Deploy Hitachi Unified Compute Platform Select for VMware vSphere with Cisco Unified Computing System Using Hitachi Unified Storage VM in a Scalable Environment

Reference Architecture Guide

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In collaboration with Hitachi Data Systems
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Reference Architecture Guide

This is a reference architecture guide for deploying Hitachi Unified Compute Platform Select for VMware vSphere with Cisco Unified Computing System using Hitachi Unified Storage VM. It contains advice on how to build a virtual infrastructure whose primary design goals are Availability, Scalability, Elasticity and Manageability.

The benefits of this solution include the following:

- Faster deployment
- Reduced risk
- Predictability
- Ability to scale out
- Lower cost of ownership

Hitachi Unified Compute Platform (UCP) is a family of completely integrated and flexible solutions. Each solution is configured for immediate deployment to run top-tier infrastructure applications without over-purchasing or provisioning unnecessary equipment. Each custom-built-solution has its entire solution stack-certified. There are no known compatibility issues.

This reference architecture guide focuses on designing a virtual infrastructure capable of hosting virtual machines running general server application workloads. It is strongly recommended to run a server capacity-planning pilot to gather sizing and IOPS information before designing your environment.
You need familiarity with the use and configuration of the following to use this reference architecture guide:

- Hitachi Unified Storage VM (HUS VM)
- Cisco Unified Computing System (UCS) – Servers and Fabric Interconnects
- Cisco Nexus Switches
- Hitachi Dynamic Provisioning (HDP)
- VMware vSphere 5

**Note** — Testing of this configuration was in a lab environment. Many things affect production environments beyond prediction or duplication in a lab environment. Follow the recommended practice of conducting proof-of-concept testing for acceptable results in a non-production, isolated test environment that otherwise matches your production environment before your production implementation of this solution.
Solution Overview

This reference architecture uses a VMware infrastructure supported by Cisco and Hitachi hardware to create a flexible and pre-validated end-to-end converged stack solution. This converged solution validates the integration of the hardware stack (compute, storage and networking) with the software stack (hypervisor and management for both software and hardware components). The following components create Hitachi Unified Compute Platform Select for VMware vSphere with Cisco Unified Computing System using Hitachi Unified Storage VM environment:

- **Cisco UCS Server** — Delivering Enterprise-class performance, versatility, and density without compromise for virtual and bare-metal workloads

- **Hitachi Unified Storage VM** — HUS VM storage virtualization system is designed for organizations that need to manage their storage assets more efficiently

- **Hitachi Dynamic Provisioning** — HDP provides wide striping and thin provisioning functionalities for greater operational and storage efficiency

- **VMware vSphere 5** — Virtualization technology providing the infrastructure for the data center

- **Cisco UCS 6248UP Fabric Interconnect Switch** — Provides a single, highly available management domain that supports all attached UCS chassis, blade servers, and rack servers connectivity to the data center network

- **Cisco Nexus 5548UP Unified Switch** — Provides infrastructure simplicity by consolidating LAN and storage traffic to the Hitachi Unified Storage VM
Figure 1 illustrates the high-level logical design of this reference architecture on HUS VM and Cisco UCS Server and Cisco Switches.
Key Solution Components

These are descriptions of the key hardware and software components used to deploy this Hitachi Unified Compute Platform for VMware vSphere with Cisco Unified Computing System using Hitachi Unified Storage VM reference architecture.

Table 1 lists the detailed information about the hardware components used in the Hitachi Data Systems lab to validate this solution.

Table 1. Hardware Components

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Unified Storage VM</td>
<td>▪ Dual Controller</td>
<td>73-02-03-00 or later</td>
</tr>
<tr>
<td></td>
<td>▪ 16 × 8 GB/sec Fibre Channel Ports</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 118 GB total cache</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 96 SAS 600 GB 10k RPM disks, 2.5 inch SFF</td>
<td></td>
</tr>
<tr>
<td>Cisco Unified Computing System</td>
<td>Cisco UCS 5108 Chassis</td>
<td>2208XP: 2.1.(3a)</td>
</tr>
<tr>
<td></td>
<td>▪ 8-blade chassis</td>
<td>B200 M3: v2.1.(1f)</td>
</tr>
<tr>
<td></td>
<td>▪ 2 Cisco UCS 2208XP FEX I/O Modules with 8 × 10 Gb/sec uplink</td>
<td>6248UP: v2.1(1e)A</td>
</tr>
<tr>
<td></td>
<td>▪ 8 Cooling fan modules</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 4 Power supply modules</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cisco UCS B200 M3 Blade Servers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 2 × 8 core Intel Xeon E5-2650 processor, 2.0 GHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 128 GB RAM – 16 × 8 GB DIMMS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cisco UCS 1240 Virtual Interface Card</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cisco UCS 6248UP Fabric Interconnect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 32 Unified Ports</td>
<td></td>
</tr>
<tr>
<td>Cisco Nexus 5548UP Switch</td>
<td>32 Unified Ports</td>
<td>6.0(2)N1(2)</td>
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<tr>
<td>Cisco UCS C22 M3 series rack server for management (optional)</td>
<td>Rack mounted servers for VMware vCenter and Hitachi Command Suite</td>
<td>C22M3.1.5.1c.0</td>
</tr>
<tr>
<td>Cisco MDS 9710 Series Multilayer Directors (optional)</td>
<td>Dedicated SAN Director</td>
<td>5.2.8b and 6.2.1</td>
</tr>
</tbody>
</table>
Hitachi Unified Storage VM

Hitachi Unified Storage VM is an entry-level enterprise storage platform from Hitachi Data Systems. It combines storage virtualization services with unified block, file, and object data management. This versatile, scalable platform offers a storage virtualization system to provide centralized storage services to existing storage assets.

Unified management delivers end-to-end central storage management of all virtualized internal and external storage on Unified Storage VM. A unique, hardware-accelerated, object-based file system supports intelligent file tiering and migration, as well as virtual NAS functionality, without compromising performance or scalability.

The benefits of HUS VM are the following:

- Enables the move to a new storage platform with less effort and cost when compared to the industry average
- Increases performance and lowers operating cost with automated data placement
- Supports scalable management for growing and complex storage environment while using fewer resources
- Achieves better power efficiency and with more storage capacity for more sustainable data centers
- Lowers operational risk and data loss exposure with data resilience solutions
- Consolidates management with end-to-end virtualization to prevent virtual server sprawl

Cisco Unified Computing System

Cisco Unified Computing System is an innovative data center platform that unites compute, network, storage access, and virtualization into a cohesive system designed to reduce total cost of ownership (TCO) and increase business agility. The system integrates a low-latency, lossless 10 Gigabit Ethernet unified network fabric with enterprise-class, x86-architecture servers. The system is an integrated, scalable, multi-chassis platform in which all resources participate in a unified management domain. Managed as a single system whether it has one server or 160 servers with thousands of virtual machines, Cisco UCS decouples scale from complexity. Cisco UCS accelerates the delivery of new services simply, reliably, and securely through end-to-end provisioning and migration support for both virtualized and non-virtualized systems.
The Cisco UCS consists of the following components:

- **Cisco UCS 6200 Series Fabric Interconnects**
  (http://www.cisco.com/en/US/products/ps11544/index.html) is a family of line-rate, low-latency, lossless, 10 Gb/sec Ethernet and Fibre Channel over Ethernet interconnect switches providing the management and communication backbone for the Unified Computing System. Cisco UCS supports VM-FEX technology, see the Cisco VM-FEX section for details.

- **Cisco UCS 5100 Series Blade Server Chassis**

- **Cisco UCS B-Series Blade Servers**

- **Cisco UCS Adapters**

- **Cisco UCS Manager**
  (http://www.cisco.com/en/US/products/ps10281/index.html) provides unified, embedded management of all software and hardware components in the Cisco UCS.


### Cisco Nexus 5500 Series Switch

The Cisco Nexus 5000 Series is designed for data center environments with cut-through technology that enables consistent low-latency Ethernet solutions, with front-to-back or back-to-front cooling, and with data ports in the rear, bringing switching into close proximity with servers and making cable runs short and simple. The switch series is highly serviceable, with redundant, hot-pluggable power supplies and fan modules. It uses data center-class Cisco NX-OS Software for high reliability and ease of management.

The Cisco Nexus 5500 platform extends the industry-leading versatility of the Cisco Nexus 5000 Series purpose-built 10 Gigabit Ethernet data center-class switches and provides innovative advances toward higher density, lower latency, and multilayer services. The Cisco Nexus 5500
platform is well suited for enterprise-class data center server access-layer deployments across a diverse set of physical, virtual, storage-access, and high-performance computing (HPC) data center environments.

The Cisco Nexus 5548UP is a 1RU 10 Gigabit Ethernet, Fibre Channel, and FCoE switch offering up to 960 Gb/sec of throughput and up to 48 ports. The switch has 32 unified ports and one expansion slot supporting modules with 10 Gigabit Ethernet and FCoE ports or to connect to Fibre Channel SANs with 8/4/2/1 Gb/sec Fibre Channel switch ports, or both.


Cisco MDS 9700 Series Multilayer Directors (Optional)

Cisco MDS 9700 Series Multilayer Directors address the stringent requirements of large, virtualized, data center storage environments. They provide uncompromised availability, scalability, flexibility, security, ease of management, and transparent integration of new technologies.

Cisco MDS 9700 Series Multilayer Directors offer:

- Outstanding SAN performance with support for 16 Gb/sec Fibre Channel and 1.5 Tb/sec throughput per slot
- High availability with fully redundant components, including fabric cards, supervisors, and power supplies
- Industry-leading scalability with up to 384 line rate 2/4/8 Gb/sec, 2/4/8/10/16 Gb/sec autosensing Fibre Channel ports
- Intelligent network features such as virtual SAN technology, ACLs, intelligent frame processing, and fabric-wide Quality of Service (QoS)

Table 2 lists the detailed information about the software components used in the Hitachi Data Systems lab to validate this solution.

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Dynamic Provisioning</td>
<td>73-01-33-00 or later</td>
</tr>
<tr>
<td>Virtualization Software</td>
<td></td>
</tr>
<tr>
<td>VMware vSphere</td>
<td>5.1U1*</td>
</tr>
<tr>
<td>Distributed Virtual Switch</td>
<td></td>
</tr>
<tr>
<td>Cisco Nexus 1000v Series Switch (optional)</td>
<td>1000v: 4.2(1)SV2(2.1)</td>
</tr>
<tr>
<td>VM-FEX technology</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
</tr>
<tr>
<td>Cisco UCS Manager</td>
<td>2.1(3a)</td>
</tr>
<tr>
<td>Cisco Prime Data Center Network Manager</td>
<td>6.2.3</td>
</tr>
<tr>
<td>Cisco UCS Director</td>
<td>4.0</td>
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<tr>
<td>Hitachi Command Suite</td>
<td>7.5.0-06</td>
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<tr>
<td>Hitachi Storage Navigator for HUS VM</td>
<td>SVP 73-02-04/00</td>
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<tr>
<td>VMware vCenter</td>
<td>5.1</td>
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<tr>
<td>vCenter Plugin - Storage Manager for VMware vCenter</td>
<td>2.4.3</td>
</tr>
<tr>
<td>vStorage API for Storage Awareness (VASA) - Storage Provider for VMware vCenter</td>
<td>2.1.1</td>
</tr>
</tbody>
</table>

* To date Hitachi Data Systems have performed qualification and certification tests using VMware vSphere 5.1 and 5.5. Cisco is in the process of performing their qualification and certification of VMware vSphere 5.5. This document will be updated once the Cisco process has been completed.
Hitachi Dynamic Provisioning

On Hitachi storage systems, Hitachi Dynamic Provisioning provides wide striping and thin provisioning functionalities.

Using Dynamic Provisioning is like using a host-based logical volume manager (LVM), but without incurring host processing overhead. It provides one or more wide-striping pools across many RAID groups. Each pool has one or more dynamic provisioning virtual volumes (DP-VOLs) of a logical size you specify of up to 60 TB created against it without initially allocating any physical space.

Deploying HDP avoids the routine issue of hot spots that occur on logical devices (LDEVs). These occur within individual RAID groups when the host workload exceeds the IOPS or throughput capacity of that RAID group. HDP distributes the host workload across many RAID groups, which provides a smoothing effect that dramatically reduces hot spots.

When used with Hitachi Unified Storage VM, HDP has the benefit of thin provisioning. Physical space assignment from the pool to the dynamic provisioning volume happens as needed using 42 MB pages, up to the logical size specified for each dynamic provisioning volume. There can be a dynamic expansion or reduction of pool capacity without disruption or downtime. You can rebalance an expanded pool across the current and newly added RAID groups for an even striping of the data and the workload.
VMware vSphere 5

VMware vSphere 5 is a virtualization platform that provides a data center infrastructure. It features vSphere Distributed Resource Scheduler (DRS), high availability, and fault tolerance.

VMware vSphere 5 has the following components:

- ESXi 5 — This is a hypervisor that loads directly on a physical server. It partitions one physical machine into many virtual machines that share hardware resources.
- vCenter Server 5 — This allows management of the vSphere environment through a single user interface. With vCenter, there are features available such as vMotion, Storage vMotion, Storage Distributed Resource Scheduler, High Availability, and Fault Tolerance.

Cisco Nexus 1000v (Optional)

Cisco Nexus 1000V Series Switches provide a comprehensive and extensible architectural platform for virtual machine (VM) and cloud networking. The switches are designed to accelerate server virtualization and multi-tenant cloud deployments in a secure and operationally transparent manner.

Integrated into the VMware vSphere hypervisor and fully compatible with VMware vCloud Director, the Cisco Nexus 1000V Series provides:

- Advanced virtual machine networking based on Cisco NX-OS operating system and IEEE 802.1Q switching technology
- Cisco vPath technology for efficient and optimized integration of virtual network services
- Virtual Extensible Local Area Network (VXLAN), supporting cloud networking
- Hypervisor agnostic

These capabilities help ensure that the virtual machine is a basic building block of the data center, with full switching capabilities and a variety of Layer 4 through 7 services in both dedicated and multi-tenant cloud environments. With the introduction of VXLAN on the Nexus 1000V Series, network isolation among virtual machines can scale beyond traditional VLANs for cloud-scale networking.
The Cisco Nexus 1000V Series Switches are virtual machine access switches for the VMware vSphere environments running the Cisco NX-OS operating system. Operating inside the VMware ESX or ESXi hypervisors, the Cisco Nexus 1000V Series provides:

- Policy-based virtual machine connectivity
- Mobile virtual machine security and network policy
- Nondisruptive operational model for your server virtualization and networking teams
- Virtualized network services with Cisco vPath providing a single architecture for L4-L7 network services such as load balancing, firewallsing and WAN acceleration


### Cisco VM-FEX

Cisco VM-FEX technology collapses virtual switching infrastructure and physical switching infrastructure into a single, easy-to-manage environment. Benefits include:

- Simplified operations: Eliminates the need for a separate, virtual networking infrastructure
- Improved network security: Contains VLAN proliferation
- Optimized network utilization: Reduces broadcast domains
- Enhanced application performance: Offloads virtual machine switching from host CPU to parent switch application-specific integrated circuits (ASICs)

VM-FEX is supported on Red Hat Kernel-based Virtual Machine (KVM) and VMware ESX hypervisors. Live migration and vMotion are also supported with VM-FEX. VM-FEX eliminates the virtual switch within the hypervisor by providing individual virtual machines (VMs) virtual ports on the physical network switch. VM I/O is sent directly to the upstream physical network switch that takes full responsibility for VM switching and policy enforcement. This leads to consistent treatment for all network traffic, virtual or physical. VM-FEX collapses virtual and physical switching layers into one and reduces the number of network management points by an order of magnitude.

The VIC (virtual interface card) uses VMware’s Direct Path I/O technology to significantly improve throughput and latency of VM I/O. Direct Path allows direct assignment of PCIe devices to VMs. VM I/O bypasses the hypervisor layer and is placed directly on the PCIe device associated with the VM. VM-FEX unifies the virtual and physical networking infrastructure by allowing a switch ASIC to perform switching in hardware, not on a software based virtual switch. VM-FEX is offloading the ESXi hypervisor, and that improves the performance of any hosted VM applications.
Cisco UCS Manager

Cisco UCS Manager provides unified, centralized, embedded management of all Cisco Unified Computing System software and hardware components across multiple chassis and thousands of virtual machines. Administrators use the software to manage the entire Cisco UCS as a single logical entity through an intuitive GUI, a command-line interface (CLI), or an XML API.

The Cisco UCS Manager resides on a pair of Cisco UCS 6200 Series Fabric Interconnects using a clustered, active-standby configuration for high availability. The software gives administrators a single interface for performing server provisioning, device discovery, inventory, configuration, diagnostics, monitoring, fault detection, auditing, and statistics collection. Cisco UCS Manager service profiles and templates support versatile role- and policy-based management, and system configuration information can be exported to configuration management databases (CMDBs) to facilitate processes based on IT Infrastructure Library (ITIL) concepts.

Service profiles let server, network, and storage administrators treat Cisco UCS servers as raw computing capacity to be allocated and reallocated as needed. The profiles define server I/O properties and are stored in the Cisco UCS 6200 Series Fabric Interconnects. Using service profiles, administrators can provision infrastructure resources in minutes instead of days, creating a more dynamic environment and more efficient use of server capacity.

Each service profile consists of a server software definition and the server's LAN and SAN connectivity requirements. When a service profile is deployed to a server, Cisco UCS Manager automatically configures the server, adapters, fabric extenders, and fabric interconnects to match the configuration specified in the profile. The automatic configuration of servers, network interface cards (NICs), host bus adapters (HBAs), and LAN and SAN switches lowers the risk of human error, improves consistency, and decreases server deployment times.

Service profiles benefit both virtualized and non-virtualized environments. The profiles increase the mobility of non-virtualized servers, such as when moving workloads from server to server or taking a server offline for service or upgrade. Profiles can also be used in conjunction with virtualization clusters to bring new resources online easily, complementing existing virtual machine mobility.


Cisco Prime Data Center Network Manager

Cisco Prime Data Center Network Manager (DCNM) is designed to help you efficiently implement and manage virtualized data centers. It includes a feature-rich, customizable dashboard that provides visibility and control through a single pane of glass to Cisco Nexus and MDS products.
Cisco Prime DCNM optimizes the overall uptime and reliability of your data center infrastructure and helps improve business continuity. This advanced management product:

- Automates provisioning of data center LAN and SAN elements
- Proactively monitors the SAN and LAN, and detects performance degradation
- Helps secure the data center network
- Eases diagnosis and troubleshooting of data center outages
- Simplifies operational management of virtualized data centers

The primary benefits of Cisco Data Center Network Manager:

- Faster problem resolution
- Intuitive domain views that provide a contextual dashboard of host, switch, and storage infrastructures
- Real-time and historical performance and capacity management for SANs and LANs
- Virtual-machine-aware path analytics and performance monitoring
- Easy-to-use provisioning of Cisco NX-OS features with preconfigured, customized templates
- Customized reports which can be scheduled at certain intervals


Cisco UCS Director

Cisco UCS Director is a unified management solution that enhances the value of shared infrastructure solutions, which bring together compute, network, and storage resources. Together, Cisco UCS Director and shared infrastructures improve IT agility, protect investments, simplify deployment of new services, and optimize asset use.
Cisco UCS Director allows IT to continue their drive towards data center transformation and innovation with holistic management, centralized automation and orchestration across virtual and physical infrastructure layers. Cisco UCS Director delivers effective unified shared infrastructure management through these capabilities:

- Centralized management console, which provides a comprehensive view of the shared infrastructure stack
- Native performance monitoring across all shared infrastructure resources to quickly address over or under-utilized resources before they compromise service
- Model-based orchestration to build and execute repeatable workflows without custom scripts
- Ability to manage virtualized and non-virtualized environments running side-by-side
- Fast time to value: installation to production in less than four hours without any service engagement

**Hitachi Command Suite 7**

Hitachi Command Suite is a centralized software management framework that incorporates multiple IT and storage management disciplines, including:

- Storage resource management
- Tiered storage management
- Service level management

Hitachi Command Suite provides advanced data management that improves storage operations, provisioning, optimization and resilience for Hitachi storage environments. It complements Hitachi storage systems, creating the most reliable and easiest-to-manage enterprise storage solution available.
The latest release of Hitachi Command Suite incorporates a number of key new enhancements, including:

- Agentless host discovery, which can be leveraged for basic storage management practices while only requiring host agent deployments for more advanced management functions.
- Enhanced integration across HCS products with a new GUI, shared data repositories and task management, so tasks can either be executed immediately or scheduled for execution at a later time.
- Improved usability with integrated use case wizards and best practices defaults for common administrative tasks.
- Improved scalability to manage larger data centers with a single Hitachi Command Suite management server and improved performance to reduce the time required to execute tasks.
- Streamlining of common administrative practices, which can unify management across all Hitachi storage systems and data types.

**Hitachi Storage Navigator for HUS VM**

Hitachi Storage Navigator provides a unified GUI for managing and optimizing the HUS VM storage system. You access the system in Storage Navigator from any computer with a web browser. Besides the GUI, Storage Navigator provides a CLI to allow scheduling of storage system events.

With Storage Navigator, you can perform the following tasks:

- Provision storage.
- Set up data replication for restoring lost data.
- View and manage the configuration of the storage system.
- Monitor and tune performance.
- Acquire logs for actions and commands performed on the storage system.
VMware vCenter Server

VMware vCenter Server is the simplest and most efficient way to manage VMware vSphere, no matter whether you have ten VMs or tens of thousands of VMs. It provides advanced data management that improves storage operations, provisioning, optimization and resilience for Hitachi storage environments. It provides unified management of all hosts and VMs from a single console and aggregates performance monitoring of clusters, hosts and VMs. VMware vCenter Server gives administrators deep insight into the status and configuration of clusters, hosts, VMs, storage, the guest OS and other critical components of a virtual infrastructure. Using VMware vCenter Server, a single administrator can manage 100 or more virtualization environment workloads, more than doubling typical productivity in managing physical infrastructure.

For more information, see: http://www.vmware.com/products/vcenter-server/overview.html

vCenter Plugin - Hitachi Storage Manager for VMware vCenter

Storage Manager for VMware vCenter provides a scalable and extensible platform that forms the foundation for virtualization management. It centrally manages VMware vSphere environments, allowing IT administrators dramatically improved control over the virtual environment compared, to other management platforms.

Storage Manager for VMware vCenter is composed of the following main components:

- VI Client—VMware Infrastructure Client allows administrators and users to connect remotely to the vCenter Server or individual VMware ESX hosts from any Windows PC.
- vCenter Server—VMware vCenter server provides a scalable and extensible platform that forms the foundation for virtualization management.
- ESXHost—VMware virtual machine software for consolidating and partitioning servers in high-performance environments.
- Storage Manager for VMware vCenter—Storage Manager for VMware vCenter connects to VMware vCenter Server and associates the Hitachi Storage system information with VMware ESX Datastore/Virtual Machine information.
vStorage API for Storage Awareness (VASA) - Storage Provider for VMware vCenter

VMware vStorage API for Storage Awareness is a VMware vCenter 5.0 plug-in that provides integrated information of physical storage resources and information based on, topology, capability and state. This information is then used by vSphere for various features, including VMware Storage Distributed Resource Scheduler (SDRS) and profile-based storage.

VMware vSphere Storage APIs for Storage Awareness enables unprecedented coordination between vSphere/vCenter and the storage system. It provides built-in storage insight in vCenter to support intelligent VM storage provisioning, bolster storage troubleshooting and enable new SDRS-related use cases for storage.

Hitachi Data Systems supports vSphere Storage APIs for Storage Awareness through the plug-in, or “provider,” which is available through your HDS sales representative. This provider is compatible with vSphere and vCenter, and supports storage system makes and models as described on the VMware Compatibility Guide.
Solution Design

This is the detailed design for Hitachi Unified Compute Platform Select for VMware vSphere with Cisco Unified Computing System using Hitachi Unified Storage VM reference solution. It includes software and hardware design information required to build the basic infrastructure for the virtualized data center environment.

To provide you with options for scaling out your environment in modular increments, this solution uses a converged cell architecture. Converged infrastructure cells offer containers with the pre-defined elements necessary to configure, size and scale converged infrastructure solutions. Each cell defines the compute, network, and/or storage resources necessary to support a specific workload. Solutions can be architected, sized and scaled using pre-defined cells, each designed for a different function: Infrastructure cells; application cells; resource cells and expansion cells. Converged infrastructure cells offer a more efficient, flexible and granular approach to sizing and scaling converged solutions than the more common uniform building blocks.

This design defines compute and storage resource groups to support a specific usage scenario. You can add additional converged cells to scale out the environment to meet your organization’s requirements.

Figure 2 illustrates a high-level concept of the cell architecture. Note: The vCPU, vRAM and Capacity numbers are for illustration only.
The architecture consists of preconfigured cells designed to support general server workload. These cells provide the following:

- **Infrastructure cell for compute resources** — Foundation for compute components
- **Infrastructure cell for storage resources** — Foundation for storage components
- **Application cell for Hitachi Unified Compute Platform Select management** — Resource to manage this environment
  - This cell is required only if an existing configuration for managing a VMware vSphere environment does not exist.
- **Application cell for VMware vSphere** — Provides the resource for hosting virtual machines running general server application workloads.
- **Expansion cell for compute resources** — Provides the compute resources for scaling out the Unified Compute Platform Select for VMware vSphere environment.
- **Expansion cell for storage resources** — Provides the storage resources for scaling out the Unified Compute Platform Select for VMware vSphere environment.

These cells provide the compute and storage hardware needed to build this scalable UCP Select for VMware vSphere with Cisco UCS solution.

**Infrastructure Cell for Compute Resources**

The infrastructure cell for compute resources provides the foundation for the compute components needed to start building this solution.
Figure 3 shows the infrastructure cell for compute resources.

Use the infrastructure cell for compute resources in conjunction with the following cells:

- Infrastructure cell for storage resources
- Application cell for Hitachi Unified Compute Platform Select management
- Application cell for VMware vSphere
- Expansion cell for compute resources

The infrastructure cell for compute resources and the infrastructure cell for storage resources are the core infrastructure cells required to build a scalable solution. Both infrastructure cells support up to three expansion cells for Cisco UCS 5100 before requiring new infrastructure cells. Every infrastructure cell for compute resources requires one infrastructure cell for storage resources.

Table 3 shows the components of the infrastructure cell for compute.
The hardware in the infrastructure cell for compute resources makes up the core compute hardware in this UCP Select for VMware vSphere with Cisco UCS solution.

### Chassis Components

The Cisco UCS 5100 Blade chassis has redundant management modules to provide high availability access to manage and monitor the chassis, switch modules, and server blades. The chassis contains redundant switch modules for high availability and maximum throughput. Hot-swappable power and fan modules allow for nondisruptive maintenance.

### Network Infrastructure

The network design used in this solution provides ample bandwidth and redundancy for the following:

- A fully populated infrastructure cell for compute resources,
- An infrastructure cell for storage resources,
- Up to three expansion cells for compute resources

---

**Table 3. Hardware Components for the Infrastructure Cell for Compute Resources**

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
<th>Version</th>
<th>Quantity</th>
</tr>
</thead>
</table>
| Cisco Unified Computing System                | ▪ Cisco UCS 5108 Chassis  
▪ 8-blade chassis  
▪ 2 × Cisco UCS 2208XP FEX I/O Modules with 8 × 10 Gb/sec uplink ports, 32 × 10 GB/sec Internal ports  
▪ 8 Cooling fan modules  
▪ 4 Power supply modules | 2208XP: 2.1.(3a) | 1        |
| Cisco UCS 6248UP Fabric Interconnect Switch   | ▪ 32 Unified Ports                                                        | 6248UP: v2.1(3a)A | 2        |
| Cisco Nexus 5548UP Switch                     | ▪ 32 Unified Ports                                                        | 5548UP: 6.0(2)N1(2) | 2        |
| Cisco MDS 9700 Series Multilayer Directors (Optional) | ▪ Dedicated SAN Director                                                | 5.2.8b and 6.2.1 | 2        |
The network design also allows for the utilization of advanced features inherent in the Nexus 5500UP switch family and the Cisco UCS 6200UP. Fabric Interconnects such as Cisco’s Unified Switching Technology help provide:

- Nonstop networking
- Simplified, automated networks
- An evolutionary approach that protects existing IT investments

See the Cisco website for more information about Cisco Nexus Switch Family and Cisco Fabric Interconnect switches.

**SAN Infrastructure**

The Hitachi Unified Storage VM controller used for this solution has 16 ports for connections to the Nexus 5548UP switches. For this reference architecture, zone the infrastructure cell for compute resources to four ports on the HUS VM controller, two ports per cluster. When adding expansion cells for compute resources to the solution, zone four new open storage ports on the cluster. Dedicating four ports to each Cisco UCS 5100 chassis ensures bandwidth between the chassis and HUS VM.
Figure 5 illustrates the physical SAN architecture of the infrastructure cell for compute.
Infrastructure Cell for Storage Resources

The infrastructure cell for storage resources contains all of the base storage hardware required to start building this solution.

Figure 6 shows the infrastructure cell for storage resources.

Figure 6

Use an infrastructure cell for storage resources in conjunction with the following cells:

- Infrastructure cell for compute resources
- Application cell for Hitachi Unified Compute Platform Select management
- Application cell for VMware vSphere

The infrastructure cell for storage resources provides the storage infrastructure for the other cells in the solution. Once an infrastructure cell for storage resources is fully populated, add additional infrastructure cells for storage resources to scale out the solution.

Table 4 shows the components of the infrastructure cell for storage.
The infrastructure cell for storage resources contains a Hitachi Unified Storage VM controller and a disk expansion tray. This disk expansion tray holds disks for this infrastructure cell. Add storage disks to this cell for the following:

- Application cell for Hitachi Unified Compute Platform Select management
- Hot spares (optional)

Note — Scalability limits depend on application workloads running on this infrastructure.

### Table 4. Infrastructure Cell for Storage Resources Hardware

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
<th>Version</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Unified Storage VM</td>
<td>Dual Controllers and Fibre Channel Modules</td>
<td>73-02-03-00 or later</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>16 × 8 GB/sec Fibre Channel Ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>32 GB total cache</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFF disk expansion tray for Hitachi Unified Storage VM</td>
<td>Contains Disks for other Cells</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

The infrastructure cell for storage resources contains a Hitachi Unified Storage VM controller and a disk expansion tray. This disk expansion tray holds disks for this infrastructure cell. Add storage disks to this cell for the following:

- Application cell for Hitachi Unified Compute Platform Select management
- Hot spares (optional)

Note — Scalability limits depend on application workloads running on this infrastructure.

### Application Cell for Hitachi Unified Compute Platform Select Management

The application cell for Hitachi Unified Compute Platform Select management contains the compute and storage components for hosting the VMware vSphere infrastructure services as well as Hitachi Command Suite shared management framework for advanced data management.

Note: This cell is required only if an existing configuration for managing a VMware vSphere environment or for managing Hitachi Command Suite does not exist.
Figure 7 shows the application cell for UCP Select management.

![Application Cell For UCP Select Management](image)

Cisco UCS C22M3 Servers

2 x Cisco UCS C22M3 Servers each with 1x UCS VIC 1225 and 1x 600GB SAS 10K RPM Internal Hard Disk

**Figure 7**

Use an application cell for Hitachi Unified Compute Platform Select management when a VMware vCenter and/or Hitachi Command Suite environment does not already exist.

---

**Note** — Scalability limits depend on application workloads running on this infrastructure.

---

**Compute Infrastructure for UCP Select Management**

The application cell for Hitachi UCP Select management provides enough capacity to support an emergency high availability event if one single server fails. Use VMware High Availability and Distributed Resource Scheduler to configure a cluster dedicated to the application cell for Unified Compute Platform Select management to ensure virtual machine failover in the event of a hardware failure.

Table 5 shows the details of the hardware configuration in the application cell for Unified Compute Platform Select management.

---

**Table 5. Application Cell for Unified Compute Platform Select management Hardware**

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
<th>Version</th>
<th>Quantity</th>
</tr>
</thead>
</table>
| Cisco UCS C22 M3 rack mounted Servers | ■ 2 x 8 core Intel Xeon E5-2450 processor, 2.10 GHz  
■ 64 GB RAM | C22M3.1.5.1c | 2        |
| SFF Disk Drives (Internal) | ■ 600 GB 10k RPM SAS Drives in a RAID1+0 (2D+2D)  
■ Hot Spare |            | 4        |

---
The compute infrastructure of the application cell for UCP Select management supports all associated Hitachi Command Suite, Microsoft SQL Server, Microsoft Active Directory, and VMware vCenter and their associated requirements.

Manage your environment using the above resources or by connecting to a preexisting VMware vSphere and Hitachi Command Suite management environment.

**Network Infrastructure for UCP Select Management**
Configure each of the C22M3 servers with two NICs connected to the Infrastructure Network. All Management and vMotion traffic will flow over these NICs.

Optionally, these C22M3 servers can be connected to the Cisco UCS fabric using a Cisco UCS 2232PP Fabric Extenders and configured for High Availability. This means these C22M3 servers are no longer standalone but are deployed in an integrated model and managed by the UCS Manager.

**Storage Infrastructure for UCP Select Management**
The storage infrastructure of the application cell for Hitachi Unified Compute Platform Select management consists of 5 units of 600 GB 10k RPM SAS drives internal to each of the UCS C22M3 servers. Configure the storage into a single RAID-1+0 (2D+2D) group. The RAID group provides an overall capacity of 1.2 TB. Configure 1 unit of 600 GB 10k RPM SAS drives internal as a spare to protect against a single drive failure.

Optionally, the storage infrastructure may reside on one of the HDP Pools on HUS VM and may be set up for SAN boot.

**Server Configuration Sizing Guidelines**
Apply the proper resource allocation for virtual machines used to manage the UCP Select for VMware vSphere with Cisco UCS using Hitachi Unified Storage VM and Hitachi Command Suite shared management environment. If using a separate environment outside of this solution for management, use the virtual machine sizing recommendations in Table 6.
Table 6 lists the virtual machine configurations used for each component of the management infrastructure used in this reference architecture.

Table 6. Virtual Machine Sizing Recommendations

<table>
<thead>
<tr>
<th>Virtual Machine Purpose</th>
<th>Configuration</th>
<th>Quantity</th>
</tr>
</thead>
</table>
| Microsoft® Active Directory®, DNS, DHCP | vCPU — 1  
vMemory — 4 GB | 1        |
| VMware vCenter          | vCPU — 2  
vMemory — 8 GB | 1        |
| Microsoft SQLServer® 2008 database for VMware vCenter | vCPU — 2  
vMemory — 8 GB | 1        |
| Hitachi Command Suite v7.5 | vCPU — 2  
vMemory — 8 GB | 1        |
| Hitachi Tuning Manager v7.5 | vCPU — 2  
vMemory — 8 GB | 1        |

Application Cell for VMware vSphere

The application cell for VMware vSphere contains all compute and storage components necessary to run general server application workloads consisting of the following:

- 64 virtual CPUs (32 virtual CPUs per blade server)
- 256 GB of virtual machine memory (128 GB of virtual machine memory per blade server)
- 31 TB of storage capacity in HDP Pool (10 × RAID6 (6D+2P) RAID Groups created from 80 × 600 GB 10k SAS Hard Disks)

It is possible to overcommit resources to the virtual machines running under VMware vSphere and care should be taken to avoid any performance issues.
Figure 8 shows the application cell for VMware vSphere.

Use the application cell for VMware vSphere in conjunction with the following cells:

- Infrastructure cell for compute resources
- Infrastructure cell for storage resources
- Expansion cell for compute resources (used for scale-out)

Add the compute components of the application cell for VMware vSphere to the infrastructure cell for compute and the storage components to the infrastructure cell for storage to start building a scalable HCP Select for VMware vSphere with Cisco UCS using HUS VM environment.

To scale out the solution and increase capacity, add additional application cells for VMware vSphere to your infrastructure cells for compute resources or expansion cells for compute resources. A single infrastructure cell for compute resources and an infrastructure cell for storage resources may physically support up to 16 application cells for VMware vSphere before you require a new infrastructure cell is required.

**Note** — Scalability limits depend on application workloads running on this infrastructure.
Compute Infrastructure
The application cell for VMware vSphere supports a maximum density of 132 virtual CPUs and 128 GB of virtual machine memory. It is possible to overcommit resources and increase these limits of maximum density but in such a maximum density configuration, a cell cannot support the failover of virtual machines in case of a server blade failure. To provide high availability, do the following:

- Reduce the number of virtual CPUs and virtual machine memory per host up to 50%.
- Configure a VMware High Availability and Distributed Resource Scheduler cluster dedicated to application cells for VMware vSphere.

Place additional hosts from each application cell for VMware vSphere into the cluster. When scaling the solution, increase the number of virtual machines per host as you add more resources to the cluster.

Based on VMware maximums, each High Availability and Distributed Resource Scheduler cluster can support up to 16 application cells for VMware vSphere (32 hosts).

Table 7 shows the details of the hardware used in the application cell for VMware vSphere.

### Table 7. Application Cell for VMware vSphere Hardware

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
<th>Version</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco UCS B200 M3 blade servers</td>
<td>▪ 2 × 8 core Intel Xeon E5-2650 processor, 2.0 GHz</td>
<td>B200 M3: v2.1.(1f)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>▪ 128 GB RAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 1240 VIC (Virtual Interface Card)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFF disk drives</td>
<td>▪ RAID-6 (6D+2P)</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>▪ 600 GB 10k RPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Installed in infrastructure cell for storage resources disk tray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFF Disk Expansion Tray</td>
<td>▪ Hot Spare</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Network Infrastructure
Configure each of the UCS VIC 1240 on board the B200M3 server blades to obtain two logical NICs per VIC 1240 port. Use Cisco UCS Manager to create a single Service Profile Template that can be applied to each of the B200 M3 Blade servers.
The Cisco UCS Virtual Interface Card (VIC) offers each VM a virtual Ethernet interface or vNIC. This vNIC provides direct access to the Fabric Interconnects and Nexus 5500 series switches where forwarding decisions can be made for each VM using a VM-FEX interface.

Figure 9 illustrates the Networking Details for the Cisco UCS B200 M3 to the Cisco 6248UP Fabric Interconnects.

As detailed in Figure 9, the path for a single VM is fully redundant across the Cisco fabric. The VM has an active virtual interface (VIF) and standby VIF defined on the adapter, an adapter that is dual-homed to Fabric A and B. Combined with the Cisco UCS Fabric Failover feature the VM-FEX solution provides fault tolerance and removes the need for software based HA teaming mechanisms. If the active uplink fails the vNIC will automatically fail over to the standby uplink and simultaneously update the network through gratuitous ARP. In this example, the active links are solid and the standby links are dashed.
Storage Infrastructure

The storage infrastructure of the application cell for VMware vSphere consists of

80 units of 600 GB 10k RPM SAS drives in one Hitachi Dynamic Provisioning pool with the following configuration:

- **Number of SFF Trays** — 4
- **Number of HDD** — 96 (24 per tray)
- **Pool 0** — 8 drives consisting of 2 RAID-1+0 (2D+2D) parity groups.
- **Pool 1** — 80 drives consisting of 10 RAID-6 (6D+2P) parity groups.

Figure 10 shows the storage configuration for the application cell for VMware vSphere.
Use RAID-1+0 to maximize performance for random workloads, which is common with virtualized environments. Use RAID-6 to balance performance and efficient use of pool space. HDS recommends RAID-6 when you need a guarantee against data loss when other associated recommendations are also followed.

Create two pools to separate virtual machine workloads with different performance characteristics.

Because of its wide striping capability, Hitachi Dynamic Provisioning can balance the I/O load in pools of RAID groups. Mixing workloads in a single dynamic provisioning pool is possible to obtain certain levels of performance. However, grouping virtual machines with similar I/O profiles optimizes storage performance and results in a more efficient use of disk resources. Within a pool, create additional LUNs as necessary to spread the workload and avoid possible queue depth issues.

When scaling out with additional application cells for VMware vSphere, add RAID groups to grow the existing pools. Increasing spindle count allows the pool to support the increasing IOPS requirement dynamically. As stated before, create additional LUNs to assign to VMDKs (Virtual Machine Disk) to prevent virtual machine workloads from saturating the LUN. HDP Pools may grow to 60 TB in size.

**SAN Infrastructure**

Configure each of the UCS VIC 1240 on board the B200M3 server blades to obtain one logical HBA per VIC 1240 port. Use Cisco UCS Manager to create a single Service Profile Template that can be applied to each of the B200 M3 Blade servers.

The Cisco UCS Virtual Interface Card (VIC) offers each VM a virtual HBA interface or vHBA. This vHBA provides direct access to the Fabric Interconnects and Nexus 5500 series switches where forwarding decisions can be made for each VM using a VM-FEX interface.

See Figure 9 to see the FC traffic paths.

The environment uses single initiator to multi-target zoning for each port on the B200M3 server blades. Following best practice, configure the SAN environment in a dual fabric topology for redundancy and high availability. This results in four paths available to each ESXi host, providing the following:

- **Resiliency to failure**
- **Redundant paths to the storage subsystem**

The storage multi-pathing policy for each target in ESXi was set to **round robin**. This results in optimal load distribution during an all paths available situation.
Table 8 shows the zone configuration used for the application cell for VMware vSphere.

### Table 8. Application Cell for VMware vSphere Zone Configuration

<table>
<thead>
<tr>
<th>Host</th>
<th>Host HBA Number</th>
<th>Fabric</th>
<th>Zone Name</th>
<th>Storage Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCSESX01</td>
<td>HBA1_1</td>
<td>Fabric A</td>
<td>ESX1_HBA1_1_HUS_VM_1A_2A</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>HBA1_2</td>
<td>Fabric B</td>
<td>ESX1_HBA1_2_HUS_VM_1B_2B</td>
<td>1B</td>
</tr>
<tr>
<td>UCSESX02</td>
<td>HBA1_1</td>
<td>Fabric A</td>
<td>ESX2_HBA1_1_HUS_VM_1A_2A</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>HBA1_2</td>
<td>Fabric B</td>
<td>ESX2_HBA1_2_HUS_VM_1B_2B</td>
<td>1B</td>
</tr>
</tbody>
</table>

**Scaling Using Expansion Cell for Compute Resources**

Use an expansion cell for compute resources to scale out this solution beyond the first infrastructure cell for compute resources.

Figure 11 shows the expansion cell for compute resources.

---

Expansion Cell for Compute Resources

Cisco UCS 5100 Chassis
UCS 2208XP IO Modules
UCS 1240 VIC

**Figure 11**

Use an expansion cell for compute resources in conjunction with the following cells:

- Infrastructure cell for compute resources
- Application cell for VMware vSphere
Once the chassis in the infrastructure cell for compute resources becomes fully populated, use an expansion cell for compute resources to provide additional resource capacity. This expansion cell for compute resources uses the storage and networking infrastructure provided in the infrastructure cells for compute resources and storage resources. House this cell in the rack enclosure of the infrastructure cell for compute resources.

You can physically add up to three expansion cells for compute resources to an infrastructure cell for compute resources and an infrastructure cell for storage resources before you need to add new infrastructure.

One infrastructure cell for compute resources and two expansion cells for compute resources may support a maximum of 10 application cells for VMware vSphere (20 server blades and 33 storage trays).

---

**Note** — Scalability limits depend on application workloads running on this infrastructure.

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**Chassis Components**

The expansion cell for compute resources uses the same chassis components contained in the infrastructure cell for compute resources.

**Networking Infrastructure**

The networking for the expansion cell for compute resources uses the same networking configurations as the infrastructure cell for compute resources.

**Storage Infrastructure**

Use four of the open storage target ports on HUS VM in the infrastructure cell for storage resources. Follow the same storage configuration described for the infrastructure cell for compute resources to use the newly provisioned storage target ports in the zoning configuration.
Figure 12 shows the storage target ports of a fully scaled-out solution.

Scaling Using Expansion Cell for Storage Resources

Use an expansion cell for storage resources to scale out the VMware vSphere solution beyond the first infrastructure cell for storage resources.

The expansion cell for storage contains up to 4 units of 2.5 inch SFF disk trays for HUS VM.

Use an expansion cell for storage resources in conjunction with the following cells:

- Infrastructure cell for storage resources
- Application cell for VMware vSphere

Once the original infrastructure cell for storage drive chassis becomes fully populated, use an expansion cell for storage resources to provide additional capacity.

Put hot spares for the first application cells in the disk tray for the infrastructure cell for storage resources. When the tray in the infrastructure cell fills, use the expansion cell for storage resources.
Engineering Validation

This describes the test methodology, test load and the verification tests used to validate this reference architecture. The reference architecture consists of systems and solutions that are designed, tested and documented to facilitate and improve customer deployments.

Test Methodology

The methodology's focus was on validating Hitachi Unified Compute Platform Select for VMware vSphere with Cisco Unified Computing System using Hitachi Unified Storage VM benefits, including the differentiated features that provide better utilization of compute resources by moving functions previously handled by the server onto the storage platform and the ability to better control how storage traffic flows through the system.

The Systems Validation Tests (including Differentiated Feature Benefit Analysis) includes:

- High Availability / Resiliency
- High Availability of Hitachi Unified Storage VM
- Hitachi Dynamic Provisioning
- VMware API for Array Integration
- Advanced UCS SAN features (link aggregation (F-port trunk), F-port port channel)

Test Infrastructure

Testing involved these cells:

- Infrastructure cell for compute resources
- Infrastructure cell for storage resources
- Application cell for Unified Compute Platform Select management
- Application cell for VMware vSphere
  - 128 vCPUs
  - 512 GB vRAM
  - 31 TB HDP Pool capacity
Figure 13 shows the cells used to validate this reference architecture.

![Diagram of cells](image)

**Figure 13**

On each application cell for VMware vSphere, 8 virtual machines ran Microsoft Windows® 2008 R2 EE SP1. Each VM had 2 vCPUs, 4 GB RAM and 100 GB storage space.

**Test Load**

The system was subjected to load while performing the System Tests. DVD Store, IOMeter, and IOZone were used to produce storage, compute, and SAN load. NetPerf was used to create IP Network traffic load. An additional server was installed to run NetPerf and generate the IP traffic to the Nexus 5548 switch.

**Interoperability Verification**

Before and during build of the environment, it was ensured that all hardware components, firmware, and software deployed are supported in the HIFIRE Interoperability Test database. All make, model and version numbers have been documented.
High Availability / Resiliency Verification

System resiliency (HA) testing was limited to major component failures in order to demonstrate system resiliency at each layer of the solution. The test cases included testing and validating the following:

- I/O Module failure and recovery
- Fabric Interconnect failure and recovery
- Fabric Interconnect SAN uplink (F-port Port Channel) failure and recovery
- Nexus 5000 failure and recovery
- HUS VM controller failure (FED failure on one cluster) and recovery
- Nexus 1000V – Create, Configure and Apply Port Profile
- Demonstrate VMware vMotion by migrating VM Server between 2 ESX hosts
- Demonstrate HA failover for UCS blade with VMware HA

VMware vStorage APIs for Array Integration (VAAI) Verification

- VAAI Full Copy – Clone VMSs (eagerzeroedthick to eagerzeroedthick vmdk)
- VAAI Full Copy – Clone VMs (eagerzeroedthick to zeroedthick vmdk)
- VAAI Full Copy – Clone VMs (eagerzeroedthick to thin vmdk)
- VAAI Full Copy – Clone VMs (zeroedthick to zeroedthick vmdk)
- VAAI Full Copy – Clone VMs (zeroedthick to thin vmdk)
- VAAI Full Copy – Clone VMs (thin to zeroedthick vmdk)
- VAAI Full Copy – Clone VMs (thin to thin vmdk)
- VAAI Full Copy – Storage vMotion VMs (zeroedthick to zeroedthick vmdk)
- VAAI Block Zeroing - (Provisioning eagerzeroedthick vmdk)
- VAAI Hardware Assisted Locking - Large Scale VM boot storms
- VAAI Hardware Assisted Locking - Large scale simultaneous vMotion
- VAAI + HDP Hardware Accelerated Thin Provisioning (eagerzeroedthick vmdk’s)
Conclusion

This reference architecture guide discusses how to design a Hitachi Unified Compute Platform Select for VMware vSphere with Cisco Unified Computing System using Hitachi Unified Storage VM. The purpose of the general server application workloads testing in the Hitachi Data Systems ISV Solutions and Engineering laboratory was to provide general guidance on the virtual resources available with this solution.

Each implementation has its own unique set of data center and application requirements. Design your implementation of this environment by understanding the I/O workload of the server applications in your environment. Creating an environment that meets your unique needs results in increased ROI from avoiding over or under provisioning resources.

Use Hitachi Dynamic Provisioning to reallocate I/O capabilities dynamically, as necessary. Having the capability to provision additional spindles to an already provisioned datastore within vSphere allows for nondisruptive upgrades to the underlying storage infrastructure. This provides immediate benefits to your environment without confusing shuffling of virtual machines, datastores, or LUs.

This UCP Select design gives you a build-as-you-go model that uses performance-proven hardware resources, including HUS VM and Cisco UCS. The modular design, using a cell architecture, permits implementing an environment for modest needs that gives you the flexibility to scale out as your IT needs grow.
For More Information

Hitachi Data Systems Global Services offers experienced storage consultants, proven methodologies and a comprehensive services portfolio to assist you in implementing Hitachi products and solutions in your environment. For more information, see the Hitachi Data Systems Global Services website.

Live and recorded product demonstrations are available for many Hitachi products. To schedule a live demonstration, contact a sales representative. To view a recorded demonstration, see the Hitachi Data Systems Corporate Resources website. Click the Product Demos tab for a list of available recorded demonstrations.

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