
    - Rebaselining is necessary to convert a version-flexible Snap Mirror relationship to default
    - Version-Flexible not supported by earlier versions of Data ONTAP
    - Use it if bidirectional topologies/single-copy DR/Single-Copy Backup and Restore are needed.
* Lesson 3 – Graphics and Animation Development Company
  + Larger Flash Pool cache sizes (increased by 4 times)
  + Support for MMC (Micrsoft Management Console)
    - Create SMB share, view sessions or files
    - Doesn’t update instantaneously
    - Node scoped view
    - Doesn’t support perfmon, live view audit, local users and groups
  + Automated NDU – decrease upgrade steps from 35 to 3
    - Installes image on all nodes
    - Single node clusters have to be disrupt updated.
    - Rolling upgrades 8.2
    - Batch Upgrade 8.2
    - Manual NDU before 8.3
      * Disable automatic giveback
      * Migrate LIFS away from node
      * Verify LIFS migrated
      * Tigger an autosupport
      * Initiate takework.
      * Wait 8 minutes
      * Return aggregates
      * Revert LIFs
* Lesson 4 – Growing Retail Store
  + Advanced Drive partitioning
    - SSD partitioning with Flash Pool
      * Can share spares between HA partners
      * Allocation units become a RAID group when they are assigned to a flash pool aggregate
      * Maximum RAID group size is 28 for RAID-DP and 14 for RAID 4
      * Use one RAID type across all allocation units in an SSD storage pool to avoid orphaned SSD partitions.
      * SSD storage pools can contain only SSD
        + Can contain between 2 – 28
      * All SSDs in an SSD storage pool must be owned by the same HA pair
      * Don’t support:
        + Metro Cluster
        + SyncMirror
        + Physical SSD
    - HDD
    - FAS2500/FAS2200
    - Lower root aggregate disk
    - HA configuration for 12-disk
    - RAID-DP
    - Data disks/total disks = efficiency
    - Storage devices that can’t use or support root-data HDD
      * Array LUNS
      * Virtual disks created for use with Data ONTAP-v
      * Drive types that aren’t internal drives mSATA, ATA, FC-AL
      * MetroCluster
      * Data ONTAP-v
      * RAID 4
  + System Setup 3.0
    - FAS220, FAS3200, FAS8000
    - .NET framework
    - Setup
      * Perform discovery
      * Setup cluster
      * Configure AutoSupport
      * Setup disks
      * Setup SVM
      * Enable protocols
  + OnCommand System Manager
* Lesson 5 – Local Bank Adding Branches
  + Snapvault software improvements
  + Transition Tool 7 MTT
    - 64-bit aggregates are only supported in clustered DATA ONTAP 8.3
    - In-place nondisruptive expansion to 64-bit aggregated
    - SnapMirror and SnapVault require 64-bit data
    - 32-bit aggregates must be converted
    - 32-bit snapshot copies must be deleted.
    - Migration of MetroClusters
    - Migration of volumes containing luns
      * Disruption in service. Hosts have to be shutdown
      * LUNS need to be remapped. Host configurations have to be updated.
      * Volumes in SnapMirror relationship must follow these
        + Primary volume must be a read/write volume
        + Primary volume must not be the destination of a data protection mirror relationship
        + Secondary and primary volumes must not be the source or destination of a load-sharing mirror relationship

Secondary can be a source for a mirror relationship

* + - * + Source path of each file or LUN is copied from the snapshot copymust be available
        + 12288 lun for node
    - Support for CLI
    - Support for FIPS
    - Support for additional host platforms
    - Remove /vol from all junction paths
  + DataMotion for LUN
  + Foreign LUN import
    - Migration of third-party lun
    - No license fees
    - No DTA2800 required
    - Required downtime and professional services
  + More LUNS supported in SAN
    - DAC (Dynamic Access Control) – identified by SMB in Windows
      * Resource property list -
      * Central Access Policies (CAPs) -
      * Central Access Rules – define rules to gain access
      * Supports BYOD
* Lesson 6
  + IPv6
    - Support for IPspaces
    - Intercluster Peering
    - Support for Metro Cluster
    - DNS LB
  + SMB
    - CIFS server can be referenced by more than a NetBIOS name (alias)
    - Server advertises additional NetBIOS names
    - 200 NetBIOS alias’s can be defined
  + NFS
    - Kerberos supports AES – 128/256
    - Qtree exports for NFSv3/v4/pNFS
    - Showmount
    - Extended local unix groups
    - <stack\_id>.<shelf\_id>.<bay>.<position>
    - NTP configuration command. Won’t work until 8.3

**Clustered Data ONTAP 8.3.1 : New Features**

* Lesson 1 – State Government IT Series
  + SnapMirror for SVM
    - Protect SVM identity and namespace, not just volumes (identity-preserver mode)
      * DNS/AD/NIS
    - Will work across different subnets but does need some reconfiguration at the network level
    - Identity-discard mode – data and namespace are the same but there is only a partial configuration in the mirror.
    - Doesn’t support
      * Automated LUN mapping for SAN
      * NFS failover without remount
      * Fan-out and cascades
      * Partial namespace replication
      * Failover of a subset of protected volumes
      * Multiple RPO within an SVM
* Lesson 2 – Online Retailers
  + Flash Enhancements
    - Inline compression with an 8kb group size
    - TR-4403
    - TR-4415
    - SPC-1 benchmark
    - Volume-level summary for AWA (automated workload analyzer)
* Lesson 3 – Other features
  + Two-Node Metro Cluster support
    - FC. Distance up to 200 km
    - Switchover and Switch back
    - Supports stretch metrocluster
  + 1 Nodes independent
    - Stretch MetroCluster (SMC) with Optical SAS
      * No switches or bridges just SAS cables
      * FC-VI connected through single-mode/multimode cables
      * Maximum distance 500 meters
    - Stretch MetroCluster with FibreBridge Bridges
      * Includes bridges (no switches)
      * FC-VI connected through single-mode or multimode FC cables
      * Maximum distance 500 meters with 2-GB FribreBridge link
      * Maximum distance 150 meters with 8G FibreBridge link
    - Fabric MetroCluster (FMC)
      * Same config as four-node metrocluster
      * Includes switches and bridges
      * Maximum 200 km
      * FC-VI connected through FC switches
      * TR4380
    - Designated intercluster connectivity – create discrete peering networks by tenant
      * One intercluster LIF per node per IPspaces
    - Audit log forwarding up to 10 remote syslog destinations
  + File System Control – command that is issued to the file system (SQL/SMB)
    - FSCTL\_QUERY\_ALLOCATED\_RANGES
    - FSCTL\_SET\_ZERO\_DATA
    - FSCTL\_FILE\_LEVEL\_TRIM
  + Management Enhancements
    - Message of the day
    - Login banner

**NetApp Transition Fundamentals**

* Transition Terms and Phases
  + **Transition** – the people, processes, and technological activites that are involved in moving a 7-Mode environment to a clustered Data ONTAP environment
  + **Data Migration** – process of copying, replicating, or moving data from a source storage system to a destination storage system
  + **Copy-based transition** – a transition in which data is copied from source disks to destination disks
  + **Copy-free transition** – transition in which source disks are connected to the destination disks.
    - Supports snapmirror relationships that can be moved.
    - Restricted on certain versions on ONTAP. Must meet controller requirements. CFT-revert can be done at any time.
    - Physical movement of disk shelf cables
    - Certain shelves and models are supported
  + **Operationalization** – transfer and modification of storage-system dependencies (people, processes, and technologies)
  + **Applications** – application that are deployed in the environment
    - ASM (Oracle Automatic Storage Management)
    - Microsoft Exchange Database Availability Group (DAG)
  + **Workload** – primary (client-generated load that is placed on the storage system.
  + **Storage Container** – storage object that is being moved, such as a storage system, aggregate, LUN, volume, or qtree
  + Host-based migration
    - Better for high file count. XCP, Rsync, NDMP copy or LVM (logical volume manager)
      * SAN host-based remediation tool (SAN HRT) – host remediation tool on a windows system.
      * Config Advisor – provides a profile for verifying cabling
      * XCP migrates third-party storage to netapp storage.
        + Show command
        + Scan command
        + Copy command
        + Verify command
        + Resume command
        + Sync command
        + Xcp.netapp.com
  + Foreign LUN import (FLI)
* Transition Phases
  + **Identity** – definition of scope, environment discovery
    - Environment discovery
      * Produce a list of workloads and applications
      * Determine business and cutover requirements for each application or workload
      * In My AutoSupport, use the **transition advisor tool** to help discover storage systems.
      * **7MTT Collect & Access** to help with environment discovery and prioritization
        + Discovers information about controllers
        + Identifies differences between features
        + Compares HBA and firmware to IMT
      * 7MTT uses **IMT** for cross reference. Can use 7MTT for discovery
      * **Inventory Collect tool** – collect information about affected systems
        + Inventory report workbook
        + Inventory report XML file
    - Scope
      * By controllers or hosted workloads
      * By applications, workloads, and constituent groups
      * Issues
        + Location of dependent storage containers
        + System warranties and tech refresh schedules
        + Transition readiness
        + Cutover requirements
        + FC Zones
        + Data-protection requirements
  + **Design** – transition planning, cluster design.
    - Transition planning
      * Plan environment updates
      * Train administrators
      * Plan data migration
      * Detailed technical discovery
      * List of management applications that require updates
      * List of the scripts that leverage CLI commands
      * Plan for providing training for data ONTAP
      * Map storage containers to final destinations
    - Cluster Design
      * Incorporate 7-Mode workload and application requirements
      * Plan for future business requirements
      * Utilization assessment and workload assessment need to be done.
  + **Implement** – data migration, deployment, configuration, environment updates.
    - It’s not a process – Unified Transition Methodology (UTM)
* 7MTT
  + Source discovery
  + SAN migration
  + NFS & CIFS migration
  + Automatic data migration
  + MetroCluster migration is copy-based for 8.3
  + Support 60 active projects
* Transition Planning
  + SnapMirror Relationship
    - **Data Protection** – data mirror from the source copy
    - **SnapVault data Protection (XDP)** – contains multiple snapshot copies from the source
    - **Transition data protection (TDP)** – only supported during migration and one-way relationship
  + Qtree
    - Qtree to Qtree migration 1:1
      * Used mainly for qtree quota.
    - Qtree to Volume migration 1:1
      * Used mainly for qtree replication.
      * Must break qtress into volumes from staging
    - Qtree consolidation
      * Used mainly for qtree replication.

**ONTAP 7-Mode**

* V series works with 3rd party storage arrays like EMC, IBM, HP, and Hitachi
* **BranchCache** – increases network responsive that are accessed from remote offices. Reduces WAN use
* Based on FreeBSD
* **SMF (Simple Management Framework)** interacts with ONTAP to collect system information that is sent to SNMP.
* **E0m –** dedicated to ONTAP data management
* **RLM (Remote LAN Modules) –** remote access to the feature
* RAID Disk Type – Data disk, hot spare disk, parity disk, double-parity disk
* Device\_id is the one to the far right bottom corner
  + DS14 Disk/Loop ID = DS14 Shelf ID \* 16 + Bay Number
  + Disk ownership is software based
* Role on CLI:
  + Admin
  + Power
  + None
* EMS (Event Management System) – gets reported to the console and syslog
* Degraded mode is shut down after 24 hours with ONTAP
* **Disk Scrubbing** – checks the blocks of all disks for media errors. Automatic or manuel
* **Full provisioned volumes** – space guarantee
* **Thin-provisioned** – does not require reserving space
* ONTAP creates checksums on each data block.
* **Read-cached copies** – are stored in the SSD tier in the flash pool
* **Write-cached blocks** – associated with flexVol volumes and written in the SSD tier. Has a HDD block reserved for it. Metadata is stored in the SSD tier.
* **Flash pool** – incompatible with 32-bit aggregates, traditional volumes, snap lock software, earlier than 7.2
  + Supported on v-series systems but only with NetApp software.
* Flash cache doesn’t have flash pool aggregates in there.
* Snapshot copies can be enabled or disabled for individual volumes but not for individual qtrees
* Qtrees don’t support space reservations or space guarantees.
* Aggregate space -> 85% for data, 10% WAFL overhead, 5% snapshot reserve
* BranchCache has two methods – distributed or hosted. Enabled at the vFiler unit and then enable it at the share level
* Can evoke quotas by /etc/quotas file.
* Dynamic interface groups cannot participate in a second-level interface group
* SnapDrive – simplifies mapping of netapp storage.