



Backup and Recovery of Hitachi Unified Compute Platform for the SAP HANA Platform in a Scale-out Configuration using Backint for SAP HANA with Veritas NetBackup on Hitachi Protection Platform

Reference Architecture Guide

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Contents

Solution Overview	3
Key Solution Elements	5
Software Elements	8
Solution Design	9
High-level Backup Infrastructure	9
Veritas NetBackup Installation and Upgrade	10
Fibre Channel SAN Architecture	11
Network Architecture	12
Hitachi Protection Platform Storage Architecture for Backup	13
Virtual Tape Library Design for Backup	14
Configure Veritas NetBackup and SAP HANA Backint.....	14
Backup and Recovery Operations	14
Engineering Validation	17
Test Methodology	17

Backup and Recovery of Hitachi Unified Compute Platform for the SAP HANA Platform in a Scale-out Configuration using Backint for SAP HANA with Veritas NetBackup on Hitachi Protection Platform

Reference Architecture Guide

This reference architecture guide describes the backup and recovery of Hitachi Unified Compute Platform for the SAP HANA Platform in a scale-out configuration using Backint for SAP HANA, the backup and recovery application interface for the SAP HANA database.

Using Backint for SAP HANA, you can use SAP-certified third party backup tools to back up the data and log volumes of the SAP HANA system. This solution with **Backint for SAP HANA** uses Veritas NetBackup to perform backup and recovery of Hitachi Unified Compute Platform for SAP HANA in a scale-out configuration. This solution does the following:

- Performs backup and recovery of the SAP HANA database to Hitachi Protection Platform S2700 or Hitachi Protection Platform S2750 virtual tape libraries (VTLs) using Backint for SAP HANA with NetBackup.
- Performs backup and recovery of the SAP HANA database to the tape libraries attached to the Veritas NetBackup media server using Backint for SAP HANA with NetBackup.

The SAP HANA database keeps the bulk of its data in memory, using persistent storage to provide a fallback in case of failure. However, if the persistent storage is damaged due to disk failures or database corruption, you need backups provide protection against data loss.

The loss of business critical system resources and services, like SAP HANA, translate directly into lost revenue. It is critical to perform a SAP HANA database backup to secondary storage media, such as external storage or tape libraries, and to be able to restore the SAP HANA database from the backup data in case of a failure.

Deploy this reference architecture using the following components:

- Hitachi Compute Blade 500 (CB 500)
- QuantaPlex T41S-2U server with Microsoft® Windows Server® 2012, standard edition
- Hitachi Virtual Storage Platform G600 (VSP G600)
- Hitachi Unified Storage VM (HUS VM)
- Hitachi NAS Platform (HNAS 4060)
- SAP High-Performance Analytic Appliance (SAP HANA)
- Veritas NetBackup
- Hitachi Protection Platform S2700 (HPP S2700) or Hitachi Protection Platform S2750 (HPP S2750)

Use this document to design and deploy a backup and recovery environment for Hitachi Unified Compute Platform for SAP HANA in a scale-out configuration.

Testing of this solution was in the Hitachi Data Systems lab using a 2+1 scale-out configuration. However, this reference architecture supports any scale-out configuration of Unified Compute Platform for SAP HANA. For more information regarding your implementation, contact your Hitachi Data Systems Global Services Solutions (GSS) representative.

This reference architecture guide assumes that you have familiarity with the following areas:

- Storage area network-based storage systems
- Network attached storage (NAS) systems
- General storage concepts
- General network knowledge
- Common IT best practices
- SAP High-Performance Analytic Appliance (SAP HANA)

Note — These procedures were developed in a lab environment. Many things affect production environments beyond prediction or duplication in a lab environment. Follow recommended practice by conducting proof-of-concept testing for acceptable results before implementing this solution in your production environment. Test the implementation in a non-production, isolated test environment that otherwise matches your production environment.

Solution Overview

This scale-out configuration of Hitachi Unified Compute Platform for SAP HANA for backup and recovery reference solution using Backint for SAP HANA and Veritas NetBackup uses the following components:

- **Hitachi Compute Blade 500**

This is an enterprise-class server blade platform. This solution uses six 520X B1 server blades.

- **Hitachi Unified Storage VM**

Use this for SAP HANA storage.

- **QuantaPlex T41S-2U server**

This is a midrange rack mountable server platform, providing advanced systems management and redundancy options. This solution uses three QuantaPlex T41S-2U servers, as follows:

- One server acts as a central device for managing the SAP HANA appliance
- One server is a NetBackup master server
- One server is the NetBackup Media server

- **Hitachi Virtual Storage Platform G600**

This is a midrange storage solution. Use it as secondary storage attached to Hitachi Protection Platform to create the virtual tape libraries that NetBackup Media server uses to store the backup files.

- **Hitachi NAS Platform 4060**

This is a network-attached storage solution. Use it for file sharing, file server consolidation, data protection, and business-critical NAS workloads.

- **System management unit**

This provides front-end server administration and monitoring tools for Hitachi NAS Platform. It supports clustering, acting as a quorum device in a cluster.

- **SAP HANA**

This multi-purpose, in-memory database appliance analyzes transactional and analytical data.

- **Brocade VDX 6740-48 switch**

These 48-port switches provide 10 GbE connectivity to the appliance. This solution uses four Brocade VDX 6740-48 switches.

- **Brocade ICX 6430-48 switch**

One 48-port 1 GbE Brocade ICX 6430-48 switch provides the management network to the appliance.

- **Brocade 6510 Switch**

These 48-port high-performance, enterprise-class switches provide Fibre Channel connectivity for Hitachi Protection Platform. This solution uses two Brocade 6510 switches.

■ **Veritas NetBackup**

Install two QuantaPlex T41S-2U servers to act as a Veritas NetBackup media server and master server. It performs backup of the SAP HANA database to Hitachi Protection Platform S2700 or Hitachi Protection Platform S2750.

■ **Hitachi Protection Platform S2700 or Hitachi Protection Platform S2750**

- Used as a virtual tape library, Hitachi Protection Platform handles backup, restore, and archive of data storage needs for the SAP HANA database.

Figure 1 shows the configuration of this solution.

HANA 1TB XL Backint with NBU7.6.1.2 on HPP Solution Architecture

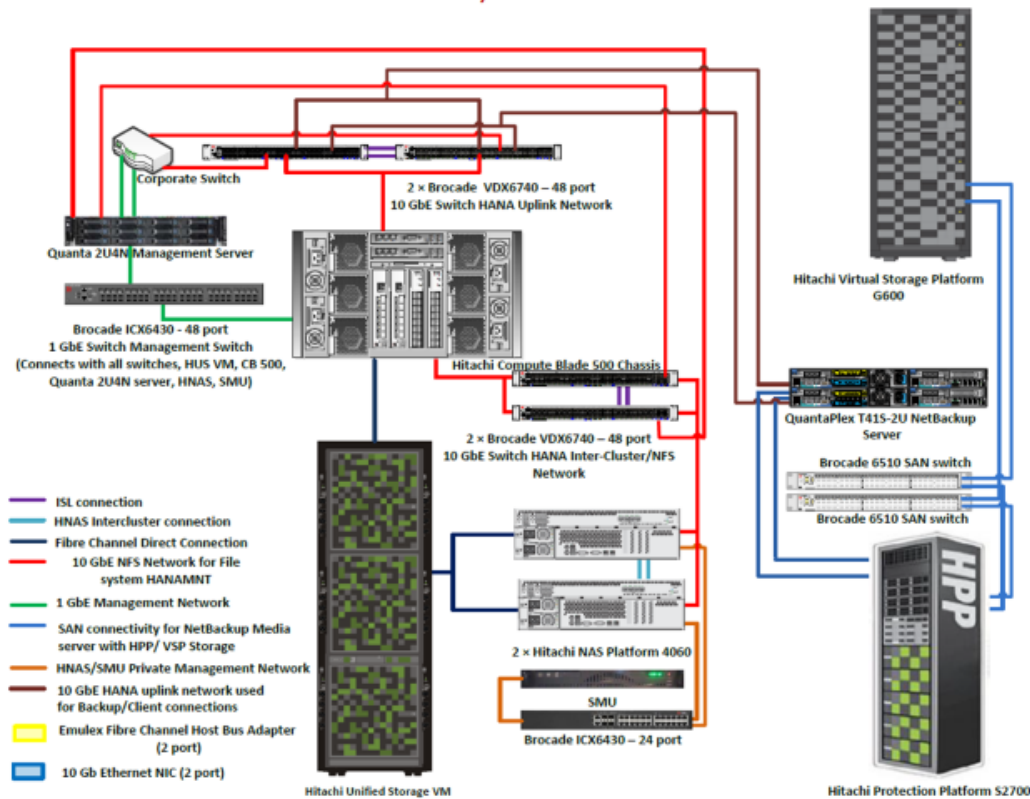


Figure 1

Key Solution Elements

These are the key hardware and software components used in this reference architecture. Hardware Elements

Table 1 describes the hardware used to deploy the backup and recovery solution for a two active node and one standby node SAP HANA configuration.

Table 1. Hardware Elements

Hardware	Quantity	Configuration	Role
Hitachi Compute Blade 500 chassis	2	<ul style="list-style-type: none"> ■ 4-blade chassis ■ 2 management modules ■ 6 cooling fan modules ■ 2 × 10 Gb/sec LAN pass-through module ■ 2 Brocade 16 Gb/sec Fibre Channel switch module (or Brocade 8 Gb/sec Fibre Channel switch module) 	Server blade chassis
520X B1 server blade	6	<ul style="list-style-type: none"> ■ 2 × 15-core processors ■ 512 GB RAM ■ 1 × 4 port 10 GbE Onboard LOM ■ 1 × 2 port Hitachi FIVE-EX Fibre Channel mezzanine card on Mezzanine Slot 2 	SAP HANA server
SMP connector module	3	<ul style="list-style-type: none"> ■ 2-blade SMP connector board ■ SMP expansion module ■ SMP connector cover 	Turn two physical blades into one SAP HANA node with 4 × 15-core processor with 512 GB of memory
Hitachi NAS Platform 4060	2	<p>For each NAS Platform server:</p> <ul style="list-style-type: none"> ■ 2 cluster ports ■ 2 × 10 GbE ports ■ 2 Fibre Channel ports ■ 2 Ethernet ports 	Provide shared file system for SAP HANA binaries, cluster-wide configuration files, and trace files
SMU	1	<ul style="list-style-type: none"> ■ 2 Intel Core 2 Duo processor E7500, 2.93 GHz CPU, 4 GB RAM 	Hitachi NAS Platform cluster management

Table 1. Hardware Elements (Continued)

Hardware	Quantity	Configuration	Role
Hitachi Unified Storage VM	1	<ul style="list-style-type: none"> Single frame 	Block storage for SAP HANA nodes and Hitachi NAS Platform
Hitachi Virtual Storage Platform G600	1	<ul style="list-style-type: none"> 2 × 8 Gb/sec Fibre Channel ports 16 GB cache memory 15 × 900 GB 10k RPM SAS drives 	Storage for backup files
QuantaPlex T41S-2U server	2	<p>3 server nodes:</p> <ul style="list-style-type: none"> Intel Xeon E5-2620 v3 processor, 2.4 GHz CPU, 32 GB RAM 2 × 500 GB 7200 RPM SATA drives 1 dual port 10 GigE Intel 82599ES SFP+OCP Mezzanine card 1 dual port 1 GigE Base-T Intel i350 Mezzanine Card Emulex Dual Port 8 Gb/sec Fibre Channel HBA 	<p>Use for the following:</p> <ul style="list-style-type: none"> Veritas NetBackup master server Veritas NetBackup media server SAP HANA management server
Hitachi Protection Platform S2700 or Hitachi Protection Platform S2750	1	<ul style="list-style-type: none"> IBM LTO Ultrium LTO-4 tape cartridge 2 × 8 Gb/sec Fibre Channel to storage 	<ul style="list-style-type: none"> Virtual Tape Library
Brocade VDX 6740-48 port switch	2	<ul style="list-style-type: none"> Two switches with distinct VLANs, each dedicated to NFS and SAP HANA inter-cluster network 	10 GbE NFS and inter-cluster network
	2	<ul style="list-style-type: none"> Two switches with one VLAN to provide uplink network to customer network infrastructure 	10 GbE backup network
Brocade ICX 6430-48 port switch	1	<ul style="list-style-type: none"> 1 GbE port 48 ports 	1 GbE Management Network
Brocade 6510-48 port switch	2	<ul style="list-style-type: none"> 48 Port Fibre Channel Switch 	Fibre Channel connection between Hitachi Protection Platform and Virtual Storage Platform G600

Hitachi Compute Blade 500

[Hitachi Compute Blade 500](#) is an enterprise-class blade server platform. It features the following:

- A balanced system architecture that eliminates bottlenecks in performance and throughput
- Configuration flexibility
- Sustainable power-saving capabilities
- Fast server failure recovery using an N+1 cold standby design that allows replacing failed servers within minutes

This configuration uses six 520X B1 server blades in the 2+1 SAP HANA configuration with two active nodes plus one standby node. Each node has two server blades connected using the two-blade SMP interface connector. This creates a SAP HANA node with a four-socket SMP node, 60 cores, and 1024 GB of memory.

Table 2 lists the specifications for 520X B1 server blades that are used in this solution as SAP HANA nodes.

Table 2. 520X B1 Server Blade Configuration

Feature	Configuration
Processors	<ul style="list-style-type: none"> ■ Intel Xeon processor E7-8800 ■ 2 processors per server blade
Processor SKU	<ul style="list-style-type: none"> ■ Intel Xeon processor E7-8880 v2
Processor frequency	<ul style="list-style-type: none"> ■ 2.50 GHz
Processor cores	<ul style="list-style-type: none"> ■ 15 cores
Memory DIMM slots	<ul style="list-style-type: none"> ■ Total of 48 of which 32 are populated
Memory	<ul style="list-style-type: none"> ■ 512 GB RAM ■ 16 GB DIMMs
Network ports	<ul style="list-style-type: none"> ■ 4 × 10 Gb Ethernet (LoM)
Other interfaces	<ul style="list-style-type: none"> ■ 1 × USB 3.0 port ■ KVM connector (VGA, COM, USB 2.0 2-port)

Hitachi NAS Platform 4060

[Hitachi NAS Platform](#) is an advanced and integrated network attached storage (NAS) solution. It provides a powerful tool for file sharing, file server consolidation, data protection, and business-critical NAS workloads.

- Powerful hardware-accelerated file system with multi-protocol file services, dynamic provisioning, intelligent tiering, virtualization, and cloud infrastructure.
- Seamless integration with Hitachi SAN storage, [Hitachi Command Suite](#), and [Hitachi Data Discovery Suite](#) for advanced search and index.
- Integration with [Hitachi Content Platform](#) for active archiving, regulatory compliance, and large object storage for cloud infrastructure.

This solution uses NAS Platform 4060 file system modules to share of the SAP HANA global binary and configuration files. There are two NAS Platform 4060 server nodes.

The system management unit provides front-end server administration and monitoring tools. It supports clustering, acting as a quorum device in a cluster.

Hitachi Virtual Storage Platform Gx00 Models

[Hitachi Virtual Storage Platform Gx00 models](#) are based on industry-leading enterprise storage technology. With flash-optimized performance, these systems provide advanced capabilities previously available only in high-end storage arrays. With the Virtual Storage Platform Gx00 models, you can build a high performance, software-defined infrastructure to transform data into valuable information.

Hitachi Storage Virtualization Operating System provides storage virtualization, high availability, superior performance, and advanced data protection for all Virtual Storage Platform Gx00 models. This proven, mature software provides common features to consolidate assets, reclaim space, extend life, and reduce migration effort. New management software improves ease of use to save time and reduce complexity. The infrastructure of Storage Virtualization Operating System creates a management framework for improved IT response to business demands.

Software Elements

Table 3 describes the software used to deploy this solution.

Table 3. Software Elements

Software	Version
Hitachi NAS Platform firmware	11.3.3450.21
SMU software	11.3.3450.03
Hitachi Storage Navigator Modular 2	Microcode dependent
SAP HANA	SAP HANA 1.0 SPS10, Rev. 102 or later
SUSE Linux Enterprise Server for SAP Applications	11 SP3
Veritas NetBackup	7.6.1.2 (for NetBackup master and media sever)
Veritas NetBackup for the SAP HANA Agent	7.6.1.2 (for HANA Nodes)
Microsoft Windows Server 2012 R2, Standard Edition	On QuantaPlex T41S-2U server nodes: <ul style="list-style-type: none"> ■ Veritas NetBackup master server ■ Veritas NetBackup media server ■ Management server

Solution Design

The detailed design for Hitachi Unified Compute Platform for SAP HANA for backup and recovery solution using Backint for SAP HANA and Veritas NetBackup includes the following:

- “High-level Backup Infrastructure” on page 9
- “Veritas NetBackup Installation and Upgrade” on page 10
- “Fibre Channel SAN Architecture” on page 11
- “Network Architecture” on page 12
- “Hitachi Protection Platform Storage Architecture for Backup” on page 13
- “Virtual Tape Library Design for Backup” on page 14
- “Configure Veritas NetBackup and SAP HANA Backint” on page 14
- “Backup and Recovery Operations” on page 14

This paper mainly provides details of the architecture and configuration needed to perform backup and recovery. For specific details on the configuration of Hitachi Unified Compute Platform for SAP HANA using a scale-out 2+1 configuration, refer to [Hitachi Unified Compute Platform for the SAP HANA Platform in a Scale-out 1 TB Configuration of Two Active Nodes and One Standby Node Reference Architecture Guide](#) (AS-304-02 or later). Contact your hardware vendor for an appliance-specific reference architecture guide.

Note — This solution works for all of the versions listed in [NetBackup 7.6.1 Maintenance Release 2](#) with Hitachi Protection Platform S2700 and Hitachi Protection Platform S2750.

High-level Backup Infrastructure

The backup and recovery operations of a 2+1 configuration in this solution by storing the SAP HANA database backup data on the Hitachi Protection Platform virtual tape library are illustrated in Figure 1.

The backup infrastructure is not a part of the standard scale-out configuration of Hitachi Unified Compute Platform for SAP HANA. The recommendation is to use existing servers and storage that are part your backup infrastructure to implement this solution.

In this solution, use two QuantaPlex T41S-2U servers with Microsoft Windows Server 2012 R2, standard edition, for the Veritas NetBackup application installation.

- One server acts as the NetBackup master server.
- One server acts as the NetBackup media server.

Attach the NetBackup media server to Hitachi Protection Platform S2700 or Hitachi Protection Platform S2750 to store the SAP HANA database backup files.

Install NetBackup Client software on all the three SAP HANA nodes in the HANA cluster. After configuring the NetBackup master and media server with recommended settings for use with SAP HANA, configure the NetBackup client (HANA nodes) to integrate with the NetBackup server using Backint for SAP HANA.

When initiating a backup or recovery process, NetBackup for the SAP HANA Agent runs on the SAP HANA nodes. It communicates with the NetBackup servers through the Backint interface to perform backup or recovery tasks.

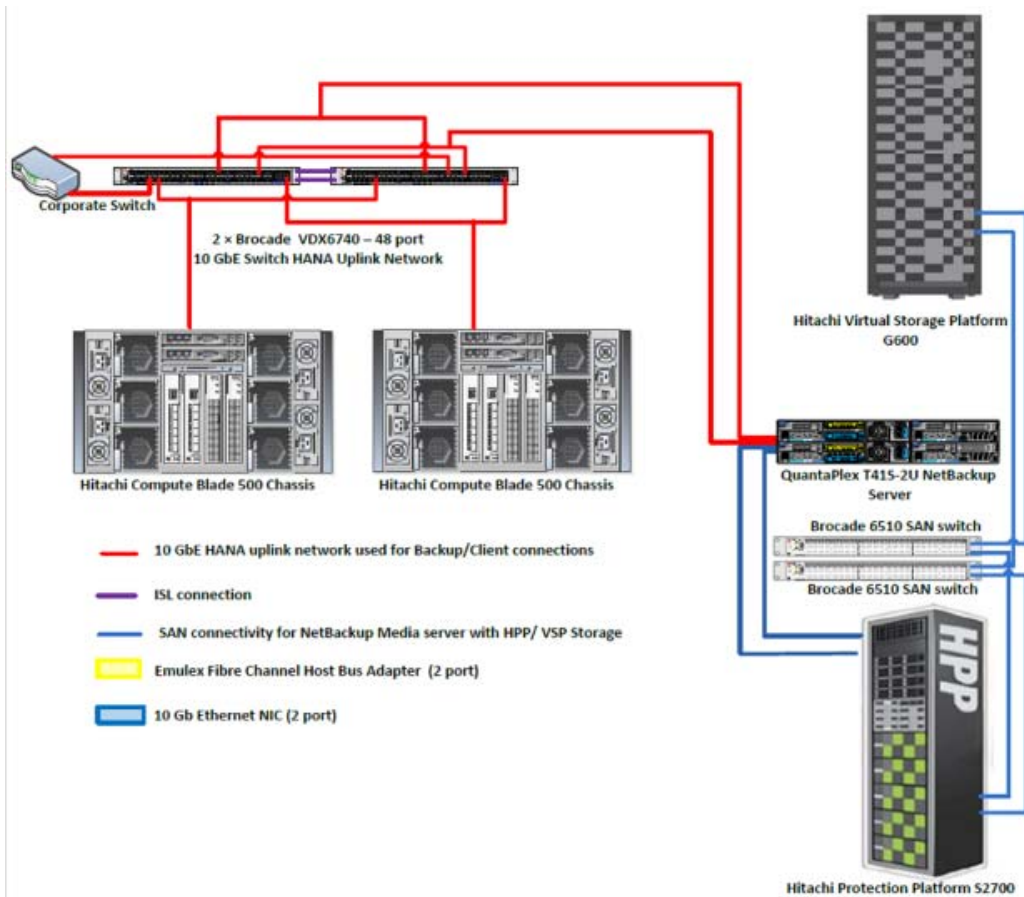


Figure 2

Veritas NetBackup Installation and Upgrade

This is how your install and upgrade Veritas NetBackup in this solution.

Install Veritas NetBackup Master Server and Media Server

Install Veritas NetBackup master server and media server on the two QuantaPlex T415-2U servers with Microsoft Windows Server 2012 R2 (standard edition). Support for NetBackup master server and media server is described in the [NetBackup 7.0-7.6.x Operating System Compatibility List](#). For detailed steps on how to install and upgrade NetBackup master server and media server, refer to [NetBackup 7.6.1 Installation Guide](#) and [NetBackup 7.6 Upgrade Guide](#).

Install Veritas NetBackup Client

Install Veritas NetBackup master server and media server before installing the Veritas NetBackup client software on all of the SAP HANA server nodes.

There is added support with NetBackup 7.6.1.2 for the SAP HANA appliance SPS 10 on SLES 11 SP3. Refer to the [NetBackup 7.0-7.6.x Database Agent Compatibility list](#) for further details.

For detailed steps on how to install and upgrade NetBackup client software on SAP HANA nodes, refer to [NetBackup 7.6.1 Installation Guide](#) and [NetBackup 7.6.1 Upgrade Guide](#).

For the NetBackup client software installation, use the SAP HANA backup network name assigned to each of the SAP HANA nodes as the NetBackup client name.

Fibre Channel SAN Architecture

The Fibre Channel SAN architecture comprises two Brocade 6510 switches to connect storage port 1A and storage port 2A on Hitachi Virtual Storage Platform G600. This is where the Hitachi Protection Platform ports are connected.

The PCI-E slot of the QuantaPlex T41S-2U server (NetBackup media server) has one Emulex 8 Gb/sec 2-port host bus adapter. Connect both of the ports on the Emulex host bus adapter to Hitachi Protection Platform directly, as shown in Figure 3.

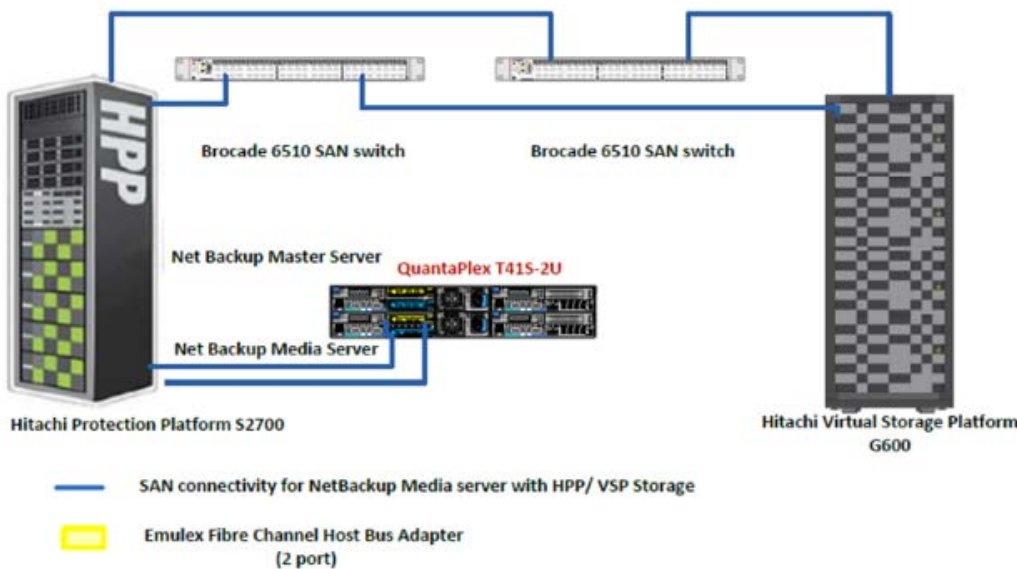


Figure 3

Table 4 shows the port mapping on the SAN switch.

Table 4. Port Mapping on the Brocade 6510 SAN Switch

Node, Slot, Port	Fibre Channel Switch
Hitachi Virtual Storage Platform G600, Fibre Channel, Port 0A	Brocade 6510, Switch A, Port 4
Hitachi Virtual Storage Platform G600, Fibre Channel, Port 1A	Brocade 6510, Switch B, Port 4
Hitachi Protection Platform, Fibre Channel, Port 0	Brocade 6510, Switch A, Port 5
Hitachi Protection Platform, Fibre Channel, Port 1	Brocade 6510, Switch B, Port 5

Table 5 shows the SAN zoning details.

Table 5. SAN Zoning

Brocade 6510 Switch	Member of Alias	Member of Zone
Switch A	VSPG600_0A	VSP_HPP_VTL
Switch A	HPP_Port0	VSP_HPP_VTL
Switch B	VSPG600_1A	VSP_HPP_VTL
Switch B	HPP_Port1	VSP_HPP_VTL

Network Architecture

The network architecture needed to backup up the data from the SAP HANA nodes requires a 10 Gb/sec LAN pass-through module network architecture.

The QuantaPlex T41S-2U server, as the Veritas NetBackup master server and media server, requires a 10 GbE Intel 82599ES SFP+OCP mezzanine card.

Connect the SAP HANA backup network ports on the 10 Gb/sec LAN pass-through module of the SAP HANA nodes to the Brocade VDX6740-48 port switch.

Use the VLAN for the SAP HANA uplink network connections to set up the Brocade VDX6740-48 port switch.

Each of the ports on both of the Brocade VDX6740-48 port switches, and the backup network ports corresponding to bond3 of the SUSE operating system on the SAP HANA nodes, utilize LACP. Assign an IP address for bond3 corresponding to the VLAN for the SAP HANA backup network.

Connect the 10 GbE Mezzanine card on the NetBackup master server and media server to the corporate 10 GbE switch. Connect this to the Brocade VDX6740-48 port switch for the SAP HANA backup network for 10 GbE backup network connections.

The NetBackup master server and NetBackup media server communicate with the SAP HANA nodes through the 10 GbE backup network.

Figure 4 illustrates the network architecture for the single SAP HANA node in this solution.

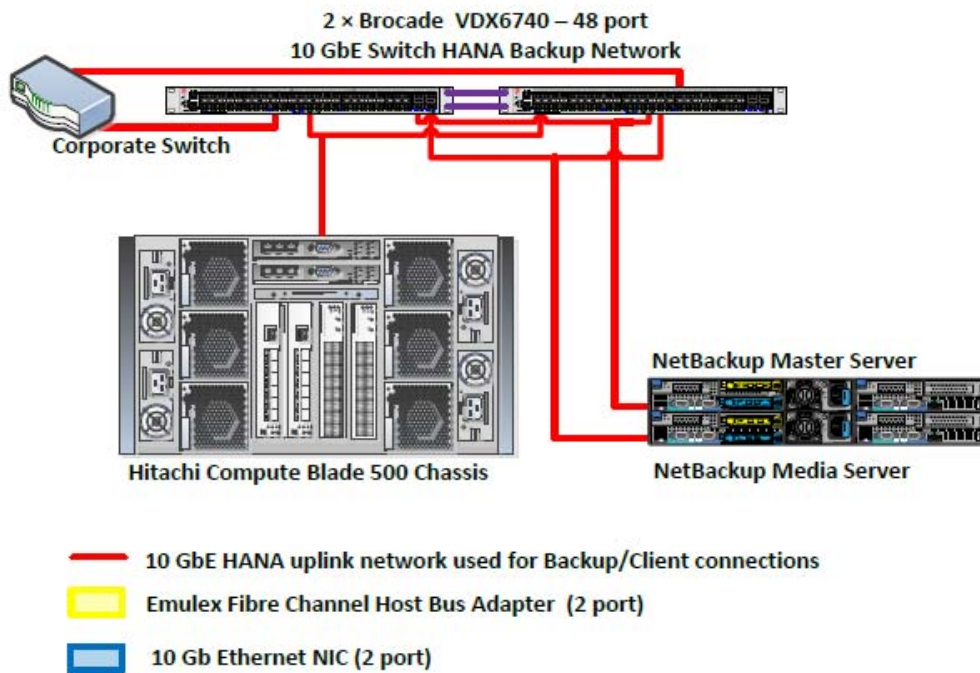


Figure 4

Hitachi Protection Platform Storage Architecture for Backup

You can perform a complete, differential, and incremental backup for SAP HANA data of the payload (actual) data.

- **To backup one complete system**, allocate a total backup space equal to the following:
 - Three times the main memory size to accommodate the data area backup
 - One times the main memory size to accommodate the log area backup
- **To backup one single node**, allocate a total backup space equal to the following:
 - Four times the main memory size

For the scale-out configuration of this SAP HANA system, the storage space requirement for the backup of a single node is equal to the following:

$$(\text{RAM per node}) \times (\text{Number of Nodes}) \times 4$$

Note — Refer to [Hitachi Protection Platform S Series v7.3 User Manual](#) and [Hitachi Protection Platform S Series Software Installation Instructions](#) to create backend storage and connect the Veritas NetBackup media server to the Hitachi Protection Platform node to create virtual tape libraries.

Configure the backend storage and create the virtual tape libraries by following instructions in *Hitachi Protection Platform S Series v7.3 User Manual* and *Hitachi Protection Platform S Series Software Installation Instructions*.

Virtual Tape Library Design for Backup

Refer to [Hitachi Protection Platform S-Series v7.3 Series User Manual](#) to perform the following:

- Create the LUNs on Hitachi Virtual Storage Platform Gx00.
- Create the virtual tape libraries on Hitachi Protection Platform.
- On the Veritas NetBackup media server, mount the virtual tape library and import the Robot Inventory to attach the backup media to NetBackup Server.

There is no difference in the virtual tape library design for Hitachi Protection Platform S2700 or Hitachi Protection Platform S2750.

Configure Veritas NetBackup and SAP HANA Backint

To complete the Veritas NetBackup configuration for SAP HANA refer to “Configuring NetBackup for SAP” in [Symantec NetBackup for SAP Administrator's Guide for UNIX Windows, and Linux \(Release 7.5\)](#).

Backup and Recovery Operations

Normal SAP HANA database operation automatically saves data from memory to disk at regular savepoints. Additionally, all data changes are recorded in the redo log. The redo log is saved from memory to disk with each committed database transaction. After a power failure, restart the database like any disk-based database, returning to its last consistent state by replaying the redo log since the last savepoint.

While savepoints and log writing protect data against certain failures such as power, memory, or module failures, savepoints do not help if the persistent storage is damaged. To protect against data loss due to disk failures or logical database corruption requires backups to a secondary storage media, such as storage disks or tape libraries.

Performing a complete backup of the SAP HANA database is a backup of the payload (actual) data in the data area. It is important to perform regular automatic backups of the log volume in order to do a point-in-time recovery of the SAP HANA database to the most recent state in the event of failure. With the automatic log backup enabled using Backint, the performance of log backups is regular and automatic.

You need to backup of the configuration files manually. Backint only automatically performs a complete data backup and automatic log backup.

For the available backup tools that you use with Backint for SAP HANA for the data and redo logs of the SAP HANA system, see to [SAP Note 1730932](#) (user name and password required). This reference solution uses Backint for SAP HANA integration with Veritas NetBackup,. Currently NetBackup is the only available third party backup tool to integrate with Backint for SAP HANA.

Initiate the backup and recovery process from the SAP HANA Studio. Initiate recovery from SAP HANA Studio or SQL statements run as the <sid>adm user.

Currently, you cannot initiate backup or restore operations from the NetBackup server.

Refer to [SAP HANA Administration guide](#) for details on the available scheduling options to perform the backup and recovery tasks.

Backup Operations

When Backup initiates a backup or recovery task from SAP HANA Studio or an SQL statement, SAP HANA creates a data stream pipe. The SAP HANA agent that runs on the SAP HANA node communicates with the Veritas NetBackup servers through the Backupint interface using these data stream pipes to perform backup or recovery processes.

During backup, each SAP HANA service has its own data stream pipe for writing backup data. NetBackup for SAP HANA Agent reads the data stream from these pipes and passes them to the NetBackup server, which then is saved to Hitachi Protection Platform virtual tape libraries (on Hitachi Virtual Storage Platform G600 through Hitachi Protection Platform), based on the policy storage chosen as the destination in the NetBackup server backup policy.

Finally, SAP HANA transmits backup catalog information before the SAP HANA agent on NetBackup writes a file reporting the result and administrative information such as backup identifiers.

Figure 5 illustrates backup operations.

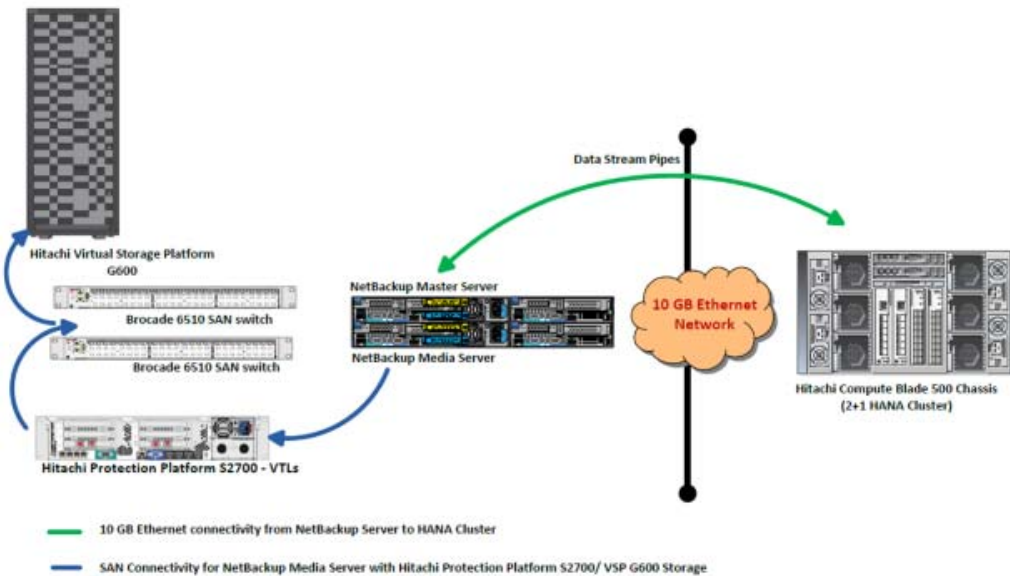


Figure 5

Recovery Operations

When initiating a recovery task from SAP HANA Studio or an SQL statement, SAP HANA establishes communication with NetBackup for SAP HANA Agent using data stream pipes. SAP HANA requests the backup data from the Veritas NetBackup server, which reads the data from Hitachi Protection Platform virtual tape libraries.

NetBackup for SAP HANA Agent then streams the backup data received from the NetBackup server through the data stream pipes to the SAP HANA services to perform the recovery.

As a final step, the NetBackup for SAP HANA Agent writes a file reporting the result of the operation.

Note — Refer to [SAP HANA log restore from tape hangs and then fails](#) on the Veritas website before performing a restore operation.

Figure 6 illustrates restore operations.

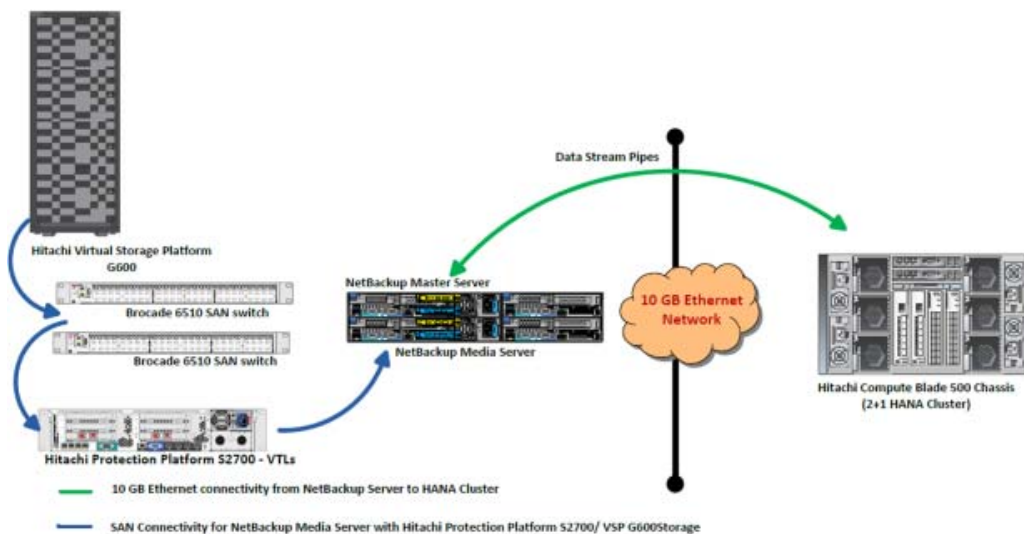


Figure 6

Engineering Validation

Validation of the backup and recovery solution of the scale-out configuration of Hitachi Unified Compute Platform for SAP HANA using Backint for SAP HANA with Veritas NetBackup on Hitachi Protection Platform was conducted in the Hitachi Data Systems Lab.

Test Methodology

Validation testing included the backup and recovery operations discussed in this reference architecture guide.

- Successful complete, differential, and incremental backups were performed, along with log backups to the Hitachi Protection Platform S2700 virtual tape libraries.
- Successful recovery of the SAP HANA database was made from backup data stored on Hitachi Virtual Storage Platform G600 through the Hitachi Protection Platform virtual tape libraries.
- The recovery option with all the recovery types were performed from SAP HANA Studio and SQL statements run as <sid>adm user. The tested recovery types were the following:
 - Recover the database to its most recent state
 - Recover the database to a specific point in time
 - Recover the database to a specific data backup

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