HITACHI

Hitachi Vantara

Hitachi Integrated Systems Solution with SAP HANA TDI Scale-up using Hitachi Advanced Server HA820 G3

Reference Architecture Guide

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Revision history

Changes	Date
▪ Minor updates.	November 2025
▪ Support for RHEL 9.6 and SLES 15 SP7 for Intel 5th and 4th Gen CPUs.	October 2025
▪ Initial release.	August 2025

Reference Architecture Guide

Use this scale-up environment for Hitachi Integrated Systems Solution with SAP HANA TDI to transform your business to boost innovation, growth, and profits. This solution uses Hitachi Advanced Server HA820 G3 and the following:

- Internal server storage in an appliance configuration
- External disks in a storage subsystem following the Tailored Data-center Integration (TDI) approach to implement SAP HANA

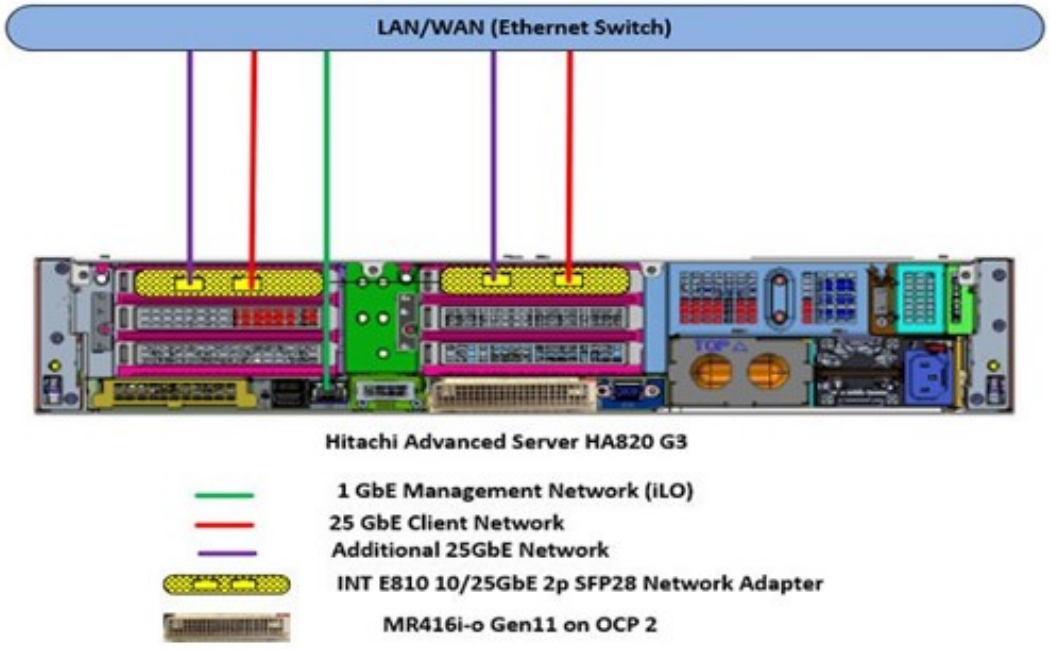
This SAP HANA infrastructure uses the following components:

- One Hitachi Advanced Server HA820 G3 with internal drives
- External storage with Hitachi Virtual Storage Platform for TDI

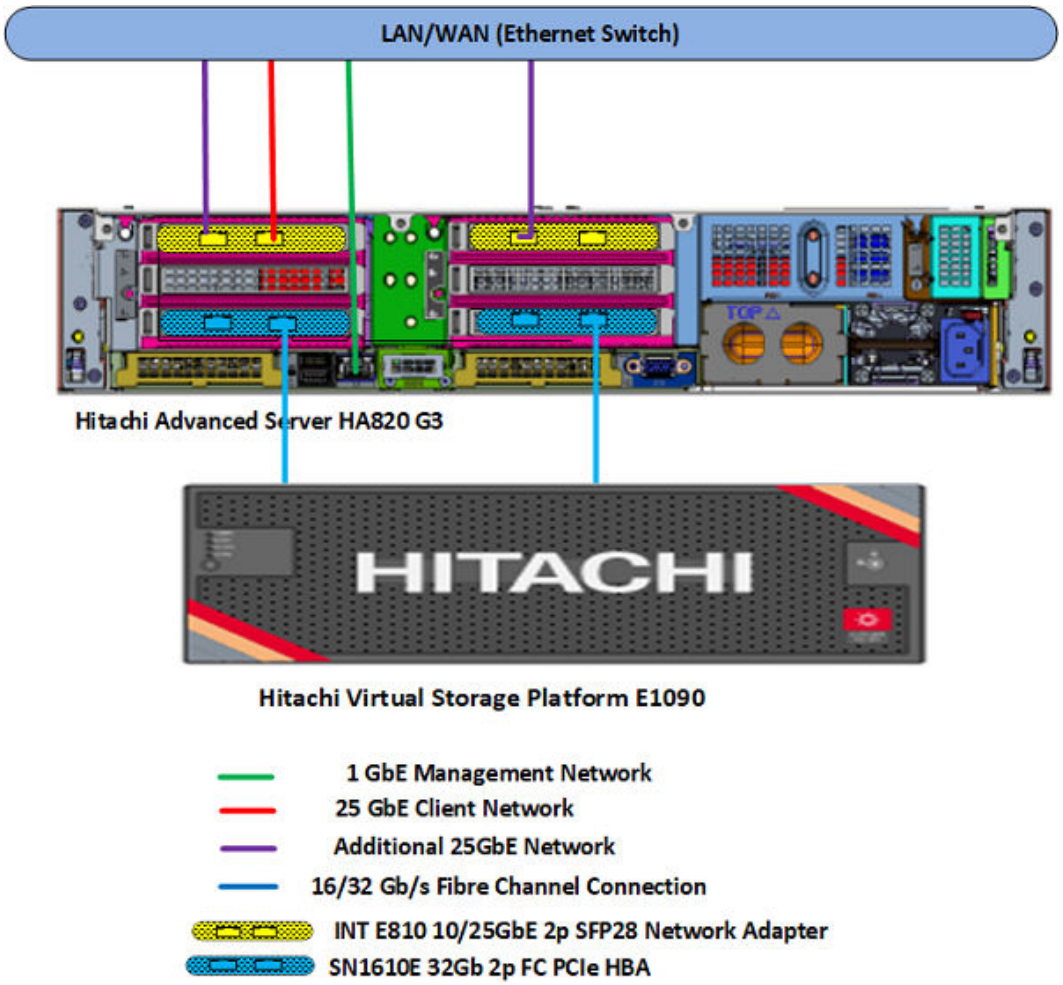
The validation of this environment was done for both of the following:

- Internal drives in an appliance configuration
- External storage with Hitachi Virtual Storage Platform such as VSP E1090 for TDI

The following figure shows the topology of this reference solution using internal drives on Hitachi Advanced Server HA820 G3.



The following figure shows the topology of this reference solution using external drives on a storage system, such as Hitachi Virtual Storage Platform E1090.



Hitachi Solution for SAP HANA is a preconfigured converged system for any business workload running on SAP HANA. It is ready to plug in to your network to host business data, deliver data-driven insights throughout your business, and predict real-time outcomes.

The 4th Generation Intel Xeon Scalable Processors system supports the configurations listed in the following table

Number of Sockets	RAM Size	Storage
CPU Appliance: Intel Sapphire Rapids with one of the following: ▪ 2 Intel Xeon Platinum 8490H Processor 60-core, 1.9GHz, 350W ▪ 2 Intel Xeon Platinum 8480+ Processor 56-core, 2.0GHz, 350W ▪ 2 Intel Xeon Platinum 8470 Processors 52-core, 2.0GHz, 350W TDI: Two 4th Generation Intel Xeon Scalable Processors Platinum/Gold/Silver (Sapphire Rapids) with a minimum of 8 cores each	256 GB with the following: ▪ 2 × 8 × 16 GB DDR5 RDIMM	Internal storage option for Appliance: ▪ Internal drives on Hitachi Advanced Server HA820 G3 External storage option for TDI: ▪ Storage subsystem, such as Hitachi Virtual Storage Platform E1090
	512 GB with the following: ▪ 2 × 16 × 16 GB DDR5 RDIMM ▪ 2 × 8 × 32 GB DDR5 RDIMM	
	1024 GB with one of the following: ▪ 2 × 16 × 32 GB DDR5 RDIMM ▪ 2 × 8× 64 GB DDR5 RDIMM	
	1536 GB with the following: ▪ 2 × 8 × 96 GB DDR5 RDIMM	
	2048 GB with one of the following: ▪ 2 × 16 × 64 GB DDR5 RDIMM ▪ 2 × 16 × 96 GB DDR5 RDIMM	
	3072 GB with the following: ▪ 2 × 16 × 256 GB DDR5 RDIMM	

Number of Sockets	RAM Size	Storage
	4096 GB with one of the following: ▪ 2 ×16 × 128 GB DDR5 RDIMM ▪ 2 × 8 × 256 GB DDR5 RDIMM	
	8192 GB with the following: ▪ 2 × 16 × 256 GB DDR5 RDIMM	

The 5th Generation Intel Xeon Scalable Processors system supports the configurations listed in the following table.

Number of Sockets	RAM Size	Storage
CPU Appliance: CPU - Intel Xeon 5th Gen SP Platinum (Emerald Rapids) 8592 + 64 Core Two 5th Gen Intel Xeon Scalable Processors Platinum/Gold/Silver (Emerald Rapids) with a minimum of 8 cores each	256 GB with the following: ▪ 2 × 8 × 16 GB DDR5 RDIMM	Internal storage option for Appliance: ▪ Internal drives on Hitachi Advanced Server HA820 G3 External storage option for TDI: ▪ Storage subsystem, such as Hitachi Virtual Storage Platform E1090
	512 GB with one of the following: ▪ 2 × 16 × 16 GB DDR5 RDIMM ▪ 2 × 8 × 32 GB DDR5 RDIMM	
	1024 GB with one of the following: ▪ 2 × 16 × 32 GB DDR5 RDIMM ▪ 2 × 8 × 64 GB DDR5 RDIMM	
	1536 GB with the following: ▪ 2 × 8 × 96 GB DDR5 RDIMM	

Number of Sockets	RAM Size	Storage
	2048 GB with one of the following: ▪ 2 × 16 × 64 GB DDR5 RDIMM ▪ 2 × 8 × 128 GB DDR5 RDIMM	
	3072 GB with the following: ▪ 2 ×16 × 96 GB DDR5 RDIMM	
	4096 GB with one of the following: ▪ 2 × 16 × 128 GB DDR5 RDIMM ▪ 2 × 8 × 256 GB DDR5 RDIMM	
	8192 GB with the following: ▪ 2 × 16 × 256 GB DDR5 RDIMM	

Note: For assistance with supported server CPU SKUs, contact a Hitachi Vantara sales representative.

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 28).

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 this solution for different sized deployments.

Hardware	Quantity	Configuration	Role	Implementation Type
Hitachi Advanced Server HA820 G3	1	▪ CPU – 4th Generation Intel® Xeon® Scalable Processors (Any one option) • 2 Intel Xeon Platinum 8490H Processor 60-core, 1.9GHz, 350W • 2 Intel Xeon Platinum 8480+ Processor 56-core, 2.0GHz, 350W • 2 Intel Xeon Platinum 8470 Processor 52-core, 2.0GHz, 350W • 2 heat sinks CPU 0/1	SAP HANA server	All implementations
		▪ CPU – 5th Generation Intel® Xeon® Scalable Processors: • 2 Intel Xeon Platinum 8592+ Processor 64-core 1.9GHz 350W • 2 heat sinks CPU 0/1		TDI
		▪ RAM per SAP HANA node (any one option) refer to the table in the “Supported memory configuration” section.		All implementations
PCIe Network cards	2	Intel E810-XXV 10/25GbE 2p SFP28 Network Adapter	For SAP HANA 10/25 GbE client network and additional	All implementations

Hardware	Quantity	Configuration	Role	Implementation Type
	2	Cisco SFP+ 3M Twinaxial cables	10/25 GbE network	
Hitachi Virtual Storage Platform E1090 (used by Engineering lab)	1	▪ CTL: 1 pair ▪ 32 Gbps 4-port CHB: 1 pair ▪ MPU: 1 pair ▪ Cache: 1024 GB ▪ NVMe SSDs: 17 × 1.9 TB for memory sizes up to 4096 GB	Block storage when using an external storage sub-system.	TDI
HBA card	2	SN1610E 32 Gb 2p Fibre Channel PCIe HBA	Connectivity to the external storage sub-system	TDI
	2	32 Gbps SFP		
RAID controller	1	▪ MR416i-o Gen11 Controller ▪ 96W Smart Stg Li-ion Battery Kit	Manage RAID configuration for local disks	Appliance
Storage drives	5	For =< 1536 GB RAM per HANA node: ▪ 5 × 1.92 TB SAS SSD internal hard drives	Local disk drives	
	9	For 2048 GB and 3072 GB RAM per HANA node: ▪ 9 × 1.92 TB SAS SSD internal hard drives		
	11	For 4096 GB RAM per HANA node: ▪ 11 × 1.92 TB SAS SSD internal hard drives		
	19	For 8192 GB RAM per HANA node: ▪ 19 × 1.92 TB SAS SSD internal hard drives		

Hardware	Quantity	Configuration	Role	Implementation Type
	1	▪ 1 × 1.92 TB SAS SSD internal hard drive		
Cisco Nexus 92348 switch	1	48 × 1 GbE ports	Optional switch for management network.	All implementations (optional)
Cisco Nexus 93180YC-FX/FX3	2	48 × 25 GbE ports	Optional switches for the client network or additional backup network.	All implementations (optional)
Minkels Global Solutions Rack	1	1 standard rack	Optional rack for mounting servers.	All implementations
PDUs	6	Vertical PDUs	Optional PDUs for the solution.	All implementations

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.

Supported memory configuration

The following table lists supported memory configurations for 4th Generation Intel Xeon Scalable Processors.

Total RAM per HANA node	256 GB	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	8192 GB
DDR5R-DIMM 16 GB memory(1DPC 4800 MT/s)	16	32	—	—	—	—	—	—
DDR5R-DIMM 32 GB memory (1DPC 4800 MT/s)	—	16	32	—	—	—	—	—

Total RAM per HANA node	256 GB	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	8192 GB
DDR5R-DIMM 64 GB memory (1DPC 4800 MT/s)	—	—	16	—	32	—	—	—
DDR5R-DIMM 96 GB memory (1DPC 4800 MT/s)	—	—	—	16	—	32	—	—
DDR5R-DIMM 128 GB memory (1DPC 4800 MT/s)	—	—	—	—	16	—	32	—
DDR5R-DIMM 256 GB memory (1 DPC 4800 MT/s)	—	—	—	—	—	—	16	32
DIMM per Channel (DPC)	1DPC 16 GB	2DPC 16 GB or 1DPC 32 GB	2DPC 32 GB or 1DPC 64 GB	1DPC 96 GB	2DPC 64 G or 1DPC 128 GB	2DPC 96 GB	2DPC 128 GB or 1DPC 256 GB	2DPC 256 GB

The following table lists supported memory configurations for 5th Generation Intel Xeon Scalable Processors.

Total RAM per HANA node	256 GB	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	8192 GB
DDR5R-DIMM 16 GB memory (1DPC 5600 MT/s)	16	32	—	—	—	—	—	—
DDR5R-DIMM 32 GB memory (1DPC 5600 MT/s)	—	16	32	—	—	—	—	—

Total RAM per HANA node	256 GB	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	8192 GB
DDR5R-DIMM 64 GB memory (1DPC 5600 MT/s)	—	—	16	—	32	—	—	—
DDR5R-DIMM 96 GB memory (1DPC 5600 MT/s)	—	—	—	16	—	32	—	—
DDR5R-DIMM 128 GB memory (1DPC 5600 MT/s)	—	—	—	—	16	—	32	—
DDR5R-DIMM 256 GB memory (1DPC 5600 MT/s)	—	—	—	—	—	—	16	32
DIMM per Channel (DPC)	1DPC 16 GB	1DPC 32 GB or 1DPC 16 GB	2DPC 32 GB or 1DPC 64 GB	1DPC 96 GB	2DPC 64 GB or 1DPC 128 GB	2DPC 96 GB	2DPC 128 GB or 1DPC 256 GB	2DPC 256 GB

Software elements

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

Software	
Operating system	SUSE Linux Enterprise Server for SAP Applications
	Red Hat Enterprise Linux for SAP Solutions
Database	SAP HANA 2.0 SPS 06 or later

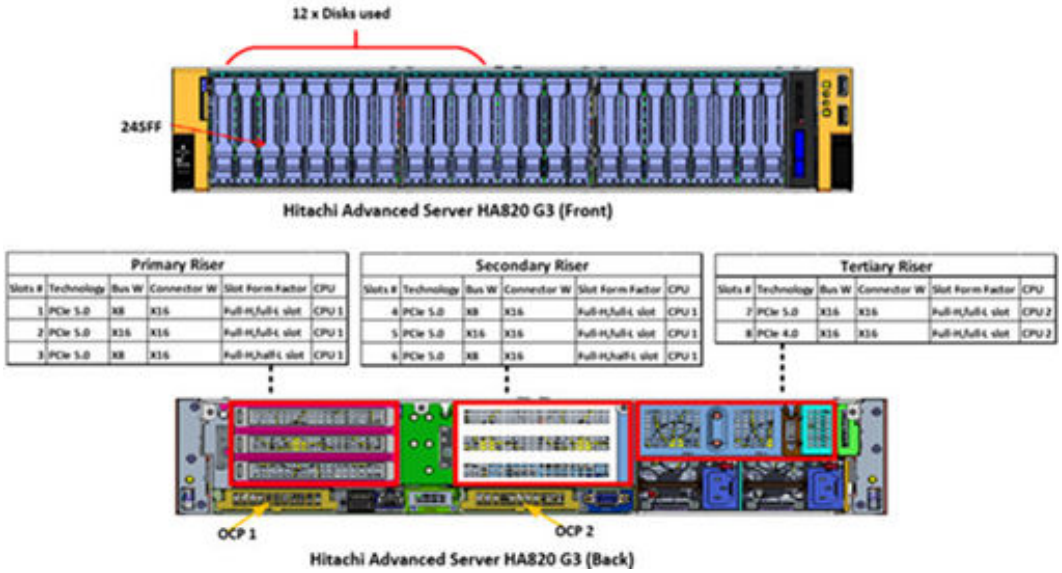
Solution design

The detailed design for the scale-up configuration of this reference solution includes the following:

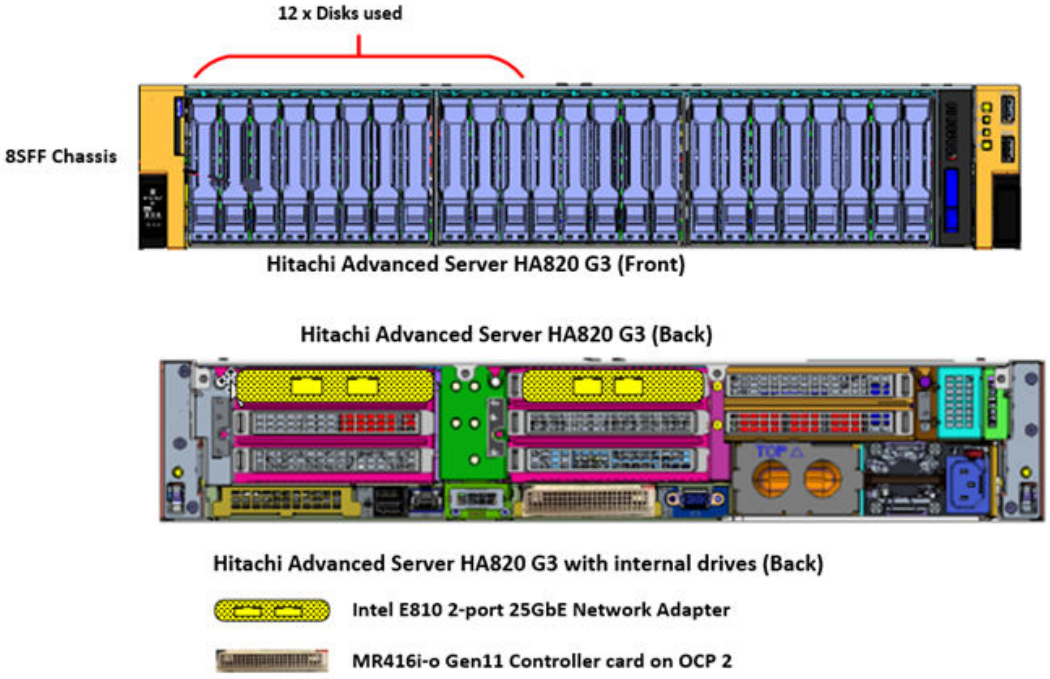
- Hitachi Advanced Server HA820 G3 configuration:
  - 1 × MR416i-o Gen11 24G RAID Controller (for internal storage only)
  - 2 × SN1610E 32 Gb 2p Fibre Channel PCIe HBA cards (for external storage only)
    - Port 1 of SN1610E 32 Gb 2p Fibre Channel PCIe HBA on Slot3
    - Port 1 of SN1610E 32 Gb 2p Fibre Channel PCIe HBA on Slot6
- Network Architecture
- Storage Architecture Configuration
- SAP HANA Configuration

Hitachi Advanced Server HA820 G3 configuration

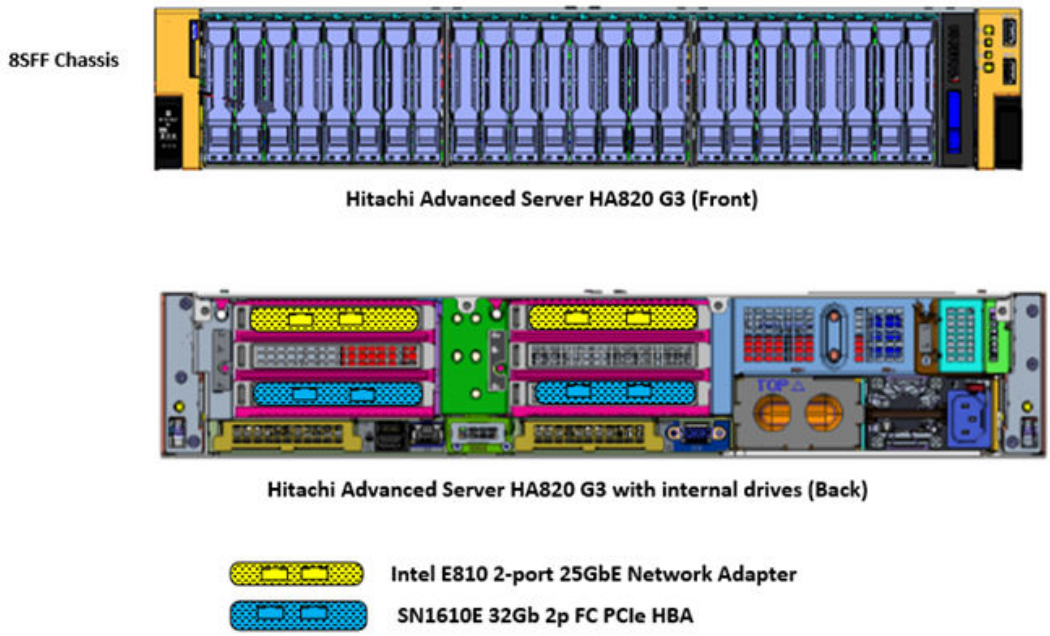
The following figure shows the back view of Hitachi Advanced Server HA820 G3 topology when using internal drives and external storage.



The following figure shows the front and back view of Hitachi Advanced Server HA820 G3 when using internal drives.



The following figure shows the front and back view of Hitachi Advanced Server HA820 G3 when using external storage.



This solution uses a single Hitachi Advanced Server HA820 G3 with the following components:

- 2 × 2-port 25 GbE Intel E810-XXVDA2 PCIe card on SLOT1_Port1 and SLOT4_Port1
- Components for the internal storage option:
  - 1 × MR416i-o Gen11 24G RAID Controller card inside of the chassis
    - 5 × 1.92 TB SAS SSD internal hard drives, supporting less than or equal to 1536 GB RAM per SAP HANA node
    - 9 × 1.92 TB SAS SSD internal hard drives, supporting 2048 GB and 3072 GB RAM per SAP HANA node
    - 11 × 1.92 TB SAS SSD internal hard drives, supporting 4096 GB RAM per SAP HANA node
    - 19 × 1.92 TB SAS SSD internal hard drives, supporting 8192 GB RAM per SAP HANA node
    - 1 × 1.92 TB SAS SSD internal hard drive used as a spare drive
- Components for the external storage option:
  - 2 × SN1610E 32 Gb 2p Fibre Channel PCIe HBA cards:
    - Port 1 of SN1610E 32 Gb 2p Fibre Channel PCIe HBA on Slot3
    - Port 1 of SN1610E 32 Gb 2p Fibre Channel PCIe HBA on Slot6

Network architecture configuration

Connect the 1 GbE management port on Hitachi Advanced Server HA820 G3 to a Cisco Nexus 92348, or to any other external 1 GbE switch for management connectivity.

See the following table to make the 25 GbE network connections for the client network setup of the SAP HANA node as an uplink network:

- Connect the following to Cisco Nexus 93180YC-FX/FX3 switches or to any other external switches:
  - Port 1 of dual port Intel E810-XXVDA2 2-port 25GbE Network Adapter on PCIe_Slot1
  - Port 1 of dual port Intel E810-XXVDA2 2-port 25GbE Network Adapter on PCIe_Slot4

  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 lacp_rate=fast
  ```

  This acts as the client network for the SAP HANA node.
- If additional 25 GbE network connections are needed, connect Port 2 of both 25 GbE Intel E810-XXVDA2 PCIe cards to the Cisco Nexus 93180YC-FX/FX3 switches or to any other external switches.

PCIe Network Card	Port	Network Description
PCIe_Slot1#	1	Client network for the SAP HANA node.
	2	Free for use as an additional network for backup, SAP HANA system replication, or other purposes.
PCIe_Slot4#	1	Client network for the SAP HANA node.
	2	Free for use as an additional network for backup, SAP HANA system replication, or other purposes.
Slot#: See the image of the HA820 G3 topology for a back view of PCIe slots.		

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

This section describes the storage configurations for this environment:

- Internal storage option for Appliance
- External storage option for TDI

Internal storage for Appliance

The following storage components are required to set up a scale-up configuration for SAP HANA using internal storage with Hitachi Advanced Server HA820 G3:

- One MR416i-o Gen11 RAID Controller card inside of the chassis
- 5 × 1.92 TB SAS SSD internal hard drives configured as RAID-5 (4D+1P), supporting less than or equal to 1536 GB RAM per SAP HANA node
- 9 × 1.92 TB SAS SSD internal hard drives configured as RAID-5 (8D+1P), supporting less than or equal to 3072 GB RAM per SAP HANA node
- 11 × 1.92 TB SAS SSD internal hard drives configured as RAID-5 (10D+1P), supporting 4096 GB RAM per SAP HANA node
- 19 × 1.92 TB SAS SSD internal hard drives configured as RAID-5 (18D+1P), supporting 8192 GB RAM per SAP HANA node
- 1 × 1.92 TB SAS SSD internal hard drive used as a spare drive

Depending on the I/O and capacity requirements, storage sizing and configuration vary for the following components:

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

The following table lists the storage configurations for different memory sizes.

Configuration		Supported SAP HANA Memory Size		
		=< 1536 GB	**=< 3072 GB**	**4096 GB**
Parity Group		1 × RAID-5 (4D+1P) using 5 × 1.92TB SAS SSD	1 × RAID-5 (8D+1P) using 9 × 1.92TB SAS SSD	1 × RAID-5 (10D+1P) using 11 × 1.92TB SAS SSD
Virtual Drives	Operating System	100 GB		
	HANA Shared	1536 GB	3072 GB	4096 GB
	Log	600 GB		
	Data	4915 GB	9216 GB	12288 GB
Spare drive		1 × 1.92TB SAS SSD		

Note: If memory will be 8 TB, then use approximately 1 × RAID-5 (18D+1P) or use higher capacity disks.

External storage for TDI

Note: You can use a different storage architecture to implement this reference architecture. Hitachi Virtual Storage Platform E1090 was used as external storage for validation testing of this environment. Contact your Hitachi Vantara account representative for details and implementation services to configure an environment using external storage.

The following storage components are required to implement a scale-up SAP HANA system with Hitachi Advanced Server HA820 G3 using external storage:

- 2 × SN1610E 32Gb 2p Fibre Channel PCIe HBA cards
  - Port 1 of SN1610E 32Gb 2p Fibre Channel PCIe HBA on Slot3
  - Port 1 of SN1610E 32Gb 2p Fibre Channel PCIe HBA on Slot6
- 1 Hitachi Virtual Storage Platform G or E series storage with the following:
  - Storage drive box trays (DBS/DBN)
  - Spare drives

The following are mandatory for the external storage option with direct connection between Hitachi Virtual Storage Platform and the SN1610E 32 Gb HBA on Hitachi Advanced Server HA820 G3:

- 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 SN1610E 32 Gb HBA. If this mode is not set, then SAN storage cannot be identified from the SN1610E 32 Gb 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.
- The Host Group ID must be 00 for SAN boot.

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

The SAP HANA node requires the following storage layout:

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

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

For the storage layout, use two dynamic provisioning pools (HDP) with the specific parity groups as listed in the following table.

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) on 1.92 TB NVMe SSD drives
Log_Pool	Log LUN	RAID-6 (6D+2P) on 1.92 TB NVMe SSD drives

Two pools are used to provide storage and throughput for all supported storage sizes:

- Pool 0 is used to create virtual volumes (V-Vols) for OS, Data and Shared binaries. Additional RAID groups and pool volumes can be added to increase the size of Pool 0 to support larger memory configurations.
- Pool 1 is used to create virtual volumes for Log.

Note: Use thin provisioning to leverage benefits of automatic performance optimization and storage space savings across pools of virtual capacity.

The following table lists the minimum storage configuration for different memory sizes for HA820 G3 with VSP E1090 as an example.

	256 GB	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	8192 GB
P-VOLs	1 × RAID 6 (6D+2P) 8 × 1.92 TB NVMe SSD 4 × 2640 GB PVOL							
VVOL-OS	OS: (1 × 100 GB)							

	256 GB	512 GB	1024 GB	1536 GB	2048 GB	3072 GB	4096 GB	8192 GB
VVOL- / hana/ shared	/hana/ shared 1 × 256 GB	/hana/ shared 1 × 512 GB	/hana/shared 1 × 1024 GB					
VVOL- / hana/ data	/hana/ data 4 × 64 GB	/hana/ data 4 × 128 GB	/hana/ data 4 × 256 GB	/hana/ data 4 × 384 GB	/hana/ data 4 × 512 GB	/hana/ data 4 × 768 GB	/hana/ data 4 × 1024 GB	/hana/ data 4 × 2048 GB
P-VOLs	1 × RAID 6 (6D+2P) 8 × 1.92 TB NVMe SSD 4 × 2640 GB PVOL							
VVOL- / hana/ log	/ hana/log 4 × 32 GB	/ hana/log 4 × 64 GB	/hana/log 4 × 128 GB					

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

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 section describes how to configure SAP HANA for this solution.

File system

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

- Operating system volume
  - BTRFS Filesystem (Only for SLES) / XFS Filesystem
- SAP HANA shared volume
- Data volume
- Log volume

Device-Mapper Multipath

If you implement this solution using internal storage on Hitachi Advanced Server HA820 G3, then deactivate Device-Mapper Multipath. If you implement this solution using external storage, then activate Device-Mapper Multipath.

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 SPS 06 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 appliance configuration using Hitachi Advanced Server HA820 G3 with 1.92 TB SAS SSD internal drives and SAP HANA TDI Enterprise Storage configuration with Hitachi Virtual Storage Platform E1090 used the following.

For both the appliance and TDI solutions, SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-070_0 was tested on the following volumes for SLES 15 SP4:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions (4th Gen Intel Xeon Scalable Processors), SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-073_0 was tested on the following volumes for SLES 15 SP5:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions, SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-072_0 was tested on the following volumes for RHEL 8.6:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions, SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-074_0 was tested on the following volumes for RHEL 8.8:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions, SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-076_0 was tested on the following volumes for RHEL 9.2:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions (5th Gen Intel Xeon Scalable Processors) SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-079_0 was tested on the following volumes for SLES 15 SP5:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions (4th and 5th Gen Intel Xeon Scalable Processors) SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-079_0 was tested on the following volumes for SLES 15 SP6:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions (4th and 5th Gen Intel Xeon Scalable Processors) SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-079_0 was tested on the following volumes for RHEL 9.4:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions (4th and 5th Gen Intel Xeon Scalable Processors) SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-086_0 was tested on the following volumes for SLES 15 SP7:

- Data volume
- Log volume
- Shared volume

For both the appliance and TDI solutions (4th and 5th Gen Intel Xeon Scalable Processors) SAP HANA Hardware and Cloud Measurement Tool (HCMT) revision hcmt-086_0 was tested on the following volumes for RHEL 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 at https://me.sap.com/notes/2399079 to set up these parameters defined in the `global.ini` for SAP HANA 2.0.

Sample global.ini files

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

SUSE Enterprise Linux Server for SAP Applications

This is a sample `global.ini` file that was configured and used for validating the environment for the Appliance and TDI solution with SUSE Linux Enterprise Server for SAP Applications 15 SP5, SP6, and SP7.

```
[communication]
tcp_backlog  2048

[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
```

This is a sample `global.ini` file that was configured and used for validating the environment for the Appliance and TDI solution with SUSE Linux Enterprise Server for SAP Applications 15 SP4.

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

[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

[system_replication_communication]
enable_ssl=off
[ldap] sslMinProtocolVersion=tls12
```

Red Hat Enterprise Linux for SAP Solutions

This is a sample `global.ini` file that was configured and used for validating the environment for the Appliance and TDI solutions with Red Hat Enterprise Linux 9.2 and 9.4 for SAP Solutions.

```
[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
```

This is a sample `global.ini` file that was configured and used for validating the environment for the Appliance and TDI solutions with Red Hat Enterprise Linux 9.2, 9.4, and 9.6 for SAP Solutions.

```
[communication] tcp_backlog = 2048

[fileio] async_read_submit[log] = on
async_write_submit_active[log] = auto
async_write_submit_blocks[log] = all
async_write_submit_active[data] = auto
async_write_submit_blocks[data] = 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
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
```

Product descriptions

The following products are part of this solution.

Hitachi Integrated Systems Platform

The Hitachi Integrated Systems platform is a high-performance, low-latency, integrated, converged solution using Hitachi Virtual Storage Platform One Block storage, Hitachi Advanced Server HA820 G3, as well as HA810 G3 with Sapphire Rapids Scalable Processors.

Hitachi Advanced Server HA820 G3

With a combination of two Intel Xeon Scalable processors and high storage capacity in a 2U rack-space package, Hitachi Advanced Server HA820 G3 delivers the storage and I/O to meet the needs of converged solutions and high-performance applications in the data center.

The Intel Xeon Scalable processor family is optimized to address the growing demands on today's IT infrastructure. The server provides 32 slots for high-speed DDR5 memory, allowing up to 4 TB for 4th Gen and 5th Gen Intel Xeon Scalable Processor memory per node when 128 GB/256 GB DIMMs are used. This server supports up to 24 small form factor local storage devices and 16/32 Gbps PCIe HBA for external storage.

Intel has launched the 5th and 4th Generation of Intel Xeon Scalable Processors that feature built-in accelerators and advanced security technologies designed over decades of innovation for the most in-demand workload requirements and up to 2× networking and storage performance.

Hitachi Virtual Storage Platform E1090

The Hitachi Virtual Storage Platform E1090 storage system is a high-performance, large-capacity data storage system. The VSP E1090 all-flash arrays (AFAs) support NVMe and SAS solid-state drives (SSDs). VSP E1090 hybrid models can be configured with both SSDs and hard disk drives (HDDs).

- The NVMe flash architecture delivers consistent, low-microsecond latency, which reduces the transaction costs of latency-critical applications and delivers predictable performance to optimize storage resources.
- The hybrid architecture allows for greater scalability and provides data-in-place migration support.

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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