

WHITE PAPER

Hitachi Solution for the SAP HANA Platform in a Scale-up Configuration using Hitachi Advanced Server DS220

Reference Architecture Guide

By Archana Kuppuswamy

November 2017

Feedback

Hitachi Vantara welcomes your feedback. Please share your thoughts by sending an email message to SolutionLab@HitachiVantara.com. To assist the routing of this message, use the paper number in the subject and the title of this white paper in the text.

Revision History

Revision	Changes	Date
SL-015-00	Initial release	December 4, 2017

Table of Contents

Key Solution Elements	3
Hardware Elements	3
Software Elements	5
Solution Design	7
Hitachi Advanced Server DS220 Configuration	7
Network Architecture Configuration	9
Storage Architecture Configuration	9
SAP HANA Configuration	14
Engineering Validation	14

Hitachi Solution for the SAP HANA Platform in a Scale-up Configuration using Hitachi Advanced Server DS220

Reference Architecture Guide

Read about the scale-up Hitachi Solution for the SAP HANA platform using Hitachi Advanced Server DS220. This solution uses either of the following:

- Internal storage housed in the server serving as an appliance configuration
- Connected to an external storage subsystem following the tailored data center integration (TDI) approach to implement SAP HANA

This SAP HANA infrastructure uses the following components:

■ Hardware

- One Hitachi Advanced Server DS220 with internal drives providing internal storage.
- (Optional) External sub-system storage, such as Hitachi Virtual Storage Platform G200 (VSP G200).

■ Software

- Preconfigured with SAP HANA to provide a converged solution for converged solutions for real time analytics

The validation of this environment with external storage was with Hitachi Virtual Storage Platform G200. Your needs may require other storage options. Contact your account representative for details and implementation services whenever you require using external storage.

Figure 1 shows the topology of this reference solution using internal drives on Hitachi Advanced Server DS220.

Figure 1

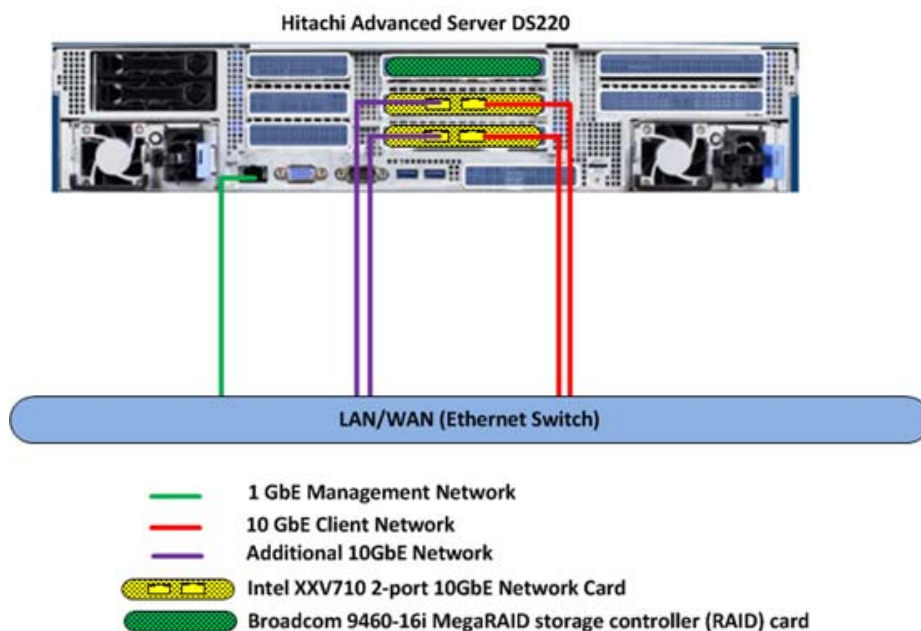
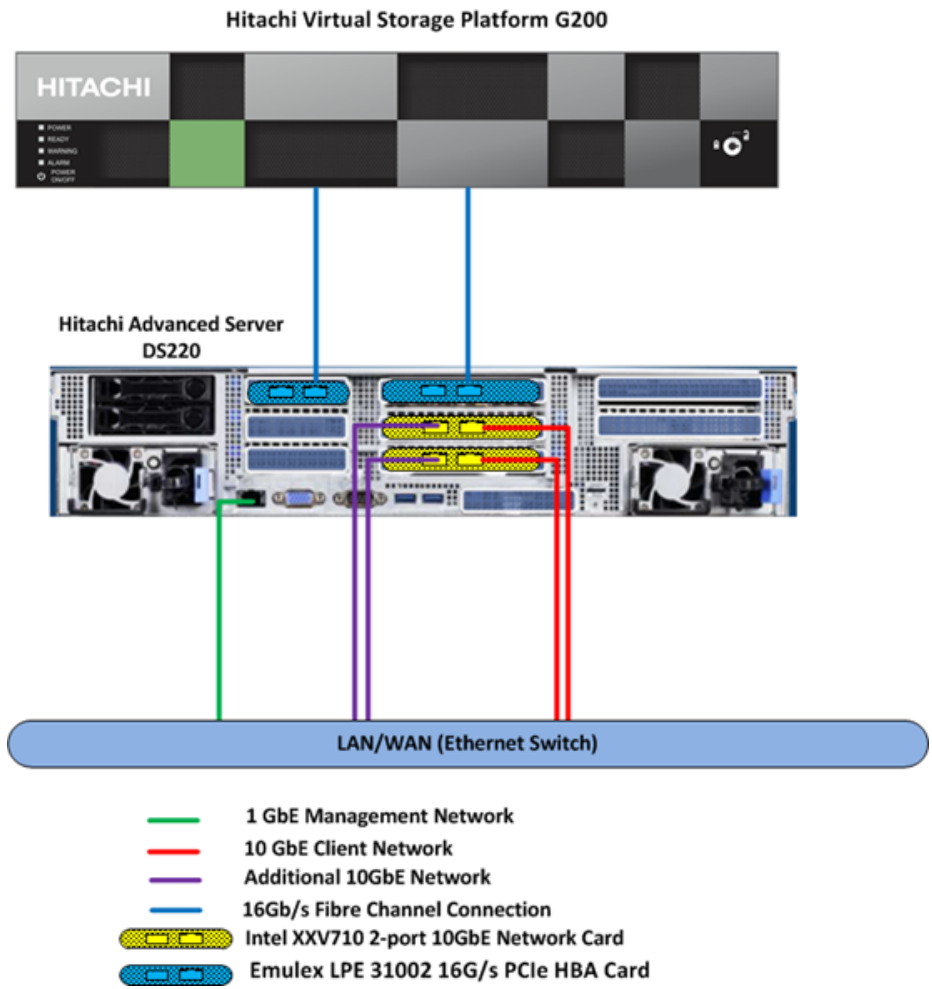


Figure 2 shows the topology of this reference solution using external drives on a storage subsystem, such as Virtual Storage Platform G200.

Figure 2



Solution for SAP HANA is a preconfigured converged system for real-time analytics. It is ready to plug into your network to provide real-time access to operational data for use in analytic models.

This system supports the configurations listed in Table 1.

TABLE 1. SUPPORTED CONFIGURATION

Number of Sockets	RAM Size	Storage
2 sockets	<ul style="list-style-type: none">■ 768 GB■ 1536 GB■ 3072 GB	Internal storage option: <ul style="list-style-type: none">■ Internal drives on the Hitachi Advanced Server DS220
		External storage option: <ul style="list-style-type: none">■ Storage subsystem, such as Hitachi Virtual Storage Platform G200

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.

Key Solution Elements

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

Note — Do not change the layout of any of the components in this environment without consulting your Hitachi Vantara account representative. Changing this layout can require manual configuration of the network and/or using different components.

Hardware Elements

Table 2, “Hardware Elements,” on page 4 lists the hardware used to deploy the specific scale-up configuration of Hitachi Solution for the SAP HANA platform for the different sized solutions.

Hitachi Advanced Server DS220 has storage drives, RAID card, and HBA card added, based on whether using an implementation with internal storage or an external storage sub-system, as indicated in Table 2.

TABLE 2. HARDWARE ELEMENTS

Hardware	Quantity	Configuration	Role	Implementation Type
Hitachi Advanced Server DS220	1	<ul style="list-style-type: none"> ■ CPU per SAP HANA node: <ul style="list-style-type: none"> ■ 2 Intel Xeon Platinum 8176 or 8176M Processor 28-core, 2.1GHz, 165W ■ 2 heat sinks CPU 0/1 ■ RAM per SAP HANA node: <ul style="list-style-type: none"> ■ 768 GB (24 × 32 GB DIMMS) ■ 1536 GB (24 × 64 GB DIMMS) ■ 3072 GB (24 × 128 GB DIMMS) 	SAP HANA server	All implementations
Intel PCIe network cards	2	<ul style="list-style-type: none"> ■ Intel XXV710 dual port SFP28 (LP-MD2) PCIe card 	For SAP HANA 10 GbE client network and additional 10 GbE network	All implementations
	2	<ul style="list-style-type: none"> ■ Cisco SFP+ 3M Twinaxial cables 		
Hitachi Virtual Storage Platform G200	1	<ul style="list-style-type: none"> ■ Single frame 	Block storage when using an external storage sub-system	External storage only
Broadcom PCIe HBA card	1	<ul style="list-style-type: none"> ■ 2-port LPE31002-M6 16 Gb/s card 	Connectivity to the external storage sub-system	External storage only
	2	<ul style="list-style-type: none"> ■ 16 Gb/s SFP 		
RAID controller card	1	<ul style="list-style-type: none"> ■ Broadcom 9460-16i MegaRAID storage controller (RAID) card 	Required on the Hitachi Advanced server DS220, when using internal storage	Internal storage only
Storage drives	5	<ul style="list-style-type: none"> ■ 1.92 TB Intel S4500 SATA SSD 	Supports less than or equal to 1536 GB RAM per HANA node.	Internal storage only
	9		Supports greater than or equal to 1536 GB RAM per HANA node	
	1		Spare drive	
Cisco Nexus 3048 switch	1	<ul style="list-style-type: none"> ■ 48 × 1 GbE ports 	Optional switch for management network	All implementations (optional)

TABLE 2. HARDWARE ELEMENTS (CONTINUED)

Hardware	Quantity	Configuration	Role	Implementation Type
Cisco Nexus 93180YC-EX switch	2	<ul style="list-style-type: none"> 48 × 10 GbE ports 	Optional switches for things such as the client network or additional backup network	All implementations (optional)
Minkel Global Solutions Rack	1	<ul style="list-style-type: none"> 1 standard rack 	Optional rack for mounting server	All implementations
PDUs	6	<ul style="list-style-type: none"> Vertical PDUs 	Optional PDUs for solution	All implementations

Hitachi Advanced Server DS220

With a combination of two Intel Xeon Scalable processors and high storage capacity in a 2U rack-space package, [Hitachi Advanced Server DS220](#) delivers the storage and I/O to meet the needs of converged solutions and high-performance applications in the data center.

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.

When validating this environment, Hitachi Virtual Storage Platform G200 was used as the external storage sub-system.

Software Elements

Table 3 describes the software products used to deploy this solution.

TABLE 3. SOFTWARE ELEMENTS

Software	
Operating system	SUSE Linux Enterprise Server for SAP Applications
	Red Hat Enterprise Linux (alternate)
SAP HANA	

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.

As a SAP customer, you can download more information on SAP HANA 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 SAP HANA. Use this for basic concepts and for planning.

- **SAP HANA Server Installation and Update Guide**

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 and Update Guide](#) for an overview on how to install SAP HANA.

- **SAP HANA Administration Guide**

This provides an end-to-end picture of the available SAP HANA administration tools and the key tasks for a system administrator to perform.

- **SAP Integration and Certification Center (SAP ICC)**

[SAP HANA hardware directory](#) provides information about SAP HANA appliances certified by SAP hardware partners.

This is a link to all SAP HANA-related documentation: https://help.sap.com/viewer/p/SAP_HANA_PLATFORM.

Operating System Choices

The scale-up configuration of Hitachi Solution for the SAP HANA Platform can run on the following Linux operating systems:

- **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 to be certified for use with SAP HANA. It remains the operating system of choice for most SAP HANA customers.

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

Using the stability and flexibility of [Red Hat Enterprise Linux](#), reallocate your resources towards meeting the next challenges instead of maintaining the status quo. Deliver meaningful business results by providing exceptional reliability on military-grade security. Use Enterprise Linux to tailor your infrastructure as markets shift and technologies evolve.

Changing the configuration settings is only supported along the guidelines of SAP and the operating system distributor and may otherwise cause 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](#)
- [2235581 – SAP HANA: Supported Operating System](#)

The initially delivered configuration of the operating system should persist. Do not make any modifications to the operating system, except as noted or approved by SAP.

Solution Design

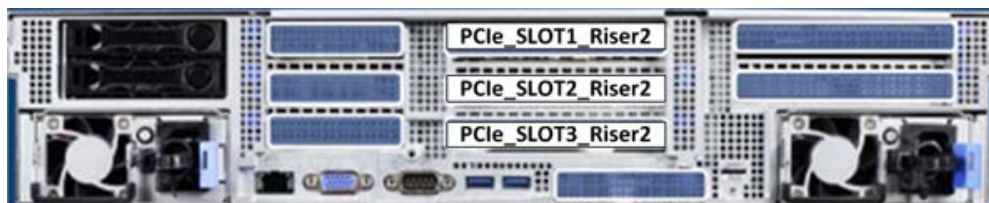
The detailed design for this scale-up configuration of Hitachi Solution for the SAP HANA Platform for this reference solution includes the following:

- “Hitachi Advanced Server DS220 Configuration” on page 7
- “Network Architecture Configuration” on page 9
- “Storage Architecture Configuration” on page 10
- “SAP HANA Configuration” on page 14

Hitachi Advanced Server DS220 Configuration

Figure 3 shows the front and back view of Hitachi Advanced Server DS220 when using internal drives.

Figure 3



Hitachi Advanced Server DS220 with internal drives - PCIe Slots used

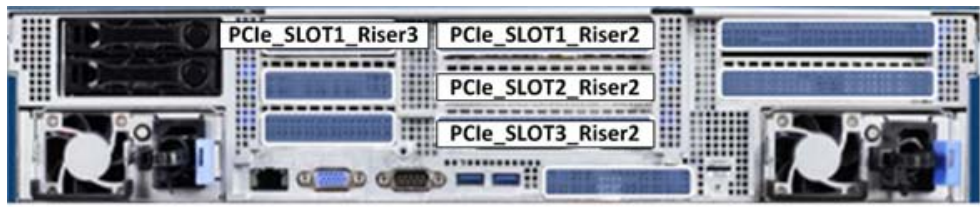


Hitachi Advanced Server DS220 with internal drives (Back)

-  Intel XXV710 2-port 10GbE Network Card
-  Broadcom 9460-16i MegaRAID storage controller (RAID) card

Figure 4 shows the front and back view of the Hitachi Advanced Server DS220 when using external drives on a storage subsystem, such as Hitachi Virtual Storage Platform G200.



Figure 4



Hitachi Advanced Server DS220 with external storage – PCIe Slots used (Back)



Hitachi Advanced Server DS220 with external Storage (Back)

-  Intel XXV710 2-port 10GbE Network Card
-  Emulex LPE 31002 16G/s PCIe HBA Card

This solution uses one Hitachi Advanced Server DS220, with the following components:

- 2 dual port 10 GbE Intel XXV710 SFP28 PCIe card on the PCIe_SLOT2_Riser2 and PCIe_SLOT3_Riser2
- Required only with the internal storage option:
 - 1 Broadcom 9460-16i MegaRAID storage controller (RAID) PCIe card on the PCIe_SLOT1_Riser2
 - 5 × 1.92 TB Intel S4500 SATA SSD drives on the front bay, supporting less than or equal to 1536 GB RAM per SAP HANA node
 - 9 × 1.92 TB Intel S4500 SATA SSD on the front bay, supporting greater than 1536 GB RAM per SAP HANA node
 - 1 × 1.92 TB Intel S4500 SATA SSD drives used as spare drive
- Required only with the external storage option:
 - 2 × 2-port Broadcom LPE31002-M6 16 Gb/s PCIe HBA card on PCIe_SLOT1_Riser2 and PCIe_SLOT1_Riser3

Network Architecture Configuration

Connect the 1 GbE management port on Hitachi Advanced Server DS220 to a Cisco Nexus 3048 switch or to any other external 1 GbE switch for management connectivity.

Make the following 10 GbE network connections for the client network setup of the SAP HANA node as an uplink network following Table 4:

- Connect the following to Cisco Nexus 93180YC-EX switches or to any other external switches:
 - Port 0 of 10 GbE Intel XXV710 SFP28 PCIe card to the two different Cisco Nexus 93180YC-EX switches
 - Bond the corresponding two ports eth9901 and eth9902 as bond0 at the operating system level using active-active network bond mode with the following options:
`mode= 802.3ad miimon=100 xmit_hash_policy=layer3+4 updelay=5000 lacp_rate=fast`
 - This acts as the client network for the SAP HANA node.
- If additional 10 GbE network connections are required, connect the Port 1 of both the 10 GbE Intel XXV710 SFP28 PCIe cards to the Cisco Nexus 93180YC-EX switches or to any other external switches.

TABLE 4. NETWORK SETUP

Network Card	Port	Network Description
PCIe_SLOT3_Riser2	0	Client network for the SAP HANA node (eth9902)
	1	Free for use as additional 10 GbE network for backup, SAP HANA system replication, or other purposes
PCIe_SLOT2_Riser2	0	Client network for the SAP HANA node (eth9901)
	1	Free for use as additional 10 GbE network for backup, SAP HANA system replication, or other purposes

Figure 1 on page 1 shows the standard network configuration used for this solution when using internal storage. Figure 2 on page 2 shows the standard network configuration for this solution when using external storage.

Note — The management network and client network can be on the same network switch or a separate network switch, depending on the network environment.

Storage Architecture Configuration

This describes the two storage configurations for this environment:

- “Internal Storage Option” on page 10
- “External Storage Option” on page 10

Internal Storage Option

These are the storage components needed to setup a scale-up configuration for SAP HANA using internal storage with Hitachi Advanced Server DS220:

- 1 Broadcom 9460-16i MegaRAID storage controller (RAID) PCIe card
- 5 × 1.92 TB Intel S4500 SATA SSD drives configured as RAID-5(4D+1P), supporting less than or equal to 1536 GB RAM per SAP HANA node including the spare drive
- 9 × 1.92 TB Intel S4500 SATA SSD drives configured as RAID-5(8D+1P), supporting greater than 1536 GB RAM per SAP HANA node including the spare drive
- 1 × 1.92 TB Intel S4500 SATA SSD drives used as a spare drive

Storage sizing and configuring varies for the different sizes by considering requirements for I/O and capacity, including the following:

- Operating system volume (OS)
- SAP HANA shared volume (/hana/shared)
- SAP HANA log volume (/hana/log)
- SAP HANA data volume (/hana/data).

Table 5 lists the storage configuration for different memory sizes.

TABLE 5. STORAGE CONFIGURATION WHEN USING INTERNAL STORAGE

Configuration	Memory Less Than or Equal to 1.5 TB	Memory Greater Than 1.5 TB
Parity Group	<ul style="list-style-type: none"> ■ 1 × RAID-5 (4D+1P) using 5 × 1.92 TB Intel S4500 SATA SSD 	<ul style="list-style-type: none"> ■ 1 × RAID-5 (8D+1P) using 9 × 1.92 TB Intel S4500 SATA SSD
OS, Data, Log and HANA Shared	<ul style="list-style-type: none"> ■ Operating system volume: 100 GB ■ SAP HANA shared volume: 1536 GB ■ Data volume: 4915 GB ■ Log volume: 600 GB 	<ul style="list-style-type: none"> ■ Operating system volume: 100 GB ■ SAP HANA shared volume: 3072 GB ■ Data volume: 9830 GB ■ Log volume: 600 GB
Spare drive	1 × 1.92TB Intel S4500 SATA SSD	

External Storage Option

Note — Each implementation of this reference architecture can use a different storage architecture. Validation testing for this environment used Hitachi Virtual Storage Platform G200 as external storage. Contact your account representative for details and implementation services when you want an environment using external storage.

These are the storage components you need to implement a scale-up SAP HANA system with Hitachi Advanced Server DS220 using Hitachi Virtual Storage Platform G200 for external storage:

- 2 × 2-port Broadcom LPE31002-M6 16 Gb/s PCIe HBA card
- 1 Hitachi Virtual Storage Platform G200
- Storage drive box trays (DBS)
- Spare drives

In case of the external storage option with direct connection between the Virtual Storage Platform G200 storage and the Emulex HBA on the DS220 server, the following is mandatory:

- Use the System Mode 847 on the storage array
- Enable the Host Mode Option 94 for the corresponding storage port connected with the server

Without setting up this option, SAN Storage cannot be identified from the Emulex HBA. Also, make sure to use the following port properties as in Table 6.

TABLE 6. PORT PROPERTIES ON VIRTUAL STORAGE PLATFORM G200

For this setting	Use this value
Port Security	Disabled
Port Speed	Auto
Fabric	OFF
Connection Type	P-to-P

The SAP HANA node needs the following storage layout:

- Operating system volume
- SAP HANA shared volume for the SAP HANA binaries and other configuration files
- Log volume
- Data volume

This reference setup utilizes a dynamic provisioning pool design for the storage layout that ensures maximum utilization and optimization at a lower cost.

Use two dynamic provisioning pools with the specific parity groups listed in Table 7 for the storage layout.

TABLE 7. DYNAMIC PROVISIONING POOLS

Dynamic Provisioning Pool Name	Purpose	Parity Group RAID Level and Disks
OS_SH_Data_Pool	Operating system LUN SAP HANA shared LUN Data LUN	RAID-6 (14D+2P) on 600 GB, 10k RPM SAS drives
Log_Pool	Log LUN	RAID-6 (6D+2P) on 600 GB, 10k RPM SAS drives

The example layout in Table 8 uses the dynamic provisioning pool layout on Virtual Storage Platform G200 for a SAP HANA TDI solution with 1.5TB scale-up system.

TABLE 8. DYNAMIC PROVISIONING POOL FOR A SAP HANA TDI SOLUTION

Dynamic Provisioning Pool	Parity Group ID	Parity Group RAID Level and Disks	LDEV ID	LDEV Name	LDEV Size (GB)	MPU Assignment
OS_SH_Data_Pool	1	RAID-6 (14D+2P) on 600 GB, 10k RPM SAS drives	00:00:01	OS_SH_DA_Pool_1	1800	MPU-10
			00:00:02	OS_SH_DA_Pool_2	1800	MPU-11
			00:00:03	OS_SH_DA_Pool_3	1800	MPU-20
			00:00:04	OS_SH_DA_Pool_4	1800	MPU-21
Log_Pool	2	RAID-6 (6D+2P) on 600 GB, 10k RPM SAS drives	00:01:01	Log_Pool_1	750	MPU-10
			00:01:02	Log_Pool_2	750	MPU-11
			00:01:03	Log_Pool_3	750	MPU-20
			00:01:04	Log_Pool_4	750	MPU-21

Provision the virtual volumes for the operating system, SAP HANA shared, data, and log volumes following Table 9, “Virtual Volumes for the SAP HANA Nodes,” on page 13 for a SAP HANA TDI solution with 1.5 TB scale-up system.

TABLE 9. VIRTUAL VOLUMES FOR THE SAP HANA NODES

Dynamic Provisioning Pool	Virtual Volume ID	Virtual Volume Name	Virtual Volume Size	MPU Assignment
OS_SH_Data_Pool	00:02:00	HANA_OS	100 GB	MPU-10
	00:02:01	HANA_SH	1024 GB	MPU-20
Log_Pool	00:02:02	HANA_LOG_1	128 GB	MPU-10
	00:02:03	HANA_LOG_2	128 GB	MPU-11
	00:02:04	HANA_LOG_3	128 GB	MPU-20
	00:02:05	HANA_LOG_4	128 GB	MPU-21
OS_SH_Data_Pool	00:02:06	HANA_DATA_1	384 GB	MPU-10
	00:02:07	HANA_DATA_2	384 GB	MPU-11
	00:02:08	HANA_DATA_3	384 GB	MPU-20
	00:02:09	HANA_DATA_4	384 GB	MPU-21

Table 10 has the LUN path assignment used when validating this environment.

TABLE 10. EXAMPLE LUN PATH ASSIGNMENT

LUN ID	LDEV ID	LDEV Name
0000	00:02:00	HANA_OS
0001	00:02:01	HANA_SH
0002	00:02:02	HANA_LOG_1
0003	00:02:03	HANA_LOG_2
0004	00:02:04	HANA_LOG_3
0005	00:02:05	HANA_LOG_4
0006	00:02:06	HANA_DATA_1
0007	00:02:07	HANA_DATA_2
0008	00:02:08	HANA_DATA_3
0009	00:02:09	HANA_DATA_4

SAP HANA Configuration

This describes how to configure SAP HANA in this solution.

File System

These volumes utilize the BTRFS file system for an implementation of this solution either with internal drives or with an external storage sub-system:

- Operating system volume
- SAP HANA shared volume
- Data volume
- Log volume

Device-Mapper Multipath

If implementing this solution with internal storage on Hitachi Advanced Server DS220, deactivate Device-Mapper Multipath.

If implementing this solution with an external storage sub-system, activate Device-Mapper Multipath.

SAP HANA Software Installation

After configuring the file system for the SAP HANA data volume and log volume, install the latest SAP HANA 2.0 SPS stack on the server.

Install the following SAP HANA software components on the server:

- Database
- Client
- Agent

Engineering Validation

The test methodology for validating the appliance configuration using Hitachi Advanced Server DS220 with Intel S4500 SATA SSD drives and SAP HANA tailored datacenter integration (TDI) enterprise storage configuration with Hitachi Virtual Storage Platform G200 used the following:

- SAP HANA Hardware Configuration Check Tool (HWCCT) using FSPERF revision hwcct-212_2 tested on:
 - Data volume
 - Log volume
- Appliance configuration with Intel S4500 SATA SSD internal drive was tested additionally using fsperf_single_mix_106.sh script:
 - MixedIO on Data/Log Volume (A MixedIO test is mandatory if the data volume and log volume are created in same parity group. Otherwise this test is optional.)

- For the optimal use of the system with a SAP HANA database, these suggested parameters were used:

- "async_write_submit_active": "on"
- "async_read_submit": "on"
- "async_write_submit_blocks": "all"
- "size_kernel_io_queue": 512
- "max_parallel_io_requests": 64

Follow SAP Note 2399079 to setup these parameters defined in global.ini for SAP HANA 2.0.

- The following is the *global.ini* file configured and used for validation of this solution:

```
[communication]
```

```
tcp_backlog = 2048
```

```
[fileio]
```

```
max_parallel_io_requests = 64
```

```
max_submit_batch_size = 64
```

```
size_kernel_io_queue = 512
```

```
min_submit_batch_size = 16
```

```
async_read_submit = on
```

```
async_write_submit_blocks = all
```

```
async_write_submit_active = auto
```

```
[multidb]
```

```
mode = multidb
```

```
database_isolation = low
```

```
singletenant = yes
```

```
[persistence]
```

```
basepath_datavolumes = /hana/data/HIQ
```

```
basepath_logvolumes = /hana/log/HIQ
```

For More Information

Hitachi Vantara 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 [Services](#) website.

Demonstrations and other resources are available for many Hitachi products. To schedule a live demonstration, contact a sales representative or partner. To view on-line informational resources, see the [Resources](#) website.

Hitachi Academy is your education destination to acquire valuable knowledge and skills on Hitachi products and solutions. Our Hitachi Certified Professional program establishes your credibility and increases your value in the IT marketplace. For more information, see the Hitachi Vantara [Training and Certification](#) website.

For more information about Hitachi products and services, contact your sales representative, partner, or visit the [Hitachi Vantara](#) website.

Hitachi Vantara



Corporate Headquarters
2845 Lafayette Street
Santa Clara, CA 96050-2639 USA
www.HitachiVantara.com | community.HitachiVantara.com

Regional Contact Information
Americas: +1 408 970 1000 or info@hitachivantara.com
Europe, Middle East and Africa: +44 (0) 1753 618000 or info.emea@hitachivantara.com
Asia Pacific: +852 3189 7900 or hds.marketing.apac@hitachivantara.com

© Hitachi Vantara Corporation 2017. All rights reserved. HITACHI is a trademark or registered trademark of Hitachi, Ltd., VSP is a trademark or registered trademark of Hitachi Vantara Corporation. All other trademarks, service marks and company names are properties of their respective owners.

Notice: This document is for informational purposes only, and does not set forth any warranty, expressed or implied, concerning any equipment or service offered or to be offered by Hitachi Vantara.

SL-015-00, November 2017.