VMware Virtual SAN

Hyper-Converged Infrastructure for All Data Centers

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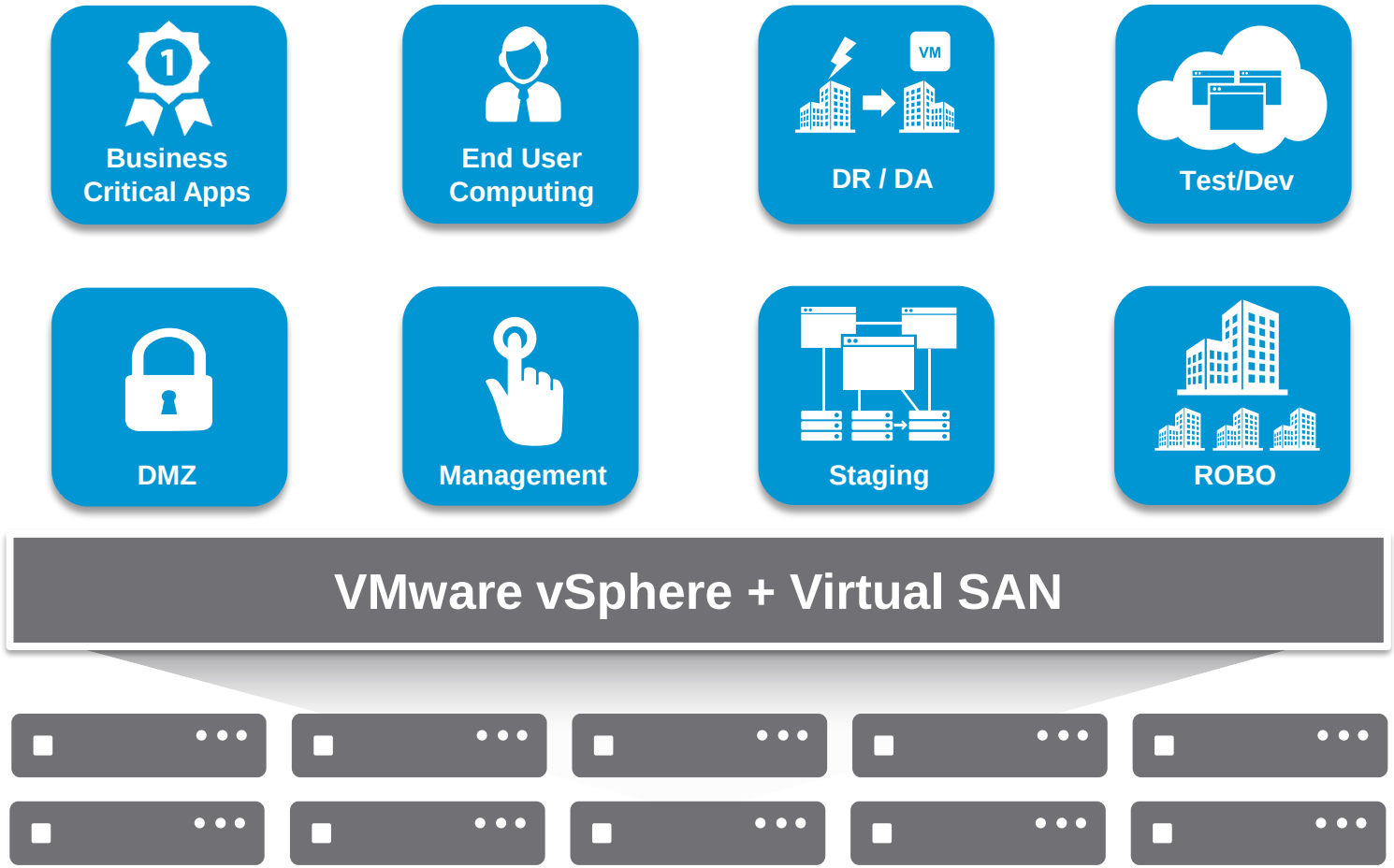
Virtual SAN, what is it?

- Software-Defined Storage
- Distributed, Scale-out Architecture
- Hyper-Converged Infrastructure
- Integrated with vSphere platform
- Ready for today's vSphere use cases

VMware Virtual SAN 6.1 For All vSphere Workloads



Best storage for VMs

Optimized for Virtual Infrastructure

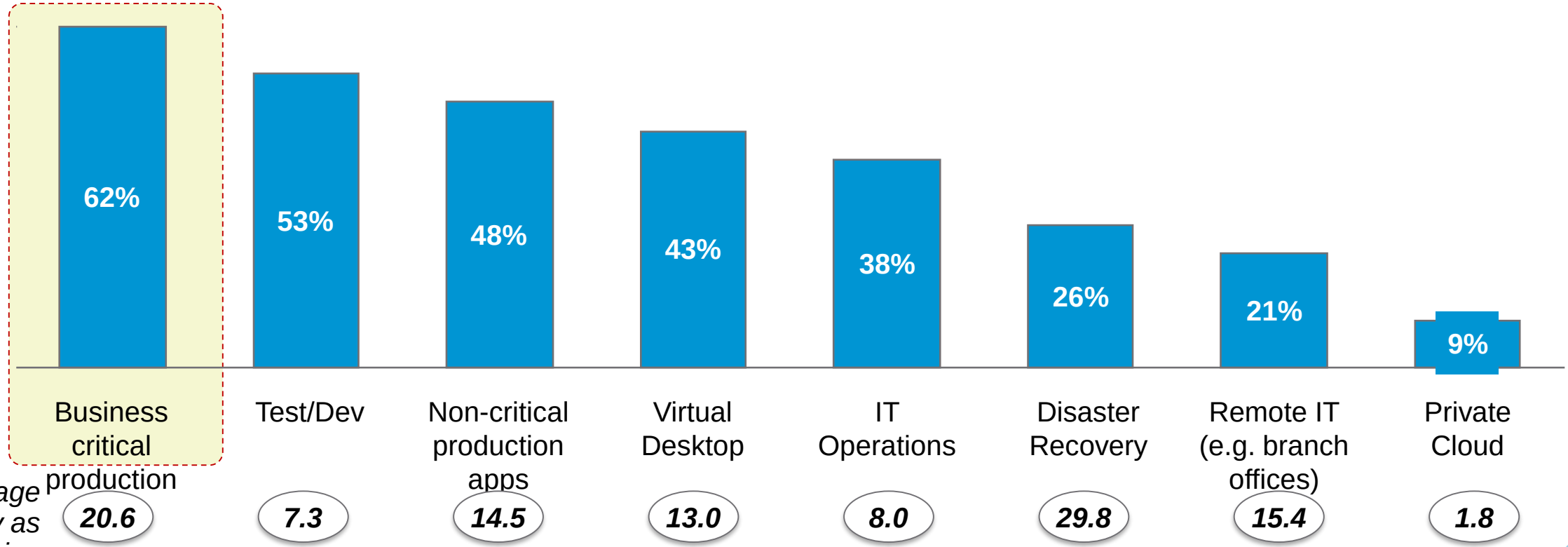
Enterprise-class

Ready for business critical apps

Most often cited Use Case is Business Critical Production Apps

We asked customers for their most common Virtual SAN use cases

- # of customers



Sources: Customer survey

Unprecedented Customer Momentum

3000+ Customers

> "In my experience VMware solutions are rock solid…we're ready to nearly double our VSAN deployment."

> "It really did work as advertised…the fact that I have been able to set it and forget it is huge!"

IBC BANK We Do More

Adobe

MIT MEDIA LAB

Medtronic

Oregon State University OSU

Indonesian Cloud

ASAHI INTERACTIVE

UNION HOSPITAL

PETER CREMER NORTH AMERICA, LP

Keck Medical Center of USC

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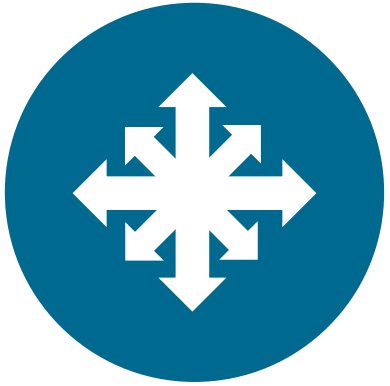
Virtual SAN Goals

SIMPLICITY

PERFORMANCE AND SCALABILITY

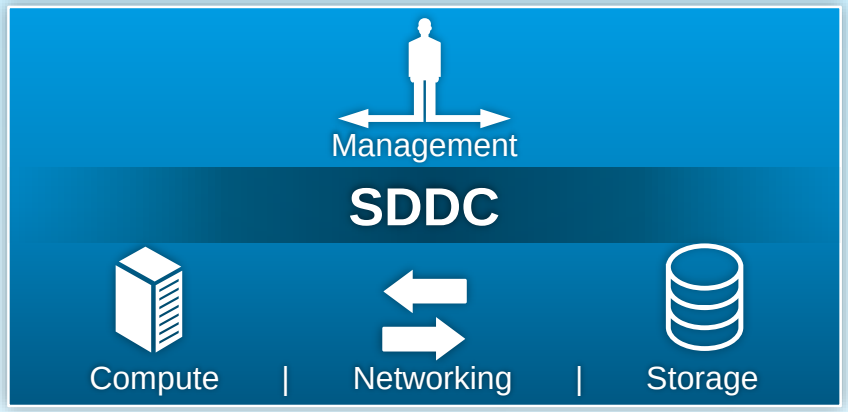
COST



CHOICE

VMware Enables SDDC on Any Infrastructure Architecture

Transforming Traditional Infrastructure with SDDC



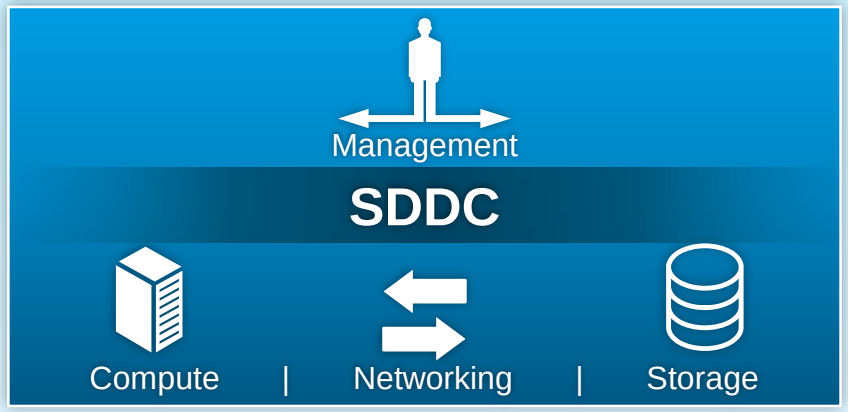
Open Systems

- Hardware components (compute, storage, networking) purchased, deployed and managed separately

Converged Infrastructure

- Hardware components (compute, networking, storage) integrated in a server chassis

Hyper-Converged Infrastructure Emerging Architecture for SDDC



- ✓ Simplicity
- ✓ Cost
- ✓ Scalability
- ✓ Performance

Hyper-Converged Infrastructure

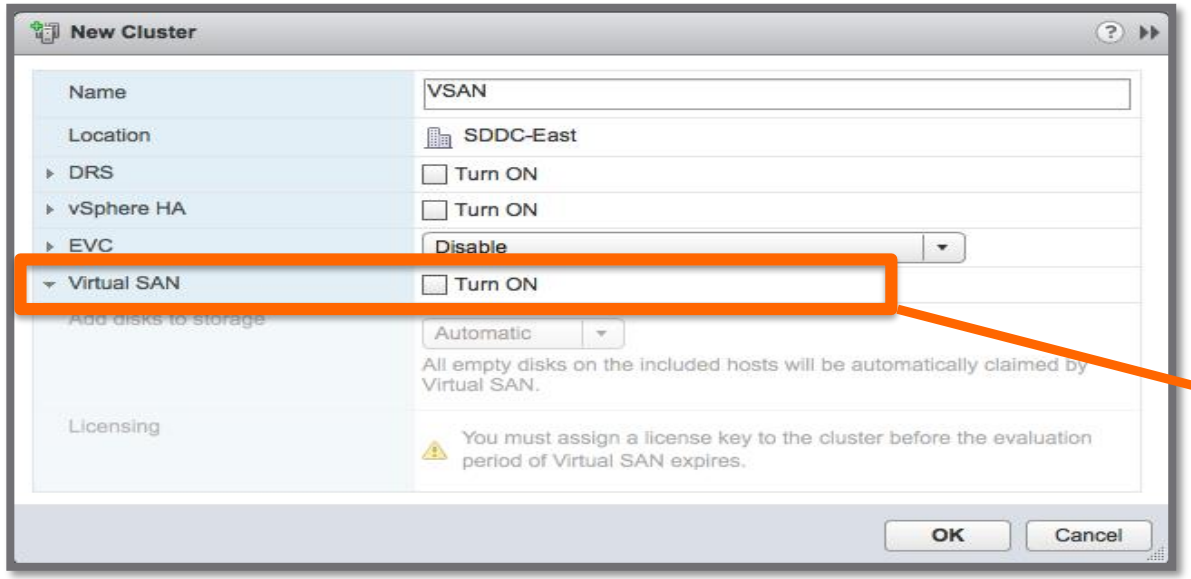
- Convergence of compute, networking and physical storage onto x86 servers enabled by software

Radically Simple Configuration

If You Know vSphere, You Know Virtual SAN

Virtual SAN is a cluster level feature similar to:

- vSphere DRS
- vSphere HA
- Virtual SAN



Two clicks to deploy!

Deployed, configured and manage from vCenter Server: UI + API

- Prepare Physical Network (IP Multicast) ✓
- Configure VMkernel interface for Virtual SAN ✓
- Enable Virtual SAN by clicking Turn On ✓

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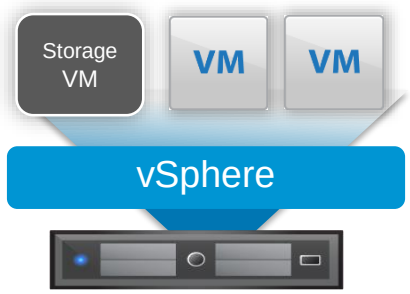
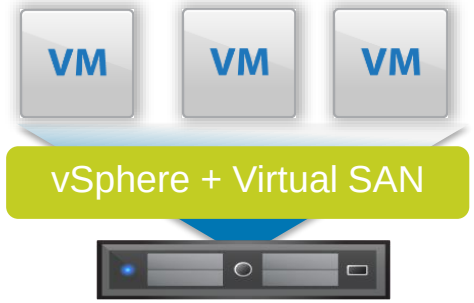
Virtual SAN Hyper-converged Architecture

Typical Hyper-Converged Solution



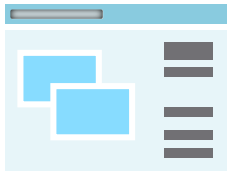
Efficiency of a Single Software Stack

VMware Virtual SAN



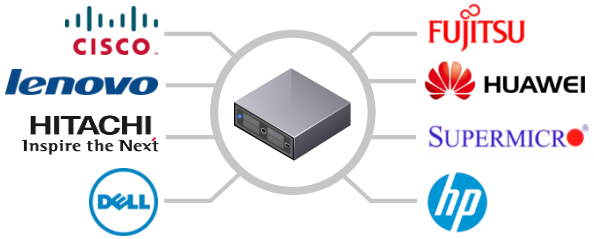
- ✓ 2x CPU efficiency
- ✓ 3x memory efficiency

Simplicity of Native Integration



- ✓ Native vMotion
- ✓ Native DRS
- ✓ Native HA
- ✓ Single pane glass

Flexibility of Hardware Agnostic



- ✓ Latest hardware
- ✓ Form factors
- ✓ Flexible Config

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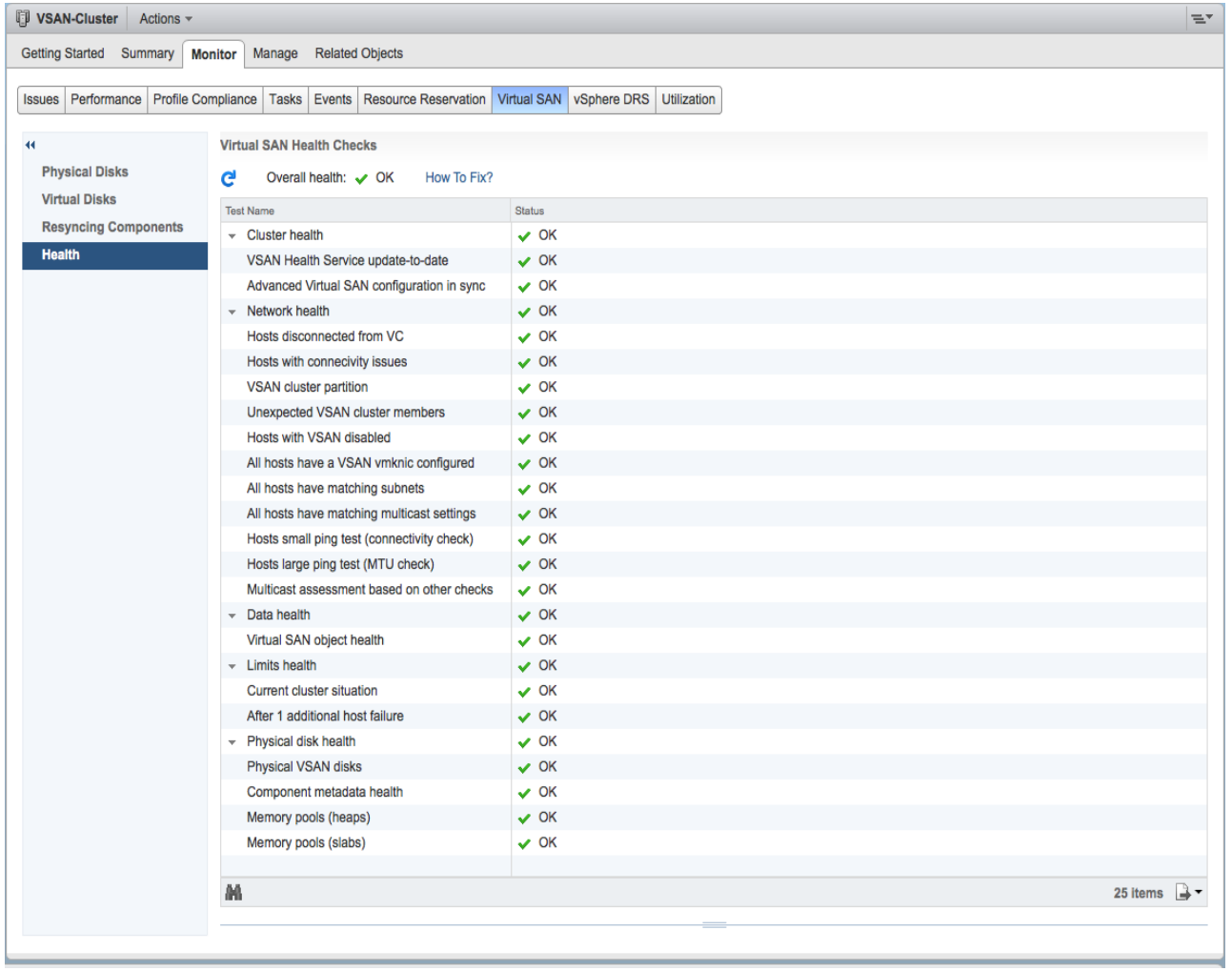
Virtual SAN Health

Virtual SAN Health Services: is designed deliver troubleshooting and health reports to vSphere Administrators about Virtual SAN 6.0 subsystems and their dependencies such as:

- Cluster Health
- Network Health
- Data Health
- Limits Health
- Physical Disk Health



Virtual SAN Host Topology

Badge: | Status: | Sort:

Host System (5 of 5)

Virtual Machine (14 of 14)

Datastore (8 of 8)

Disk Group (4 of 4)

Solid State Device (5 of 5)

VsanDisk (26 of 26)

EsxPnic (26 of 26)

Top Alerts on Virtual SAN Cluster

Hard Drive is down
3 objects impacted | 2 Recommendation(s)
Check the hard drive and replace if necessary

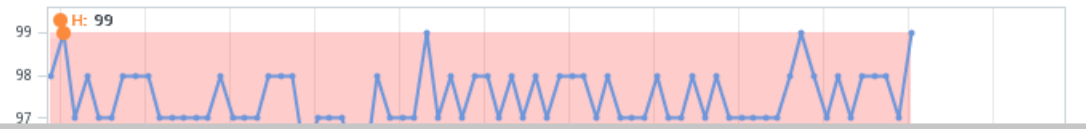
Interesting Metrics

w2-eestoragedev-004.eng.vmware.com

99	Badge|Workload
10.3	Badge|Stress
0	Badge|Capacity Remaining
0	Badge|Time Remaining with committed projects
0	Badge|Time Remaining
16.3	Badge|Density
No Data	vSphere Configuration Lim ... be based on peak usage)
2,092	System:host/vim/vmviso ... urceMemConsumed_latest

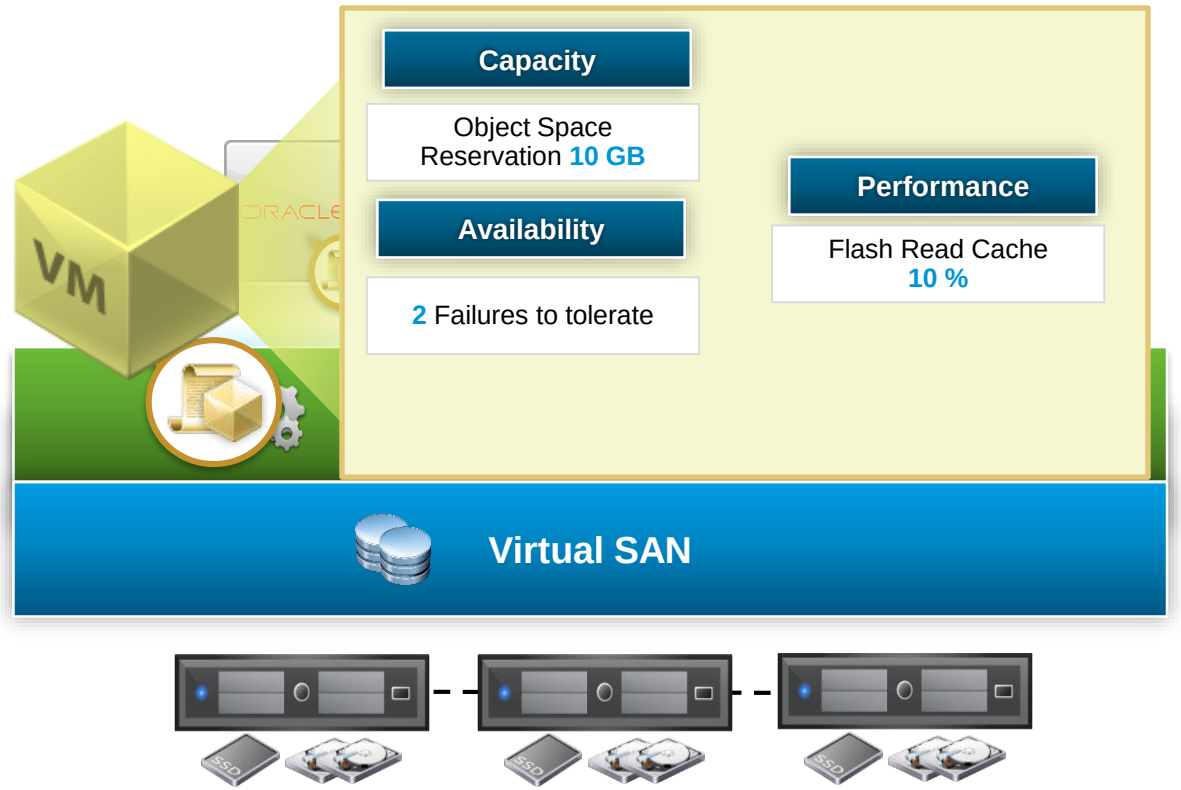
Metric Chart

w2-eestoragedev-004.eng.vmware.com: Badge|Workload (%)



Storage Policy-Based Management:

App-centric Control Plane Across Storage Tiers



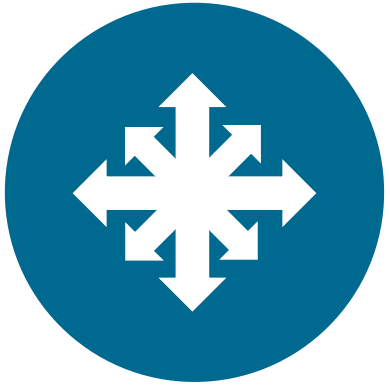
- Intelligent storage placement at scale
- Dynamic adjustments in real time
- Automated policy enforcement
- Mitigates storage infrastructure operational risks

Virtual SAN Goals

SIMPLICITY

PERFORMANCE AND SCALABILITY

COST



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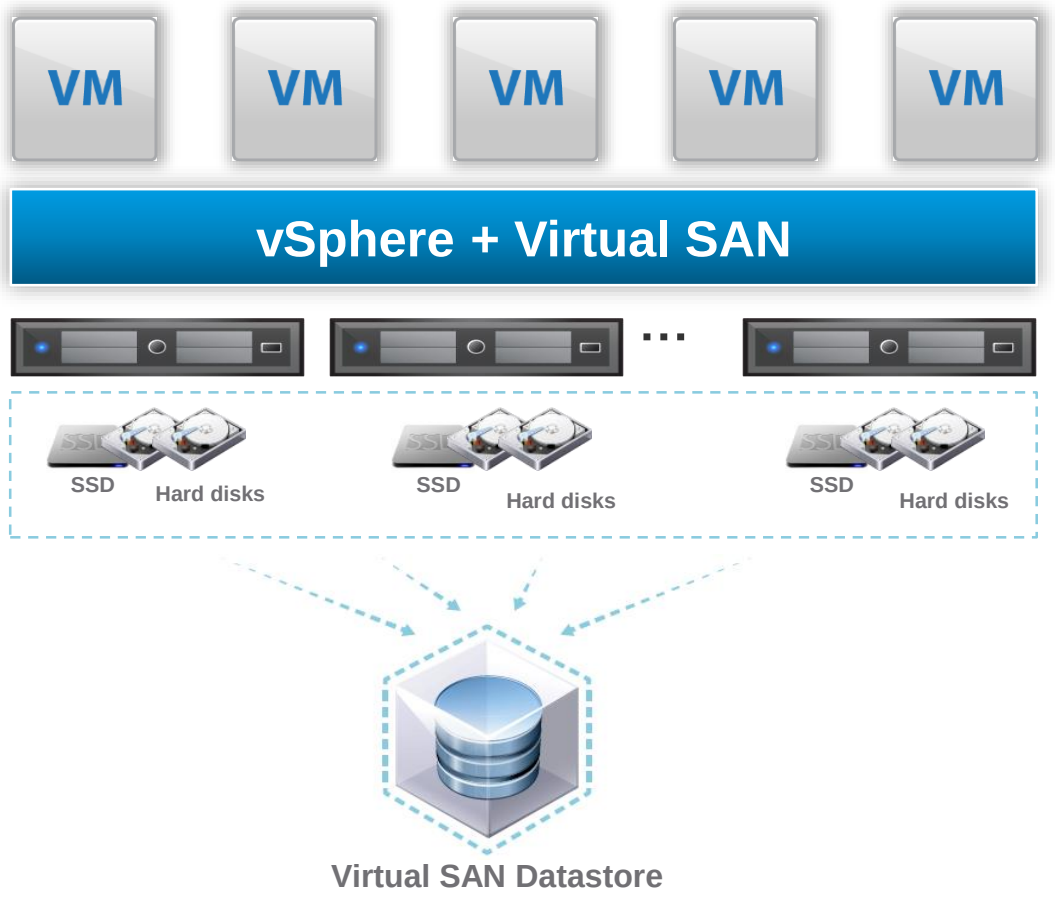
VMware Virtual SAN

Radically Simple Hypervisor-Converged Storage for VMs



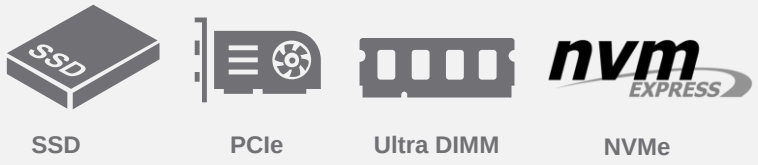
Overview

- Software-defined storage optimized for VMs
- Hypervisor-converged architecture
- Runs on any standard x86 server
- Pools HDD/SSD into a shared datastore
- Delivers enterprise-level scalability and performance
- Managed through per-VM storage policies
- Deeply integrated with the VMware stack

Tiered Hybrid and All-Flash Architectures

Virtual SAN

Hybrid



Read and Write Cache

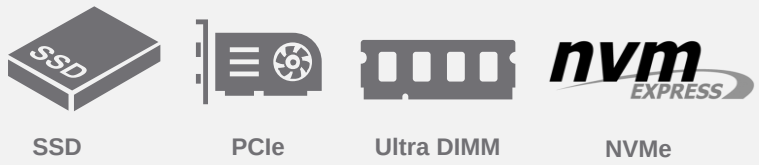
Capacity Tier
SAS / NL-SAS / SATA

40K IOPS per Host

Caching

Data Persistence

All-Flash

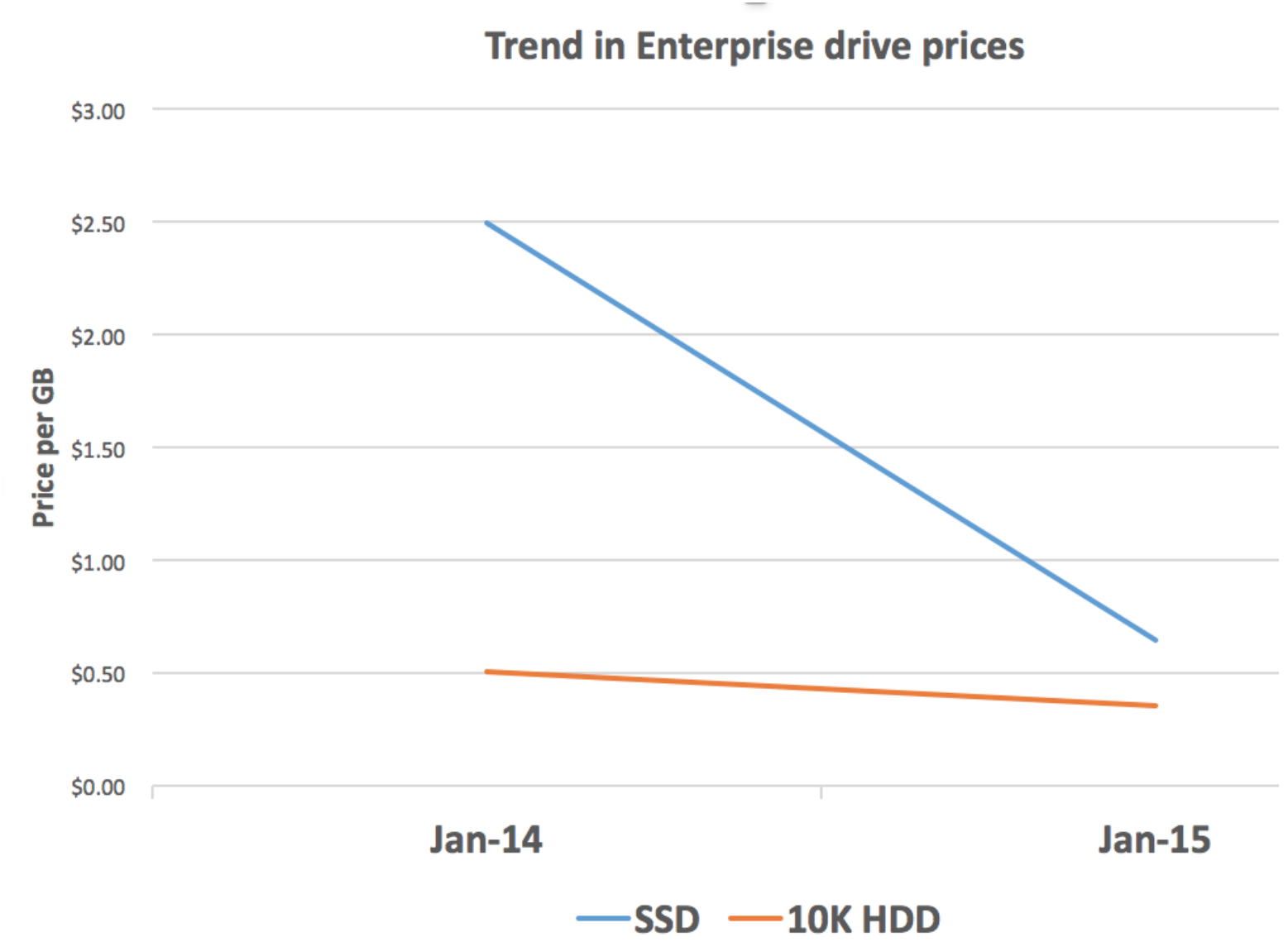


Writes cached first,
Reads from capacity tier

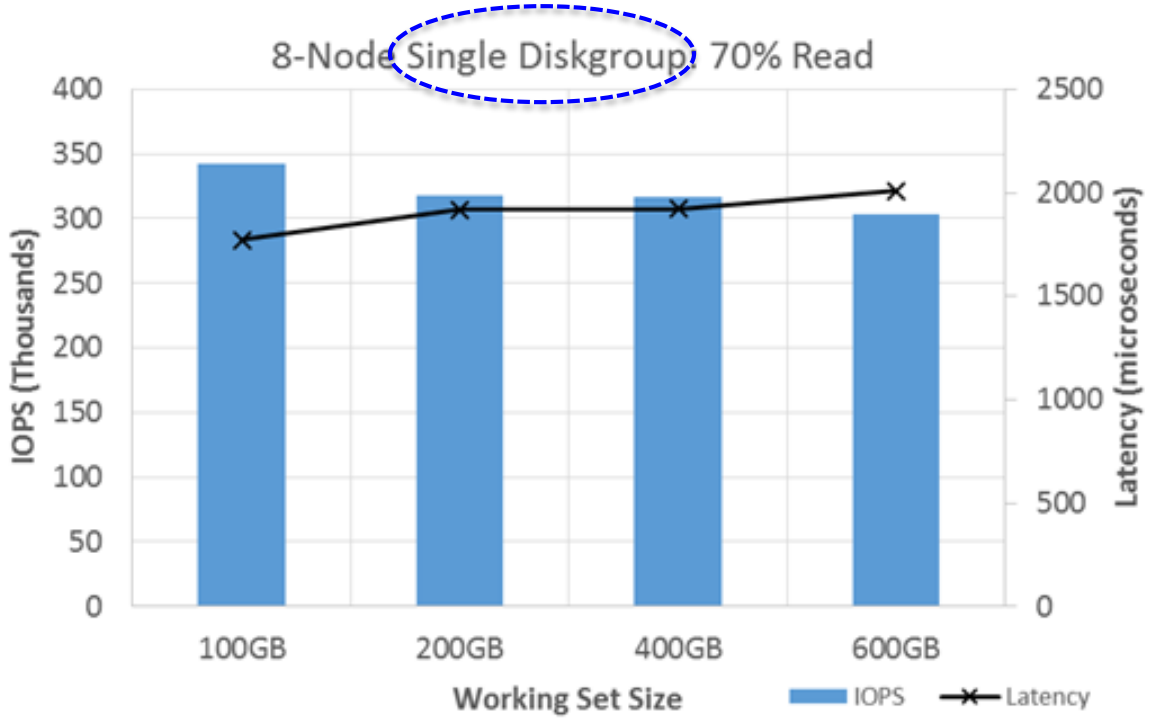
Capacity Tier
Flash Devices
Reads go directly to capacity tier

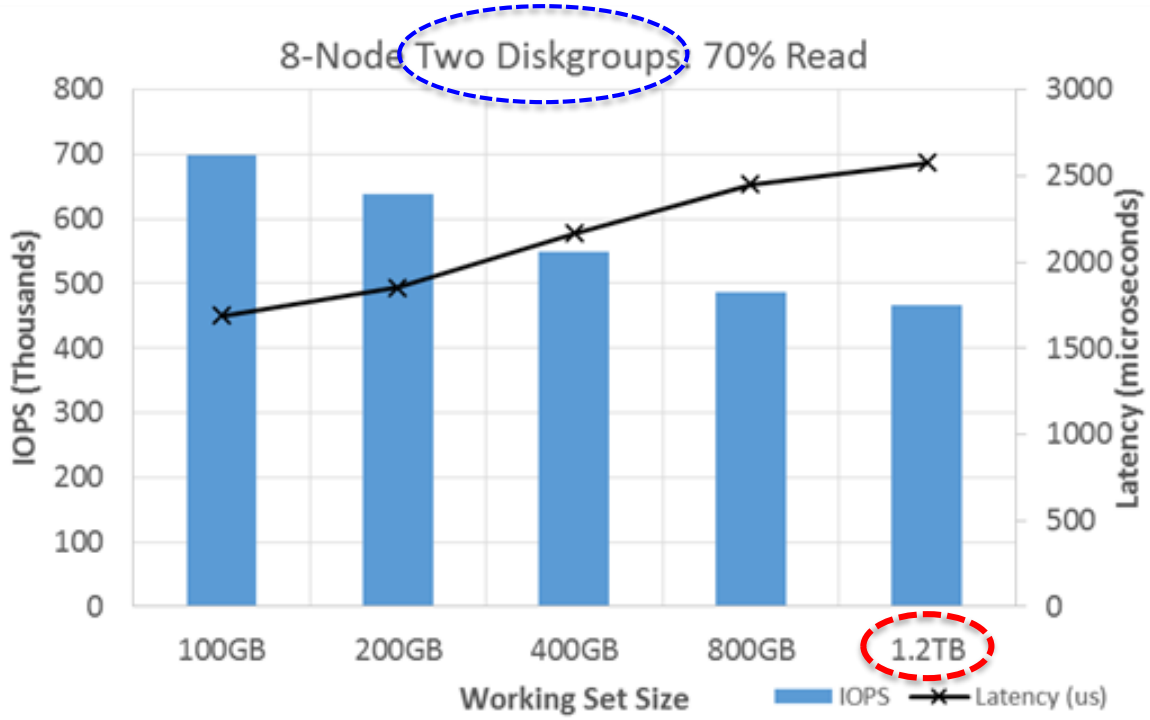
90K IOPS per Host
+
sub-millisecond latency

Trend in Enterprise Drive Prices



VSAN 6.0 Performance: 8 hosts All-flash





1 VM per host, 8 IOMeter workers per VM, 100% Random, 70% Read
1/2x 400 GB P3700, 3/6 800 GB S3500 per host

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World's 1st 64-Node, All-Flash Array with Virtual SAN and NVMe

Intel & VMware team to deliver

64
Nodes

6,400
VMs

4.2M
IOPS

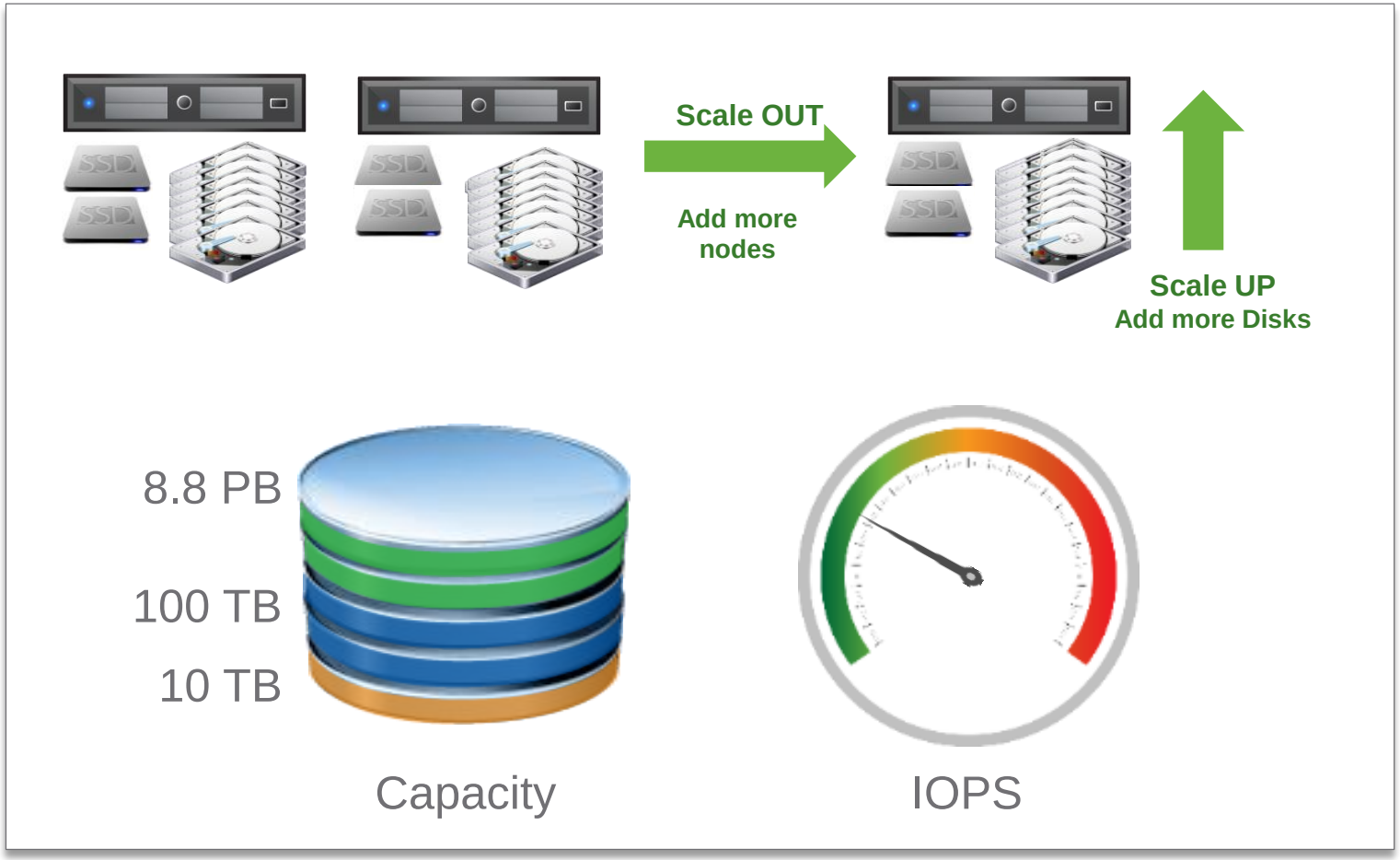
500
Terabytes

Servers:
Intel

Storage:
Virtual SAN

Virtual SAN Enables Elastic Scaling of Performance and Capacity

No More Complex Forecasting & Large Upfront Investments



- ✓ **Elastic**
  Grow or shrink on demand
- ✓ **Granular**
  Add single nodes or disks
- ✓ **Non-disruptive**
  No app downtime

IBC BANK
We Do More

"Virtual SAN lets us buy what we need when we need it. With non-disruptive scaling we can add capacity or increase performance at any time without interrupting our operations."

— Chris Reynolds
Senior Systems Engineer

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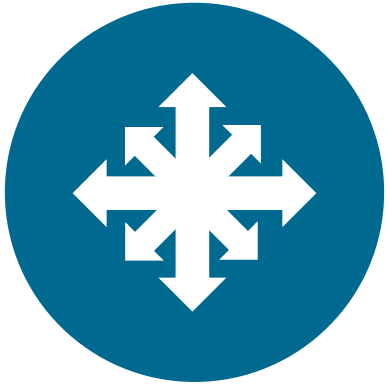
Up to 5 Caching Devices and 35 Storage Devices per Host

Virtual SAN Goals

SIMPLICITY

PERFORMANCE AND SCALABILITY

COST



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Server-side Economics

Server components (Hardware) competitively priced vs. Traditional External Arrays (Hardware + Software)

Magnetic Disk (HDDs)

$0.49/GB*

Up to 80%

$0.10/GB

Flash (SSDs)

$22.48/GB*

Up to 91%

$1.85/GB

Networking

$1235/Port

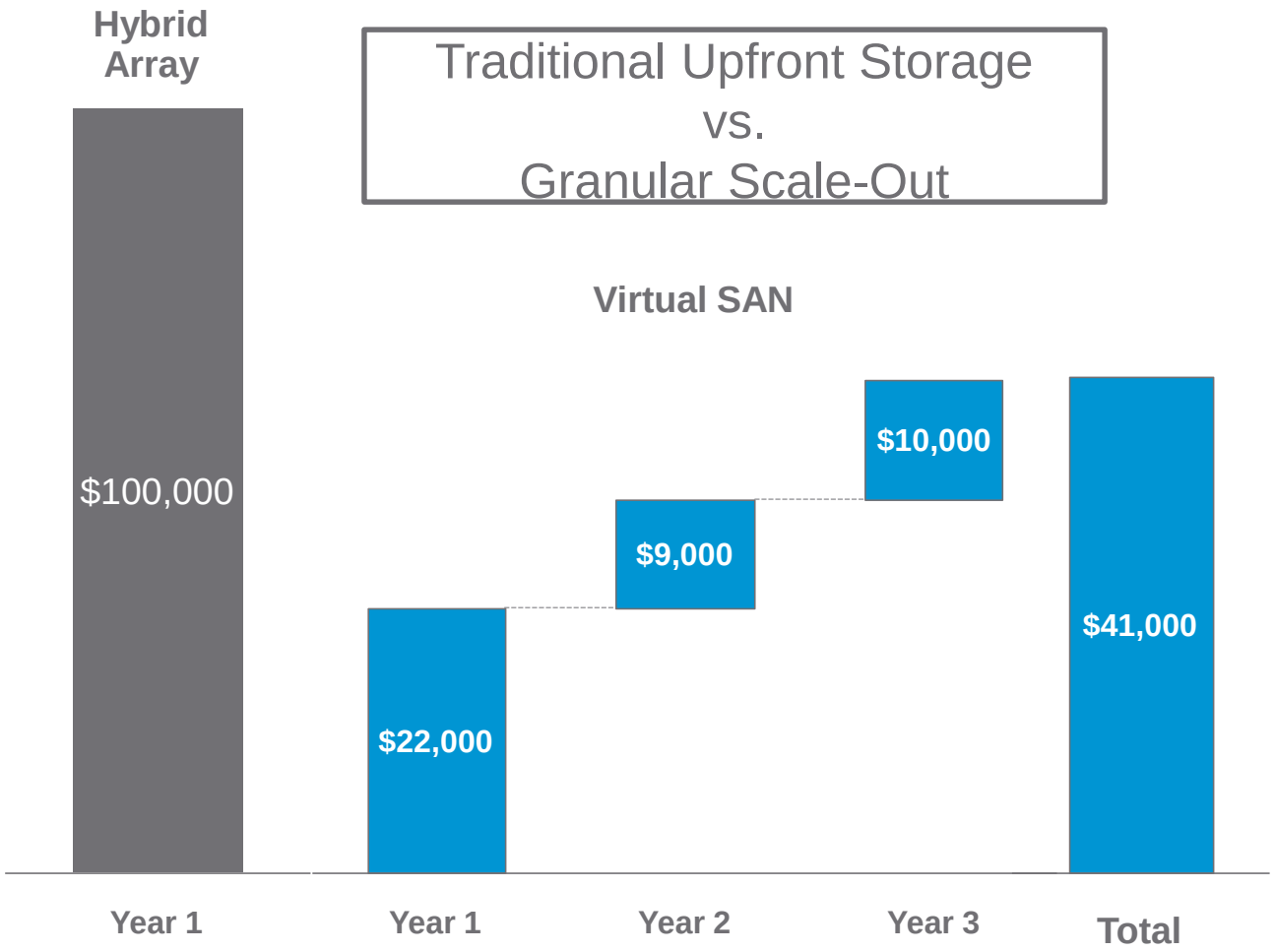
Up to 70%*

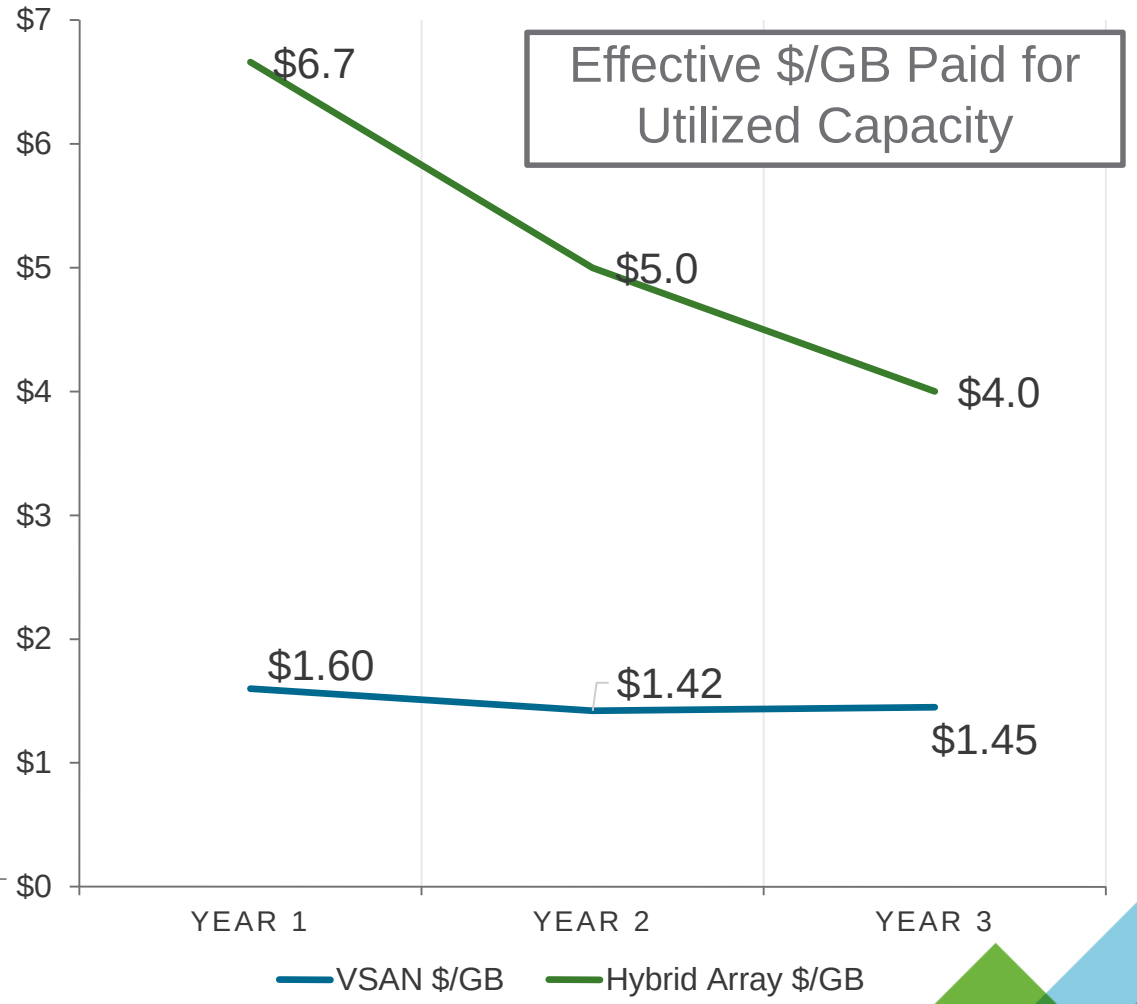
$364/Port

Source: Gartner Competitive Profiles & Vendors/Resellers public website prices

*10GbE vs. FC
*$/GB refers to disk prices raw GB only

Low Upfront Investment & Granular Scaling





Source: Gartner Competitive Profiles & Vendors/Resellers public website prices

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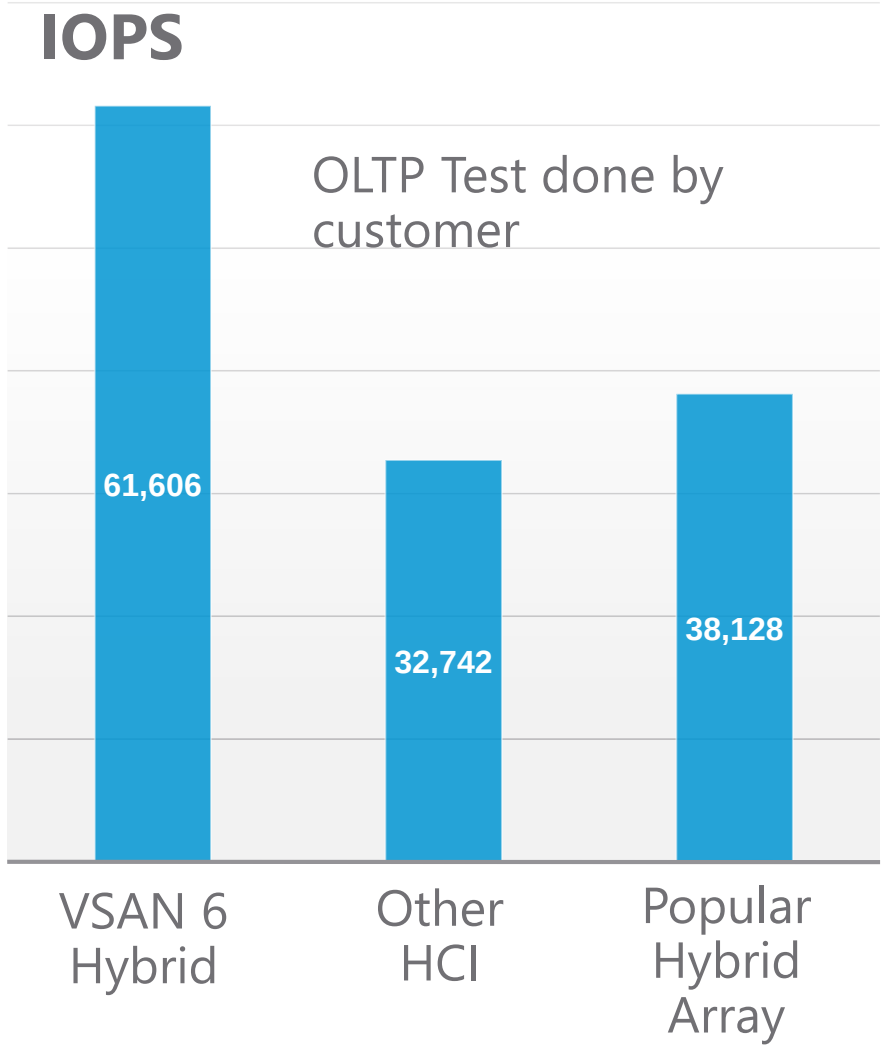
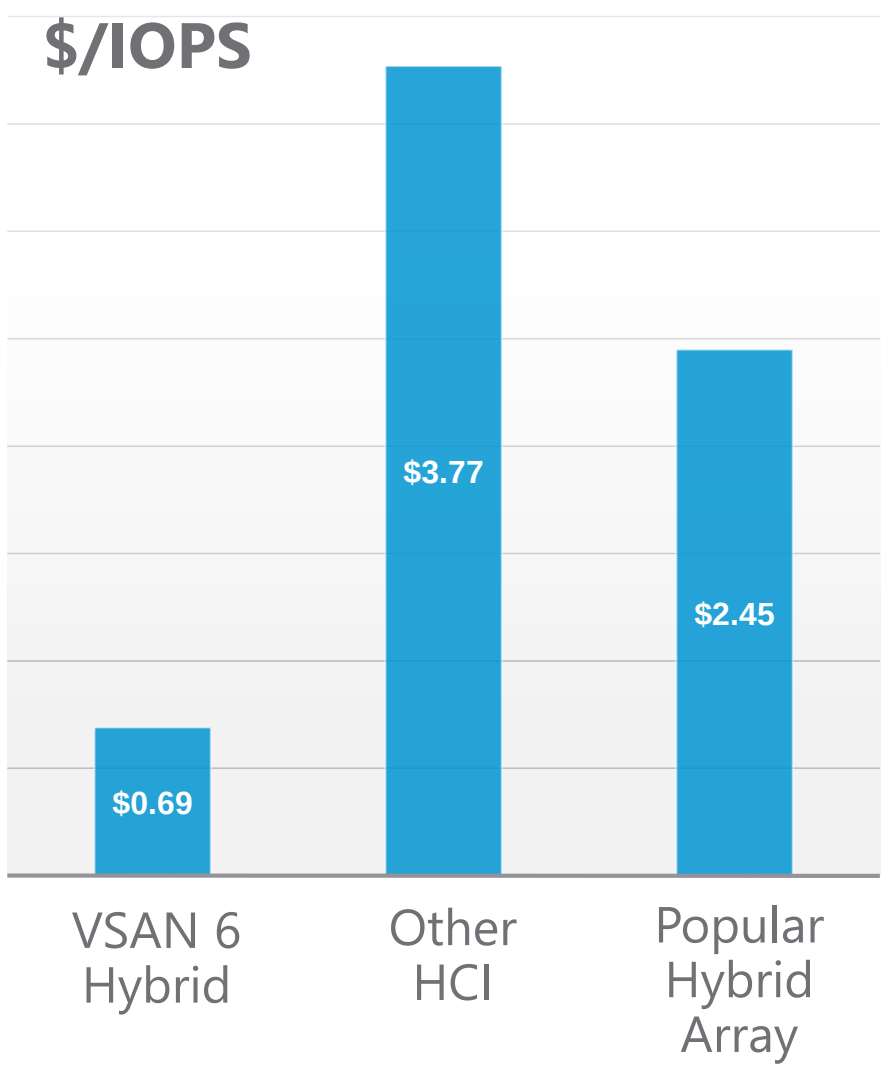
* VSAN prices include storage costs and software license in street pricing
* Hybrid array is all inclusive with current estimated street pricing

Performance Comparison - $/IOPS Critical Metric





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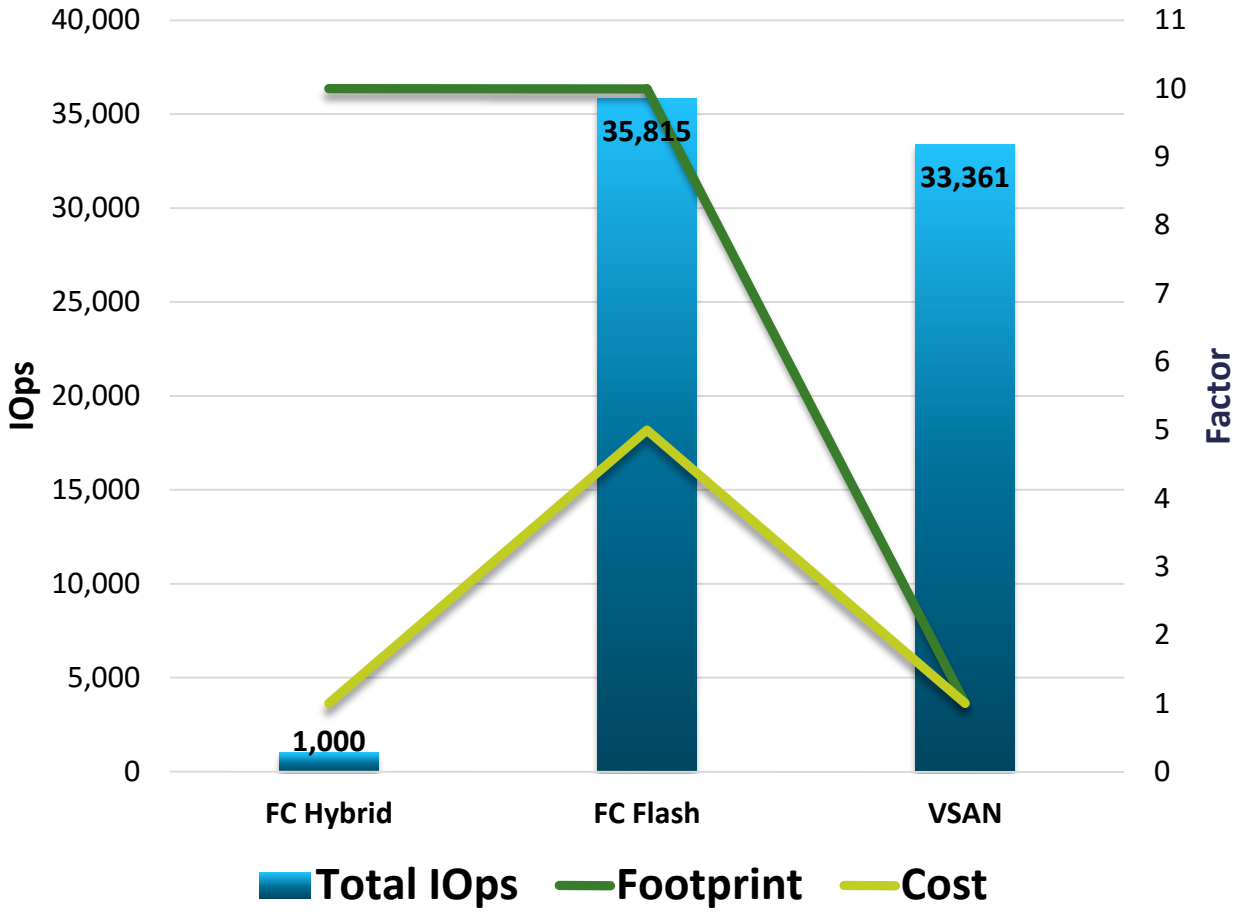
Customer Data Center – VSAN Analysis - IOps, Cost and Footprint



- VSAN is a 5x reduction in cost with a performance delta of less than 8% as compared to FC Flash
- FC Hybrid is roughly the same cost as VSAN but with over a 32x reduction in performance
- Both FC Arrays require 10x the footprint as compared to VSAN

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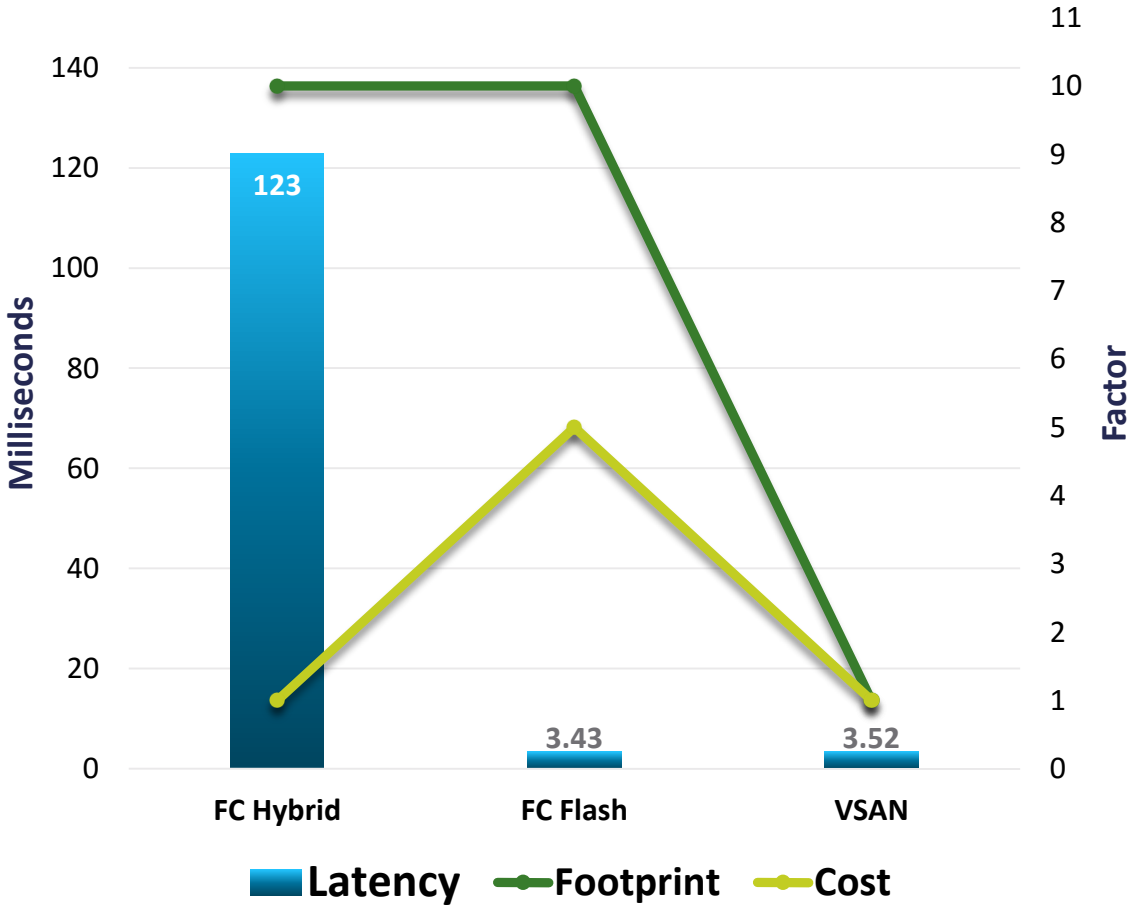
Analysis - Latency, Cost and Footprint



- FC Flash and VSAN response times only differ by less than 3% despite 5x difference in cost
- Again VSAN requires 1/10th the footprint of either FC Array

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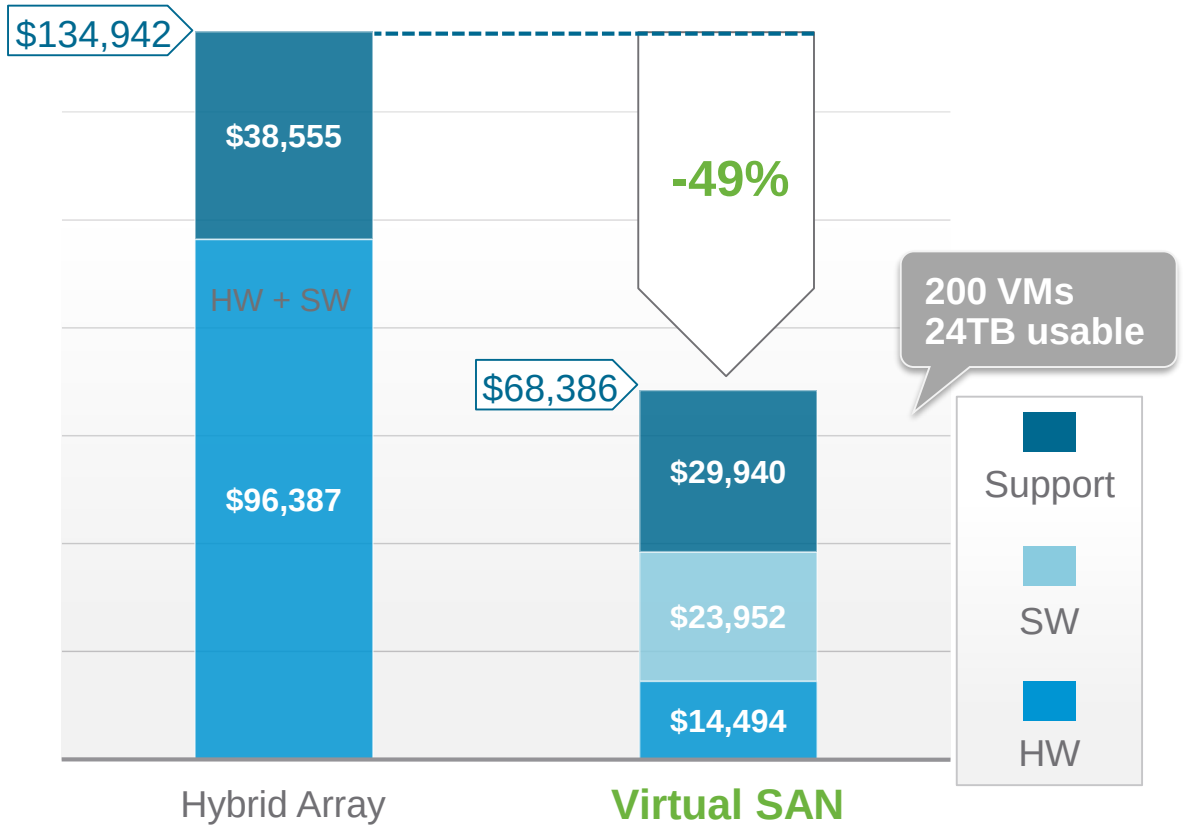
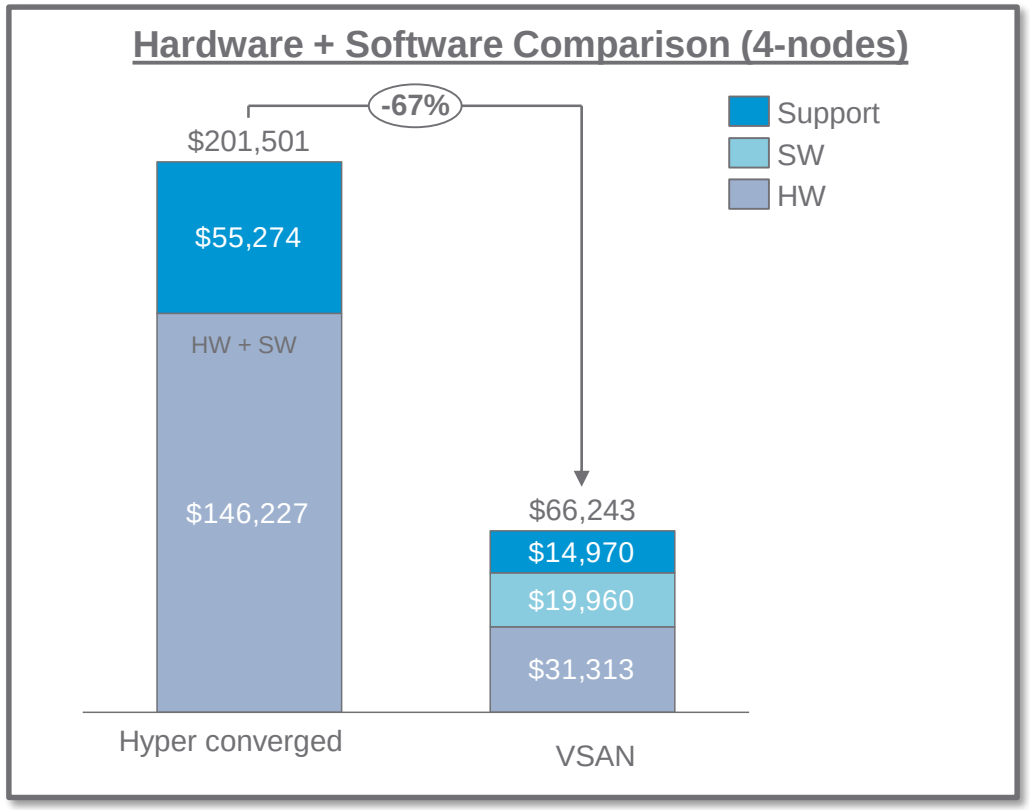
Virtual SAN - More Performance for 50% Less CapEx

Hybrid Array



- VSAN HW includes SSDs and HDDs only, since compute required on both sides
- Hybrid array support is estimated at 20% of list for 3-years 24x7
- Estimated required 54K IOPS for normal operation on array after RAID penalty – 70R/30W
- Estimated VSAN performance: 128,000 IOPS – based on HY-6 series ready nodes

Hyper-converged



- street assumed @50%
- Comparable VSAN hardware configuration created on SuperMicro reseller website: www.thinkmate.com – see notes for spec - no discount assumed on top of online provided price
- support includes Hardware + Software support, VSAN support is 3yr production SnS only while HW price includes HW support – 3yr NBD onsite service

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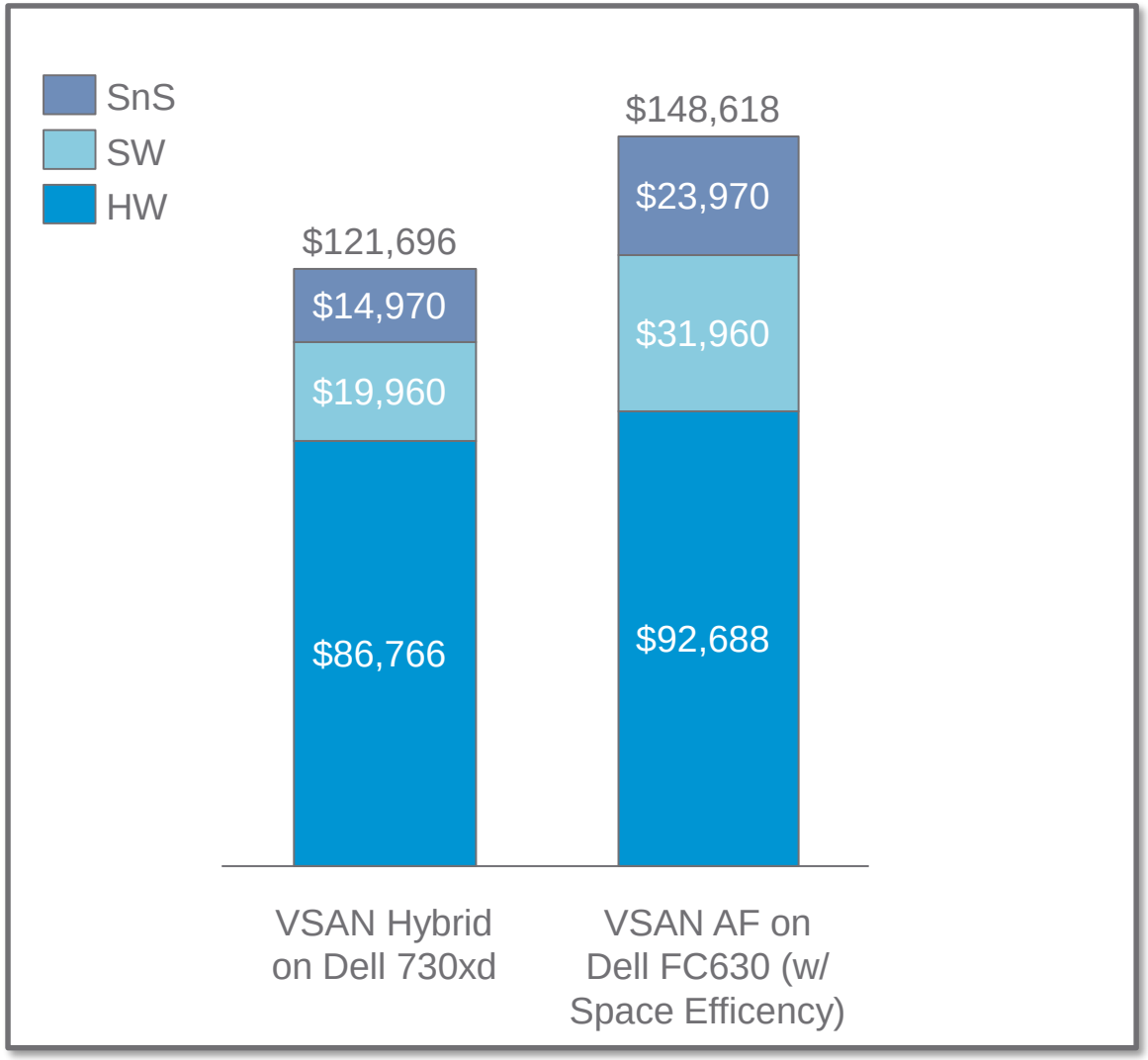
Why Virtual SAN All-Flash



- A customer needs ~25TB usable
- On Hybrid you'll need:
  - 50TB Raw
  - ~10x1.2TB (on 4-node cluster)
  - 2x400gb Caching SSD
  - ~100K IOPS
- On All Flash w/ 2x Dedupe & EC:
  - 19.2TB Raw
  - ~6x800gb Capacity SSDs (on 4-node cluster)
  - 1 x 400gb Cache SSD
  - ~180K IOPS

Virtual SAN Goals

SIMPLICITY

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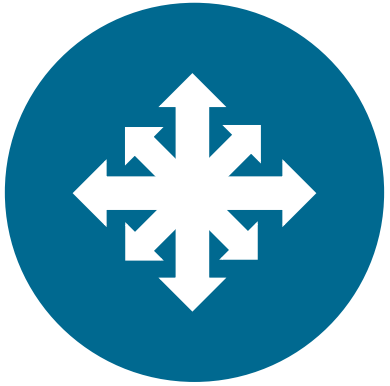
COST



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Two Ways to Implement VMware Hyper-Converged Infrastructure

Certified Hardware

Virtual SAN Ready Node / BYO

- 50+ Ready Nodes (validated server configurations with pre loaded software
- Jointly recommended by VMware and Server OEM
- Ready for Virtual SAN deployment
- Build your own SDDC by adding VMware software components

Virtual SAN + vSphere

Virtual SAN Ready Node

Integrated Systems

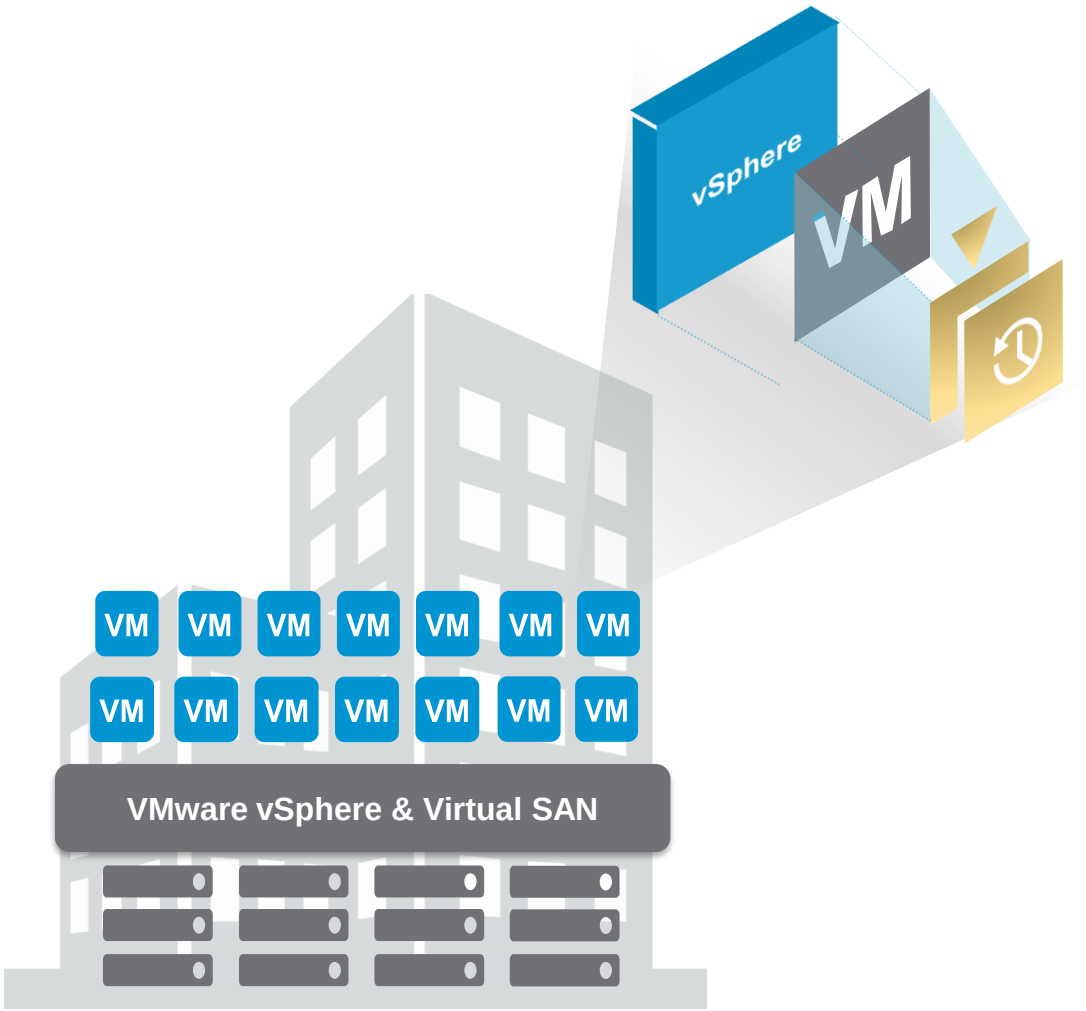
EVO SDDC

- Pre-integrated and pre-configured software with certified partner H/W
- Software to simplify deployment, configuration and lifecycle management
- vSphere, Virtual SAN and management software included

vmware EVO SDDC

Flexibility ⟷ **Ease of Use**

Virtual SAN – Data Protection



- Data protection provided through our public VADP API
- Data protection produces by most industry data protection vendors.

VERITAS
IBM
Symantec
ca Computer Associates
rubrik
veeam
EMC²
commvault
Acronis
Hewlett Packard Enterprise
arcserve
COHESITY

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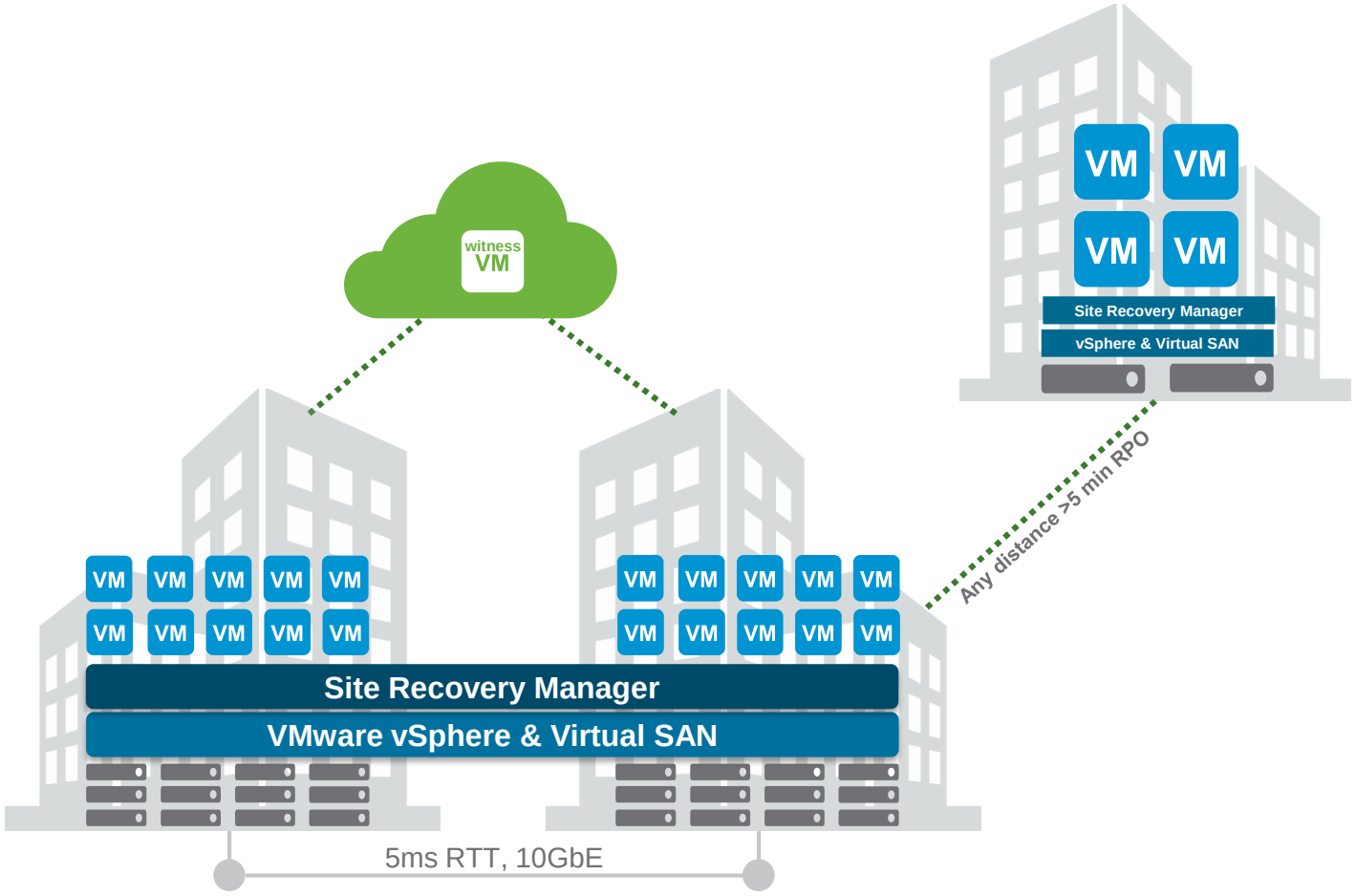
Virtual SAN – Disaster Recovery



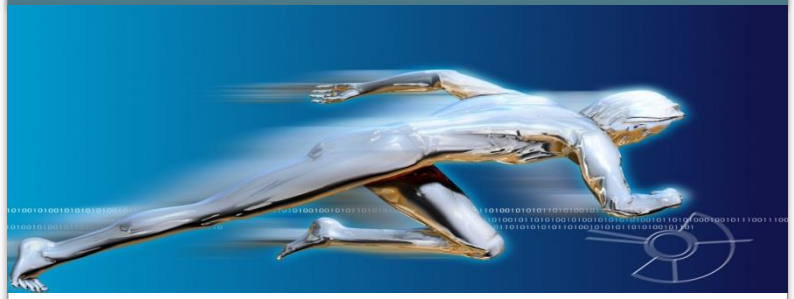
- Virtual SAN uses **vSphere Replication** as a DR replication mechanism
- Replication between Virtual SAN datastores enables **RPO** as low as **5 minutes**
  - Exclusively available to Virtual SAN 6.x, leverages vSphere Replication
- Leverage **Site Recovery Manager** for disaster recovery orchestration
- Stretched across **metro** distance, replicated across **geo**!

Why Customers Love Virtual SAN?

Radically Simple

- Two click install
- Single pane of glass
- Policy-driven
- Self-tuning
- Integrated with VMware stack

High, Predictable Performance with Elastic Scalability



- Flash-acceleration and SSD persistence
- Consistent IOPS with sub-millisecond response times
- Linear, non-disruptive scaling
- Embedded in vSphere kernel

Lower TCO

- Server-side economics
- No large upfront investments
- Grow-as-you-go
- Easy to operate with powerful automation
- No specialized skillset needed

Three Ways to Get Started with Virtual SAN Today

1 Online Hands-on Lab

FREE

vmware.com/go/try-vsan-en

- Test-drive Virtual SAN right from your browser—with an instant Hands-on Lab
- Register and your free, self-paced lab is up and running in minutes

2 Download Evaluation

FREE

vmware.com/go/try-vsan-en

- 60-day Free Virtual SAN Evaluation
- VMUG members get a 6-month EVAL or 1-year EVALExperience for $200

VMUG ADVANTAGE
VMWARE USER GROUP

3 VSAN Assessment

FREE

- Reach out to your VMware Partner, SEs or Rep for a FREE VSAN Assessment
- Results in just 1 week!
- The VSAN Assessment tool collects and analyzes data from your vSphere storage environment and provides technical and business recommendations.

Learn more…

vmware.com/go/virtual-san

- Virtual SAN Product Overview Video
- Virtual SAN Datasheet
- Virtual SAN Customer References
- Virtual SAN Assessment
- VMware Storage Blog
- @vmwarevsan

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VMware Virtual SAN Resources

- VMware.com – Product – Virtual SAN
  - http://www.vmware.com/products/virtual-san/ VMware Infrastructure Planner – VIP
  - https://vip.vmware.com/features
- VMware Virtual SAN TCO and Sizing Calculator
  - https://vsantco.vmware.com/vsan/SI/SIEV
- VMware Compatibility Guide for Virtual SAN
  - http://www.vmware.com/resources/compatibility/search.php?deviceCategory=vsan
  - Virtual SAN Hardware Quick Reference Guide
    - http://partnerweb.vmware.com/programs/vsan/Virtual%20SAN%20Hardware%20Quick%20Start%20Guide.pdf
- Download: https://my.vmware.com/group/vmware/info/slug/datacenter_cloud_infrastructure/vmware_virtual_san/6_0
- Doc landing page: http://www.vmware.com/support/pubs/virtual-san-pubs.html
- https://www.youtube.com/playlist?list=PL9MeVsU0uG65kM9iszj5KmNj01PiAWgvf

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VSAN Blogs

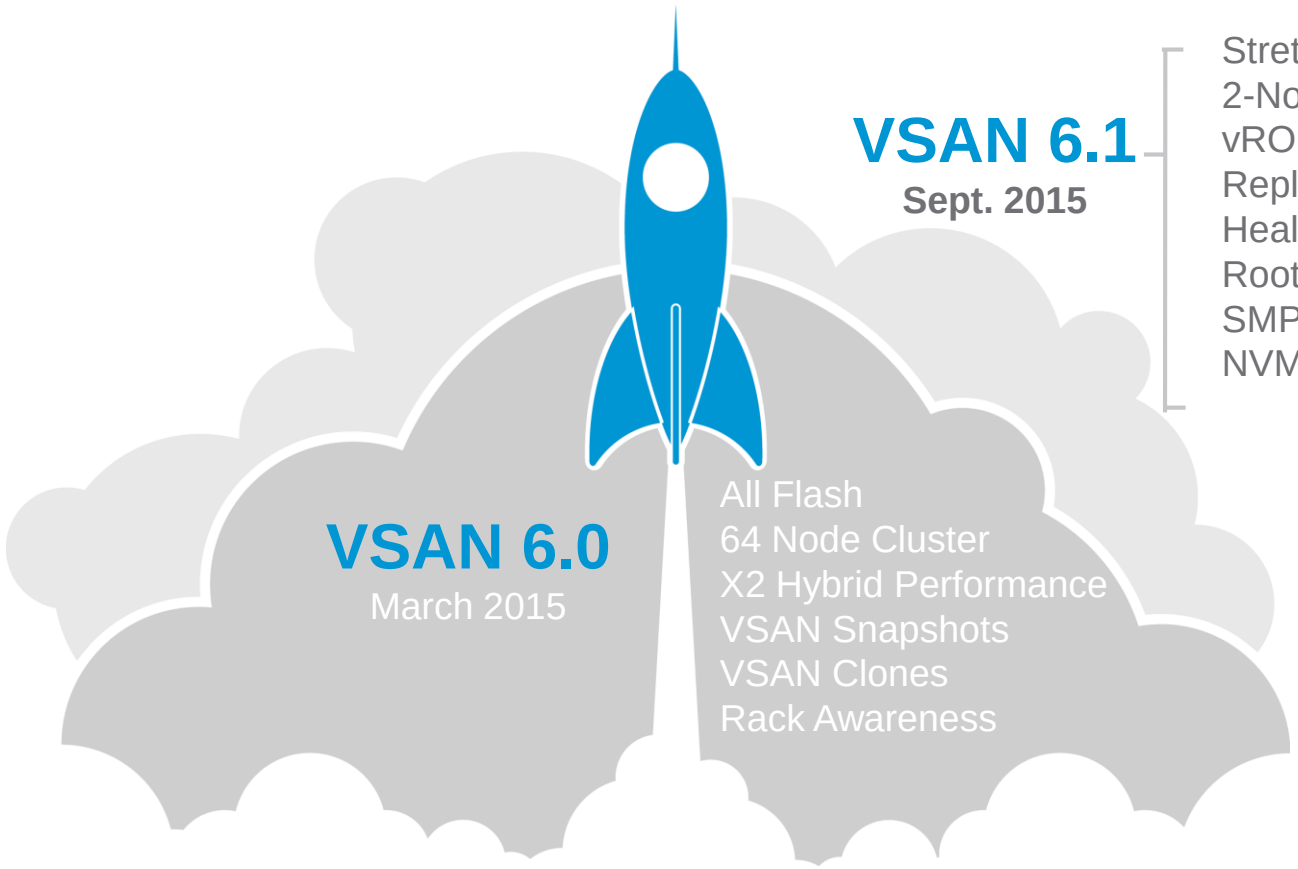
- https://blogs.vmware.com/virtualblocks/
- http://blogs.vmware.com/vsphere/tag/VSAN
- http://www.yellow-bricks.com/virtual-san/
- http://cormachogan.com/vsan/
- http://www.punchingclouds.com/
- http://www.virtuallyghetto.com/
- http://livevirtually.net/
- http://blogs.vmware.com/storage/author/chuck_hollis/

- StorageReview.com
  - VMware Virtual SAN Review: Overview and Configuration
  - VMware Virtual SAN Review: VMmark Performance
  - VMware Virtual SAN Review: Sysbench OLTP Performance
  - VMware Virtual SAN Review: SQL Server Performance

Virtual SAN Data Services

VSAN 6.2
Q1 2016

- RAID5 and RAID6 over the Network
- Deduplication and Compression
- Software Checksum
- QoS IOPS Limits
- Health Check Improvements and Performance Monitoring



VSAN 6.1
Sept. 2015

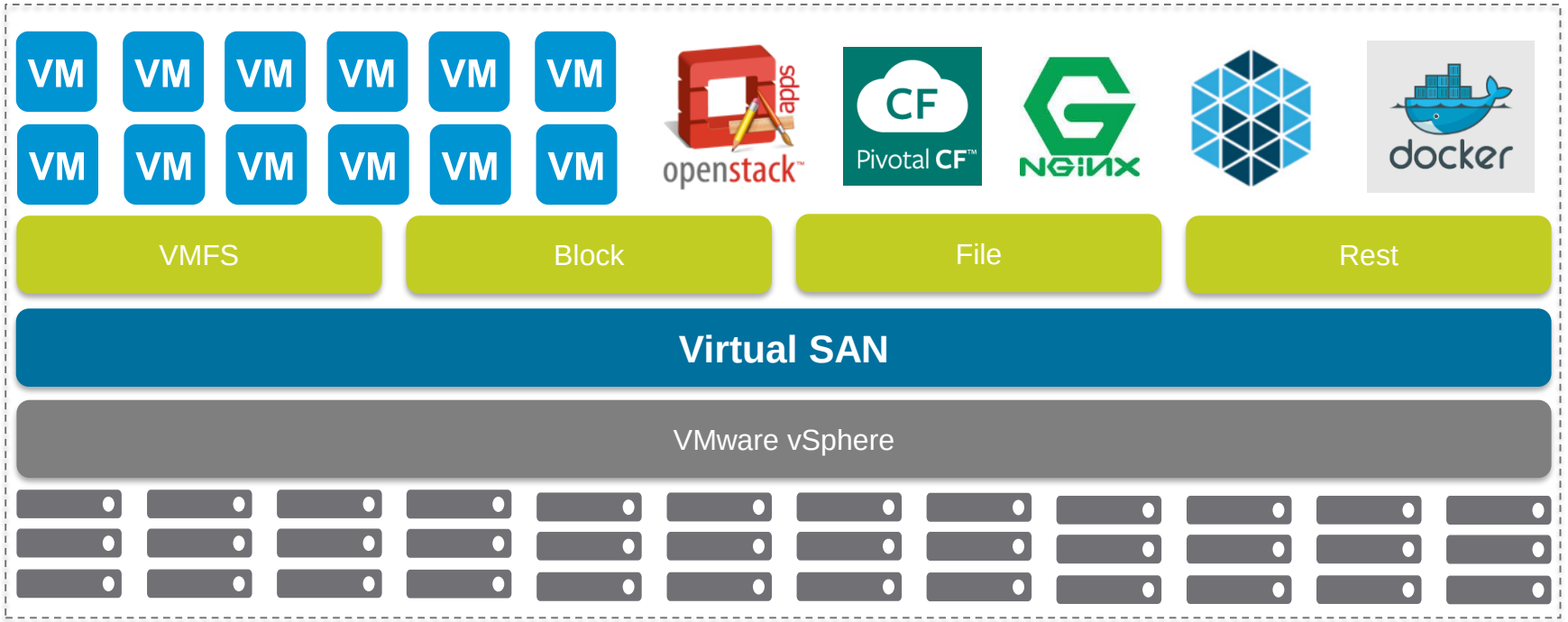
- Stretched Cluster
- 2-Node (ROBO)
- vROps Management Pack
- Replication - 5 Minutes RPO
- Health and Performance Monitoring
- Root Cause Analysis & Guided Remediation
- SMP-FT
- NVMe & UltraDIMM

VSAN 6.0
March 2015

- All Flash
- 64 Node Cluster
- X2 Hybrid Performance
- VSAN Snapshots
- VSAN Clones
- Rack Awareness

VSAN 5.5
March 2014

VMware Virtual SAN: Generic Object Storage Platform



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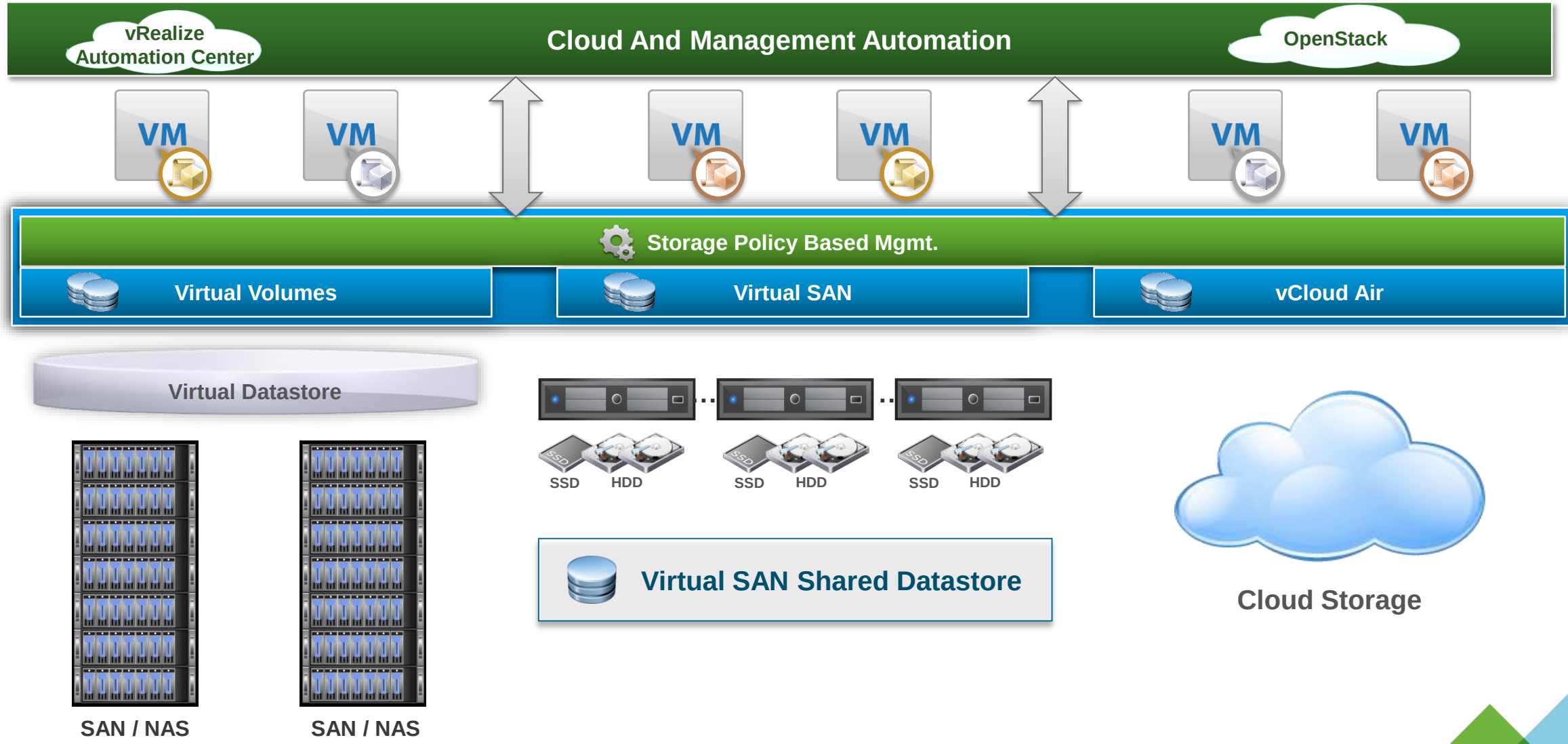
Enabling Self-service Consumption



Thank You

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Choices to Place Your Workloads

- Public Cloud
- Internal Cloud – Build your own infrastructure
  - Hperconverded Invrastructure
    - EMC VxRAIL
    - VMware VSAN ReadyNode
    - Build your own
      - VMware VSAN
      - EMC ScaleIO
      - Others
  - Converged Infrastructure
    - EMC Vblock
    - Build your own