Hitachi Unified Compute Platform Select for Microsoft® Private Cloud v3 Management

Reference Architecture Guide

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Reference Architecture Guide

This Hitachi and Microsoft® Hyper-V® Private Cloud Fast Track Version 3 solution provides a reference architecture to build private clouds according to your organization’s specific requirements. This fast-track solution helps organizations implement private clouds with ease and confidence. The benefits of this solution are faster deployment, reduced risk, predictability, and a lower cost of ownership.

Managing this private cloud reference architecture is simplified by the integration of Hitachi storage and servers into Microsoft System Center 2012 SP1. These integrations provide the customer with a central platform to manage the private cloud architecture, application, and storage infrastructures.

The key components of this solution are:

- Hitachi storage management packs to monitor the performance and health of Hitachi storage.
- Hitachi server management packs to monitor the performance and health of Hitachi servers.
- Hitachi embedded SMI-S provider to manage and provision storage using Microsoft System Center Virtual Machine Manager (SCVMM) 2012 SP1.
- Hitachi SMP provider to manage and provision storage using the Microsoft System Center Virtual Machine Manager (SCVMM) 2012 SP1.
- Hitachi Storage Adapter for Microsoft® Windows PowerShell snap-in which allows for the management and provisioning of Hitachi storage via PowerShell cmdlets.
- Hitachi Storage Adapter for Microsoft® System Center Orchestrator which provides for automated storage provisioning through System Center 2012 SP1 Orchestrator.
This solution will validate the management of a Microsoft Private Cloud infrastructure leveraging Microsoft System 2012 SP1, and highlight the Hitachi integrations with System Center 2012 SP1. The following System Center 2012 SP1 components were tested and validated:

- System Center 2012 SP1 Operations Manager
- System Center 2012 SP1 Orchestrator
- System Center Virtual Machine Manager 2012 SP1

This solution also demonstrates Hitachi storage and server integrations with System Center 2012 SP1 to:

- Manage and monitor Hitachi servers with SCVMM and SCOM management packs.
- Manage and monitor Hitachi storage with the SCVMM, SCOM, and System Center Orchestrator.
Solution Overview

The reference architecture, described in this paper, is built on hardware and software virtualization platforms from Hitachi and Microsoft. Hitachi Compute Blade 500 was configured with two distinct Hyper-V failover clusters, a six node tenant cluster that hosts production or tenant virtual machines, and a two node management cluster. The management cluster contains the Hitachi and Microsoft software required to deploy virtual machines to the tenant cluster along with the products and tools to manage the Hyper-V private cloud infrastructure components.

This reference architecture provides the following capabilities:

- **Virtual machine high availability**—With Hitachi Compute Blade 500 running Hyper-V failover clustering, the virtual machines deployed in the failover cluster are made highly available. In case one of the blades in the cluster fails, the virtual machines residing on that blade will automatically failover to another blade in the cluster.

- **Virtual machine live migration**—The administrator can live migrate a virtual machine from one blade in the cluster to another to balance workloads, or can do the migration before performing server maintenance.

- **Template based virtual machine provisioning**—Virtual machine templates that allow administrators to rapidly deploy virtual machines.

- **Integration with System Center Orchestrator**—Administrators can delegate authority to other users or a group of business owners. This allows them to create virtual machines based on a set of predetermined templates using a web interface.

- **Integration with System Center Operations Manager**—Hitachi provides monitoring packs for Hitachi Compute Blade 500, Hitachi Virtual Storage Platform, and Hitachi Unified Storage VM. These packs enable the administrator to be notified of any alerts.

- **Integration with Microsoft PowerShell** - Hitachi Storage Management PowerShell Snap-in software allows storage administrators to extend Microsoft PowerShell to include Hitachi storage management functionality.
System Center 2012 SP1 is used to manage the compute, network and storage resources in a private cloud infrastructure. Figure 1 shows a high-level design of the reference architecture documented in this white paper.

![Image](https://example.com/image.png)

**Figure 1**
Key Solution Components

These are descriptions of the key hardware and software components used to deploy this solution.

Hardware Components

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

<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 controller</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 8 × 8 Gb/sec Fibre Channel ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 64 GB cache memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 64 × SAS 600 GB 10K RPM disks 2.5&quot; SFF</td>
<td>73-03-00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 48 × SAS 3 TB 7.2K RPM disks LFF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hitachi Unified Storage VM

Hitachi Unified Storage VM is an enterprise storage platform. It combines storage virtualization services with unified block, file, and object data management. This versatile, scalable platform offers a storage virtualization system to provide central 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.

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Description</th>
<th>Version</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Virtual Storage Platform</td>
<td>16 × 8 Gb/sec Fibre Channel ports</td>
<td>70-06-00</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>256 GB cache memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>294 × SAS 600 GB 10K RPM disks 2.5&quot; SFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hitachi Compute Blade 500 chassis</td>
<td>8-blade chassis</td>
<td>A0130-C-6655</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2 × Brocade 5460 FC Switch Modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Brocade VDX6746 10 Gb DCB switch modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 × external 10 Gb/sec network ports</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 × management modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 × cooling fan modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 × power supply modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>520B1 server blade (with CNA)</td>
<td>Half-size blade</td>
<td>01-51/03-04</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>2 × 8-Core Intel Xeon E5-2680 2.70 GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>192 GB memory per blade</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Hitachi Fibre Channel 2-port mezzanine card, Slot 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The benefits of Unified Storage 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

**Hitachi Virtual Storage Platform**

*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.
Hitachi Compute Blade 500

Hitachi Compute Blade 500 is an enterprise-class blade server platform. It features the following:

- A balanced system architecture that eliminates bottlenecks in performance and throughput
- Configuration flexibility
- Eco-friendly power-saving capabilities
- Fast server failure recovery using a N+1 cold standby design that allows replacing failed servers within minutes

Hitachi Compute Blade 500 is ideal for a private cloud solution in that the compute blade chassis contains internal Fibre Channel and network switches for meeting the high availability requirements of the Microsoft Private Cloud program.

Software Components

This section describes the software components deployed for this reference architecture. Table 2 describes the software used in this reference architecture.

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Storage Navigator</td>
<td>Microcode Dependent</td>
</tr>
<tr>
<td>Hitachi Dynamic Provisioning</td>
<td>Microcode Dependent</td>
</tr>
<tr>
<td>Hitachi Command Suite</td>
<td>7.4.0</td>
</tr>
<tr>
<td>Hitachi Compute Systems Manager</td>
<td>7.4.0</td>
</tr>
<tr>
<td>Hitachi Storage Adapter for Microsoft System Center Orchestrator</td>
<td>1.1.0</td>
</tr>
<tr>
<td>Hitachi Storage Array Management Pack for Microsoft SCOM</td>
<td>3.1</td>
</tr>
<tr>
<td>Hitachi Server Management Pack for Microsoft SCOM</td>
<td>2.1.0</td>
</tr>
<tr>
<td>Hitachi Storage Adapter for Microsoft Windows PowerShell</td>
<td>5.0</td>
</tr>
<tr>
<td>Hitachi Embedded SMI-S Provider</td>
<td>Microcode Dependent</td>
</tr>
<tr>
<td>Hitachi Storage Adapter for Microsoft Storage Management Provider</td>
<td>2.0.0</td>
</tr>
<tr>
<td>Microsoft Multipath I/O (MPIO)</td>
<td>006.0001.7600.16385</td>
</tr>
<tr>
<td>Microsoft Windows Server® 2012</td>
<td>Datacenter edition</td>
</tr>
<tr>
<td>Microsoft SQL Server® 2012</td>
<td>Enterprise edition SP1</td>
</tr>
<tr>
<td>Microsoft System Center Virtual Machine Manager</td>
<td>2012 SP1</td>
</tr>
<tr>
<td>Microsoft System Center Operations Manager</td>
<td>2012 SP1</td>
</tr>
<tr>
<td>Microsoft System Center Configuration Manager</td>
<td>2012</td>
</tr>
<tr>
<td>Microsoft System Center Orchestrator</td>
<td>2012</td>
</tr>
</tbody>
</table>
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 allocating any physical space initially.

Deploying Dynamic Provisioning 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. Dynamic provisioning 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 or Hitachi Virtual Storage Platform Hitachi Dynamic Provisioning has the benefit of thin provisioning. Physical space assignment from the pool to the dynamic provisioning volume happens as needed using 1 GB chunks, 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.

Hitachi Command Suite 7.4.0

Hitachi Command Suite provides a unified management framework for advanced data and storage management across all Hitachi storage environments and data types. By unifying block and file management capabilities, HCS delivers efficient management practices for Hitachi Unified Storage that cover key administrative functions of device configuration, system monitoring and service level management.

Hitachi Compute Systems Manager 7.4.0

Hitachi Compute Systems Manager integrates easily with the Hitachi Command Suite software to manage and monitor Hitachi Compute Blade 500 / 2000 and Windows and Linux physical and virtual environments.

Hitachi Storage Adapter for Microsoft System Center Orchestrator

Hitachi Storage Adapter for Microsoft System Center Orchestrator integrates Hitachi storage subsystem configuration, discovery and management functionality within Microsoft System Center Orchestrator.

Hitachi SMI-S Provider

Microsoft System Center 2012 (SCVMM) provides new storage automation features. In order to take advantage of these new features, Hitachi has implemented enhanced, embedded SMI-S providers for Virtual Storage Platform SP and Hitachi Unified Storage VM. With this new interface SCVMM administrators can discover, classify, allocate, provision, map, assign and decommission storage associated with clustered hosts.
Hitachi Storage Adapter for Microsoft Storage Management Provider (HiSMP)

Hitachi Storage Adapter for Microsoft Storage Management Provider (HiSMP) is a new interface in Windows 2012 that enables support for Windows-based storage management for Hitachi storage subsystems through the Windows Storage Management APIs (SM API).

Hitachi Storage Adapter for Microsoft® Storage Management Provider (HiSMP) uses the Microsoft SMP framework to manage Hitachi storage subsystems.

Hitachi Storage Adapter for Microsoft Windows PowerShell

Microsoft Windows PowerShell Snap-in for Hitachi Storage allows you, as a Hitachi storage administrator, to use PowerShell to use Hitachi storage management functionality. This software provides a set of Hitachi storage cmdlets for discovering and managing Hitachi storage system information.

With the Hitachi storage cmdlets, you can create scripts with logic and other PowerShell cmdlets to automate complex tasks. Filter, sort, and group storage information by piping the output of Hitachi storage cmdlets to PowerShell cmdlets.

Microsoft Windows Server 2012 Hyper-V

Microsoft Windows Hyper-V is a hypervisor-based virtualization technology that is integrated into Windows Server 2012 x64 and Windows Server 2008 R2 versions of the operating system. It allows for the reduction of hardware footprints and capital expenses through server consolidation.

Microsoft SQL Server 2012 Enterprise Edition

Microsoft SQL Server 2012 is a complete set of enterprise-ready database technologies and tools to help your business derive the most value from information. SQL Server provides high levels of performance, availability, and security while employing more productive management and application development tools.

Additional highlights of Microsoft SQL Server 2012 include the following:

- A complete business intelligence platform that connects users to the right information at the right time. This improves business decisions through familiar tools, such as Microsoft Excel® and Microsoft SharePoint® Server.
- You receive high levels of performance, scalability, availability, and security for mission-critical applications.
- With Microsoft Visual Studio®, the Microsoft .NET Framework, and Microsoft SQL Server, developers use integrated development tools to build rich, intuitive, and connected applications quickly.
For more information about the features of SQL Server 2012, see the Product Documentation page of SQL Server 2012 Books Online or "Product Information" on the Microsoft web site.

**Microsoft System Center Virtual Machine Manager 2012 SP1 (SCVMM)**

Virtual Machine Manager 2012 helps enable centralized management of physical and virtual IT infrastructure, increased server utilization, and dynamic resource optimization across multiple virtualization platforms. It includes end-to-end capabilities such as planning, deploying, managing, and optimizing the virtual infrastructure. For this solution, SCVMM is used to manage only Hyper-V Private Cloud hosts and guests in a single datacenter.

**Microsoft System Center Orchestrator 2012 SP1**

System Center Orchestrator simplifies the process of automating system administrator tasks. Orchestrator uses a GUI based approach to create automation activities. Monitoring and action activities are created by System Center Orchestrator to carry out specific procedures such as creating virtual machines and deploying software updates.

**Microsoft System Center Operation Manager 2012 SP1**

Operation Manager agents were deployed to the Fabric Management hosts and virtual machines. These in-guest agents are used to provide performance and health monitoring of the operating system only. The Operation Manager instance is used for Hyper-V Cloud infrastructure monitoring only.

**Microsoft Windows® PowerShell**

Microsoft Windows PowerShell is a task automation framework consisting of a command-line shell and associated scripting language built on top of, and integrated with, the .NET framework. In PowerShell, perform administrative tasks using **cmdlets**. Combine these cmdlets into executable scripts.

The management solutions described in this solution use PowerShell cmdlets from Hitachi Data Systems to extend the functionality of Windows PowerShell to manage Hitachi storage.
Solution Design

This solution uses Hitachi and Microsoft components to provide a centralized management platform for managing the private cloud. The Hitachi integrations and components along with the Microsoft management components are used to manage the private cloud infrastructure.

This section shows the management components and architecture used in this solution.

Management Architecture

These are the management systems and tools that are used to deploy, operate, and manage this private cloud reference architecture. Hitachi Command Suite, the Hitachi storage and server integrations, combined with Microsoft System Center management suite provides the capabilities to manage the private cloud end-to-end.
To provide high availability for the management system, a two-node Hyper-V failover cluster was implemented to host the management software. Figure 2 provides a high level overview of the virtual machines that are hosted on the two node management cluster.
Table 3 summarizes the configuration of the virtual machines deployed in the management cluster. All of them run as highly available virtual machines, with the exception of the two SQL Server instances which are configured as a failover cluster for high availability.

<table>
<thead>
<tr>
<th>Virtual Machine</th>
<th>Role</th>
<th>Hyper-V Host</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM-Device Mgr</td>
<td>Storage Management</td>
<td>BS-Node6</td>
<td>Microsoft Windows Server 2008 R2 Enterprise Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 1 vCPUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 4 GB RAM</td>
</tr>
<tr>
<td>VM- SQL1</td>
<td>SQL Server 2012 SP1</td>
<td>BS-Node6</td>
<td>Microsoft Windows Server 2012 Standard Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 4 vCPUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 32 GB RAM</td>
</tr>
<tr>
<td>VM- SQL2</td>
<td>SQL Server 2012 SP1</td>
<td>BS-Node7</td>
<td>Microsoft Windows Server 2012 Standard Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 4 vCPUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 32 GB RAM</td>
</tr>
<tr>
<td>VM- SCVMM</td>
<td>SCOM/VMM System Center VMM 2012 SP1</td>
<td>BS-Node7</td>
<td>Microsoft Windows 2012 Standard Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 2 vCPUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 32 GB RAM</td>
</tr>
<tr>
<td>VM -OpsMgr</td>
<td>SCOM/OpsMgr System Center Operation Mgr 2012 SP1</td>
<td>BS-Node7</td>
<td>Microsoft Windows 2012 Standard Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 2 vCPUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 8 GB RAM</td>
</tr>
<tr>
<td>VM-Scorch</td>
<td>System Center Orchestrator</td>
<td>BS-Node7</td>
<td>Microsoft Windows 2012 Standard Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 2 vCPUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 8 GB RAM</td>
</tr>
<tr>
<td>VM-Library</td>
<td>SCVMM Library Server</td>
<td>BS-Node7</td>
<td>Microsoft Windows 2012 Standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 2vCPUs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 8 GB RAM</td>
</tr>
</tbody>
</table>
Microsoft SQL Server 2012 SP1

The Microsoft System Center family includes a comprehensive set of tools to manage the private cloud. The components of Microsoft System Center are database driven applications. SQL Server 2012 SP1 is ideal for providing a highly available and well-performing database platform that is critical to the overall management of the environment.

For this reference architecture, two SQL Server virtual machines were deployed to support the management infrastructure. These two virtual machines were configured into a failover cluster. Each virtual SQL server was configured with 32 GB of memory, four virtual CPUs, and Windows 2012 Standard Edition.

Virtual Fibre Channel was implemented to allow for virtual machine guest clustering of SQL Server 2012 SP1. This provides high availability for the System Center Virtual Machine 2012 SQL databases along with the System Center Operation Manager and System Center Orchestrator SQL databases.

Table 4 shows the configuration for each SQL Server virtual machine.

<table>
<thead>
<tr>
<th>LUN</th>
<th>Purpose</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUN1, CSV Volume</td>
<td>Operating System</td>
<td>30 GB</td>
</tr>
<tr>
<td>LUN2, CSV Volume</td>
<td>Database LUN</td>
<td>100 GB</td>
</tr>
<tr>
<td>LUN3, CSV Volume</td>
<td>Log LUN</td>
<td>25 GB</td>
</tr>
</tbody>
</table>

Table 5 shows how the databases are configured for the SQL Server failover cluster.

<table>
<thead>
<tr>
<th>Database Client</th>
<th>Instance Name</th>
<th>Database Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchestrator</td>
<td>SQLInstance</td>
<td>SCVMM_ORCH</td>
</tr>
<tr>
<td>VMM</td>
<td>SQLInstance</td>
<td>VMM_DB</td>
</tr>
<tr>
<td>Ops Mgr</td>
<td>SQLInstance</td>
<td>Ops_Mgr_DB</td>
</tr>
<tr>
<td>Ops Mgr</td>
<td>SQLInstance</td>
<td>Ops_Mgr_DW_DB</td>
</tr>
<tr>
<td>Orchestrator</td>
<td>SQLInstance</td>
<td>Scorh_DB</td>
</tr>
</tbody>
</table>

Microsoft System Center Virtual Machine Manager 2012 SP1

Microsoft System Center Virtual Machine Manager 2012 SP1 (SCVMM) is deployed for this reference architecture to manage the Hyper-V hosts and guests in a single datacenter. Do not use the SCVMM instance that manages this solution to manage any virtualization infrastructure outside of this solution. The design of SCVMM only operates the scope of this reference architecture.
SCVMM deploys on a virtual machine running Microsoft Windows Server 2012 Standard Edition with two virtual CPUs, 32 GB of memory and a 30 GB operating system virtual hard drive which is allocated in a CSV.

For this environment, the following roles are enabled within SCVMM:

- SCVMM Administrator
- Administrator Console
- Command shell
- SCVMM Library
- SQL Server database (remote)

**Hitachi SMI-S Integration with Microsoft System Center 2012 SP1**

System Center 2012 SP1 now provides the ability to discover storage arrays, classify the newly discovered storage and also provision the storage on the HUS-VM and VSP using the SCVMM console. SCVMM controls the presentation of storage to the private cloud hosts and tracks the storage resources that are managed by SCVMM.

The Microsoft Storage Management Service is implemented in SCVMM 2012 SP1 to communicate with Hitachi storage via a Hitachi SMI-S provider.

Hitachi Unified Storage VM and Hitachi Virtual Storage Platform with the embedded SMI-S provider is built to take full advantage of the System Center Virtual Machine Manager 2012 SP1 (SCVMM) automation capabilities for the private cloud. The Hitachi SMI-S provider in conjunction with SCVMM provides the following benefits:

- Integrates the management of virtual machine resources with the resources of the Hitachi Unified Storage VM and Hitachi Virtual Storage Platform.
- Allows administration of the private cloud assets including storage through a single GUI, the SCVMM console.
- Deploys virtual machines faster and at scale by supporting rapid provisioning to the private cloud Hyper-V hosts. SCVMM can now communicate directly with Hitachi Unified Storage VM and Hitachi Virtual Storage Platform to provision storage for the virtual machines.
- Reduces load on the network by using the storage resources of Hitachi Unified Storage VM and Hitachi Virtual Storage Platform to provision storage for the virtual machines.
The architecture of the Hitachi Embedded SMI-S Provider is shown in Figure 3.

**Figure 3**

The Hitachi Embedded SMI-S provider is imported to the SCVMM console to allow for management of the Hitachi Unified Storage VM and Hitachi Virtual Storage Platform. The classification of storage pools on Hitachi storage is shown in Figure 4 for both the HUS-VM and VSP. These classifications allow for the administrator to define pools based on quality of service.

**Figure 4**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Total Capacity</th>
<th>Available Capacity</th>
<th>Assigned</th>
<th>Description</th>
<th>Provisioning Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUS-VM TI Classification</td>
<td>61,440.00 GB</td>
<td>2,142.82 GB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ThinProvi Storage pool</td>
<td>61,440.00 GB</td>
<td>2,142.82 GB</td>
<td></td>
<td></td>
<td>ThinProvisio...</td>
<td></td>
</tr>
<tr>
<td>VSPThin Classification</td>
<td>61,440.00 GB</td>
<td>1,730.74 GB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ThinProvi Storage pool</td>
<td>61,440.00 GB</td>
<td>1,730.74 GB</td>
<td></td>
<td></td>
<td>ThinProvisio...</td>
<td></td>
</tr>
</tbody>
</table>
Configure SCVMM to discover Hitachi Storage via SMI-S Provider

To configure SCVMM to discover and import Hitachi storage do the following:

1. Expand the Storage pane.
2. Right click Providers.
3. Select Add Storage Devices.
4. Click on Radio button for Add a storage device that is managed by an SMI-S provider.
5. Specify the protocol as SMI-S CMIMXML, input the IP address of Hitachi Unified Storage VM or Hitachi Virtual Storage Platform, select Use Secure Sockets Layer (SSL) connection, and assign Run As account for the storage as shown in Figure 5:

![Figure 5](image-url)
After discovering the Hitachi storage with SCVMM, the pools that are defined on the HUS-VM and VSP can now be managed by SCVMM and creation of LUNs can be done within these managed pools. To specify which pools on the storage are to be managed by SCVMM do the following:

1. Expand the **Array Pane**

2. Right click on the Hitachi array and click **Properties** to choose the pools to be brought under SCVMM management as shown in Figure 6.

![Figure 6](image)

**Figure 6**

Note: In this case a storage classification of HUS-VM Thin had been previously created using the **Create classification** wizard.

3. Click **OK**.
After determining and selecting which pools on Hitachi storage to bring into management under SCVMM, the administrator can now provision LUNs within these managed pools by following these steps as shown in Figure 7.

1. Right click the **Storage** pane and select **Create Logical Unit**
2. Select the storage pool where the LUN is to be created
3. Define the name and size of the LUN.
4. Click **OK**.

![Create Logical Unit](image)

**Figure 7**

**SCVMM 2012 SP1 Rapid Provisioning Options**

SCVMM 2012 SP1 administrators now have the capability to deploy virtual machines using rapid provisioning using Hitachi Unified Storage VM, Hitachi Virtual Storage Platform and SAN based transfers. A requirement to use this feature is that SCVMM 2012 SP1 virtual machine templates be implemented. These templates are stored on the SCVMM 2012 SP1 library server. The library server contains the templates along with a host’s VM files which are used to generate VSP read/write snapshots for rapid provisioning of new VMs. The Hitachi Thin Image feature on the VSP enables the use of snapshots by SCVMM 2012 SP1.

To use the Rapid Provisioning feature of SCVMM 2012 SP1, one or more Thin Image snapshot pools must be created and snapshot target volumes prepared. For information on planning and creating Thin Image pools, see the "Hitachi Virtual Storage Platform Hitachi Thin Image User Guide".
Snapshot target volumes must be created and mapped to either an unused array port or a host group with no initiators on a port. The target volume size must be exactly the same number of blocks as the source volume.

Perform the following steps in SCVMM 2012 SP1 to define the HUS-VM or VSP method for rapid provisioning support.

1. Go to the SCVMM console and expand the Storage tab on the left action pane and select Arrays.

2. In the right pane, right click on the HUS-VM array and select Properties.

3. In the left pane of the array properties window click Settings.

   The Storage array settings window will display.

4. Select Use Snapshots and then click OK as shown in Figure 8.

![Figure 8](image)

For additional information on implementing the Hitachi SMI-S Embedded Provider please reference the following guide on Hds.com: [Hitachi SMI-S Embedded Provider for VSP](https://hds.com).

For additional details on prerequisites and VM template creation details please reference the following Microsoft Technet article: [Rapid Provisioning of Virtual Machines Using SAN Copy](https://technet.microsoft.com).
Microsoft Storage Management Provider
The Microsoft Storage Management Provider (SMP) is a new interface in Windows 2012 that enables storage vendors to support Windows-based storage management for their storage subsystems through the Windows Storage Management APIs (SM API). This API supersedes the Virtual Disk Service (VDS) used in previous versions of Windows Server.

The Hitachi Storage Adapter for Microsoft® Storage Management Provider (HiSMP) uses Microsoft SMP framework to manage Hitachi storage subsystems.

Hitachi Storage Adapter for Microsoft Storage Management Provider (HiSMP)
The Hitachi Storage Adapter for Microsoft Storage Management Provider (HiSMP) integrates with SCVMM 2012 SP1 which allows for SCVMM to manage Hitachi storage using HiSMP.

The prerequisites for integrating HiSMP with SCVMM 2012 SP1 are:

- Hitachi Device Manager version 7.2.1 or later installed. HiSMP communicates with HUS-VM and VSP subsystems through Hitachi Device Manager.
- HiSMP application installed on the SCVMM 2012 SP1 server.
- Add the HUS-VM or VSP subsystem to the HiSMP configuration.
Figure 9 shows the high level configuration of the HiSMP provider integrated with SCVMM 2012 SP1.
After installing the HiSMP package, complete the following step to add HUS-VM or VSP subsystem to the HiSMP configuration:

1. In the "Hitachi Storage Adapter for Microsoft Storage Management Provider Snapin.psc1" PowerShell console, type the **Add-Subsystem** cmdlet supplying the input parameters to match the HUS/VM or VSP storage to be added:

   ```powershell
   ```

   The **Add-Subsystem** cmdlet modifies the configuration file hismp.config in the C:\Program Files\Hitachi\hismp for all subsystems that are added. Below is the configuration file entry after adding HUS-VM to HiSMP:

   ```
   ARRAY.HM700.210930@HDVM@172.17.244.84:2001
   ```

   After adding the subsystem to the HiSMP configuration the storage array can now be imported to SCVMM 2012 SP1 using the SCVMM console. This will allow for management of the storage pools by SCVMM 2012 SP1 using the HiSMP provider.
To configure SCVMM to discover and import the SMP provider for Hitachi storage do the following:

1. Expand the **Storage** pane.

2. Right click **Providers**.

3. Select **Add Storage Devices**.

4. Click on Radio button for **Add a storage device that is managed by an SMP provider**.

5. Input the **IP address** of the instance of Hitachi Command Device Manage Server that is managing the Hitachi Unified Storage VM or Hitachi Virtual Storage Platform in the **Provider** field and click **Import** as shown in Figure 10.

6. Select the storage resources to be managed by SCVMM and, if desired, click **Create classification** to assign classifications to different types of storage resources.

7. Click **OK** to finish.
After determining and selecting which pools on Hitachi storage to bring into management under SCVMM, the administrator can now provision LUNs within these managed pools by following these steps as shown in Figure 11.

1. Right click the **Storage** pane and select **Create Logical Unit**
2. Select the storage pool where the LUN is to be created
3. Define the name and size of the LUN.
4. Click **OK**.

**Figure 11**
Once these LUNs are created and managed by SCVMM 2012 SP1, the HiSMP adapter can be used to present these LUNs to any Hyper-V host and virtual machine managed by SCVMM. Prior to presenting LUNs to a Hyper-V host or virtual machine, create a Host Group in SCVMM and add the Hyper-V hosts to it. The steps for unmasking and presenting a LUN to a Hyper-V host are outlined below:

1. Select **Allocate Capacity** to add storage pools to the SCVMM Host Group as shown in Figure 12.

![Figure 12](image)

2. Select the **Host groups** for allocating storage pools.

3. Click **Allocate Storage Pools** as shown in Figure 13.
Select a host group to view the capacity information for hosts and clusters and allocate storage logical units and storage pools

Host groups: All Hosts

Storage capacity for this host group includes storage allocated to the parent host groups.

Storage capacity for hosts in this host group

<table>
<thead>
<tr>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total capacity: 0 GB</td>
<td>Total capacity: 1,282.95 GB</td>
</tr>
<tr>
<td>Available capacity: 0 GB</td>
<td>Available capacity: 215.69 GB</td>
</tr>
</tbody>
</table>

Allocated storage for this host group

<table>
<thead>
<tr>
<th>Logical units</th>
<th>Allocate Storage Pools...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of logical units: 7</td>
<td>Allocate Logical Units...</td>
</tr>
<tr>
<td>Total capacity: 1,016.00 GB</td>
<td></td>
</tr>
<tr>
<td>Available capacity: 0 GB</td>
<td></td>
</tr>
</tbody>
</table>

Storage pools:

<table>
<thead>
<tr>
<th>Name</th>
<th>Classification</th>
<th>Total Capacity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin Provisioning Pool.HUS VM.210930.12</td>
<td>HUS-VM Thin</td>
<td>61,440.00 GB</td>
<td>Thin Provisioning Pool.HUS VM.210930.12</td>
</tr>
<tr>
<td>Thin Provisioning Pool.VSP.33118.4</td>
<td>VSPThin</td>
<td>61,440.00 GB</td>
<td>Thin Provisioning Pool.VSP.33118.4</td>
</tr>
</tbody>
</table>

**Figure 13**

The **Allocate Storage Pools** dialog will display.

4. Select from **Available Storage Pools** the pools to allocate to the Host Group.

5. Click **OK**.
To allocate available LUNs to these storage pools to a Hyper-V host do the following:

1. Select **Allocate Capacity**.

2. Select **Allocate Logical Units** as shown in Figure 14.

3. Select LUNs from **Available logical units** pane and click **Add** as shown in Figure 15.
4. Click **OK**.

The allocated storage logical unit is now ready to be presented to the host group under SCVMM. For detailed steps on allocating logical units to a host group under SCVMM follow the steps in the Microsoft SCVMM 2012 SP1 documentation at [http://technet.microsoft.com/en-us/library/gg610686.aspx](http://technet.microsoft.com/en-us/library/gg610686.aspx)

As shown in the previous sections, implementing Hitachi storage integrations into SCVMM 2012 SP1 provides for the management of Hitachi Unified Storage VM and Virtual Storage Platform with both the Microsoft SMI-S provider and Microsoft Storage Management Provider framework. Figure 16 shows SCVMM 2012 SP1 managing the Hitachi Unified Storage VM and the Virtual Storage Platform.

![Figure 16](image)

**Monitor and Reporting of Storage and Servers with System Center Operations Manager 2012 SP1 (SCOM)**

This section covers the storage and server monitoring features available in SCOM and also provides the step required for the discovery and monitoring of Hitachi storage and servers using SCOM 2012 SP1 and the Hitachi Storage and Server Management Packs.

**Microsoft System Center Operations Manager 2012 SP1 Configuration**

For this reference architecture Microsoft SCOM agents are deployed to the Hyper-V hosts and virtual machines. The in-guest agents provide performance and health information of the operating system within the virtual machine. The scope of this SCOM instance is only to monitor Hyper-V cloud infrastructure. Application-level monitoring is not within the scope of this SCOM instance.
The following roles are enabled for this instance of SCOM:

- Root management server
- Reporting server (database resides on SQL Server)
- Data warehouse (database resides on SQL Server)
- Operator console
- Command shell

The following management packs are installed to provide for monitoring of the cloud infrastructure:

- Hitachi Data Systems Storage Array Management Pack
- Hitachi Compute Blade 500 Management Pack
- Microsoft Virtual Machine Manager 2012 SP1
- Microsoft Windows Server operating system monitoring management pack
- Microsoft Windows Server failover clustering
- Microsoft Windows Server 2012 Hyper-V
- Microsoft SQL Server management pack
- Microsoft System Center management packs
- Microsoft.System Center.OutofBand.SMASH.Library

The above management packs must be installed prior to installing Hitachi Storage, Server and Server Pro Management packs.
Figure 17 shows System Center Operations Manager 2012 SP1 monitoring Hitachi Unified Storage VM, Virtual Storage Platform, and Compute Blade 500.

Figure 17
Hitachi Storage Adapter for Microsoft System Center Operations Manager
Hitachi Storage Adapter for Microsoft System Center Operations Manager integrates with the SCOM server to report and monitor on Hitachi storage arrays. This management pack provides the following object views that are displayed inside the monitoring pane (under “Hitachi Storage Systems Root”) of the Operations Manager console.

- Subsystem (displays all the arrays that are managed)
- Controller and port views and status
- Array drive view and status
- Hitachi Dynamic Provisioning pools view and status
- LU view and status
- RAID group view and status
The following steps are required before importing the Hitachi Storage Adapter into SCOM 2012:

- An account and user name must be created on the Hitachi storage for use by the Hitachi Storage Adapter connector service. This account requires assignment of storage administrator privileges.

- The storage subsystem to be monitored must have a dual controller configuration with both controllers being connected to an Ethernet network.

- For HUS-VM and VSP subsystems, the server that runs the Hitachi Storage Connector Windows service must have access to a command device setup on the storage subsystem to be monitored.

The Hitachi Storage Adapter for Microsoft System Center Operations Manager management packs are installed on the SCOM server with the Hitachi Storage Connector Windows service providing the communications link between the Hitachi Storage Adapter and the SCOM server.
After installation of the management pack follow these steps to discover the storage subsystem:

1. From **Start> All Programs** select **Hitachi>Hitachi Storage Management for SCOM>Hitachi Storage Connector Configuration**. The connector snap-in dialog will display as shown in Figure 18.

![Figure 18](image)

2. Click the **Add Subsystem** button from the Actions pane. The Add Subsystem menu will display.

3. From the **Select Model** pull down select the model of storage array to add as shown in Figure 19.

   In this example we chose a HUS-VM storage subsystem.
4. Enter the **HDvM Server IP address**, **HDvM User name**, and **HDvM password**.

5. Enter the **HUS VM Serial #**, **User name** for HUS-VM subsystem, and **Password**.

6. Click **OK**.

**Figure 19**
To configure the Hitachi Storage Connector to allow for connection between the Hitachi Storage Adapter and SCOM 2012, select the **Connection Configuration** in the Hitachi Storage Connection Configuration dialog as shown in Figure 20.

**Figure 20**

1. Update the **Enter Server address** with Localhost if SCOM 2012 is running on the same server as the Hitachi Storage Connector service, or enter the IP address of the SCOM 2012 server.

2. Select the **Start Service** from the Actions pane.

   The Connector service status will change from "Not Running", to "Starting" and then to "Running" as shown above.
Starting the connector service for the first time installs the Hitachi Storage Adapter for Microsoft for System Center Operations Manager management packs and connector setting on the SCOM 2012 server.

3. Select **Test connection status** to test the connection between Hitachi Storage Adapter for Microsoft for System Center Operations Manager and the SCOM 2012 server.

4. Click **Save Configuration** to update the setting to the configuration file.

5. To verify that the management pack is installed in the SCOM 2012 server, from the SCOM 2012 administration console select **Administrator>Management Packs**. The Hitachi Storage Systems management pack should be displayed as shown in Figure 21:

![Management Packs - HDSCLoud - Operations Manager](image)

**Figure 21**

Storage monitoring is now enabled in SCOM 2012 for the Hitachi HUS-VM, and VSP and SCOM will now receive alerts for any possible problems with disk components, storage controllers, and storage pools.
Figure 22 shows the SCOM 2012 subsystem view and status of Hitachi Unified Storage VM and Virtual Storage Platform.

Figure 22

Figure 23 shows the status of the HDP pools being monitored by SCOM 2102. Pool utilization thresholds will generate an alert to the SCOM 2012 server.

Figure 23
Hitachi Server Management Packs

The Hitachi server management packs integrate with the System Center Operations Manager 2012 SP1 server to report and monitor on Hitachi Compute Blade 500 chassis and blades. These management packs are SNMP based and as such provide out of band monitoring support for the Hitachi Compute Blade 500 with the exceptions of the Hitachi Windows Server Management Pack which provides in band support for the Hitachi Server Conductor agent for extended monitoring.

The Hitachi Server Management Packs are:

- Hitachi.Base.mpb
- Hitachi.ComputeBlade.500.mpb
- Hitachi.WindowsServer.mpb
- Hitachi.ComputeBlade.SwitchModules.mpb
- Hitachi.WindowsServer.mpb

These management packs provide alert, diagram, and state views that are displayed inside the monitoring pane under **Hitachi Compute Blade** of the Operations Manager console.

The **Alert View** provides the following information:

- Chassis alerts
- Windows server alerts

The **Diagram View** provides the following information:

- Hitachi Compute Blade comprehensive diagram
- Windows Server blade diagram

The **State View** provides the following information:

- Blade state view
- Chassis state view
- Fan state view
- Management module state view
- Partition state view
- PCI state view
- Power Supply View
- Internal Switch State View
The following steps are required before importing the Hitachi Server Management Packs for Hitachi Compute Blade 500 into SCOM:

1. Configure the Hitachi Compute Blade 500 chassis as an SNMP device.
2. Enable SMASH support on the Hitachi Compute Blade 500.
3. Configure an IPMI/SMASH user account on the Hitachi Compute Blade 500.
4. Install and import the Hitachi server management packs for SCOM 2012 SP1.
5. Discover the Hitachi Compute Blade 500 in SCOM 2012 SP1.

For further detail on configuring the Hitachi Compute Blade 500 and installing and importing the Hitachi Server Management Packs for System Center 2012 SP1 please reference the "Hitachi Server Management Packs for SCOM 2012 User's Guide".
After installing and importing the management packs follow these steps to discover the Hitachi Compute Blade 500:

1. Open the System Center Operations Manager Operations console.
2. Navigate to the Administration Frame.
3. On the left side of the console right click on **Network Management** and select **Discovery Wizard** as shown in Figure 24.

![Image](image.png)

**Figure 24**

4. Select **Network devices** and click **Next**.
5. In the **General Properties** screen specify a **Name** for the discovery and the name of the SCOM server in the **available servers** pull down as shown in Figure 25.
Figure 25

6. Click **Next**.

   The **Discovery Method** dialog will display.

7. Select **Explicit discovery** and click **Next**.

   The **Default Accounts** dialog will display.

8. Create a Run As account by clicking on the **Create Account** button.

   The **Create Run as Account Wizard** will display.

9. Select **General Properties** and update the **Display name** field to **SNMP_Discovery_Run_As**.

   The **Credentials** dialog will display.

10. In the **Community string** field enter the community string to be used and click **Create**.

    Ensure that the community string used matches the community string SNMP setting in the CB 500.

11. Click **OK**, The account should now be ready for use.

12. On the Devices screen click **Add** to add the Hitachi Compute Blade 500 chassis. Click on **Add** to enter the IP address of the Hitachi
Compute Blade 500 service processor (SVP).

The **Add a Device** dialog will display.

13. Enter the **IP address** of the Hitachi Compute Blade 500 SVP to discover and the **Run As account** that was created.

The **Schedule Discovery** dialog will display.

14. Set the schedule to execute this discovery if desired.

15. Click **Next**.

The **Summary** page will display.

16. Click **Save** to store the discovery.

The **Completion** screen will display.

17. Leave the **Run the discovery** box checked and click **Close**. The discovery will run immediately after closing the wizard.

It will take a minimum of 30 minutes before discovery will start to push and populate monitoring data within SCOM 2012 for the Hitachi Compute Blade 500.

After importing the Hitachi server management packs, a view of the state of the CB 500 can be seen by selecting the Hitachi Compute Blade 500 Chassis State View under the Monitoring view as shown in Figure 26.

This view displays the status of all components within the Hitachi Compute Blade 500 chassis. Further information on the state of a component can be shown by clicking on a specific component.

![Figure 26](image.png)

Also provided with the Hitachi server management packs is the Hitachi Compute Blade Module MOM pack for monitoring the internal Fibre Channel and LAN switch modules. The Fibre Channel and LAN switch modules must be configured to send SNMP traps to the SCOM 2012 server.

The SNMP switch module configuration is done by logging into the switch modules themselves using their command line interfaces.
For complete information on configuring the Fibre Channel and LAN switch module SNMP configuration please reference the "Hitachi Server Management Packs for SCOM 2012 User's Guide".

Microsoft System Center Orchestrator 2012 SP1
Microsoft System Center Orchestrator 2012 SP1 is partner extensible-software that enables private clouds and IT as a service with Microsoft Windows Hyper-V and the System Center suite of management software.

Key benefits of Orchestrator for this private cloud architecture are the following:

- **Data center resource allocation** — This pools data center infrastructure resources, such as storage, networks, and virtual machine templates. It makes them available to business units to meet their infrastructure needs.

- **Simplifying bringing new applications online** — This can simplify the process when a business unit has to bring a new application online. It provides methods for a business unit owner to request resources from the infrastructure pool to host their IT services.

- **Self-service provisioning** — This provides an end-user self-service capability for virtual machine provisioning. It streamlines the end user experience of managing virtual machines.

For this reference architecture, System Center Orchestrator 2012 creates virtual machines and provisions the appropriate hardware, operating system settings, and storage based on the previously-defined templates.

Hitachi Storage Adapter for Microsoft System Center Orchestrator 2012 SP1
Hitachi Storage Adapter for Microsoft System Center Orchestrator 2012 provides subsystem configuration, discovery and management functionality to the custom automation provided by System Center Orchestrator 2012. The Hitachi SCO adapter consists of a runbook designer, and a runbook deployment wizard which is used to deploy the Hitachi SCO adapter integration pack.

In SCO 2102 SP1, using the Hitachi Storage Adapter for SCO 2012 and Hitachi Storage Management PowerShell Snap-in together, provisioning virtual machines along with the storage required to support these virtual machines can be done with a runbook under SCO 21012.
The following must be completed prior to configuring a runbook on the SCO 2102 virtual machine.

1. Install Hitachi Storage Adapter for Microsoft System Center Orchestrator integration pack.

2. Install Hitachi Storage Adapter for Microsoft Windows PowerShell.
   Note: Hitachi Storage Adapter for Microsoft Windows PowerShell snap-in must be installed on a virtual machine or server separate from the SCO 2012 virtual machine.

3. Install the Microsoft Virtual Machine Manager 2012 SP1 Integration Pack for System Center Orchestrator.

4. Configure the System Center Integration Pack for System Center 2012 Virtual Machine Manager. This allows for communication between SCVMM 2012 and SCO 2012.

5. Set the PowerShell execution policy to unrestricted.

   From PowerShell prompt: `Set-ExecutionPolicy Unrestricted`

For further information on configuring the System Center Integration Pack for System Center 2012 Virtual Machine Manager connections please see:


For further information on installing and configuring the Hitachi Storage Adapter for Microsoft System Center Orchestrator integration pack please reference the "Hitachi Storage Adapter for Microsoft System Center Orchestrator User's Guide".
Figure 27 shows the architecture and components of the Hitachi Storage Adapter for Microsoft System Center Orchestrator environment.

The following section shows how to create a virtual machine, deploy it to a host, and provision the storage on an HUS-VM or VSP using a runbook.

Microsoft System Center Orchestrator 2012 Sp1 provides runbooks. Runbooks contain the instructions for an automated task or process. The individual steps throughout a runbook are called activities. The activities required to create a virtual machine, deploy it to a host, and provision the storage are:

1. Provision storage to be allocated to the virtual machine by activities provided by the Hitachi Storage Adapter for Microsoft System Center Orchestrator 2012.

2. Virtual Machine creation and deployment using the templates from "Create VM from Template" activity provided by the SCVMM 2012 SP1 Orchestrator Integration pack.
In the Hitachi Storage Management activities as shown in Figure 28 list select the following activities and drag them on to the runbook designer GUI.

- Add USP-V/VSP/HUS-VM Subsystem
- Create LU
- Present LU

The properties for each of the above storage activities must be updated as required by the configuration.
To update the Add USPV/VSP/HUS-VM activity:

1. In the Runbook Designer GUI right-click on the Add the USP V/VSP/HUS-VM Subsystem icon.
2. Select Properties.
   
   The Add USP V/VSP/HUS-VM Subsystem Properties dialog will display as shown in Figure 29.
3. Input the Device Manager IP, Subsystem ID, and Computer Name to match the configuration.
4. Click Finish.
To update the Create LUN activity:

1. In the Runbook Designer GUI right-click on the **Create LUN** icon.
2. Select **Properties**.
   
   The Create Lü Properties dialog will display as shown in Figure 30.
3. Input the **Subsystem Serial Number**, **HDP Pool Number**, **Lu size**, and **Computer Name** to match the configuration.

   ![Create Lü Properties](image)

   **Figure 30**

4. Click **Finish**.
To update the Present LU activity:

1. In the Runbook Designer GUI right-click on the Present Lu icon.

2. Select Properties.

   The Create Lu Properties dialog will display as shown in Figure 31.

3. Input the Subsystem Serial Number, Lu, WWN List, and Computer Name to match the configuration.

4. Click Finish.
In the System Center 2012 Virtual Machine Manager activities list select **Create VM from Template** as shown in Figure 32. This activity creates a virtual machine based on the properties of the template and then deploys them either to a Hyper-V host cluster or standalone server.

**Figure 32**

Update the properties of the **Create VM from Template** activity with the appropriate parameters, as shown in Figure 33. These parameters are pulled from the SCVMM 2012 server.

**Figure 33**
If additional properties are required beyond what the SCVMM Source Template Name provides, additional SCVMM template properties can be defined as shown in Figure 34.

**Figure 34**

After the runbook has been created and Runbook Tester has been executed against the runbook, this runbook can now be used to provision virtual machines and the associated storage using Orchestrator.
Hitachi provides a full set of runbook activities that can be customized to allocate and manage storage on the Hitachi Unified Storage Platform and Virtual Storage Platform. Shown below is a full list of Hitachi storage activities available for use with Hitachi Storage Adaptor for Microsoft System Center Orchestrator 2012 SP1.

- Add USP V/VSP/HUS_VM Subsystem
- CreateClone
- Create HostGroup
- CreateLU
- DeleteClone
- DeleteHostGroup
- DeleteLU
- DismountLU
- ExpandLU
- Get Subsystem
- MountLU
- Present LU
- Re-sync Clone
- Split Clone
- Unpresent LU

Hitachi Storage Management PowerShell Snap-in

The Hitachi Storage Adapter for Microsoft Windows PowerShell snap-in allows Hitachi storage administrators to extend the Microsoft Windows PowerShell window with Hitachi storage management functionality. It includes a set of cmdlets to discover Hitachi storage array information. The cmdlets provide information for subsystems, RAID groups (RG), logical units (LU), disk drives, controllers, and controller ports.

With the Hitachi Storage Adapter for Microsoft Windows PowerShell snap-in cmdlets, administrators can create scripts together with logic and the other PowerShell cmdlets to automate complex tasks. They can filter, sort, and group the storage information by piping the output of the Hitachi Snap-in cmdlets to other cmdlets.
The following prerequisites are required to implement and start using the Hitachi Storage PowerShell cmdlets.

- An account and user name available on the Hitachi Unified Storage VM or Virtual Storage Platform in order to add the storage to the PowerShell window. This account requires assignment of storage administrator privileges.
- Hitachi Device Manager installed and desired Hitachi subsystem managed by Hitachi Device Manager.
- The host that executes the Hitachi Storage PowerShell cmdlets must have access to a command device mapped to this host through Fibre Channel.
- The command device must have Command Device Security and User Authentication enabled.
- The desired subsystem must be added to the current PowerShell session. Once the subsystem has been added you can start to use the Hitachi Snap-n cmdlets.

To add the desired subsystems do the following:

1. In the Windows Start menu, click Hitachi, and then click Hitachi PowerShell Snap-in.

   The Windows PowerShell command console opens.

2. Add the desired Hitachi subsystem(s) to the current PowerShell console session, as shown below:

   ```powershell
   ```

   The Add-Subsystem command will return the following information after successful execution.

   - **Subsystem**: HUS-VM_210930
   - **Firmware**: 73-02-00
   - **Status**: Online
   - **Model**: HUS-VM
   - **Serial Num**: 210930
   - **Total Capacity**: 62.3 TB
   - **Available Capacity**: 24.13 TB
   - **Used Capacity**: 38.17 TB
For further information on the Add-Subsystem command, type "Get-Help Add-Subsystem" in the PowerShell console session.

Once the subsystem has been added, the Hitachi Snap-in cmdlets can now be used to manage Hitachi storage.

For additional information on using the Hitachi Storage PowerShell commands to manage Hitachi storage, please reference "Hitachi Storage Snap-in Windows PowerShell User Guide".
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.

Hitachi Data Systems Academy provides best-in-class training on Hitachi products, technology, solutions and certifications. Hitachi Data Systems Academy delivers on-demand web-based training (WBT), classroom-based instructor-led training (ILT) and virtual instructor-led training (vILT) courses. For more information, see the Hitachi Data Systems Services Education website.

For more information about Hitachi products and services, contact your sales representative or channel partner or visit the Hitachi Data Systems website.