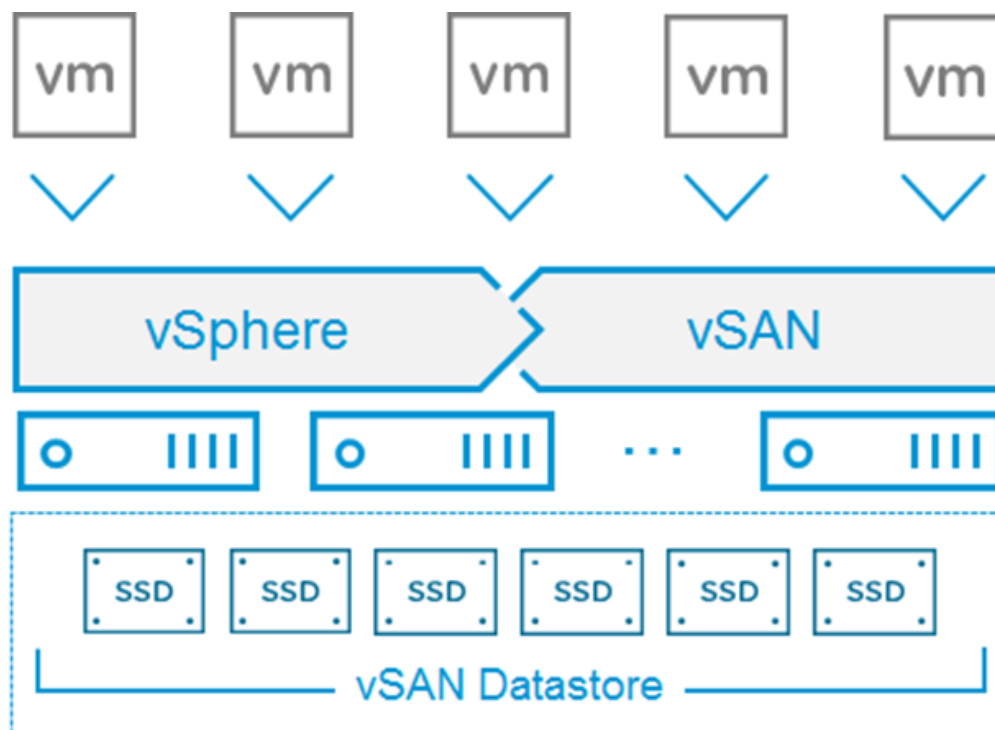


## VMware vSAN 6.6 – new features

### Evolve without risk through native security and smart availability

What if someone asked you to design an environment as if you know it is going to change. This challenge becomes fundamentally easier to solve in a software defined data center. VMware vSphere with vSAN takes this integrated approach to let you evolve your data center without risk. Accommodating for change in new levels of security and availability requirements, and do so in a safe, predictable manner. We will look at how vSAN 6.6 will help you evolve without risk through native security:

#### Secure Data with vSAN Data-at-Rest Encryption

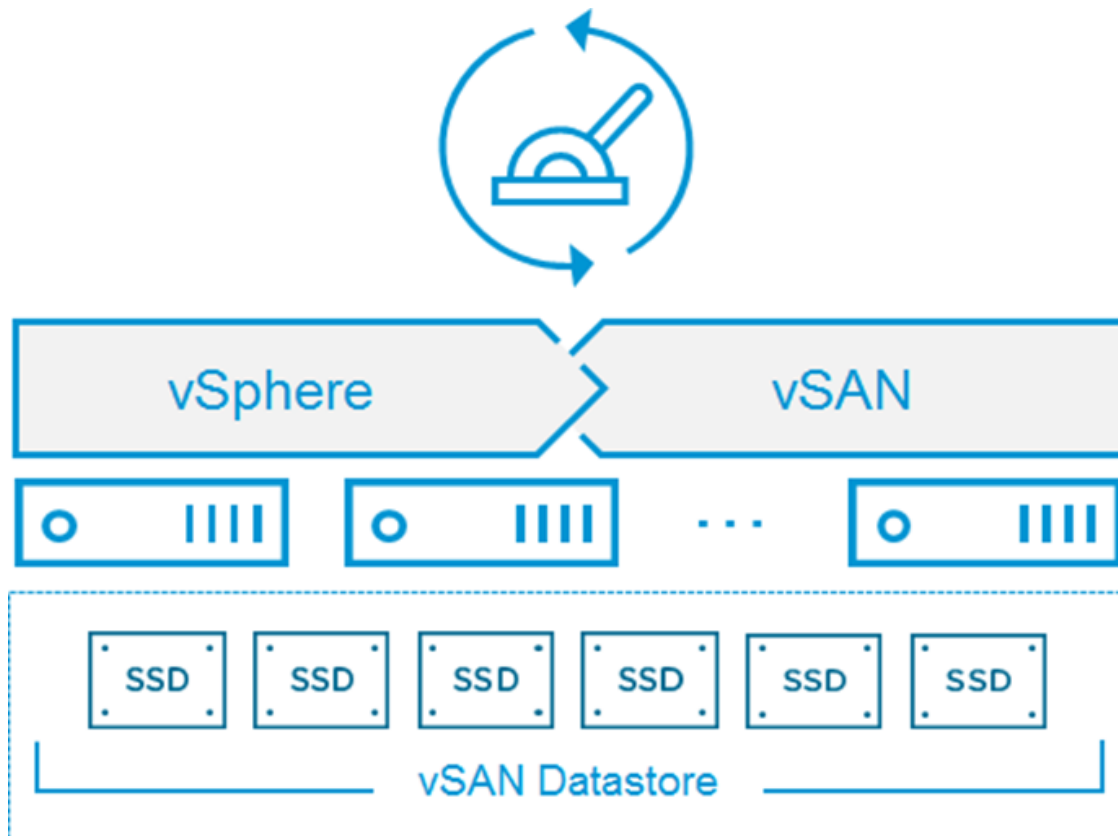


- Cluster wide setting that provides encryption of all data at rest((data in flight is transmitted unencrypted)) and supporting hybrid, all-flash, and stretched clusters.
- All core dumps are encrypted
- No need for self encrypting drives (SEDs), reducing cost and complexity
- Works with all vSAN features
- Hybrid and All Flash

- Space Efficiency technologies such as dedup & compression, RAID5/6
- QoS, Checksum
- Stretched clusters (Witness VM is not encrypted. No data is stored on witness, and not encrypting reduces attack matrix)
- Transparent to other vSphere features. (e.g. vMotion, vSphere Replication, etc.)
- Encryption occurs in last step for highest level of protection.
- Order: 1. Checksum > 2. dedup > 3. compress > 4. Encryption
- Encryption happens on 512B to make read-modify-write easier
- Encryption at final step achieves highest level of protection with AES-256. Encrypting earlier would require running ECB degraded mode, not acceptable in financial institutions.
- Integration with major central key management technologies that are KMIP compliant
- Configured in UI
- Tested with SafeNet, Hytrust, Thales, Vormetric, but other KMIP should work.
- Supports KMS servers running as KMS clusters to ensure high availability
- Encrypted vSAN must have KMS available in order to boot.
- vSAN datastore must be upgraded to the vSAN on-disk format version 5.0, as a part of vSAN 6.6
- Enabling encryption requires that all disks in disk group to be reformatted
- vSAN encryption a part of Enterprise licensing
- Witness host is not encrypted. Why? **It is more secure to not encrypt the witness node.** If the witness node is encrypted, it has to store all the credentials to get the secret key from the Key Management Server (KMS). These credentials become another attack surface that we have to protect. However, since witness runs in a virtual environment, it is easier to be attacked than regular hosts which run in physical environments. Not encrypting witness node reduced attack surface and makes the system more secure. What can be leaked on the witness node includes number and size of each vSAN object, their log sequence number, and policy. None of these are sensitive user data.

### **Intelligent Rebuilds Using Enhanced Rebalancing**

vSAN™ is an extremely intelligent distributed storage system that knows how to balance the data stored across the hosts that comprise the vSAN™ cluster. This has been enhanced even more to achieve better balance, and in turn, improving efficiency of the cluster. These new intelligent rebuilds can help use the existing hardware in a more efficient manner, delaying need for any additional, unplanned hardware. vSAN™ 6.6 introduces new controls for the administrator to ensure that these self healing mechanisms like resyncing have minimal interference with the primary workloads. This is a valuable new feature that can play a part in both planned, and unplanned maintenance events.



### Overview:

- Achieves better balance by splitting large components during redistribution
- Smarter decision making on component placement decisions reduces overhead, resulting in faster recovery times
- Improved visibility in rebalancing status in Health UI
- All improvements part of the proactive “Rebalance Disks” button found in the Health UI.

### Resync throttling

- New throttling mechanism gives administrator ability to easily control amount of bandwidth is consumed by resync traffic
- General improvements in resync should minimize the need to adjust this, but is provided now for corner cases.
- Set at vSAN™ cluster level, using slider bar in GUI.
- Helps address rolling maintenance or host failure scenarios during periods of high activity.

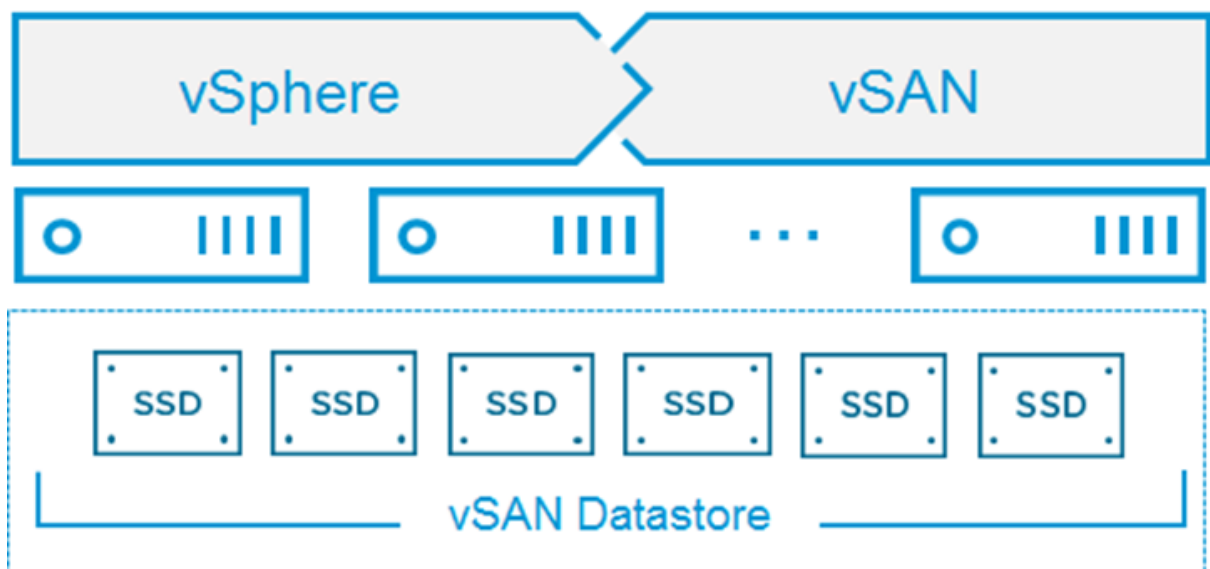
### Details:

- Rebalancing protocol updated to accommodate various scenarios more effectively.
- Previous limitations included inability to break large component into smaller pieces.
- Rebalancing of large components sometimes lead to less than ideal placement decisions
- During reactive rebalancing, vSAN™ can now break large components into chunks
- If vSAN™ can find a new disk for the component without the need for breaking up into multiple components, it won't break up.
- If vSAN™ can't find a new disk without breaking, it will break into 2, and retry previous step.
- Will proceed with this logic of more splits up to 8
- Breaking into chunks occurs when disk has achieved greater than 80% utilization

- Rebalancing status has been updated to provide more frequent updates with a more accurate report of progress.  
Resync Throttling
- Previously resync operations had been controlled entirely by vSAN™. Limited ways for Administrator to adjust them.
- Control mechanism added for proactive throttling of all resync operations in a cluster.
- Adjustment allows to specify throttling at cluster level by throughput (Mbps) in slider bar in UI, or command in ESXCLI
- Can adjust in real-time
- General improvements to resync should minimize scenarios in which changing the default (no throttling) is necessary. **It is highly encouraged to leave it set to the default setting of no throttling**
- New resync graphs in performance service introduce to monitor resync traffic in greater detail (found in disk group layer of host related vSAN™ metrics)
- Monitoring object resynchronization is not available for clusters containing hosts on 5.x

### Intelligent Rebuilds Using Smart, Efficient Repairs

Related to the previous feature demonstrating rebalancing improvements, vSAN™ improves on its approach for repairing a protection state to ensure that a VM is adhering to a given protection policy. The improvements in vSAN™ 6.6 aim to reduce the amount of overhead needed for these repair actions, as it will now detect and analyze the conditions prior to determining the best course of action. This helps drive down TCO, but also helps you evolve without risk



#### Overview:

- Two methods for repairs of offline components reappearing after 60 minutes.
- Calculates cost of methods of repair at time host comes back online
- Will choose most efficient method, and cancel other action

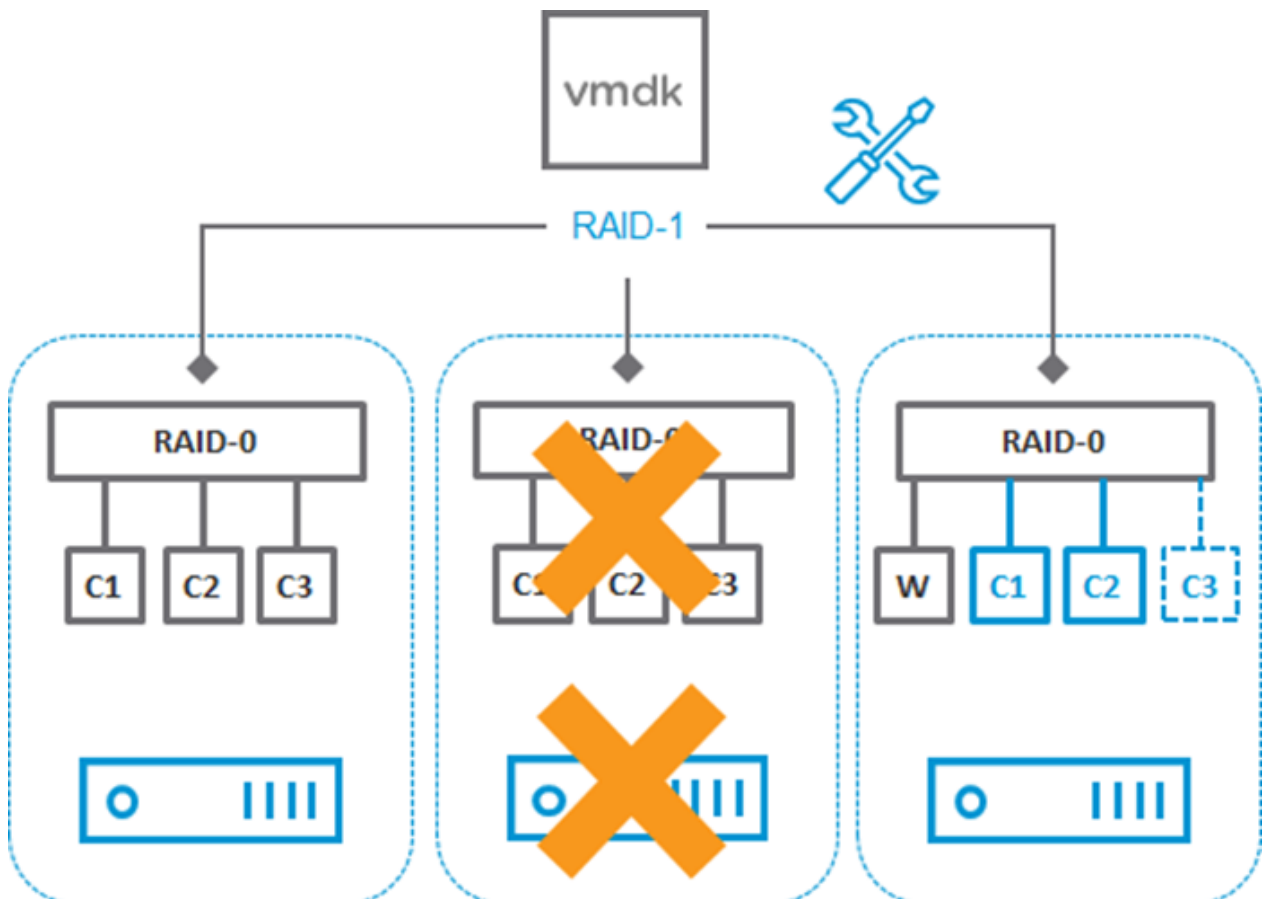
- Significant improvement in speed and efficiency of component repairs

**Details:**

- No longer a strict, full resync with a new mirror if the host is offline for more than 60 minutes
- When absent host comes back after 60 minutes, vSAN™ will calculate the “cost” between reusing the old component on the host and continuing to resync for the new mirror (kicked off at the 60 minute timeout).
- vSAN™ will choose the one with the lower calculated cost, and cancel the other operation.
- Improvements in logic apply to all rotten components (from offline hosts, offline disk groups, or offline disks), including degraded or absent components for more than 60 minutes

**Intelligent Rebuilds Using Partial Repairs**

The ability to quickly heal itself from hardware failures has been improved significantly in vSAN™ 6.6 Opportunistic healing through partial repairs is an approach used in vSAN™ 6.6, where in the event of degraded or absent components are missing for more than 60 minutes, vSAN™ will repair all components possible even if there is not enough capacity to satisfy the original protection policy. This “repair what you can” approach up the repair process because it will only need to repair the remaining unrepaired components as soon as additional resources become available.



**Overview:**

- More resilient, opportunistic repair process
- Will repair as many degraded or absent components as possible even if not enough resources to insure full compliance
- Remaining components will be repaired as soon as enough resources are available

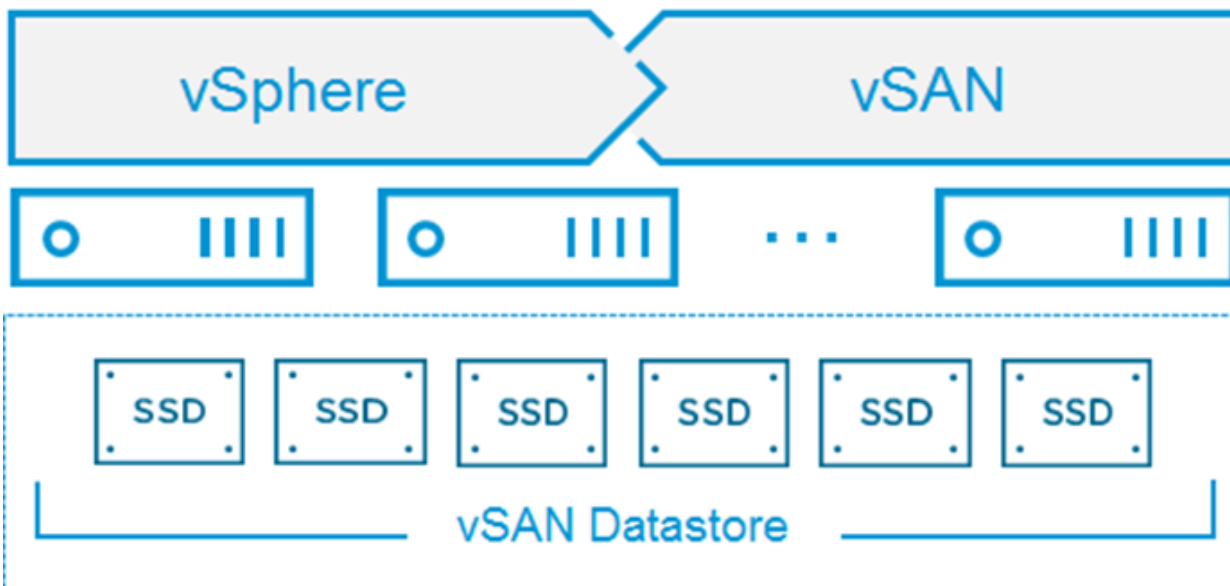
- Works in non stretched, and stretched clusters

**Details:**

- In previous releases, if there was not enough resources to repair all degraded or absent (aka “rotten”) components, vSAN™ would fail the repair attempt and take no further action
- Partial repair is only executed when there are enough resources to increase the effective failures to tolerate (PFTT/SFTT) of an object
- Data components take precedence over witness components in partial repair

**Health Monitoring —Degraded Device Handling**

Enhancements to detection of failing disks is an important factor in delivering a proactively stable environment. vSAN 6.6 delivers smarter intelligence to detecting impending drive failures, with mechanisms in place to accommodate those conditions in the most efficient way. Intelligent predictive failure handling is an important step in driving up the confidence in a vSAN environment, and driving down the cost of operation while minimizing risk.



**Overview:**

- Smarter intelligence in detecting impending drive failures
- If replica exists, components on suspect device marked as “absent” with standard repair process
- If last replica, proactive evacuation of components occurs on suspect device
- Any evacuation failures will be shown in UI.

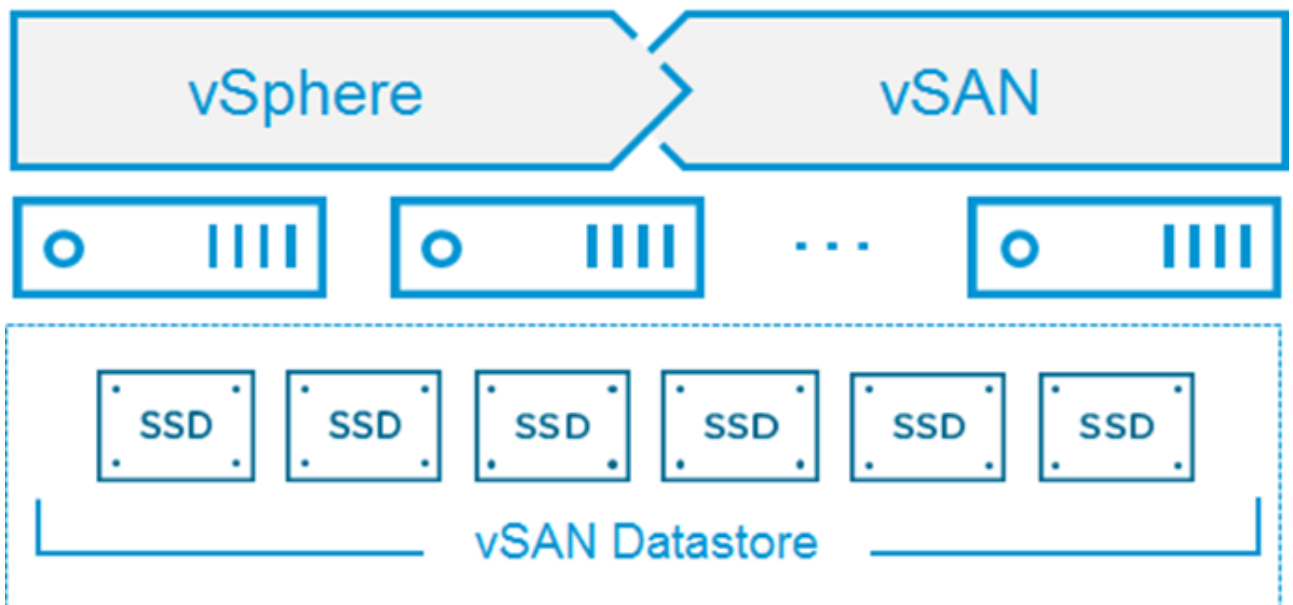
**Details:**

- Previously known as “Dying Disk Handling” (DDH). New name is “vSAN Proactive Drive HA”
- Enhanced detection and management of drive failures on persistent storage devices

- vSAN Proactive Drive HA now looks at performance traits of device over time.
- vSAN Proactive Drive HA now looks at performance traits of a time period by breaking a configurable time period (4 hour default) into a series of configurable intervals (20 minute default). A disk is considered unhealthy if performance traits exceed the configured average performance trait for that disk. These are randomly selected non-contiguous intervals to better represent a pattern of degrading performance.

### Health Monitoring —Decommissioning Host Improvements

Decommissioning a host from a cluster has been improved as well. A “pre-check” has been introduced that allows for the conditions of the cluster to be analysed to ensure that adequate space can be met for the decommissioning event. This is all built right into the typical process of entering a host into maintenance mode, and is used when removing a disk or disk group as well. It’s a simple, yet effective way to help the administrator better understand the environment prior to decommissioning. The improvements with decommissioning do not stop with the pre-check feature. vSAN 6.6 is now able to handle the data in a more granular fashion, meaning that only data that needs to be moved, will be moved. This benefit is applied to the decommissioning process. It helps deliver faster decommissioning, and reduced overhead requirements. This helps drive down TCO, but also helps you evolve without risk.



### Overview:

#### Safety

- vSAN conducts a precheck for required free space before decommission job is started
- Factors in the data migration type in calculation
- Provides a precheck report while placing host into Maintenance Mode
- Uses this same approach when user is removing a disk group

### Efficiency

- Increased granularity for faster, more efficient decommissioning
- Reduces amount of temporary space needed
- Data moved by components instead of copy

### Details:

#### Safety

- Prevents decommissioning scenarios that could fail due to running out of resources
- Precheck evacuation report accommodates the three vSAN data migration types
- Evacuate all data to other hosts
- Ensure data accessibility from other hosts
- No data evacuation
- Accounts only for capacity usage when determining decommissioning in a given mode
- Simplified “what-if” engine may not account for extreme, corner case conditions, such as nearly full cluster, or extremely low host count in cluster.

#### Efficiency

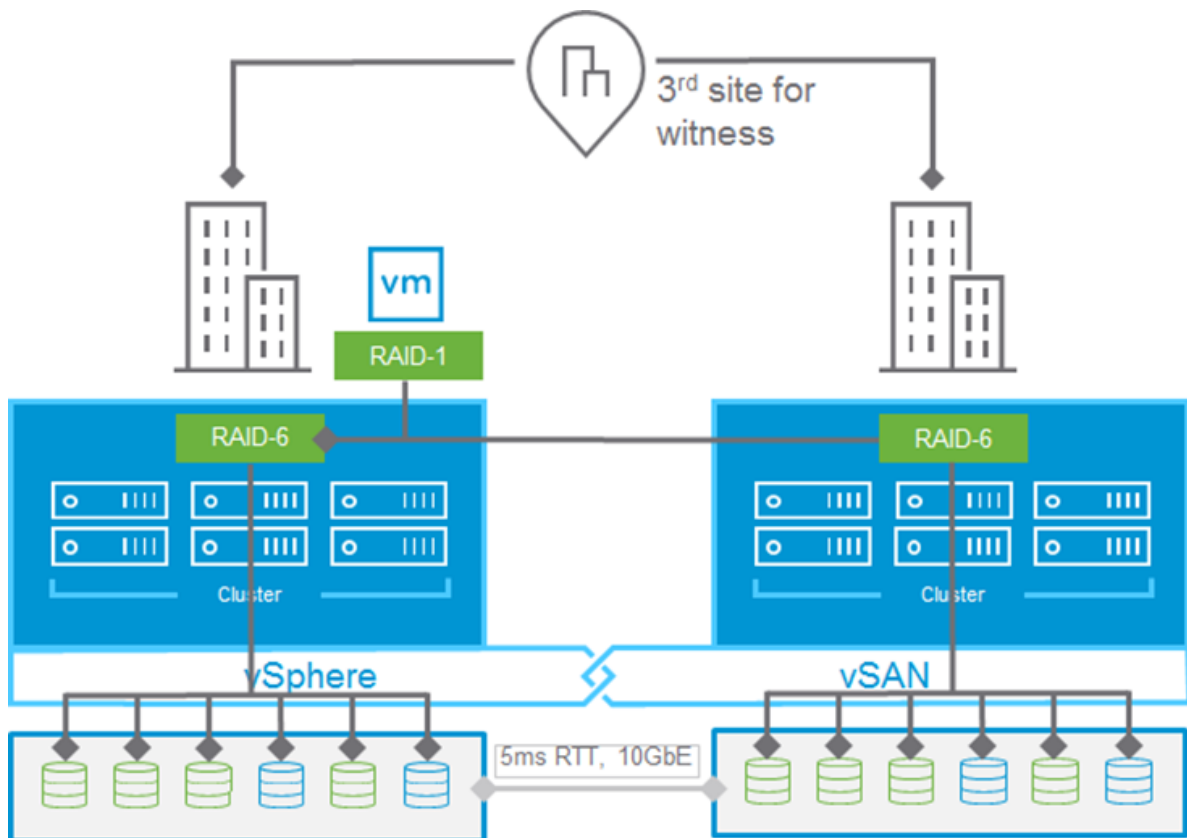
- Previous method used for decommissioning moved data at the granularity of copies. This meant that even if a part of an object copy was impacted by a decommissioning job, the entire copy needed to be recreated and resynced
- New point fix framework is used to perform reconfigurations for all workflows, including decommissioning
- Object Manager can now understand and perform compliance checks of components as they are being decommissioned

## **Lower TCO with Efficiency at Scale and Intelligent Operations**

Software solutions that are smarter help reduce the design and operational burden of a data center. By shifting features away from platform independent hardware, and toward software, organizations will see a significant reduction in both CapEx and OpEx. Let's look at how vSAN 6.6 can lower TCO with efficient, intelligent operations:

### **Low Cost Local and Remote Protection for Stretched Clusters**

vSAN's ability to provide a fully active-active, stretched cluster has already proven it's value in data centers. vSAN 6.6 takes this a step further, allowing for storage redundancy within a site AND across sites at the same time. This helps deliver effective, affordable protection against entire site outages, as well as host outages within a site. This level of protection is extraordinary, and what many of our customers have asked for. Lower TCO is the result of no need to purchase additional hardware or software, while addressing protection requirements with software you already know.



### Overview:

- Ensures redundancy within a site (host failures), as well as across sites (site failures) when using stretch clusters.
- With site failure, vSAN maintains availability with local redundancy in surviving site
- No change in stretched cluster configuration steps
- Optimized site locality logic to minimize I/O traffic across sites

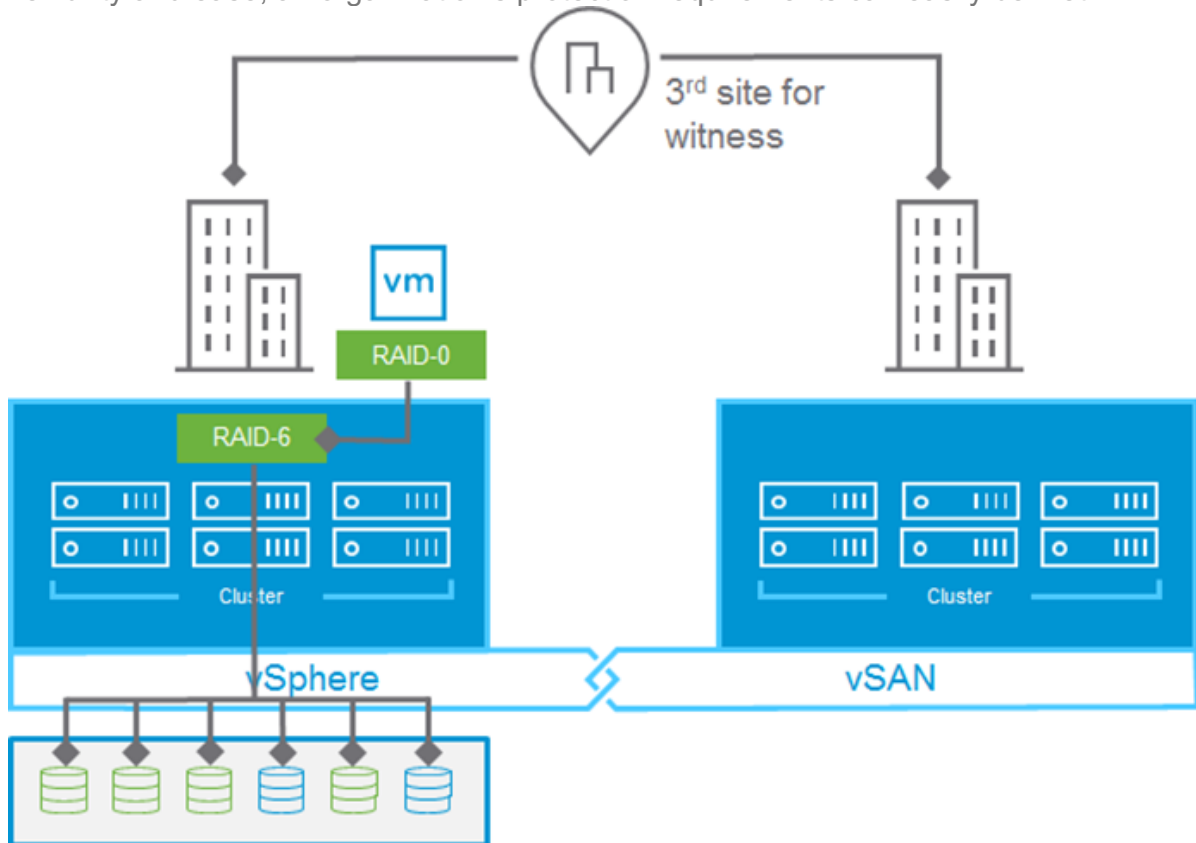
### Details:

- Synchronous I/O occurs within a site, as well as across sites. This means:
  - If host or fault domain fails in a site, failover will occur in the same site without any loss of data.
  - If a site fails, failover to the other site occurs without any loss of data.
- Site availability is maintained by witness VM that resided in central location, accessible by both sides. Internal availability is maintained by internal witness components.
- Supported "Failure Tolerance Method" (FTM) configurations:
  - RAID1 across sites, with RAID1 in each site: Hybrid, and All-Flash
  - RAID1 across sites, with RAID5/6 in each site: All-Flash
- "Secondary Failures to Tolerate" (SFTT) represents the FTT policy within a site (0-3)
- "Primary Failures to Tolerate" (PFTT) represents the FTT policy across sites (0-1)
- "Affinity" is an SPBM rule that specifies the site that the vSAN object is placed in
- Options: None, Preferred Fault Domain, Secondary Fault Domain
- Data Path optimizations for Stretch Clusters
  - Local Read
  - Local Resync
  - Single cross-site write for multiple replicas

- Partial repairs supported
- vSAN datastore must be upgraded to the vSAN on-disk format version 5.0, as a part of vSAN 6.6

### Increase Flexibility with Site Affinity for Stretched Clusters

vSAN™ 6.6 not only added more protection for stretched cluster topologies, but it now provides easy to configure options that allow you to protect VMs across a site, or just within a single site. This allows for more effective use of network and storage resources across the infrastructure, and simplifies design and operation of an environment. With this level of flexibility and ease, an organization’s protection requirements can easily be met.



### Overview:

- User can specify site location of VM’s components if site level protection is unnecessary
- Policy driven setting allows user to specify site (preferred or secondary) where VM data should be placed.
- Reduces network and storage requirements
- Ideal for solutions that already use application redundancy (Exchange DAGs, SQL Availability groups)

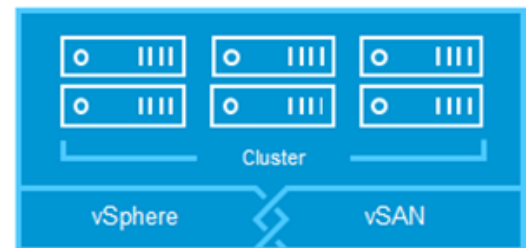
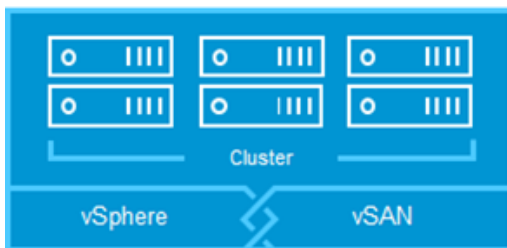
### Details:

- Site affinity setting tied to objects using PFTT=0. (representing FTT policy across site of 0)
- “Affinity” is an SPBM rule that specifies the site that the vSAN™ object is placed in
- Options: None, Preferred Fault Domain, Secondary Fault Domain
- New policy setting will be honored by all vSAN™ operations, including repairing, rebalancing, decommissioning

- Should be used in conjunction with DRS affinity rule so that site location for computing is controlled. (vSAN™ SPBM will control location of storage components, and vSphere® DRS affinity rule will control location of compute.)

### Simplified Effort to Change Witness Host for Stretched Cluster

Having a solution that easily adapts to the needs of the organization is key to lowering TCO. For stretched cluster environments, vSAN™ 6.6 has introduced a simplified method for easily replacing a witness host.



### Overview:

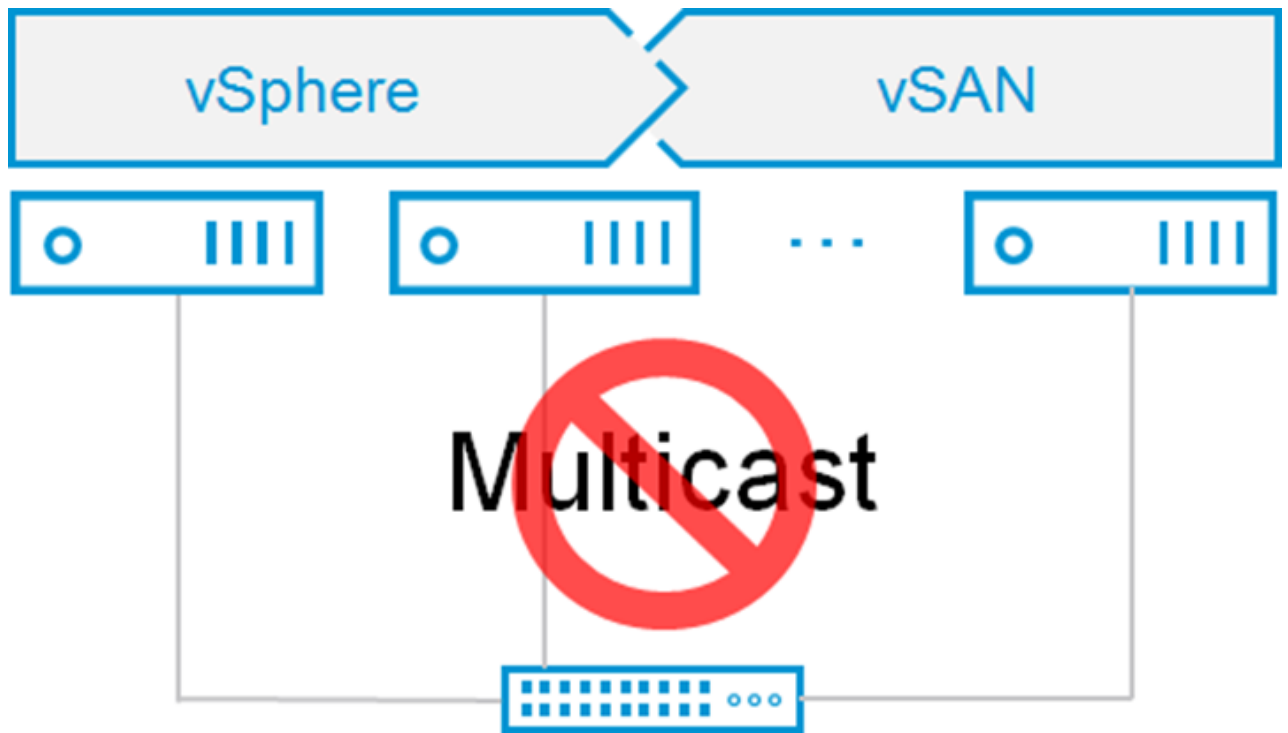
- Easy replacement of witness host in stretched cluster environments
- Reduces potential time stretched cluster configuration may be without a witness
- UI driven. Eliminates need for manual steps or scripting

### Details:

- Eliminates previous method of replacing witness host in stretched cluster was to 1.) disable current stretched cluster configuration 2.) remove old witness 3.) Reconfigure stretched cluster and add new witness

### Simplified, Cloud-friendly Networking with Unicast

Simplicity is an important element in providing a software defined storage solution. vSAN™ 6.6 takes a major step in simplifying the design and deployment by removing the need for multicast network traffic. This can provide a noticeably simpler deployment effort for not only single site environments, but stretched clusters as well.



### Overview:

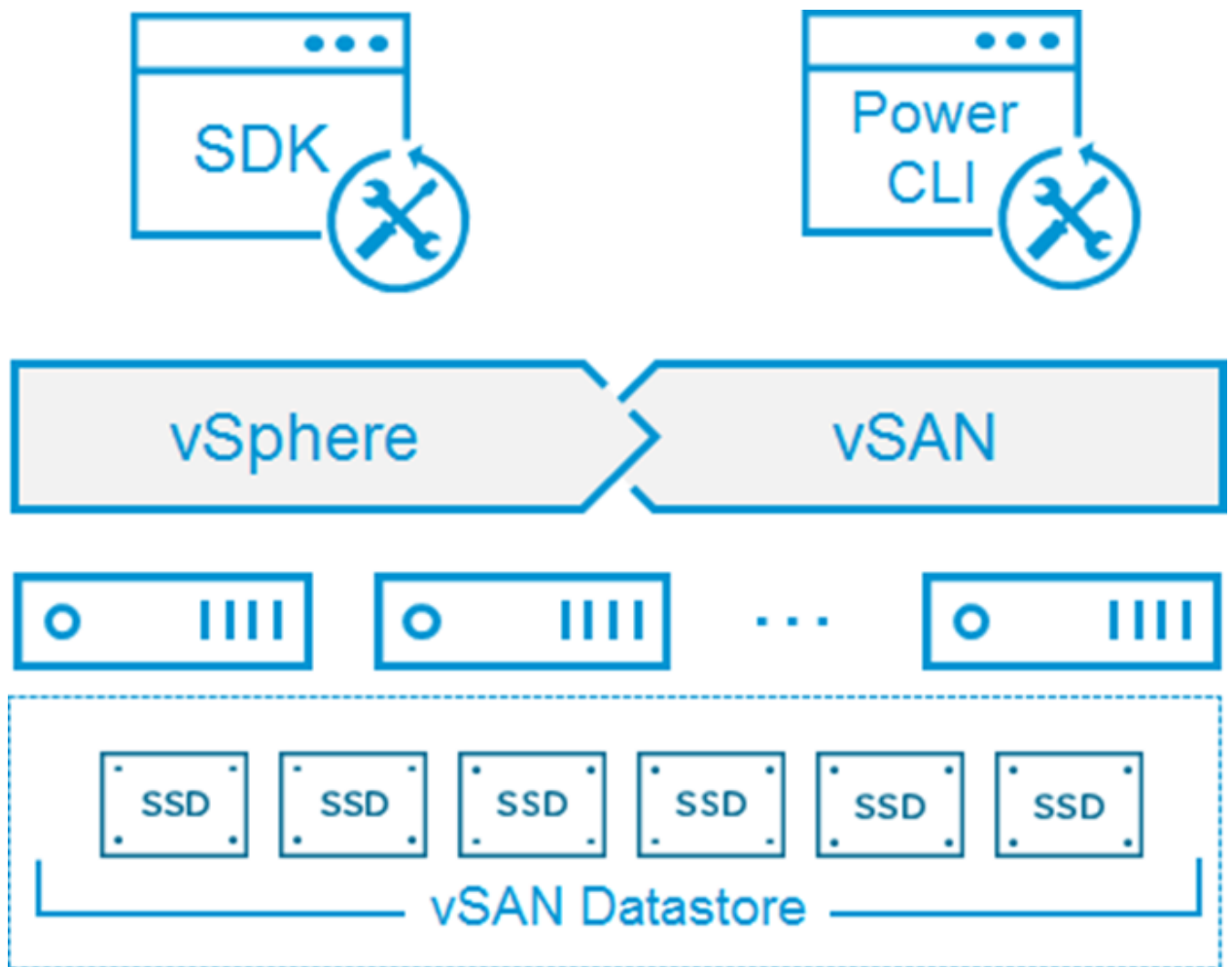
- Multicast no longer used.
- Easier configurations for multiple clusters in a single site, as well as stretched clusters
- vSAN™ automatically changes to unicast once vSAN™ cluster upgrade to 6.6 completes
- Increased efficiencies means no compromises in CPU utilization

### Details:

- During upgrade, vSAN™ cluster will automatically change over to unicast once the final host in the cluster is upgraded.
- Increased efficiencies have demonstrated that CPU utilization on the master is largely unchanged, if not improved in smaller cluster sizes.
- No sizing changes for the witness
- Remaining on multicast, or forcing a setting to use multicast is not an option. All vSAN™ environments moving forward will use unicast exclusively

### Management at Scale with vSAN API and PowerCLI

VMware has always believed strongly in the “APIs first” approach, and with vSAN™ 6.6, the SDK has been enhanced to provide access to unique data that vSAN™ can collect. Exposing this data via API helps complementary solutions that use these APIs deliver more value, and drives down TCO. PowerCLI has also proven to be a flexible way to interface with vSAN™. vSAN™ 6.6 introduces new cmdlets that incorporate new functionality introduced in vSAN™.



### **Overview:**

#### vSAN™ SDK update

- Host level vSAN™ mgmt. APIs can monitor/query cluster level information
- Accommodates new event handling scenarios (ex: vCenter® offline)
- S.M.A.R.T drive data available in API

#### PowerCLI enhancements

- Upgrading, performance monitoring, and iSCSI operations

### **Details:**

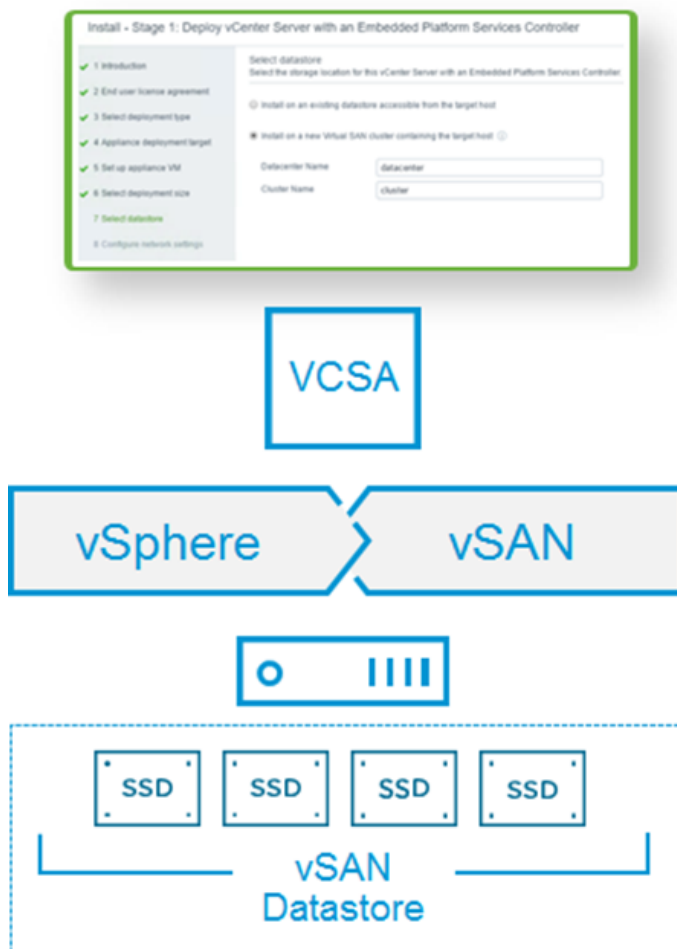
#### vSAN™ SDK update

- Host level vSAN™ API can monitor/query cluster level info without dependency on vCenter® server
- Ex: Can handle vCenter® down scenarios, and call upon host to present cluster level health check results
- Exclusive: S.M.A.R.T drive data in vSAN™ API.
- Pulled from ESXi native S.M.A.R.T plugin in ESXi
- No need to use ESXCLI to fetch S.M.A.R.T data
- No yet tied to HCL, so user will not be able to see if their disk can retrieve S.M.A.R.T data
- Not yet integrated into vSAN Proactive Drive HA
- PowerCLI commands added or enhanced (many have associated "set" commands as well, but omitting for clarity)
- Get-vSAN™View

- Get-vSAN™ClusterConfiguration
- Set-ScsiLun
- Get-vSAN™PerformanceMetrics
- Get-vSAN™ClusterConfiguration
- Get-vSAN™IScsiTarget
- Get-vSAN™IScsiLun
- Get-vSAN™IScsiInitiatorGroup
- Get-vSAN™IscsiInitiatorGroupTargetAssociation
- Get-vSAN™SpaceUsage
- Get-vSAN™PerformanceMetrics

## Intelligent, Automated Operations with vSAN Easy Install

When VMware looked for opportunities to improve the experience of running vSAN™, they saw tremendous opportunities for improvement in the deployment of brand new clusters from scratch. “Easy Install” in vSAN™ 6.6 provides a simple way to deploy vSphere® and vSAN™ with a VCSA on a single host, to then begin the process of adding additional hosts to the cluster. The result is an easy to use wizard that is incorporated into the VCSA installer that can result in a rapid deployment of a greenfield vSAN™ installation.



### Overview:

- Provides easy way to bootstrap new vCenter® Server on a single host
- vSAN™ configuration steps built into VCSA installer workflows

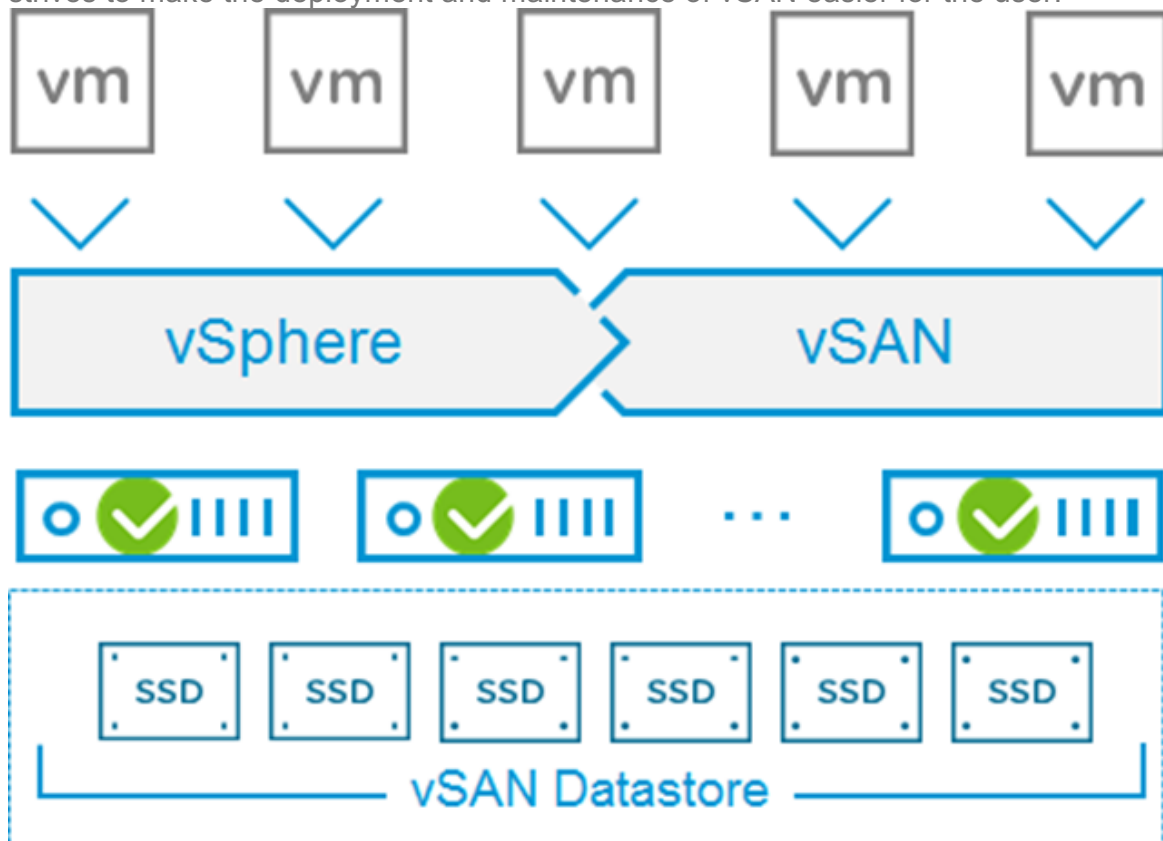
- Simplifies process of building out new environment

**Details:**

- Allows user to claim disks, enable space efficient for vSAN™ within installer
- Allows user to install on existing vSAN™ datastore, or new vSAN™ datastore on a target ESXi host
- Supports both embedded vC/PSC and external vC/PSC deployment options on vSAN™
- Command line option to OVF tool has been added to support deploying VM on single node vSAN™ datastore

**Intelligent, Automated Operations with vSAN Config Assist**

vSAN allows an administrator to use the very latest and greatest of hardware technologies. In an effort to simplify the management of these devices that contribute to vSAN, vSAN 6.6 introduces “Config Assist” that will run through the process of checking for the latest OEM firmware and drivers. “Config Assist” also helps in ensuring that software configuration settings for vSAN are set optimally. As with other features in vSAN 6.6, “Config Assist” strives to make the deployment and maintenance of vSAN easier for the user.



**Overview:**

- Simplify HCI Management with prescriptive one-click controller firmware and driver upgrades
- HCL aware. Pulls correct OEM firmware and drivers for selected controllers from participating vendors including Dell, Lenovo, Fujitsu, and SuperMicro
- Validate and remediate software configuration settings for vSAN
- Configuration wizards validate config/operation of vSAN settings and ensure best practice compliance

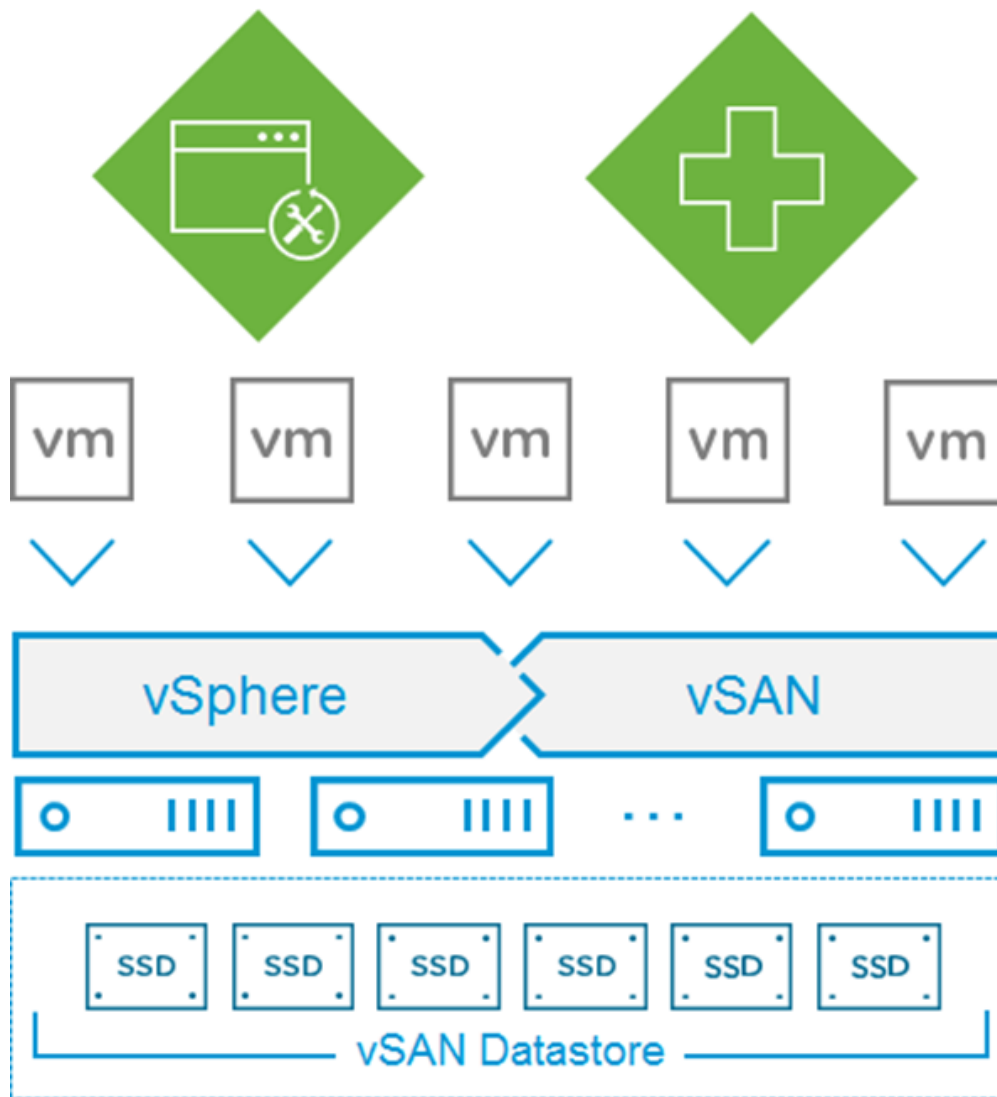
**Details:**

Config Assist Checks:

- Network
- Network group: Use vDS for vSAN
- Network group: vDS covers entire cluster
- Network group: Physical NICs
- Network group: Detect if vMotion/vSAN service has not been configured
- Network group: Detect if vSAN service has not been configured
- Network group: Ping test for vMotion network
- Network group: Ping test for vSAN network
- Network group: Cluster formation for vSAN network
- vSAN Config
- vSAN config group: Is vSAN enabled?
- vSAN config group: All physical disks claimed?
- vSAN HCL
- vSAN HCL group: Driver supported for controller
- vSAN HCL group: Firmware supported for controller
- vSAN Generic Cluster
- Generic Cluster group: DRS enabled?
- Generic Cluster group: HA enabled?
- Generic Cluster group: DRS/HA configuration
- Generic Cluster group: Hostname configuration
- vSAN burn-in
- vSAN Burn In group: Basic burn in performed
- **Drive controllers**
- Selected controllers to be supported from Dell, Lenovo, Fujitsu, and SuperMicro
- Config assist follows the typical workflow for drive controller firmware:
- Check controller, and will show warning if firmware is outdated\*  
(\* If unable to read controller info, will prompt customer to install vendor tool which does firmware scanning & flashing)
- Downloads from OEM website
- Completes flashing across vSAN cluster
- Rechecks cluster to validate firmware level

### **Enhanced Health Monitoring**

Effective operation of an environment includes easily understanding if an issue needs to be addressed. The enhanced health monitoring in vSAN 6.6 does this in a number of ways. Advanced HCL checks ensure the proper device, firmware, and driver compliance in a vSAN cluster. Also introduced is “what-if” capacity planning that can help understand capacity requirements when performing extended maintenance tasks. Alerting has been tuned to provide information in a more concise manner. All of these help drive down the cost of operation in an environment.



### Overview:

- HCL checks include firmware of selected device controllers
- Enhanced alert management to reduce quantity of duplicate alerts
- Ability to skip future health checks for known issues that previously generated alert

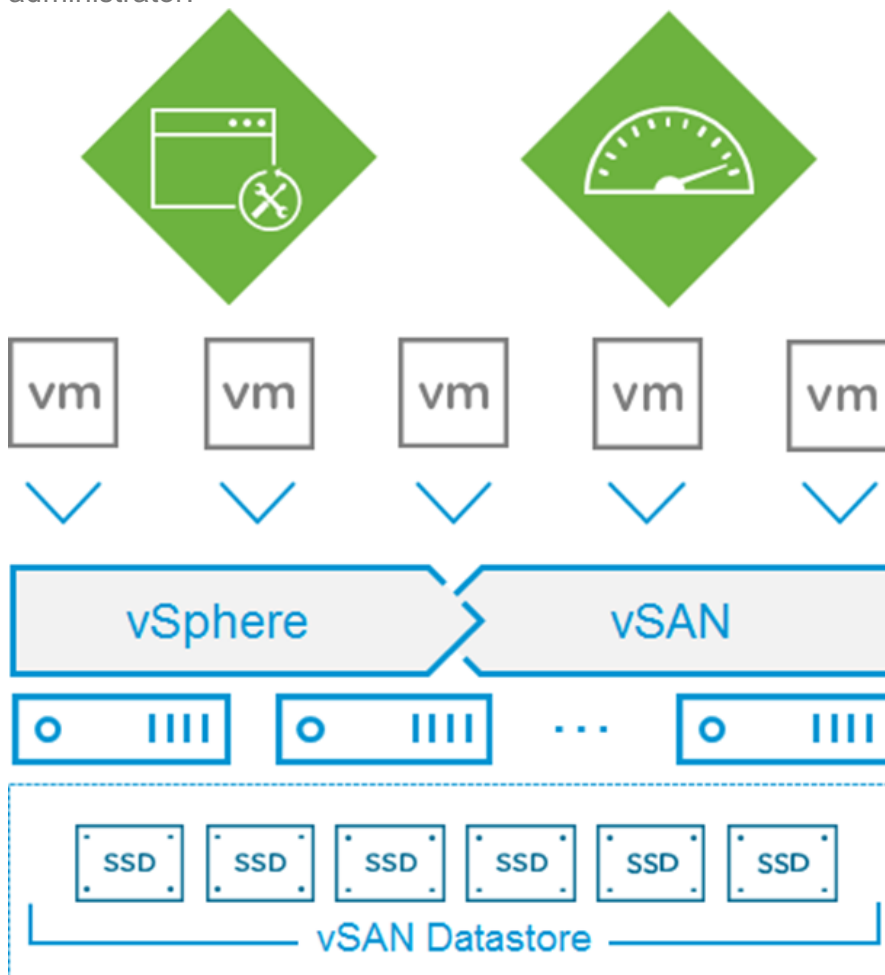
### Details:

- Cleaner alerting of vSAN health checks
- New HCL checks
- Firmware check of selected controllers (does not include firmware checks of NVMe devices at this time)
- Controller queue depth checks
- Hybrid/All-flash environmental check
- New & Enhancements of health checks for both S/W and H/W
- New health checks for vSAN encryption when it is enabled
- Disk balance check: more precise in monitoring and more responsive in proactive rebalancing action.
- Physical disk health check: vSAN natively detects “failing” disks and attempt proactive data evacuation
- Network health check: distinguish connectivity and performance by separating latency check from ping test check.

- New & Enhancements of vSAN performance monitoring
- Ability to save/query time range on performance monitoring history
- Add detailed vSAN network and resync metrics
- Add detailed iSCSI related performance monitoring
- General alerting cleanup
- Cleanup duplicate alerts
- Option to silent health check for “known issue” to help with handling known conditions, and a desire to have a clean green dashboard.

### **Enhanced Performance Monitoring**

Providing a detailed, and accurate understanding of performance is an important part vSAN. In vSAN 6.6, the performance monitoring service now includes additional metrics that are meaningful to the operation and effective performance of the environment. The improvements specifically address exposing important metrics to aid in the troubleshooting of performance issues. Having this built right into the UI will be a great benefit to the typical administrator.



### **Overview:**

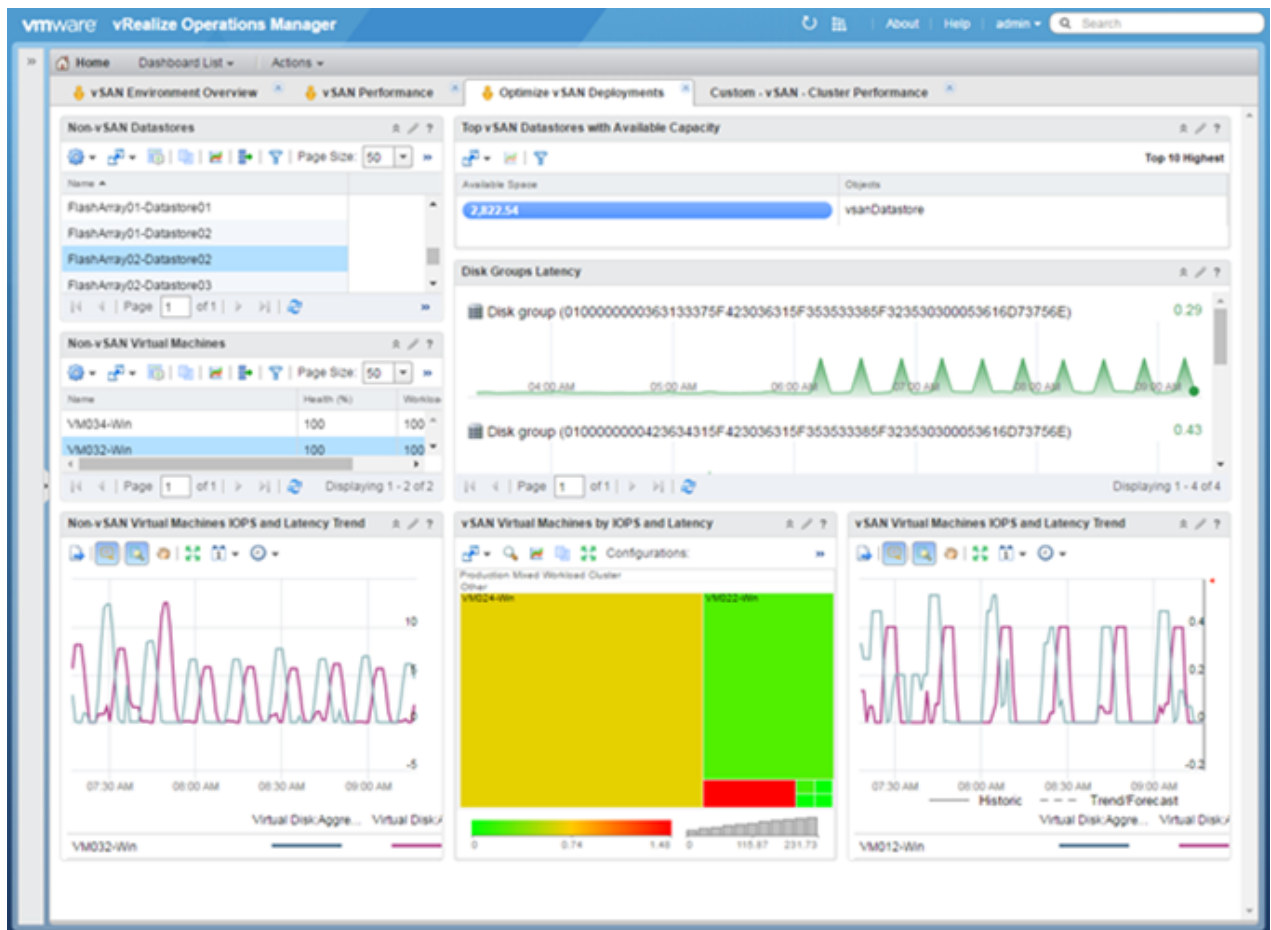
- Wider array of metrics collected for easier troubleshooting
- Now includes metrics for vSAN network, resync, iSCSI, and client cache
- Save a defined time range
- Special “verbose mode” to assist in support engagements

### **Details:**

- “Verbose mode” toggled on/off in the vSAN Performance service dialog
- Ability to save/query time range on performance monitoring history
- New host metrics for individual vSAN VMkernel Adapters, with breakdowns for:
  - Network Adapter Throughput
  - Network Adapter Packets per second
  - Network Adapter Pack Loss Rate
- New host metrics for aggregate (per host) vSAN VMkernel Adapters, with breakdowns for:
  - Network Adapter Throughput
  - Network Adapter Packets per second
  - Network Adapter Pack Loss Rate
- New host metrics for vSAN Disk Group, with breakdowns for:
  - Resync IOPS
  - Resync Throughput
  - Resync Latency
- New host metrics for VM local client cache hit rate
- New metrics for iSCSI
- Special “verbose mode” performance monitoring for engagements with GSS

### **vRealize Operations Management Pack for vSAN**

Integration is a key benefit of VMware’s implementation of an SDDC. vSAN plays a significant part in this path to an SDDC. VMware vRealize Operations (vR Ops) is a great example of how this integration can be exploited. Using the vR Ops Management for vSAN, the same level of monitoring and analytics for vSphere is easily extended to vSAN. Let vR Ops provide the insight needed to make smart design, operation, and optimization decisions.



## Overview

vR Ops MP for vSAN

- Visibility and Analytics to vSAN related metrics
- Prebuilt dashboards
- Easily customize to expose any type of vSAN data. (write buffers, etc.)
- Display vSAN and non vSAN metrics together

## Details:

vR Ops MP for vSAN

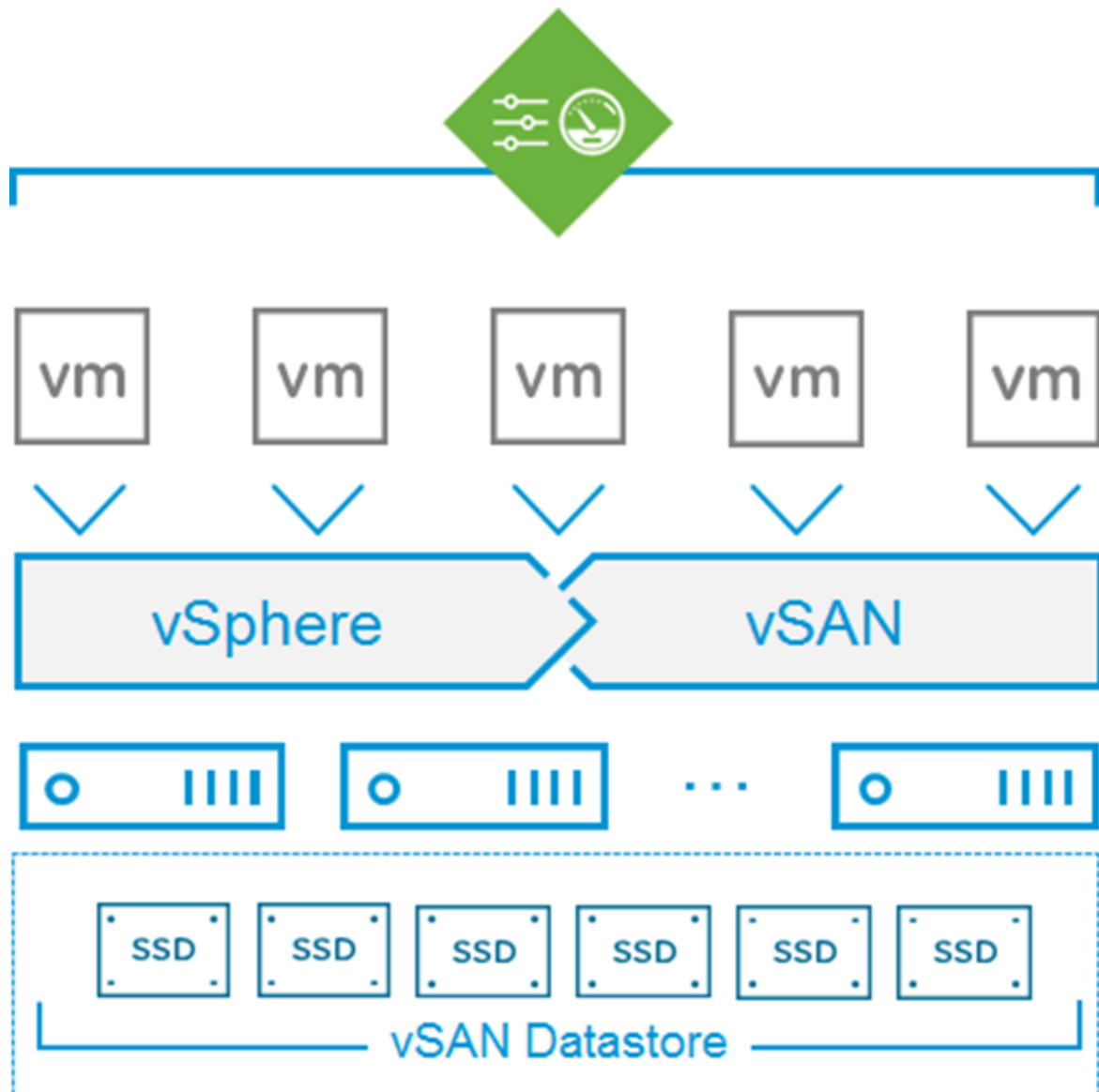
- Extends visibility and analytics to vSAN information to vR Ops using Mgmt pack framework
- Prebuilt dashboards focus on design, operations, and optimization of environment
- Customization allows user to configure dashboards to use any type of vSAN data. (write buffers, etc.)
- Standalone Mgmt pack for vSAN means it is no longer tied to Management Pack for Storage Devices (MPSD)
- Mgmt pack for vSAN can be used with vR Ops Std Edition

## Scale to tomorrow – power new applications and hardware

Having a scalable infrastructure that can easily accommodate change is the key to a successful data center. New services require new demands of the data center. The ability to adapt a data center to these next generation services using next generation hardware has historically been very difficult, and expensive. Let's take a look at how vSAN 6.6 can scale to tomorrow by powering new applications and hardware:

## vSAN Performance Enhancements

vSAN™'s performance and efficiency is unmatched to any other solution in the industry. In order to accommodate more demanding workloads, a number of optimizations have occurred in vSAN™ 6.6. Whether it be data services such as deduplication and compression, or back-end I/O handling by the object managers, vSAN™ 6.6 improves on performance throughout the stack to deliver better performance, more consistently.



### Overview:

- Reduced overhead of checksum, particularly on read requests
- Improved deduplication and compression
- Destaging optimizations
- Object Manager file system improvements
- More accurate cache sizing guidelines

### Details:

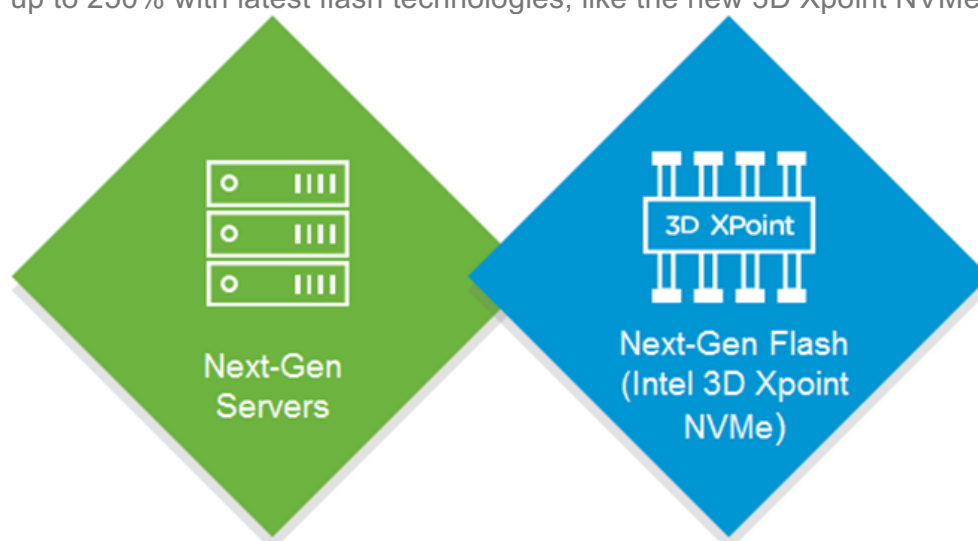
- Improved checksum
- Checksum read and write paths have been optimized to avoid redundant table lookups and also takes a very optimal path to fetch checksum data. Checksum reads are the significant beneficiary

- Improved deduplication
- Destages in log order for more predictable performance. Especially for sequential writes
- Optimize multiple I/O to the same Logical Block Address (LBA). Increases parallelization for dedup.
- Improved compression.
- New efficient data structure to compress meta-data writes. Meta-data compaction helps with improving performance for guest and backend I/O.
- Destaging optimizations
- Proactively destage data to avoid meta-data build up and impact guest IOPS or re-sync IOPs. Can help with large number of deletes, which invoke metadata writes.
- **More aggressive destaging can help in write intensive environments**, reducing times in which flow control needs to throttle
- Applies to hybrid and all flash
- Object management improvements (LSOM File System)
- Reduce compute overhead by using more memory
- Optimize destaging by reducing cache/CPU thrashing
- iSCSI for vSAN™ performance improvements made possible by:
- Upgraded edition of FreeBSD used in vSAN™. vSAN™ 6.5 used FreeBSD 10.1. vSAN™ 6.6 uses version 10.3
- General improvements of LSOM

### Scale to Tomorrow with Latest Hardware Innovations

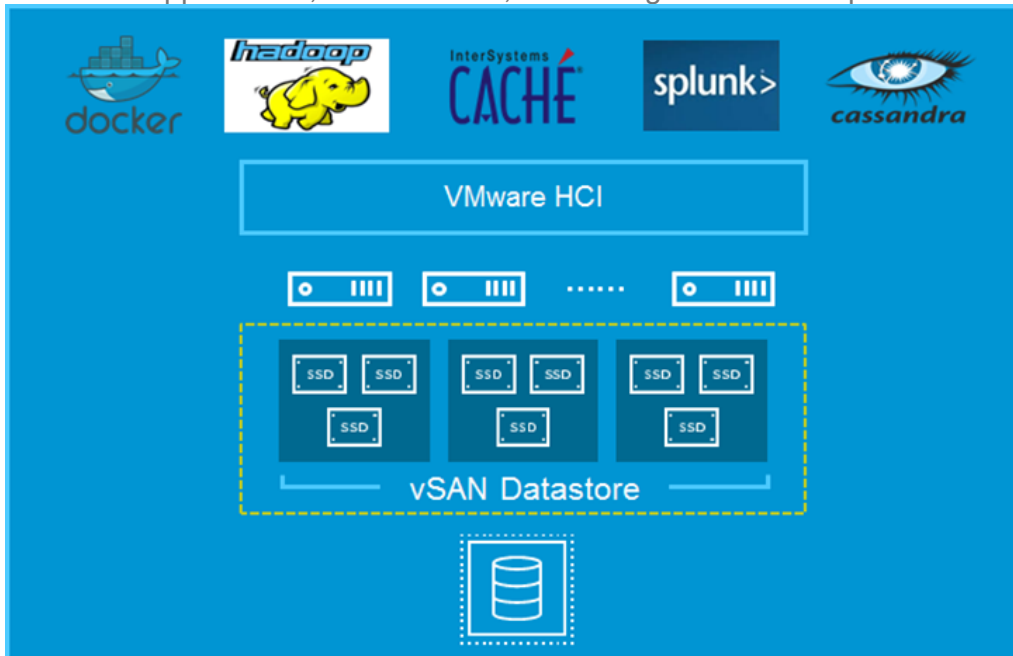
Accelerate new hardware adoption with Day 0 support of the latest flash technologies. Expedite next-generation applications that are sequential-write intensive such as big data up to 250% with latest flash technologies, like the new 3D Xpoint NVMe drives from Intel. The broad choice of new hardware platforms and strong ecosystem of vSAN™ provides the fastest path to next-generation server platforms and flash devices. vSAN™ 6.6 also provides larger caching drive options, including 1.6TB flash drives, so that customers can take advantage of the latest and larger capacity flash drives

Expedite next-generation applications that are sequential-write intensive such as big data up to 250% with latest flash technologies, like the new 3D Xpoint NVMe drives from Intel.



## New Apps and Hardware

vSAN's ability to deliver supreme performance and efficiency is one reason behind its ability to deliver next generation applications. Large applications like SAP, or Hadoop now can be found as reference architectures. vSAN is tightly integrated with the ability to run cloud native apps using cluster managers such as Mesos, Kubernetes, and Swarm. It's this flexibility that allows organizations to adopt a blend of workload types, whether they be traditional applications, or containers, all running on the same platform.



### Overview:

- Deliver enhanced enterprise features and additional application support for wider uses
- New SSD and server support
- Photon 1.1 with vSAN

### Details:

- Reference Architectures showcasing:
  - InterSystems Caché
  - Hadoop and Big Data
  - XenDesktop/XenApp
- Latest hardware
- Intel 'Cold Stream' NVMe drives
- HP Apollo and Synergy Servers

## How Do I Get Started with Virtual SAN Today??

- [vmware.com/go/virtual-san](https://vmware.com/go/virtual-san)
- [Virtual SAN Datasheet](#)
- [Virtual SAN Customer References](#)
- [Virtual SAN Assessment](#)
- [VMware Storage Blog](#)
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