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Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration using MDS with VSP E590, VSP E790, and VSP E1090

Reference Architecture Guide

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Feedback

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Revision history

Changes	Date
▪ Support for Hitachi Virtual Storage Platform E1090 ▪ Support for Cisco UCS B200 M6 Blade Server	March 31, 2022
Initial release	December 22, 2020

Reference Architecture Guide

Create a best-practices-based enterprise environment with Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration (TDI). Developed through collaboration between Hitachi Vantara and Cisco Systems, this solution orchestrates efficiency across the data path with an intelligent system that helps you anticipate and navigate challenges as they grow.

This architecture builds a self-optimizing data center that automatically spreads workloads across devices to help ensure consistent utilization and performance. This solution helps you effectively plan infrastructure growth and eliminate budgeting guesswork with predictive risk profiles that identify historical trends.

This solution architecture implements Adaptive Solutions for SAP HANA TDI to support Cisco Unified Computing System (Cisco UCS) with the following:

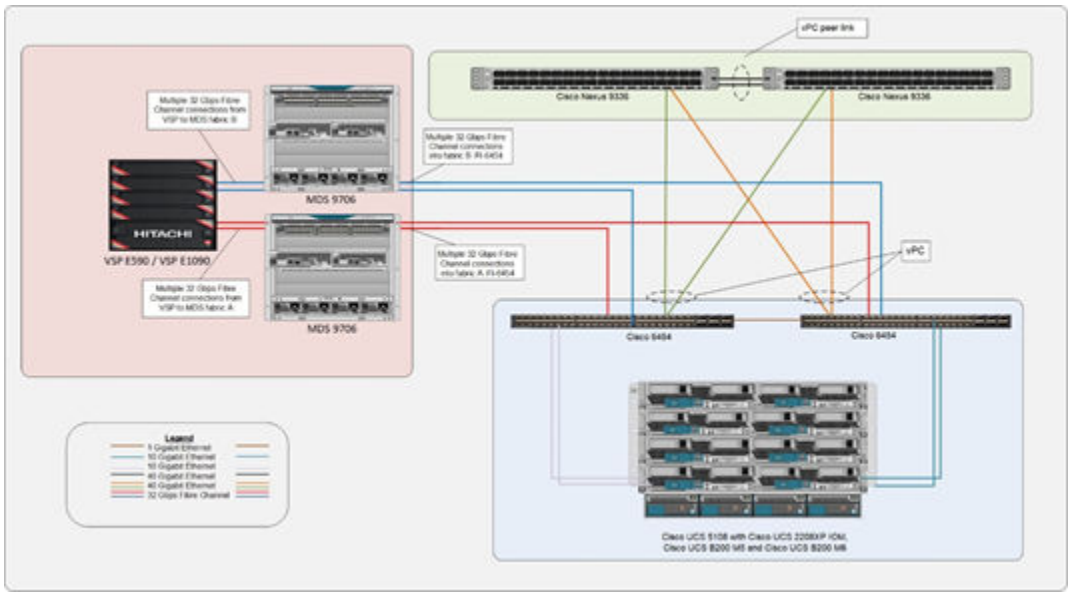
- Cisco UCS 5108 Blade Server Chassis
- Cisco UCS B-Series Blade Servers
- Cisco MDS 9706
- Cisco UCS 6454 Fabric Interconnects
- Cisco Nexus 9000 series switches
- Hitachi Virtual Storage Platform (VSP)
  - VSP E590, using Non-Volatile Memory express (NVMe) solid state drives (SSDs)
  - VSP E790, using Non-Volatile Memory express (NVMe) solid state drives (SSDs)
  - VSP E1090, using Non-Volatile Memory express (NVMe) solid state drives (SSDs)

SAP HANA

These components form a powerful and scalable design, built on the best practices of both companies to create an excellent environment for a SAP HANA deployment. This architecture supports SUSE Linux Enterprise Server (SLES) and Red Hat Enterprise Linux (RHEL) for SAP applications.

The validation of this environment used Hitachi Virtual Storage Platform E590 or VSP E1090.

The following figure shows the topology of this architecture for Cisco and Hitachi Adaptive Solutions for SAP HANA TDI, with a VSP E590, VSP E790, or VSP E1090 storage system.



The architecture was validated with 32 Gbps Fibre Channel capability.

This document assumes that you have familiarity with the following technologies:

- Cisco UCS
- General storage concepts
- Common IT storage practices
- Hitachi Virtual Storage Platform
- 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. For detailed component information, see Product descriptions (on page 25).

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 or different components.

Hardware elements

The following table lists the hardware and firmware versions validated to deploy Cisco and Hitachi Adaptive Solutions for SAP HANA TDI using Cisco UCS MDS configuration. The substitution of hardware and software versions other than those listed here is acceptable within this reference architecture, but substitutions must comply with the hardware and software compatibility matrices from Cisco, Hitachi, and SAP. For more information, see References (on page 25).

Table 1 Key Hardware Components

Hardware Component		Firmware Version
Network	Cisco Nexus 9336C-FX2 switch	Release 7.0(3) I7 (7) and 7.0(3) I7 (9)
	Cisco UCS Virtual Interface Card (VIC) 1440 (network adapter)	Release UCSB-MLOM-40G-04
	Cisco UCS 6454 Fabric Interconnect	Release 4.1(1b) and 4.2(1f)
Compute	Cisco UCS 2208XP Fabric extender I/O module (IOM)	Release 4.1(1b) and 4.2(1e)
	Cisco UCS B200 and Cisco UCS B480 M5 Blade Servers	4.2 (1a) and 4.1(1b)
	Cisco UCS VIC (Fibre Channel)	Release 5.1 (1e) and 5.0 (3a)
Fibre Channel SAN	MDS 9706	Release 8.4(1a) and 8.4(2b)
Storage	VSP E590 or VSP E790	93-03-20-40/04
	VSP E1090	93-06-21

Table 2 VSP E590 and VSP E790 Specifications

Item			Specifications
	Type		VSP E590 and VSP E790
System	SVOS Version		Hitachi Storage Virtualization Operating System RF v9.5
	Maximum Drives	NVMe SSD	24
	Drive Options	NVMe SSD	1.9 TB, 3.8 TB, 7.6 TB, 15.3 TB

Item			Specifications
	Type		VSP E590 and VSP E790
	RAID Level		RAID 10, RAID 6, RAID 5
	RAID group configuration	RAID 10	2D+2D
		RAID 5	3D+1P, 4D+1P, 6D +1P, 7D+1P
		RAID-6	6D+2P, 12D+2P, 14D +2P
	Max. number of LDEVs		32768 (VSP E590), 49152 (VSP E790)
	Max. storage capacity		0.33 PB
	Max. external configuration		128 PB (VSP E590), 192 PB (VSP E790)
Memory	Cache memory capacity		768 GB
Device I/F	Supported channel type	Fibre Channel	24
		Data transfer rate	8 Gbps, 16 Gbps, 32 Gbps
	Max. number of CHB		6
Non-stop maintenance	Control PCB		Supported
	Cache memory		Supported
	Cache flash memory		Supported
	Power supply, fan		Supported
	Microcode		Supported
	Flash drive		Supported
	Flash module drive		Supported

Table 3 VSP E590 or VSP E790 Specifications

	Storage Components
VSP E590 (NVMe SSD)	CTL: 1 pair 32 Gbps 4-port CHB

	Storage Components
	MPU: 1 pair Cache: 768 GB NVMe SSDs: 24 × 1.9 TB
VSP E790 (NVMe SSD)	CTL: 1 pair 32 Gbps 4-port CHB MPU: 1 pair Cache: 768 GB NVMe SSDs: 24 × 1.9 TB

Table 4 VSP E1090 Specifications

Item			Specifications
	Type		VSP E1090
System	SVOS Version		Hitachi Storage Virtualization Operating System RF v9.8
	Maximum Drives	NVMe SSD	96
	Drive Options	NVMe SSD	1.9 TB, 3.8 TB, 7.6 TB, 15.3 TB
	RAID Level		RAID 10, RAID 5, RAID 6
	RAID group configuration	RAID 1	2D+2D, 4D+4D
		RAID 5	3D+1P, 4D+1P, 6D +1P, 7D+1P
		RAID 6	6D+2P, 12D+2P, 14D +2P
	Max. number of LDEVs		65280
	Max. storage capacity		1.3 PB
	Max. external configuration		255 PB
Memory	Cache memory capacity		1024 GiB
Device I/F	Supported channel type	Fibre Channel	32

Item			Specifications
	Type		VSP E1090
		Data transfer rate	8 Gbps, 16 Gbps, 32 Gbps
	Max. number of CHB		8
Non-stop maintenance	Control PCB		Supported
	Cache memory		Supported
	Cache flash memory		Supported
	Power supply, fan		Supported
	Microcode		Supported
	Flash drive		Supported
	Flash module drive		Supported

Table 5 VSP E1090 Hardware elements

	Storage Components
VSP E1090 (NVMe SSD)	▪ CTL: 1 pair ▪ 32 Gbps 4-port CHB ▪ MPU: 1 pair ▪ Cache: 1024 GB ▪ NVMe SSDs: 48 × 1.9 TB

Software elements

The following tables describe the software products used to deploy this solution.

Table 6 Key Software Components for VSP E590 or VSP E790

Software		Software or Firmware Version
Operating system choices	SUSE Linux Enterprise Server for SAP applications	SLES 15 SP1 and SLES 12 SP4 ▪ ENIC: 4.0.0.6-802.21 ▪ FNIC: 2.0.0.59-133.0

Software		Software or Firmware Version
	Red Hat Enterprise Linux for SAP Solutions	RHEL 8.1 ▪ ENIC: 4.0.0.8-802.24 ▪ FNIC: 2.0.0.60-141.0
Database	SAP HANA	2.0 SPS 04

Table 7 Key Software Components for VSP E1090

Software		Software or Firmware Version
Operating system choices	SUSE Linux Enterprise Server for SAP applications	SLES 15 SP2 ▪ ENIC: 4.1.0.3-868.9 ▪ FNIC: 2.0.0.72-186.0
	Red Hat Enterprise Linux for SAP Solutions	RHEL 8.4 ▪ ENIC: 4.1.0.5-868.10 ▪ FNIC: 2.0.0.72-189.0
Database	SAP HANA	2.0 SPS 05

Operating system choices

Cisco and Hitachi Adaptive Solution for SAP HANA TDI in a direct-attached storage configuration can run on the following Linux operating systems:

- SUSE Linux Enterprise Server (SLES) for SAP Applications

  Compete more effectively though 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) for SAP HANA

  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. See the following SAP Notes for SLES and RHEL for more information:

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

Solution design

Cisco and Hitachi Adaptive Solutions for SAP HANA TDI on Cisco UCS with VSP E590, VSP E790, or VSP E1090 in an MDS configuration uses the following design components:

Cisco UCS 5108 Blade Server Chassis with Cisco UCS 2208XP Fabric Extender (on page 10)

- Cisco UCS B200 M6 Blade Server (on page 11)
- Cisco UCS B200 M5 Blade Server (on page 11)
- Cisco UCS B480 M5 Blade Server (on page 12)
- Network architecture configuration (on page 12)
- Storage configuration (on page 13)
- SAP HANA configuration (on page 23)

Cisco UCS 5108 Blade Server Chassis with Cisco UCS 2208XP Fabric Extender

The 6RU Cisco UCS 5108 Blade Server Chassis can accommodate up to eight half-width, four full-width, or any combination of blade form factors (M1 to M6 generation) that fit in the available number of blade slots.

Each Cisco UCS B200 M6 Blade Server in this topology is hosted on a Cisco UCS 5108 Blade Server Chassis, and they connect to the fabric interconnects from the chassis using Cisco UCS 2208XP Fabric Extender IOMs.

Each Cisco UCS B200 M5 Blade Server in this topology is hosted in a Cisco UCS 5108 Blade Server Chassis, connected to the fabric interconnects from the chassis using Cisco UCS 2208XP Fabric Extender IOMs.

Each Cisco 2208XP Fabric Extender IOM supports 10 Gbps connections into the 10/25 Gbps ports of each Cisco UCS 6454 Fabric Interconnect, delivering high port availability.

Cisco UCS B200 M6 Blade Server

The enterprise-class Cisco UCS B200 M6 Blade Server extends the capabilities of the Cisco UCS portfolio in a half-width blade form factor. The B200 M6 server harnesses the power of the latest Intel Xeon Scalable processors, with the following:

- Up to 4 TB of RAM per CPU (using 16 × 256 GB DRAMs) or up to 6 TB per CPU using 8 × 256 GB DRAMs and 8 × 512 GB Intel Optane Persistent Memory Modules (PMEMs)
- Two solid-state drives (SSDs), or PCIE NVMe drives
- Mini storage carrier with M.2 SATA drives
- Up to 80 Gbps throughput connectivity

The following figure shows the Cisco UCS B200 M6 Blade Server:

Cisco UCS B200 M5 Blade Server

The enterprise-class Cisco UCS B200 M5 Blade Server extends the capabilities of the Cisco UCS portfolio in a half-width blade form factor. The B200 M5 server harnesses the power of the Intel Xeon Scalable processors, with the following:

- Up to 3072 GB of RAM using 128-GB DIMMs
- Two SSDs or HDDs
- Up to 80 Gbps throughput connectivity

The following figure shows the Cisco UCS B200 M5 Blade Server:

Cisco UCS B480 M5 Blade Server

The Cisco UCS B480 M5 Blade Server combines a large memory footprint with four-socket scalability, using Intel Xeon Scalable processors. The B480 M5 uses Cisco UCS VIC technology to achieve up to 160 Gbps of aggregate I/O bandwidth in a dense, full-width blade form factor.

The B480 M5 maintains memory performance, even as capacity grows, and can support up to 6 TB of memory without compromising CPU speed or core count.

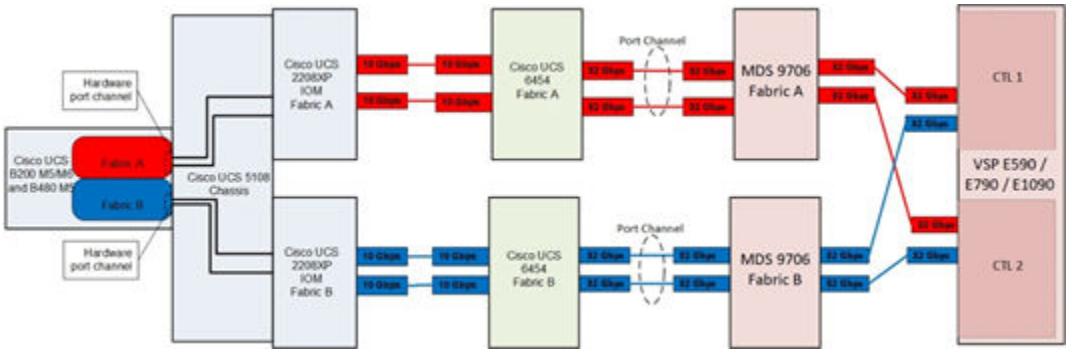
Up to four Cisco UCS B480 M5 Blade Servers can be installed in the Cisco UCS 5108 Blade Server Chassis.

The following figure shows the Cisco UCS B480 M5 Blade Server:

Network architecture configuration

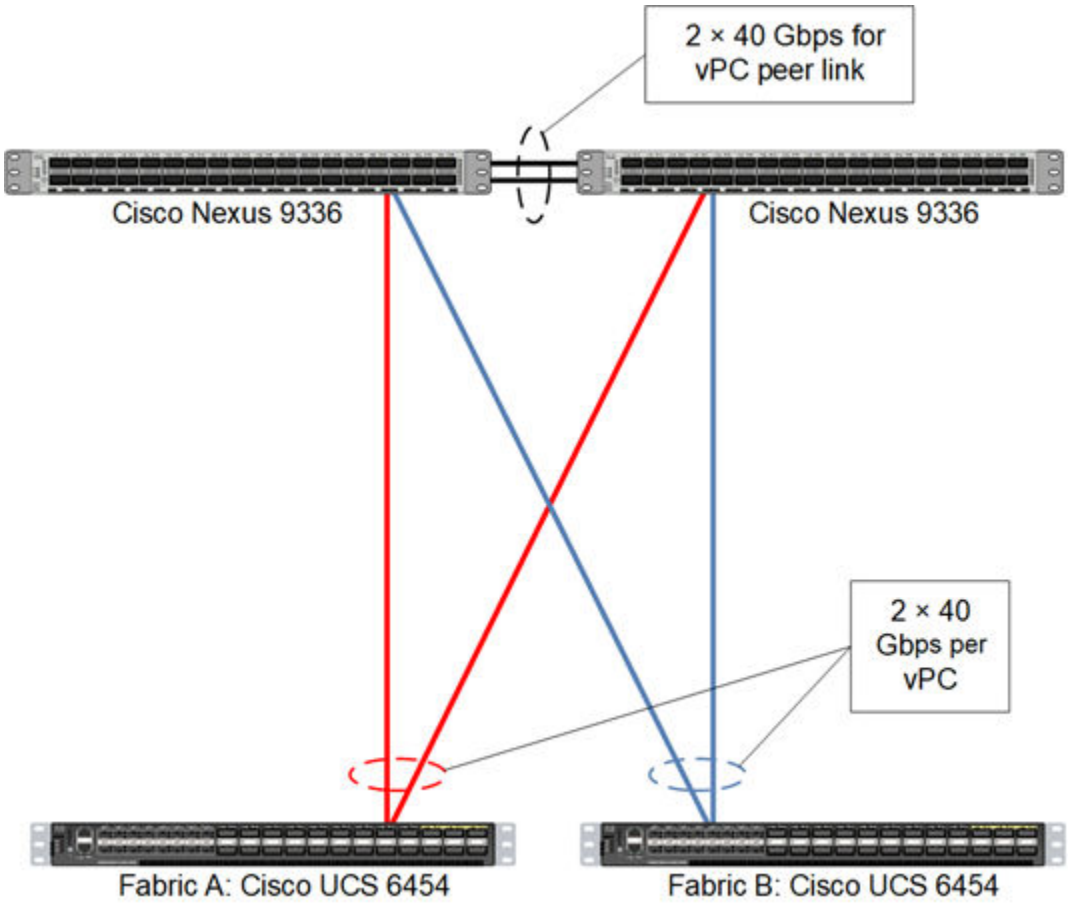
The Cisco UCS B200 Blade Server M5, B200 Blade Server M6, and Cisco B480 M5 Blade Server used in this topology are hosted within a Cisco UCS 5108 Blade Server Chassis. They connect into the fabric interconnects from the chassis using Cisco UCS 2208XP Fabric Extender IOMs. The 2208XP IOM supports 10 Gbps connections to the 10/25 Gbps ports of the Cisco UCS 6454 Fabric Interconnects, delivering high port availability.

The following figure shows the network topology from the UCS Blade Servers to the VSP E590, VSP E790, or VSP E1090 through the 2208XP IOMs.



The application gateways are hosted by the pair of Cisco Nexus 9336 switches, but primary routing is passed onto an existing router that is upstream of the converged infrastructure for the SAP HANA environment.

The following figure shows the upstream network for the application gateway.



For the SAP HANA nodes, you must make network connections to the Cisco Nexus 9336 switches or to any other external switches. Bond the corresponding two ports, ethX and ethY, as bond0 at the operating system level using the active-active network bond mode with the following options:

```
mode=802.3ad miimon=100 xmit_hash_policy=2 lacp_rate=fast mtu=9000
```

This network acts as the client network for the SAP HANA node.

Storage configuration

Note: Each implementation of this reference architecture can use a different storage architecture. Validation for this environment used VSP E590, VSP E790, or VSP E1090 as external storage.

You need the following storage components to implement a scale-up SAP HANA system with Cisco UCS B200 Blade Servers or Cisco B480 M5 Blade Servers in a Cisco UCS 5108 Blade Server Chassis using VSP E590, VSP E790, or VSP E1090 using NVMe SSDs:

Cisco VIC FCoE host bus adapter (HBA)

Storage, such as VSP E590, VSP E790, or VSP E1090 with NVMe SSD

Storage drive box trays (DBS drive boxes)

Spare drives

Use the port properties listed in the following table.

Table 8 Port Properties for Virtual Storage Platform E590/VSP E1090

For this setting	Use this value
Port Security	Enabled
Port Speed	32 Gbps
Fabric	OFF
Connection Type	P-to-P

The SAP HANA node needs the following storage layout:

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

This reference architecture 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 the following tables for the storage layout.

Table 9 Dynamic Provisioning Pools for VSP 590\VSP 790

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 5 (6D+1P), 1.9 TB SSD drives
Log_Pool	Log LUN	RAID 5 (6D+1P), 1.9 TB SSD drives

Table 10 Dynamic Provisioning Pools for VSP E1090

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 (6D+2P), 1.9 TB SSD drives
Log_Pool	Log LUN	RAID 6 (6D+2P), 1.9 TB SSD drives

The example layout uses the dynamic provisioning pool layout on the VSP E590, VSP E790, or VSP E1090 used for validation for a SAP HANA TDI solution with 512 GB, 768 GB, 1 TB, and a 1.5 TB scale-up system.

Table 11 Dynamic Provisioning Pool for a SAP HANA TDI Solution for VSP 590\VSP 790

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 5 (6D +1P), 1.9 TB SSD Drives	00:00:01	OS_SH_DA_Pool_1	2640	MPU-10
			00:00:02	OS_SH_DA_Pool_2	2640	MPU-20
			00:00:03	OS_SH_DA_Pool_3	2640	MPU-10
			00:00:04	OS_SH_DA_Pool_4	2640	MPU-20
Log_Pool	2	RAID 5 (6D +1P), 1.9 TB SSD Drives	00:01:01	Log_Pool_1	2640	MPU-10
			00:01:02	Log_Pool_2	2640	MPU-20
			00:01:03	Log_Pool_3	2640	MPU-10
			00:01:04	Log_Pool_4	2640	MPU-20

Table 12 Dynamic Provisioning Pool for a SAP HANA TDI Solution for VSP E1090

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 (6D +2P), 1.9 TB SSD Drives	00:00:01	OS_SH_DA_Pool_1	1536	MPU-10
			00:00:02	OS_SH_DA_Pool_2	1536	MPU-20
			00:00:03	OS_SH_DA_Pool_3	1536	MPU-10
			00:00:04	OS_SH_DA_Pool_4	1536	MPU-20
Log_Pool	2	RAID 6 (6D +2P), 1.9 TB SSD Drives	00:01:01	Log_Pool_1	878	MPU-10
			00:01:02	Log_Pool_2	878	MPU-20
			00:01:03	Log_Pool_3	878	MPU-10
			00:01:04	Log_Pool_4	878	MPU-20

Provision the virtual volumes for the operating system, SAP HANA shared, data, and log volumes.

While mapping the LUN path assignment for each node, add volumes in the following order:

1. The operating system volume
2. The SAP HANA shared volume
3. The log volume
4. The data volume

The following tables lists the settings used during validation for a SAP HANA TDI solution with 512 GB, 768 GB, 1 TB, and 1.5 TB scale-up systems.

Table 13 Virtual Volumes for the SAP HANA Nodes for 768 GB and 1.5 TB Memory Sizes

Dynamic Provisioning Pool	Virtual Volume ID	Virtual Volume Name	Virtual Volume Size	MPU Assignment	System Memory
OS_SH_Data_Pool	00:02:00	HANA_OS	100 GB	MPU-10	768 GB
	00:03:00	HANA_OS	100 GB	MPU-20	1536 GB
	00:02:01	HANA_SH	768 GB	MPU-10	768 GB
	00:03:01	HANA_SH	1536 GB	MPU-20	1536 GB
Log_Pool	00:02:02	HANA_LOG_1	96 GB	MPU-10	768 GB
	00:02:03	HANA_LOG_2	96 GB	MPU-20	
	00:02:04	HANA_LOG_3	96 GB	MPU-10	
	00:02:05	HANA_LOG_4	96 GB	MPU-20	
Log_Pool	00:03:02	HANA_LOG_1	192 GB	MPU-10	1536 GB
	00:03:03	HANA_LOG_2	192 GB	MPU-20	
	00:03:04	HANA_LOG_3	192 GB	MPU-10	
	00:03:05	HANA_LOG_4	192 GB	MPU-20	
OS_SH_Data_Pool	00:02:06	HANA_DATA_1	192 GB	MPU-10	768 GB
	00:02:07	HANA_DATA_2	192 GB	MPU-20	
	00:02:08	HANA_DATA_3	192 GB	MPU-10	
	00:02:09	HANA_DATA_4	192 GB	MPU-20	
OS_SH_Data_Pool	00:03:06	HANA_DATA_1	384 GB	MPU-10	1536 GB
	00:03:07	HANA_DATA_2	384 GB	MPU-20	
	00:03:08	HANA_DATA_3	384 GB	MPU-10	
	00:03:09	HANA_DATA_4	384 GB	MPU-20	

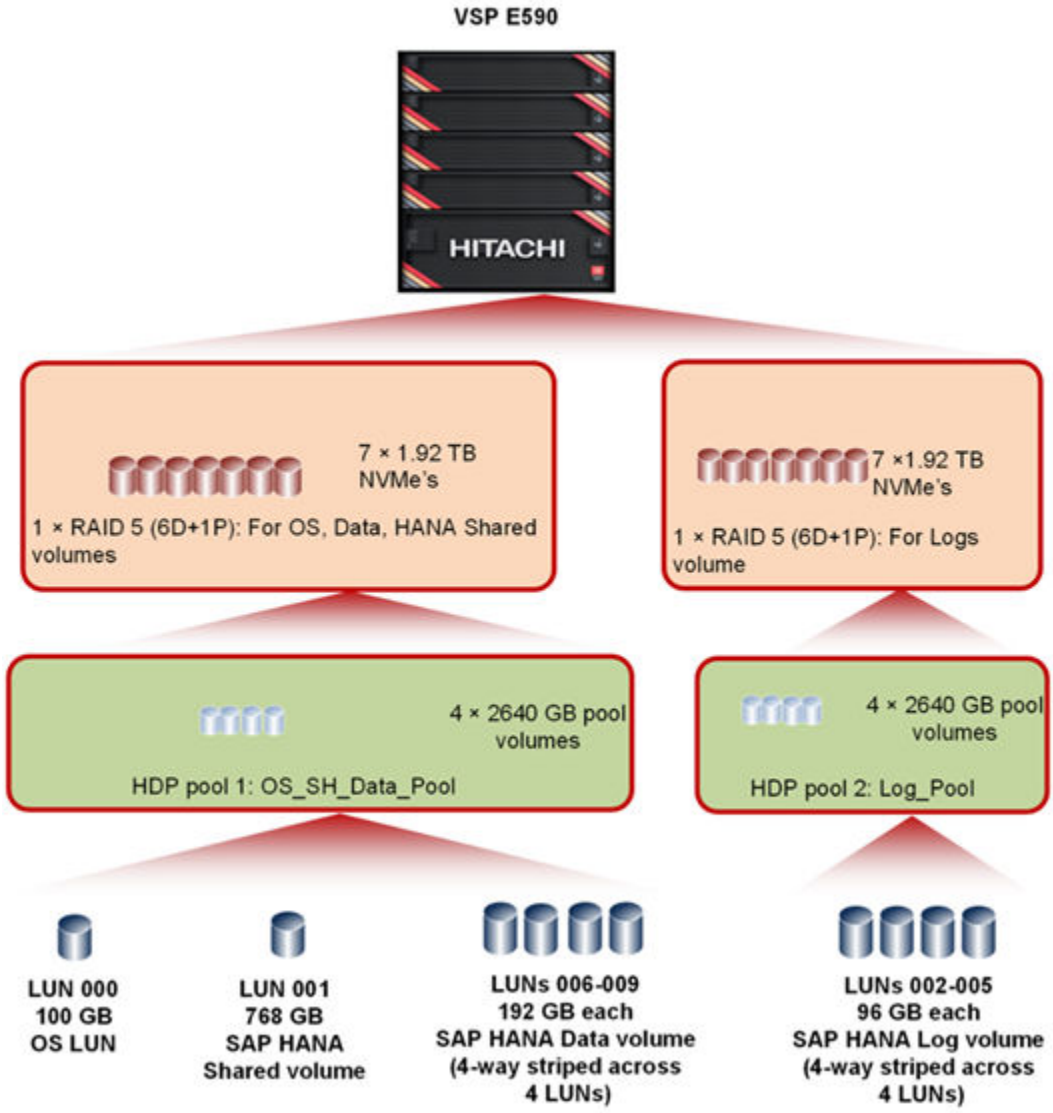
Table 14 Virtual Volumes for the SAP HANA Nodes for 512 GB and 1 TB Memory Sizes

Dynamic Provisioning Pool	Virtual Volume ID	Virtual Volume Name	Virtual Volume Size	MPU Assignment	System Memory
OS_SH_Data_Pool	00:02:00	HANA_OS	100 GB	MPU-10	512 GB

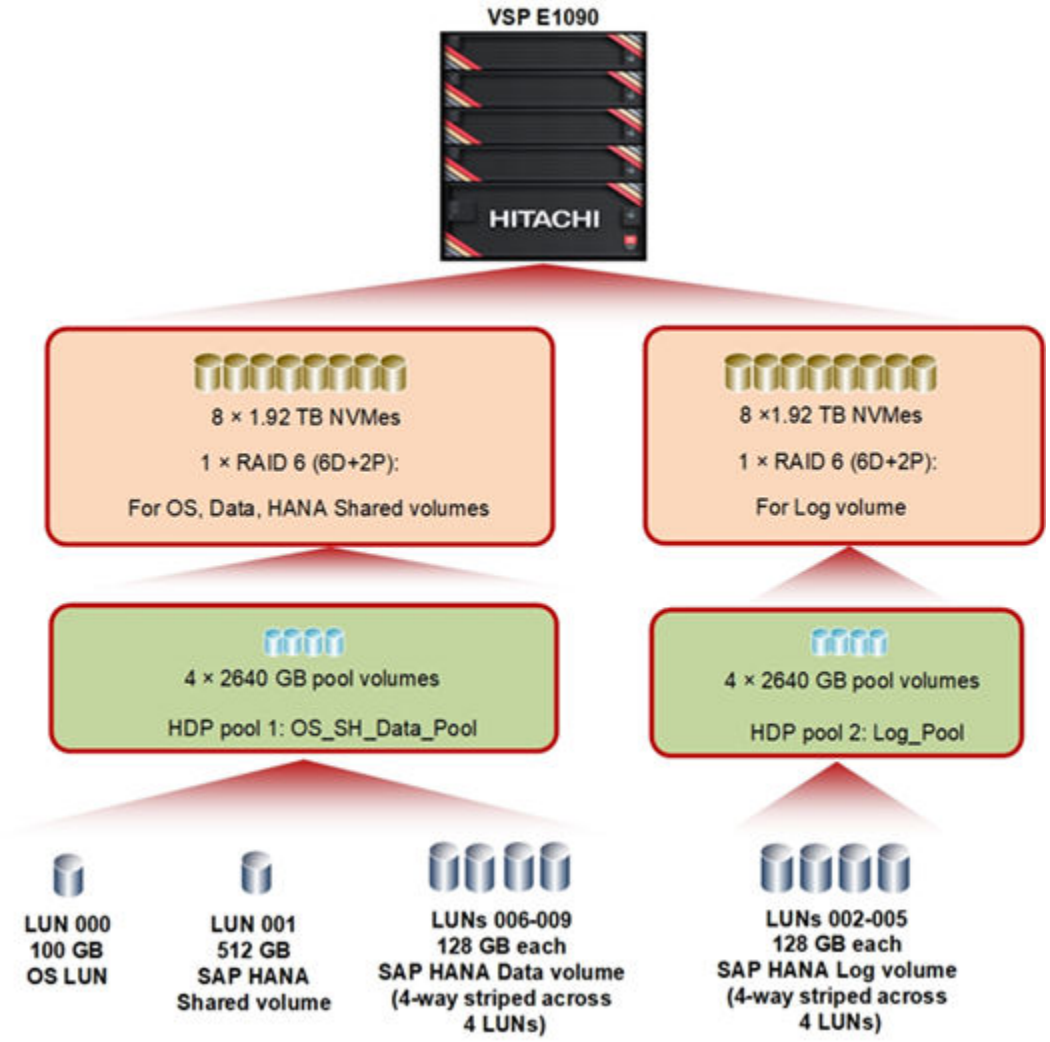
Dynamic Provisioning Pool	Virtual Volume ID	Virtual Volume Name	Virtual Volume Size	MPU Assignment	System Memory
	00:03:00	HANA_OS	100 GB	MPU-20	1024 GB
	00:02:01	HANA_SH	512 GB	MPU-10	512 GB
	00:03:01	HANA_SH	1024 GB	MPU-20	1024 GB
Log_Pool	00:02:02	HANA_LOG_1	128 GB	MPU-10	512 GB
	00:02:03	HANA_LOG_2	128 GB	MPU-20	
	00:02:04	HANA_LOG_3	128 GB	MPU-10	
	00:02:05	HANA_LOG_4	128 GB	MPU-20	
Log_Pool	00:03:02	HANA_LOG_1	128 GB	MPU-10	1024 GB
	00:03:03	HANA_LOG_2	128 GB	MPU-20	
	00:03:04	HANA_LOG_3	128 GB	MPU-10	
	00:03:05	HANA_LOG_4	128 GB	MPU-20	
OS_SH_Data_Pool	00:02:06	HANA_DATA_1	128 GB	MPU-10	512 GB
	00:02:07	HANA_DATA_2	128 GB	MPU-20	
	00:02:08	HANA_DATA_3	128 GB	MPU-10	
	00:02:09	HANA_DATA_4	128 GB	MPU-20	
OS_SH_Data_Pool	00:03:06	HANA_DATA_1	256 GB	MPU-10	1024 GB
	00:03:07	HANA_DATA_2	256 GB	MPU-20	
	00:03:08	HANA_DATA_3	256 GB	MPU-10	

Dynamic Provisioning Pool	Virtual Volume ID	Virtual Volume Name	Virtual Volume Size	MPU Assignment	System Memory
	00:03:09	HANA_DATA_4	256 GB	MPU-20	

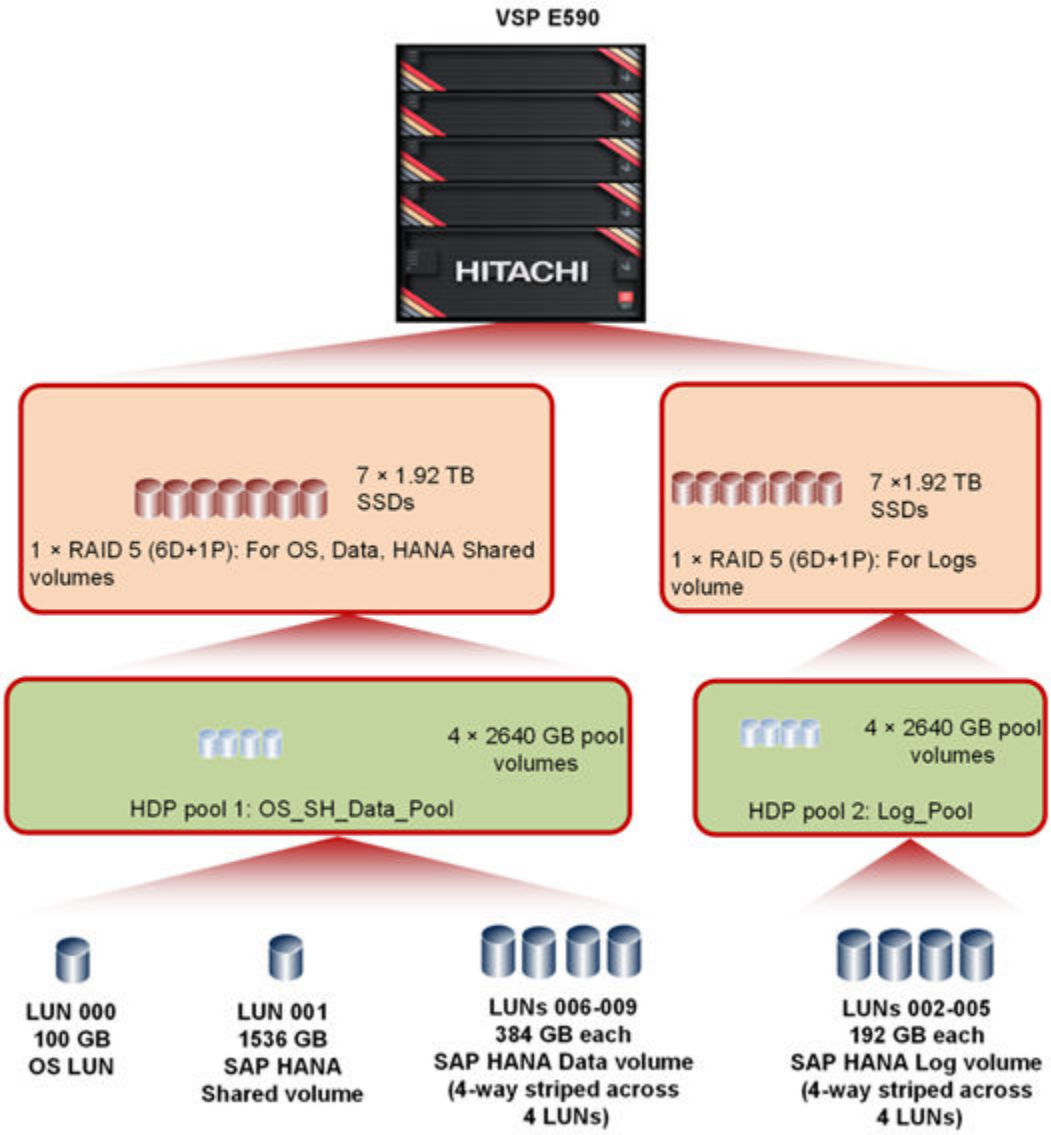
The following figure shows the VSP E590 storage layout for a SAP HANA system with 768 GB memory size used for validation.



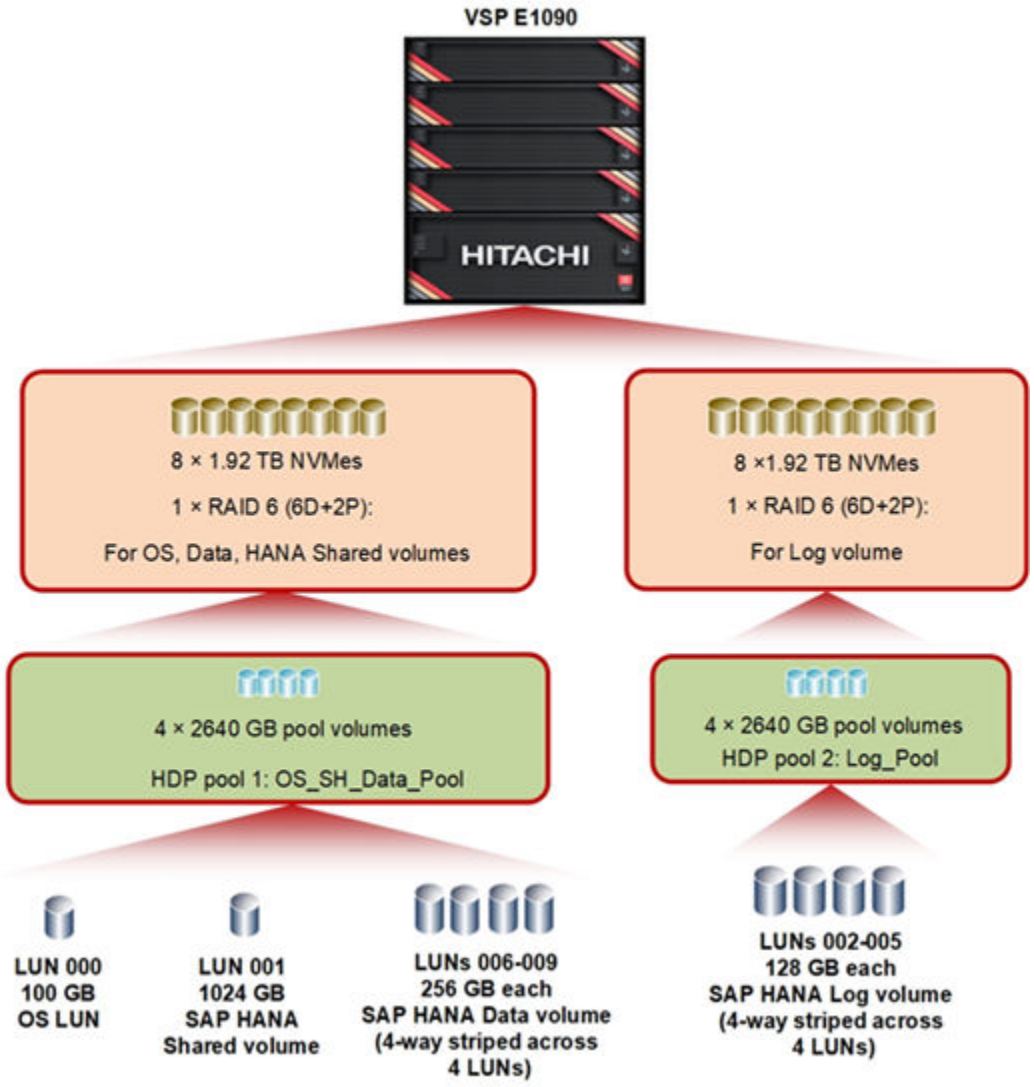
The following figure shows the VSP E1090 storage layout for a SAP HANA system with 512 GB memory size used for validation.



The following figure shows the VSP E590 storage layout for a SAP HANA system with 1.5 TB memory size used for validation.



The following figure shows the VSP E1090 storage layout for a SAP HANA system with 1 TB memory size used for validation.



The following table lists the LUN path assignments used when validating this environment.

Table 15 LUN Path Assignments

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

LUN ID	LDEV ID	LDEV Name
0007	00:02:07	HANA_DATA_2
0008	00:02:08	HANA_DATA_3
0009	00:02:09	HANA_DATA_4

SAP HANA configuration

See the official SAP documentation which describes the installation process, the SAP HANA Server Installation Guide. View all SAP installation and administration documentation.

Install the following SAP HANA software components on the server:

- Database
- Client

Engineering validation

The test methodology for validating this SAP HANA TDI solution using a Cisco UCS 5108 Blade Server Chassis, Cisco B200 M6 Blade Servers, Cisco B200 M5 Blade Servers, and Cisco B480 M5 Blade Servers in an enterprise storage configuration with VSP E590, VSP E790, or VSP E1090 used the following:

SAP HANA Hardware and Cloud Measurement Tools HCMT-052_0 was tested on these volumes for SLES 15 SP1 and RHEL 8.1:

- Data volume

Log volume For optimal use of SAP HANA database, use the parameters listed in the following *global.ini* file. Use SAP Note 2399079 to define the parameters in the global.ini file for SAP HANA 2.0:

```
[communication]
tcp_backlog = 2048

[fileio]
max_parallel_io_requests[data] = 128
max_submit_batch_size[data] = 64
size_kernel_io_queue[data] = 512
async_read_submit[data] = on
async_write_submit_blocks[data] = all
min_submit_batch_size[data] = 16
async_write_submit_active[data] = auto
max_parallel_io_requests[log] = 128
max_submit_batch_size[log] = 64
size_kernel_io_queue[log] = 512
async_read_submit[log] = on
async_write_submit_blocks[log] = all
```

```
min_submit_batch_size[log] = 16
async_write_submit_active[log] = auto

[multidb]
mode = multidb
database_isolation = low
singletenant = yes

[persistence]
basepath_datavolumes = /hana/data/HIT
basepath_logvolumes = /hana/log/HIT
```

SAP HANA Hardware and Cloud Measurement Tools HCMT-060_0 was tested on these volumes for SLES 15 SP2 and RHEL 8.4:

- Data volume
- Log volume

For optimal use of SAP HANA database, use the parameters listed in the following *global.ini* file. Use SAP Note 2399079 to define the parameters in the global.ini file for SAP HANA 2.0 SPS 05:

```
[communication]
tcp_backlog = 2048

[fileio]
async_read_submit[log] = on
async_write_submit_active[log] = auto
async_write_submit_blocks[log] = all
min_submit_batch_size[log] = 16
max_submit_batch_size[log] = 64
max_parallel_io_requests[log] = 64
size_kernel_io_queue[log] = 512
async_read_submit[data] = on
async_write_submit_active[data] = auto
async_write_submit_blocks[data] = all
min_submit_batch_size[data] = 16
max_submit_batch_size[data] = 64
max_parallel_io_requests[data] = 64
size_kernel_io_queue[data] = 512

[multidb]
mode = multidb
database_isolation = low
singletenant = yes

[persistence]
basepath_datavolumes = /hana/data/HIT
basepath_logvolumes = /hana/log/HIT
```

References

Use these references when designing your system.

- UCS Hardware and Software Compatibility from Cisco Systems
- Release Notes from Cisco Systems
- Recommended Cisco NX-OS Releases for Cisco Nexus 9000 Series Switches
- Hitachi Interoperability Reports
- Hitachi Virtual Storage Platform E series family (VSP E590, VSP E790, VSP E990, and E1090)

Product descriptions

The following information describes the hardware and software components used in this reference architecture.

Cisco Unified Computing System

The Cisco Unified Computing System is a next-generation data center platform that unites compute, network, storage access, and virtualization into a cohesive system designed to reduce total cost of ownership (TCO) and increase business agility. Managed as a single system, whether it has one server or hundreds of servers with thousands of virtual machines, the Cisco Unified Computing System decouples scale from complexity. The Cisco Unified Computing System accelerates the delivery of new services simply, reliably, and securely through end-to-end provisioning and migration support for both virtualized and nonvirtualized systems.

Hitachi Virtual Storage Platform E series family

The Hitachi Virtual Storage Platform E series family provides agile and automated storage built upon the innovative technologies found in our high-end enterprise systems. The expansion of the VSP E series portfolio includes 2 new all-NVMe flash models that deliver super charged, ultra-low latency performance for the business-critical applications that small and midsized businesses rely on.

- Improve IT agility: “Faster-to-market” for IT projects with proven high-performance infrastructure. Brings “enterprise-class” features and benefits to customers of all sizes whose business is outpacing their existing infrastructure and supports modern business processes like DevOPs.
- Financial elasticity that aligns costs to business goals, growth, and use: Customers can “have it their way” with purchase, lease, or cloud-like consumption models.
- Improved workforce efficiency: a better digital experience which boosts customer satisfaction (with both internal LOBs and end-users) and increases business productivity and profitability.

Hitachi Storage Virtualization Operating System RF

Hitachi Storage Virtualization Operating System RF powers the Hitachi Virtual Storage Platform (VSP) family. 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.

Flash performance is optimized with a patented flash-aware I/O stack, which accelerates data access. Adaptive inline data reduction increases storage efficiency while enabling a balance of data efficiency and application performance. Industry-leading storage virtualization allows SVOS RF to use third-party all-flash and hybrid arrays as storage capacity, consolidating resources for a higher ROI and providing a high-speed front end to slower, less-predictable arrays.

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 Vantara. For more information, see https://www.sap.com/products/hana.html.

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, including the following:

- 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.

- SAP HANA Administration Guide

  This provides the central operations documentation for the on-premises deployment of the SAP HANA Platform.

SAP HANA hardware directory provides information about SAP HANA appliances certified by SAP hardware partners.

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