VMware Vision and Strategy for Software-defined Storage

Alberto Farronato, VMware, Inc
Vijay Ramachandran, VMware, Inc
Disclaimer

• This presentation may contain product features that are currently under development.
• This overview of new technology represents no commitment from VMware to deliver these features in any generally available product.
• Features are subject to change, and must not be included in contracts, purchase orders, or sales agreements of any kind.
• Technical feasibility and market demand will affect final delivery.
• Pricing and packaging for any new technologies or features discussed or presented have not been determined.
Agenda

1. VMware’s Vision for Software-defined Storage
   - Overview of key VMware Technologies
2. Virtual Volumes and Storage Policy-based Management
3. Partner implementation of Virtual Volumes – NetApp
4. VMware Virtual SAN
5. Q&A
The Software-Defined Data Center

Expand virtual **compute** to all applications

Virtualize the **network** for speed and efficiency

Transform **storage** by aligning it with app demands

Management tools give way to **automation**
The Software-Defined Data Center

Transform storage by aligning it with app demands
Today’s Challenge: Massive Increase in Storage Demand & Complexity

Storage Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Terabytes Sold</th>
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<tbody>
<tr>
<td>2008</td>
<td>M</td>
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<td>2009</td>
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<td>2010</td>
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<tr>
<td>2011</td>
<td>M</td>
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<tr>
<td>2012</td>
<td>M</td>
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<tr>
<td>2013</td>
<td>41% YoY</td>
</tr>
<tr>
<td>2014</td>
<td>60M</td>
</tr>
<tr>
<td>2015</td>
<td>80M</td>
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<tr>
<td>2016</td>
<td>120M</td>
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Most Pressing Storage Challenges

- Meeting SLA: 42%
- Troubleshooting: 31%
- Data Migrations: 28%
- Time/budget: 28%
- Provisioning: 26%
- Management Complexity: 24%

Source: IDC, Yezhkova, Worldwide Enterprise Storage Systems Forecast, November 2013, #244293

Increasing Diversity Of Devices

**Hot Edge**
- CPU/Memory-bound
- Low Latency
- Dominated by flash

**Cold Core**
- Capacity-centric
- Increasing commodity hardware
- Scale-out, multi-geo
- Extends into cloud
Rapidly Emerging x-86 Server Storage Brings Data Close To Applications

- Greater CPU Densities
- High Density Flash
- Flash Interfaces
  - DIMM
  - SAS/SATA

Hypervisor

x86 Servers
Rapidly Emerging x-86 Server Storage Brings Data Close To Applications
Legacy Operational Model Creates Several Challenges
Legacy Operational Model Creates Several Challenges

Device Mgmt.

vSphere

SAN

NAS

All-flash

Snapshot

Replication

Encryption

VM

VM

VM

VM
Legacy Operational Model Creates Several Challenges

Storage Consumer Challenges:
- Lengthy provisioning cycles
- Difficult to make adjustments
- Lack of granular control
- Complex troubleshooting
- Frequent data migrations

Storage Provider Challenges:
- Fragmented device management
- Rigid capacity and data services allocation
- Complex LUN/Volume management
The Hypervisor Opens Up New Opportunities

The Virtualization Platform:
- Knows the needs of all apps in real time
- Sits directly in the I/O path
- Global view of underlying infrastructure
- Hardware agnostic
The Hypervisor Opens Up New Opportunities

New application centric control plane
• Common consumption model across all storage tiers
• Dynamic composition of storage services
• Granular control of service levels

Virtualize The Data Plane
• Abstract and pool infrastructure
• Make the virtual disk the primary unit of data management
• Enable new hot-edge for vSphere: Hypervisor-converged storage tier on x-86
VMware Software-Defined Storage Vision For External Storage

vSphere

SAN / NAS  SAN / NAS
VMware Software-Defined Storage Vision For External Storage
VMware Software-Defined Storage Vision For External Storage
VMware Software-Defined Storage Vision For External Storage

- Storage Policy
  - Capacity
  - Performance
  - Availability
  - Data Protection
  - Security

- Storage Policy-Based Mgmt.
- Virtual Volumes
- Virtual Datastore

Published Capabilities
- Snapshot
- Replication
- Deduplication
- QoS
VMware Software-Defined Storage Vision For External Storage

Storage Policy
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Virtual Volumes

Virtual Datastore

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SAN / NAS

Device Mgmt.

vmworld® 2014
VMware Software-Defined Storage Vision For External Storage

Storage Policy-Based Mgmt.
- Virtual Volumes

Virtual Datastore

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SAN / NAS

Device Mgmt.
VMware Software-Defined Storage Vision For External Storage

Storage Policy Based Management
- Policy driven, VM-centric control plane
- Dynamic composition of storage services
- Intelligent placement and transparent remediation
- Common across heterogeneous devices

Virtual Volumes
- Virtual disks natively represented on external storage
- Granular control of native array data services on a per VM basis
- No more LUNs/Volumes

Published Capabilities
- Snapshot
- Replication
- Deduplication
- QoS
Storage Policy-Based Management Simplifies Provisioning And Delivers Agility

**Today**
- Hardware centric
- Vendor specific management
- Static pre-allocation of shared storage container (LUN)
- Data services aligned to storage container

- Long provisioning cycles
- Overprovisioning of resources
- Management complexity
- Frequent data migrations

**Storage Policy-Based Management**
- Application-centric
- Common management across heterogeneous devices
- Policy-based dynamic composition of services
- Granular control of data services to individual VMs

- Raid provisioning
- No overprovisioning of resources
- Efficiency through automation
- Simple change management
Solving Storage Provider Challenges Through Integration With Partner Solutions
Solving Storage Provider Challenges Through Integration With Partner Solutions

Third-party storage control plane
Example: ViPR Controller, NetApp OnCommand, etc.

- Common management layer across heterogeneous arrays
- vSphere, physical, non-vSphere
- Integration into policy-driven control plane
- Automates storage administration
Enabling New Storage Tiers With Common Control Plane
Enabling New Storage Tiers With Common Control Plane
Enabling New Storage Tiers With Common Control Plane

Storage Policy Based Mgmt.

- Virtual Volumes
- Virtual SAN
- vCloud Air

Virtual Datastore

Virtual SAN Shared Datastore

SAN / NAS

Cloud Storage
Enabling Self-service Consumption

- Storage Policy Based Mgmt.
  - Virtual Volumes
  - Virtual SAN
  - vCloud Air

Cloud And Management Automation

- vCloud Automation Center
- OpenStack

Virtual Datastore

SAN / NAS

Cloud Storage

Virtual SAN Shared Datastore

SAN / NAS

SAN / NAS

HDD

HDD

SSD

SSD

SSD

HDD
VMware Software-Defined Storage
Bringing the Efficient Operational Model of Virtualization to Storage
VMware and EMC Integrations For Software-Defined Storage

vSphere

Storage Policy Based Mgmt.

Virtual SAN

Virtual Volumes

ViPR Controller

ViPR Data Services

VASA

Multi Hypervisor

Physical

Hypervisor-Converged Storage

Virtual SAN Shared Datastore

3rd Party

SAN / NAS

VNX

Isilon

XIO

VMAX
Agenda

1 VMware's Vision for Software-defined Storage

Overview of key VMware Technologies

2 Virtual Volumes and Storage Policy-based Management

3 Partner implementation of Virtual Volumes – NetApp

4 VMware Virtual SAN

5 Q&A
Virtual Volumes Overview
Management and integration framework for VM centric operations with native array capabilities

The Basics
- Virtual disks are natively represented on arrays
- Enables VM granular storage operations using array-based data services
- Integrates with Storage Policy-Based Management for policy consumption
- Supports existing storage I/O protocols (FC, iSCSI, NFS)
- Ecosystem-wide initiative
Virtual Volumes Architecture

- Storage Policies
- VSA
- Control Path
- Vendor Provider (VASA)

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<th>Capacity</th>
<th>Access</th>
<th>Published Capabilities</th>
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VI Admin

VM

vSphere

Virtual Datastore

SAN / NAS
Virtual Volumes Architecture

- Storage Policies
  - Capacity
  - Access
  - Published Capabilities
    - Snapshot
    - Replication
    - Deduplication
    - QoS

- vSphere
- Control Path
- Vendor Provider (VASA)
- SAN / NAS
- Control Path

VI Admin
Storage Admin
Virtual Volumes Architecture

- **Storage Policies:**
  - Access
  - Capacity

**Published Capabilities:**
- Snapshot
- Replication
- Deduplication
- QoS

- **vSphere:**
  - Data Path
  - Control Path

- **Vendor Provider (VASA):**
  - Control Path

- **Virtual Datastore:**
  - SAN / NAS

- **VI Admin**
- **Storage Admin**
Virtual Volumes Will Soon Be Available

...and many more

29 VVOL Partners

Virtual Volumes in Beta

Partners Announcing GA
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VMware And NetApp Integrations For Software-Defined Storage

vSphere

Storage Policy Based Mgmt.

Virtual SAN

Virtual Volumes

Multi Hypervisor

Hypervisor-Converged Storage

Virtual SAN Shared Datastore

VASA

Clustered Data ONTAP®

SVM

SVM

SVM

Enterprise Data Services – Dedupe, backup, DR, cloning, non-disruptive movement, SAN/NAS
Enabling VM Granular Management

Storage management of virtual disks with SLOs

Quality of Service
- Control the performance of each VM

Snapshots
- Per VM backup schedule and retention policies

Disaster recovery
- Per VM replication and recovery

Delegated management
- Define who can manage which VMs

Automation and policy based control
- Manage 1000s of VMs automatically by policy groups
Software Defined Storage with VVOLs

Create VVOL Datastore, add volumes and configure Storage Capabilities

Container capacity and capabilities == Sum of volumes & storage features

Create Rules in VM Storage profiles

Provision VMs using VM Storage Profiles

Check VM Storage Profile == SLO Conformance

OK?

Remediate or Alert Admin of Non-Conformance
Extending to Software Based Data Services
vSphere API for IO Filtering

Storage Policy Based Management

Virtual SAN

Virtual Volumes

Virtual SAN Shared Datastore

SAN / NAS  SAN / NAS
Extending to Software Based Data Services

**vSphere API for IO Filtering**

- Integration API for Software-based Data Services within vSphere
- Performance of kernel-mode with the stability of user-mode
- Tight integration with vSphere and Storage Policy Based Management
- Granular provisioning and control on a per VM basis
## Agenda

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VMware Virtual SAN
Radically simple hypervisor-converged storage

- Software-defined storage embedded in vSphere
- Pools HDD/flash into a shared distributed datastore
- Runs on any standard x86 server
- Highly resilient - zero data loss in the event of hardware failures
- High performance through flash cache acceleration
- Elastically scalable
- Managed through Storage Policy-Based Management
- Deeply integrated with the VMware stack
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Virtual SAN Simplifies Storage
If You Know vSphere, You Know Virtual SAN
Virtual SAN Simplifies Storage
If You Know vSphere, You Know Virtual SAN

Two clicks to deploy!
Virtual SAN Simplifies Storage
If You Know vSphere, You Know Virtual SAN
Virtual SAN is Deeply Integrated with VMware Stack

Ideal for VMware Environments

**vSphere**
- vMotion
- vSphere HA
- DRS
- Storage vMotion

**Data Protection**
- Snapshots
- Linked Clones
- VDP Advanced
- vSphere Replication

**Virtual Desktop**
- VMware View

**Cloud Ops and Automation**
- vCenter Operations Manager
- vCloud Automation Center

**Disaster Recovery**
- Site Recovery Manager
- Site A
- Site B

**Storage Policy-Based Management**
Customers are Deploying VSAN in Several Use Cases

**Virtual Desktop (VDI)**
- Handle peak performance requirements (boot, login, read/write storms)
- Granularly scale from POC to production without huge upfront investments
- Supports high VDI density

**Tier 2 Production**
- Simple to deploy and manage for any vSphere admin through integration with VMware stack
- High performance and consolidation ratios
- VM level SLA management via policy
- Ideal for workloads that require replication RPOs > 15 min and 2/3 daily snapshots

**Disaster Recovery Target**
- Integrated with vSphere Replication and VMware SRM
- Reduces cost of storage
- Minimizes data center footprint

**Staging & Test/Dev**
- Rapid storage provisioning and complete automation
- Reduces cost of storage for non-mission critical workloads
- Enables Cloud Architect to easily provision storage

Customers are Deploying VSAN in Several Use Cases
- Site A Site B
- Staging & Test/Dev
- Customers are Deploying VSAN in Several Use Cases
  - Site A
  - Site B
VMware Virtual SAN File Services with Maginatics

Solution Overview & Features
• Built-in Fault Tolerance
• Massive Scale-Out in the Cloud
• Interoperability with VMware Stack
• Seamless, Secure, Mobile Access to Data

Use Cases & Benefits
• File services for Virtual SAN
• Lower TCO: Elastic and Scalable
• Unified Global Namespace
• Data Resiliency: DR, Backups, Snapshots, HA
• WAN Optimized w/ Multi-tier Caching
• Software-defined Virtual Appliance
NexentaConnect VMware Virtual SAN

Features

• Easily provision file services (NFSv3, NFSv4, SMB)
• Managed through vCenter Web Client
• Capacity saving using inline compression and de-duplication
• AD / LDAP / Kerberos Authentication

Benefits & Use Cases

• Scalable and Highly Available
• Seamless Integration with vSphere
• Fulfills the software based Hyper-Converged Model
• Integrated VDI Pods
How To Deploy A Virtual SAN Cluster

Software + Hardware

Component Based

Choose individual components …

Any Server on vSphere Hardware Compatibility List

SSD or PCIe

SAS/NL-SAS/ SATA HDDs

HBA/RAID Controller

…using the VMware Virtual SAN Compatibility Guide (VCG) (1)

Virtual SAN Ready Node

40 OEM validated server configurations ready for Virtual SAN deployment (2)

VMware EVO:RAIL

Hyper-Converged Infrastructure

A Hyper-Converged Infrastructure Appliance (HCIA) for the SDDC

Each EVO:RAIL HCIA is pre-built on a qualified and optimized 2U/4 Node server platform.

Sold via a single SKU by qualified EVO:RAIL partners (3)

Maximum Flexibility

Maximum Ease of Use

Note: 1) Components must be chosen from Virtual SAN HCL, using any other components is unsupported – see Virtual SAN VMware Compatibility Guide Page

2) VMware continues to update/add list of the available Ready Nodes, please refer to Virtual SAN VMware Compatibility Guide Page for latest list

3) EVO:RAIL availability in 2H 2014. Exact dates will vary depending on the specific EVO:RAIL partner
Virtual SAN: Unprecedented Customer Interest

“Best of Interop and Audience Choice Award”

“Best of TechEd Virtualization Winner”

300+ Customers in the first three months

“Virtual SAN takes VMware a big step closer to the software-defined datacenter...”
—Charles Babcock

“It’s really a no-brainer when the hypervisor you want to use also includes this virtualized storage.”
—Ryan Hoenle

IT Director of The Doe Fund
VMware Software-Defined Storage
Bringing the Efficient Operational Model of Virtualization to Storage

- Policy-driven Control Plane
- Virtual Data Plane
  - Virtual Data Services
    - Data Protection
    - Mobility
    - Performance
  - Virtual Datastores
    - x86 Servers
    - SAN / NAS
    - Cloud Object Storage

x86 Servers
SAN / NAS
Cloud Object Storage
Learn More about VMware Software-defined Storage

• Breakout sessions:
  – STO1963 - Virtual Volumes Business Overview
  – STO1965 - Virtual Volumes Technical Deep Dive
  – STO1809 - Virtual SAN 101 & Building a Business Case
  – STO1211 - Virtual SAN Ready Node and Hardware Guidance for Hypervisor Converged Infrastructure
  – STO2462 - Virtual SAN – Customer Panel
  – STO1279 - Virtual SAN Architecture Deep Dive
  – STO3098 - Virtual SAN Best Practices for Monitoring and Troubleshooting
  – STO2521 - Virtual SAN Best Practices and Use Cases

• Hands-On-Labs at Moscone South
  – VSAN online HOL  vmware.com/go/vsanlab

• Try VSAN – Get a 60-day evaluation –
  vmware.com/go/try-vsan-en

• Visit Virtual Volumes page –
  vmware.com/products/virtual-volumes

• Visit VMware Virtual SAN Booth

• Virtual Volumes Demos at partner booths
  – Dell, HP, EMC, NetApp, IBM, HDS, Nimble, Tintri, SolidFire

• Virtual SAN Demo at partner booths
  – Dell, IBM, SuperMicro & Intel
Thank You
Fill out a survey

Every completed survey is entered into a drawing for a $25 VMware company store gift certificate
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