
# SAP HANA on VMware vSphere 9.0 with Hitachi Advanced Server DS220 G6 and Virtual Storage Platform One Block

Reference Architecture Guide

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# Feedback

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## Revision history

| Changes | Date |
|---|---|
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# Contents

Solution overview ..... 4
Solution elements ..... 5
Solution design ..... 6
Hitachi Advanced Server DS220 G6 configuration ..... 7
Network architecture configuration ..... 9
Storage architecture ..... 10
ESXi Operating system boot configuration ..... 10
Hitachi Virtual Storage Platform setup and configuration ..... 11
Parity Group, RAID, and LUN configuration ..... 11
Virtual machine data store configuration ..... 12
VMware vSphere configuration ..... 13
Guest operating system configuration ..... 15
SAP HANA installation and configuration ..... 15
Engineering validation ..... 16
Sample global.ini files ..... 17
Product descriptions ..... 18
Hitachi Advanced Server DS220 G6 ..... 18
Hitachi Virtual Storage Platform One Block ..... 18
SAP HANA ..... 19
SAP HANA Tailored Data Center Integration ..... 19
Operating system options for SAP HANA ..... 20
VMware vSphere ..... 21

# Reference Architecture Guide

Use this reference architecture guide to design your implementation of Hitachi Solution for the SAP HANA platform using a converged solution for VMware vSphere. This scalable, converged infrastructure uses Hitachi Advanced Servers with Intel Granite Rapids processors and a Hitachi Virtual Storage Platform One Block storage system certified as SAP HANA enterprise storage. This guide demonstrates the solution using Hitachi Advanced Server DS220 G6 as an example platform. You will see Hitachi Virtual Storage Platform One Block 24 used in this guide, but you can use other certified storage systems from Hitachi as listed in the SAP Certified Solutions. SAP HANA tailored datacenter integration (TDI) offers great flexibility for SAP business solutions in production and non-production environments. This can be in bare metal or virtualized environments.

Hitachi Solution for SAP HANA with Intel Granite Rapids processors running on VMware vSphere 9.0 follows the SAP HANA TDI guidelines. The supported VMWare ESXi version for SAP HANA can be found in SAP Note 3663150 (SAP user credentials required). It offers the power of SAP HANA while benefiting from the flexibility of a virtualized environment. It is ready to plug into your network to provide real-time access to operational data inside SAP HANA in your software-defined data center.

**Note:** Testing of this configuration was in a lab environment. Many factors 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 solution uses the Hitachi Advanced Server DS220 G6 with SAN Boot from Hitachi Virtual Storage Platform One Block 24. The ESXi 9.0 host operating system boots from SAN via the VSP One Block 24 storage system.

Deploy and configure VMware ESXi 9.0 following VMware and SAP best practices to guarantee best performance for SAP HANA running on a single or multiple virtual machine deployment.

Hitachi Advanced Server DS220 G6 is certified as a scale-up appliance in various configurations running SUSE Linux Enterprise Server (SLES) for SAP Applications or Red Hat Enterprise Linux for SAP Solutions. For more details, see the Certified and Supported SAP HANA Hardware Directory.

The Hitachi engineering team tested SAP HANA on VMware vSphere 9.0 with Hitachi Advanced Server DS220 G6 using SLES 15 SP7 and Red Hat Enterprise Linux for SAP Solutions 9.6.

VMware has certified vSphere 9.0 and SAP has certified the DS220 G6 with Intel® Xeon® 6 Processors (Granite Rapids) for virtualized SAP HANA deployments. See SAP Note 3663150 (SAP user credentials required).

# Solution elements

The converged infrastructure stack of Hitachi Advanced Server for SAP HANA follows the rules of SAP HANA TDI for virtualized environments. This solution demonstrates a scale-up architecture using virtualization to consolidate multiple SAP HANA instances on a single server, delivering the flexibility of SAP HANA TDI while maintaining the performance and reliability characteristics of dedicated appliances.

### Hardware elements

This reference architecture guide uses Hitachi Advanced Server DS220 G6 for running VMware vSphere 9.0 to host SAP HANA virtual instances. The testbed configuration uses Hitachi Virtual Storage Platform One Block 24 as persistent storage with SAN Boot for ESXi 9.0. However, other members of the VSP One Block series certified as SAP HANA Enterprise Storage may also be offered based on specific customer requirements. For a full list of Hitachi Vantara SAP HANA Enterprise Storage certifications, see SAP Certified Solutions.

The following table lists the hardware elements used in this solution.

| Hardware | Quantity | Configuration | Role |
|---|---|---|---|
| Hitachi Advanced Server DS220 G6 | 1 | CPU* – 2 Intel Xeon 6 Processors<br>2 Intel Xeon 6787P Processor 86-core, 2.00 GHz, 336M Cache<br>2 Heat Sinks CPU 0/1 | ESXi Host |
| PCIe Network cards | 2 | Supermicro STD LP 2-port 25G SFP28 (Mellanox ConnectX-4Lx) | For SAP HANA 25 GbE client network and additional 25 GbE |
| VSP One Block 24 (used by the Engineering lab) | 1 | CTL: 1 pair<br>32/64 Gbps 4-port CHB: 3 pairs<br>MPU: 1 pair<br>Cache: 256 GB<br>NVMe SSDs: 24 × 1.92 TB | Block storage |

| Hardware | Quantity | Configuration | Role |
|---|---|---|---|
| HBA Card | 2 | Emulex LPe35002-M2 32Gb 2p FC HBA | Connectivity to the external storage sub-system |
| Cisco Nexus 92348 switch (Optional) | 1 | 48 × 1 GbE Ports | Optional switch for management network |
| Cisco Nexus 93180YC-FX3 switch (Optional) | 2 | 48 × 25GbE Ports | Optional switches for client network or additional backup network |
| Hitachi Universal V3 Rack | 1 | 1 standard rack | Optional rack for mounting server/ storage/switches |
| PDUs | 2 | Vertical PDUs | Optional PDUs for solution |

**Software components**

This solution uses VMware ESXi as a hypervisor. Red Hat Enterprise Linux and SUSE Linux Enterprise Server for SAP Applications are available as guest operating systems within the VMs for running SAP HANA. For more information see the Hitachi Product Compatibility Guide.

The following table lists the software elements used in this solution.

| Software | Details |
|---|---|
| Host operating system | ESXi 9.0 |
| Virtual machine operating system | SUSE Linux Enterprise Server 15 SP7 for SAP Applications |
| | Red Hat Enterprise Linux for SAP Solutions 9.6 |
| SAP HANA SPS08 and later | |

# Solution design

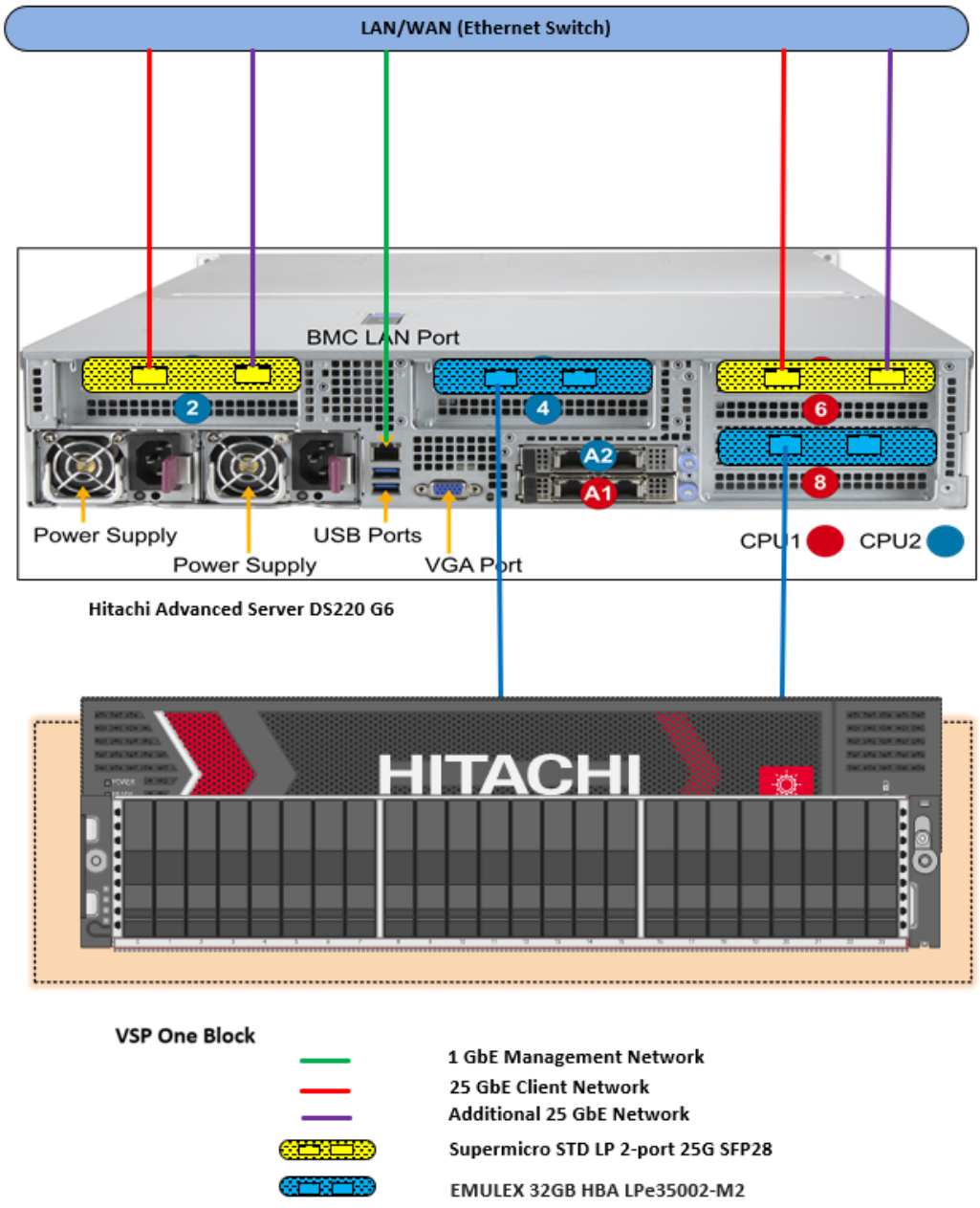
The detailed design of the Hitachi Solution for virtualized SAP HANA (vHANA) using VMware ESXi in this reference architecture guide includes the following:

- Hitachi Advanced Server DS220 G6 configuration
- Network architecture configuration

- Storage architecture
- VMware vSphere configuration
- Guest operating system configuration
- SAP HANA installation and configuration

## Hitachi Advanced Server DS220 G6 configuration

The following figure shows the back view of Hitachi Advanced Server DS220 G6 when using external storage.



**Supported configurations**

DS220 G6 solution supports the configurations listed in the following table.

| Total RAM per ESXi Host | 512 GB | 1024 GB | 1536 GB | 2048 GB | 3072 GB | 4096 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 | --- |
| DDR5 R-DIMM 128 GB memory (1DPC 6400 MT/s) | --- | --- | --- | 16 | --- | 32 |
| DDR5 R-DIMM 256 GB memory (1DPC 6400 MT/s) | --- | --- | --- | --- | --- | 16 |
| DIMM per Channel (DPC) | 1DPC<br>32 GB | 2DPC<br>32 GB/1DPC<br>64 GB | 1DPC<br>96 GB | 2DPC<br>64G/1DPC<br>128 GB | 2DPC<br>96 GB | 2DPC<br>128 GB/1DPC 256 GB |

## Network architecture configuration

This solution uses a dual-network architecture with separate 1 GbE management and 25 GbE client connectivity for high availability and performance.

Management Network Connect the 1 GbE management port on Hitachi Advanced Server DS220 G6 to a Cisco Nexus 92348, or to any other external 1 GbE switch for management connectivity.

Client Network (25 GbE) Configure the following 25 GbE network connections for the ESXi host and virtual machine client network:

- Port 0 of Supermicro STD LP 2-port 25G SFP28 (Mellanox ConnectX-4Lx) Network Adapter on PCIe_Slot1 → Connect to Cisco Nexus 93180YC-FX3 switch.
- Port 1 of Supermicro STD LP 2-port 25G SFP28 (Mellanox ConnectX-4Lx) Network Adapter on PCIe_Slot4 → Connect to Cisco Nexus 93180YC-FX3 switch.

ESXi Switch Configuration

Configure the corresponding two 25 GbE ports at the VMware ESXi level as uplinks in the virtual standard switch (VSS). Configure both vmnics as active. Use these two ports as the management network for the ESXi node as well as the network for the guest operating system, which acts as the client network for the SAP HANA instances.

At installation, the field engineer from Hitachi Vantara works with your VMware vCenter administrator to convert, merge, and migrate the VSS to your existing or new Virtual Distributed Switch (VDS) for enhanced management capabilities.

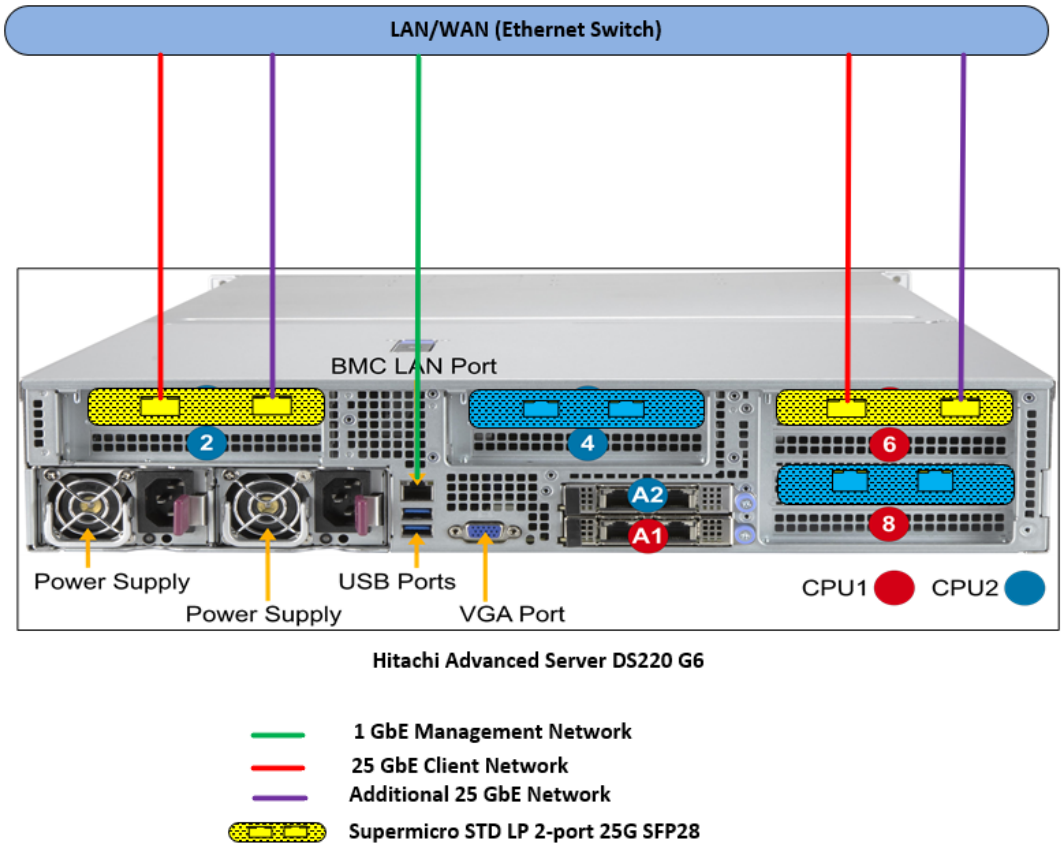
Optional – At this point, to speed up detecting corrupted connections, configure external switch ports with a port channel set to active/active as well as setting the LACP timeout value to short. On VDS, use vLAGs instead of uplinks.

The following table provides network setup details:

| Network Card | Port | Network Description |
|---|---|---|
| PCIe Slot_1 of Primary Riser | 0 | VMware ESXi kernel and virtual machine traffic |
| | 1 | Free for use |
| PCIe Slot_4 of Secondary Riser | 0 | VMware ESXi kernel and virtual machine traffic |
| | 1 | Free for use |
| Slot_#: refer to figure below for back view of DS220 G6 with PCIe slots. | | |

The following illustration shows PCI cards and the management network connection.

**Note:** The ESXi kernel network and virtual machine traffic can be on the same network switch or on separate network switches. It depends on the network environment.




## Storage architecture

The following storage architecture and configuration was used for this solution:

- ESXi Operating system boot configuration
- Hitachi Virtual Storage Platform setup and configuration
- Parity Group, RAID, and LUN configuration
- Virtual machine datastore configuration

### ESXi Operating system boot configuration

This solution configuration uses SAN Boot from Hitachi Virtual Storage Platform One Block 24. The ESXi boot volume (LUN 0) is provisioned on the VSP One Block 24 storage system. SAN Boot provides a simplified and unified storage approach that consolidates all storage resources (including the ESXi boot volume, guest operating system, and SAP HANA data) on a single storage platform. This approach eliminates the need for separate boot devices and simplifies overall infrastructure management.

### Hitachi Virtual Storage Platform setup and configuration

For the Hitachi Solution for virtualized SAP HANA (vHANA), the following storage components are required to support ESXi SAN Boot and SAP HANA data storage using Hitachi Virtual Storage Platform One Block 24.

The storage configuration for SAP HANA node needs the following for different sizes:

- SAN Boot from VSP One Block 24.
  - ESXi boot volume (LUN 0) on VSP One Block 24

Storage Components for Scale-Up SAP HANA System

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

- 2 × Emulex LPe35002-M2 32Gb 2-port FC HBA cards (installed in PCIe Slots 3 and 7) 1 Hitachi Virtual Storage Platform One Block 24 storage system

The following are mandatory for the external storage option with direct connection between Hitachi Virtual Storage Platform One Block 24 and the Emulex LPe35002-M2 32Gb HBA on Hitachi Advanced Server DS220 G6:

- Enable Host Mode Option 02, Host Mode Option 94, and Host Mode Option 109 for the corresponding storage port connected with the server.
- Host Mode Option 109 — This option fixes a SAN boot issue, when the system cannot find the Boot LUN after a restart.
- Host Mode Option 94 — This option is mandatory for direct connection between the Hitachi Virtual Storage Platform and the Emulex HBA. If this mode is not set, then SAN storage cannot be identified from the Emulex HBA.
- Host Mode Option 02 (Optional) — This option is recommended when the system uses test-unit-ready (TUR) for path_checker in the /etc/multipath.conf file. This mode is typically used for fencing technology.

An example configuration for port properties with Hitachi Virtual Storage Platform is listed in the following table.

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

## Parity Group, RAID, and LUN configuration

This reference architecture uses a dynamic drive protection (DDP) pool design for the storage layout that ensures maximum utilization and optimization with automatic data protection for Hitachi Solution for SAP HANA using VMware vSphere.

This is the configuration of parity groups, RAID level, and LUNs. Use one Dynamic drive protection pool with the specific RAID configuration and LUN assignment listed in the following table for the storage layout.

| P-VOL Configuration | Specification |
|---|---|
| **RAID Configuration** | 1 × DDP RAID-6 (6D+2P) |
| **NVMe SSD Drives** | 9 × 1.92 TB (1 DDP Group) |
| **Pool Size (Usable)** | 10.11 TB |
| **Pool Description** | Single DDP Pool (6D+2P) for Hypervisor , Guest OS , Shared, Data, and Log volumes |

| Storage Element | 4 TB System |
|---|---|
| **SAN Boot (LUN 0)** | 256 GB |
| **HANA OS (LUN 1)** | 500 GB |
| **/hana/shared (LUN 2)** | 2 TB |
| **/hana/data (LUN 7-10)** | 4 × 1.5 TB |
| Total /hana/data | (6 TB) |
| **/hana/log (LUN 3-6)** | 4 × 256 GB |
| Total /hana/log | (512 GB) |

This solution uses a dynamic drive protection (DDP) pool design for the storage layout.

One pool is used to provide storage and throughput for all supported storage sizes:

- Hitachi Virtual Storage Platform One Block 24 is used for ESXi SAN Boot (LUN 0).
- Pool 0 is configured as 1 × DDP RAID-6 (6D+2P) with 9 × 1.92 TB NVMe SSDs and creates all virtual volumes (V-Vols) for SAN Boot, HANA OS, shared binaries, data and log of virtual machines. The single pool design simplifies management and provides optimal performance for all storage sizes.
- Dynamic Drive Protection (DDP) with 9 × 1.92 TB NVMe SSDs includes 6 data drives, 2 parity drives, and 1 spare/operations drive, providing automatic data protection.

## Virtual machine data store configuration

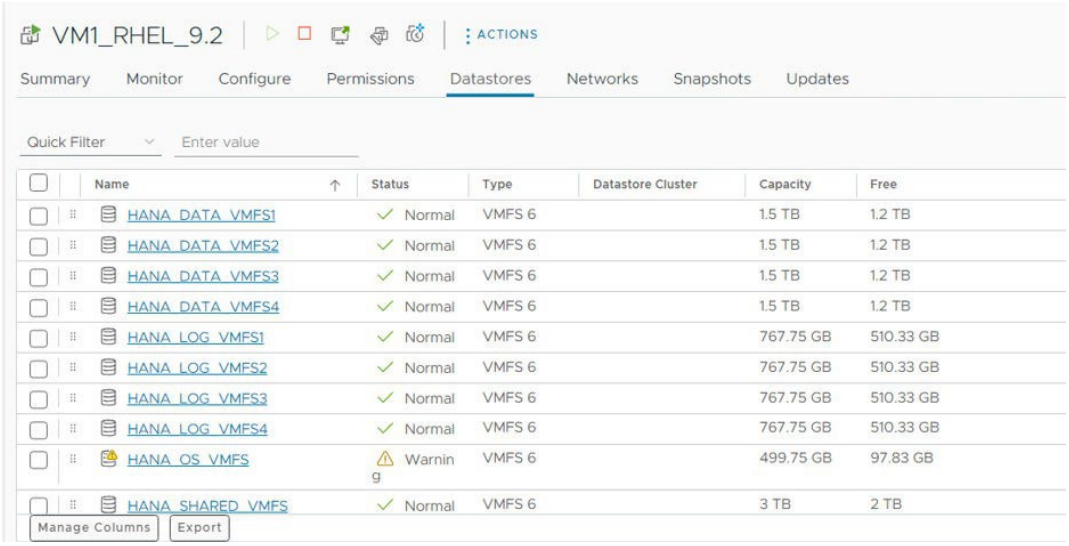
The ESXi installer from Hitachi Vantara automatically creates datastores during installation, and the following are details of the datastore created experiments tested in the lab environment.

The following volumes are created on the ESXi host.

```
[root@esxihana:~] df -h
Filesystem      Size  Used  Avail  Use% Mounted on
VMFS-6         319.0G   1.4G 317.6G   0% /vmfs/volumes/esxihana_boot
VMFS-6         499.8G 402.3G  97.4G  81% /vmfs/volumes/HANA_OS_VMFS
VMFS-6           3.0T   1.0T   2.0T  33% /vmfs/volumes/HANA_SHARED_VMFS
VMFS-6         767.8G 257.5G 510.3G  34% /vmfs/volumes/HANA_LOG_VMFS2
VMFS-6         767.8G 257.5G 510.3G  34% /vmfs/volumes/HANA_LOG_VMFS1
VMFS-6         767.8G 257.5G 510.2G  34% /vmfs/volumes/HANA_LOG_VMFS3
VMFS-6           1.5T 309.5G   1.2T  20% /vmfs/volumes/HANA_DATA_VMFS1
VMFS-6         767.8G 257.5G 510.2G  34% /vmfs/volumes/HANA_LOG_VMFS4
VMFS-6           1.5T 309.5G   1.2T  20% /vmfs/volumes/HANA_DATA_VMFS2
```

```
VMFS-6            1.5T 309.5G   1.2T  20% /vmfs/volumes/HANA_DATA_VMFS3
VMFS-6            1.5T 309.5G   1.2T  20% /vmfs/volumes/HANA_DATA_VMFS4
VMFSSOS         119.8G  22.0G  97.7G  18% /vmfs/volumes/OSDATA-66b666b9-
29cb159f-c883-303ea705709a
vfat              4.0G 302.9M   3.7G   7% /vmfs/volumes/BOOTBANK1
vfat              4.0G  84.0K   4.0G   0% /vmfs/volumes/BOOTBANK2
```

The following image shows datastores created for one of the VMs that was used for testing as an example.




## VMware vSphere configuration

This section covers configuration of the VMware ESXi server, SAP requirements, and possible virtual machine configurations.

The following table lists the minimum and maximum sizes for virtual machines running SAP HANA workloads on DS220 G6 with Intel Granite Rapids processors.

| Configuration | Size |
|---|---|
| Minimum virtual machine size | 1 socket with 172 vCPUs minimum |
| Maximum virtual machine size | 2 sockets with 344 vCPUs and 4 TB vHANA |
| Sub-socket virtual machine sizes | Not supported for Granite Rapids. Only full-socket configurations are permitted. |
| Maximum number of virtual machines | Maximum 2 VMs per host: one 2-socket VM with max 4 TB vHANA RAM, or two 1-socket VMs with max 2 TB vHANA RAM each |

**Note:** Half-socket and sub-socket virtual machine configurations are not supported for Granite Rapids 2-socket servers following SAP Note 3663150. Only full-socket configurations (1-socket or 2-socket) are permitted for SAP HANA workloads on this platform.

These are the SAP general sizing guidelines for virtualized environments, with respect to storage, CPU, and memory requirements of SAP HANA.

When creating single or multi-virtual machine environments on a VMware ESXi server, some memory must be reserved for the ESXi server itself. Do not assign all available physical memory to the virtual machines.

**Note:** According to VMware guidance, this memory overhead can be between 0.5% and a more conservative 3%. For example, on Hitachi Advanced Server DS220 G6 with 8192 GB of RAM, assign up to 4096 GB to virtual machines (4 TB vHANA maximum per SAP Note 3663150), after reserving 4096 GB memory.

### ESXi Operating system boot configuration

This solution configuration uses SAN Boot from Hitachi Virtual Storage Platform One Block 24. The ESXi boot volume (LUN 0) is provisioned on the VSP One Block 24 storage system with dual-path multipathing that enables automatic failover protection.

### Activate the round robin multipathing policy

Using the round robin multipathing policy allows the configuration of multiple I/O paths between the server and the Hitachi Virtual Storage Platform One Block 24. Round-robin aggregates all physical I/O paths into a single logical path, providing high availability and load balancing for the block devices. The LUNs are always available unless all paths fail.

Use the round robin multipathing policy for the following I/O paths:

- ESXi operating system on SAN Boot (LUN 0)
- SAP HANA guest operating system LUN
- SAP HANA VM data volume LUN
- SAP HANA VM log volume LUN
- SAP HANA VM shared volume LUN

### Virtual machine configuration parameters

VMware releases best practices for configuring the VMware ESXi server when running SAP HANA workloads that result from the certification together with SAP to ensure that all performance requirements for SAP HANA are met.

When provisioning virtual machines for SAP HANA, make sure to use hyperthreads on fewer NUMA nodes instead of only physical CPU cores spread over multiple NUMA nodes.

Also, add or change the parameters on the virtual machines as listed in the following table.

| For This | Use This |
|---|---|
| monitor.halt_in_monitor | TRUE |
| monitor.idleLoopSpinBeforeHalt | TRUE |
| tools.guestlib.enableHostinfo | TRUE |
| numa.nodeAffinity | i.e.: 0,1 |
| disk.EnableUUID | TRUE |

### Multiple virtual machine configurations

When running this solution in a single-virtual machine configuration, Hitachi Advanced Server

DS220 G6 with 2 Intel Granite Rapids sockets provides enough resources to run a virtual machine with up to 344 vCPUs and 4 TB vHANA VM memory at maximum capacity.

Depending on the number of virtual machines as well as the requirements of the SAP HANA installation inside these virtual machines, storage resources are pre-sized in this reference architecture for the maximum 4 TB vHANA VM configuration.

Contact your Hitachi Vantara account team to size storage for alternative SAP HANA configurations or for certified enterprise storage units beyond VSP One Block 24.

The VSP One Block 24 is certified to support multiple SAP HANA nodes as documented in the SAP Certified Hardware Directory. For virtualized environments, one virtual machine counts as one SAP HANA node, according to SAP requirements.

In a single server environment for DS220 G6, the maximum number of virtual machines is 2 (one 2-socket VM with 4 TBor two 1-socket VMs with 2 TB each) when connected to Hitachi Virtual Storage Platform One Block 24. This sizing is also valid for running multiple ESXi servers connected to one Hitachi storage system.

SAP HANA Tailored Data Center Integration on Hitachi Virtual Storage Platform One Block 24 with Hitachi Storage Virtualization Operating System provides insight into best practices for Hitachi storage in SAP HANA TDI environments.

According to SAP Note 3663150, Sub NUMA Clustering (SNC-2) is supported on 2-socket Granite Rapids hosts.

## Guest operating system configuration

The following are supported as guest operating systems for the virtual machines in Hitachi Advanced Server DS220 G6:

- SUSE Linux Enterprise Server for SAP Applications

Red Hat Enterprise Linux for SAP Solutions Changing the configuration settings is only supported according to the guidelines from SAP and the operating system distributor. Otherwise, changes can 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
- 2684254 - SAP HANA DB: Recommended OS settings for SLES 15 / SLES for SAP Applications 15
- 3108316 - Red Hat Enterprise Linux 9.x: Installation and Configuration 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.

## SAP HANA installation and configuration

This section describes the SAP HANA configuration on the scale-up configuration for Hitachi Solution for SAP HANA on VMware vSphere.

### SAP HANA volume configuration for virtual machines

Use the following virtual volumes (V-Vols) for the SAP HANA virtual machine configuration

on the Hitachi Virtual Storage Platform One Block 24 system with DDP RAID-6 (6D+2P) pool design. The following configuration is used for the 4 TB vHANA engineering testing environment as an example:

- One 256 GB V-Vol for SAN Boot (LUN 0) - ESXi host operating system
- One 500 GB V-Vol for HANA OS (LUN 1) - Guest VM operating system
- One 2 TB V-Vol for /hana/shared (LUN 2) - SAP HANA binaries, configuration, and trace files
- Four 256  GB V-Vols for /hana/log (LUN 3-6) - SAP HANA redo log volumes
- Four 1.5 TB V-Vols for /hana/data (LUN 7-10) - SAP HANA data persistence volumes

  The logical volume manager (LVM) configures the SAP HANA persistent storage volumes from virtual machines. With four VMDKs for the SAP HANA data, the LVM creates a single 4-way striped volume on which to create the XFS file system to store the SAP HANA data volumes. Similarly, with four VMDKs for the SAP HANA log, the LVM creates a single 4-way striped volume for the XFS file system to store the SAP HANA log volumes.

For SAP HANA shared, create an XFS file system to store SAP HANA binaries, configuration, and trace files.

#### SAP HANA software installation

After configuring the file system for the SAP HANA shared, data volume and log volume, install SAP HANA SPS08 or later on the SAP HANA server.

Install the following SAP HANA software components on the SAP HANA node for VMware vSphere 9.0 server:

- SAP HANA database
- SAP HANA Client
- SAP Host agent

# Engineering validation

The test methodology for validating the SAP HANA TDI Enterprise Storage configuration with Hitachi Virtual Storage Platform One Block 24 and ESXi 9.0 used the following.

For TDI solutions, SAP HANA Hardware, and Cloud Measurement Tool (HCMT) latest available version was tested on the following volumes for RHEL 9.6:

- Data volume
- Log volume
- Shared volume

For TDI solutions, SAP HANA Hardware, and Cloud Measurement Tool (HCMT) latest version was tested on the following volumes for SLES 15 SP7:

- 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.

## Sample global.ini files

This section provides the `global.ini` files used for the following operating systems.

**Red Hat Enterprise Linux 9.6 operating system**

Use this `global.ini` configuration file with a solution using Red Hat Enterprise Linux 9.6 for an operating system.

**SUSE Enterprise Linux 15 SP7 operating system**

Use this `global.ini` configuration file with a solution using SUSE Enterprise Linux 15 SP7 operating system for an operating system.

# Product descriptions

The following products are part of this solution.

## 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 highspeed 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.

## 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.

## SAP HANA Tailored Data Center Integration

SAP increases flexibility and provides an alternative to SAP HANA Appliances with SAP HANA tailored data center integration (TDI) in currently 5 phases. This includes many kinds of virtualization technology. Understanding the possibilities and requirements of an SAP HANA TDI environment is crucial. One of these requirements is that all virtualized environments for SAP HANA are considered as SAP HANA TDI by SAP. SAP provides documentation around SAP HANA TDI environments that explain the 5 phases of SAP HANA TDI as well as hardware and software requirements for the whole stack:

- SAP Help Portal: SAP HANA Platform (frequently asked questions)
- SAP HANA Storage Requirements
- SAP HANA Network Requirements

Taking all this into account, Hitachi offers a solution for the whole SAP HANA TDI stack from hardware infrastructure to software deployment.

## 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.

## VMware vSphere

VMware vSphere is a virtualization platform that provides datacenter infrastructure. It helps you get the best performance, availability, and efficiency from your infrastructure and applications. Virtualize applications with confidence using consistent management.

Note: VMware vSphere requires a valid subscription license for production use.

VMware vSphere has the following components:

- VMware vSphere ESXi

  This hypervisor loads directly on a physical server. ESXi provides a robust, high-performance virtualization layer that abstracts server hardware resources and makes them shareable by multiple virtual machines.

- VMware vCenter Server

  This management software provides a centralized platform for managing your VMware vSphere environments so you can automate and deliver a virtual infrastructure with confidence:

  - VMware vSphere vMotion
  - VMware vSphere Storage vMotion
  - VMware vSphere Distributed Resource Scheduler
  - VMware vSphere High Availability
  - VMware vSphere Fault Tolerance

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