# Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration in a Direct-Attached Configuration

## Reference Architecture Guide

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May 2020

# Feedback

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# Revision History

| Revision | Changes | Date |
|---|---|---|
| MK-SL-199-00 | Initial release | May 8, 2020 |
| MK-SL-199-01 | Update HMO settings | July 22, 2020 |

# Table of Contents

# Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration in a Direct-Attached Configuration

## 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, 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 UCS 6454 Fabric Interconnects

- Cisco Nexus 9000 series switches

- Hitachi Virtual Storage Platform (VSP) in a direct-attached storage (DAS) configuration.

- SAP HANA

Within this direct-attached model, 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 G700. However, other Virtual Storage Platform models are supported, including the Virtual Storage Platform 5000 series. Contact your account representative for details and implementation services.

Figure 1 on page 2 shows the topology of this architecture for Cisco and Hitachi Adaptive Solutions for SAP HANA TDI, featuring Cisco UCS 6454 Fabric interconnects with a Hitachi Virtual Storage Platform G700 subsystem.

**Figure 1**
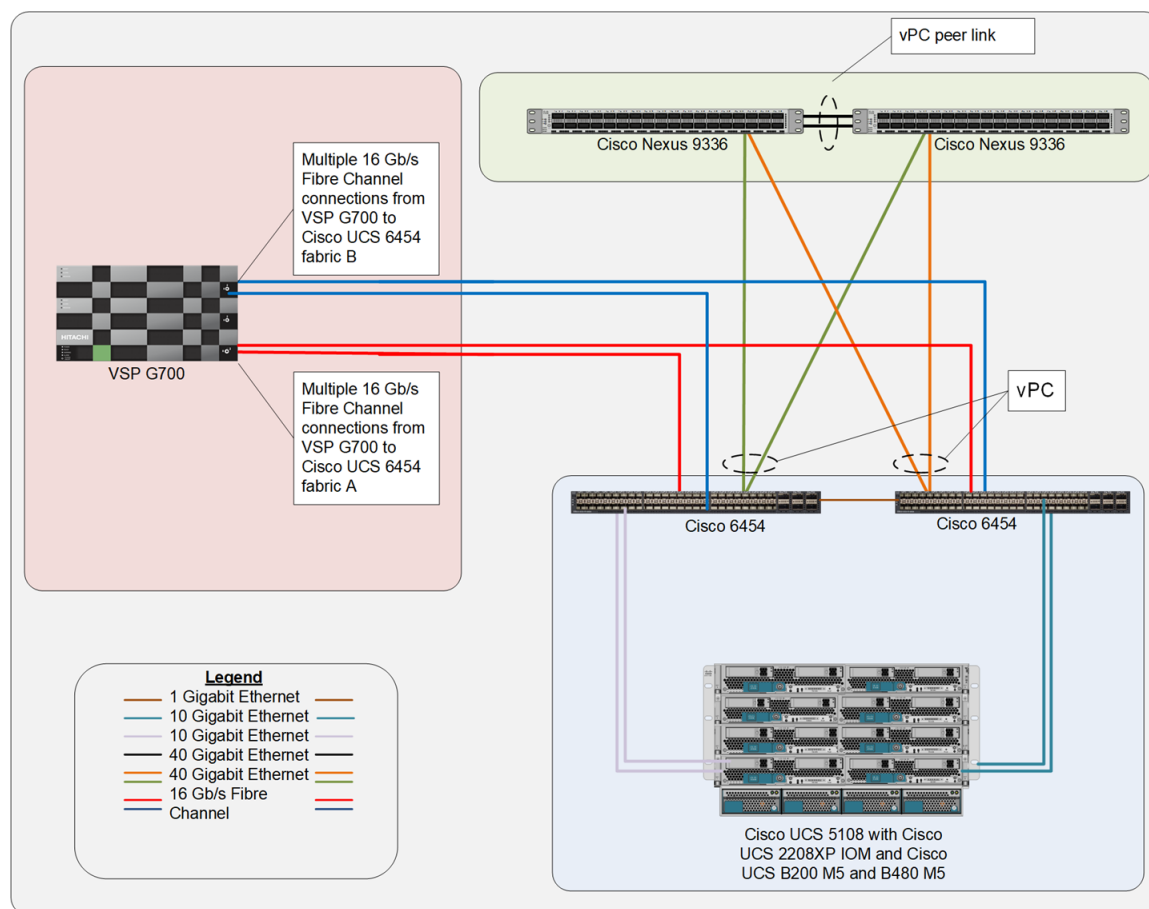


The architecture in Figure 1 was validated with 16 Gb/s Fibre Channel capability. However, both Virtual Storage Platform G700 and UCS 6454 have 32 Gb/s Fibre Channel capability.

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.

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**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 using different components.

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## Hardware Elements

Table 1 lists the hardware and firmware version validated to deploy Cisco and Hitachi Adaptive Solutions for SAP HANA TDI using a Cisco UCS DAS 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 18.

**TABLE 1. KEY HARDWARE COMPONENTS**

| Hardware Component | | Firmware Version |
|---|---|---|
| Network | Cisco Nexus 9336C-FX2 switch | Release 7.0(3) I7 (7) |
| | Cisco UCS Virtual Interface Card (VIC) 1440 (network adapter) | Release UCSB-MLOM-40G-04 |
| Compute | Cisco UCS 6454 Fabric Interconnect | Release 4.1(1b) |
| | Cisco UCS 2208XP Fabric extender I/O module (IOM) | Release 4.1(1b) |
| | Cisco UCS B200 and Cisco UCS B480 M5 Blade Servers | 4.1(1b) |
| Storage | Hitachi Virtual Storage Platform G700 | Release 88-02-03-60/00 |
| | Cisco UCS VIC (Fibre Channel) | Release 5.1 (1e) |

## 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 5000 Series

This enterprise-class, flash array evolution storage, Hitachi Virtual Storage Platform 5000 series (VSP) has an innovative, scale-out design optimized for NVMe and storage class memory. It achieves the following:

- **Agility using NVMe** – Speed, massive scaling with no performance slowdowns, intelligent tiering, and efficiency.

- **Resilience** – Superior application availability and flash resilience. Your data is always available, mitigating business risk.

- **Storage simplified** – Do more with less, integrate AI (artificial intelligence) and ML (machine learning), simplify management, and save money and time with consolidation.

## Hitachi Virtual Storage Platform F Series Family

Use Hitachi Virtual Storage Platform F series family storage for a flash-powered cloud platform for your mission critical applications. This storage meets demanding performance and uptime business needs. Extremely scalable, its 4.8 million random read IOPS allows you to consolidate more applications for more cost savings.

## Hitachi Virtual Storage Platform G Series Family

The Hitachi Virtual Storage Platform G series family enables the seamless automation of the data center. It has a broad range of efficiency technologies that deliver maximum value while making ongoing costs more predictable. You can focus on strategic projects and to consolidate more workloads while using a wide range of media choices.

Hitachi Storage Virtualization Operating System RF is at the heart of the Virtual Storage Platform F series family. It provides storage virtualization, high availability, flash optimized performance, quality of service controls, and advanced data protection. This proven, mature software provides common features, management, and interoperability across the Hitachi portfolio. This means you can reduce migration efforts, consolidate assets, reclaim space, and extend life.

Reduce risks and solve problems faster. Integrated power analytics and automation features bring artificial intelligence to your data center. Cloud-assessible monitoring tools give your product support experts access wherever they have an internet connection for fast troubleshooting and remediation.

See more about this storage at All-Flash and Hybrid Flash Storage.

# Software Elements

Table 2 describes the software products used to deploy this solution.

**TABLE 2. KEY SOFTWARE COMPONENTS**

| Software | | Software or Firmware Version |
|---|---|---|
| Operating system choices | SUSE Linux Enterprise Server for SAP applications | SLES 15 SP1 and SLES 12 SP4<br><br>▪ Enic: 4.0.0.6-802.21<br><br>▪ Fnic: 2.0.0.59-133.0 |
| | Red Hat Enterprise Linux for SAP Solutions | RHEL 7.6<br><br>▪ Enic: 4.0.0.8-802.24<br><br>▪ Fnic: 2.0.0.60-141.0 |
| Database | SAP HANA | |

## Hitachi Storage Virtualization Operating System RF

Hitachi Storage Virtualization Operating System RF (SVOS RF) spans and integrates multiple platforms. 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.

Storage Virtualization Operating System RF has been optimized for Hitachi Virtual Storage Platform 5000 series for the scale-out, NVMe design. It incorporates artificial intelligence and machine learning to reduce costs with intelligent tiering. This automates data placement to assure that your data always resides on the most optimized tier.

## 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 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-premise deployment of the SAP HANA Platform.

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

## 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. The following SAP Notes for SLES and RHEL are a good starting point for information on this topic:

- 1944799 - SAP HANA Guidelines for SLES Operating System Installation

- 2009879 - SAP HANA Guidelines for Red Hat Enterprise Linux (RHEL) Operating System

- 2235581 – SAP HANA: Supported Operating System

# Solution Design

Cisco and Hitachi Adaptive Solutions for SAP HANA TDI on Cisco UCS with Hitachi Virtual Storage Platform in a direct-attached storage configuration uses these design components:

- "Cisco UCS 5108 Blade Server Chassis with Cisco UCS 2208XP Fabric Extender" on page 7
  - "Cisco UCS B200 M5 Blade Server" on page 7
  - "Cisco UCS B480 M5 Blade Server" on page 8
- "Network Architecture Configuration" on page 8
- "Storage Configuration" on page 10
- "SAP HANA Configuration" on page 16

# 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 M5 generation) that fit in the available number of blade slots.

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 Gb/s connections into the 10/25 Gb/s ports of each Cisco UCS 6454 Fabric Interconnect, delivering high port availability.

Figure 2 shows the front and rear view of a Cisco UCS 5108 Blade Server Chassis with Cisco B200 M5 Blade Servers and Cisco B480 M5 Blade Servers.

**Figure 2**
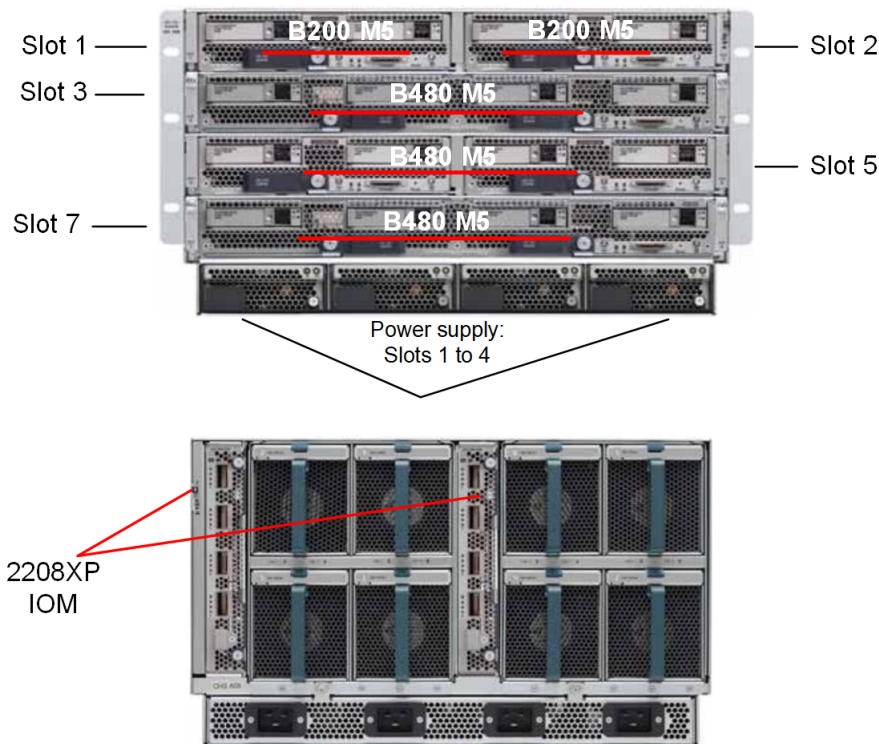


## Cisco UCS B200 M5 Blade Server

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 Gb/s throughput connectivity

Figure 3 shows Cisco UCS B200 M5 Blade Server.

**Figure 3**



## 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 Gb/s 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.

Figure 4 shows the Cisco UCS B480 M5 Blade Server.

**Figure 4**



## Network Architecture Configuration

The Cisco UCS B200 Blade Server 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 Gb/s connections to the 10/25 Gb/s ports of the Cisco UCS 6454 Fabric Interconnects, delivering high port availability.

Figure 5 shows the network topology from the UCS Blade Servers to the 6454 Fabric Interconnects through the 2208XP IOMs.
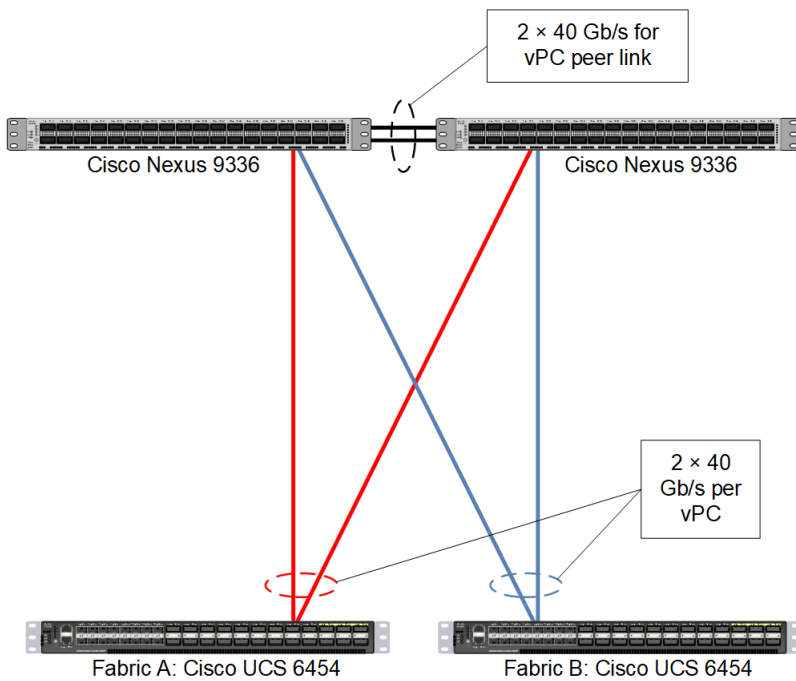
**Figure 5**
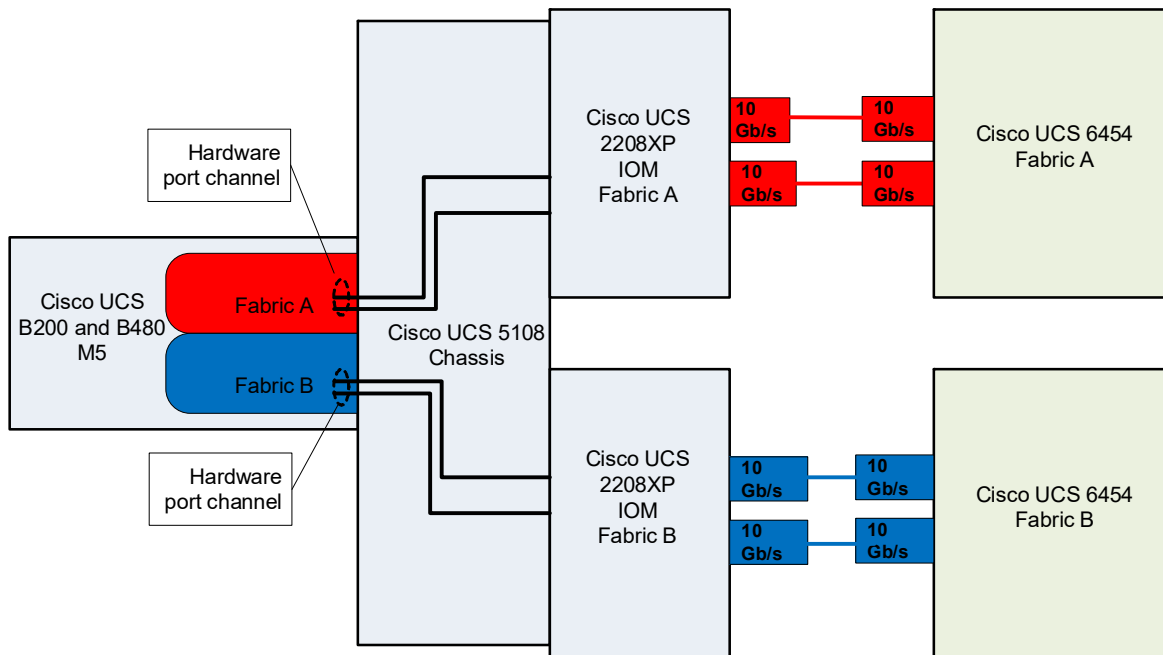


The application gateways are hosted by the pair of Cisco Nexus 9336 switches, but primary routing is passed onto an existing router that is upstream of the converged infrastructure for the SAP HANA environment.

Figure 6 on page 10 shows the upstream network for the application gateway.

**Figure 6**



For the SAP HANA nodes, you need to 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

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**Note** – Each implementation of this reference architecture can use a different storage architecture. Validation for this environment used Hitachi Virtual Storage Platform G700 as external storage.

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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 storage such as Hitachi Virtual Storage Platform G700:

▪ Cisco VIC FCoE host bus adapter (HBA)

▪ Storage, such as Hitachi Virtual Storage Platform G700

▪ Storage drive box trays (DBS drive boxes)

▪ Spare drives

Use the port properties listed in Table 3.

**TABLE 3. PORT PROPERTIES ON VIRTUAL STORAGE PLATFORM G700**

| For this setting | Use this value |
|---|---|
| Port Security | Disabled |
| Port Speed | 16 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 Table 4 for the storage layout.

**TABLE 4. DYNAMIC PROVISIONING POOLS**

| Dynamic Provisioning Pool Name | Purpose | Parity Group RAID Level and Disks |
|---|---|---|
| OS_SH_Data_Pool | Operating system LUN SAP HANA shared LUN Data LUN | RAID-10 (2D+2P), 1.9 TB SSD drives |
| Log_Pool | Log LUN | RAID-10 (2D+2P), 1.9 TB SSD drives |

The example layout in Table 5 uses the dynamic provisioning pool layout on the Hitachi Virtual Storage Platform G700 used for validation for a SAP HANA TDI solution with 768 GB in a 1.5 TB scale-up system.

**TABLE 5. EXAMPLE OF DYNAMIC PROVISIONING POOL FOR A SAP HANA TDI SOLUTION**

| Dynamic Provisioning Pool | Parity Group ID | Parity Group RAID Level and Disks | LDEV ID | LDEV Name | LDEV Size (GB) | MPU Assignment |
|---|---|---|---|---|---|---|
| OS_SH_Data_Pool | 1 | RAID 10 (2D+2P), 1.9 TB SSD Drives | 00:00:01 | OS_SH_DA_Pool_1 | 878 | MPU-10 |
| | | | 00:00:02 | OS_SH_DA_Pool_2 | 878 | MPU-20 |
| | | | 00:00:03 | OS_SH_DA_Pool_3 | 878 | MPU-10 |
| | | | 00:00:04 | OS_SH_DA_Pool_4 | 878 | MPU-20 |
| Log_Pool | 2 | RAID 10 (2D+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. Table 6 were the settings used during validation for a SAP HANA TDI solution with 768 GB in a 1.5 TB scale-up system.

**TABLE 6. EXAMPLE OF VIRTUAL VOLUMES FOR THE SAP HANA NODES FOR 768 GB WITH 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 | |

**TABLE 6. EXAMPLE OF VIRTUAL VOLUMES FOR THE SAP HANA NODES FOR 768 GB WITH 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 | 00:02:06 | 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 | |

Figure 7 on page 14 shows the storage layout for a SAP HANA system with 768 GB memory size used for validation.
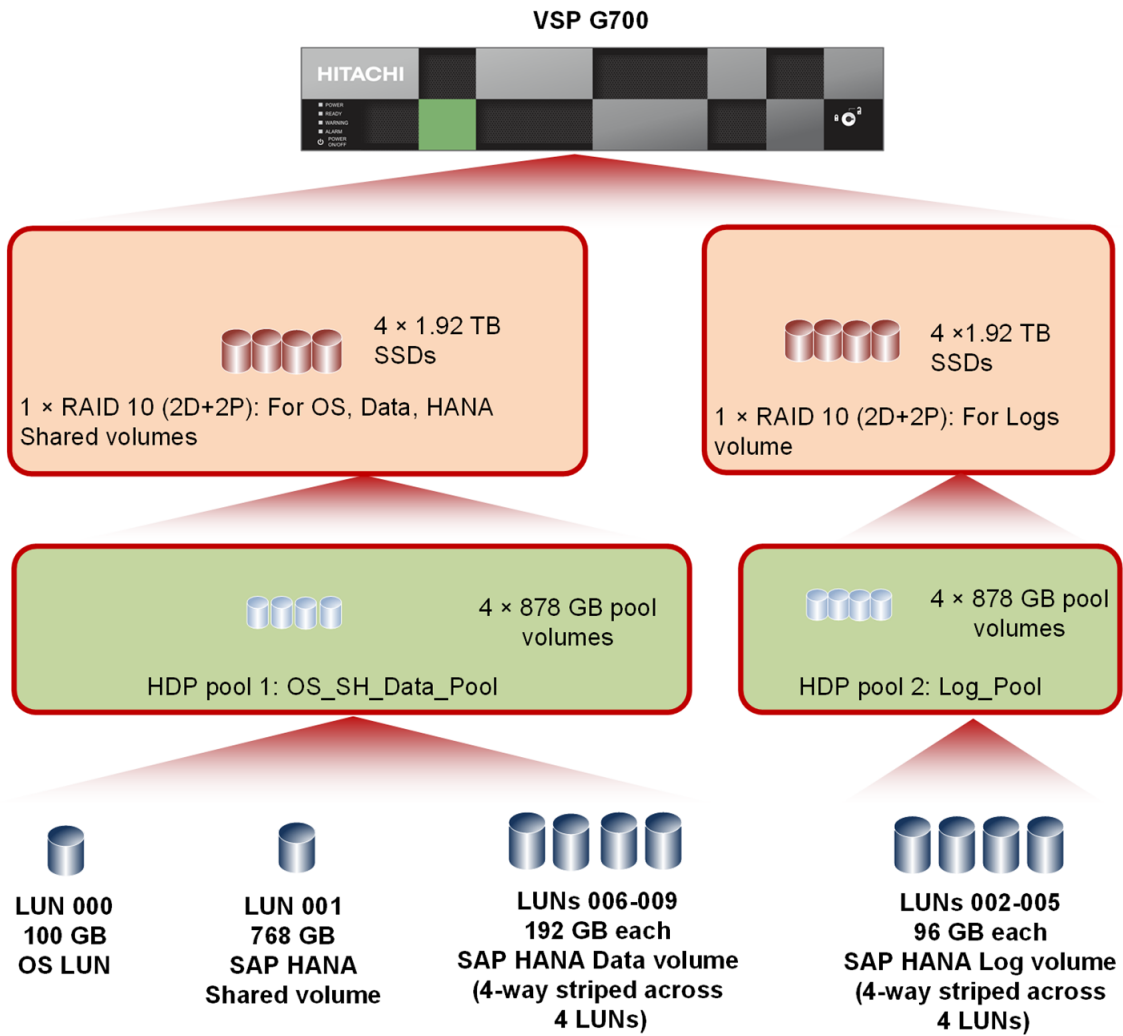
**Figure 7**

Figure 8 shows the storage layout for a SAP HANA system with 1.5 TB memory size used for validation.
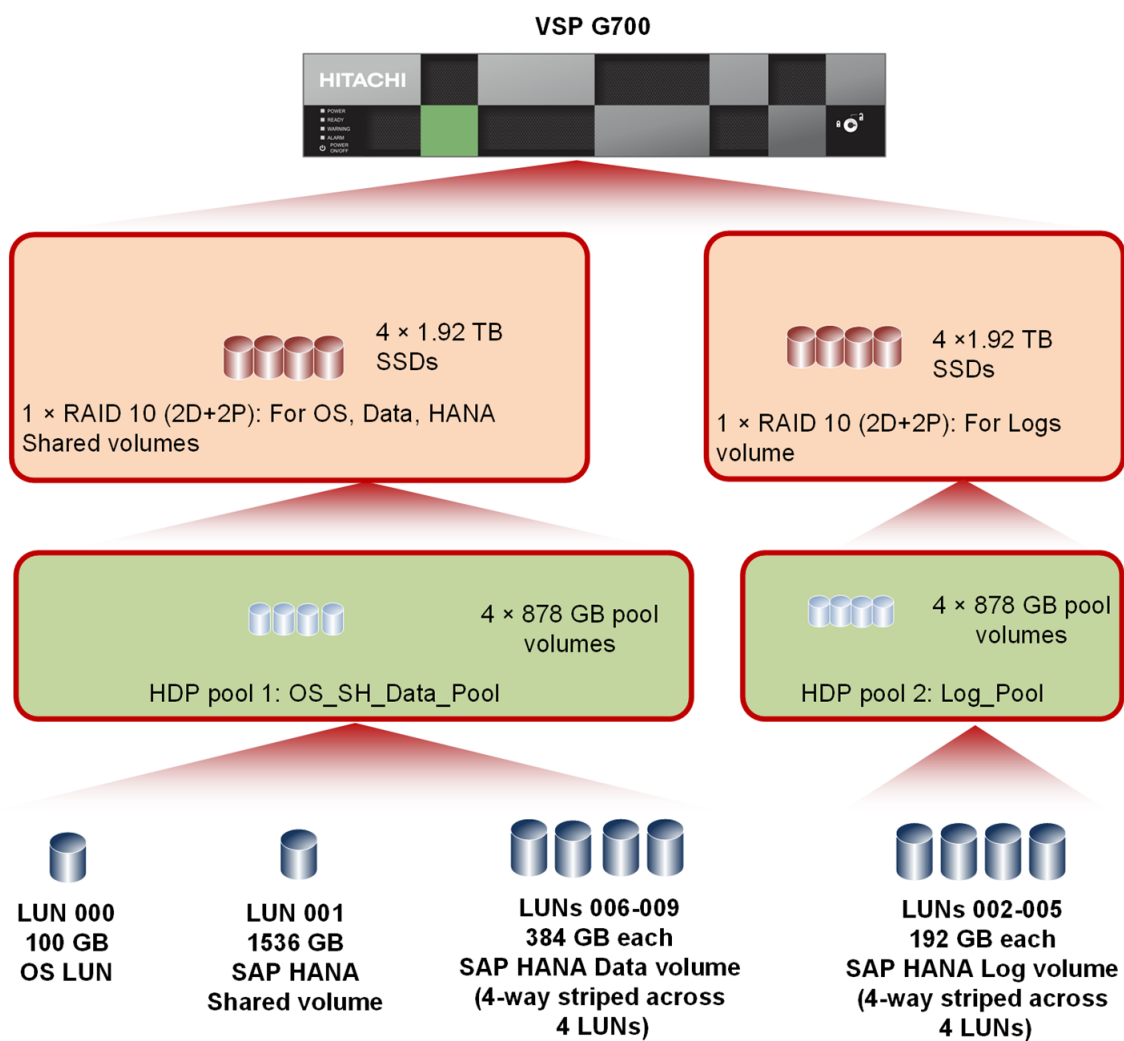
**Figure 8**

Table 7 has the LUN path assignment used when validating this environment.

**TABLE 7. EXAMPLE OF LUN PATH ASSIGNMENT**

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

# SAP HANA Configuration

Refer to 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 components validated in this integrated architecture are the following:

- **Cisco Nexus 9336C-FX2 Switch** – This switch provides100 Gb/s-capable LAN connectivity to the Cisco UCS computing resources.

- **Cisco UCS 6454 Fabric Interconnect** – This provides unified management of Cisco UCS resources and their access to storage and networks.

- **Cisco UCS B200 M5 Blade Server** – This is a high-powered, versatile blade server for SAP HANA with two CPUs.

- **Cisco UCS B480 M5 Blade Server** – This is a high-powered, versatile blade server for SAP HANA with four CPUs.

- **Hitachi Virtual Storage Platform G700** – This is a midrange, high-performance storage subsystem with optional all-flash configuration.

- **Cisco UCS Manager** – This manages the environment through the Cisco UCS 6454 Fabric Interconnect, providing stateless compute and policy-based implementation of the servers it manages.

- **SAP HANA** – This combines database, data processing, and application platform capabilities in a single in-memory platform.

In your implementation, other Hitachi Virtual Storage Platform models, including from the Virtual Storage Platform 5000 series, and Cisco products may be substituted. Contact your sales representative for more information.

The test methodology for validating this SAP HANA TDI solution using a Cisco UCS 5108 Blade Server Chassis and Cisco B200 M5 Blade Servers and Cisco B480 M5 Blade Servers in an enterprise storage configuration with Hitachi Virtual Storage Platform G700 used the following:

- SAP HANA Hardware and Cloud Measurement Tools HCMT-046_0 was tested on these volumes for SLES 15 SP1, SLES 12 SP4 and RHEL 7.6:
    - 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

# References

Use these references when designing your system.

- [UCS Hardware and Software Compatibility](#) from Cisco

- [Release Notes](#) from Cisco

- [Recommended Cisco NX-OS Releases for Cisco Nexus 9000 Series Switches](#)

- [Hitachi Interoperability Reports](#)

# For More Information

Hitachi Vantara Global Services offers experienced storage consultants, proven methodologies and a comprehensive services portfolio to assist you in implementing Hitachi products and solutions in your environment. For more information, see the [Services](#) website.

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

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

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

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