The next step in Software-Defined Storage with Virtual SAN

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VMware vForum, 2014
Agenda

• Virtual SAN’s Place in the SDDC
• Overview
• Features and Benefits
• Use Cases
• Summary
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
Storage Market in Midst of Disruption

Key Drivers

- Falling storage prices
- Abundant CPU cycles
- Hypervisor-converged infrastructure
- Server flash
- Cloud economics

Server Storage
20-30 years ago

Shared Storage
10-15 years ago

New Forms
Today

Server Storage

Shared Storage

New Forms
New Storage Tiers Are Rapidly Growing

• Flash: Enables New Storage Architectures
  - Flash is 50x – 2,000x faster than HDD
    - 110K/140K IOPs R/W from 360GB MLC PCIe card\(^1\)
    - Less than $0.10 per IOP
  - Eliminates the need to stripe across 100s of HDDs
  - Enables high performance server-side storage

• Cloud: Enables Cost-Effective Storage
  - Highly scalable, pay-as-you-go
  - Access through standard APIs
  - Low cost for capacity
    - $0.05 per GB per month\(^2\)
  - Forecasted to grow at 40% annually to 2018\(^3\)

1. Source: FusionI/O ioDrive2, Feb 2014
2. Source: Amazon S3, Feb 2014
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>20M</td>
</tr>
<tr>
<td>2009</td>
<td>40M</td>
</tr>
<tr>
<td>2010</td>
<td>60M</td>
</tr>
<tr>
<td>2011</td>
<td>80M</td>
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<tr>
<td>2012</td>
<td>100M</td>
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<tr>
<td>2013</td>
<td>120M</td>
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<tr>
<td>2014</td>
<td>120M</td>
</tr>
<tr>
<td>2015</td>
<td>120M</td>
</tr>
<tr>
<td>2016</td>
<td>120M</td>
</tr>
</tbody>
</table>

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

Most Pressing Storage Challenges

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

Virtual SAN Overview
Virtual SAN: Radically Simple Hypervisor-Converged Storage

- Storage system that pools DAS HDD and flash-cache into a shared datastore with high resilience and performance
- Object based, policy driven, distributed storage platform
  - No “filesystem”
  - Single datastore per cluster
  - Rapidly grow by adding nodes
- Distributed across local storage on 3+ nodes
  - SSD cache (30% reserved for writes at all times)
  - Non-RAID Magnetic Disk (MD)
  - Max of 32 nodes
  - Integrated with vCenter, DRS, etc.
VSAN Scale-Out Storage – Radically Simple
Self-tuning Dynamic Storage For Virtual Machines

Instantly provision VM storage using simple policies.

Each VM maintains its unique policy in the clustered VSAN datastore.

Storage capacity and performance scale dynamically with your cluster.
Two Ways to Build a Virtual SAN Node

- Completely Hardware Independent

1. Virtual SAN Ready Node
   Preconfigured server ready to use Virtual SAN...
   - with multiple options available at GA + 30

2. Build Your Own
   Choose individual components ...
   - Any Server on vSphere Hardware Compatibility List
   - SSD or PCIe
   - SAS/NL-SAS/ SATA HDDs
   - HBA/RAID Controller
   - using the Virtual SAN Compatibility Guide*

* Note: For additional details, please refer to Virtual SAN VMware Compatibility Guide Page
* Components for Virtual SAN must be chosen from Virtual SAN HCL, using any other components is unsupported
Virtual SAN Benefits
Virtual SAN Is Highly Resilient Against Any Hardware Failure

Virtual SAN is Designed to Ensure Data is Never Lost in Case of Failures

- **Simple** to set up via policy
- Delivered on **per VM** basis
- **Zero data loss** in case of disk, network or host failures
- Ensures **zero downtime** from disk or network failures
- Interoperable with vSphere HA and Maintenance Mode
Virtual SAN Simplifies Storage

If You Know vSphere, You Know Virtual SAN
Virtual SAN Simplifies And Automates Storage Management

Per VM Storage Service Levels From a Single Self-tuning Datastore

Per VM Storage Policies

Policies Set Based on Application Needs

Software Automates Control of Service Levels

"Virtual SAN is easy to deploy, just a few check boxes. No need to configure RAID."

Jim Streit, IT Architect, Thomson Reuters

No more LUNs/Volumes!
Granular Scaling Eliminates Overprovisioning

Delivers Predictable Scaling and ability to Control Costs

- Compared to external storage at scale
- Estimated based on 2013 street pricing, Capex (includes storage hardware + Software License costs)
- Additional savings come from reduced Opex through automation
- Virtual SAN configuration: 9 VMs per core, with 40GB per VM, 2 copies for availability and 10% SSD for performance

![Graph showing $/VDI Storage Cost vs Number of Desktops]

- Spikes correspond to scaling out due to IOPs requirements
- VSAN enables predictable linear scaling
Virtual SAN Reduces CAPEX and OPEX for Better TCO

**CAPEX**
- Server-side economics
- No Fibre Channel network
- Pay-as-you-grow

**OPEX**
- Simplified storage configuration
- No LUNs
- Managed directly through vSphere Web Client
- Automated VM provisioning
- Simplified capacity planning

- As Low as $0.25/IOPS
- As Low as $50/Desktop\(^1\)
- As Low as $0.50/GB\(^2\)
- 5X Lower OPEX\(^4\)
- Up to 50% TCO Reduction

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1. Full clones
2. Usable capacity
3. Estimated based on 2013 street pricing, Capex (includes storage hardware + Software License costs)
4. Source: Taneja Group
Uniquely Positioned In The Storage Landscape

- **Low Cost ($/GB)**
  - VSAN

- **High Performance (IOPS)**
  - All Flash
  - High End SAN/NAS
  - Mid-Range SAN/NAS

- **Low Performance (IOPS)**
  - Low-End SAN/NAS
  - Scale-out File

- **High Cost ($/GB)**
  - Low-End SAN/NAS
  - Scale-out File
Putting The Application In Charge

• Simpler and Automated Storage Management Through Application-centric Approach

<table>
<thead>
<tr>
<th>Today</th>
<th>Virtual SAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pre-define storage configurations</td>
<td>1. Define storage policy</td>
</tr>
<tr>
<td>2. Pre-allocate static bins</td>
<td>2. Apply policy at VM creation</td>
</tr>
<tr>
<td>3. Expose pre-allocated bins</td>
<td>Resource and data service are automatically provisioned and maintained.</td>
</tr>
<tr>
<td>4. Select appropriate bin</td>
<td></td>
</tr>
<tr>
<td>5. Consume from pre-allocated bin</td>
<td></td>
</tr>
</tbody>
</table>

- Overprovisioning (Better safe than sorry!)
- Wasted resources, wasted time
- Frequent data migrations

- No overprovisioning
- Less resources, less time
- Easy to change
### Flexibly Configure For Performance And Capacity

<table>
<thead>
<tr>
<th>Performance</th>
<th>Capacity</th>
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<tbody>
<tr>
<td>2xCPU – 8-core 128GB Memory</td>
<td>2xCPU – 8-core 128GB Memory</td>
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<tr>
<td>2xCPU – 8-core 128GB Memory</td>
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<table>
<thead>
<tr>
<th>SSD</th>
<th></th>
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<tbody>
<tr>
<td>1x 400GB MLC SSD (~15% of usable capacity)</td>
<td>1x 400GB MLC SSD (~10% of usable capacity)</td>
</tr>
<tr>
<td>2x 400GB MLC SSD (~4% of usable capacity)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Storage</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5x 1.2TB 10K SAS</td>
<td>7x 2TB 7.2K NL-SAS</td>
</tr>
<tr>
<td>10x 4TB 7.2K NL-SAS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IOPS¹</th>
<th>Raw Capacity</th>
<th>Raw Capacity</th>
<th>Raw Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>~20-15K</td>
<td>~15-10K</td>
<td>~10-5K</td>
<td></td>
</tr>
<tr>
<td>6TB</td>
<td>14TB</td>
<td>40TB</td>
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</table>

<table>
<thead>
<tr>
<th>Price/Unit</th>
<th>$0.32/IOPS</th>
<th>$0.57/IOPS</th>
<th>$1.38/IOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2.12/GB</td>
<td>$1.02/GB</td>
<td>$0.52/GB</td>
<td></td>
</tr>
</tbody>
</table>

1. Mix workload 70% Read, 80% Random

Estimated based on 2013 street pricing, Capex (includes storage hardware + Software License costs)
Use Cases
Running a Google-like Datacenter

Modular infrastructure. Break-Replace Operations

"From a break fix perspective, I think there's a huge difference in what needs to be done when a piece of hardware fails. I can have anyone on my team go back and replace a 1U or 2U servers. ... essentially modularizing my datacenter and delivering a true Software-Defined Storage architecture."

— Ryan Hoenle
Director of IT, DOE Fund
Performance Example

- Estimated based on 2013 street pricing, Capex (includes storage hardware + software license costs)
- Additional savings come from reduced Opex through automation
- Configuration assume 10TB dual socket hosts 2 data copies for availability and 10% SSD for performance

8 node Virtual SAN cluster provides 80-100k IOPS
Virtual SAN Use Cases

- Use Cases for Virtual SAN 5.5

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

**Tier 2 / Tier 3 / Staging**
- Rapid storage provisioning and complete automation
- Ideal price/performance
- Enables Cloud Architect to easily provision storage

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

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VMware

![Image](vmware.png)
VSAN Delivers The Same VDI Density As An All SSD Array At 25% Of The Cost

- View Planner performance testing maximum VDI density on a 3 host scale
- Estimated based on 2013 street pricing, CAPEX (includes storage hardware + Software License costs). Additional savings come from reduced Opex through automation.
- Virtual SAN configuration: 9 VMs per core, with 40GB per VM, 1 copy for availability and 10% SSD for performance

View Planner Benchmark
(3 hosts cluster, 36 cores)

Virtual SAN
Full Clones
All SSD Array
Linked Clones
All SSD Array
Full Clones

VSAN vs. All SSD
$/desktop

VSAN cost per desktop is 75% less than All SSD
Why Virtual SAN?

Radically Simple
- Two click Install
- Single pane of glass
- Policy-driven
- Self-tuning
- Integrated with VMware stack

High Performance
- Embedded in vSphere kernel
- Flash-accelerated
- Up to 2M IOPs from 32 nodes
- Granular and linear scaling

Lower TCO
- Server-side economics
- No large upfront investments
- Grow-as-you-go
- Easy to operate with powerful automation
- No specialized skillset
Broad Partner Ecosystem Support for Virtual SAN

<table>
<thead>
<tr>
<th>Server / Systems Solution</th>
<th>Storage</th>
<th>Data Protection Solution</th>
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<tbody>
<tr>
<td>Cisco</td>
<td>EMC²</td>
<td>Acronis</td>
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<tr>
<td>IBM</td>
<td>SAMSUNG</td>
<td>actifio</td>
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<td>Fusion-iO</td>
<td>Virident</td>
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<tr>
<td>Supermicro</td>
<td>Sandisk</td>
<td></td>
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</tbody>
</table>
Unprecedented Customer Interest And Validation

12,000+ Virtual SAN Beta Participants

95% Beta customers Recommend VSAN

90% Believe VSAN will impact Storage like vSphere did to Compute
Thank you

Product Page
http://www.vmware.com/products/virtual-san/

Hands-On-Lab
http://vmware.com/go/vsanlab

Virtual SAN 60-day Free Evaluation
http://www.vmware.com/go/try-vsan-en