TECHNICAL PAPER

SAP HANA Tailored Data Center Integration on Hitachi Virtual Storage Platform G1500 using Dynamic Provisioning Pools

Reference Architecture Guide

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Hitachi Data Systems

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Revision History

Revision	Changes	Date
AS-561-00	Initial release	February, 2017
AS-561-01	■ Cache memory is 512 GB for all nodes (1 to 16) ■ 1 pair of MPUs for all nodes (1 to 16) ■ Update the number of drives to pass the KPI for 1 to 16 nodes	May, 2017

Contents

SAP HANA Tailored Data Center Integration 2
Hitachi Virtual Storage Platform G1500 2
Solution Overview 4
Key Solution Elements 5
Hardware Elements 5
Software Elements 7
Solution Design 8
Fibre Channel Architecture 8
Storage Architecture 9
Best Practices of Storage Setup for SAP HANA TDI 17
Engineering Validation 18

SAP HANA Tailored Data Center Integration on Hitachi Virtual Storage Platform G1500 using Dynamic Provisioning Pools

Reference Architecture Guide

Use this reference architecture guide to determine the optimized storage requirements and configuration for up to 16 supported active SAP HANA nodes on a Hitachi Virtual Storage Platform G1500 (VSP G1500) storage array. This tailored data center integration (TDI) solution provides a real time data processing environment for SAP HANA.

Virtual Storage Platform G1500 at full capacity can go beyond 16 nodes. Table 1 shows the node scalability when adding more capacity to the storage. This includes cache memory, microprocessor server blade, and controller. This reference architecture guide only covers up to 16 active SAP HANA nodes.

Table 1. Node Scalability for Virtual Storage Platform G1500 with Variable Capacity

Number of Nodes	Cache Memory (GB)	VSD Pair	Number of Controllers
4 nodes	512	1	1
8 nodes	512	1	1
12 nodes	512	1	1
16 nodes	512	1	1
Greater than 16 nodes	Greater than 512 and less than or equal to 2048	Greater than 1 and less than or equal to 4	Cache memory is less than or equal to 1024 GB: 1 Cache memory greater than 1024 GB: 2

The environment uses dynamic provisioning pools created with Hitachi Dynamic Provisioning (HDP) in a tailored data center integration (TDI) approach to implement SAP HANA, rather than the SAP HANA appliance model.

This technical paper assumes you have familiarity with the following:

- Storage area network (SAN) based storage systems
- Network attached storage (NAS) systems
- General storage concepts
- General network knowledge
- SAP HANA platform
- Common IT storage practices
- SAP HANA TDI

Note — Testing of this configuration was performed 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 matches your production environment before your production implementation of this solution.

SAP HANA Tailored Data Center Integration

Unlike a SAP HANA appliance, in which the hardware vendor preconfigures all hardware components, SAP HANA tailored data center integration deployments are customized solutions. You choose a server from any certified SAP HANA server vendors, along with storage from any certified SAP HANA enterprise storage, to implement SAP HANA. This provides you an opportunity to leverage your existing hardware to reduce the total cost of ownership (TCO).

Using this reference architecture, you can deploy SAP HANA solutions for real time data processing using hardware from any certified SAP HANA server vendor and Hitachi Virtual Storage Platform G1500. View a list of SAP-certified servers available for SAP HANA appliances in Certified SAP HANA Hardware Directory.

SAP only allows using homogeneous compute server hardware from a single hardware partner in a SAP HANA tailored data center integration. If a certificate provided by SAP is for a specific operating system, only that operating system can be used for SAP HANA implementation. Engineering validation for this solution has been performed using server blades from Hitachi Data Systems.

Every SAP-certified enterprise storage platform must meet the TDI storage KPI requirements set by SAP. Testing showed that the storage design of Hitachi Virtual Storage Platform G1500 for the SAP HANA platform meets the TDI storage KPI requirements from SAP.

It is not mandatory for you to use the same storage design that was used for storage KPI testing as demonstrated in this reference architecture guide. Refer to the SAP HANA Tailored Data Center Integration FAQ (PDF) for more details about TDI.

During validation, the scalability and storage KPI testing was performed using SAP HANA HW Configuration Check Tool (HWCCT). See SAP Note 1943937 — Hardware Configuration Check Tool — Central Note (user logon required):

- A maximum of 16 scale-up SAP HANA systems passed the TDI KPIs on a single Hitachi Virtual Storage Platform G1500 using HWCCT 1.1.

Note — Since the release of SAP HANA TDI in November 2013, several versions of HWCCT have been published. To check whether or not the hardware configuration of your SAP HANA TDI infrastructure meets the KPIs from SAP, it is crucial that you use the same version of the HWCCT used during the certification of the hardware (compute servers and storage system) for your tests. SAP Note 1943937 describes how to determine the right version of HWCCT for your tests.

Hitachi Virtual Storage Platform G1500

Hitachi Virtual Storage Platform G1500 (VSP G1500) is an enterprise platform. These enable continuous operations, self-managing policy-driven management, and agile IT that for cloud applications. Global storage virtualization enables an always-on infrastructure with enterprise-wide scalability. An ideal solution for applications that require zero recovery point and recovery time objectives, Virtual Storage Platform G1500 redefines mission-critical storage virtualization to reset expectations for the data center.

Virtual Storage Platform G1500 is equipped with the virtual storage directors. These directors use the latest generation of Intel Xeon 2.3GHz 8-core microprocessors to efficiently manage the following:

- Front-end and back-end directors
- PCI-Express interface
- Local memory
- Communication between the service processors

Virtual Storage Platform Family Feature Comparison

Hitachi Data Systems and certified SAP HANA server vendors define the final configuration for your solution. Find the feature comparison of the Virtual Storage Platform family in SAP HANA Tailored Data Center Integration on Hitachi Virtual Storage Platform Gx00 using Hitachi Dynamic Provisioning Pools Reference Architecture Guide (PDF, AS-490-00 or later).

Using the family of enterprise storage products from Hitachi Data Systems for SAP HANA TDI, including Hitachi Virtual Storage Platform family, has the following benefits:

- Increased performance when loading data into SAP HANA
- Scalable deployments of SAP HANA
- Disaster recovery with minimal performance impact to the production instance

Solution Overview

This document provides an example configuration of the storage layout for up to 16 SAP HANA nodes with variable sizes of main memory consolidated onto Hitachi Virtual Storage Platform G1500. This was tested within a Hitachi Data Systems lab environment.

This configuration uses the following storage components:

- **Hitachi Virtual Storage Platform G1500 (VSP G1500)** — Storage virtualization system designed to manage storage assets more efficiently

Figure 1 shows the server to storage configuration of this solution using Virtual Storage Platform G1500.

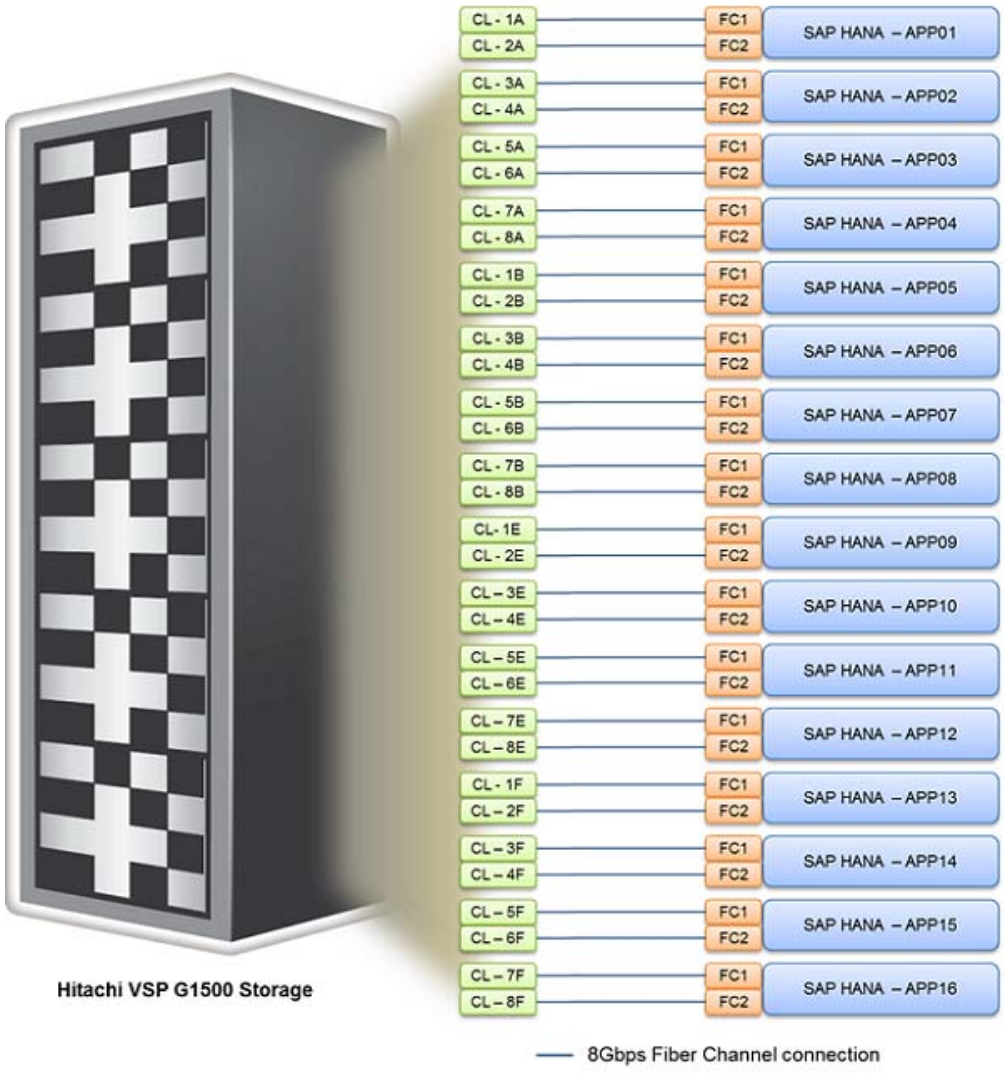


Figure 1

Key Solution Elements

These are the key hardware and software elements used for the scalability testing.

Hardware Elements

Table 2 describes the hardware used to test the maximum scalability of 16 active nodes on Hitachi Virtual Storage Platform G1500 using 512 GB cache size.

Table 2. Hardware Elements

Hardware	Quantity	Configuration	Role
Hitachi Virtual Storage Platform G1500 (VSP G1500)	1	■ Single frame ■ 1 pair VSD ■ 512 GB Cache ■ 3 DKU ■ 2 pairs CHA (16FC8) ■ 1 pair MPB	Block storage for SAP HANA nodes
Rack Optimized Server for Solutions, 2U Four Node (optional)	1	■ 2U 2.5 inch bay chassis ■ 1 server node ■ 3 server filler ■ 2 Intel Xeon E5-2620 v3 processor (6 C, 2.4 GHz, 85 W) ■ 1 heat sink on CPU0 and CPU1 ■ 2 × 16 GB DDR4 2,133 MHz memory module ■ 2 × 500 GB, 7200 RPM, 2.5 inch SATA HDD (6 Gb) ■ 1 dual port 10 GbE Intel 82599ES SFP+ OCP mezzanine card ■ 1 dual port 1 GbE Base-T Intel i350 mezzanine card ■ 1 Emulex dual port 8 Gb/sec Fibre Channel HBA	Used as a management server to run the following: ■ NTP ■ Hitachi Command Suite ■ Hi-Track Remote Monitoring system ■ SAP HANA Studio

Table 2. Hardware Elements (Continued)

Hardware	Quantity	Configuration	Role
SAP HANA Server	16	■ Rack servers or server blade chassis certified for SAP HANA with 256 GB nodes (SAP HANA Platform 1.0 SPS12, Rev. 120 or later). A list of certified configurations can be found on the SAP website	SAP HANA servers with 256 GB of main memory
Brocade ICX 6430-48 port switch (optional)	1	■ 1 GbE ■ 48 ports	1 GbE Management Network
Brocade VDX 6740-48 port switch (optional)	2	■ 10 GbE ■ 48 ports	10 GbE external connectivity

SAP HANA Server

Only certified SAP HANA servers are allowed in the SAP HANA TDI environment. They follow the exact same bill of materials as the certified SAP HANA appliance server, but without the storage or local disks. View a list of all certified servers and enterprise storage solutions in the SAP HANA Hardware Directory. For more information on SAP HANA TDI, consult SAP HANA Tailored Data Center Integration - Frequently Asked Questions.

Rack Optimized Server for Solutions, 2U Four Node (Optional)

The rack optimized server for solutions, 2U four node, is an ultra-dense design equipped with four independent nodes. It creates the flexibility to set up different workloads independently in one 2U shared infrastructure, providing optimal data center performance per dollar.

Optionally, this solution uses one node of a rack optimized server chassis for the management server. The management server acts as a central device for managing SAP HANA. Manage the following from the management server:

- Hitachi Compute Blade chassis
  - Hitachi Data Systems server blades
- Brocade ICX 6430 48 port switch
- Brocade VDX 6740 48 port switch
- SAP HANA nodes
- Hitachi Virtual Storage Platform G1500
- NTP configuration
- Hi-Track Remote Monitoring system from Hitachi Data Systems
- Hitachi Command Suite (HCS) and management of the server blades
- SAP HANA Studio

Software Elements

Table 3 describes the software products used to deploy this solution.

Table 3. Software Elements

Software	Version
SUSE Linux Enterprise Server for SAP Applications (see **Note 1**)	11 SP4
SAP HANA	1.0 SPS12, Rev. 120 or later
Hitachi Storage Navigator Modular 2	Microcode dependent
Hitachi Command Suite	8.1.2 or later
Hitachi Virtual Storage Platform G1500 Microcode	80-05-01
Microsoft® Windows Server® 2012 R2	Standard Edition ■ Used on the optional management server

Note 1. Scalability testing was carried out using SUSE Linux Enterprise Server. This solution also supports Red Hat Enterprise Linux.

Hitachi Storage Virtualization Operating System

Hitachi Storage Virtualization Operating System (SVOS) 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 includes standards-based management software on a Hitachi Command Suite (HCS) base. This provides storage configuration and control capabilities for you.

Storage Virtualization Operating System uses Hitachi Dynamic Provisioning (HDP) to provide wide striping and thin provisioning. Dynamic Provisioning provides one or more wide-striping pools across many RAID groups. Each pool has one or more dynamic provisioning virtual volumes (DP-VOLs) without initially allocating any physical space. Deploying Dynamic Provisioning avoids the routine issue of hot spots that occur on logical devices (LDEVs).

Solution Design

This is the detailed solution example design for the SAP HANA tailored data center integration with Hitachi Virtual Storage Platform G1500 with 16 active nodes.

Fibre Channel Architecture

Connect the SAP HANA platform nodes directly to the designated Hitachi Virtual Storage Platform target port.

Table 4 shows the storage port mapping.

Table 4. Storage Port Mapping

SAP HANA Platform Node	Fibre Channel Port	Hitachi Virtual Storage Platform G1500 Ports
Node001	Port 0	1A
	Port 1	2A
Node002	Port 0	3A
	Port 1	4A
Node003	Port 0	5A
	Port 1	6A
Node004	Port 0	7A
	Port 1	8A
Node005	Port 0	1B
	Port 1	2B
Node006	Port 0	3B
	Port 1	4B
Node007	Port 0	5B
	Port 1	6B
Node008	Port 0	7B
	Port 1	8B
Node009	Port 0	1E
	Port 1	2E
Node010	Port 0	3E
	Port 1	4E
Node011	Port 0	5E
	Port 1	6E
Node012	Port 0	7E
	Port 1	8E
Node013	Port 0	1F
	Port 1	2F
Node014	Port 0	3F
	Port 1	4F

Table 4. Storage Port Mapping (Continued)

SAP HANA Platform Node	Fibre Channel Port	Hitachi Virtual Storage Platform G1500 Ports
Node015	Port 0	5F
	Port 1	6F
Node016	Port 0	7F
	Port 1	8F

Storage Architecture

Each SAP HANA node needs the following storage layout:

- Operating system (OS) volume
- SAP HANA shared volume for the SAP HANA binaries and other configuration files
- Log volume
- Data volume

This SAP HANA TDI setup utilizes a dynamic pool design for the storage layout that ensures maximum utilization and optimization at a lower cost. Create these dynamic provisioning pools using Hitachi Dynamic Provisioning (HDP), a component of Hitachi Storage Virtualization Operating System (SVOS).

The layout uses two dynamic provisioning pools with the specific type of parity groups listed in the Table 5.

Table 5. Dynamic Provisioning Pools

Dynamic Provisioning Pool Name	Purpose	Parity Group RAID Level and disks
OS_SH_Data_Pool	Operating system (OS), SAP HANA Shared, and Data	RAID-6 (14D+2P) on 600 GB 10k RPM SAS HDD
Log_Pool	Log	RAID-6 (6D+2P) on 600 GB 10k RPM SAS HDD

Table 6 shows the minimum number of number of parity groups needed per dynamic provisioning pool for the various combinations of nodes on Hitachi Virtual Storage Platform G1500.

Table 6. Minimum Parity Groups Needed per Node on Virtual Storage Platform G1500 and Minimum Cache

Nodes	OS_SH_Data_Pool	Log_Pool	Cache (GB)
1	1	1	512
2	1	1	
3	1	1	
4	1	1	
5	1	1	512
6	1	1	
7	1	1	
8	3	2	

Table 6. Minimum Parity Groups Needed per Node on Virtual Storage Platform G1500 and Minimum Cache

Nodes	OS_SH_Data_Pool	Log_Pool	Cache (GB)
9	4	2	512
10	4	2	
11	8	2	
12	8	2	
13	8	2	512
14	11	3	
15	16	3	
16	17	3	

This example layout shows a dynamic provisioning pool configuration on Virtual Storage Platform G1500 used in a SAP HANA TDI solution, with four active SAP HANA systems:

- System 1: 256 GB
- System 2: 512 GB
- System 3: 1 TB
- System 4: 2 TB

Determine the smallest sizes for the data, log, and HANA shared using these formulas recommended by SAP:

Data = 1.0 × memory

Log = 0.5 × memory, for system less than or equal to 512 GB

Log = 512 GB, for systems greater than 512 GB

HANA Shared = Min(1 × memory; 1 TB)

Provision the dynamic provisioning pools with the following number of parity groups:

- Create a dynamic provisioning pool named **OS_SH_DT_Pool.** Use this to provision these volumes for the four SAP HANA systems on Virtual Storage Platform G1500 :
  - Operating system volume
  - SAP HANA shared volume
  - Data volume.
- Create a dynamic provisioning pool named **LG_Pool**. Use this to provision the Log volume for the four SAP HANA systems on Virtual Storage Platform G1500.

Table 7 lists an example of how to provision the parity groups for the dynamic provisioning pools for 16 SAP HANA nodes. Assign all the LDEVs created to the appropriate pools.

Table 7. Example of Dynamic Provisioning Pool Provisioning for 16 Nodes

Dynamic Provisioning Pool	Parity Group ID	Parity Group RAID Level and disks	LPool VOLName	Capacity	MPB Assignment
OS_SH_Data_Pool	1	RAID-6 (14D+2P) on 600 GB SAS HDD	OSD_Pool_Vol_1	1800 GB	MPB-0
			OSD_POOL_VOL_2	1800 GB	MPB-4
			OSD_POOL_VOL_3	1800 GB	MPB-0
			OSD_POOL_VOL_4	1800 GB	MPB-4
OS_SH_Data_Pool	2	RAID-6 (14D+2P) on 600 GB SAS HDD	OSD_POOL_VOL_5	1800 GB	MPB-0
			OSD_POOL_VOL_6	1800 GB	MPB-4
			OSD_POOL_VOL_7	1800 GB	MPB-0
			OSD_POOL_VOL_8	1800 GB	MPB-4
OS_SH_Data_Pool	3	RAID-6 (14D+2P) on 600 GB SAS HDD	OSD_POOL_VOL_9	1800 GB	MPB-0
			OSD_POOL_VOL_10	1800 GB	MPB-4
			OSD_POOL_VOL_11	1800 GB	MPB-0
			OSD_POOL_VOL_12	1800 GB	MPB-4
OS_SH_Data_Pool	4	RAID-6 (14D+2P) on 600 GB SAS HDD	OSD_POOL_VOL_13	1800 GB	MPB-0
			OSD_POOL_VOL_14	1800 GB	MPB-4
			OSD_POOL_VOL_15	1800 GB	MPB-0
			OSD_POOL_VOL_16	1800 GB	MPB-4
OS_SH_Data_Pool	…	RAID-6 (14D+2P) on 600 GB SAS HDD	…	…	MPB-0

Table 7. Example of Dynamic Provisioning Pool Provisioning for 16 Nodes

Dynamic Provisioning Pool	Parity Group ID	Parity Group RAID Level and disks	LPool VOLName	Capacity	MPB Assignment
OS_SH_Data _Pool	17	RAID-6 (14D+2P) on 600 GB SAS HDD	OSD_POOL_ VOL_65	1800 GB	MPB-4
			OSD_POOL_ VOL_66	1800 GB	MPB-0
			OSD_POOL_ VOL_67	1800 GB	MPB-4
			OSD_POOL_ VOL_68	1800 GB	MPB-0
LOG_Pool	18	RAID-6 (6D+2P) on 600 GB SAS HDD	LOG_POOL_ VOL_1	750 GB	MPB-4
			LOG_POOL_ VOL_2	750 GB	MPB-0
			LOG_POOL_ VOL_3	750 GB	MPB-4
			LOG_POOL_ VOL_4	750 GB	MPB-0
LOG_Pool	19	RAID-6 (6D+2P) on 600 GB SAS HDD	LOG_POOL_ VOL_5	750 GB	MPB-4
			LOG_POOL_ VOL_6	750 GB	MPB-0
			LOG_POOL_ VOL_7	750 GB	MPB-4
			LOG_POOL_ VOL_8	750 GB	MPB-0
LOG_Pool	20	RAID-6 (6D+2P) on 600 GB SAS HDD	LOG_POOL_ VOL_9	750 GB	MPB-4
			LOG_POOL_ VOL_10	750 GB	MPB-0
			LOG_POOL_ VOL_11	750 GB	MPB-4
			LOG_POOL_ VOL_12	750 GB	MPB-0

Provision the virtual volumes (VVOLs) for each of the nodes as shown in Table 8 for these dynamic provisioning pools in a configuration for 16 SAP HANA nodes:

- Operating system (OS), SAP HANA shared, and Data
- Log

Table 8. Example of VVOLs for 16 SAP HANA Nodes

Dynamic Provisioning Pool	VVOL ID	VVOL Name	VVOL Size	MPB Assignment
OS_SH_DATA_Pool	00:02:00	HANA_OS_N1	100 GB	MPB-0
	00:03:00	HANA_OS_N2	100 GB	MPB-4
	00:04:00	HANA_OS_N3	100 GB	MPB-0
	00:05:00	HANA_OS_N4	100 GB	MPB-4
	00:06:00	HANA_OS_N5	100 GB	MPB-0
	00:07:00	HANA_OS_N6	100 GB	MPB-4
	00:08:00	HANA_OS_N7	100 GB	MPB-0
	00:09:00	HANA_OS_N8	100 GB	MPB-4
	00:10:00	HANA_OS_N9	100 GB	MPB-0
	00:11:00	HANA_OS_N10	100 GB	MPB-4
	00:12:00	HANA_OS_N11	100 GB	MPB-0
	00:13:00	HANA_OS_N12	100 GB	MPB-4
	00:14:00	HANA_OS_N13	100 GB	MPB-0
	00:15:00	HANA_OS_N14	100 GB	MPB-4
	00:16:00	HANA_OS_N15	100 GB	MPB-0
	00:17:00	HANA_OS_N16	100 GB	MPB-4
	00:02:01	HANA_SH_N1	256 GB	MPB-0
	00:03:01	HANA_SH_N2	512 GB	MPB-4
	00:04:01	HANA_SH_N3	1024 GB	MPB-0
	00:05:01	HANA_SH_N4	1024 GB	MPB-4
	00:06:01	HANA_SH_N5	256 GB	MPB-0
	00:07:01	HANA_SH_N6	512 GB	MPB-4
	00:08:01	HANA_SH_N7	1024 GB	MPB-0
	00:09:01	HANA_SH_N8	1024 GB	MPB-4
	00:10:01	HANA_SH_N9	256 GB	MPB-0
	00:11:01	HANA_SH_N10	512 GB	MPB-4

Table 8. Example of VVOLs for 16 SAP HANA Nodes (Continued)

Dynamic Provisioning Pool	VVOL ID	VVOL Name	VVOL Size	MPB Assignment
OS_SH_DATA_Pool (Continued)	00:12:01	HANA_SH_N11	1024 GB	MPB-0
	00:13:01	HANA_SH_N12	1024 GB	MPB-4
	00:14:01	HANA_SH_N13	256 GB	MPB-0
	00:15:01	HANA_SH_N14	512 GB	MPB-4
	00:16:01	HANA_SH_N15	1024 GB	MPB-0
	00:17:01	HANA_SH_N16	1024 GB	MPB-4
	00:02:06	HANA_DATA_N1_1	64 GB	MPB-0
	00:02:07	HANA_DATA_N1_2	64 GB	MPB-4
	00:02:08	HANA_DATA_N1_3	64 GB	MPB-0
	00:02:09	HANA_DATA_N1_4	64 GB	MPB-4
	00:03:06	HANA_DATA_N2_1	128 GB	MPB-0
	00:03:07	HANA_DATA_N2_2	128 GB	MPB-4
	00:03:08	HANA_DATA_N2_3	128 GB	MPB-0
	00:03:09	HANA_DATA_N2_4	128 GB	MPB-4
	00:04:06	HANA_DATA_N3_1	256 GB	MPB-0
	00:04:07	HANA_DATA_N3_2	256 GB	MPB-4
	00:04:08	HANA_DATA_N3_3	256 GB	MPB-0
	00:04:09	HANA_DATA_N3_4	256 GB	MPB-4
	00:05:06	HANA_DATA_N4_1	512 GB	MPB-0
	00:05:07	HANA_DATA_N4_2	512 GB	MPB-4
	00:05:08	HANA_DATA_N4_3	512 GB	MPB-0
	00:05:09	HANA_DATA_N4_4	512 GB	MPB-4
	00:06:06	HANA_DATA_N5_1	64 GB	MPB-0
	00:06:07	HANA_DATA_N5_2	64 GB	MPB-4
	00:06:08	HANA_DATA_N5_3	64 GB	MPB-0
	00:06:09	HANA_DATA_N5_4	64 GB	MPB-4
	00:07:06	HANA_DATA_N6_1	128 GB	MPB-0
	00:07:07	HANA_DATA_N6_2	128 GB	MPB-4
	00:07:08	HANA_DATA_N6_3	128 GB	MPB-0
	00:07:09	HANA_DATA_N6_4	128 GB	MPB-4
	00:08:06	HANA_DATA_N7_1	256 GB	MPB-0
	00:08:07	HANA_DATA_N7_2	256 GB	MPB-4
	00:08:08	HANA_DATA_N7_3	256 GB	MPB-0
	00:08:09	HANA_DATA_N7_4	256 GB	MPB-4
	00:09:06	HANA_DATA_N8_1	512 GB	MPB-0
	00:09:07	HANA_DATA_N8_2	512 GB	MPB-4
	00:09:08	HANA_DATA_N8_3	512 GB	MPB-0

Table 8. Example of VVOLs for 16 SAP HANA Nodes (Continued)

Dynamic Provisioning Pool	VVOL ID	VVOL Name	VVOL Size	MPB Assignment
OS_SH_DATA_Pool (Continued)	00:09:09	HANA_DATA_N8_4	512 GB	MPB-4
	…	…	…	…
	00:17:06	HANA_DATA_N16_1	512 GB	MPB-0
	00:17:07	HANA_DATA_N16_2	512 GB	MPB-4
	00:17:08	HANA_DATA_N16_3	512 GB	MPB-0
	00:17:09	HANA_DATA_N16_4	512 GB	MPB-4
LOG_Pool	00:02:02	HANA_LOG_N1_1	32 GB	MPB-0
	00:02:03	HANA_LOG_N1_2	32 GB	MPB-4
	00:02:04	HANA_LOG_N1_3	32 GB	MPB-0
	00:02:05	HANA_LOG_N1_4	32 GB	MPB-4
	00:03:02	HANA_LOG_N2_1	64 GB	MPB-0
	00:03:03	HANA_LOG_N2_2	64 GB	MPB-4
	00:03:04	HANA_LOG_N2_3	64 GB	MPB-0
	00:03:05	HANA_LOG_N2_4	64 GB	MPB-4
	00:04:02	HANA_LOG_N3_1	128 GB	MPB-0
	00:04:03	HANA_LOG_N3_2	128 GB	MPB-4
	00:04:04	HANA_LOG_N3_3	128 GB	MPB-0
	00:04:05	HANA_LOG_N3_4	128 GB	MPB-4
	00:05:02	HANA_LOG_N4_1	128 GB	MPB-0
	00:05:03	HANA_LOG_N4_2	128 GB	MPB-4
	00:05:04	HANA_LOG_N4_3	128 GB	MPB-0
	00:05:05	HANA_LOG_N4_4	128 GB	MPB-4
	00:06:02	HANA_LOG_N5_1	32 GB	MPB-0
	00:06:03	HANA_LOG_N5_2	32 GB	MPB-4
	00:06:04	HANA_LOG_N5_3	32 GB	MPB-0
	00:06:05	HANA_LOG_N5_4	32 GB	MPB-4
	00:07:02	HANA_LOG_N6_1	64 GB	MPB-0
	00:07:03	HANA_LOG_N6_2	64 GB	MPB-4
	00:07:04	HANA_LOG_N6_3	64 GB	MPB-0
	00:07:05	HANA_LOG_N6_4	64 GB	MPB-4
	00:08:02	HANA_LOG_N7_1	128 GB	MPB-0
	00:08:03	HANA_LOG_N7_2	128 GB	MPB-4
	00:08:04	HANA_LOG_N7_3	128 GB	MPB-0
	00:08:05	HANA_LOG_N7_4	128 GB	MPB-4
	00:09:02	HANA_LOG_N8_1	128 GB	MPB-0
	00:09:03	HANA_LOG_N8_2	128 GB	MPB-4
	00:09:04	HANA_LOG_N8_3	128 GB	MPB-0

Table 8. Example of VVOLs for 16 SAP HANA Nodes (Continued)

Dynamic Provisioning Pool	VVOL ID	VVOL Name	VVOL Size	MPB Assignment
LOG_Pool (Continued)	00:09:05	HANA_LOG_N8_4	128 GB	MPB-4
	…	…	…	…
	00:17:02	HANA_LOG_N16_1	128 GB	MPB-0
	00:17:03	HANA_LOG_N16_2	128 GB	MPB-4
	00:17:04	HANA_LOG_N4_16	128 GB	MPB-0
	00:17:05	HANA_LOG_N4_16	128 GB	MPB-4

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

1. Map the operating system volume for the specific SAP HANA platform node.
2. Map the SAP HANA shared for the specific SAP HANA platform node.
3. Map the log volume and data volume for the specific SAP HANA platform node.

Table 9 shows an example configuration of the LUN path assignment for Node 1. The LUN assignment is similar for all of the other nodes.

Table 9. Example of LUN Path Assignment for Node001 in a SAP HANA Node Configuration

LUN ID	DP-VOL Name
0000	HANA_OS_N1
0001	HANA_SH_N1
0002	HANA_LOG_N1_1
0003	HANA_LOG_N1_2
0004	HANA_LOG_N1_3
0005	HANA_LOG_N1_4
0006	HANA_DATA_N1_1
0007	HANA_DATA_N1_2
0008	HANA_DATA_N1_3
0009	HANA_DATA_N1_4

Best Practices of Storage Setup for SAP HANA TDI

Follow these best practices when setting up your storage in a SAP HANA TDI environment:

- Create a dynamic provisioning pool with Hitachi Dynamic Provisioning with a minimum of two parity groups.
- Dedicate a parity group to one dynamic provisioning pool only. Do not use the parity group for other purposes if one of its LDEVs is a pool volume.
- Configure dynamic provisioning pools as RAID-6.
- Distribute the parity groups across at least two DBS trays.
- Create four VVOLs for Log volumes for each SAP HANA system. Distribute the VVOLs for the Log volumes across the various MPBs.
- Create four VVOLs for Data volumes for each SAP HANA system. Distribute the VVOLs for the Log volumes across the various MPBs.
- Setup System Operation Mode (SOM) for 908 with value “on”

Engineering Validation

The test methodology used to validate this TDI configuration used the following:

- SAP HANA HW Configuration Check Tool (HWCCT) was used for testing on Hitachi Virtual Storage Platform G1500 for the enterprise storage certification, revision hwcct-122_1.
- For the optimal use of the appliance with a SAP HANA database, the suggested parameters were used:
  - "async_read_bumit=on"
  - "async_write_submit_blocks=all"

  These parameters were setup using hdbparam, following SAP Note 2186744.

For More Information

Hitachi Data Systems 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 Hitachi Data Systems Global Services website.

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