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Hitachi Unified Compute Platform for the SAP HANA Platform with Logical Partitioning in a Scale-up Configuration using Hitachi Compute Blade 500 and Hitachi Unified Storage VM

TECHNICAL PAPER

Reference Architecture Guide

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Hitachi Data Systems

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Reference Architecture Guide

Hitachi Unified Compute Platform for the SAP HANA platform (UCP for SAP HANA) with logical partitioning (LPAR) in a scale-up configuration is a pre-configured virtual appliance ready to plug into a network to provide real-time access to operational data for use in analytic models.

SAP HANA on Hitachi solutions with logical partitioning are based on a number of bare metal appliance configurations with modifications that are required for running logical partitions (LPARs) in dedicated mode. The basis configurations are shown in Table 1, and possible LPAR sizes are shown in Table 2. The modifications necessary to run LPARs for productive SAP HANA instances are described in this document.

Table 1. Supported Scale-up Configurations for SAP HANA with Logical Partitioning

		Small (S)	Medium (M)	Large (L)
Number of CPU sockets		2	4	8
Number of Server Blades		1	2 (using a 2-blade SMP)	4 (using a 4-blade SMP)
Memory (in GB)		128, 256, 384, 512, 768, 1024, 1536	256, 384, 512, 768, 1024, 1536, 2048, 3072	512, 768, 1024, 1536, 2048, 3072, 4096, 6144
Number of LPARs for Productive Usage		■ 2 × 1-socket ■ 1 × 2-socket	■ 4 × 1-socket ■ 2 × 2-socket ■ 2 × 1- socket + 1 × 2-socket	■ 8 × 1-socket ■ 4 × 2-socket ■ 6 × 1-socket + 1 × 2-socket ■ 4 × 1-socket + 2 × 2-socket ■ 2 × 1-socket + 3 × 2-socket
Maximum Memory Size per LPAR	1-socket	50% of the memory	25% of the memory	12.5% of the memory
	2-socket	100% of the memory	50% of the memory	25% of the memory

Based on these configurations, LPARs can be created following the memory and CPU socket restrictions shown in Table 2. Throughout this document the term CPU socket is used to differentiate the LPAR size and bare metal system size. CPU socket does not refer to an empty CPU socket, but includes the Intel E7 8880v2 IvyBridge CPU.

Table 2. Supported LPAR Memory Configurations for SAP Application Scenarios

LPAR Configuration	SAP Business Warehouse (BW) on HANA or Data Mart Scenarios	SAP Business Suite on HANA Scenarios
1-socket LPARs memory size (in GB)	64, 128, 192, 256	128, 256, 384, 512, 768
2-socket LPARs memory size (in GB)	128, 192, 256, 384, 512	128, 256, 384, 512, 768, 1024, 1536

A partition on the CPU core level instead of the CPU socket level is not supported for LPARs running productive SAP HANA instances.

This reference architecture guide describes how to deploy Unified Compute Platform for SAP HANA on Hitachi solutions with LPAR in a scale-up configuration using the following:

- Hitachi Compute Blade 500 (CB 500) with 520X B1 server blades
- Hitachi Unified Storage VM (HUS VM)
- SAP HANA

This technical paper assumes familiarity with the following:

- SAN-based storage systems
- General storage concepts
- SAP HANA
- Hitachi logical partitioning concept
- Common IT storage practices

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 scale-up configuration of Hitachi Unified Compute Platform for SAP HANA with logical partitioning (LPAR) reference solution is a server blade solution for SAP HANA using logical partitioning.

This reference architecture uses the following:

- **Hitachi Compute Blade 500 (CB 500)** — An enterprise-class server platform.
  - This solution uses a different number of 520X B1 server blades for a different number of CPU sockets and memory sizes. See Table 1, “Supported Scale-up Configurations for SAP HANA with Logical Partitioning,” on page 1 for a list of supported configurations.
- **Hitachi Unified Storage VM (HUS VM)** — Entry-level Enterprise Storage virtualization system designed to manage storage assets more efficiently. The persistent storage of the HANA server resides on this storage device.
- **SAP HANA** — A multi-purpose, in-memory database to analyze transactional and analytical data.
- **Logical Partitioning (LPAR)** — A feature of Hitachi Compute Blade family, this firmware-based hypervisor creates logical partitions on one physical server.

Key Solution Elements

These are the key hardware and software components used in this reference architecture.

Hardware Elements

Based on Hitachi Unified Compute Platform for the SAP HANA Platform it is possible to create scale-up configurations with logical partitioning.

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 storage.

The configuration uses a different number (one, two, or four) of 520X B1 server blades in the Hitachi Compute Blade 500 chassis for different size systems as outlined inTable 1 on page 1.

Table 3 shows the specifications for the 520X B1 server blades used in the solutions for different size configurations.

Table 3. 520X B1 Server Blade Configuration

Feature	Configuration
Processors	Intel Xeon processor E7-8880v2 2 processors per server blade
Processor SKU	Intel Xeon processor E7-8880v2
Processor frequency	2.50 GHz
Processor cores	15 cores
Memory	According to the requirements. See Table 2 on page 1 for possible memory sizes
Network ports	4 × 10 Gb Ethernet mezzanine card on slot 1 of each blade. Additional 4 × 10 Gb Ethernet mezzanine cards on slot 3 of the primary blade
Fibre Channel Mezzanine ports	2 × Hitachi 8 Gb 2-port Fibre Channel mezzanine cards on mezzanine slot 2 and slot 4 on each blade
Other interfaces	1 × USB 3.0 port KVM connector (VGA, COM, USB2.0 2 port)

Symmetric Multiprocessing Connector

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

The 520X B1 server blade uses symmetric multiprocessing in one of two ways:

- Combine the resources of two server blades with a 2-blade SMP connector
- Combine the resources of four server blades with a 4-blade SMP connector

Refer to Table 1 on page 1 for memory and CPU information, and LPAR configurations.

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 environments 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 LUNs for the operating system volume, the HANA data volumes, and HANA log volumes reside on this storage device as well as the LUNs for the HANA shared volumes of each LPAR.

This solution uses a single Hitachi Unified Storage VM.

Software Elements

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

Table 4. Software Elements

Software	Version
SUSE Linux Enterprise Server for SAP Applications or Red Hat Enterprise Linux	All operating system releases and service packs that are listed as certified with Intel Ivy Bridge EX E7 CPUs in the Certified SAP HANA Hardware Directory
SAP HANA	1.0 SPS09, Rev. 91 or later
Hitachi Logical Partitioning Manager	02-08 or later
Hitachi Compute Blade 500 management module firmware pack	A0241/00 or later
Hitachi Compute Blade 500 management module firmware	A0241-B-9901 or later
SEL dictionary for Hitachi Compute Blade 500	A0138 or later
Equipment parameter for Hitachi Compute Blade 500	1019
Hitachi Compute Blade 500 520X server blade integrated firmware	07-21 or later
Hitachi Unified Storage VM	73-03-08-00
Hitachi Storage Navigator Modular 2	Microcode dependent

SAP HANA

SAP HANA is a flexible, multipurpose in-memory database. It combines SAP software components optimized to specific hardware. These components come from leading hardware partners of SAP, including Hitachi. The use of the SAP HANA appliance does not depend on the data source.

The SAP HANA appliance enables the analysis of huge volumes of detailed business information in real-time from almost any data source. It captures operational data in memory as it occurs. Flexible views quickly expose analytic information. External data can be added to analytic models from across an entire organization.

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 Master Guide — this is the central starting point for the technical implementation of the SAP HANA platform. Use this for basic concepts and for planning the SAP HANA application system landscape.
- **SAP HANA Installation and Initial Configuration Guides** — use the various installation guides to install the required SAP In-Memory Database and the other software components for the different replication technologies. Refer to the SAP HANA Server Installation Guide for an overview on how to install SAP HANA.
- SAP HANA Technical Operations Manual — provides an end-to-end picture of the available SAP HANA appliance administration tools and the key tasks for a system administrator to perform.
- SAP HANA Master Update Guide — this explains how to update SAP HANA and its components.
- SAP Integration and Certification Center (SAP ICC) — this page provides information about SAP HANA appliances certified by SAP hardware partners.
- The following is a link to all SAP-related documentation: http://help.sap.com/hana_platform/
- Information on productive SAP HANA systems on Hitachi LPAR can be found in SAP Note 2063057
- For SAP Community Network documents on Hitachi systems with LPAR, use the following documents as a starting point: SAP on Hitachi LPAR and Best Practices Guide for Hitachi LPAR

SUSE Linux Enterprise Server (SLES) for SAP Applications and Red Hat Enterprise Linux (RHEL)

The following Linux distributions are available as guest operating system for the LPARs:

- 64-bit SUSE Linux Enterprise Server (SLES) for SAP Applications
- 64-bit Red Hat Enterprise Linux (RHEL)

For more detailed information on supported OS releases and service packs refer to the systems certified with Intel Ivy Bridge EX E7 CPUs listed in the Certified SAP HANA Hardware Directory.

Changing the configuration settings is only supported along the guidelines of SAP and the operating system distributor and may otherwise cause significant performance problems. A good starting point for information on this topic provide the following SAP Notes for SLES and RHEL:

- 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 section 2.1.4.1, “Updating and Patching the Operating System,” in the SAP HANA Technical Operations Manual.

Hitachi Logical Partitioning

The logical partitioning feature from Hitachi partitions the physical resources of one single-blade or multi-blade server logically into independent server environments called LPARs (logical partitions).

CPUs, memory, and I/O devices can be assigned in dedicated mode to LPARs to create fully isolated server environments for SAP HANA single node installations within each LPAR running on the same physical host without any noisy neighbor effects between the different server environments.

520X B1 server blades have to be set to LP mode to enable logical partitioning capabilities. LPARs using one or two CPU sockets in dedicated mode accessing the CPU sockets' local memory bank can be created for running productive SAP HANA instances. Combined with dedicated HBA cards for each LPAR and separated controller ports and RAID groups in Hitachi Unified Storage VM, the LPAR manager enables the consolidation of multiple productive SAP HANA instances on the same physical server using a single Unified Storage VM.

An overview of the supported LPAR configurations can be found in Table 1, "Supported Scale-up Configurations for SAP HANA with Logical Partitioning," on page 1 and Table 2, "Supported LPAR Memory Configurations for SAP Application Scenarios," on page 1.

More information on the operations and administration of LPARs can be found in *Hitachi Compute Blade 500 Series Logical Partition Manager User's Guide* (MK-91CB500068-18). If you need this document, contact your Hitachi Data Systems representative.

The licenses listed in Table 5 are required for running SAP HANA on Unified Compute Platform for the SAP HANA Platform with logical partitioning.

Table 5. Licenses Required for UCP for SAP HANA with Logical Partitioning

License Name	Mandatory
Logical partitioning advanced license	1 per server blade
Logical partitioning optional license for SAP HANA	1 per server blade

Solution Design

The detailed design for Hitachi Unified Compute Platform for the SAP HANA Platform with logical partitioning (LPAR) in a scale-up configuration reference solution includes the following:

Hitachi Compute Blade 500 Chassis Configuration

Figure 1 shows the front and back view of the Hitachi Compute Blade 500 chassis for all three possible SMP blade configurations.

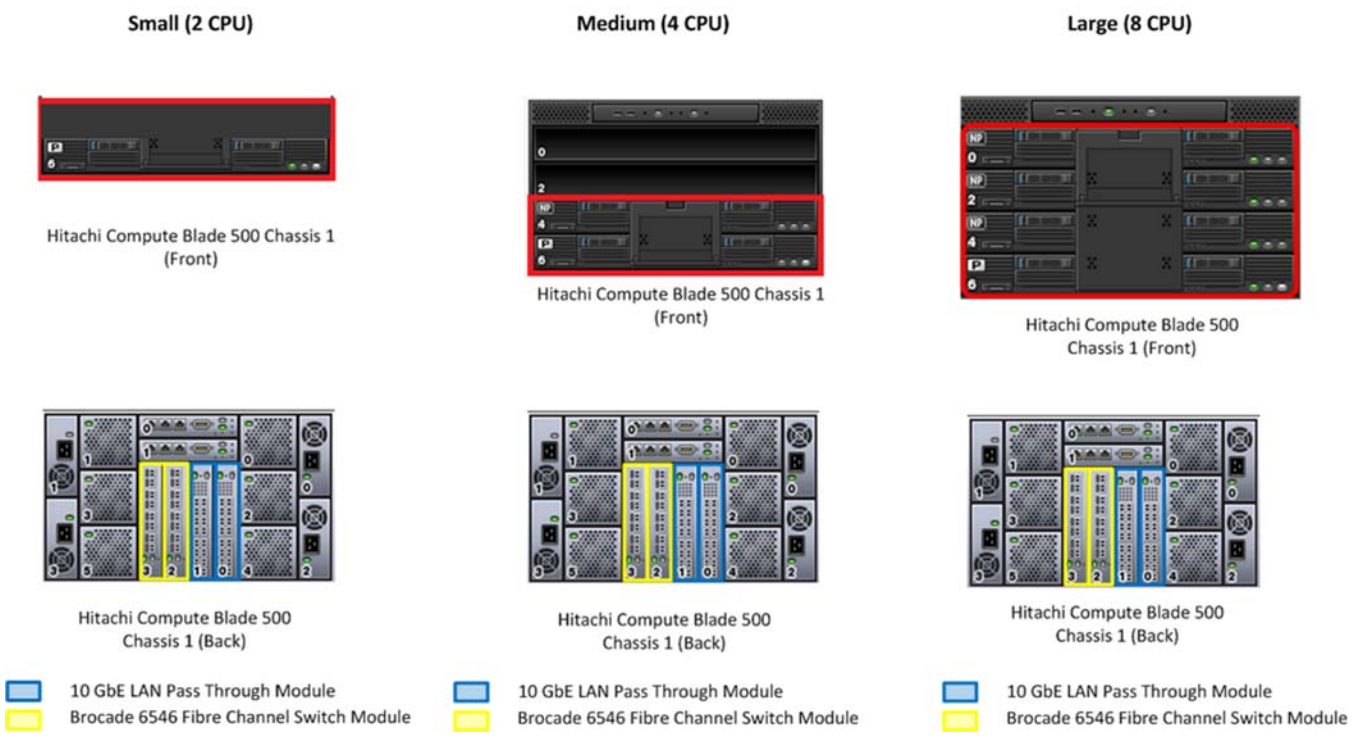

Figure 1

This solution uses one Hitachi Compute Blade 500 chassis and either one, two, or four 520X B1 server blades with different memory configurations. For a detailed overview see Table 1 on page 1.

There are four switch modules within the Hitachi Compute Blade 500 chassis and they have the following components:

- In switch module 0 and 1 there are 10 Gb/sec Ethernet LAN pass-through modules.
- In switch module 2 and 3 there are 16 Gb/sec Brocade Fibre Channel switch modules.

Hitachi Server Blade Architecture

Each solution size has from one to four server blades. Multiple blades use a two or four-blade SMP interface connector to create a single four or eight-socket SMP node with a total of 60 or 120 cores and different sizes of memory. Table 6 lists the information for small, medium, and large solution sizes.

Table 6. Server Blade Configuration

	Small (2 CPU)	Medium (4 CPU)	Large (8 CPU)
520X B1 Server Blades	Total 1 server blade Blade 6 (primary)	Total 2 server blades Blade 4 (non-primary) Blade 6 (primary)	Total 4 server blades Blade 0 (non-primary) Blade 2 (non-primary) Blade 4 (non-primary) Blade 6 (primary)
Total Number of CPU Sockets	2	4	8
Total Number of CPU Cores	30	60	120
SMP Interface Connector	N/A	2-blade SMP connector	4-blade SMP connector

Fibre Channel SAN Architecture

The Fibre Channel SAN architecture consists of the following components on each 520X B1 server blade:

- Two Hitachi 8 Gb/sec 2-port Fibre Channel mezzanine cards:
  - One mezzanine card in slot 2
  - One mezzanine card in slot 4

The mezzanine cards installed in mezzanine slot 2 and slot 4 of each server blade connect to the 16 Gb/sec Brocade 6546 Fibre Channel switch modules installed in switch slot 2 and slot 3 through the backplane within the Hitachi Compute Blade 500 server chassis.

With this configuration there are dedicated Fibre Channel ports on Hitachi Unified Storage VM for Fibre Channel connection with each of the HBA ports of the SAP HANA node.

The Brocade 6546 Fibre Channel switch modules provide eight external ports each. That enables every LPAR to have two or four dedicated paths to Unified Storage VM, even when operating with a full chassis.

The port mapping for the HBA ports, the Fibre Channel switch modules, and the HUS VM ports is shown in Table 7, “LPAR HBA Port to Hitachi Unified Storage VM Storage Port Mapping for 16 Gb/sec Fibre Channel Switch Modules,” on page 10.

Table 7. LPAR HBA Port to Hitachi Unified Storage VM Storage Port Mapping for 16 Gb/sec Fibre Channel Switch Modules

Server Blade Number	HBA Port	Switch Module, Internal Port	Switch Module, External Port	Hitachi Unified Storage VM Ports
6	Port 0 on mezzanine slot 2	Switch module 2, Port 6	Switch module 2, Port 22	1A
	Port 1 on mezzanine slot 2	Switch module 3, Port 6	Switch module 3, Port 22	2A
	Port 0 on mezzanine slot 4	Switch module 2, Port 7	Switch module 2, Port 23	3A
	Port 1 on mezzanine slot 4	Switch module 3, Port 7	Switch module 3, Port 23	4A
4	Port 0 on mezzanine slot 2	Switch module 2, Port 4	Switch module 2, Port 20	5A
	Port 1 on mezzanine slot 2	Switch module 3, Port 4	Switch module 3, Port 20	6A
	Port 0 on mezzanine slot 4	Switch module 2, Port 5	Switch module 2, Port 21	7A
	Port 1 on mezzanine slot 4	Switch module 3, Port 5	Switch module 3, Port 21	8A
2	Port 0 on mezzanine slot 2	Switch module 2, Port 2	Switch module 2, Port 18	1B
	Port 1 on mezzanine slot 2	Switch module 3, Port 2	Switch module 3, Port 18	2B
	Port 0 on mezzanine slot 4	Switch module 2, Port 3	Switch module 2, Port 19	3B
	Port 1 on mezzanine slot 4	Switch module 3, Port 3	Switch module 3, Port 19	4B
0	Port 0 on mezzanine slot 2	Switch module 2, Port 0	Switch module 2, Port 16	5B
	Port 1 on mezzanine slot 2	Switch module 3, Port 0	Switch module 3, Port 16	6B
	Port 0 on mezzanine slot 4	Switch module 2, Port 1	Switch module 2, Port 17	7B
	Port 1 on mezzanine slot 4	Switch module 3, Port 1	Switch module 3, Port 17	8B

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.

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 Gb/sec)**
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 Name of the Hitachi 8 Gb/sec 2-port Fibre Channel mezzanine port as the host to the corresponding host group.

Table 9. Host Storage Group WWN Port Mapping

1-socket LPAR	1-socket LPAR Number, Port WWN	Host Storage Group	2-socket LPAR Number, Port WWN	2-socket LPAR
1	LPAR 1, Port 0 WWN	1A-G00	LPAR 1, Port 0 WWN	1
	LPAR 1, Port 1 WWN	2A-G00	LPAR 1, Port 1 WWN	
2	LPAR 2, Port 0 WWN	3A-G00	LPAR 1, Port 2 WWN	
	LPAR 2, Port 1 WWN	4A-G00	LPAR 1, Port 3 WWN	
3	LPAR 3, Port 0 WWN	5A-G00	LPAR 2, Port 0 WWN	2
	LPAR 3, Port 1 WWN	6A-G00	LPAR 2, Port 1 WWN	
4	LPAR 4, Port 0 WWN	7A-G00	LPAR 2, Port 2 WWN	
	LPAR 4, Port 1 WWN	8A-G00	LPAR 2, Port 3 WWN	
5	LPAR 5, Port 0 WWN	1B-G00	LPAR 3, Port 0 WWN	3
	LPAR 5, Port 1 WWN	2B-G00	LPAR 3, Port 1 WWN	
6	LPAR 6, Port 0 WWN	3B-G00	LPAR 3, Port 2 WWN	
	LPAR 6, Port 1 WWN	4B-G00	LPAR 3, Port 3 WWN	
7	LPAR 7, Port 0 WWN	5B-G00	LPAR 4, Port 0 WWN	4
	LPAR 7, Port 1 WWN	6B-G00	LPAR 4, Port 1 WWN	
8	LPAR 8, Port 0 WWN	7B-G00	LPAR 4, Port 2 WWN	
	LPAR 8, Port 1 WWN	8B-G00	LPAR 4, Port 3 WWN	

Realize mixed configurations with both 1-socket and 2-socket LPARs by first creating all the 2-socket LPARs and then the 1-socket LPARs. The host storage groups are the same, except for the adapted numbering of the LPARs.

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.

- Each 520X B1 server blade has one 4-port 10 GbE LAN mezzanine card installed in mezzanine slot 1.
- Server blade 6 also has one 4-port 10 GbE LAN Mezzanine card installed in mezzanine slot 3, whereby only one controller with two ports is usable.
- The LAN mezzanine cards connect to the 10 GbE LAN pass-through switch modules installed in switch slot 0 and slot 1.

The total number of 10 GbE LAN ports available for the various configurations is shown in Table 10. Two LAN ports are used for the logical partitioning management network connection while the rest are usable for server network connections from within the LPARs. In dedicated network mode, NIC controllers with two ports each can be assigned to LPARs within this configuration.

Logical partitioning manager management network links must be aggregated using active-backup mode. The IP address of LPAR manager and the chassis management modules (SVP) have to be in the same subnet. For more information on VLAN configuration for the LPAR management path, see *Hitachi Compute Blade 500 Series Logical Partitioning Manager User's Guide* (MK-91CB500068-18). Contact your Hitachi Data Systems representative if you need this manual.

Table 10. Available 10 GbE LAN Ports

Number of 520X B1 Server Blades	Number of Available 10 GbE LAN Ports
1	2 NIC controllers with a total of 4 ports
2	4 NIC controllers with a total of 8 ports
4	8 NIC controllers with a total of 16 ports

For 1-socket LPARs, each LPAR uses a dedicated NIC controller with two ports that are bonded to one network interface on the operating system level, providing a highly available 2 × 10 GbE LAN connection to the client/uplink network.

An additional NIC controller is available for 2-socket LPARs. This allows two highly available bonding devices on the operating system level that can be used for separating the client network and a second network, such as the backup network.

Table 11. Network Setup Using 10 GbE LAN Pass-through Modules

Server Blade Number	NIC Port	LAN Pass-through Module Port	Usage
6	Port 0 on mezzanine slot 1	Switch 0 Port 12	Management network to connect to SVP
	Port 1 on mezzanine slot 1	Switch 1 Port 12	Management network to connect to SVP
	Port 2 on mezzanine slot 1	Switch 0 Port 13	LPAR 1 client LAN
	Port 3 on mezzanine slot 1	Switch 1 Port 13	LPAR 1 client LAN
	Port 0 on mezzanine slot 3	Switch 0 Port 14	LPAR 2 client LAN or additional LAN interface for 2-socket LPAR
	Port 1 on mezzanine slot 3	Switch 1 Port 14	LPAR 2 client LAN or additional LAN interface for 2-socket LPAR
4	Port 0 on mezzanine slot 1	Switch 0 Port 8	LPAR 3 client LAN
	Port 1 on mezzanine slot 1	Switch 1 Port 8	LPAR 3 client LAN
	Port 2 on mezzanine slot 1	Switch 0 Port 9	LPAR 4 client LAN or additional LAN interface for 2-socket LPAR
	Port 3 on mezzanine slot 1	Switch 1 Port 9	LPAR 4 client LAN or additional LAN interface for 2-socket LPAR
2	Port 0 on mezzanine slot 1	Switch 0 Port 4	LPAR 5 client LAN
	Port 1 on mezzanine slot 1	Switch 1 Port 4	LPAR 5 client LAN
	Port 2 on mezzanine slot 1	Switch 0 Port 5	LPAR 6 client LAN or additional LAN interface for 2-socket LPAR
	Port 3 on mezzanine slot 1	Switch 1 Port 5	LPAR 6 client LAN or additional LAN interface for 2-socket LPAR

Table 11. Network Setup Using 10 GbE LAN Pass-through Modules (Continued)

Server Blade Number	NIC Port	LAN Pass-through Module Port	Usage
0	Port 0 on mezzanine slot 1	Switch 0 Port 0	LPAR 7 client LAN
	Port 1 on mezzanine slot 1	Switch 1 Port 0	LPAR 7 client LAN
	Port 2 on mezzanine slot 1	Switch 0 Port 1	LPAR 8 client LAN or additional LAN interface for 2-socket LPAR
	Port 3 on mezzanine slot 1	Switch 1 Port 1	LPAR 8 client LAN or additional LAN interface for 2-socket LPAR

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

- Independent management LAN interfaces from the data network for remote and secure management of the chassis and all associated blades
- A serial command line interface along with a web interface
- Hot swapping
- Live firmware updates without the need for shutting down the blades

Storage Architecture

Many factors impact the drive size and storage configuration in Hitachi Unified Compute Platform for SAP HANA solutions, including I/O and capacity requirements.

With fully dedicated LPARs running on these systems, the SAS drive RAID groups that are used for the HANA data and log volumes are dedicated to each LPAR and must not be shared between the LPARs. This increases the storage requirements if Unified Compute Platform for SAP HANA uses logical partitioning, when compared to the standard scale-up solution that is used as a basis for this solution.

Figure 2 on page 14 shows the disk configuration of the storage subsystem for a 4-socket 1 TB configuration with four LPARs.

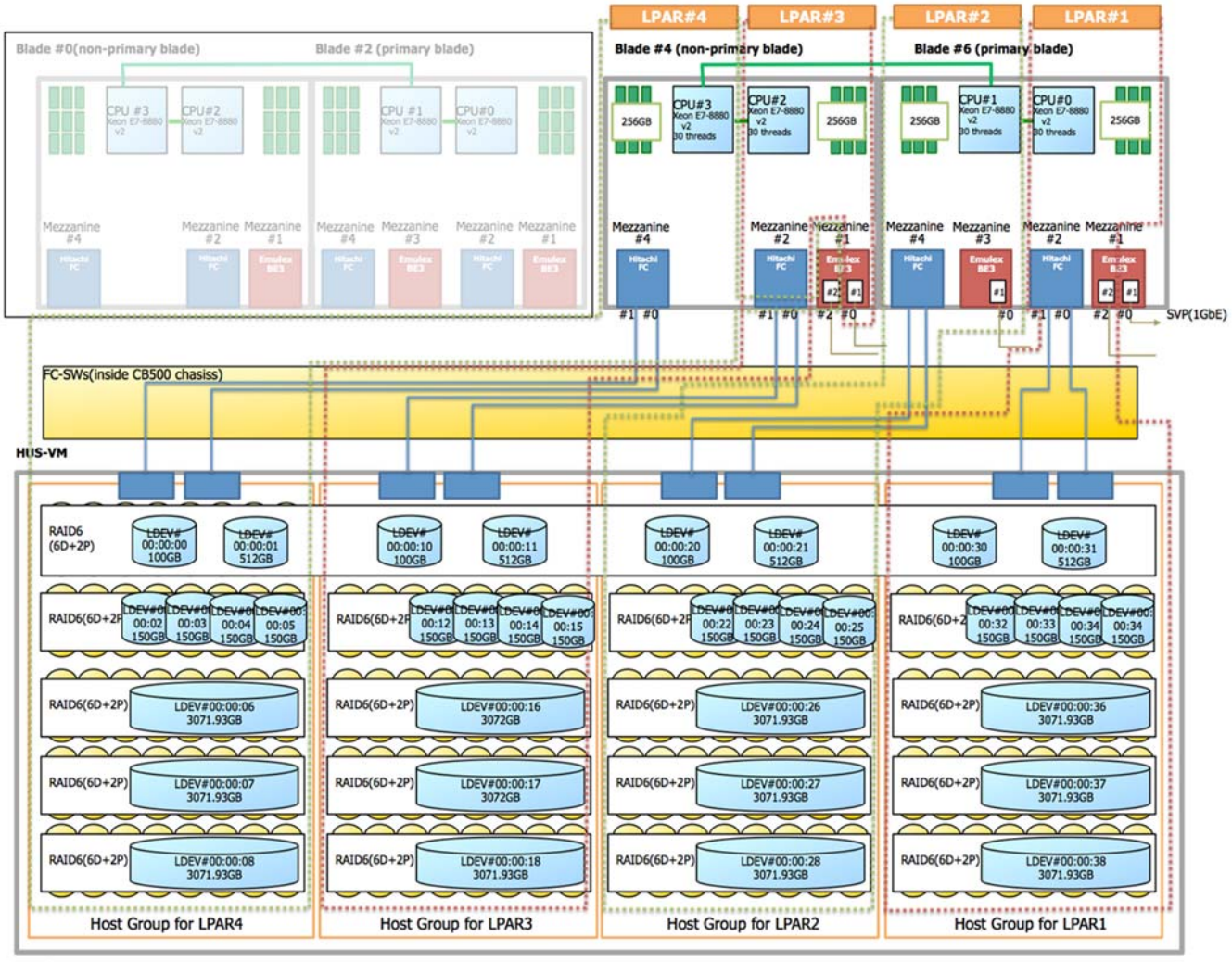

Figure 2

RAID and LUN Configuration

This reference architecture uses the following RAID configuration on Hitachi Unified Storage VM:

- Create one RAID-6 (6D+2P) group using 8 × 600 GB 10k RPM SAS drives for hosting the operating system and HANA shared volumes.
  - On systems with a memory size of 3 TB or more, create one RAID-6 (14D+2P) group using 16 × 600 GB 10k RPM SAS drives to meet the size requirements for the operating system and /hana/shared.
- For each LPAR, create four RAID-6 (6D+2P) groups using 32 × 600 GB 10k RPM SAS drives.
- Use one spare 600 GB 10k RPM SAS drive for every 32 SAS drives.

For each LPAR, create following LUNs:

- One 100 GB LUN to host the LPAR guest operating system.
- One LUN to host the HANA shared volume that matches the LPAR memory size.
- Four 150 GB LUNs to host the HANA log volume located on the same RAID group. Use a striped volume over the four LUNs.
- Three 3 TB LUNs to host the HANA data volume. Use a striped volume over the three LUNs.

Table 12 shows the parity groups and LDEV assignments for one LPAR with 512 GB of main memory. Use this to derive the LDEV assignments for the other LPARs located on the same system.

Table 12. Storage Configuration for one LPAR with 512 GB of Main Memory

Parity Group	Parity Group RAID Level and Disks	LDEV Size	MPU ID	Description	LUN ID per LPAR
1-1	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	100 GB	MPU11	LPAR1_OS	LUN ID 0
		512 GB	MPU11	LPAR1_SHARED	LUN ID 1
1-2	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	150 GB	MPU10	LPAR1_LOG1	LUN ID 2
		150 GB	MPU11	LPAR1_LOG2	LUN ID 3
		150 GB	MPU20	LPAR1_LOG3	LUN ID 4
		150 GB	MPU21	LPAR1_LOG4	LUN ID 5
1-3	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	3 TB	MPU21	LPAR1_DATA1	LUN ID 6
1-4	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	3 TB	MPU10	LPAR1_DATA2	LUN ID 7
1-5	RAID-6 (6D+2P) on 600 GB 10k RPM SAS drives	3 TB	MPU20	LPAR1_DATA3	LUN ID 8

SAP HANA Configuration

This describes the SAP HANA volume and operating system configuration.

SAN Operating System Boot Configuration

Deploying SAP HANA in a scale-up configuration requires using SAN boot. Each LPAR uses one 100 GB LUN on Hitachi Unified Storage VM with LUN ID 0 for the operating system volume.

Configure the Hitachi 8 Gb/sec 2-port Fibre Channel mezzanine cards listed in Table 9, “Host Storage Group WWN Port Mapping,” on page 11 to use the 100 GB operating system LUN as the primary boot device for each LPAR. The operating system LUN holds partitions for the following:

- Operating system
- /usr/sap/
- The Linux swap space.

LPAR Configuration and Volume Assignment

The following describe the configuration and volume assignment for each separate LPAR.

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 paths fail.

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

- Operating system volume LUN
- SAP HANA data volume LUN
- SAP HANA log volume LUN
- SAP HANA shared volume LUN

HANA Data Volume Configuration

Use the Logical Volume Manager for the Linux operating system to configure the SAP HANA persistent storage volumes. Create a single striped volume formatted with the XFS file system to store the SAP HANA data volume.

HANA Log Volumes Configuration

Use Logical Volume Manager to configure the SAP HANA log volume. For the four 150 GB SAP HANA log volume LUNs, create a single 4-way striped volume formatted with the XFS file system to store the SAP HANA log volume.

SAP HANA Shared Volume

For the SAP HANA shared volume containing SAP HANA binaries, configuration, and traces, use the Logical Volume Manager to create a single volume of at least the same size as the memory size of the LPAR.

SAP HANA Appliance Software Installation

After configuring the file system for the SAP HANA data volume and log volume, install the current version of SAP HANA 1.0 supported by SAP on the SAP HANA server. Hitachi Data Systems has a unified installer for SAP HANA that does this

Install the following SAP HANA software components on the SAP HANA server node:

- SAP HANA database
- SAP HANA client
- SAP Host Agent

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.

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