

Hitachi Unified Compute Platform 6000 for the SAP HANA Platform with Intel Xeon E7-88xx Processors on VMware vSphere

Reference Architecture Guide

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Hitachi Unified Compute Platform 6000 for the SAP HANA Platform with Intel Xeon E7-88xx Processors on VMware vSphere

Reference Architecture Guide

Use Hitachi Unified Compute Platform 6000 for the SAP HANA platform with Intel Xeon E7-88xx processors on VMware vSphere 6.0 U2 in a scale-up configuration as a pre-configured virtual solution. It is ready to plug into your network to provide real-time access to operational data for use in analytic models.

This guide provides a converged solution for SAP applications to help you to create a scalable converged solution for business applications. It provides a Hitachi solution for VMware environment hosting SAP HANA.

This solution assumes that a management server already exists in your landscape and is available for use with this solution. Make sure that your landscape has the VMware vCenter infrastructure set up and available.

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 scalable converged solution for business applications provides you a multi-purpose, in-memory database to analyze transactional and analytical data.

This converged solution for SAP applications uses the following:

- **Hitachi Compute Blade 2500 (CB 2500)**

This has enterprise computing power and performance with flexible I/O architecture and logical partitioning. Multiple applications securely co-exist in the same chassis.

You can implement this solution with a varying number of 520X B2 or 520X B3 server blades to provide the flexibility for multiple virtual machine configuration options.

- **Hitachi Virtual Storage Platform G400 (VSP G400) or Hitachi Virtual Storage Platform G600 (VSP G600)**

These storage systems scale for all data types, flexibly adapting for performance, capacity, and multi-vendor storage.

When you implement this solution, the persistent storage for SAP HANA resides on Hitachi Virtual Storage Platform G400 or Virtual Storage Platform G600.

- **Symmetric Multiprocessing Connector**

The symmetric multiprocessing connector turns multiple server blades together into a single unit.

Brocade ICX 6430-24 switch — 24-port 1 GbE switch that provides a management network to the solution.

Brocade VDX 6740-48 switch — 48-port switch that provides 10 GbE external connectivity to the solution.

QuantaPlex T41S-2U server — An ultra-dense design equipped with four independent nodes with the flexibility to set up different workloads independently in one 2U shared infrastructure. This solution uses one node of this server as a management server.

- **10 Gb 2-port LAN PCIe adapters**

- **Hitachi 16 Gb PCI-FX Fibre Channel adapters**

- **VMware vSphere 6.0 update 2**

- **SUSE Linux Enterprise Server**

- **Red Hat Enterprise Linux**

- **SAP HANA**

This is a multi-purpose, in-memory database to analyze transactional and analytical data.

Figure 1 depicts the hardware used in this solution.

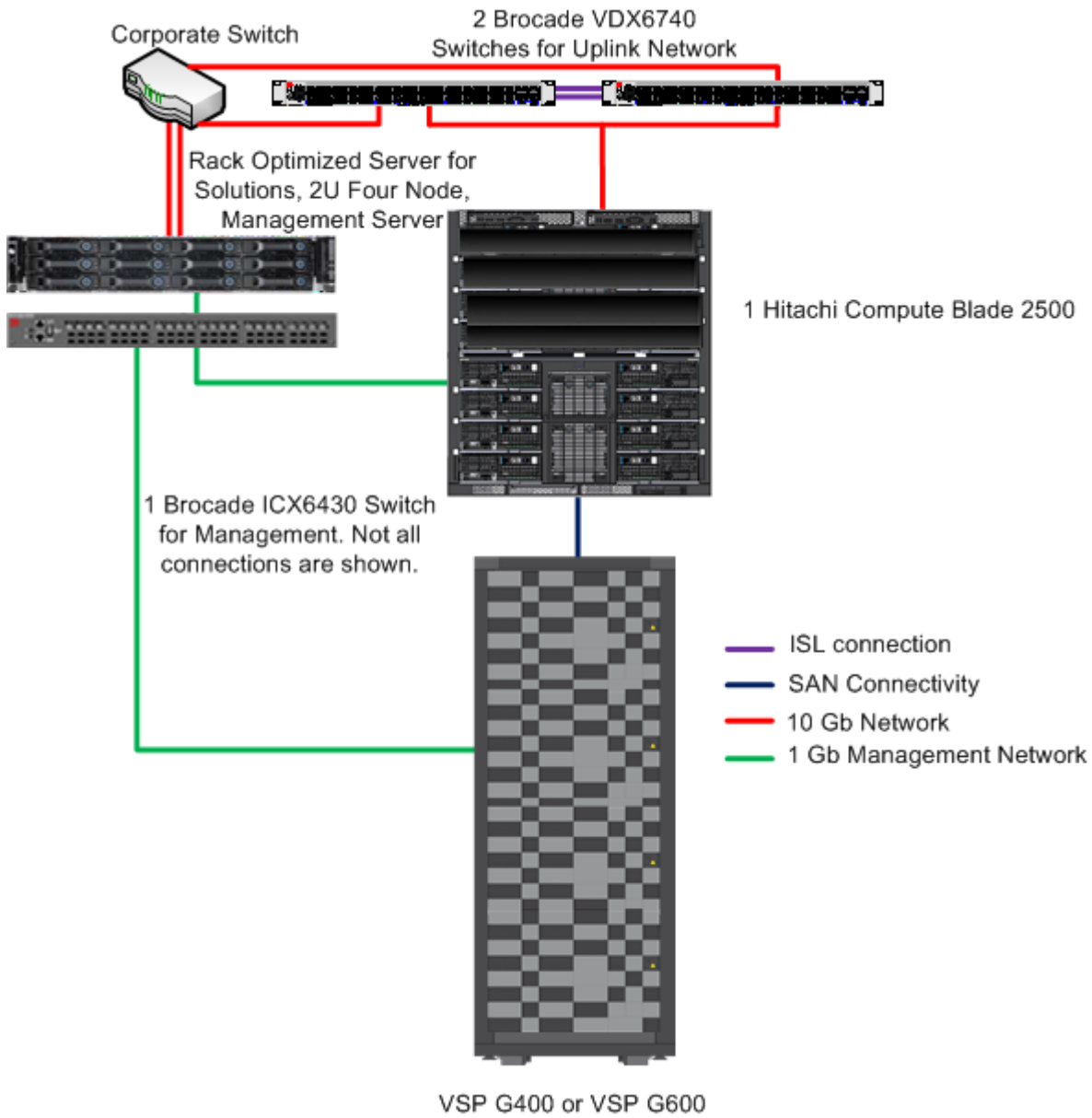


Figure 1

Key Solution Elements

These are the key hardware and software components used in this converged solution for SAP applications.

Hardware Elements

Using Hitachi Unified Compute Platform for the SAP HANA Platform, you can create scalable converged solution for business applications with VMware vSphere.

Hitachi Compute Blade 2500

[Hitachi Compute Blade 2500](#) delivers enterprise computing power and performance with unprecedented scalability and configuration flexibility. Lower your costs and protect your investment.

Flexible I/O architecture allow configurations to match application needs exactly with Hitachi Compute Blade 2500. Multiple applications easily and securely co-exist in the same chassis.

Add server management and system monitoring at no cost with Hitachi Compute Systems Manager. Seamlessly integrate with Hitachi Command Suite in Hitachi storage environments.

Different sizes of this solution use one or two 520X B2 or 520X B3 server blades in Hitachi Compute Blade 2500.

Symmetric Multiprocessing Connector

For multiple server blades, the solution uses symmetric multiprocessing (SMP) technology to combine multiple server blade resources into a single server.

The 520X B2 or 520X B3 server blades use 2-blade SMP connection board, depending on the size of the solution.

Hitachi Virtual Storage Platform Gx00 Models

[Hitachi Virtual Storage Platform Gx00 models](#) are based on industry-leading enterprise storage technology. With flash-optimized performance, these systems provide advanced capabilities previously available only in high-end storage arrays. With the Virtual Storage Platform Gx00 models, you can build a high performance, software-defined infrastructure to transform data into valuable information.

Hitachi Storage Virtualization Operating System provides storage virtualization, high availability, superior performance, and advanced data protection for all Virtual Storage Platform Gx00 models. This proven, mature software provides common features to consolidate assets, reclaim space, extend life, and reduce migration effort.

This solution uses a single storage system. The choice depends on the amount of memory needed and the size of the virtual machines used. All Virtual Storage Platform Gx00 models went through enterprise storage certification with SAP.

- Virtual Storage Platform G600 can fit up to 11 virtual machines.
- Virtual Storage Platform G400 can fit up to 7 virtual machines.

Hitachi Storage Virtualization Operating System

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

Storage Virtualization Operating System includes standards-based management software on a Hitachi Command Suite base. This provides storage configuration and control capabilities for you.

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

Rack Optimized Server for Solutions, 2U Four Node

The rack optimized server for solutions, 2U four node, is an ultra-dense design equipped with four independent nodes. It creates the flexibility to set up different workloads independently in one 2U shared infrastructure, providing optimal data center performance per dollar.

Brocade Switches

[Brocade and Hitachi Data Systems](#) partner to deliver storage networking and data center solutions. These solutions reduce complexity and cost, as well as enable virtualization and cloud computing to increase business agility.

This solution can include the following Brocade products:

- Brocade VDX 6740-48 port switch
- Brocade ICX 6430-24 port switch

Software Elements

This reference architecture uses this software to create scale-up configurations for the Unified Compute Platform for SAP HANA solution for VMware environment.

Guest Operating System for the Virtual Machines

You have the following options available as guest operating system for the virtual machines:

- **SUSE Linux Enterprise Server (SLES) for SAP Applications**

Compete more effectively through improved uptime, better efficiency, and accelerated innovation using [SUSE Linux Enterprise Server](#). This is a versatile server operating system for efficiently, deploying highly available enterprise-class IT services in mixed IT environments with performance and reduced risk.

SUSE Linux Enterprise Server was the first Linux operating system certified for use with SAP HANA. It remains the operating system of choice for the vast majority of SAP HANA customers.

- **Red Hat Enterprise Linux (RHEL)**

[Red Hat Enterprise Linux](#) delivers military-grade security, 99.999% uptime, support for business-critical workloads, and so much more. Ultimately, the platform helps you reallocate resources from maintaining the status quo to tackling new challenges.

Red Hat Enterprise Linux Server for SAP HANA provides an open, reliable, and scalable foundation for your most demanding data solutions. This ready-to-use environment is preconfigured for performance and optimized for SAP HANA.

Changing the configuration settings is supported only along the guidelines from SAP and the operating system distributor. Otherwise, configuration changes can cause you significant performance problems. The following SAP Notes for SLES and RHEL are a good starting point for information on this topic:

- [1944799 - SAP HANA Guidelines for SLES Operating System Installation](#)
- [2009879 - SAP HANA Guidelines for Red Hat Enterprise Linux \(RHEL\) Operating System](#)

For more details, see “Updating and Patching the Operating System” in the [SAP HANA Technical Operations Manual](#).

SAP HANA

[SAP HANA](#) converges database and application platform capabilities in-memory to transform transactions, analytics, text analysis, predictive and spatial processing so businesses can operate in real-time. This combines database, data processing, and application platform capabilities in a single in-memory platform. Also, the platform provides libraries for predictive, planning, text processing, spatial, and business analytics — all on the same architecture. This architecture comes from leading hardware partners of SAP, including Hitachi.

By eliminating the divide between transactions and analytics, SAP HANA allows you to answer any business question anywhere in real time.

SAP customers can download more information on the SAP HANA platform at the [SAP Service Marketplace](#). See the installation and upgrade guides download section for SAP In-Memory Computing (SAP In-Memory Appliance — SAP HANA). The following are available:

- [SAP HANA Platform \(Core\) Documentation](#).

This page is the central starting point to find documentation for SAP HANA platform.

- [SAP Integration and Certification Center \(SAP ICC\)](#)

This page provides information about appliances certified by SAP hardware partners.

Find information on production SAP HANA on VMware in SAP Note [2315348](#)

VMware vSphere

[VMware vSphere](#) is a virtualization platform that provides a datacenter infrastructure. It helps you get the best performance, availability, and efficiency from your infrastructure and applications. Virtualize applications with confidence using consistent management.

VMware vSphere has the following components:

- **VMware vSphere ESXi**

This hypervisor loads directly on a physical server. ESXi provides a robust, high-performance virtualization layer that abstracts server hardware resources and makes them shareable by multiple virtual machines.

- **VMware vCenter Server**

This provides a centralized platform for managing your VMware vSphere environments so you can automate and deliver a virtual infrastructure with confidence:

- VMware vSphere vMotion
- VMware vSphere Storage vMotion
- VMware vSphere Distributed Resource Scheduler
- VMware vSphere High Availability
- VMware vSphere Fault Tolerance

This solution for Hitachi Unified Compute Platform for the SAP HANA Platform on VMware vSphere combines the benefits of the Unified Compute Platform for SAP HANA appliance with the flexibility and manageability of VMware vSphere.

As a VMware vSphere customer, you can download more information about the ESXi Platform from [VMware vSphere Documentation](#). See the vSphere Installation and Setup Guide in “ESXi and vCenter Server Product Documentation” for more information.

In addition, you can download [Performance Best Practices for VMware vSphere 6.0](#) (PDF).

For more information on SAP HANA on VMware best practices, review [Best Practices and Recommendations for Scale-up Deployments of SAP HANA on VMware vSphere](#) (PDF) and the [SAP HANA on vSphere – Support Status and Best Practices Summary](#).

For more information on VMware vMotion best practices, review [VMware vSphere 5.1 vMotion Architecture, Performance and Best Practices](#).

Note – This solution assumes that a management server already exists in your landscape and is available for use with this solution. Make sure that your landscape has a VMware vCenter infrastructure set up and available.

Solution Design

This is the detailed design for the scale-up configuration of Unified Compute Platform for SAP HANA on VMware vSphere 6.0 U2. It is a Hitachi solution for VMware environments to host a scalable solution for business applications.

Hitachi Compute Blade 2500 Configuration

This solution uses one Hitachi Compute Blade 2500 with the following components:

- **520X B2 or 520X B3 server blades** — The scale-up configurations for SAP HANA on VMware can have two server blades. Refer to Table 1 for supported configurations.
- Two management modules on Hitachi Compute Blade 2500 connect to the management network.

Table 1. Chassis Configuration

Feature	Medium (4-Socket) Configuration
Server Blades	2 × 520X B2 or 520X B3
Server Blade Location	<ul style="list-style-type: none"> ■ Blade 3 (non-primary) ■ Blade 1 (primary)
SMP	1 × 2 server blade SMP
Network ports	<ul style="list-style-type: none"> ■ 2 × 2-port 10GBASE-SR LAN PCI-E adapter on two I/O board modules for each server blade
Fibre Channel Ports	<ul style="list-style-type: none"> ■ 2 × Hitachi 16 Gb/sec, 2-port Fibre Channel PCI-E adapters on two I/O board modules for each server blade
Other interfaces	<ul style="list-style-type: none"> ■ 1 USB 3.0 port ■ KVM connector (VGA, COM, USB 2.0 port)

You can install a maximum of 28 I/O board modules (IOBD) on one Hitachi Compute Blade 2500. Depending on the size of the solution and number of virtual machines, use between 4 or more I/O board modules in your implementation.

Figure 2 shows the layout of the I/O board modules from the back of the Hitachi Compute Blade 2500 chassis.

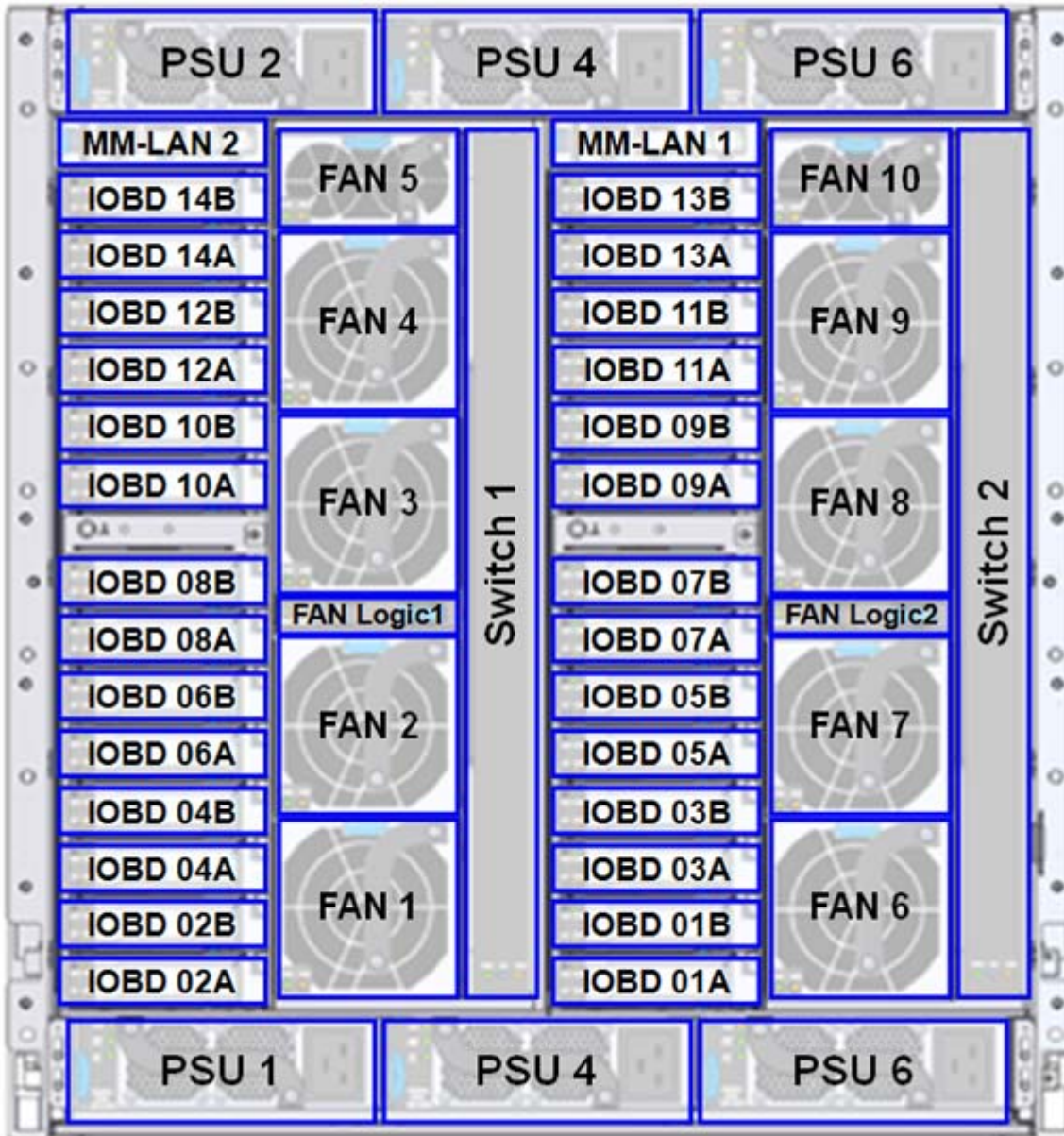


Figure 2

Server Blade Architecture

Each solution size uses a different number of server blades, from one or two full-width server blades. Multiple server blades use a two-server blade SMP connector board to create a single four-socket SMP node with a total of 96 cores and different memory sizes. Table 2 shows the supported server blade CPU support.

Table 2. Server Blade CPU Support

CPU Supported	520X B2 Server Blades		520X B3 Server Blades	
Processor SKU	Intel Xeon E7-8880 v3	Intel Xeon E7-8890 v3	Intel Xeon E7-8880 v4	Intel Xeon E7-8890 v4
Processor Cores	18	18	22	24
Base Processor Frequency	2.3 GHz	2.5 GHz	2.2 GHz	2.2 GHz

Table 3 shows the supported memory configuration.

Table 3. Memory Configuration

DIMMs	Memory Per Server Blade	Total Memory
		Medium (4-Socket)
32 × 16 GB DIMMs	512 GB	1024 GB
48 × 16 GB DIMMs	768 GB	1536 GB
32 × 32 GB DIMMs	1024 GB	2048 GB
48 × 32 GB DIMMs	1536 GB	3072 GB

Storage Architecture

This solution uses Hitachi Virtual Storage Platform G400 or Hitachi Virtual Storage Platform G600. Sizing and configuring of storage including storage drive box trays (DBS), spare drives, the operating system volume (OS), and the existing SAP HANA shared volume (/hana/shared) varies for different size solutions by taking storage and I/O requirements into account.

Fibre Channel SAN Architecture

This solution uses 4 × 16 Gb/sec Fibre Channel ports on Hitachi Virtual Storage Platform directly attached to Hitachi Compute Blade 2500 using the Fibre Channel PCI-E adapters. Table 4 shows the Fibre Channel port mappings between the ports on Virtual Storage Platform and the Fibre Channel adapters on the I/O board modules.

This configuration provides four dedicated paths from VMware vSphere ESXi within Hitachi Compute Blade 2500 to the ports on Virtual Storage Platform. The first server virtual machines share these ports.

Table 4. Fibre Channel Port Mapping

Server Blade Number	PCI-E Slot Number	Port Number	VSP G400 Ports	VSP G600 Ports
Blade 1	IOBD 01A	0	1E	1E
		1	2E	2E
Blade 2	IOBD 04A	0	3E	3E
		1	4E	4E
Blade 3 (More than 11 Virtual Machines)	IOBD 05A	0	N/A	5E
		1	N/A	6E
Blade 5 (More than 11 Virtual Machines)	IOBD 08A	0	N/A	7E
		1	N/A	8E

Shared Storage Architecture

Shared storage architecture can realize better return on investment and reduce total cost of ownership than having storage dedicated to one virtual machine. This architecture increases the number of virtual machines that can use the storage subsystem to reduce the number of disks required.

Create the following dynamic provisioning pool configuration with Hitachi Dynamic Provisioning:

- One dynamic provisioning pool for the following:
 - Operating system
 - SAP HANA shared volumes
 - SAP HANA data volumes
- One dynamic provisioning pool for the following:
 - SAP HANA log volumes

See Table 6, “Storage Configuration,” on page 17 for more information about configuring the dynamic provisioning pools.

Each virtual machine in this solution follows TDI sizing, using the following VMDKs:

- One VMDK to host the Linux guest operating system
- One VMDK to host the SAP HANA shared volume of the following size:
 - For a memory size of up to 1 TB, equal to the memory size
 - For a memory size larger than 1 TB, equal to 1 TB
- Four VMDKs to host the SAP HANA log volume of the following size:
 - For a memory size of up to 1 TB, equal to half the memory size
 - For a memory size larger than 1 TB, equal to 512 GB
- Four VMDKs to host the SAP HANA data volume, equal to 1.2 times the memory size

Network Architecture

There are two 10GBase-SR 2-port LAN adapters installed on the PCIe slots of the I/O board module of server blade 1 of the Hitachi Compute Blade 2500 chassis. The solution uses two 10 GbE ports on the 10GBase-SR 2-port LAN adapters for connectivity with the 10 GbE external switches.

Connect the management module on Hitachi Compute Blade 2500 to an external switch for management connectivity.

Make the following network connections for the client network setup of the VMware vSphere ESXi node as an uplink network setup:

- Connect the following to the external switches:
 - Port 0 of the I/O board module on PCIe slot IOBD 01B.
 - Port 0 of the I/O board module on PCIe slot IOBD 04B.
- Configure the corresponding two ports at the ESXi level as uplinks in the virtual standard switch (VSS). Configure both vmnics as **active**. Use these two ports as the management network for the ESXi node as well as the network for the guest operating system.
- At installation, the field agent from Hitachi Data System works with your VMware vCenter administrator to convert, merge, and migrate the VSS to your existing or new virtual distributed switch.
- **Optional** — At this point, to speed up detecting corrupted connections, configure external switch ports with a port channel set to **active/active** as well as setting the LACP timeout value to **short**. On VDS, use **vLAGs** instead of uplinks.

The compute network setup uses the following ports on the 10GBase-SR 2-port LAN adapters listed in Table 5.

Table 5. Network Setup Using 10GBase-SR 2-Port LAN Adapter Medium Systems

Server Blade	PCIe Slot Number	Switch Module Port	Network Description
Server Blade 1	IOBD 01B	0	ESXi Kernel and VM Traffic
		1	Free for use
	IOBD 02B	0	Free for use
		1	Free for use
Server Blade 2	IOBD 03B	0	Free for use
		1	Free for use
	IOBD 04B	0	ESXi Kernel and VM Traffic
		1	Free for use

Besides Port 0 on IOBD01B and IOBD04B, you are free to use all other network ports as the following and more:

- Extra management kernel ports
- Virtual machine traffic
- VMware vSphere vMotion

The Hitachi Compute Blade 2500 chassis has two management modules to secure fault tolerance:

- Manage the power supply of each module and monitor the status of the system unit.
- Support the management functionality of the network within the system unit for server blades and various modules.
- Connect a management module and an external network through a management LAN module.

Figure 3 shows the standard network configuration used for Hitachi Compute Blade 2500 for this solution.

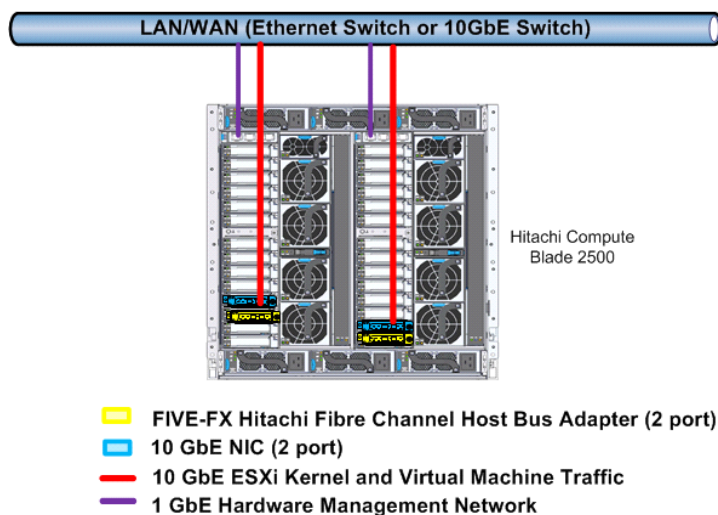


Figure 3

Note — The ESXi kernel network and virtual machine traffic can be on the same network switch or on separate network switches, depending on the network environment.

Management Server

This solution uses a rack optimized server for solutions, 2U four node, for management. The management server acts as a central device for managing SAP HANA. This server is optional.

Manage the following from the management server:

- Hitachi Compute Blade 2500
- 520X B2 or 520X B3 server blades
- Brocade switches
- VMware vSphere Web Client
- SAP HANA platform virtual machines
- Hitachi Virtual Storage Platform G400 or Virtual Storage Platform G600
- NTP configuration

Figure 4 shows the management server network ports using one dual port 1 GbE Base-T Intel i350 mezzanine card.

- **Slot 01 Port 2** — Connect this to the Brocade ICX 6430 switch. It provides the 1 GbE network to the management server.
- **Slot 01 Port 1** — Connect this to the Brocade ICX 6430 port switch. It provides the 1 GbE management network.

The management server has the following additional components:

- One dual port 10 GbE Intel 82599ES SFP+ OCP mezzanine card
- One Emulex 2-port 8 Gb/sec Fibre Channel HBA on the PCIe slot

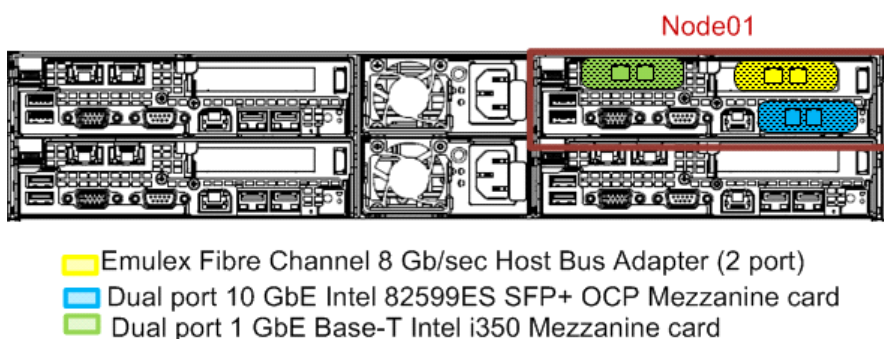


Figure 4

Storage Architecture

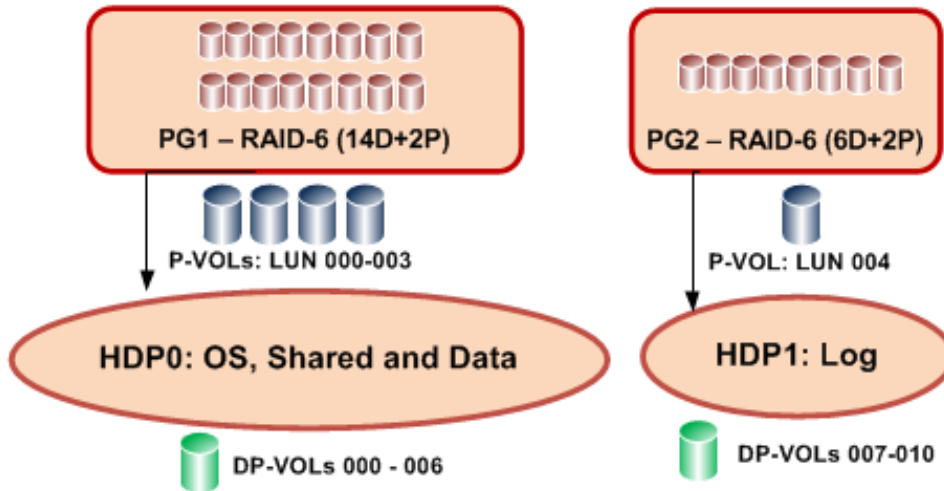
This solution uses Hitachi Virtual Storage Platform G400 or Virtual Storage Platform G600. This describes the following for the storage:

- Sizing and configuring of storage, including storage drive box trays (DBS)
- Spare drives
- Operating system volume (OS)
- SAP HANA shared volume (/hana/shared), log volume (/hana/log), data volume (/hana/data)

Figure 5 shows the disk configuration of a 1 TB, 2 TB, or 3 TB scale-up configuration of SAP HANA on VMware vSphere on Hitachi Virtual Storage Platform. If implementing a 4 TB or 6 TB design, do the following:

- Add a new PG3 set to HDP0.
- Add a new PG4 set to HDP1.
- Extend DP-VOLs and VMFS.
- Use the logical volume manager to stripe Log and Data four ways.

Memory = 1 TB or 2 TB or 3 TB
VSP G400 or VSP G600



600 GB 10K SAS Drive

P- VOLS		
LUN #	Size	Description
000-003	1.8 TB	OS, Shared, DATA
004	3 TB	LOG

DP- VOLS		
LUN #	Size	Description
000	20 GB	ESXi Boot LUN
001	380 GB	SLES OS VOLS
002	1 TB	HANA SH VOLS
003-006	1.8 TB	HANA DATA VOLS
007-010	768 GB	HANA LOG VOLS

Figure 5

Table 6 lists the storage configuration for all available solutions.

Table 6. Storage Configuration

	1 TB, 2 TB, or 3 TB Memory	4 TB or 6 TB Memory
DBS	2	3
OS	1 RAID-6 (14D+2P) parity group	2 RAID-6 (14D+2P) parity groups
/hana/shared	16 × 600 GB HDD	32 × 600 GB HDD
/hana/data	4 × 1.8 TB LUNs	8 × 1.8 TB LUNs
/hana/log	1 RAID-6 (6D+2P) parity group 8 × 600 GB HDD 1 × 3 TB GB LUNs	2 RAID-6 (6D+2P) parity groups 8 × 600 GB HDD 2 × 3 TB GB LUNs
Spare drives	1 × 600 GB HDD	2 × 600 GB HDD

Parity Group, RAID, and LUN Configuration

This is the configuration of parity groups, RAID level, and LUNs on Unified Compute Platform for SAP HANA on VMware vSphere solution.

Table 7 has the parity groups and LDEV assignment for a 1 TB, 2 TB, or 3 TB memory solution. For sizes larger than 3 TB, use the same format as Table 7 to create more LUNs and add those to the same pool.

Table 7. Parity Group and LDEV Assignment for a 1 TB, 2 TB, or 3 TB Memory Solution

Parity Group	RAID Level and Disks	LDEV ID	LDEV Size	MPU ID	Description
1	RAID-6 (14D+2P) on 600 GB 10k RPM SAS drives	0:00:00	1.8 TB	MPU10	Used for HDP (0)
		0:00:01	1.8 TB	MPU11	
		0:00:02	1.8 TB	MPU20	
		0:00:03	1.8 TB	MPU21	
2	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	0:00:04	3 TB	MPU21	Used for HDP (1)

Table 8 has the DP-VOL assignment for a 1 TB, 2 TB, or 3 TB memory solution. For sizes larger than 3 TB or for hosting more virtual machines, use and expand the same DP-VOLs.

Table 8. DP-VOL Assignment for 1 TB, 2 TB, or 3 TB Memory Solution

HDP Pool	DP-VOL ID	DP-VOL Name	DP-VOL Size	MPU ID
OS_SH_DATA Pool	0:00:05	ESXi_host	20 GB	MPU10
	0:00:06	HANA_OS_VMFS	380 GB	MPU11
	0:00:07	HANA_SHARED_VMFS	1 TB	MPU20
	0:00:08	HANA_DATA_VMFS1	1.8 TB	MPU10
	0:00:09	HANA_DATA_VMFS2	1.8 TB	MPU11
	0:00:10	HANA_DATA_VMFS3	1.8 TB	MPU20
	0:00:11	HANA_DATA_VMFS4	1.8 TB	MPU21
LOG Pool	0:00:12	HANA_LOG_VMFS1	768 GB	MPU10
	0:00:13	HANA_LOG_VMFS2	768 GB	MPU11
	0:00:14	HANA_LOG_VMFS3	768 GB	MPU20
	0:00:15	HANA_LOG_VMFS4	768 GB	MPU21

For the DP-VOL assignment, use the host IDs defined in Table 8 to configure host groups on Hitachi Virtual Storage Platform G400 or Virtual Storage Platform G600. To support high availability, each LUN has multiple paths from the host within Hitachi Compute Blade 2500 to multiple ports on Virtual Storage Platform. Use the ports listed in Table 4, “Fibre Channel Port Mapping,” on page 11.

VMware vSphere ESXi Configuration

This describes how to configure VMware vSphere ESXi.

SAN Operating System Boot Configuration

This solution configuration requires SAN boot. It uses one 20 GB LUN from Hitachi Virtual Storage Platform as the operating system volume to host the hypervisor.

The Hitachi 16 GB FIVE-FX 2-port Fibre Channel adapters in Table 4, “Fibre Channel Port Mapping,” on page 11 have the 20 GB ESXi LUN configured as the primary boot device. Install VMware vSphere ESXi on this LUN.

Activate Round Robin Multipathing Policy

Use the **round robin** multipathing policy, a component of the VMware vSphere ESXi operating system.

Using the round robin multipathing policy allows the configuration of multiple I/O paths between the server blades and Hitachi Virtual Storage Platform G400 or Virtual Storage Platform G600. Round robin aggregates all physical I/O paths into a single logical path, providing high availability and load balancing for the block devices. The LUNs are always available unless all four paths fail.

Use the round robin multipathing policy for the following I/O paths:

- ESXi operating system LUN
- SAP HANA server operating system LUN
- SAP HANA data volume LUN
- SAP HANA log volume LUN
- SAP HANA shared volume LUN

SAP HANA Configuration

This describes the SAP HANA configuration on this scale-up configuration for the Unified Compute Platform for the SAP HANA Platform on VMware vSphere.

Operating System Boot Configuration

This virtualized SAP HANA configuration requires SAN boot. Carve out one 100 GB VMDK for the SAP HANA operating system, including the `/usr/sap/` **directory** for files related to the SAP application.

SAP HANA Volume Configuration

Use the following DP-VOLs for the SAP HANA virtual machine configuration on Hitachi Virtual Storage Platform:

- Four 1.8 TB DP-VOLs to create four 1.8 TB VMFSs for the SAP HANA data volumes
- Four 768 GB DP-VOLs to create four 768 GB VMFSs for the SAP HANA log volumes
- One 1 TB DP-VOL to create one 1 TB VMFS for the SAP HANA shared volume

The logical volume manager (LVM) configures the SAP HANA persistent storage volumes from virtual machines. With four VMDKs for the SAP HANA log, the LVM creates a single 4-way striped volume on which to create the XFS file system to store the SAP HANA log volumes. Similarly, do this for the SAP HANA data volumes.

For SAP HANA shared, create an XFS file system to store SAP HANA binaries, configuration, and trace files.

SAP HANA Software Installation

After configuring the file system for the SAP HANA data volume and log volume, install the latest SAP HANA Datacenter Service Point (DSP) stack on the SAP HANA server, upgraded to the required HANA revision.

Install the following SAP HANA software components on the SAP HANA node for VMware vSphere server:

- SAP HANA database
- SAP HANA client
- SAP Host agent

Multiple Virtual Machine Configurations

Note — Multiple virtual machines only apply to non-production environments. The production environment only allows one SAP HANA virtual machine. For more information on controlled availability for multi-virtual machine scenarios, see SAP Note [2024433](#).

For non-production environments used for development and quality assurance, these are the size configurations of multiple virtual machines in this 1-6 TB HOST RAM solution using SAP HANA in a VMware environment.

SAP and VMware require that the production 6 TB HOST RAM machine only use 5880 GB of RAM, based off the original 1TB and 980 GB scheme. VMware vSphere ESXi processes use the remaining memory. To allocate memory evenly to all virtual machines and keep within the limitation of 5880 GB of RAM for the production virtual machine, use the following sizes to have the maximum number of virtual machines as shown in Table 11, “Sample Values for Different Size Virtual Machines,” on page 21 for SAP HANA on VMware in a conservative approach.

For a single production virtual machine host, one RAID-6 (14D+2P) parity group for SAP HANA data LUNs and one RAID-6 (6D+2P) parity group for SAP HANA log LUNs is used. Hitachi Data Systems recommends the limitations in Table 9 when running multi-virtual non-production systems:

Table 9. Virtual Machine Scalability

Number of Virtual Machines	Required Number of Parity Groups for LOG	Required Number of Parity Groups for DATA	Storage Source
2	1	1	VSP G400
3	1	1	VSP G400
4	2	2	VSP G400
5	2	2	VSP G400
6	2	2	VSP G400
7	3	3	VSP G400
8	3	3	VSP G600
9	3	3	VSP G600
10	3	4	VSP G600
11	3	4	VSP G600

Default configuration can only support up to three virtual machines. If you configure more, you will need to add more Parity groups to the HDP Pool and extend the existing DP-VOLs to fit what you are creating on the host side. But to configure more than 11 virtual machines, you need a second storage source. Apply the same building block structure from Table 9. For more information about multi-virtual machines, see SAP Note [2024433](https://support.sap.com/en/notes/2024433.html).

Table 10 is a sample table of virtual machines for SAP HANA that fit within the 3920 GB (4 TB) limitation.

Table 10. Sample Virtual Machine Allocation (1 TB Limitation)

Number of Virtual Machines	Virtual Machine Size							
	1st	2nd	3rd	4th	5th	6th	...	15th
2	735 GB	245 GB						
2	490 GB	490 GB						
3	490 GB	245 GB	245 GB					
4	490 GB	245 GB	122 GB	122 GB				
5	490 GB	245 GB	64 GB	64 GB	64 GB			
6	490 GB	122 GB	122 GB	122 GB	122 GB			

Table 10. Sample Virtual Machine Allocation (1 TB Limitation) (Continued)

Number of Virtual Machines	Virtual Machine Size							
	1st	2nd	3rd	4th	5th	6th	...	15th
7	490 GB	122 GB	122 GB	64 GB	64 GB	64 GB		
15	64 GB	64 GB	64 GB	64 GB	64 GB	64 GB	...	64 GB

Table 11 lists input of CPU, RAM, hard disk capacity for SAP HANA operating system, HANA shared, data, and log requirements when deploying various sized virtual machine. You need sufficient storage to support those virtual machines.

Table 11. Sample Values for Different Size Virtual Machines

RAM (Size)	Cores per Socket	CPU	RAM*	HANA_OS	HANA_Shared	HANA_Log**	HANA_Data**
64 GB	1	5	64 GB	100 GB	64 GB	4 × 16 GB	4 × 20 GB
128 GB	1	10	122 GB		128 GB	4 × 32 GB	4 × 39 GB
256 GB	1	15	245 GB		256 GB	4 × 64 GB	4 × 77 GB
512 GB	2	32	490 GB		512 GB	4 × 128 GB	4 × 154 GB
768 GB	3	45	735 GB		768 GB		4 × 231 GB
1024 GB	4	64	980 GB		1024 GB		4 × 308 GB
1536 GB	4	90	1470 GB				4 × 461 GB
2048 GB	4****	128	1960 GB				4 × 615 GB
3072 GB			2940 GB		4 × 922 GB		
4096 GB			3920 GB	4 × 1229 GB			

* You can allocate only 5880 GB memory in total in a *host* 6 TB system, regardless of how many virtual machines are to be created. For any Suite on HANA virtual machine, 4096 GB is the maximum. For any Business Warehouse on HANA virtual machine, 3166 GB is the maximum.

** 4 × <size>: means to assign <size> to each of four VMFS for the log volume, totaling 1/2 × memory of virtual machine, or 512 GB for any virtual machine larger than 512 GB.

*** 4 × <size>: means to assign <size> to each of four VMFS for the data volume, with <size> calculated from 1.2 × memory of the virtual machine, and then dividing by 4.

**** Currently only 4 socket VMs are supported for Broadwell.

For More Information

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