

Hitachi Integrated Systems Solution for the SAP HANA Appliance in a Scale-up Configuration using Hitachi Advanced Server DS220 G6 and VSP One Block Storage

Reference Architecture Guide

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Revision history

Changes	Date
▪ Initial release	November 2025

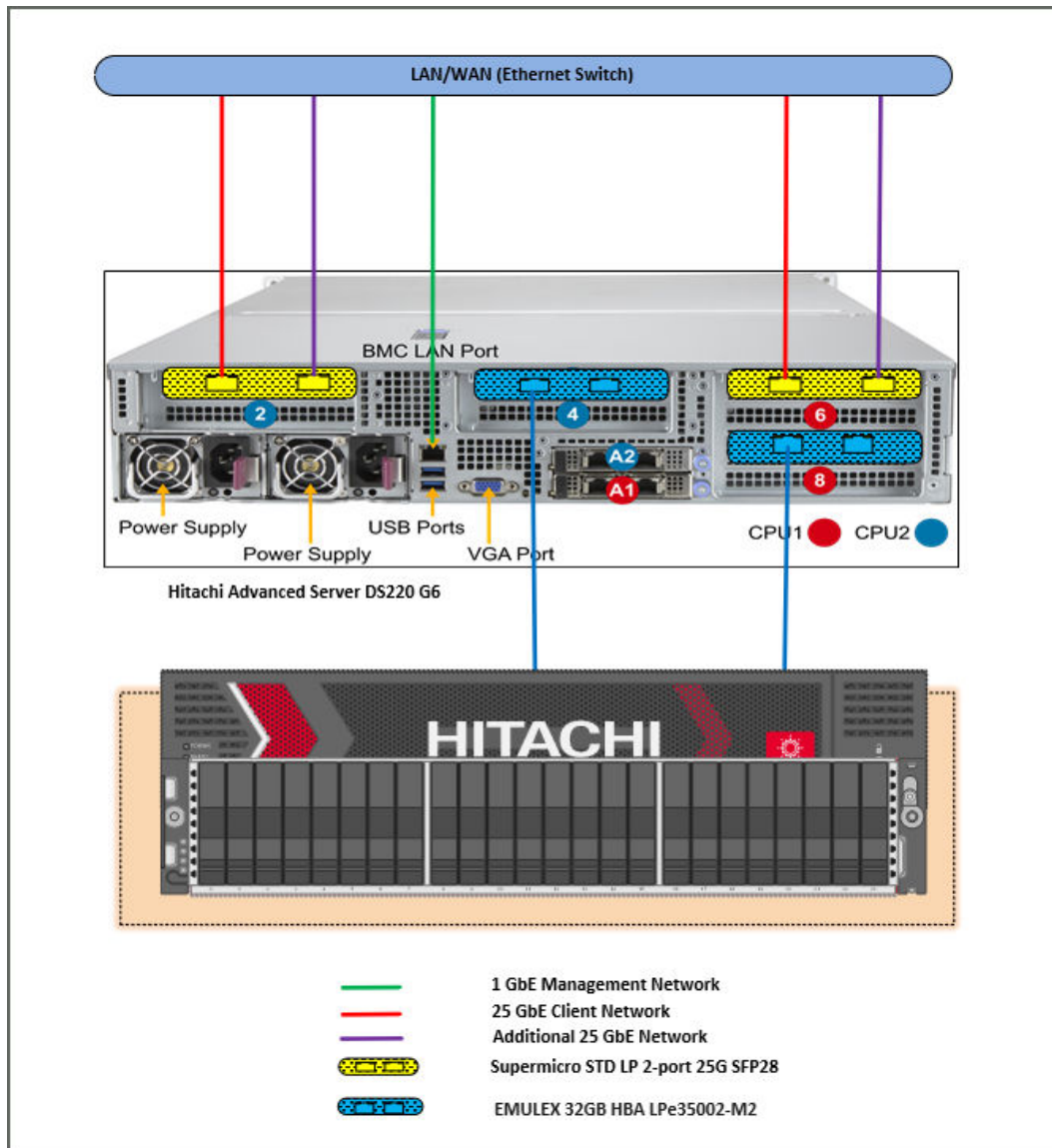
Reference Architecture Guide

Use this reference architecture guide to implement a pre-configured, validated, high-performance scale-up Hitachi Integrated Systems solution for SAP HANA ensuring faster deployment, simplified operations, and enterprise-grade reliability. This solution uses Hitachi Advanced Server DS220 G6 with Intel 6th Gen Xeon Scalable Processors and Hitachi Virtual Storage Platform One Block (VSP One Block) storage for SAP HANA scale-up appliance deployments.

The validation of this environment was done for the following configuration:

- VSP One Block 24
- Hitachi Advanced Server DS220 G6

The following figure shows the network and storage topology of this scale-up solution on Hitachi Advanced Server DS220 G6 Server and VSP One Block storage.



This technical paper assumes that you are familiar with the following:

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

Key solution elements

The following are the key hardware and software components used in this reference architecture. For detailed component information, see [Product Descriptions \(on page 15\)](#).



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

Hardware elements

The following table lists the hardware used to deploy the specific scale-up configuration of this solution for the different sized solutions.

Hardware	Quantity	Configuration	Role
Hitachi Advanced Server DS220 G6	1	CPU – 2 Intel Granite Rapids Intel® Xeon® 6787P Processor 86C (336M Cache- 2.00 GHz) 2 heat sinks CPU 0/1 RAM per SAP HANA node, see the <i>Supported memory configuration</i> table. KVM connector (VGA, USB 3.0 2-port)	SAP HANA server
PCIe Network cards	2	STD LP 2-port 25G SFP28 (Mellanox Connect X-4L) Network Adapter Ports: 4 × SFP28	For the SAP HANA 10/25 GbE client network and additional 10/25 GbE network
	2	3M 25G SFP28 Direct Attach Copper Cable	
VSP One Block 24	1	CTL: 1 pair 32/64 Gbps 4-port CHB: 3 pairs MPU: 1 pair Cache: 256 GB NVMe SSDs: 24 × 1.92 TB	Block storage
HBA card	2	Emulex LPe35000/LPe36000 Series 32 Gb/64 Gb	Connectivity to the storage subsystem
Cisco MDS 9220i (optional)	1	48 × 1 GbE ports	Optional switch for the management network
Cisco Nexus 93180YC- FX3 switch (optional)	2	48 × 25 GbE ports	Optional switches for a client network or additional backup network

Hardware	Quantity	Configuration	Role
Hitachi Universal V3 Rack	1	1 standard rack	Optional rack for mounting server/ storage/switches
PDUs	2	Vertical PDUs	Optional PDUs for the solution

Software elements


The following table describes the software products used to deploy this solution.

Purpose	Software
Operating system	SUSE Linux Enterprise Server for SAP Applications
	Red Hat Enterprise Linux Server for SAP Solutions
Database	SAP HANA 2.0 SPS08 Rev 83 or later

Supported memory configuration

Hitachi Advanced Server DS220 G6 scale-up appliance supports the T-shirt size configurations as listed in the following table.

Total RAM per HANA node	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	6144 GB	8192 GB
DDR5 R-DIMM 32 GB memory (1DPC 6400 MT/s)	16	32	—	—	—	—	—	—
DDR5 R-DIMM 64 GB memory (1DPC 6400 MT/s)	—	16	—	32	—	—	—	—
DDR5 R-DIMM 96 GB memory (1DPC 6400 MT/s)	—	—	16	—	32	—	—	—

Total RAM per HANA node	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	6144 GB	8192 GB
DDR5 R-DIMM 128 GB memory (1DPC 6400 MT/s)	—	—	—	16	—	32	—	—
DDR5 R-DIMM 192 GB memory (1DPC 6400 MT/s)	—	—	—	—	16	—	32	—
DDR5 R-DIMM 256 GB memory (1DPC 6400 MT/s)	—	—	—	—	—	16	—	32
DIMM per Channel (DPC)	1DPC 16 GB	2DPC 32 GB	1DPC 96 GB	2DPC 64GB	2DPC 96 GB	2DPC 128 GB	2DPC of 192 GB	2DPC 256 GB
	—	or 1DPC 64 GB	—	or 1DPC 128 GB	or 1DPC 192 GB	or 1DPC 256 GB	—	—
 Note: <ul style="list-style-type: none"> ▪ Mixed DIMM sizes are not supported. ▪ 192G and 256G DIMMs are supported by Hitachi but they are considered as special order. 								

Solution design

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

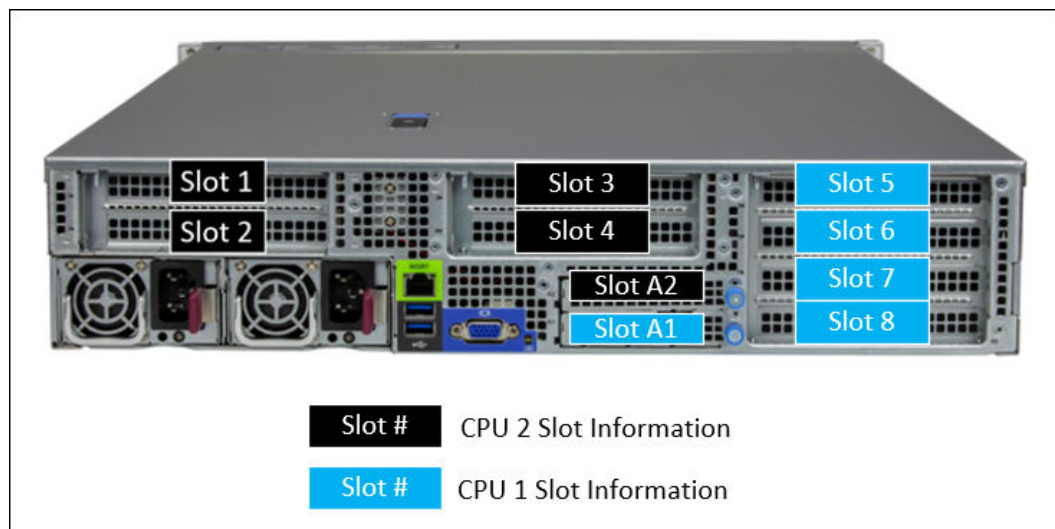
- [Hitachi Advanced Server DS220 G6 configuration \(on page 9\)](#)
- [Network architecture configuration \(on page 10\)](#)
- [Storage architecture configuration \(on page 10\)](#)
- [SAP HANA configuration \(on page 13\)](#)

Hitachi Advanced Server DS220 G6 configuration

This solution uses a single Hitachi Advanced Server DS220 G6 with the following components:

- For scale-up appliance models using VSP One Block 24 storage:
 - 2 × STD LP 2-port 25G SFP28 (Mellanox ConnectX-4 L) Network Adapters
 - 2 × Emulex 32 GB HBA LPe35002-M2 HBAs
- 2 × Intel Xeon 6787P Processor 86C (336M Cache- 2.00 GHz)
- 16 × memory DIMMs per CPU / 32 × DIMMs per 2S server
- 1 × 1 GbE Management port for BMC

The following figure shows the rear view of Hitachi Advanced Server DS220 G6.



Network architecture configuration

Make the following 25 GbE network connections for SAP HANA nodes (see the following table):

- Connect the following to Cisco Nexus 93180YC-FX3 switches or to any other external switches:
 - Port 0 of slot 1 and Port 0 of slot 5 of STD LP 2-port 25G SFP28 (using Mellanox Connect X-4L Network PCIe cards) to two different Cisco Nexus 93180YC-FX3 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=2 updelay=5000 lacp_rate=fast`. This acts as the client network for the SAP HANA node.
- If additional 25 GbE network connections are required, connect Port 1 of both STD LP 2-port 25G SFP28 (Mellanox Connect X-4L) Network PCIe cards to the Cisco Nexus 93180YC-FX3 switches or to any other external switches.
- Configure the external switch ports with a short LACP timeout value to detect corrupted connections quickly.

The following table provides network setup details. See [Hitachi Advanced Server DS220 G6 configuration \(on page 9\)](#) for port details.

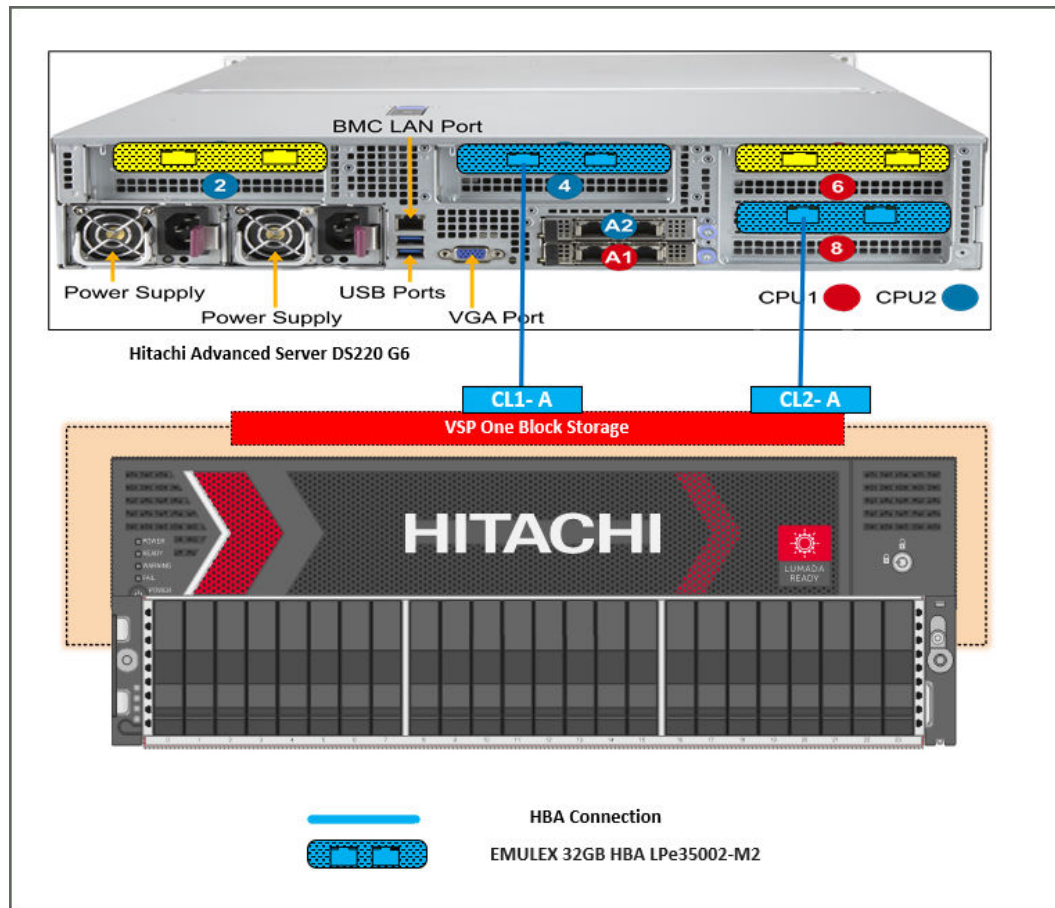
Network Card	Port	Network Description
PCIe Slot_1	0	Client network for the SAP HANA node (eth9902)
	1	Free for use as an additional 10/25 GbE network for backup, SAP HANA system replication, or other purposes
PCIe Slot_5	0	Client network for the SAP HANA node (eth9901)
	1	Free for use as an additional 10/25 GbE network for backup, SAP HANA system replication, or other purposes



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

Storage architecture configuration

The following illustration shows the storage configuration for this environment.



The following storage components are needed to implement a scale-up SAP HANA system with Hitachi Advanced Server DS220 G6 with VSP One Block 24 storage:

- 2 × Emulex LPE35002-M32 32 Gb 2p Fibre Channel PCIe HBA cards
 - Port 0 of LPE35002-M32 32 Gb 2p Fibre Channel PCIe HBA on Slot3
 - Port 0 of LPE35002-M32 32 Gb 2p Fibre Channel PCIe HBA on Slot7
- 1 Hitachi Virtual Storage Platform One Block 24 storage with storage drive box trays (DBS/DBN2). The volume ID must be 0 for boot devices.

The SAP HANA node must have the following storage layout:

- Operating system volume (OS)
- SAP HANA shared volume (/hana/shared) for HANA binaries and other configuration and trace files
- SAP HANA log volume (/hana/log)
- SAP HANA data volume (/hana/data)

This solution uses a dynamic drive protection pool (DDP Pool) design and capacity saving by using a deduplication and compression method for the storage layout.

- One pool is used to provide storage and throughput for VSP One Block 24 supported storage sizes.
- Pool0 is used to create virtual volumes (volumes for OS, Data, Shared and Log) binaries.
- Enable capacity saving to leverage the benefits storage space savings across pool of virtual capacity.

The following table shows the storage configuration for different memory sizes of Hitachi Advanced Server DS220 G6.

	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	6144 GB	8192 GB
DDP Pool	RAID6 - 9 NVMe SSD × 1.92 TB				RAID6 - 12 NVMe SSD × 1.92 TB	RAID6 - 13 NVMe SSD × 1.92 TB	RAID6 - 20 NVMe SSD × 1.92 TB	RAID6 - 24 NVMe SSD × 1.92 TB
Pool0	10.11 TB Pool				13.91 TB	17.71 TB	28.03 TB	33.94 TB
LDEV	9 × 1.29 TB				12 × 1.29 TB	15 × 1.29 TB	20 × 1.50 TB	24 × 1.50 TB
OS Volume	OS:(100 GB)							
Shared Volume 1 TB or 1 ×RAM, whichever is larger	/hana/shared 1024 GB		/hana/shared 1 × memory (GB)					
Data Volume	/hana/ data	/hana/ data	/hana/ data	/hana/ data	/hana/ data	/hana/ data	/hana/ data	/hana/ data
3 ×RAM	4 × 384 GB	4 × 768 GB	4 × 1152 GB	4 × 1536 GB	4 × 2304 GB	4 × 3072 GB	4 × 4608 GB	4 × 6144 GB
	1536 GB	3072 GB	4608 GB	6144 GB	9216 GB	12288 GB	18432 GB	24576 GB
Log Volume	/hana/log 4 × 150 GB 600 GB							

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

ID	Volume ID	Volume Name
0	0 (0x0010)	HANA_OS
1	1 (0x0001)	HANA_SH
2	2 (0x0002)	HANA_LOG_1
3	3 (0x0003)	HANA_LOG_2
4	4 (0x0004)	HANA_LOG_3
5	5 (0x0005)	HANA_LOG_4
6	6 (0x0006)	HANA_DATA_1
7	7 (0x0007)	HANA_DATA_2
8	8 (0x0008)	HANA_DATA_3
9	9 (0x0009)	HANA_DATA_4

SAP HANA configuration

This section describes how to configure SAP HANA for this solution.

File system

These volumes use the following file systems for implementation of this solution with a storage system:

- Operating system volume: BTRFS Filesystem (only for SLES)/XFS Filesystem
- SAP HANA Shared volume
- Data volume
- Log volume

SAP HANA software installation

After you configure the file systems for the SAP HANA data volume and log volume, install the latest SAP HANA 2.0 SPS08 or higher on the server.

Install the following SAP HANA software components on the server:

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

Engineering validation

The test methodology for validating the scale up configuration using Hitachi Advanced Server DS220 G6 and with Hitachi Virtual Storage Platform One Block 24 used the following.

For this solution, SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-086_0 was tested on the following volumes for SUSE Linux Enterprise Server 15 SP7:

- Data volume
- Log volume
- Shared volume

For this solution, SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-086_0 was tested on the following volumes for RedHat Linux Enterprise Server 9.6:

- Data volume
- Log volume
- Shared volume

For optimal use of the system with an SAP HANA database, use the parameters listed in the corresponding appendix for your operating system release. Follow [SAP Note 2399079](#) to set up these parameters defined in the `global.ini` file for SAP HANA 2.0.

```
[communication]
tcp_backlog = 2048
sslMinProtocolVersion=tls12

[database_initial_encryption]
backup_encryption = on
persistence_encryption = on
log_encryption = on

[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

[ldap]
sslMinProtocolVersion=tls12

```

Product Descriptions

These products are used in this reference architecture.

Hitachi Advanced Server DS220 G6

The Hitachi Advanced Server DS220 G6 is a high-performance 2U server engineered for demanding enterprise workloads, including SAP HANA. It features dual-socket Intel® Xeon® 6700 series processors and supports up to 8TB of DDR5-5200MT/s memory across 32 DIMM slots, delivering exceptional compute and memory scalability.

Designed for external storage configurations, the DS220 G6 omits local drives and connects to VSP One Block storage via dual-port 32/64Gb Fibre Channel HBAs, ensuring high-throughput and low-latency data access. The server supports PCIe Gen5 architecture, offering flexible I/O expansion through OCP 3.0 and PCIe slots, and accommodates high-speed networking adapters up to 200GbE.

With support for advanced GPU options, Redfish/IPMI management interfaces, and redundant Titanium-rated power supplies, the DS220 G6 provides a robust, scalable, and energy-efficient platform for mission-critical SAP HANA deployments and other memory-intensive applications.

Hitachi Virtual Storage Platform One Block

Hitachi Virtual Storage Platform One Block simplifies data management while enabling enterprises to reliability and sustainability meet initiatives to fuel growth and innovation.

Dynamic Carbon Reduction optimizes energy usage by switching CPUs to ECO mode during low activity. Adaptive Data Reduction (ADR) is always on, enhancing efficiency and reducing the overall CO2 footprint.

Thin Image Advanced (TIA) integrates with major snapshot ecosystems, supporting business continuity and defending against threats. CyberArk Privileged Access Manager plugins enhance block storage system security by prioritizing data confidentiality, ensuring compliance, and actively defending against security threats.

Hitachi Virtual Storage Platform One Block includes the following dedicated models:

- VSP One Block 24 – 256 GB Cache + SW Advanced Data Reduction (ADR) + 24 cores
- VSP One Block 26 – 768 GB Cache + 2x Compression Accelerator Module (CAM) + 24 cores
- VSP One Block 28 – 1 TB Cache + 4x CAM + 64 cores

All models support Fibre Channel, iSCSI, and NVMe TCP connectivity. The new capabilities reduce complexity: data reduction is always on, Dynamic Drive Protection removes complicated RAID setup, and Dynamic Carbon Reduction delivers real-world reduction in power consumption. In addition, the models are FIPS compliant.

In short, Hitachi Virtual Storage Platform One Block combines simplicity, sustainability, and robust security features to optimize system management, energy efficiency, and data protection.

See <https://www.hitachivantara.com/en-us/products/storage-platforms/block-storage/midrange/vsp-one-block> for more information.

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.

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

As an 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 guide for basic concepts and for planning.

- SAP HANA Server Installation and Update Guide

This guide provides an overview of how to install and update an SAP HANA system with the SAP HANA lifecycle management tools.

- SAP HANA Administration Guide

This guide explains how to configure, manage, maintain, and optimize your SAP HANA installation using SAP HANA administration tools.

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

Operating system options for SAP HANA

SUSE Linux Enterprise Server for SAP Applications and Red Hat Enterprise Linux for SAP HANA are available operating systems when running SAP HANA.

- SUSE Linux Enterprise Server (SLES) for SAP Applications

Compete more effectively through improved uptime, better efficiency, and accelerated innovation using [SUSE Linux Enterprise Server for SAP Applications](#). 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 for SAP HANA](#), reallocate your resources towards meeting the next challenges instead of maintaining the status quo. Deliver meaningful business results by providing exceptional reliability and 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 SUSE Linux Enterprise Server and Red Hat Enterprise Linux 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 \(RHEL\)](#)

For more details, see "Updating and Patching the Operating System" by searching in the "View SAP HANA document" from [Technical Information and Best Practices](#).

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