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Scale-Up Tailored Datacenter Configuration using Hitachi Compute Blade 500 Chassis, 520X B2 Server Blades, and Hitachi Unified Storage VM

Reference Architecture Guide

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Hitachi Data Systems

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Scale-Up Tailored Datacenter Configuration using Hitachi Compute Blade 500 Chassis, 520X B2 Server Blades, and Hitachi Unified Storage VM

Reference Architecture Guide

This reference architecture guide describes the recommended Hitachi Unified Compute Platform for the SAP HANA Platform solution for CB 500 chassis with 520X B2 server blades, and Hitachi Unified Storage VM for use in a SAP HANA Tailored Datacenter Integration (TDI) setup with 1 TB, 1.5 TB, 2 TB, and 3 TB SAP HANA Nodes.

Testing showed that the Unified Compute Platform (UCP) solution for this SAP HANA appliance met the KPI requirements from SAP. Following experience gained with SAP HANA appliances, this SAP HANA Tailored Datacenter Integration solution from Hitachi Data Systems performs well while not running into compute and storage capacity issues.

SAP HANA Tailored Datacenter Integration (TDI) deployments are customized solutions where you can choose any of the certified SAP HANA server vendors along with any SAP certified enterprise storage.

- SAP certifies the minimum enterprise class Unified Compute Platform and Storage layout requirements only, as described in this document.
- Hitachi Data Systems and the storage vendor define the final complete configuration for the customer solution.

Using the family of enterprise UCP and storage products from Hitachi Data Systems, including Hitachi Unified Storage VM, SAP HANA has the following benefits:

- Increased performance when loading data into SAP HANA
- Scalable deployments of SAP HANA
- Disaster recovery with minimal performance impact to the production instance

The SAP HANA Tailored Datacenter Integration solution released by SAP allows the following:

- Reduced hardware and operational costs
- Lowered operational risk
- Optimized time-to-value for existing hardware
- Shortened implementation cycles

This appliance supports all of the configuration sizes listed in Table 1.

Table 1. Supported Scale-Up Configuration Sizes

	2-Socket	*4-Socket*
CPU	2	4
Number of Server Blades	1	2 Server Blades with 2-way SMP
Memory	■ 128 GB ■ 256 GB ■ 384 GB ■ 512 GB ■ 768 GB ■ 1024 GB ■ 1536 GB	■ 128 GB ■ 256 GB ■ 384 GB ■ 512 GB ■ 768 GB ■ 1024 GB ■ 1536 GB ■ 2048 GB ■ 3072 GB

This technical paper assumes that you have familiarity with the following:

- Storage area network (SAN)-based storage systems
- General storage concepts
- Common IT storage practices
- SAP HANA

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

Solution Overview

This reference solution for a Scale-Up environment for Hitachi Unified Compute Platform for the SAP HANA Platform for different sizes uses the following components:

- **Hitachi Compute Blade 500** — An enterprise-class server platform
  - This solution uses different number of 520X B2 server blades for the different sizes, as shown in Table 1 on page 2.
- **Hitachi Unified Storage VM** — A storage virtualization system designed to manage storage assets more efficiently. The persistent storage of the HANA server resides on this storage device.
- **SAP HANA Platform** — A flexible, data source-agnostic, in-memory data platform that allows customers to analyze large volumes of data in real time.

Figure 1 shows the topology of this reference architecture.

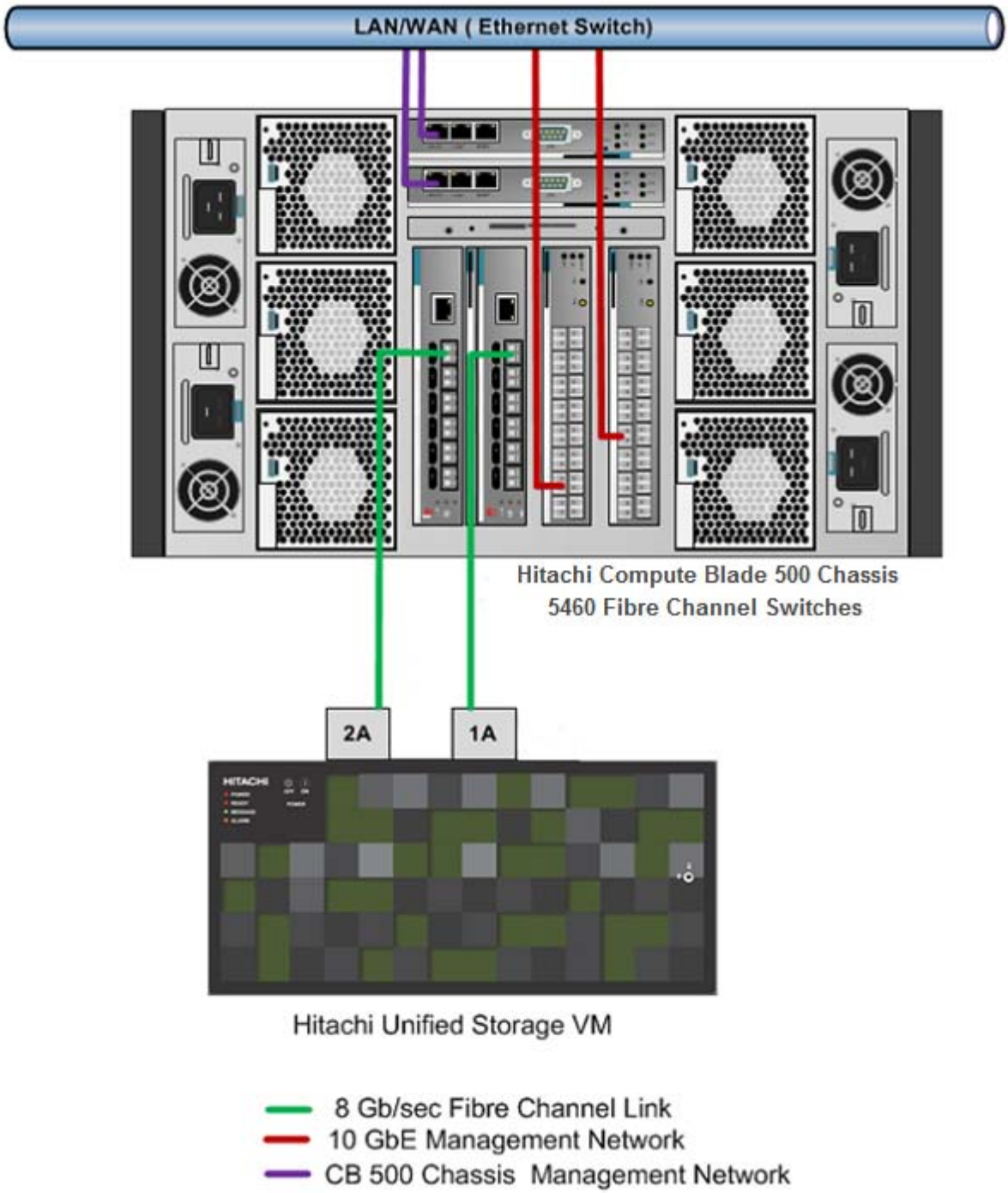

Figure 1

Key Solution Elements

The following are the key hardware and software components used in this TDI reference architecture.

Hardware Elements

Table 2 lists the hardware used to deploy the specific Scale-Up configuration of Unified Compute Platform for SAP HANA for the different sized solutions.

Table 2. Hardware Elements

Hardware		*Quantity*	*Configuration (per unit)*	*Role*
Hitachi Compute Blade 500 (CB 500) chassis		1	■ 4-blade chassis ■ 2 management modules ■ 6 cooling fan modules ■ 2 × 10 Gb/sec LAN pass-through module ■ 2 × 8 Gb/sec	Server blade chassis
520X B2 server blade	2-Socket	1	■ 2 × 18-core processors ■ RAM for all memory sizes listed in Table 1 on page 2 ■ On Blade - 1 × 4 port 10 GbE Onboard LAN on Motherboard (LOM) on each Blade ■ On Blade - 1 × Hitachi 2-port Fibre Channel mezzanine on mezzanine slot 2 on each Blade	SAP HANA server
	4-Socket	2		
SMP connector module	2-Socket	N/A	■ SMP connector board ■ 2-blade connector board for 4-Socket ■ SMP expansion module ■ SMP connector cover	SMP connector
	4-Socket	1		
Hitachi Unified Storage VM		1	■ Single frame	Block storage for SAP HANA nodes

Hitachi Compute Blade 500

Hitachi Compute Blade 500 combines the high-end features with the high compute density and adaptable architecture you need to lower costs and protect investment. Safely mix a wide variety of application workloads on a highly reliable, scalable, and flexible platform. Add server management and system monitoring at no cost with Hitachi Compute Systems Manager, which can seamlessly integrate with Hitachi Command Suite in IT environments using Hitachi server/storage.

The configuration uses one or two 520X B2 server blades in the Hitachi Compute Blade 500 chassis for the different configuration sizes listed in Table 1 on page 2.

Table 3 has the specifications for the 520X B2 server blades used in the various sized solutions.

Table 3. 520X B2 Server Blade Configuration

Feature		*Configuration*	
		Small (2-Socket)	*Medium (4-Socket)*
Processors		2 × Intel Xeon E7-8800 processors	4 × Intel Xeon E7-8800 processors
Processor SKU		Intel Xeon E7-8880v3	
Processor frequency		2.30 GHz (Turbo frequency 3.1 GHz)	
Processor cores		18 cores	
Number of blades		1	2
Number of DIMMs per blade	128 GB	8 × 16 GB DIMMs	8 × 8 GB DIMMs
	256 GB	16 × 16 GB DIMMs	16 × 8 GB DIMMs
	384 GB	24 v 16 GB DIMMs	24 × 8 GB DIMMs
	512 GB	32 × 16 GB DIMMs	16 × 16 GB DIMMs
	768 GB	48× 16 GB DIMMs	24 × 16 GB DIMMs
	1024 GB	32 × 32 GB DIMMs	32 × 16 GB DIMMs
	1536 GB	48 × 32 GB DIMMs	48 × 16 GB DIMMs
	2048 GB	N/A	32 × 32 GB DIMMs
	3072 GB	N/A	48 × 32 GB DIMMs

Table 3. 520X B2 Server Blade Configuration (Continued)

Feature	*Configuration*	
	Small (2-Socket)	*Medium (4-Socket)*
Network Ports	1 × 10 Gb/sec Ethernet LOM	2 × 10 Gb/sec Ethernet LOM
Fibre Channel Ports	1 × Hitachi 2-port Fibre Channel mezzanine on mezzanine slot 2	2 × Hitachi 2-port Fibre Channel mezzanine on mezzanine slot 2
Other Interfaces	1 USB 3.0 port KVM connecter (VGA, COM, USB2.0 port)	

Hitachi Symmetric Multiprocessing Connector

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

The 520X B2 server blades use 2-blade SMP connector, depending on the size of the solution to combine the two server blades

Hitachi Unified Storage VM

Hitachi Unified Storage VM is an entry-level 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.

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

The operating system LUNs, SAP HANA data, and log LUNs reside on this storage array as well as the shared LUNs for configuration, binaries and traces.

The solution uses a single Hitachi Unified Storage VM.

Software Elements

Table 4 describes the software products used to deploy one active node.

Table 4. Software Elements

Software	*Version*
▪ SUSE Linux Enterprise Server for SAP Applications or ▪ Red Hat Enterprise Linux	▪ SLES11 SP3 or ▪ RHEL 6.6
SAP HANA Platform	1.0 SPS09, Rev. 91 or later
Hitachi Storage Navigator Modular 2	Microcode dependent
Hitachi Command Suite	8.0.0-04 or higher

SAP HANA

The SAP HANA platform is flexible, multipurpose in-memory software. It combines SAP software components optimized to specific hardware. These components come from leading hardware partners of SAP, including Hitachi Data Systems.

The SAP HANA platform allows customers to analyze large volumes of data in real time. It is also a development platform, providing an infrastructure and tools for building high-performance applications based on SAP HANA Extended Application Services (SAP HANA XS). It is the foundation of various SAP HANA editions, like the SAP HANA Platform Edition, providing core database technology, and the SAP HANA Enterprise Edition, bundling additional components for data provisioning. The SAP HANA Platform Edition integrates a number of SAP components, including the SAP HANA database, SAP HANA studio and SAP HANA clients.

As a SAP customer, you can get more information on the SAP HANA platform at the SAP Service Marketplace and help.sap.com.

See **Installation and Upgrade Information** on SAP HANA Platform for the following guides and all other SAP-related documentation:

- **The SAP HANA Master Guide** — This guide is the entry point for planning the installation of your SAP HANA system landscape.
- **The SAP HANA Master Update Guide** — This guide describes how to update the SAP HANA platform and related components.
- **SAP HANA Server Installation and Update Guide** — This guide describes how to install and update an SAP HANA system with the SAP HANA life-cycle management tools.
  - There are various related installation guides to install the required SAP in-memory database and the other software components for the different replication technologies.
- **SAP HANA Technical Operations Manual** — This guide is the entry point for administering and operating your SAP HANA system landscape.

SAP Integration and Certification Center (SAP ICC) provides information about SAP-certified SAP HANA appliances by SAP hardware partners.

SUSE Linux Enterprise Server (SLES) and Red Hat Enterprise Linux (RHEL)

The following is applicable in special cases where Hitachi Data Systems acts as both server and storage vendor.

Hitachi Unified Compute Platform for the SAP HANA Platform in a Scale-Up configuration can run on either of the following:

- 64-bit SUSE Linux Enterprise Server for SAP Applications 11 SP3
- 64-bit Red Hat Enterprise Linux 6.6

The initially delivered configuration of the operating system should persist. Changing the configuration settings can cause significant performance problems to occur.

Do not make any modifications to the operating system, except as noted or approved by SAP. To modify your operating system configuration or the installed software packages, follow the guidelines given by SAP and the operating system distributor. See the following SAP Notes for SLES and RHEL:

1944799 - SAP HANA Guidelines for SLES Operating System Installation

2136965 - SAP HANA DB: Recommended OS settings for RHEL 6.6

For more details, see the section “Updating and Patching the Operating System,” in the SAP HANA Technical Operations Manual.

Solution Design

The detailed design for this solution includes the following:

- Hitachi Compute Blade 500 Chassis Configuration
- 520X B2 Server Blade Architecture
- Fibre Channel SAN Architecture
- Network Architecture
- Storage Architecture
- RAID and LUN Configuration
- SAP HANA Configuration

Hitachi Compute Blade 500 Chassis Configuration

Figure 2 shows the front and back view of the Hitachi Compute Blade 500 chassis for different configuration sizes.

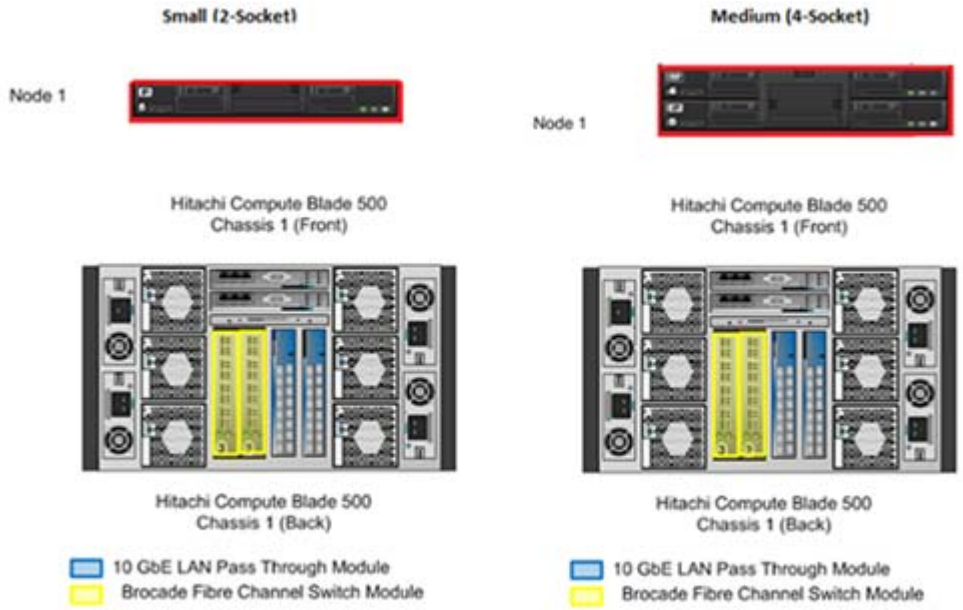

Figure 2

The solution uses one Hitachi Compute Blade 500 chassis. Each configuration size has a different number of 520X B2 server blades.

There are four switch modules on the Hitachi Compute Blade 500 chassis with the following components:

- Switch Module 0 and Switch Module 1 have 10 GbE LAN pass through modules.
- Switch Module 2 and Switch Module 3 have the 8 Gb/sec Brocade 5460 Fibre Channel switch modules.

520X B2 Server Blade Architecture

Each configuration size has either one or two server blades. Multiple server blades use a two server blade SMP interface connector to create a single four socket SMP node with total of 36 or 72 cores and different sizes of memory.

Table 5 lists the configuration details for small and medium configuration sizes.

Table 5. Server Blade Configuration

	Small (2-Socket)	*Medium (4-Socket)*
Server Blades	Total of 1 server blade - Blade (the higher number blade acts as primary)	Total of 2 server blades: - Blade (the lower number blade acts as non-primary) - Blade (the higher number blade acts as primary)
Total Number of CPU Cores	36	72

Fibre Channel SAN Architecture

The Fibre Channel SAN architecture consists of the following components on the 520X B2 server blades in Table 6.

Table 6. Fibre Channel SAN Architecture Components

	Small (2-Socket)	*Medium (4-Socket)*
Blade (the higher number acts as primary)	1 × Hitachi 8 Gb 2-port Fibre Channel mezzanine card on mezzanine Slot 2	1 × Hitachi 8 Gb/sec 2-port Fibre Channel mezzanine card on mezzanine Slot 2
Blade (the higher number acts as primary)	N/A	1 × Hitachi 8 Gb/sec 2-port Fibre Channel mezzanine card on mezzanine Slot 2

For small (2-Socket) systems, the mezzanine card connects to the 8 Gb/sec Brocade Fibre Channel switch modules installed in switch slots 2 and 3 through the backplane within the Hitachi Compute Blade 500 server chassis.

For medium (4-Socket) solutions, the mezzanine cards connect to the 8 Gb/sec Brocade Fibre Channel switch modules installed in switch slots 2 and 3 through the backplane within the Hitachi Compute Blade 500 server chassis.

With different size Scale-Up SAP HANA configurations, there are two or four dedicated Fibre Channel ports on Hitachi Unified Storage VM for Fibre Channel connections with the SAP HANA node. Table 7 shows the storage port mapping and ports for the Brocade switch used by different size configurations.

Table 7. Storage Port Mapping for Brocade Switch

Switch Module	*Hitachi Unified Storage VM Ports*	
	5460 Switch Module	*2/4 Socket System*
Switch module 2	Port 0	1A
Switch module 3	Port 0	2A

This configuration supports high availability by providing multiple paths from the host within Hitachi Compute Blade 500 to multiple ports on Hitachi Unified Storage VM.

Figure 3 shows the direct connect Fibre Channel architecture for different size solutions using Brocade 5460 switches.

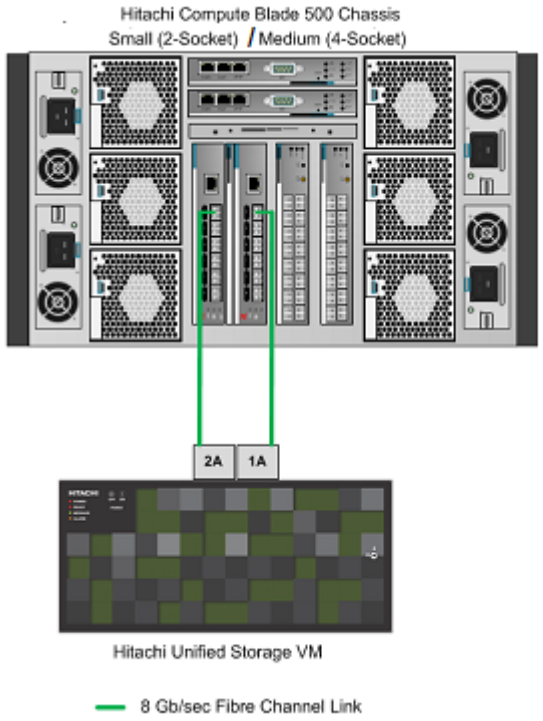

Figure 3

Set the port properties for the point-to-point connection between Hitachi Compute Blade 500 and Hitachi Unified Storage VM, as shown in Table 8.

Table 8. Port Properties

Property	*Value*
Port Attribute	**Target**
Port Security	**Enabled**
Port Speed	**Auto (8 Gbps)**
Fabric	**ON**
Connection Type	**P-to-P**

On Hitachi Unified Storage VM, use the default host storage group for each port listed in Table 9, and assign the World Wide Names of the Hitachi 8 Gb/sec 2-port Fibre Channel mezzanine ports as the host to the corresponding host group.

Table 9. Host Storage Group WWN Port Mapping on Hitachi Unified Storage VM

Host Storage Group (Ports)	*Chassis, Server Blade, Mezzanine 2, Mezzanine Port WWN*	
	Small (2 CPUs)	*Medium (4 CPUs)*
1A-G00	Chassis 1, Server Blade 2, Mezzanine 2, Port 0 WWN	Chassis 1, Server Blade 2, Mezzanine 2, Port 0 WWN
2A-G00	Chassis 1, Server Blade 2, Mezzanine 2, Port 1 WWN	Chassis 1, Server Blade 0, Mezzanine 2, Port 0 WWN

Network Architecture

There are two 10 Gb/sec LAN pass-through modules on switch slot 0 and slot 1 of the Hitachi Compute Blade 500 chassis.

- For multiple blade systems, there is only one 4-port 10 GbE onboard LOM on each 520X B2 server blade in position 2 and position 0.
- For single blade systems, the 520X B2 server blade in position 2 has one 4-port 10 GbE onboard LOM.

LOM pass through connectors installed on each 520X B2 server blade connect the onboard LAN to the 10 GbE LAN pass-through switch modules installed in switch slot 0 and slot 1.

- The medium (4-Socket) size Scale-Up SAP HANA configurations have a total of eight 10 GbE LOM ports.
- The small (2-Socket) size Scale-Up SAP HANA configuration have a total of four 10 GbE LOM ports.

Make the following network connections for the client network setup for use as an uplink network setup considering Blade 2 and 0 can be used for medium size configurations, and Blade 2 can be used for small size configurations:

- For medium size, connect the following to the external switch:
  - Port 0 of the LAN pass-through module on switch Slot 0
  - Port 4 of the LAN pass-through module on switch Slot 1
- For small size, connect the following to the external switch:
  - Port 4 of the LAN pass-through module on switch Slot 0
  - Port 4 of the LAN pass through module on switch slot 1

- Bond the corresponding two Network interfaces eth9901 and eth9902 as bond0 at the operating system level using active-active mode, which acts as the client network for the SAP HANA node.
- For medium size configurations, the following can be used for the appliance to connect to the 10 GbE external switch for use as uplink network ports:
  - Switch slot 0 LAN pass-through module ports 2, 4 and 6
  - Switch slot 1 LAN pass-through module ports 0, 2 and 6
- For small size configurations, the following can be used for the appliance to connect to the 10 GbE external switch for use as uplink network ports:
  - Switch slot 0 LAN pass-through module port 6
  - Switch slot 1 LAN pass-through module port 6

The compute network setup uses the ports on the 10 GbE LAN pass-through modules, as listed in Table 10.

Table 10. Network Setup Using 10 GbE LAN Pass-through Modules

Server Blade	*LAN Pass-through Switch Module*	*Switch Module Port*	*Network Description*	
			Medium (2 CPUs)	*Small (4 CPUs)*
0	Switch 0	0	N/A	Client network for HANA node
		2	N/A	Free for uplink network
	Switch 1	0	N/A	Free for uplink network
		2	N/A	Free for uplink network
2	Switch 0	4	Client network for HANA node	Free for uplink network
		6	Free for uplink network	Free for uplink network
	Switch 1	4	Client network for HANA node	Client network for HANA node
		6	Free for uplink network	Free for uplink network

The Hitachi Compute Blade 500 chassis has two management modules for redundancy. Each module has the following attributes:

- Supports an independent management LAN interface from the data network for remote and secure management of the chassis and all server blades.
- Supports a serial command line interface and a web interface.
- Is hot swappable and supports live firmware updates without the need for shutting down the server blades.

Figure 4 shows the standard network configuration used for Hitachi Compute Blade 500 chassis for different size configurations.

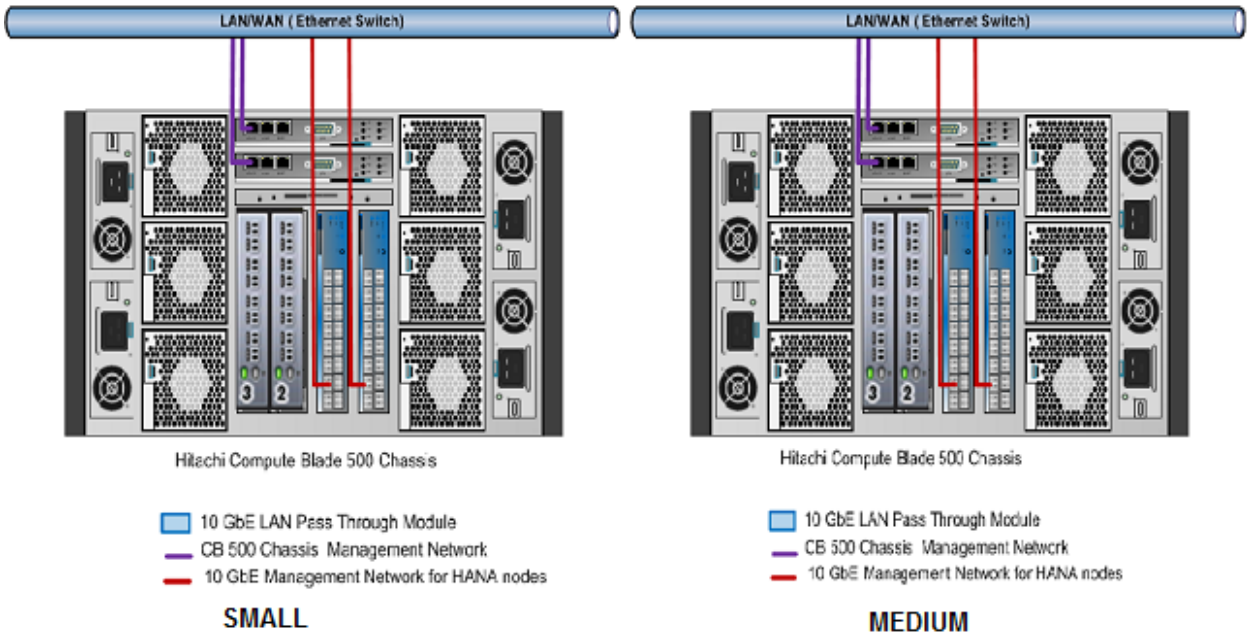

Figure 4

Storage Architecture

Many factors drive sizing and configuring storage for use with different configuration sizes of the Scale-Up Hitachi Unified Compute Platform for the SAP HANA Platform reference solution. This includes I/O and capacity requirements.

Figure 5 shows the disk configuration of the storage subsystem for memory less than or equal to 3 TB.

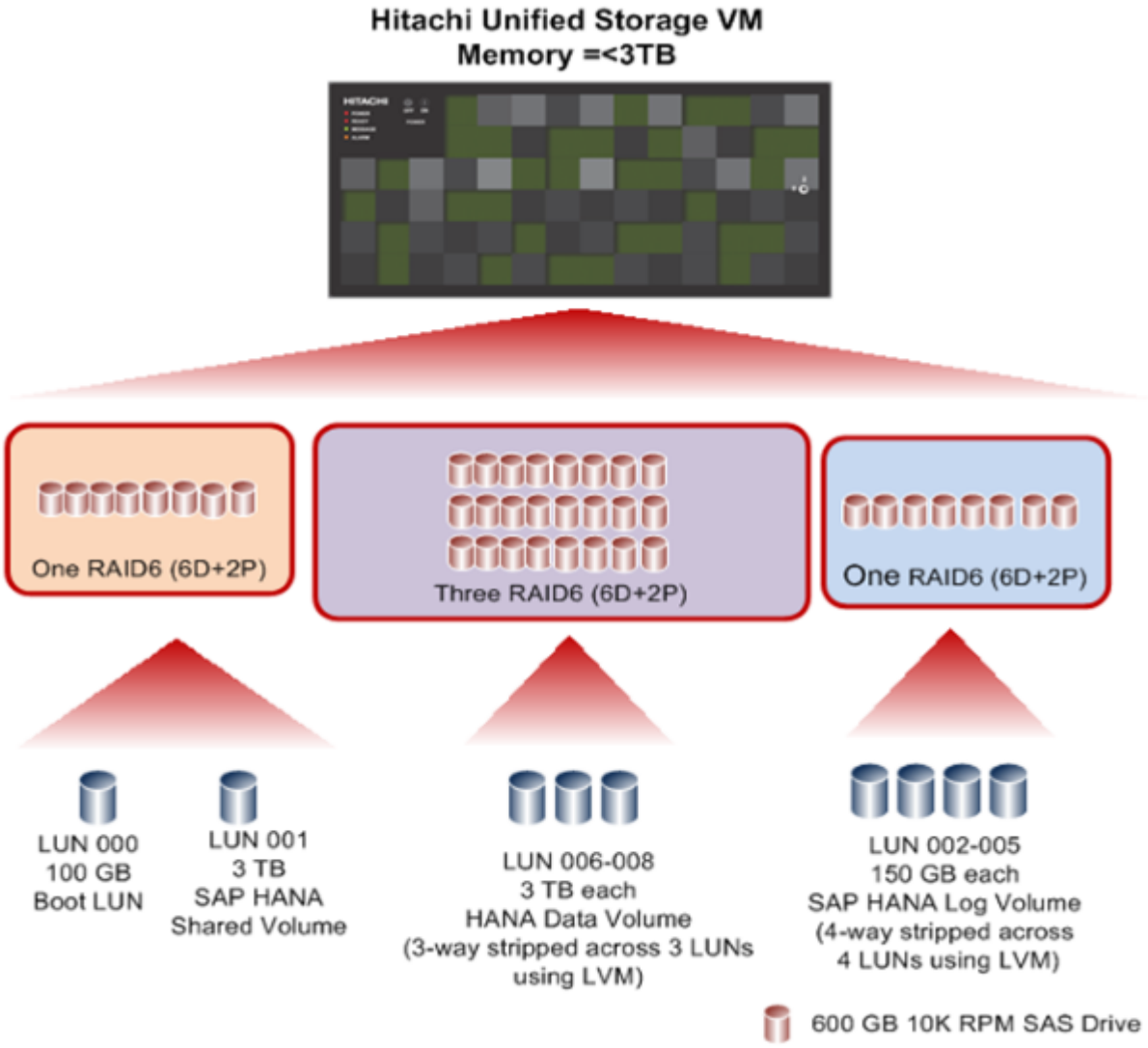

Figure 5

RAID and LUN Configuration

This reference architecture uses a RAID configuration on Hitachi Unified Storage VM.

Table 11 and Table 12 list the storage configuration, parity groups and LDEV assignment that are applied to different memory configurations listed in Table 1 on page 2.

Table 11. Storage Configuration

	Memory =<3 TB
Hitachi Unified Storage VM Trays	■ 2
OS	■ 1 × RAID6 (6D+2P) ■ 8 × 600 GB HDD ■ OS: 100 GB ■ /hana/shared: 3 TB
/hana/shared	
/hana/data	■ 3 × RAID6 (6D+2P) ■ 24 × 600 GB HDD ■ 3 × 3 TB LUNs
/hana/log	■ 1 × RAID6 (6D+2P) ■ 8 × 600 GB HDD ■ 4 × 150 GB LUNs
Spare drives	■ 2 × 600 GB HDD

Table 12. RAID and LUN Configuration for =<3 TB Memory Sizes

Parity Group	*RAID Level and Disks*	*LDEV ID*	*LDEV Size*	*LUN ID*	*MPU ID*	*Description*
1	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	0:01:00	100 GB	000	MPU10	Operating system volume
		0:00:01	3 TB	001	MPU11	SAP HANA shared volume
2	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	0:01:01	150 GB	002	MPU20	SAP HANA log volume
	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	0:01:02	150 GB	003	MPU10	
	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	0:01:03	150 GB	004	MPU11	
	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	0:01:04	150 GB	005	MPU21	

Table 12. RAID and LUN Configuration for =<3 TB Memory Sizes (Continued)

Parity Group	RAID Level and Disks	LDEV ID	LDEV Size	LUN ID	MPU ID	Description
3	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	00:0A:01	3 TB	006	MPU21	SAP HANA data volume
4	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	00:0A:02	3 TB	007	MPU11	
5	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	00:0A:03	3 TB	008	MPU20	

For LUN assignment, use the LUN ID defined in Table 11 on page 19 to configure host groups on Hitachi Unified Storage VM. To support high availability, each LUN has multiple paths from the host within Hitachi Compute Blade 500 to multiple ports (1A and 2A) on Hitachi Unified Storage VM.

Table 7 on page 13 lists which ports are used for different size configurations.

There are four MP units (MPUs) used to distribute the workload for all LUNs needed for the solution.

SAP HANA Configuration

This explains the SAP HANA configuration.

SAN Operating System Configuration

The SAP HANA Scale-Up configuration requires SAN boot. It uses one 100 GB LUN on Hitachi Unified Storage VM for the operating system volume for the SAP HANA appliance.

The Hitachi Fibre Channel mezzanine ports in Table 9 on page 15 have the 100 GB operating system LUN configured as the primary boot device. The operating system LUN holds partitions for SUSE Linux for SAP Applications version 11 SP3 or Red Hat Linux for SAP HANA 6.6, **/usr/sap/,** and the Linux swap space.

Activate Device-Mapper Multipath

This reference architecture uses Device-mapper Multipath, a component of the native Linux operating system.

Using Device-mapper Multipath allows the configuration of multiple I/O paths between the server blades and Hitachi Unified Storage VM. Multipathing aggregates all physical I/O paths into a single logical path. The LUNs are always available unless all four paths fail.

Device-mapper Multipath is used for the following I/O paths:

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

SAP HANA Data Volume Configuration

The Logical Volume Manager configures the SAP HANA persistent storage volumes. Refer to Table 12 on page 19 for the size of SAP HANA data volume LUNs.

Logical Volume Manager creates a single striped volume on which the XFS file system is created to store the SAP HANA data volume. The striped volume acts as the persistent layer for the SAP HANA server.

SAP HANA Log Volumes Configuration

This reference architecture uses Logical Volume Manager to configure the SAP HANA log volumes.

With the four 150 GB SAP HANA log volume LUNs, Logical Volume Manager creates a single striped volume across 4 LUNs on which the XFS file system is created to store the SAP HANA log volume.

Table 13 contains options used by striped volume creation, XFS file system creation, and mount for log volume to optimize performance.

Table 13. XFS File System Creation and Mounted Options for Data and Log Volumes

Option	*Data Volume*	*Log Volume*
	Memory =<3TB	
Logical volume stripe type	Striped across 3 LUNs	Striped across 4 LUNs
Logical volume extents	Using 100% of the free space	Using 100% of the free space
LVM stripe size	512	512
XFS stripe unit	1024	1024
XFS stripe width	18432	6144
Write barrier support	Disabled	Disabled
64-bit inode support	Enabled	Enabled

SAP HANA Shared Volume

This reference architecture uses one 3 TB LUNs for the SAP HANA shared volume. Logical Volume Manager creates a single striped volume on which the XFS file system is created to store the SAP HANA binaries, configuration, and trace files.

Refer to Table 12 on page 19 and Table 13 on page 21 for the striped volumes to be created for different size configurations.

SAP HANA Appliance Software Installation

After configuring the file system for the SAP HANA shared binaries, data volume and log volume, the latest SAP HANA SPS stack is installed.

The following SAP HANA software components are installed on the HANA server node:

- SAP HANA database
- SAP HANA client
- SAP HANA Studio (excluded after HANA SPS09)
- SAP Host agent
- LM structure (excluded after HANA SPS09)
- SAP JVM (excluded after HANA SPS09)

For More Information

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

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