

# The Easier Path to the Hybrid Cloud - Using Hitachi Virtual Storage Platform with VMware Cloud Foundation and VMware Virtual Volumes

## Reference Architecture Guide

By Hitachi Vantara

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## Feedback

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## Revision History

Revision	Changes	Date
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# The Easier Path to the Hybrid Cloud - Using Hitachi Virtual Storage Platform with VMware Cloud Foundation and VMware Virtual Volumes

## Reference Architecture Guide

Use this reference architecture guide to design and configure your [Hitachi Unified Compute Platform RS](#) system with VMware vVols capability, with the following:

- [Hitachi Unified Compute Platform HC](#)
- [Hitachi Unified Compute Platform CI](#)
- [Hitachi Virtual Storage Platform](#)
- [VMware Cloud Foundation](#)

## Executive Summary

The following are key benefits of the new architecture:

- A flexible hybrid cloud to improve performance, enhance simplicity, and reduce costs.
- Enterprise-ready turnkey integrated solution to modernize legacy datacenters.
- A scalable software-defined datacenter (SDDC) solution for general-purpose, tier-1, and test/dev workloads.
- Maximized investments in external SAN while embracing hybrid cloud benefits.
- Accelerated application release cycles with native Kubernetes orchestration and management capabilities with VMware Tanzu.
- Seamless workload mobility between on-premises and key public clouds to provide the most optimal infrastructure for the workload that delivers on performance, availability, and costs.
- Automated software and firmware upgrades with Hitachi Unified Compute Platform Advisor and SDDC Manager that eliminates performance bottlenecks and keeps the stack updated.

Use the [online demo center](#) to experience the next-gen hybrid cloud solutions and take your IT strategy to the next level.

## Overview

As your business demands faster delivery of new services, there is the complexity and cost of deploying and managing the technology resources to support them. Many IT departments spend almost a quarter of their time and resources evaluating and installing increasingly disparate hardware components.

Furthermore, the lack of a unified management framework and the need for highly specialized individuals who can design, configure, optimize, test, and manage each component increases your cost, complexity, and risk. Hybrid cloud operating model combines the agility and speed of cloud while retaining control and visibility of on-premises infrastructure. It provides flexibility to extend workloads to public clouds while delivering a consistent operational experience.

Hitachi Vantara and VMware have collaborated to accelerate your journey to the hybrid cloud by introducing Hitachi Unified Compute Platform RS (UCP RS), a VMware Cloud Foundation (VCF) certified integrated system. To learn more about the fundamentals of UCP RS and VCF, see this previously co-published [reference architecture paper](#).

VCF 4.1, 4.2, and later releases bring in support for VMware vSphere Virtual Volumes (vVols). This allows Hitachi Virtual Storage Platform (VSP) storage systems to surface many of its benefits such as simplicity, agility, granular object-level services, and just-in-time provisioning. It also preserves its enterprise advantages to support tier-1 applications and allows 3D scaling.

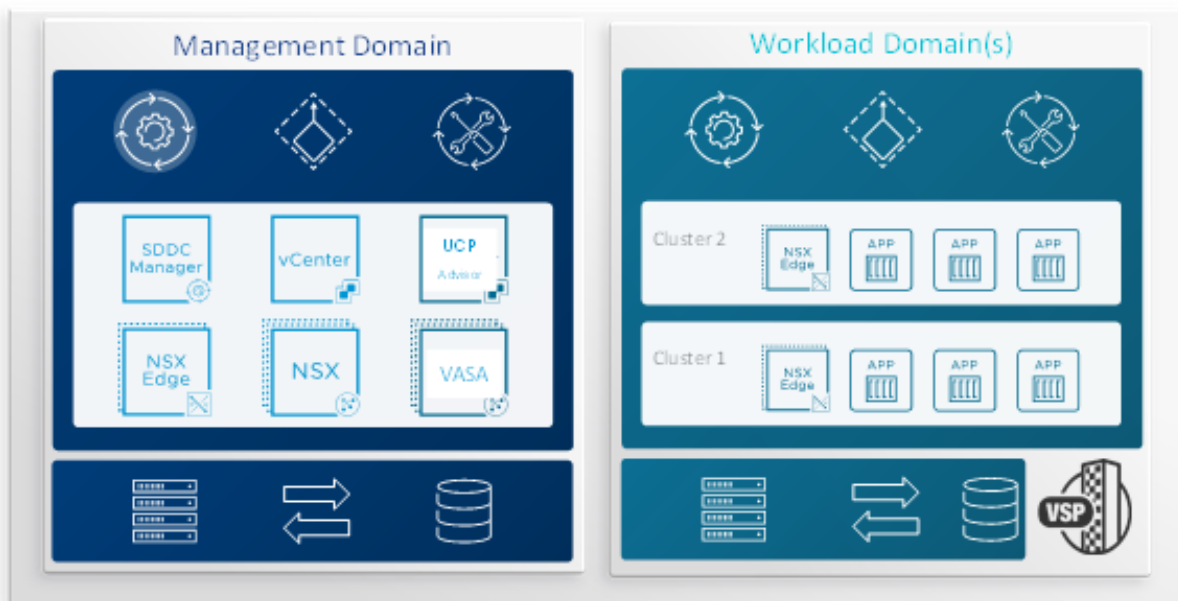
Through the VMware APIs for Storage Awareness (VASA), Hitachi Storage Provider for VMware vCenter enables software-defined storage integration into the VMware Storage Policy Based Management (SPBM) framework. This integration into VCF allows many capabilities only available with VMware hyperconverged infrastructure (HCI) storage.

With its pre-validated building blocks of compute, storage, and networking, the UCP RS architecture with VCF, VSP storage, UCP HC nodes, and UCP Advisor is guaranteed to work together as a VMware certified VCF Integrated system. This integrated system delivers an agile hybrid cloud environment with predictable, efficient, reliable, and scalable performance and operations. The path to enable a private cloud leverages UCP RS to transform a traditional datacenter into a modernized software-defined datacenter (SDDC) and onwards to a hybrid cloud architecture.

Hitachi Vantara integrates Hitachi Virtual Storage Platform (VSP) with Hitachi Unified Compute Platform RS. This integration provides the flexibility to use the correct storage platform to deploy hybrid cloud for your business needs. The following types of compute nodes are available:

- UCP HC with internal disks without HBAs (hyperconverged nodes)
- UCP CI node with HBAs for Fibre Channel storage connectivity
- A combination of UCP HC nodes with Fibre Channel HBAs connecting to Fibre Channel storage

Hybrid cloud with a disaggregated hyperconverged storage architecture allows you the autonomy to resize your compute and storage independently and to better serve your IT strategy. Hitachi Unified Compute Platform Advisor with VMware SDDC Manager automates provisioning, management, and life-cycle management of software and hardware on Hitachi Unified Compute Platform RS; they are the heart and the brain of UCP RS and deliver cloud-like Infrastructure-as-a-Service (IaaS) automation. All-in-all, this architecture offers unprecedented agility, security, consistency, repeatability, and flexibility.



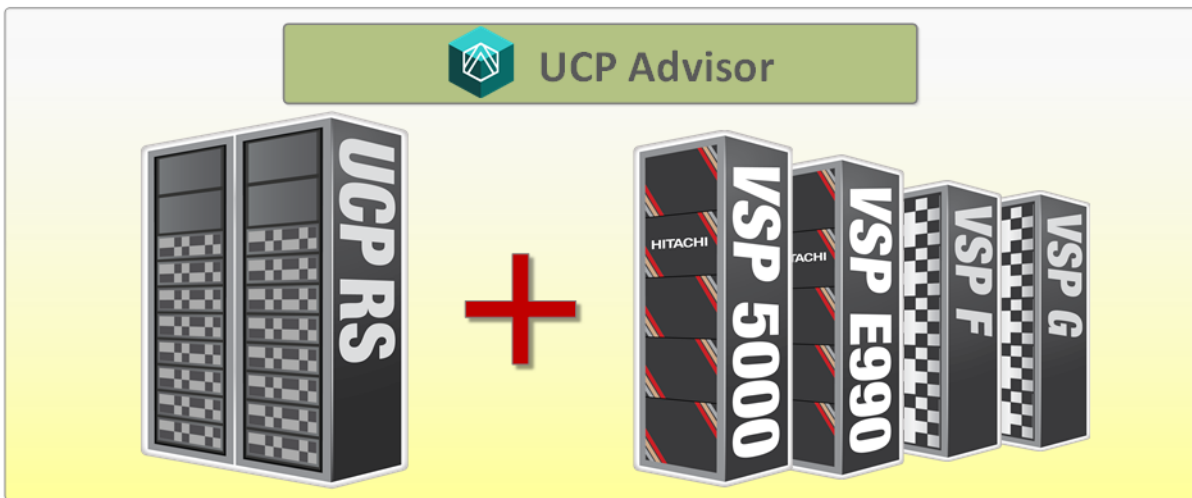
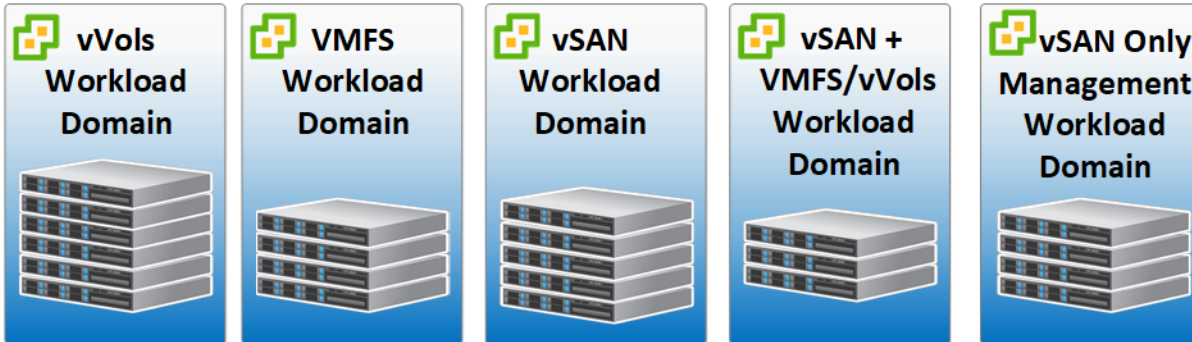
## VMware Cloud Foundation

Hitachi VSP is now a natural part of VCF deployment with VCF's native integrations with Hitachi VASA Provider for flexible integrated policy-based storage provisioning and UCP Advisor to extend lifecycle management, this provides a unique combination to meet varied use cases and outcomes.

## Solution Overview

To simplify your hybrid cloud journey, Hitachi Unified Compute Platform RS provides a turnkey solution. This solution reduces the total cost of ownership (TCO) in deploying and operating an on-premises cloud with VMware Cloud Foundation with an on-ramp to hybrid cloud. It also improves security and availability of SLAs. This paper reviews the flexible storage choices integrated with VMware Cloud Foundation utilizing Hitachi Virtual Storage Platform and Unified Compute Platform Converged Infrastructure innovations.

The following figure shows the workload domain options available on Hitachi Unified Compute Platform RS with VMware Cloud Foundation.



**Hitachi Unified Compute Platform (UCP) Stack**

Starting with VMware Cloud Foundation 4.1, you can use storage container-based vVol datastores from external storage as principal storage in a workload domain. SDDC Manager enables this integration between VMware Cloud Foundation and Hitachi Virtual Storage Platform series in a UCP RS stack by automating key tasks around Hitachi Storage Provider. UCP RS provides the following VCF workload domain options for storage:

- **vVols Workload Domain** — vVols from VSP storage systems as principal storage.
- **VMFS Workload Domain** — VMFS datastore from VSP storage systems as principal storage.
- **vSAN Workload Domain** — VMware vSAN datastore as principal storage. VCF management workload domain requires this type of storage.
- **vSAN + VMFS/vVols Workload Domain** — A combination of VMware vSAN datastore as principal storage and VMFS/vVols datastore from VSP storage systems as a supplement storage.

This solution also includes Hitachi Unified Compute Platform Advisor, which is a comprehensive management and automation software that simplifies infrastructure management and operations. Seamless integration allows automated provisioning of the Unified Compute Platform systems, providing the following features:

- Manage, compute, network, and storage from one view.
- Automate external SAN infrastructure configuration and provisioning.
- Smart life cycle management for firmware (including BMC and IO cards) and EFI BIOS upgrade on compute, network, and Fibre Channel switches.
- Element visibility and troubleshooting.

Unified Compute Platform Advisor provides pertinent information, allowing you to manage operations for connected devices.

## Solution Benefits - UCP RS with VCF

Hitachi Unified Compute Platform RS provides the following advancements and benefits:

- Deploy private cloud on top of advanced Hitachi Vantara Unified Compute Platform HC as a key component to deliver and simplify growth with a wide range of CPU and memory configurations to meet your workload needs.
- Automate software-defined storage deployment with VMware vSAN.
- Automate software-defined networking deployment with VMware NSX.
- Future-proof your infrastructure to run any application on virtualized, cloud native, artificial intelligence, or machine learning workloads.
- Support external SAN storage on Hitachi Virtual Storage Platform.
- Have complete end-to-end management, including compute nodes, storage, and networking, with Hitachi Unified Compute Platform Advisor.
- Optimize performance and eliminate over-provisioning costs with a highly configurable and integrated infrastructure.
- Support high availability and reliability with enterprise-class hardware components and preconfigured resilient architectures.
- Achieve data resilience and scalability using VMware vSAN and the industry-leading Hitachi Virtual Storage Platform hybrid and all-flash arrays.

**TABLE 1. INFRASTRUCTURE USE CASES TO CONSIDER WHEN DECIDING STORAGE OPTIONS**

Use Case	vVols Workload Domain	VMFS Workload Domain	vSAN Workload Domain	vSAN + VMFS/vVols Workload Domain
▪ Mission-critical low latency Tier1 applications	Yes	Yes		Yes
▪ Use Storage Policy Based Management (SPBM) to enable software defined storage	Yes	Yes	Yes	Yes
▪ Start small with lower initial cost			Yes	
▪ Require larger storage capacity than compute requirements for the vSphere cluster	Yes	Yes		Yes
▪ More choice of storage tiers	Yes	Yes		Yes
▪ Rebalance available vSAN storage capacity from under-utilized vSAN cluster to over-utilized vSAN cluster (vSAN HCI Mesh)			*	
▪ Additional capacity expansion on vSAN cluster without adding HCI nodes				Yes
▪ Replication with near zero RPO	Yes	Yes		
▪ Replication with 5-15 minutes RPO	Yes	Yes	Yes	Yes
▪ Metro Storage Cluster	**	Yes	Yes	Yes
▪ Multi-layer snapshots with no performance degradation	Yes	Yes		

\*Requires vSAN Enterprise licenses; HCI Mesh is only available in VCF 4.2 and later, and only works with vSAN clusters within the same VCF Workload domain.

\*\*Consult VMware for a roadmap.



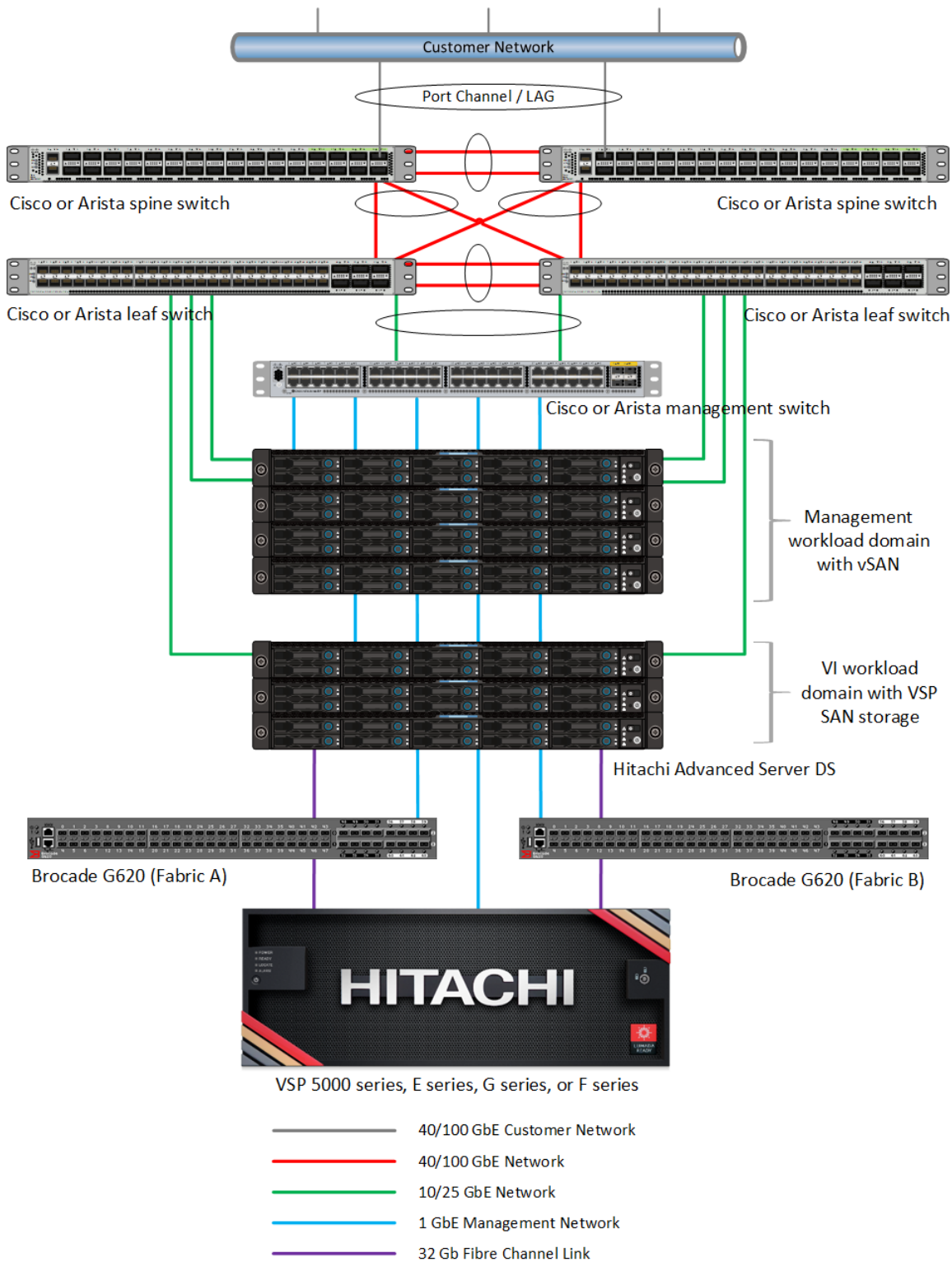
## Solution Design Components

This is the Hitachi Unified Compute Platform configuration used for this reference architecture.

### Infrastructure Components

The following figure shows high availability configuration of Hitachi Unified Compute Platform RS solution including following components:

- Two Cisco 9332C or Arista 7050CX3 spine Ethernet switches.
- Two Cisco 93180YC-FX or Arista 7050SX3 leaf Ethernet switches.
- One Cisco 92348 or Arista 7010T management switch.
- Four Hitachi DS120 for VCF management nodes. vSAN Ready Node Certified as UCP HC V120-series, UCP HC V120F, UCP HC V121F, UCP HC V123F, or UCP HC V124N.
- Three or more Hitachi DS120, DC220, DS225, DS240 for VCF virtual infrastructure workload domain nodes.
  - For vSAN compute nodes, leverage supported internal drives. These computed nodes are vSAN Ready Node Certified as UCP HC V120-series/V120F/V121F/V123F/V124N, UCP HC V220-series/V220F, UCP HC V225G, or UCP HC DS240, respectively.
  - For vVols or VMFS compute nodes, leverage HBA PCIe card, which is optionally configured together with the UCP HC vSAN Ready nodes above, or when configuring UCP Fibre Channel-only nodes, in UCP RS.
- One or more Hitachi VSP storage systems.



For more information regarding the Unified Compute Platform RS configurations, see [Unified Compute Platform RS with VMware Cloud Foundation Quick Start Guide - Hitachi Vantara Knowledge](#).

The configuration with Hitachi Virtual Storage Platform is described in Unified Compute Platform CI. For more information regarding Unified Compute Platform CI configurations, see [Hitachi Unified Compute Platform CI for VMware vSphere Reference Architecture Guide](#).

Table 2 lists additional information about the components used for validation.

**TABLE 2. HARDWARE COMPONENTS**

Hardware	Description	Version	Quantity
Hitachi Advanced Server DS120 Compute node for VCF management workload domain	<ul style="list-style-type: none"> <li>▪ 2 Intel Xeon 6240R, 2.40 GHz processor</li> <li>▪ 8 × 32 GB DIMM, 128 GB memory</li> <li>▪ 128 GB SATADOM (boot)</li> <li>▪ Intel X527-DA4 10 GbE quad-port NIC</li> <li>▪ The cache tier includes a single Intel SSD S4610 (960GB, U.2) drive</li> <li>▪ The capacity tier includes four Intel SSD S4510 (1.92TB, U.2) drives</li> </ul>	BMC: 4.65.06  BIOS: S5BH3B16.H01	4
Hitachi Advanced Server DS220 Compute node for VCF VI workload domain	<ul style="list-style-type: none"> <li>▪ 2 Intel Xeon 8268, 2.90 GHz processor</li> <li>▪ 8 × 32 GB DIMM, 128 GB memory</li> <li>▪ 128 GB SATADOM (boot)</li> <li>▪ Emulex LPe3200 32 Gb/s dual-port PCIe HBA</li> <li>▪ Intel X527-DA4 10 GbE quad-port NIC</li> <li>▪ If VMware vSAN is configured:               <ul style="list-style-type: none"> <li>▪ The cache tier includes two Intel Optane SSD DC P4610 (1.6TB, U.2) NVMe drives</li> <li>▪ The capacity tier includes six Intel SSD DC S4510 (1.92TB, U.2) drives</li> </ul> </li> </ul>	BMC: 4.65.06  BIOS: S5BH3B16.H01	3
Hitachi Virtual Storage Platform 5500	<ul style="list-style-type: none"> <li>▪ 2 TB cache</li> <li>▪ 24 × 1.9 TB NVMe drives used</li> <li>▪ 4 × 32 Gb/s Fibre Channel ports used</li> </ul>	90-05-02-00/01	1

**TABLE 2. HARDWARE COMPONENTS (CONTINUED)**

Hardware	Description	Version	Quantity
Hitachi Virtual Storage Platform G600	<ul style="list-style-type: none"> <li>▪ 512 GB cache</li> <li>▪ 24 × 10K SAS drives used</li> <li>▪ 4 × 32 Gb/s Fibre Channel ports used</li> </ul>	83-05-39	1
Cisco Nexus 9332C switch (spine)	<ul style="list-style-type: none"> <li>▪ 32-port 40/100 GbE</li> <li>▪ 2-port 1/10 GbE</li> </ul>	9.2.3	2
Cisco Nexus 93180YC-FX switch	<ul style="list-style-type: none"> <li>▪ 48-port 10/25 GbE</li> <li>▪ 6-port 40/100 GbE</li> </ul>	7.0(3)I7(6)	2
Cisco Nexus 92348 switch	<ul style="list-style-type: none"> <li>▪ 48-port 1 GbE</li> <li>▪ 4-port 1/10/25 GbE</li> <li>▪ 2-port 40/100 GbE</li> </ul>	9.3.1	1
Brocade G620 switch	<ul style="list-style-type: none"> <li>▪ 48-port 16/32 Gbps Fibre Channel switch</li> </ul>	8.2.1c	2

Hitachi Unified Compute Platform hardware options are described in “Product Descriptions” on page 36.

## Software Components

Table 3 lists the key software components.

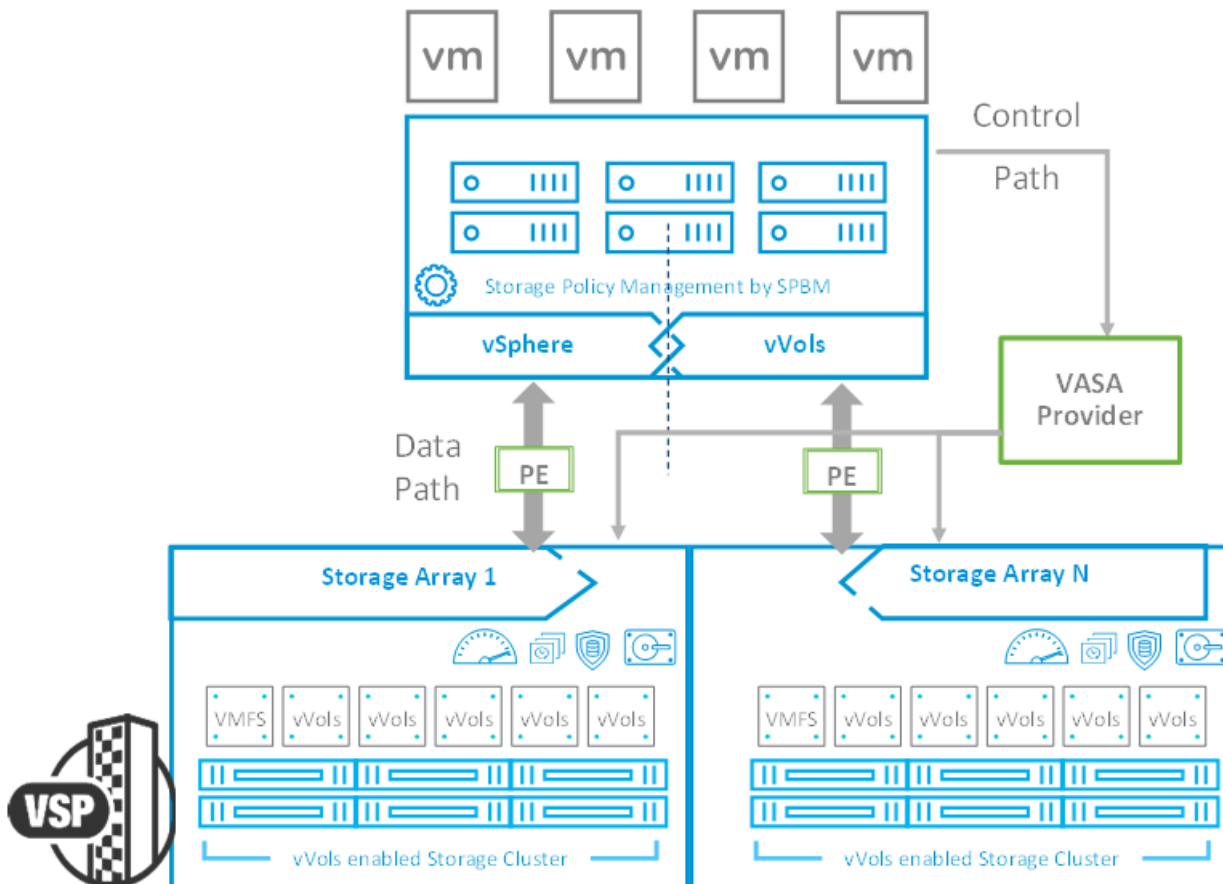
**TABLE 3. SOFTWARE COMPONENTS**

Software	Version
Hitachi Storage Virtualization Operating System RF	90-05-02-00/01 83-05-39
Hitachi Unified Compute Platform Advisor	3.10.0
Hitachi Storage Provider for VMware vCenter	3.5.9
VMware Cloud Foundation	4.1.0, 4.2.0
VMware vSphere	7.0.1

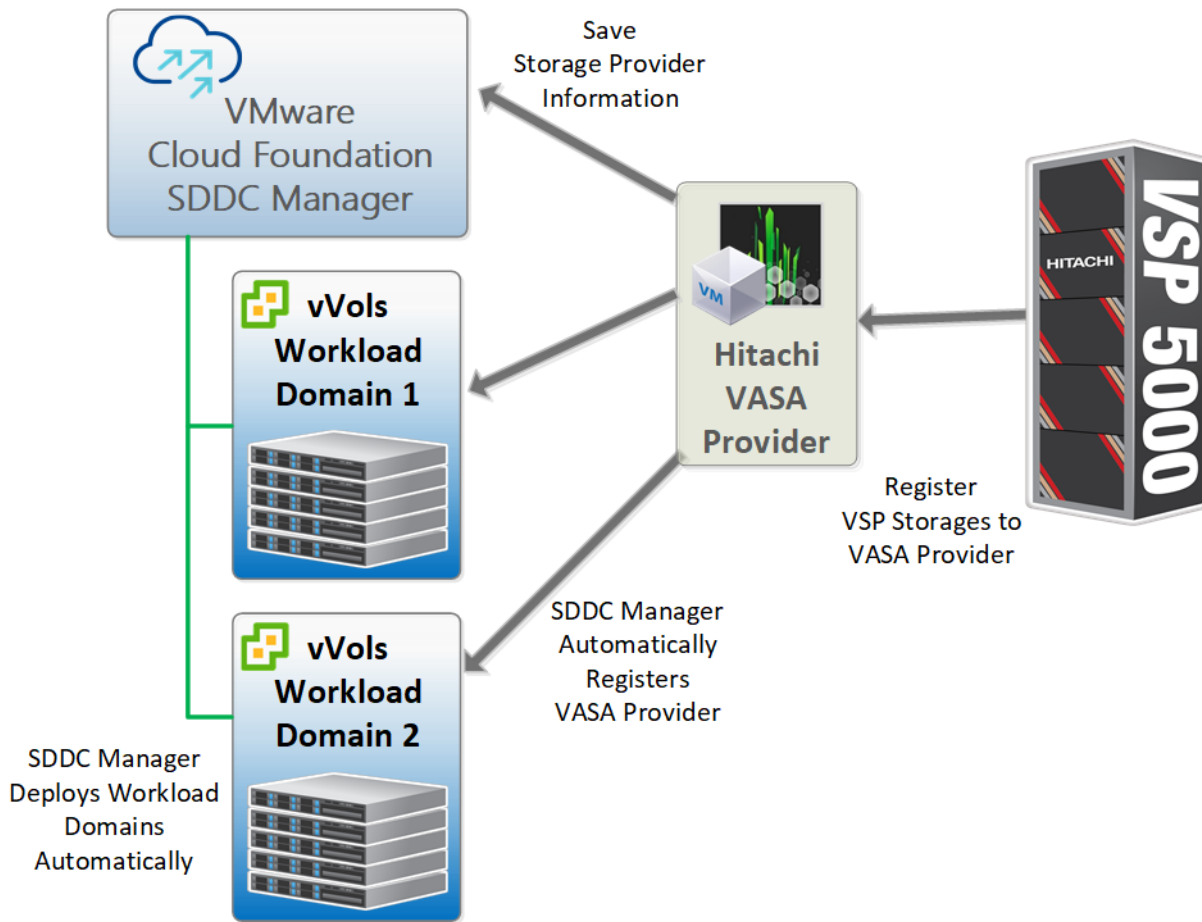
# Hitachi Storage Provider for VMware vCenter Deployment

Hitachi Storage Provider for VMware vCenter is deployed as an OVF virtual appliance with the following features:

- A single VASA provider manages multiple VSP storage systems, as shown in the figure below.
  - One or more storage containers per VSP storage system.
  - A storage container is mapped to a resource group in VSP.
- A single VASA provider can also be shared with multiple vCenters.



The following figure shows the relationship between VCF and Hitachi VASA provider.



See the following links for detailed information on deploying Hitachi VASA Provider to enable a vVols environment or automating policy-based management for VMFS datastores:

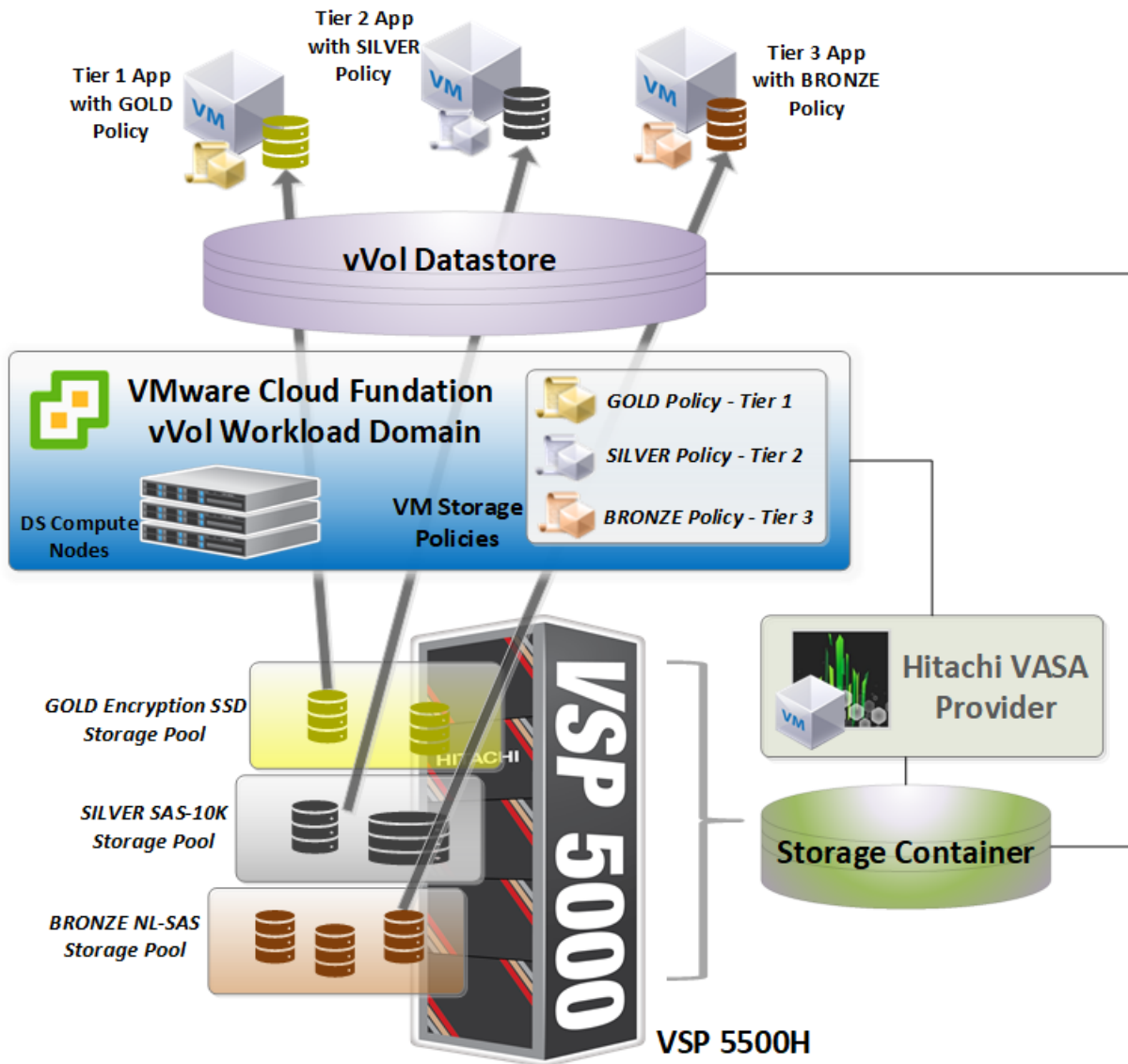
[VMware vSphere Virtual Volumes \(vVols\) with Hitachi Virtual Storage Platform Quick Start and Reference Guide | Hitachi Vantara](#)

[Storage Provider for VMware vCenter - Hitachi Vantara Knowledge](#)

## VMware vVols and Storage Policy Based Management (SPBM)

Hitachi Storage Provider for VMware vCenter enables organizations to deploy Hitachi Storage infrastructure with VMware vSphere Virtual Volumes (vVols) to bring customers on a reliable enterprise journey to a software-defined, policy-controlled data center.

Hitachi storage policy-based management allows automated provisioning of virtual machines (VM) and quicker adjustment to business changes. Virtual infrastructure (VI) administrators can make changes to policies to reflect changes in their business environment, dynamically matching storage-policy requirements for VMs to available storage pools and services. The vVols solution reduces the operational burden between VI administrators and storage administrators with an efficient collaboration framework leading to faster and better VM and application services provisioning. The following figure provides an overview of vVols on VCF vVols workload domain.



In this example, three storage pools are created on VSP 5500H by UCP Advisor.

**TABLE 4. EXAMPLE OF HITACHI VIRTUAL STORAGE PLATFORM 5500H STORAGE POOLS**

Storage Pool Name	Disk Type	Usage and Capability
GOLD Encryption SSD	SSD	High performance, high data protection with encryption.
SILVER SAS-10K	SAS 10K RPM	Mid performance. General use.
BRONZE NL-SAS	SAS 7.2K RPM	High capacity, lower performance, and cost effective.

The different types of storage pools meet the following types of application demands:

- Virtual Storage Platform 5500H and VSP G series provide different storage pools with different capability levels.
- Hitachi VASA provider is registered in VCF vVols workload domain vCenter.
- Hitachi VASA provider hosts a single storage container that contains the information and capabilities of three storage pools from VSP 5500H.
- On the vVols workload domain vCenter, a single vVol Datastore is created based on the storage container from VASA provider.
- VM applications require different storage requirements.
- On the vVols workload domain vCenter, VI administrators create the following VM storage policies:
  - GOLD policy for high performance tier1 applications
  - SILVER policy for mid performance tier2 applications
  - BRONZE policy for low performance tier3 applications
- VI administrators attach the desired VM storage policy to the VM.
- VASA provider matches the VM storage policy with the appropriate storage pool in VSP 5500H.
- The vVols are automatically provisioned from the appropriate storage pool that fits the application requirements.

You can find the validation of a similar example in “VASA Storage Policy with vVols - Example” on page 27.

## Hitachi Unified Compute Platform Advisor

When you use VMFS datastores as part of a workload domain, all VSP storage operations are performed outside of VMware SDDC Manager. These LUNs are not managed by VMware Cloud Foundation.

An advantage of a Hitachi Unified Compute Platform RS with Hitachi Virtual Storage Platform architecture, when comparing with other VMware Cloud Foundation plus external storage validated solutions from other infrastructure vendors or system integrators, is in the ease of SAN storage provisioning and SAN storage management using Hitachi Unified Compute Platform Advisor, even when vVols are not used.



These include the following:

- Creating, presenting, expanding, and removing LUNs.
- Configuring and lifecycle-managing the Fibre Channel or IP network switches.
- Orchestration and provisioning features provided by UCP Advisor's central panel and extended by the UCP Advisor Rest API.
- 100% parity with the UI, offering further automation integrations into cloud management portals such as VMware vRealize Automation.

Without UCP Advisor, a typical non-vVol storage provisioning request on VCF would take approximately twenty plus steps that will span multiple hours to complete, and be performed by two operational teams — the SAN admin and vCenter admin. This also requires opening a service ticket and waiting for management approvals. But with UCP Advisor, this process is now transformed into a highly automated and agile operation. This is why the hyperconverged infrastructure has become a cloud-enabler technology, but UCP Advisor enables Hitachi VSP SAN storage to inherit the same cloud benefits on VCF as hyperconverged infrastructure clusters do with vSAN.

An example of a high-level UCP Advisor workflow would be a use case where an existing VCF workload domain requires more storage to deploy new virtual machines.

In order to provision a new VMFS datastore, UCP Advisor will first ensure that the Fibre Channel zoning and host groups are all properly configured for all the ESXi hosts in the VCF workload domain.

Then by just providing a few inputs, UCP Advisor will automate the rest for you:

1. The datastore name.
2. The volume size.
3. The array you want to provision from.
4. The storage pool to use.
5. The resource group.
6. Use Compression/dedupe, Y/N.
7. Select the vSphere DRS cluster to provision volume to.
8. Advanced optional feature Customize the LUN path; if you want to present the data volume to a particular host group, then you can drill down and specify the LUN path for the volume.
9. Click **Submit**.

After you click **Submit**, the following tasks are automated:

1. Scan host groups for all the selected servers, on the selected VSP storage.
2. Provision the volume with the specified capacity.
3. Verifies user settings like dedupe/compression.
4. Finds all of the host groups to confirm the correct host mode for VMware and host group options.
5. Present volume to all the host groups in the DRS cluster.
6. Identify consistent LUN across the host group.
7. Use the consistent LUN ID to present the volume.
8. Rescan all the vSphere hosts.
9. Verify that the LUN is visible on the ESXi hosts.
10. Format datastore as VMFS.
11. Rescan all the hosts again for newly formatted VMDS datastore.

In a few minutes, the VCF Workload Domain has more storage capacity available. The tenant that is the vCenter Admin for this workload domain is ready to deploy new VMs or migrate existing VMs to this new externally connected datastore, hosted on a Hitachi VSP storage.

Quick takeaway: With UCP Advisor, these provisioning steps are **AUTOMATED, REPEATABLE CONSISTENTLY** with no human errors, and on average take about 120 seconds to complete, rather than 2+ hours across two operational teams or people, thus enabling **CLOUD AGILITY** with high operational efficiency. Again, if you are using vVols datastore, you would have avoided all the LUN mgmt. tasks previously described but intent is to show that even if requirements mandate VMFS datastore, the burden is significantly reduced.

Let's now circle back on the discussion about Host Groups and Fibre Channel Zoning.

If you are using vVols datastore, then all the LUN management tasks would be avoided as previously described. The intent is to show that even if requirements mandate VMFS datastore, the burden is significantly reduced. UCP Advisor automates high-level workflows with agility and consistency, enables integrated lifecycle management of all the compute nodes and IP network switches for firmware upgrades of the best Composable Infrastructure systems in the market. UCP Advisor also manages the end-to-end Fibre Channel storage connectivity between the vSphere hosts in the VCF workload domains, and the external VSP storage arrays. This includes the mapping of Fibre Channel Host groups to the WWNs of the individual compute nodes, either Fibre Channel-only or hyperconverged infrastructure with disaggregated Fibre Channel supplemental storage, and the access assignment to specific storage target ports. UCP Advisor also communicates with the Brocade Fibre Channel switches integrated with UCP RS and configures the aliases and Fibre Channel zoning between the actual host initiator ports and the VSP storage target ports. This also applies to vVols environment where the protocol endpoint, also known as ALU, is in a host group that is accessible by the WWNs of the compute nodes.

The UCP Advisor REST API offers feature-parity with the main graphical user interface, these external storage management tasks and high-level workflows can easily be orchestrated and be tied into vRealize Automation blueprints to deliver a complete self-service portal for Infrastructure-as-a-Service business. The cloud experience is seamless whether you use vSAN or external SAN, because of the UCP Advisor management, life-cycle management, intelligent orchestration, and API extensibility features.

UCP Advisor can also unregister the LUNs when hosts are decommissioned by VMware SDDC Manager. All LUNs presented to these hosts must be removed when they are decommissioned, either using the Unified Compute Platform Advisor central panel or manually.

The following table lists infrastructure tasks that UCP Advisor and Hitachi VASA provider perform. It helps you to decide which type of datastore, VMFS, vVols, or vSAN is most suitable for your needs. It also helps you to visualize how UCP Advisor and the Hitachi VASA Provider complement each other to offer the flexibility when deploying new workload domains.

UCP Advisor provides integration to the entire hardware stack, seamlessly integrating with SDDC Manager and vSphere Lifecycle Manager (vLCM), which provide the lifecycle management for the entire VMware software stack.

**TABLE 5. UCP ADVISOR AND HITACHI VASA PROVIDER TASKS**

<b>Task</b>	<b>vVols Workload Domain</b>	<b>VMFS Workload Domain</b>	<b>vSAN Workload Domain</b>	<b>vSAN + VMFS/ vVols Workload Domain</b>
Configure LUNs for VMFS datastores	N/A	UCP Advisor	N/A	UCP Advisor
Configure Fibre Channel zoning	UCP Advisor	UCP Advisor	N/A	UCP Advisor
VSP storage configuration such as, storage pool creation, host groups creation, and LUN mapping	UCP Advisor	UCP Advisor	N/A	UCP Advisor
Configure Storage Capabilities or Storage based Tagging for SPBM	VASA Provider	VASA Provider	SPBM natively	VASA Provider
Firmware/BIOS update for Compute Nodes	UCP Advisor	UCP Advisor	UCP Advisor	UCP Advisor
Firmware update for network switches from Arista or Cisco	UCP Advisor	UCP Advisor	UCP Advisor	UCP Advisor
Firmware update for Brocade G620 Fibre Channel switches	UCP Advisor	UCP Advisor	N/A	UCP Advisor
UCP Advisor as a Hardware Support Manager (HSM plugin) for vSphere Lifecycle Manager (vLCM) to enable streamlined firmware upgrades of ESXi hosts	UCP Advisor	UCP Advisor	UCP Advisor	UCP Advisor

The following shows UCP Advisor as a Hardware Support Manager Plug-in for vSphere Lifecycle Manager (vLCM) to provide streamlined firmware upgrades on ESXi hosts:

Select Firmware and Drivers Addon ✕

vSphere integrates with hardware support managers to install the selected firmware and driver addon on hosts in your cluster as part of applying the image to the cluster.

Select the hardware support manager  
 Hitachi UCP Advisor ▼ ⓘ  
 Hitachi UCP Advisor as HSM for vSphere Lifecycle Manager (vLCM)

Select a firmware and driver addon

Addon name	Addon version	Support
UCPAdvisorNetworkFirmwareBundle-12152020	v3.10	7.0
UCPAdvisorComputeFirmwareBundle-02222021	v3.10	7.0

UCPAdvisorComputeFirmwareBundle-02222021 v3.10 ✕

*Hitachi Vantara*

UCPAdvisorComputeFirmwareBundle-02222021

Supported ESXi Versions  
7.0

No included driver components  
This Firmware and Driver Addon has no drivers bundled within. It only includes firmware.

CANCEL
SELECT

The following shows how UCP Advisor reports via its HSM plug-in for vLCM the compliance drift between the firmware versions running on the ESXi hosts and those available in the latest firmware bundle:

The screenshot shows the vSphere Client interface for an HSM Cert Cluster. The 'Updates' tab is active, displaying a table of software and firmware compliance for three hosts.

**Software compliance**

Image	Host Version	Image Version
ESXi Version	7.0 U1b - 17168205	7.0 U1b - 17168205
Vendor Addon	None	None
Firmware and Drivers Addon	None	UCPAdvisorComputeFirmwareBundle-02222021 v3.10

**Firmware compliance**

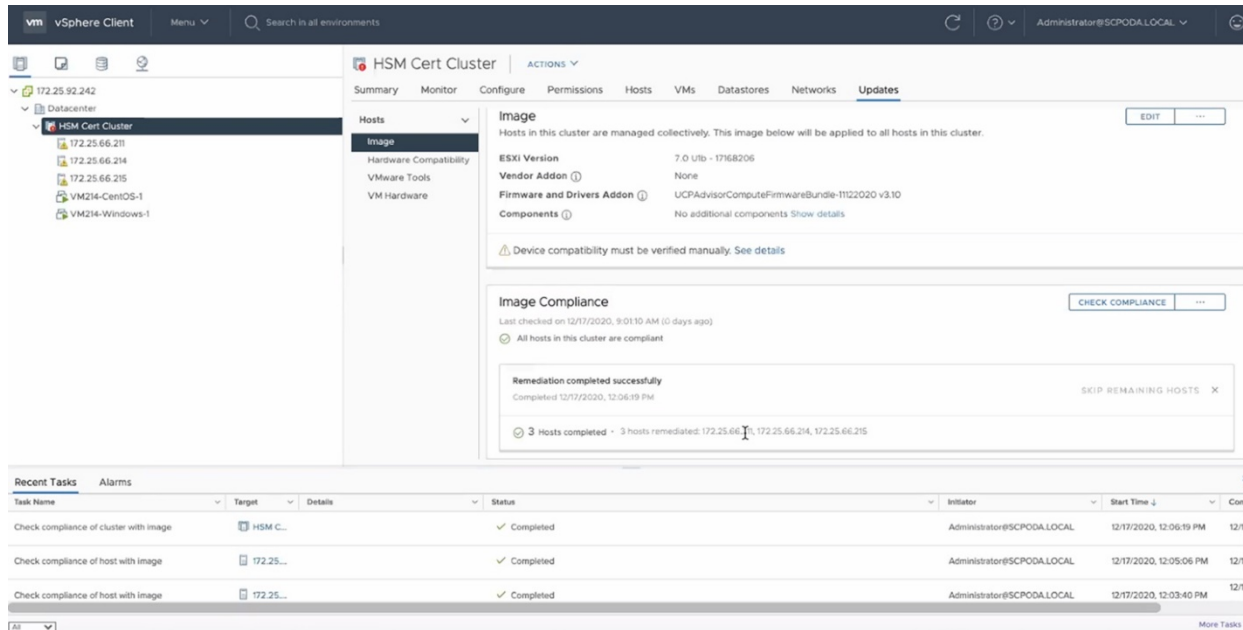
Firmware component	Host Version	Image Version
BIOS	55B43B18-H00	55B43B18-H00
BMC	4.66.06	4.67.06
CPLD	0.11	0.11

Components per page: 4 / 3 components

**Recent Tasks**

Target	Details	Status	Initiator	Start Time	Completion Time
Availability of cluster's hosts with	HSM C...	✓ Completed	Administrator@SCPOD.LOCAL	12/17/2020, 10:35:29 AM	12/17/2020, 10:36:00 AM
f cluster with image	HSM C...	✓ Completed	Administrator@SCPOD.LOCAL	12/17/2020, 10:34:15 AM	12/17/2020, 10:35:29 AM
luster	HSM C...	✓ Completed	Administrator@SCPOD.LOCAL	12/17/2020, 10:34:14 AM	12/17/2020, 10:34:15 AM

The following shows how all the vSphere hosts under a given DRS cluster were all remediated (FW-upgraded) together as one workflow from vLCM using UCP Advisor's HSM plug-in, to reach the compliant, desired state:



UCP Advisor reduces the complexity of SAN configuration, provisioning, and life cycle management by automating many tasks, and integrates tightly into the vSphere Lifecycle Manager framework via its own Hardware Support Manager (HSM) Plug-in. See [UCP Advisor - Hitachi Vantara Knowledge](#) for more information regarding UCP Advisor configurations.

## Solution Validation and Configuration Notes

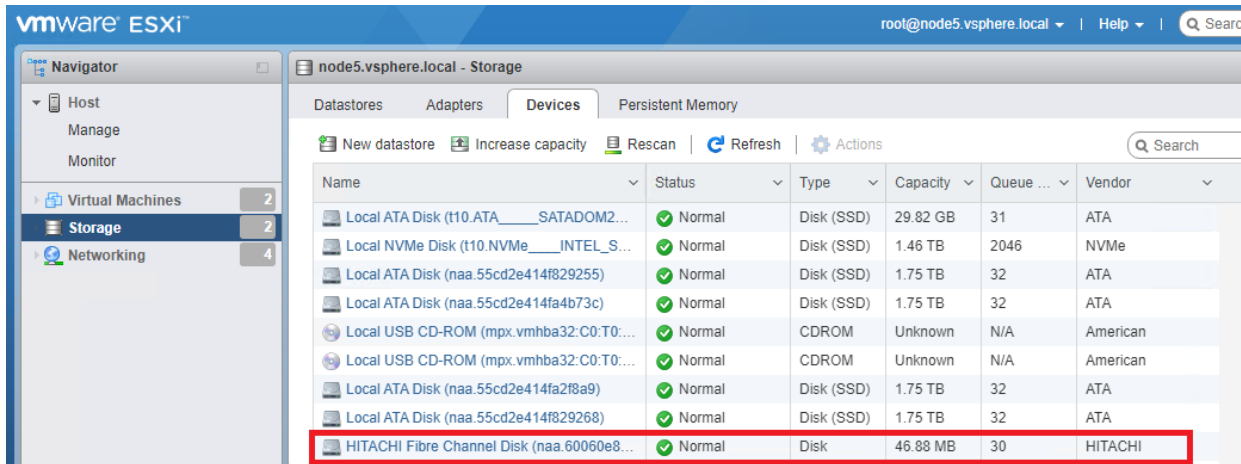
The following VMware Cloud Foundation virtual infrastructure (VI) workload domains have been deployed and validated successfully along with basic VM operations:

- Workload Domain with vVols as principal storage
- Workload Domain with VMFS as principal storage
- vSAN Workload Domain
- vSAN Workload Domain with VMFS/vVols as supplemental storage

This section also describes some of the prerequisites that were identified during the validation tests.

## Prepare ESXi Hosts for vVols Workload Domain

Before you create a vVol VI workload domain from SDDC Manager, you must provision the device for vVol protocol endpoints from the VSP storage to each ESXi host. If multiple storage systems are used in your environment, then present at least one vVol protocol endpoint from each VSP storage. The following figure shows 46.88 MB virtual device provisioned before creating vVol workload domain. Reboot the ESXi hosts after presenting this device from the storage. This step ensures that your SAN infrastructure including Fibre Channel zoning has been configured correctly.



The screenshot shows the VMware ESXi interface for a host named 'node5.vsphere.local'. The 'Storage' tab is selected, displaying a list of storage devices. The following table represents the data shown in the screenshot:

Name	Status	Type	Capacity	Queue ...	Vendor
Local ATA Disk (t10.ATA____SATADOM2...	Normal	Disk (SSD)	29.82 GB	31	ATA
Local NVMe Disk (t10.NVMe____INTEL_S...	Normal	Disk (SSD)	1.46 TB	2046	NVMe
Local ATA Disk (naa.55cd2e414f829255)	Normal	Disk (SSD)	1.75 TB	32	ATA
Local ATA Disk (naa.55cd2e414fa4b73c)	Normal	Disk (SSD)	1.75 TB	32	ATA
Local USB CD-ROM (mpx.vmhba32:C0:T0:...	Normal	CDROM	Unknown	N/A	American
Local USB CD-ROM (mpx.vmhba32:C0:T0:...	Normal	CDROM	Unknown	N/A	American
Local ATA Disk (naa.55cd2e414fa2f8a9)	Normal	Disk (SSD)	1.75 TB	32	ATA
Local ATA Disk (naa.55cd2e414f829268)	Normal	Disk (SSD)	1.75 TB	32	ATA
HITACHI Fibre Channel Disk (naa.60060e8...	Normal	Disk	46.88 MB	30	HITACHI

# Create a vVols Workload Domain

Before you create a vVols workload domain, ensure that following have been completed:

- Deploy Hitachi Storage Provider for VMware vCenter. You can deploy the VASA provider either in the VCF management domain or outside the VCF. Hitachi recommends deploying VASA Provider into management clusters if the VSP storage is dedicated to the VCF.
- Commission three or more ESXi hosts with vVol protocol endpoints provisioned from VSP storage.
- Save VASA provider configuration information to SDDC manager as shown. SDDC manager deploys a workload domain with vVols as principal storage. SDDC manager registers VASA provider automatically to the new vCenter and creates the vVol datastore.

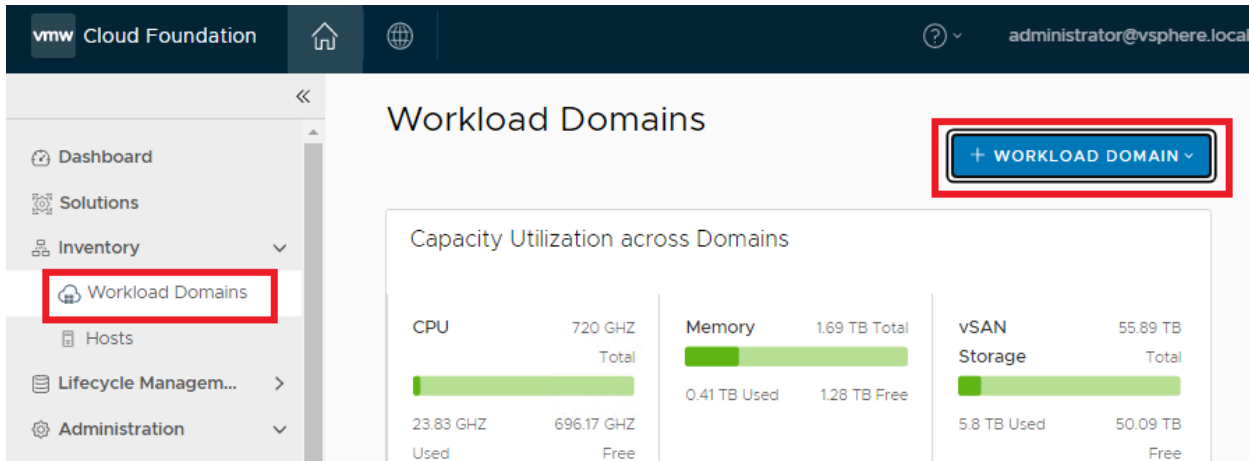
The screenshot shows the VMware Cloud Foundation interface. On the left is a navigation menu with 'Storage Settings' highlighted in a red box. The main content area is titled 'Storage Settings' and 'VASA Providers'. It features a form to 'Add VASA Provider' with the following fields:

- Name:** Hitachi\_VASA\_Provider
- URL:** https://10.76.46.120:50001/version.xml
- User Credentials:**
  - User Name:** vsphere.local/administrator
  - Password:** (masked with dots)
- Storage Containers:**
  - Container Name:** StorageContainerVSP5k
  - Container Type:** FC

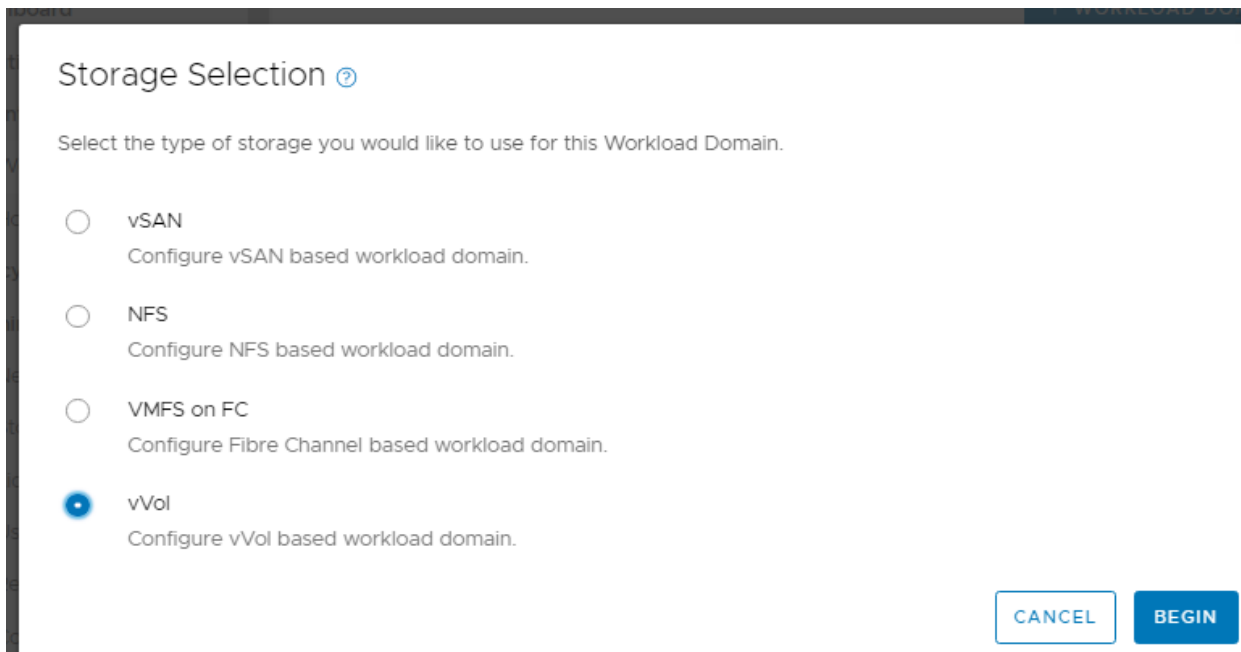
Buttons for 'SAVE' and 'CANCEL' are at the bottom.

**Note:** The VASA user format is domain\administrator.

1. To create a workload domain, select Workload Domains.



2. Select vVol in the Storage Selection window.





3. Enter the virtual infrastructure name in the **Virtual Infrastructure Name** field.

4. Enter the organization name in the **Organization Name** field.

VI Configuration

- 1 Name
- 2 Cluster
- 3 Compute
- 4 Networking
- 5 vVol Storage
- 6 Host Selection
- 7 License
- 8 Object Names

Name ⓘ

Virtual Infrastructure Name ⓘ

Organization Name ⓘ

vSphere Lifecycle Manager and Kubernetes - Workload Management Readiness ⓘ

Select the vSphere Lifecycle Manager for this workload domain. The selected vSphere Lifecycle Manager determines whether Kubernetes - Workload Management can be deployed. This cannot be changed once the workload domain has been deployed.

Enable vSphere Lifecycle Manager Baselines

- Kubernetes - Workload Management can be deployed.
- Firmware upgrades not supported natively.

Enable vSphere Lifecycle Manager Images

- Kubernetes - Workload Management cannot be deployed.
- Firmware upgrades using cluster images can be performed.

5. Enter the cluster name in the **Cluster Name** field.

VI Configuration

- 1 Name
- 2 Cluster
- 3 Compute
- 4 Networking
- 5 vVol Storage
- 6 Host Selection

Cluster ⓘ

Enter the details for the first cluster that will be created as default in this new workload domain.

Cluster Name ⓘ

Cluster Image ⓘ

6. Enter the vCenter information.

VI Configuration	
1 Name	
2 Cluster	
<b>3 Compute</b>	
4 Networking	
5 vVol Storage	
6 Host Selection	
7 License	

Compute ⓘ	
<b>vCenter</b>	
vCenter FQDN ⓘ	vcsa-vi2.vsphere.local
vCenter IP Address ⓘ	192.168.200.32
vCenter Subnet Mask ⓘ	255.255.255.0
vCenter Default Gateway ⓘ	192.168.200.1
vCenter Root Password ⓘ	..... ⓘ
Confirm vCenter Root Password	..... ⓘ

7. Enter the NSX-T information.

VI Configuration	
1 Name	
2 Cluster	
3 Compute	
<b>4 Networking</b>	
5 vVol Storage	
6 Host Selection	
7 License	
8 Object Names	
9 Review	

Networking ⓘ	
<b>Overlay Networking</b>	
VLAN ID ⓘ	203
<b>NSX-T Manager</b>	
Cluster FQDN ⓘ	nsxt-mgmt-vi.vsphere.local
Cluster IP ⓘ	192.168.200.90
FQDN 1 ⓘ	nsxt-mgmt1-vi.vsphere.local
IP Address 1 ⓘ	192.168.200.91
FQDN 2 ⓘ	nsxt-mgmt2-vi.vsphere.local
IP Address 2 ⓘ	192.168.200.92
FQDN 3 ⓘ	nsxt-mgmt3-vi.vsphere.local
IP Address 3 ⓘ	192.168.200.93
Admin Password ⓘ	..... ⓘ
Confirm Admin Password	..... ⓘ

8. Enter the vVol storage information.

### VI Configuration

- 1 Name
- 2 Cluster
- 3 Compute
- 4 Networking
- 5 vVol Storage**
- 6 Host Selection
- 7 License

### vVol Storage ?

**vVol Storage Details**

Select VASA Protocol Type i FC ▼

Select VASA Provider i Hitachi\_VASA\_Provider-46-120 ▼

Select Storage Container i StorageContainerVSP5k ▼

Select VASA User i vsphere.local/administrator ▼

**Datastore Name** i vVol-DS-VSP5K

9. Select the hosts in the **Hosts Selection** pane.

### VI Configuration

- 1 Name
- 2 Cluster
- 3 Compute
- 4 Networking
- 5 vVol Storage
- 6 Host Selection**
- 7 License
- 8 Object Names
- 9 Review

### Host Selection ? ×

As a best practice, VMware recommends deploying ESXi hosts with similar or identical configurations across all cluster members, including similar or identical storage configurations. The minimum configuration required for vVol is 3 hosts. For more detail, please check product documentation.

⚠ Add VI only supports hosts that have physical NICs 0 and 1, please ensure these are connected and active, as these will be used to connect to DVS from UI. Use API to select hosts with other physical NIC configurations.

Selected resources: 144 Cores, 702.94 GB Memory, 32,192.95 GB Storage

Show only selected hosts RESET FILTER CLEAR SELECTION

<input checked="" type="checkbox"/>	FQDN <span>▼</span>	Network Pool <span>▼</span>	Memory	Dirty Host <span>▼</span>
<input checked="" type="checkbox"/>	node6.vsphere.local <span>i</span>	vVOL-vMotion <span>i</span>	255.65 GB	
<input checked="" type="checkbox"/>	node7.vsphere.local <span>i</span>	vVOL-vMotion <span>i</span>	255.65 GB	
<input checked="" type="checkbox"/>	node5.vsphere.local <span>i</span>	vVOL-vMotion <span>i</span>	191.65 GB	

3 ⌵

10. Select the available licenses.

VI Configuration

- 1 Name
- 2 Cluster
- 3 Compute
- 4 Networking
- 5 vVol Storage
- 6 Host Selection
- 7 License

### License ?

**NSX-T Data Center** ?

▼

? Please ensure there are enough available licenses before proceeding.

**VMware vSphere** ?

▼

? License key is being applied.

11. Review the object names in the **Object Names** pane.

VI Configuration

- 1 Name
- 2 Cluster
- 3 Compute
- 4 Networking
- 5 vVol Storage
- 6 Host Selection
- 7 License
- 8 Object Names

### Object Names ? ✕

Virtual Infrastructure Name      vVOL-WLD

Cluster Name

vCenter Name                      vcsa-vi2

Your input above will be used as a pre-fix to generate vSphere Object Names.

Object Names	Description	Generated Name
resource.vds	vSphere Distributed Switch	vVOL-WLD-vcsa-vi2--vds01
resource.portgroup.management	Distributed Port Group for Management Traffic	vVOL-WLD-vcsa-vi2--vds01-management
resource.portgroup.vmotion	Distributed Port Group for vMotion Traffic	vVOL-WLD-vcsa-vi2--vds01-vmotion
resource.portgroup.fc	resource-name-desc-distributed-port-group-fc-traffic	vVOL-WLD-vcsa-vi2--vds01-fc

12. Review the input values and click **Finish**.

### VI Configuration

- 1 Name
- 2 Cluster
- 3 Compute
- 4 Networking
- 5 vVol Storage
- 6 Host Selection
- 7 License
- 8 Object Names
- 9 Review**

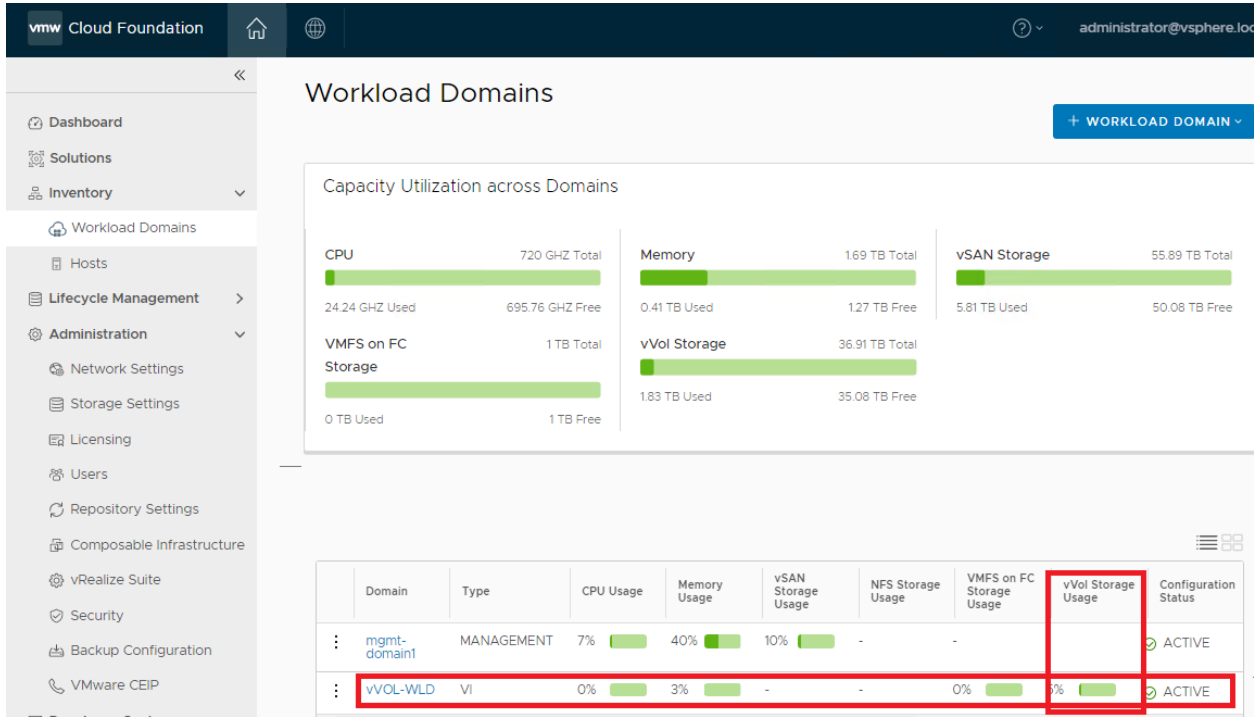
### Review

General	
Virtual Infrastructure Name	vVOL-WLD
Organization Name	vVol-WLD
Cluster	
Cluster Name	DS220F
Cluster Image	vLCM is disabled for this workload domain.
Compute	
vCenter IP Address	192.168.200.32
vCenter DNS Name	vcsa-vi2.vsphere.local
vCenter Subnet Mask	255.255.255.0
vCenter Default Gateway	192.168.200.1
Networking	
Overlay Networking VLAN ID	203
NSX Manager Cluster IP	192.168.200.90
NSX Manager Cluster FQDN	nsxt-mgmt-vi.vsphere.local
NSX Manager IP Addresses	192.168.200.91, 192.168.200.92, 192.168.200.93

[CANCEL](#) [BACK](#) [FINISH](#)

SDDC manager starts to create the vVols workload domain.

After SDDC Manager completes the workload domain creation, the vVol datastore is available inside new workload domain to be consumed by VMs or containers.



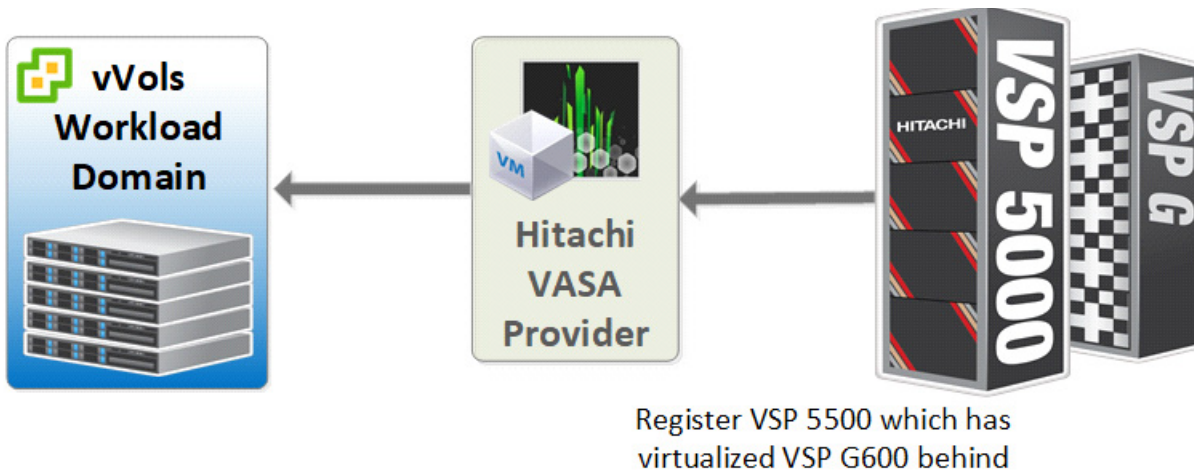
## VASA Storage Policy with vVols - Example

This section provides an example of using the VMware Storage Policy Based Management (SPBM) capability inside a workload domain with vVols as principal storage. The intent is to place the VM or container on the correct storage resource that matches the application requirements. Storage Policy Based Management includes both placement and replication policies. This test focused on placement policy, but an example of replication policies available in Hitachi VASA Provider v3.6 or later is at the end for reference.

The following are required:

- VSP 5500 has a storage container, resource group with two storage pools:
  - Gold NVMe storage pool
  - Silver SAS 10k storage pool
- The vVol datastore or storage container has two capability profiles. One for Gold NVMe storage pool, and the other for Silver SAS 10K storage pool.
- When a VM is created with Gold storage policy, Hitachi VASA provider finds the matching storage capability and provisions a VM and its VMDKs (vVols) from the Gold NVMe storage pool.

In this validation, storage configuration can virtualize other storage so it can be part of that storage container. The following figure provides a high level diagram of this validation.



Additional details used for this validation are:

- VSP 5500 with all NVMe drives was used as main storage. NVMe drives are the only option for VSP 5500 unless VSP 5500H is used.
- Virtualize VSP G600 behind VSP 5500 as secondary storage by presenting an external drive from the SAS 10K storage pool of VSP G600.
- Two dynamic provisioning (DP) storage pools were added to the resource group:

DP Pool Name	Pool ID	Drive Type
▪ Gold-NVMe-RAID5-pool	▪ DP 2	▪ NVMe
▪ Silver-Ext-G600-SAS10k	▪ DP 8	▪ SAS 10K

LDEV ID	LDEV Name	Parity Group ID	Pool Name(ID)	Capacity	Provisioning Type	Attribute	Journal ID
00:00:00	ext-g60...	E1-1	Silver-Ext-G600-SAS10k-JC(8)	2048.00...	External	Pool VOL	-
00:00:01	pool-vol	1-6	Gold-NVMe-RAID5-pool(2)	2969.60...	Basic	Pool VOL	-
00:00:04	pool-vol	1-6	Gold-NVMe-RAID5-pool(2)	2312.28...	Basic	Pool VOL	-
00:00:23	-	-	Gold-NVMe-RAID5-pool(2)	4.00 GB	DP	SLU	-
00:00:24	-	-	Gold-NVMe-RAID5-pool(2)	4.00 GB	DP	SLU	-

1. Create the associated storage container on the Hitachi VASA Provider. Define the following capabilities:

- Gold-NVMe: Tier1\_IOPS
- Silver-Ext-SAS10k: Tier2\_IOPS

Hitachi Storage Provider for VMware vCenter - block component 03.5.9.3260 Welcome to administrator@vsphere.local Help About Logout

Management

StorageContainerVSP5k

Storage Container

Name		Storage Container	Quota 70%	Description	Storage System	VSP 5500H #30595
Capacity	Total	7.15TB (5.01TB)			Total	∞
	Free	7.02TB (4.87TB)			Free	∞
	Used	133.96GB			Used	1.81TB
Resource Group		Wols-RG		TI Pools		-

Capability Profile Default Profile VVols

Name contains GO OFF 30 page 1 / 1 Filtered: 2 / All:2

Name	Description	Pool	Pool Name	Pool Type	Capacity		Logical Capacity	
					Total	Free	Total	Free
Gold-NVMe		DP 2	Gold-NVMe-RAID5-pool	HDP	5.15TB	5.02TB	∞	∞
Silver-Ext-SAS10k		DP 8	Silver-Ext-G600-SAS10k-JC	HDP	2.00TB	2.00TB	∞	∞

Maintenance

Single Sign-on Setting Download Logs

2. Create VM storage policies after successfully deploying vVol workload domain.

3. Select the correct vCenter from the drop-down list as in the VCF environment. Multiple VI vCenters are linked together.

Create VM Storage Policy

1 Name and description

2 Policy structure

3 Storage compatibility

4 Review and finish

Name and description

vCenter Server: VCSA-MGMT.VSPHERE.LOCAL

Name: vcsa-mgmt.vsphere.local

vcsa-vi.vsphere.local

Description:



4. Create the **vVol VSP Gold** policy with Tier1\_IOPS.

**Create VM Storage Policy**

- 1 Name and description
- 2 Policy structure
- 3 com.hitachi.storageprovider.vvol r...
- 4 Storage compatibility
- 5 Review and finish**

**Review and finish**

General	
Name	vVol-VSP-Gold-Policy
Description	Backed by NVMe drives
vCenter Server	vcsa-vi.vsphere.local

**com.hitachi.storageprovider.vvol rules**

Placement	
Performance IOPS – Class	Tier1_IOPS

5. Create the **vVol-VSP-Silver** policy with Tier2\_IOPS.

**Create VM Storage Policy**

- 1 Name and description
- 2 Policy structure
- 3 com.hitachi.storageprovider.vvol r...
- 4 Storage compatibility
- 5 Review and finish**

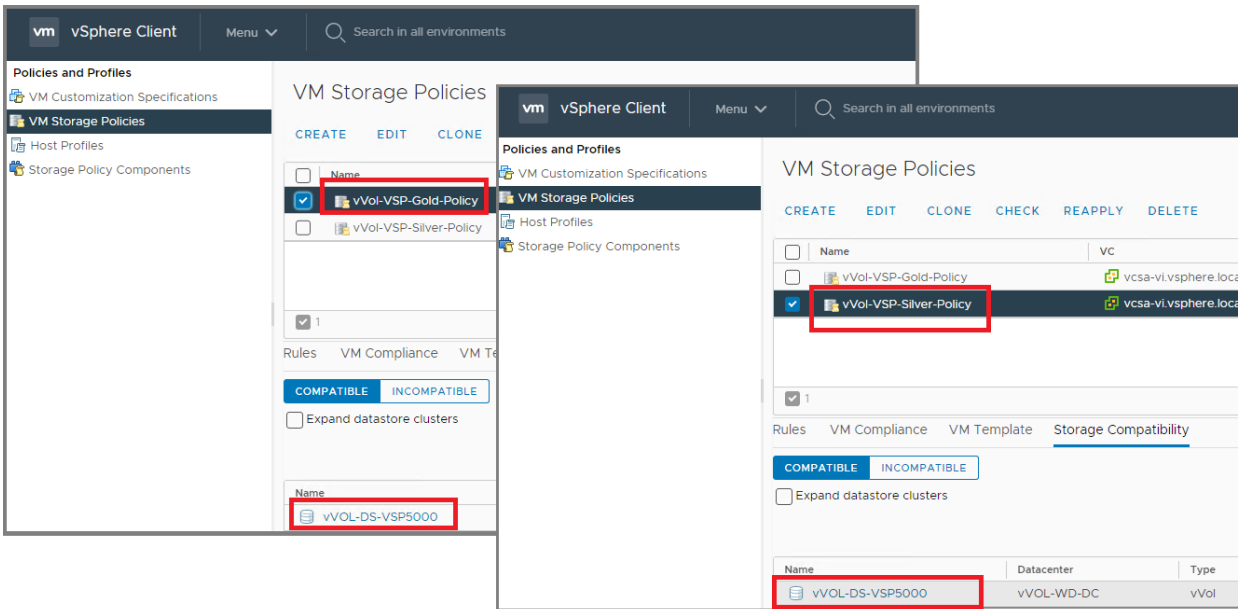
**Review and finish**

General	
Name	vVol-VSP-Silver
Description	Backed by SAS 10K Drives
vCenter Server	vcsa-vi.vsphere.local

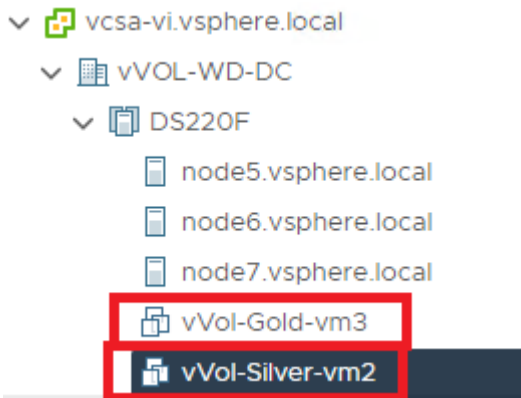
**com.hitachi.storageprovider.vvol rules**

Placement	
Performance IOPS – Class	Tier2_IOPS

The following figure shows that the **vVOL-DS-VSP5000** datastore is compatible for both storage policies.



6. Create two VMs that use each policy.



This creates the VMDK-vVols for those VMs:

- **vVol-Gold-vm3** from **DP 2**, Gold-NVMe-RAID5-pool in VSP 5500.
- **vVol-Silver-vm2** from **DP 8**, Silver-Ext-G600-SAS10k pool in VSP 5500.

VM Name	VMFS File	VVol Type	Volume	Label	Capacity	Pool	Binding ALUs	VM Policy Name
	vCLS (1)-466ecae4.vswp	Swap	00:FE:28		128.00MB	DP 2	00:00:14	Default Profile for Swap VVol
	vCLS (2)-466ecae2.vswp	Swap	00:FE:29		128.00MB	DP 2	00:00:14	Default Profile for Swap VVol
vSphere-HA	vSphere-HA	Config	00:FE:21		4.00GB	DP 2	00:00:09.00:00:14	Default Profile for Config VVol
Ora_7	Ora_7_6.vmdk	Data	00:FE:24		50.00GB	DP 2	-	VVol No Requirements Policy
Ora_7	Ora_7	Config	00:00:23		4.00GB	DP 2	00:00:09	VVol No Requirements Policy
Ora_7	Ora_7_4.vmdk	Data	00:00:24		50.00GB	DP 2	-	VVol No Requirements Policy
paul	paul	Config	00:FE:1D		4.00GB	DP 2	00:00:09	VVol No Requirements Policy
paul	paul_1.vmdk	Data	00:FE:23		80.00MB	DP 2	00:00:09	VVol No Requirements Policy
paul	paul.vmdk	Data	00:FE:22		48.00MB	DP 2	00:00:09	VVol No Requirements Policy
paul	paul-466ecaf0.vswp	Swap	00:FE:25		48.00MB	DP 2	00:00:06	Default Profile for Swap VVol
vCLS (1)	vCLS (1)	Config	00:FE:18		4.00GB	DP 2	00:00:06	VVol No Requirements Policy
vCLS (1)	vCLS (1).vmdk	Data	00:FE:19		2.00GB	DP 2	00:00:14	VVol No Requirements Policy
vCLS (2)	vCLS (2).vmdk	Data	00:FE:1C		2.00GB	DP 2	00:00:14	VVol No Requirements Policy
vCLS (2)	vCLS (2)	Config	00:FE:16		4.00GB	DP 2	00:00:09	VVol No Requirements Policy
vCLS (3)	vCLS (3)	Config	00:FE:1F		4.00GB	DP 2	00:00:06.00:00:14	VVol No Requirements Policy
vCLS (3)	vCLS (3).vmdk	Data	00:FE:20		2.00GB	DP 2	00:00:14	VVol No Requirements Policy
vCLS (3)	vCLS (3)-466ecaf2.vswp	Swap	00:00:2E		128.00MB	DP 2	00:00:14	Default Profile for Swap VVol
vVol-Gold-vm3	vVol-Gold-vm3	Config	00:FE:2A		4.00GB	DP 2	-	vVol-VSP-Gold-Policy
vVol-Gold-vm3	vVol-Gold-vm3.vmdk	Data	00:FE:2F		16.00GB	DP 2	-	vVol-VSP-Gold-Policy
vVol-Silver-vm2	vVol-Silver-vm2.vmdk	Data	00:FE:2E		16.00GB	DP 8	-	vVol-VSP-Silver-Policy
vVol-Silver-vm2	vVol-Silver-vm2	Config	00:00:2D		4.00GB	DP 8	-	vVol-VSP-Silver-Policy
vVol-vm1	vVol-vm1	Config	00:FE:1B		4.00GB	DP 2	00:00:06	VVol No Requirements Policy

Note that if you are using Hitachi Storage Provider for VMware vCenter version v3.6 or later, you will have access to replication policies as well.

### Edit VM Storage Policy

- 1 Name and description
- 2 Policy structure
- 3 com.hitachi.storageprovider.vvol r...
- 4 Storage compatibility
- 5 Review and finish

### com.hitachi.storageprovider.vvol rules

Placement

Replication

Tags

Disabled  
 Custom

Provider: com.hitachi.storageprovider.vvol.replication

Remote Storage Container  ⓘ SCB REMOVE

Replication Mode  ⓘ Asynchronous(HUR) REMOVE

Asynchronous(HUR)

Active-Active(GAD)

Synchronous(TC)

Remote Snapshot Frequency  ⓘ REMOVE

Remote Snapshot Retention  ⓘ REMOVE

ADD RULE

CANCEL
BACK
NEXT

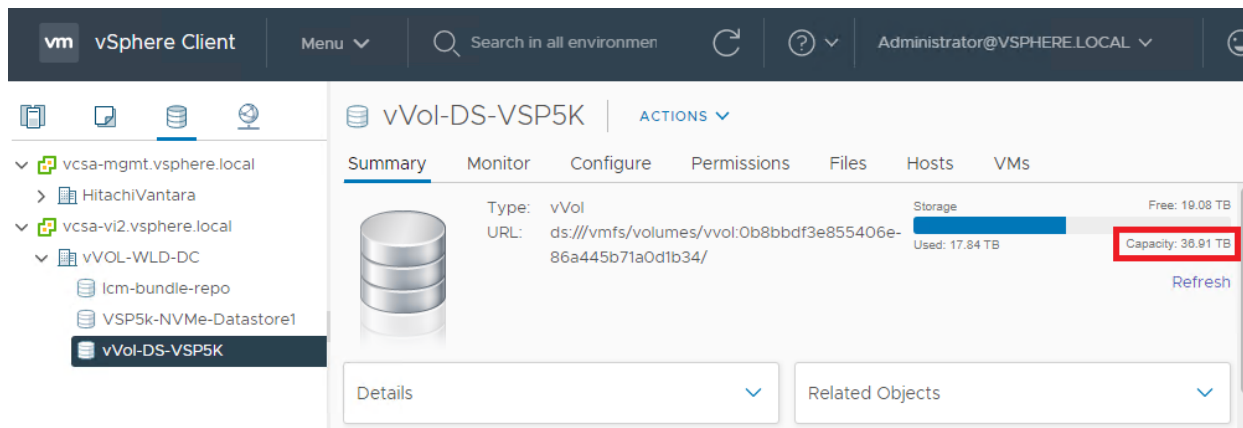
# Additional Use Case Validation for External Principal Storage

This section describes the use case validation for vVols workload domains.

## Access Storage Capacity Beyond Limits of vSAN Workload Domains

In a previous use case, the need to address a large storage capacity for a certain application without requiring the administrator to license additional vSAN nodes to a particular workload domain was mentioned.

In a lab configuration, three available vSAN nodes that had potentially 13 TB of useable capacity was used. The workload domain was provisioned to utilize vVols as the principal storage. Access to 30 TB of datastore was provided to meet the application requirements.



VSP storage usage was over-subscribed as part of the storage container configuration. The storage container, that is the resource group pools was set with an over-subscription of 600%. This allowed 7 TB of physical capacity to be presented as 36 TB of usable vVols datastore. In addition, the quota was set to 100% to make the full logical capacity available.

**StorageContainerVSP5k**

Storage Container		Name	Description	Storage System	
		StorageContainerVSP5k (Quota 100%)		VSP 5500H #30595	
Capacity	Total	7.15TB (7.15TB)	Logical Capacity	Total	36.91TB
	Free	7.01TB (7.01TB)		Free	35.08TB
	Used	140.36GB		Used	1.83TB
Resource Group		vVols-RG		TI Pools	-

**Capability Profile** | Default Profile | VVols

Name: [ ] contains [ ] GO OFF 30 [ ] [ ] [ ] page [ 1 / 1 ] GO [ ] [ ] Filterd: 2 / All:2

Name ▲	Description	Pool	Pool Name	Pool Type	Capacity		Logical Capacity	
					Total	Free	Total	Free
<a href="#">Gold-NVMe</a>		DP 2	Gold-NVMe-RAID5-pool	HDP	5.15TB	5.02TB	30.92TB	29.14TB
<a href="#">Silver-Ext-SAS10k</a>		DP 8	Silver-Ext-G600-SAS10k-JC	HDP	2.00TB	2.00TB	5.99TB	5.94TB

## Create and Access Large Scale Data Services (Storage Snapshots)


Use vVol-based workload domains to provide infrastructure or workload domains for applications with high transaction throughput that require rich data services, including snapshots for additional analytics or recovery options

In the following example, a SAP HANA VM with 16 TB and 4 TB data and log volumes has snapshots created every hour. As these snapshots are offloaded directly to VSP storage, they provide an efficient storage option for these data services without the performance overhead

### Edit Settings | SAP-HANA-VM

Virtual Hardware | VM Options

ADD NEW DEVICE ▾

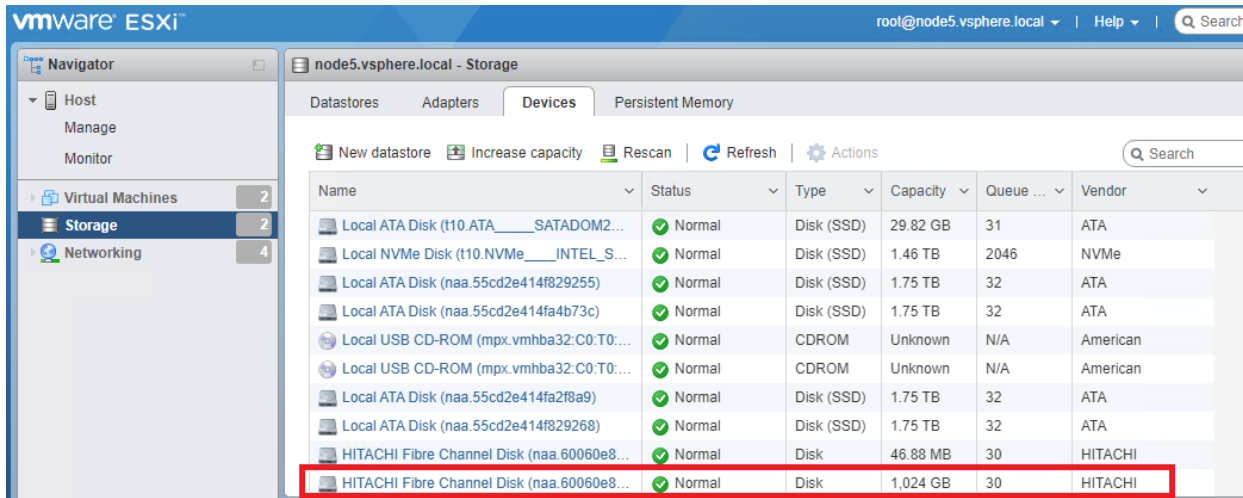
> CPU	24 ▾	
> Memory	24560 ▾ GB ▾	
> Hard disk 1	1 TB ▾	
> Hard disk 2	16 TB ▾	
> Hard disk 3	4 TB ▾	
> SCSI controller 0	VMware Paravirtual	
> Network adapter 1	vVOL-WLD-vcasa-vi2--vds01-r ▾	<input checked="" type="checkbox"/> Connect...

# VMFS-based Workload Domains

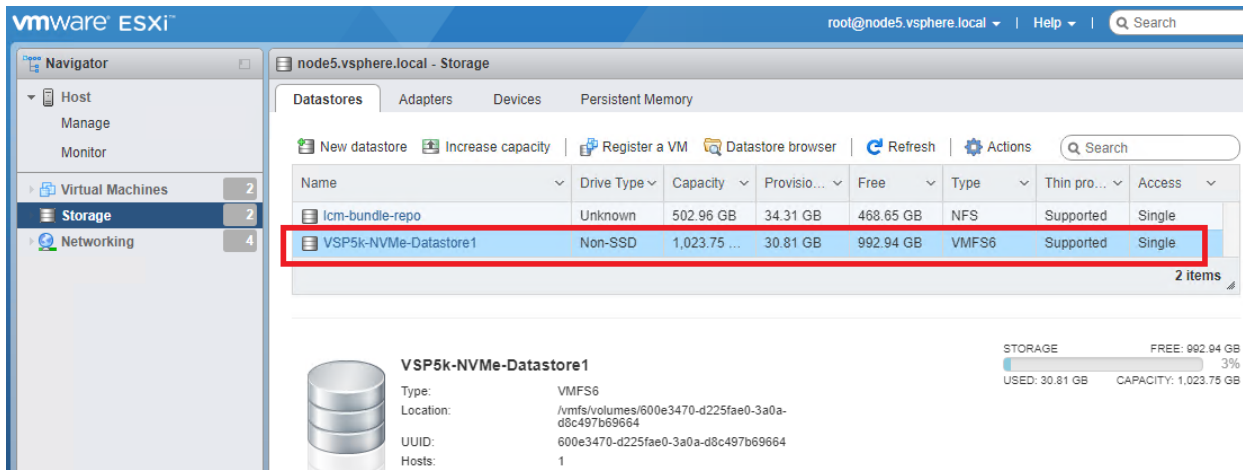
This section lists the supplemental procedures to deploy VCF VMFS workload domains.

1. Before you commission the ESXi hosts for VMFS VI workload domain from SDDC Manager, provision at least one VMFS datastore from the VSP storage to each ESXi host.

The following figure shows the provisioning of a 1 TB device. Reboot the ESXi hosts after presenting this device from the storage. This ensures that your SAN infrastructure including Fibre Channel zoning has been configured correctly.



2. Create a VMFS datastore from the newly provisioned device. You can use UCP Advisor to simplify and accelerate datastore provisioning. Ensure that the same datastore is shown in all of the ESXi hosts for the VMFS workload domain.



See the following reference architecture for detailed VMFS workload domain deployment with VSP storage systems:

[Integrate Hitachi Virtual Storage Platform with VMware Cloud Foundation Reference Architecture Guide - Hitachi Vantara Knowledge](#)

## Conclusion

Hitachi Vantara has validated that UCP RS with VMware Cloud Foundation, which is integrated with Hitachi VSP Storage to deliver a wide variety of storage use cases for different workloads and data services requirements that will be deployed inside various workload domains. The flexibility to consume vSAN and vVols in an integrated automated solution using VCF and Hitachi infrastructure software such as UCP Advisor and Hitachi VASA Provider helps drive towards an effective efficient cloud platform while taking advantage of unique characteristics of each option. UCP Advisor also provides many orchestration and lifecycle management tasks, across all of the hardware components of the UCP RS integrated system, and is tightly integrated into vSphere Lifecycle Manager for streamlined cluster-level upgrades.

## Product Descriptions

This reference architecture has the following products:

### Hitachi Advanced Server DS120

Optimized for performance, high density, and power efficiency in a dual-processor server, [Hitachi Advanced Server DS120](#) delivers a balance of compute and storage capacity. This 1U rack mounted server has the flexibility to power a wide range of solutions and applications.

The highly scalable memory supports up to 3 TB RAM using 24 slots of 2666 MHz DDR4 RDIMM. Advanced Server DS120 is powered by the Intel Xeon Scalable processor family for complex and demanding workloads. There are flexible OCP and PCIe I/O expansion card options available. This server supports up to 12 small form factor storage devices.

### Hitachi Advanced Server DS220

With a combination of two Intel Xeon Scalable processors and high storage capacity in a 2U rack-space package, [Hitachi Advanced Server DS220](#) delivers the storage and I/O to meet the needs of converged solutions and high-performance applications in the data center.

The Intel Xeon Scalable processor family is optimized to address the growing demands on today's IT infrastructure. The server provides 24 slots for high-speed DDR4 memory, allowing up to 3 TB of memory per node when 128 GB DIMMs are used. This server supports up to 12 large form factor storage devices and an additional 2 small form factor storage devices.

### Hitachi Advanced Server DS225

Choose [Hitachi Advanced Server DS225](#) to ensure you have the flexibility and performance you need to support your business-critical enterprise applications.

Advanced Server DS225 delivers compute density and efficiency to meet the needs of your most demanding high-performance applications. It takes full advantage of the Intel Xeon scalable processor family with up to four dual-width 300 W graphic accelerator cards, up to 3 TB memory capacity, and additional PCIe 3.0 expansion slots in a 2U rack space package.

Front-side accessible storage bays supports up to eight hot-pluggable, serial-attached SCSI (SAS) or serial-ATA (SATA) devices. These bays also support flexible configuration, which allows Advanced Server DS225 to deliver high I/O performance and high capacity.

## Hitachi Advanced Server DS240

Meet the needs of your most demanding high-performance applications with [Hitachi Advanced Server DS240](#). With up to four Intel Xeon Scalable Processors and up to 6 TB memory capacity in a 2U rack-space package, this server delivers unparalleled compute density and efficiency.

The Advanced Server DS240 architecture takes full advantage of the groundbreaking Intel Xeon Scalable Processor family, including the highest performance options, to address the growing demands of your IT infrastructure.

## Hitachi Virtual Storage Platform Family

[Hitachi Virtual Storage Platform](#) is the first 3-D scaling storage platform designed for all data types. Its storage architecture flexibly adapts for performance, capacity, and multi-vendor storage. Combined with the unique Hitachi Command Suite management platform, it transforms the data center.

- **Scale Up** — Meet increasing demands by dynamically adding processors, connectivity, and capacity in a single unit. Provide the highest performance for both open and mainframe environments.
- **Scale Out** — Meet multiple demands by dynamically combining multiple units into a single logical system with shared resources. Support increased demand in virtualized server environments. Ensure safe multi-tenancy and quality of service through partitioning of cache and ports.
- **Scale Deep** — Extend storage value by virtualizing new and existing external storage systems dynamically. Extend the advanced functions of Hitachi Virtual Storage Platform to multivendor storage. Offload less demanding data to external tiers to save costs and to optimize the availability of tier-one resources.

Using flash acceleration in Virtual Storage Platform is transparent to Hitachi Dynamic Provisioning, Hitachi Dynamic Tiering, in-system replication, and remote replication. Flash media efficiency increases with more workload consolidation when using flash acceleration.

Flash acceleration raises Virtual Storage Platform scalability. Express host I/O processing targets flash media or a large pool of disk drives. The performance boost increases random I/O throughput of the virtual storage director and lowers I/O response time.

## Arista Data Center Switches

[Arista Networks](#) builds software-driven cloud networks for data center, cloud, and campus environments. Arista delivers efficient, reliable, and high-performance Universal Cloud Network architectures, based on 10 GbE, 25 GbE, 40 GbE, 50 GbE, and 100 GbE platforms delivered with an extensible operating system — Arista EOS.

- [Arista 7050CX3-32S](#) is a 1RU-sized spine switch with 32 (downlink) and 4 (uplink) 100 GbE QSFP ports for multiple-rack solutions. Each QSFP port supports a choice of five speeds, with flexible configuration between 100 GbE, 40 GbE, 4 × 10 GbE, 4 × 25 GbE, or 2 × 50 GbE modes.
- [Arista 7050SX3-48YC8](#) is a 1RU-sized switch with 48 × 25 GbE SFP and 8 × 100 GbE QSFP ports. The high density SFP ports can be configured in groups of 4 to run either at 25 GbE or a mix of 10 GbE/1 GbE speeds. The QSFP ports allow 100 GbE or 40 GbE high speed network uplinks.
- [Arista 7010T](#) is a 1RU-sized, 48-port 1 GbE management switch for single-rack and multiple-rack solutions.



## Cisco Nexus Data Center Switches

[Cisco Nexus data center switches](#) are built for scale, industry-leading automation, programmability, and real-time visibility.

This solution uses the following Cisco switches to provide Ethernet connectivity:

- [Cisco Nexus 9332C](#) is a 1U-sized spine switch with 32 ports 40/100 GbE for multiple-rack solutions. Uplink ports also support 4 × 10 GbE or 4 × 25 GbE breakouts, if needed.
- [Cisco Nexus 93180YC-FX](#) is a 1U-sized top-of-rack or leaf switch with 48 ports 10/25 GbE (downlink) and 6 ports 40/100 GbE (uplink) for single-rack and multiple-rack solutions.
- [Cisco Nexus 92348GC-X](#) is a 1U-sized management switch with 48 ports 1 GbE, 4 ports 1/10/25 GbE and 2 ports 40/100 GbE for single-rack and multiple-rack solutions.

## Brocade Fibre Channel Switches from Broadcom

[Brocade Fibre Channel switches](#) deliver industry-leading performance, simplifying scale-out network architectures. Get the high-performance, availability, and ease of management you need for a solid foundation to grow the storage network you want.

[Broadcom G620](#) is a 1U-sized QSFP Fibre Channel switch with 48 ports 16/32 Gb/s and 4 ports 128 Gb/s for multiple-rack solutions.

## Hitachi Storage Virtualization Operating System RF

[Hitachi Storage Virtualization Operating System RF](#) (SVOS RF) spans and integrates multiple platforms. It integrates storage system software to provide system element management and advanced storage system functions. Used across multiple platforms, Storage Virtualization Operating System includes storage virtualization, thin provisioning, storage service level controls, dynamic provisioning, and performance instrumentation.

Storage Virtualization Operating System RF uses Hitachi Dynamic Provisioning (HDP) to provide wide striping and thin provisioning. Dynamic Provisioning provides one or more wide-striping pools across many RAID groups. Each pool has one or more dynamic provisioning virtual volumes (DP-VOLs) without initially allocating any physical space. Deploying Dynamic Provisioning avoids the routine issue of hot spots that occur on logical devices (LDEVs).

Storage Virtualization Operating System RF has been optimized for Hitachi Virtual Storage Platform 5000 series for the scale-out, NVMe design. It incorporates artificial intelligence and machine learning to reduce costs with intelligent tiering. This automates data placement to assure that your data always resides on the most optimized tier.

## Hitachi Unified Compute Platform Advisor

[Hitachi Unified Compute Platform Advisor](#) (UCP Advisor) brings simplified IT administration to virtualized, converged, and hyperconverged systems from Hitachi. Unified Compute Platform Advisor supports guided life-cycle management to the server, network, and storage elements within supported Unified Compute Platform systems.

Unified Compute Platform Advisor is used to discover and provision servers initially, and later to manage the compute nodes:

- Identify Unified Compute Platform servers for remote management.
- Provision servers.
- Image the custom BIOS settings on the server.
- Install the operating system.
- Upgrade the installed firmware,
- Power cycle a compute node remotely.
- Launch a remote console for a server.
- Provides remote access to general system information.

## Hitachi Storage Provider for VMware vCenter

When you want to support policy-based automation and improve operational insight into the storage or converged platform hosting that environment, use [Hitachi Storage Provider for VMware vCenter](#). This allows a unique implementation of VMware vSphere API for Storage Awareness (VASA), supporting traditional VMFS datastores and VMware vVols-based datastores.

Storage Provider for VMware vCenter, as part of the infrastructure, communicates with VMware vCenter to indicate storage capabilities and state information. It supports policy-based management, operations management, and resource scheduling functionality.

## VMware Cloud Foundation

[VMware Cloud Foundation](#) is the hybrid cloud platform for managing VMs and orchestrating containers, built on full-stack hyperconverged infrastructure (HCI) technology. With a single architecture that is easy to deploy, VMware Cloud Foundation enables consistent, secure infrastructure and operations across private and public cloud. Increase enterprise agility and flexibility with the hybrid cloud that delivers it all.

## VMware vSphere

[VMware vSphere](#) is a hypervisor that provides virtualized resources on bare-metal servers.

This is a hypervisor that loads directly on a physical server. It partitions one physical machine into many virtual machines that share hardware resources.

## Hitachi Vantara



Corporate Headquarters  
2535 Augustine Drive  
Santa Clara, CA 95054 USA  
[www.HitachiVantara.com](http://www.HitachiVantara.com) | [community.HitachiVantara.com](http://community.HitachiVantara.com)

Regional Contact Information  
USA: 1-800-446-0744  
Global: 1-858-547-4526  
[HitachiVantara.com/contact](http://HitachiVantara.com/contact)

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