

WHITE PAPER

Hitachi Cloud Foundation for Oracle Database

Reference Architecture Guide

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Hitachi Cloud Foundation for Oracle Database

Reference Architecture Guide

Use Hitachi Cloud Foundation for Oracle Database to provide reliability, high availability, scalability, and performance while processing small to large Oracle workloads. This reference architecture is a validated cloud solution for Oracle Database 13c running on Oracle VM 3.4.1, with virtual machine using Oracle Linux Operating System 7.2.

Cloud is fast, agile, and aims to be a more efficient use of resources. Cloud deployment aims for IT transformation. You want a fast and flexible journey to reduce cost, quickly scale up or down, and—most importantly—be easy and intuitive.

This solution integrates many innovative technologies from Hitachi Data Systems and from Oracle. To create a Oracle database cloud service, this environment uses Hitachi Unified Compute Platform (UCP) with Oracle Virtual Machine and Oracle Enterprise Manager (OEM) Cloud Control 13c. Unified Compute Platform has Hitachi Virtual Storage Platform G800 (VSP G800) and Hitachi Compute Blade 2500 (CB 2500) for storage and computing resources. It provides a base of the following to migrate to Oracle database cloud service:

- Quick database deployment in cloud
- Validation of virtual machine configurations
- Central monitoring of Hitachi storage and servers, virtual machines, database, and applications

This solution provides flexibility to slice and dice storage and compute resources based on unique requirements. Deploy small databases as well as huge databases, as long as there are resources available.

As a cloud solution, this environment features simple provisioning, chargeback/showback, and centralized user interface using Oracle Enterprise Manager Cloud Control 13c.

This reference architecture guide includes best practices for using Cloud Foundation on Unified Compute Platform with the following adapters:

- Hitachi Storage Adapter for Oracle Enterprise Manager
- Hitachi Storage Adapter for Oracle VM
- Hitachi Server Adapter for Oracle Enterprise Manager

This document is for the following audiences:

- Database administrators
- Storage administrators
- System administrators

To use this reference architecture guide, you need familiarity with the following:

- Storage area networks
- Oracle Database administration
- Oracle Database 12c Release 1 with Oracle RAC option
- Oracle Linux
- Oracle Virtual Machine
- Oracle Enterprise Manager Cloud Control 13c

Note — These practices 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

Use this reference architecture to implement Hitachi Cloud Foundation for Oracle Database using Hitachi Unified Compute Platform 6000 for Oracle Database. Cloud Foundation includes the following components:

- Hitachi Compute Blade 2500 (CB 2500) with five 520H B3 server blades
- Hitachi Virtual Storage Platform G800 (VSP G800)
- Rack optimized server for solutions, 2U single node
- Brocade 16 Gb/sec SAN infrastructure
- Brocade 10 GbE LAN infrastructure
- Optional industry standard load balancer

Figure 1 on page 3 shows high-level infrastructure for this solution.

Oracle VM provides the foundation for the cloud infrastructure. It provides fully integrated enterprise management from disk to applications to cloud. It provides rapid enterprise application deployment with Oracle VM templates.

This solution uses an Oracle VM server pool created with multiple 520H B3 server blades to deploy virtual machines for an Oracle RAC database and Oracle applications. Cloud Foundation provides the flexibility to add or remove servers in the Oracle VM server, pool based on business requirement.

This environment may use 520H B4 servers blades in place of 520H B3 server blades.

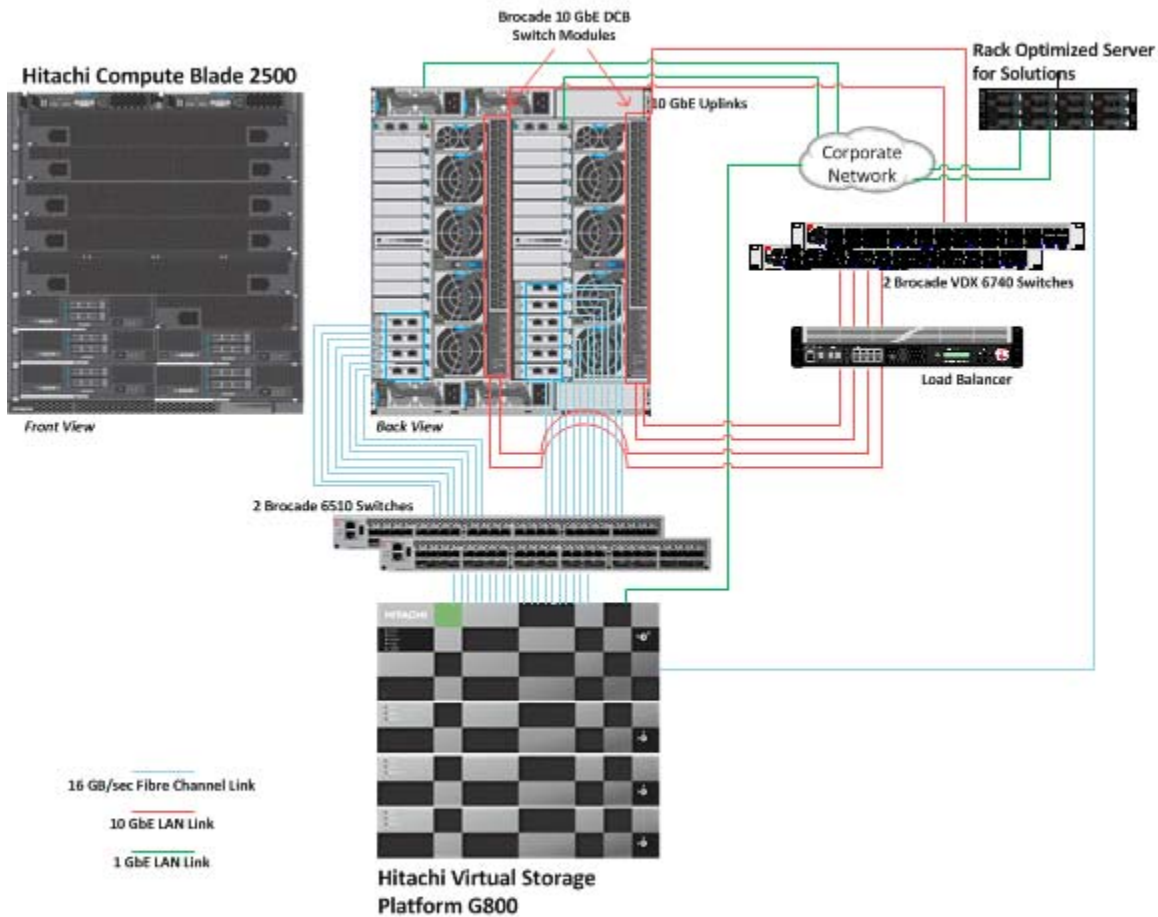
Configure Oracle Enterprise Manager Cloud Control 13c to self-provision and administer the integrated technology stack, including storage, virtual machines with Oracle VM, and Oracle databases.

The rack optimized server for solutions uses VMware ESXi to deploy virtual machines for the management servers. The management servers include the following:

- Oracle VM Manager
- Oracle Enterprise Manager
- Manager for Hitachi adapters for Oracle Database
- Hitachi Compute Systems Manager (HCSM)

You can deploy the manager for Hitachi adapters for Oracle Database as a virtual appliance in VMware ESXi and Oracle VM.

Figure 1



Key Solution Components

The key components used for this testing are in Table 1, “Hardware Components,” on page 4 and Table 2, “Software Components,” on page 4.

TABLE 1. HARDWARE COMPONENTS

Hardware	Detail Description	Firmware Version	Quantity
Hitachi Virtual Storage Platform G800	2 controllers	83-03-25-60/00	1
	24 × 16 Gb/sec Fibre Channel ports		
	40 × 1.6 TB FMDs		
	36 × 1.2 TB SAS HDDs		
	512 GB Cache memory		
Hitachi Compute Blade 2500	2 × 10 Gb/sec Brocade DCB LAN switch modules	Management module firmware: A0165-C-1467	1
	10 fan modules		
	2 management modules		
520H B3 Half width server blade	2 Intel Xeon E5-2699v3 processor CPUs	08-66	5
	384 GB (32 GB × 12) DDR4		
	1 Emulex 16 Gb/sec 2-port Fibre Channel card	10.6.144.21	10
Load balancer	Optional industry standard load balancer	N/A	1
Brocade 6510 switches	Fibre Channel switches	v7.3.1d	2
Brocade VDX 6740 switches	Brocade IP network switches	4.1.3a	2
Rack optimized server for solutions, 2U single node	24 CPU cores	3.17	1
	Intel Xeon E5-2680 v3 processor @ 2.5 GHz		
	64 GB RAM		

TABLE 2. SOFTWARE COMPONENTS

Software	Version	Function
Hitachi Storage Navigator (SN)	Microcode dependent	Storage management software
Hitachi Compute Systems Manager (HCSM)	8.4.1-03	Server management software
Hitachi Storage Adapter for Oracle Enterprise Manager	01.0.0	Storage management software
Hitachi Storage Adapter for Oracle VM	01.0.0	Storage management software
Hitachi Server Adapter for Oracle Enterprise Manager	01.0.0	Server management software

TABLE 2. SOFTWARE COMPONENTS (CONTINUED)

Software	Version	Function
Oracle VM	3.4.1	Host operating system
Manager for Hitachi adapters for Oracle Database	01.0.0	Hitachi adapters management software
Oracle Linux	OL 7.2	Guest operating system
Oracle Database 12c	12c Release 1(12.1.0.2.0)	Database software
Oracle Grid Infrastructure 12c	12c Release 1(12.1.0.2.0)	Cluster software
Oracle Enterprise Manager Cloud Control 13c	13c Release 2 (13.2.0.0)	OEM software
Oracle Enterprise Manager Cloud Control 13c plug-ins	13c Release 2	OEM plugins
Oracle E-Business Suite	12.2.6	Oracle application software
Oracle Virtual Assembly Builder	12.1.2.0.0	Build virtual appliance
VMware ESXi	6.0.0	Management server host operating system
VMware vCenter Appliance	6.0.0	Centralized management application software

Hitachi Compute Blade 2500

[Hitachi Compute Blade 2500](#) delivers enterprise computing power and performance with unprecedented scalability and configuration flexibility. Lower your costs and protect your investment.

Flexible I/O architecture and logical partitioning allow configurations to match application needs exactly with Hitachi Compute Blade 2500. Multiple applications easily and securely co-exist in the same chassis.

Add server management and system monitoring at no cost with Hitachi Compute Systems Manager. Seamlessly integrate with Hitachi Command Suite in Hitachi storage environments.

Hitachi Compute Blade 2500 provides scalability and flexibility for an Oracle Real Application Cluster configuration.

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.

These cloud solution was validated on Virtual Storage Platform G800, which supports Oracle Real Application Clusters.

Rack Optimized Server for Solutions, 2U Single Node

The rack optimized server for solutions, 2U single node, is a rack mounted server designed for optimal performance and power efficiency. It supports up to 1.5 TB highly scalable memory capacity. It is powered by the Intel Xeon E5-2600 v3 processor product family for complex and demanding workloads. It supports flexible OCP and PCIe I/O expansion card options.

Hitachi Compute Systems Manager

Hitachi Compute Systems Manager is the management software for Hitachi servers. Compute Systems Manager can be purchased with an optional Server Management Module, Network Management Module, or Server Deployment Module. Use Compute System Manager to introduce new servers into your data center environment.

Use Hitachi Compute Systems Manager for administering the server blades on Hitachi Compute Blade 2500.

Oracle Enterprise Manager

[Oracle Enterprise Manager](#) provides a “single pane of glass” that allows you to manage on-premises and cloud-based IT using the same familiar interface you know and use on-premises every day. Oracle Enterprise Manager today is the nerve center of IT operations among thousands of enterprises. Millions of assets in Oracle’s SaaS and PaaS public cloud operations are managed by Enterprise Manager round the clock.

Enterprise Manager is the industry’s first complete cloud solution with [Cloud Management](#). This includes self-service provisioning balanced against centralized, policy-based resource management, integrated chargeback and capacity planning and complete visibility of the physical and virtual environments from applications to disk.

This solution uses Oracle Enterprise Manager Cloud Control, version 13c release 2, This allows you to use these cloud management features:

- [Using the Database Cloud Self Service Portal](#)
- [Improved Service Catalog](#)
- [Snap Cloning using “Test Master Snapshot”](#)
- [Chargeback and Consolidation Planner Plugin](#)
 - Ability to apply ad-hoc charges and discounts for a target, day, and so on
 - Ability to modify a plan for a target in a past report cycle
 - New cost center and entities tab in the user interface
 - Tiered Pricing
 - Charge Estimation Advisor

For more information, see [New Features In Oracle Enterprise Manager Cloud Control 13c](#).

Oracle VM

Designed for efficiency and optimized for performance, [Oracle VM](#) supports x86 and SPARC architectures. It also supports a variety of workloads, such as Linux, Microsoft® Windows®, and Oracle Solaris.

In addition to solutions that are hypervisor-based, Oracle also offers virtualization built in to hardware and Oracle operating systems to deliver the most complete and optimized solution for your entire computing environment.

Oracle VM Server provides application-driven virtualization. Going beyond simple server consolidation, Oracle VM Server virtualization is designed to enable rapid enterprise application deployment and simplify lifecycle management.

Oracle VM provides the foundation for cloud. It is a fully integrated virtual machine lifecycle and cloud management solution with Oracle Enterprise Manager Cloud Control 13c.

Oracle Tools and Adapters from Hitachi Data Systems

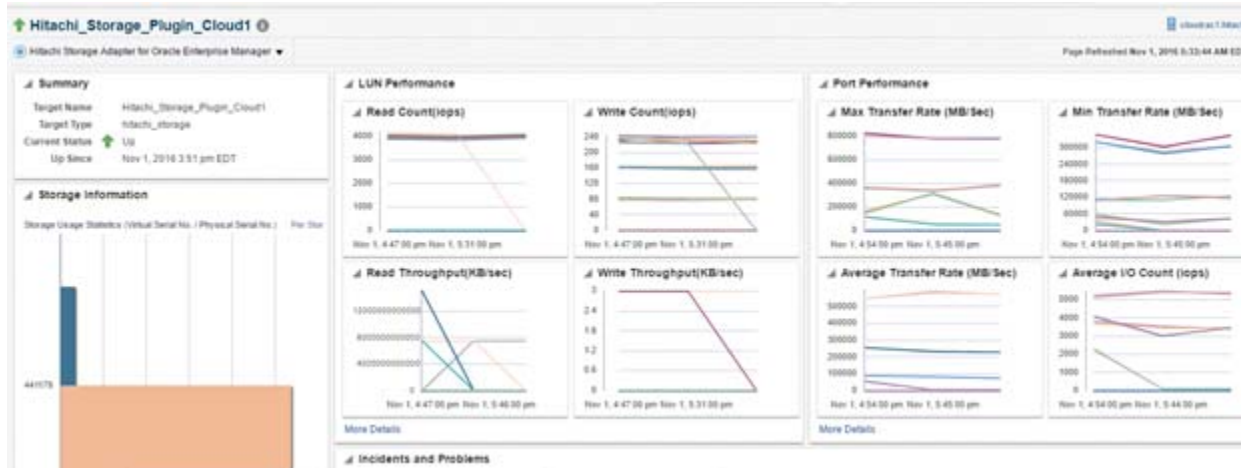
This solution uses these [Oracle tools and adapters](#) from Hitachi Data Systems:

■ Hitachi Storage Adapter for Oracle Enterprise Manager

Hitachi Storage Adapter for Oracle Enterprise Manager presents an integrated, detailed view of the Hitachi storage or converged infrastructure supporting your Oracle databases. By gaining visibility into capacity, performance and configuration information, administrators can manage service levels more effectively, and ensure service level agreements (SLAs) are met to support business goals.

When you log on to Oracle Cloud Control, the home page for Storage Adapter for Oracle Enterprise Manager shows a summary of the storage and performance statistics graphs shown in Figure 2.

Figure 2



■ Hitachi Storage Adapter for Oracle VM

Hitachi Storage Adapter for Oracle VM enables monitoring and managing storage for virtual machines from Oracle VM Manager.

Provision storage for virtual machines. Instantly clone of Oracle virtual machines with storage using a single user interface that manages and monitors virtual machines and storage infrastructure.

■ Hitachi Server Adapter for Oracle Enterprise Manager

Hitachi Server Adapter for Oracle Enterprise Manager makes possible monitoring in Oracle Enterprise Manager of Hitachi Compute Blade 2500, Hitachi Compute Blade 500, and rack optimized server for solutions. This adapter provides you visibility of the status, health, and attributes for the servers. The adapter also supplies information about any Oracle database instances running on the servers.

When you log on to Oracle Cloud Control, the home page for Server Adapter for Oracle Enterprise Manager shows a summary of performance statistics graphs for Hitachi Compute Blade and the rack optimized server for solutions shown in Figure 3.

Figure 3



Oracle Database With the Real Application Cluster Option

[Oracle Database](#) has a multitenant architecture so you can consolidate many databases quickly and manage them as a cloud service. Oracle Database also includes in-memory data processing capabilities for analytical performance. Additional database innovations deliver efficiency, performance, security, and availability. Oracle Database comes in two editions: Enterprise Edition and Standard Edition 2.

[Oracle Real Application Clusters](#) (Oracle RAC) is a clustered version of Oracle Database. It is based on a comprehensive high-availability stack that can be used as the foundation of a database cloud system, as well as a shared infrastructure. This ensures high availability, scalability, and agility for any application.

[Oracle Automatic Storage Management](#) (Oracle ASM) is a volume manager and a file system for Oracle database files. This supports single-instance Oracle Database and Oracle Real Application Clusters configurations. Oracle ASM is the recommended storage management solution that provides an alternative to conventional volume managers, file systems, and raw devices.

[Oracle Clusterware](#) is portable cluster software that allows clustering of independent servers so that they cooperate as a single system. Oracle Clusterware is the required cluster technology for Oracle Real Application Clusters.

Brocade Networking

[Brocade and Hitachi Data Systems](#) partner to deliver storage networking and data center solutions. These solutions reduce complexity and cost, as well as enable virtualization and cloud computing to increase business agility.

The solution uses the following Brocade products:

- Brocade VDX 6740 10 GbE switch module
- Brocade 6510 Fibre Channel switch

Solution Design

This describes the reference architecture environment implemented on Hitachi Cloud Foundation for Oracle Database

Specific infrastructure configuration details include the following:

- **Storage System** — Map LDEVs as LUNs to each port presented to the server.
- **Server** — Configure server blades as a Oracle VM Server pool cluster.
- **SAN Connection** — Connect each Fibre Channel HBA port to the storage front-end port using the switched SAN environment.

Storage Architecture

This describes the storage architecture of this reference architecture. It takes into consideration Hitachi Data Systems and Oracle recommended practices for the deployment of database storage design.

Figure 4 on page 10 shows the storage configuration used for this solution.

Figure 4

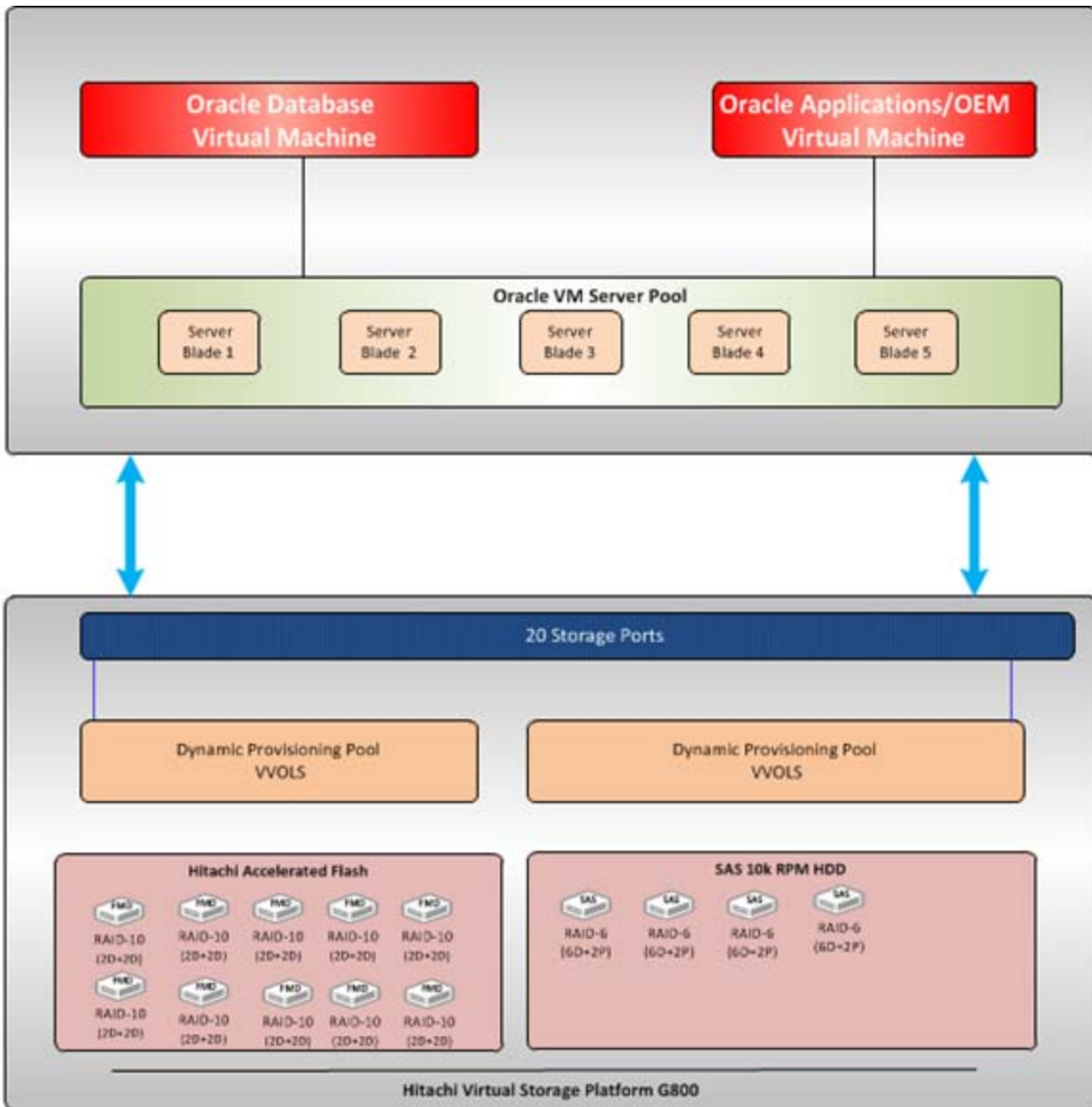


Table 3 shows a sample storage pool configuration.

TABLE 3. STORAGE POOL CONFIGURATION

Pool ID	Ora_dp_fmd_01	Ora_dp_sas_01
Pool type	Dynamic Provisioning Pool	Dynamic Provisioning Pool
RAID group	1-5 to 1-14	1-1 to 1-4
RAID level	RAID-10 (2D+2D)	RAID -6 (6D+2P)
Drive type	1.6 TB Flash Module Drive (FMD)	1.2 TB 10k RPM SAS Drive
Number of drives	40	32
Number of spare drives	2	4
Number of LDEVs	320 (32 per RAID group)	16 (4 per RAID group)
LDEV size or sizes	102.08 GB	1610 GB
Pool capacity	31.9TB	25.16TB

Table 4 shows a sample logical storage configuration used in the tested configuration for production instance. You may use a different configuration.

TABLE 4. LOGICAL STORAGE CONFIGURATION

Dynamic Provisioning Pool ID	Ora_dp_fmd_01	Ora_dp_sas_01
Total number of DP-Vols	712	15
DP-Vols Sizes	100 GB, 300 GB	20 GB, 100 GB, 500 GB
Purpose	All tablespaces Redo logs Software binary Undo Temp	Operating system FRA (incremental backups, archived redo logs, control file autobackups) Oracle cluster registry Voting disk Backup Stage
Storage Port	1A, 2A, 3A, 4A, 1B, 2B, 3B, 4B, 1C, 2C, 3C, 4C, 1D, 2D, 3D, 4D, 1E, 2E, 3E, 4E	

Database Layout

To configure the database, use the best practices for database layout from [Hitachi Unified Compute Platform 6000 for Oracle Real Application Clusters on Four Nodes Using Hitachi Virtual Storage Platform F800, Hitachi Accelerated Flash, and Hitachi Compute Blade 2500 Reference Architecture Guide](#) (AS-542-01 or later, PDF).

The database layout design uses recommended practices from Hitachi Data Systems for Hitachi Virtual Storage Platform G800 using Hitachi Accelerated Flash for small random I/O traffic, such as OLTP transactions. The layout also takes into account Oracle ASM best practices when using Hitachi storage.

Base the storage design on the requirements of a specific application implementation. The design can vary greatly from one implementation to another. The components shown here have the flexibility for use in various deployment scenarios to provide the right balance between performance and ease of management.

■ Data and Indexes Tablespace

Assign a data Oracle ASM disk group for the data and index tablespaces. Set the tablespace to a small initial size with **auto extend** enabled to maximize storage utilization.

■ TEMP Tablespace

Create a bigfile temporary tablespace from a data Oracle ASM disk group in this configuration.

■ Undo Tablespace

Create two bigfile UNDO tablespaces from the data Oracle ASM disk group. Assign one UNDO tablespace for each database instance in the Oracle RAC database.

■ Online Redo Logs

Assign an Oracle ASM disk group REDO for online redo logs.

■ Oracle Cluster Registry and Voting Disk

Place each of these files in the ASM disk group for Oracle cluster registry.

■ Size Settings

Set the database block size to 8 KB. Set the ASM allocation unit to 1 MB.

■ ASM FILE SYSTEM I/O Settings

Set the Oracle ASM I/O operations for database files as follows:

FILESYSTEMIO_OPTIONS = setall

Table 5 has the Oracle RAC database configuration.

TABLE 5. ORACLE RAC DATABASE SETTINGS

For This Environment	Use This Value
RAC configuration	Yes
ASM	Yes - Oracle RAC Database

Table 6 lists the details for the disk mappings from the LUNs to the operating system devices and to the ASM disk groups for Oracle RAC Database tablespaces.

TABLE 6. ORACLE ASM DISK CONFIGURATION

ASM Disk Group	ASM Disk	LUN Path	LUNs Count	Purpose
OCR	OCR1	/dev/xvdz	3	Oracle Cluster Registry
	OCR2	/dev/xvdaa		Voting Disk
	OCR3	/dev/xvdae		
REDO	REDO01	/dev/xvdv	4	Online REDO Logs
	REDO02	/dev/xvdw		Control Files
	REDO03	/dev/xvdx		
	REDO04	/dev/xvdy		
DATA	DADISK01	/dev/xvdl	8	Application Data
	DADISK02	/dev/xvdm		Undo
	DADISK03	/dev/xvdn		System
	DADISK04	/dev/xvdo		Sysaux
	DADISK05	/dev/xvdp		TEMP
	DADISK06	/dev/xvdab		
	DADISK07	/dev/xvdac		
	DADISK08	/dev/xvdad		
FRA	FRDISK01	/dev/xvdd	8	Archive Logs
	FRDISK02	/dev/xvde		Incremental Backups
	FRDISK03	/dev/xvdf		Control File
	FRDISK04	/dev/xvdg		Autobackups
	FRDISK05	/dev/xvdh		
	FRDISK06	/dev/xvdi		
	FRDISK07	/dev/xvdj		
	FRDISK08	/dev/xvdk		

Server and Application Architecture

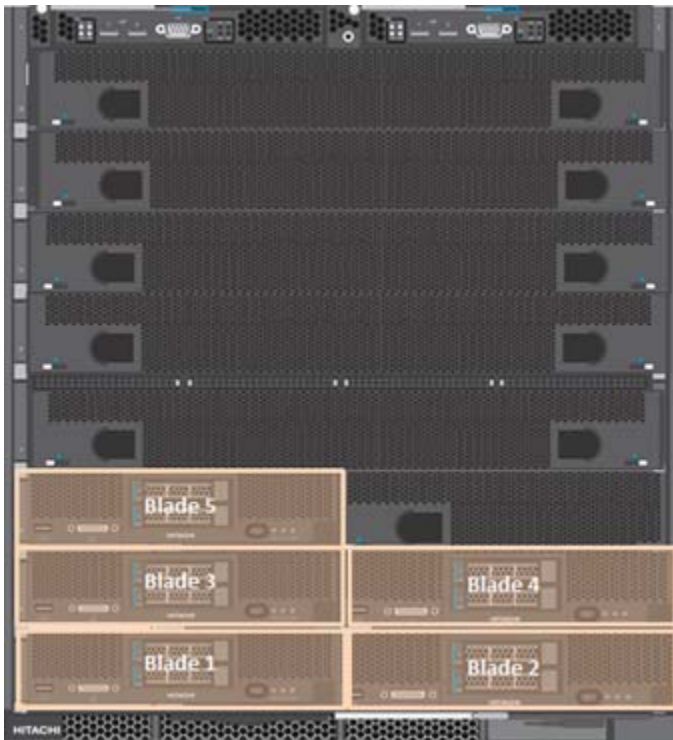
This reference architecture uses a single Hitachi Compute Blade 2500 chassis with five server blades. This provides the compute power for Oracle Database to handle complex database queries and a large volume of transaction processing in parallel. Table 7 describes the details of the server configuration for this solution

TABLE 7. Hitachi Compute Blade 2500 Details

Blade	Form Size	Server Name	Role	CPU Core	RAM
1	Half-Width	computenode01	Oracle VM Server	36	384 GB
2	Half-Width	computenode02	Oracle VM Server	36	384 GB
3	Half-Width	computenode03	Oracle VM Server	36	384 GB
4	Half-Width	computenode04	Oracle VM Server	36	384 GB
5	Half-Width	computenode05	Oracle VM Server	36	384 GB

Figure 5 shows the server infrastructure for the reference architecture.

Figure 5



SAN Architecture

Map the provisioned LDEVs to multiple ports on Hitachi Virtual Storage Platform G800. These LDEV port assignments provide multiple paths to the storage system from the host for high availability. Each of the server blades use four Fibre Channel ports, with two ports from each of the PCIe HBA cards from Emulex, as listed in Table 1, “Hardware Components,” on page 4.

Table 8 shows the SAN connection from the HBA of the blade server to the Hitachi Virtual Storage Platform G800 ports.

TABLE 8. FIBRE CHANNEL SAN CONNECT CONFIGURATION ON HITACHI VIRTUAL STORAGE PLATFORM G800

Host	HBA	Storage Port	Storage Host Group	Zone Name
BLADE 1	HBA1-1	1A	BLADE1_OVS1	CB2500_20_B1_HBA1_1_ASE42_43_1A
	HBA1-2	2A	BLADE1_OVS1	CB2500_20_B1_HBA1_2_ASE42_43_2A
	HBA2-1	3A	BLADE1_OVS1	CB2500_20_B1_HBA2_3_ASE42_43_3A
	HBA2-2	4A	BLADE1_OVS1	CB2500_20_B1_HBA2_4_ASE42_43_4A
BLADE 2	HBA1-1	1B	BLADE2_OVS2	CB2500_20_B2_HBA1_1_ASE42_43_1B
	HBA1-2	2B	BLADE2_OVS2	CB2500_20_B2_HBA1_2_ASE42_43_2B
	HBA2-1	3B	BLADE2_OVS2	CB2500_20_B2_HBA2_3_ASE42_43_3B
	HBA2-2	4B	BLADE2_OVS2	CB2500_20_B2_HBA2_4_ASE42_43_4B
BLADE 3	HBA1-1	1C	BLADE3_OVS3	CB2500_20_B3_HBA1_1_ASE42_43_1C
	HBA1-2	2C	BLADE3_OVS3	CB2500_20_B3_HBA1_2_ASE42_43_2C
	HBA2-1	3C	BLADE3_OVS3	CB2500_20_B3_HBA2_3_ASE42_43_3C
	HBA2-2	4C	BLADE3_OVS3	CB2500_20_B3_HBA2_4_ASE42_43_4C
BLADE 4	HBA1-1	1D	BLADE4_OVS4	CB2500_20_B4_HBA1_1_ASE42_43_1D
	HBA1-2	2D	BLADE4_OVS4	CB2500_20_B4_HBA1_2_ASE42_43_2D
	HBA2-1	3D	BLADE4_OVS4	CB2500_20_B4_HBA2_3_ASE42_43_3D
	HBA2-2	4D	BLADE4_OVS4	CB2500_20_B4_HBA2_4_ASE42_43_4D
BLADE 5	HBA1-1	1E	BLADE5_OVS5	CB2500_20_B5_HBA1_1_ASE42_43_1E
	HBA1-2	2E	BLADE5_OVS5	CB2500_20_B5_HBA1_2_ASE42_43_2E
	HBA2-1	3E	BLADE5_OVS5	CB2500_20_B5_HBA2_3_ASE42_43_3E
	HBA2-2	4E	BLADE5_OVS5	CB2500_20_B5_HBA2_4_ASE42_43_4E

Emulex 16 Gb/sec PCIe HBA Card Configuration

This describes the best practices to configure the Emulex 16 Gb/sec PCIe cards that are used on the server blades. Figure 6 on page 16 shows the Emulex 16 Gb/sec HBA PCIe cards that are installed in Hitachi Compute Blade 2500.

- Use latest firmware version supported for the architecture. Find the supportability matrix at [Support Connect](#).
- Set the following parameters for each of the Emulex HBA PCIe cards, following the settings in Table 9 on page 16.

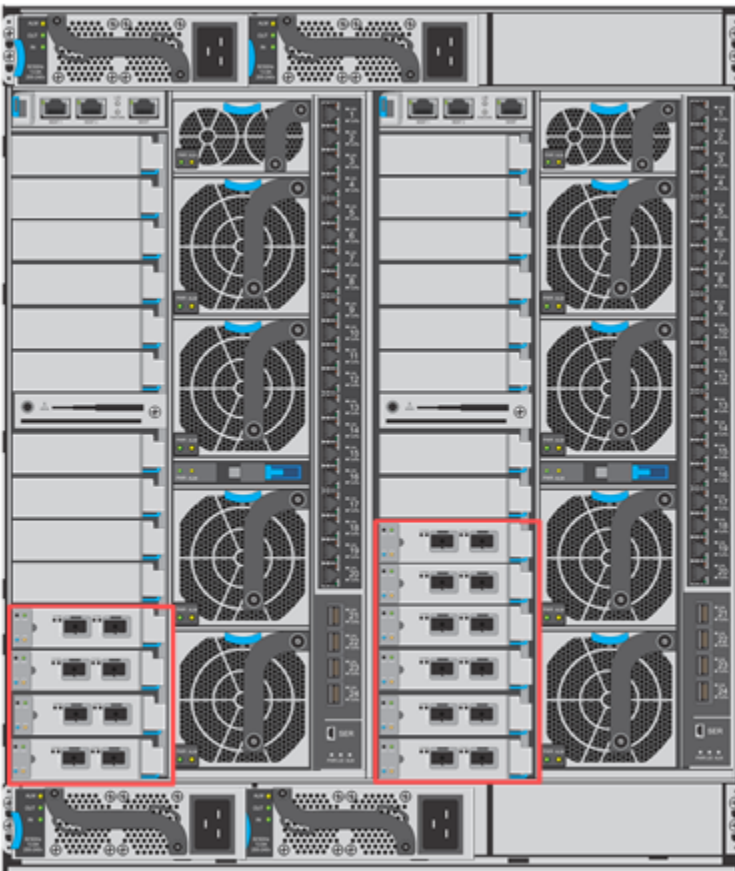
TABLE 9. EMULEX HBA PCIE CARD PARAMETERS

For This	Use This
Boot Function	Enable
Link Speed	16 Gb/sec link speed
Connection Type	Point to Point

- Run the Hitachi Compute Blade 2500 series maintenance test program (BSTP) to recognize Emulex HBA cards in the web console of Hitachi Storage Navigator and Hitachi Compute Systems Manager. To see how to run this program, see “How to Run Hitachi Compute Blade 2500 Series Maintenance Test Program (BSTP)” on page 31.

Figure 6

Hitachi Compute Blade 2500



Back View

Network Architecture

This architecture requires the following separate networks:

- **Private Network (also called cluster interconnect)**

This network must be scalable. In addition, it must meet the low latency needs of the network traffic generated by cache synchronization of Oracle RAC and inter-node communication amongst the nodes in the cluster.

- **Public Network**

This network provides client connections to the applications and Oracle RAC.

Hitachi Data Systems recommends using a pair of 10 Gb/sec NICs for the cluster interconnect and public network.

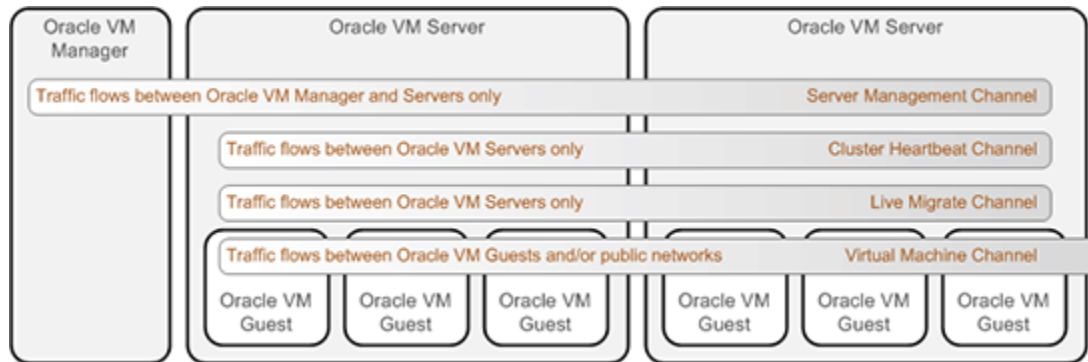
Each server blade in this reference architecture has a quad port 10 Gb/sec onboard NIC. The NIC ports have interconnected links to the two internal 10 Gb/sec Ethernet switches in the chassis.

Observe these points when configuring private and public networks in your Oracle RAC environment:

- For each server in the Oracle RAC clusterware configuration, use at least two identical, high bandwidth, low-latency NICs for the interconnection.
- Use NIC bonding to provide fail over and load balancing of interconnections within a server.
- Set all NICs to full duplex mode.

Figure 7 shows the Oracle VM environment recommended network.

Figure 7



Configure each sever blade with two bonding interfaces:

- Management/public
- Private network

Each virtual machine has public and private vNICs. The recommendation is to use separate VLANs for the following:

- Oracle VM management network
- Oracle RAC database public network

Table 10 lists the network configuration for this solution. Configure the VLAN to fit your network environment.

TABLE 10. NETWORK CONFIGURATION

Server	NIC Ports	NIC BOND	VLAN	Network	Bandwidth (Gb/Sec)
Computenode01	B1-CNIC-0	Bond0	1201	Management/Public for OVS	10
	B1-CNIC-1				10
	B1-CNIC-2	Bond1	1200	Private	10
	B1-CNIC-3				10
Computenode02	B2-CNIC-0	Bond0	1201	Management/Public	10
	B2-CNIC-1				10
	B2-CNIC-2	Bond1	1200	Private	10
	B2-CNIC-3				10
Computenode03	B3-CNIC-0	Bond0	1201	Management/Public	10
	B3-CNIC-1				10
	B3-CNIC-2	Bond1	1200	Private	10
	B3-CNIC-3				10
Computenode04	B4-CNIC-0	Bond0	1201	Management/Public	10
	B4-CNIC-1				10
	B4-CNIC-2	Bond1	1200	Private	10
	B4-CNIC-3				10
Computenode05	B5-CNIC-0	Bond0	1201	Management/Public	10
	B5-CNIC-1				10
	B5-CNIC-2	Bond1	1200	Private	10
	B5-CNIC-3				10

Virtual Machine Configuration

Table 11 lists the virtual machine configuration for Oracle database, applications, Oracle Enterprise Manager Cloud Control, and Oracle VM Manager in this solution.

TABLE 11. VIRTUAL MACHINE CONFIGURATION

Virtual Machine	vCPU	Virtual Memory	OS
Oracle Database Sever Node 1	16	128	OL 7.2
Oracle Database Sever Node 2	16	128	OL 7.2
Oracle Applications Server 1	12	96	OL 7.2
Oracle Applications Server 2	12	96	OL 7.2
OEM Cloud Control 13c Server	8	32	OL 7.2
Oracle VM Manager	2	8	OL 6.7

Manager for Hitachi Adapters for Oracle Database

The manager for Hitachi adapters for Oracle Database is deployed as a virtual appliance. Follow these best practices to set up this virtual machine:

- Use VMware ESXi Server or Oracle VM to host the virtual machine hosting the manager.
- Use VMware vCenter server to deploy the pre-built open virtual machine format (OVF) template or Oracle VM Manager to deploy the Oracle VM template for the virtual machine hosting the manager.
- When deploying the virtual machine, use **Thin provisioning format** for virtual disks.
- When deploying the virtual machine, use Fibre Channel connection to the host for block storage support.
- Create a command device if using block storage support for command control interface and map the device to the virtual machine for the manager.
- Make sure the device set as a command device does not contain any user data. After setting a volume as a command device, it is inaccessible to the host.
- Configure the device as needed before setting it as a command device. Use the settings in Table 12 when setting it as a command device. For instructions, see the provisioning manual or the virtual LUN manual for the storage system.

TABLE 12. MANAGER FOR HITACHI ADAPTERS FOR ORACLE DATABASE COMMAND DEVICE SETTINGS

For This	Set This
Command Device	Enable
Command Device Security	Disable
User Authentication	Enable
Device Group Definition	Disable

- Before starting the virtual machine hosting the manager for Hitachi adapters for Oracle Database, map the command device LUN as the hard disk type **Raw Device Mappings** with VMware vCenter or the VMware vSphere client.
- Run **metro_check.sh** on the virtual machine to display the current status of the manager for the Hitachi adapters, as shown in Figure 8.

Figure 8

```

root@localhost:~
[root@localhost ~]# /opt/hitachi/metro/metro_check.sh
Metro RPM Install Check      [ PASS ]
Metro Process Check         [ PASS ]
Metro cURL Check            [ PASS ]
Metro Monitor Check         [ PASS ]

All command devices that exist on this machine:

  LDEV ID  Device  Storage Serial
  -----  -----
    255    /dev/sdb  441179

Command devices used by Metro:

Device: /dev/sdb
LDEV ID: 255
Storage Array Serial Number: 441179
Metro HORCM Instance Number: 550
HORCM Process State: Running

[root@localhost ~]#

```

Adapter Setup

Set up the following adapters in your environment to administer and monitor this solution.

Hitachi Storage Adapter for Oracle Enterprise Manager

Hitachi Storage Adapter for Oracle Enterprise Manager facilitates storage administration. Install it as a plug-in in Oracle Enterprise Manager.

For detailed steps on how to set up the adapter, see [Hitachi Adapters for Oracle Database User's-Guide](#) (MK-92ADPTR130-00 or later, PDF).

After deploying the adapter on the server, the recommendation is to log out and to log on again to see the latest plug-in list.

It generally takes at least 2 hours for data collection to start after you create the plugin target. Report data is visible after a successful data collection.

Hitachi Server Adapter for Oracle Enterprise Manager

Hitachi Server Adapter for Oracle Enterprise Manager facilitates server administration. Install it as a plug-in in Oracle Enterprise Manager.

For detailed steps on how to set up this adapter, see [Hitachi Adapters for Oracle Database User's-Guide](#) (MK-92ADPTR130-00 or later, PDF).

After deploying the adapter on the server, the recommendation is to log out and to log on again to see the latest plug-in list.

It generally takes at least 30 minutes for data collection to start after you create the plug-in target. Report data is visible after successful data collection.

Hitachi Storage Adapter for Oracle VM

Hitachi Storage Adapter for Oracle VM is distributed as a single Linux RPM package. Oracle recommends using the RPM specification to create the adapter RPM. Install the adapter RPM from Hitachi on each Oracle VM server that uses the particular storage subsystem.

For detailed steps on how to set up this adapter, see [Hitachi Adapters for Oracle Database User's-Guide](#) (MK-92ADPTR130-00 or later, PDF).

On the **Storage** tab, the management pane shows a list of iSCSI and Fibre Channel storage arrays. Create a new storage array instead of using the unmanaged Fibre Channel storage array. To do that, in the **Discover SAN Server** dialog box, click **Hitachi Storage Adapter** from the **Storage Plug-in** list. See Figure 9.

Figure 9

The screenshot shows the 'Discover SAN Server' dialog box. On the left is a navigation pane with steps: Discover SAN Server, Access Information (if required), Set Storage Name (if required), Add Admin Servers, and Manage Access Group (if required). The main area contains a form with the following fields:

* Name:	VSP_G800_441179
Description:	Hitachi OVM Adapter
Storage Type:	FibreChannel
* Storage Plug-in:	Hitachi Storage Adapter(06.)
Plug-in Private Data:	id=441179, stype=vsp, metroip=
* Admin Host:	172.17.42.43
* Admin Username:	maintenance
* Admin Password:

Adapter Use

Use these adapters to administer and monitor your environment for this solution.

Hitachi Virtual Storage Platform Using Hitachi Storage Adapter for Oracle Enterprise Manager

Deploying Hitachi Storage Adapter for Oracle Enterprise Manager provides centralized administration of Hitachi Virtual Storage Platform. It has many information publisher reports to help you administer and monitor Hitachi Virtual Storage Platform.

Here are some Hitachi Cloud Foundation for Oracle Database use cases using this adapter.

Database File to Storage Mapping Report

To find out the location where various Oracle database files for the database deployed on Hitachi Cloud Foundation for Oracle Database use the **Database File to Storage Mapping** report.

Some files might be on the local disks of the database server. However, for the database files that reside on Hitachi storage systems, this report shows the following (Figure 10):

- File
- What database it belongs to
- Which Hitachi system the file is located, with a serial number and LUN ID

Figure 10

Host Name	Database Name	Tablespace / Redo Log Group	Database File	ASM Disk Group / Volume Group	ASM Disk	ASM Disk Path / Mount Point	Host Device	Host Initiator Type	Host Group/OSDB Target	Storage Pool	Storage Utilization	Storage Serial No.
cloudhch1mach16b.local	CLOUD		+DATA/CL005/CONTROU52/current242.8246385C DATA		DATA_0000	/dev/vdb1	/dev/vdb1	WWN		HEP-0	00:00:38	441179
					DATA_0001	/dev/vdb1	/dev/vdb1	WWN		HEP-0	00:00:38	441179
					DATA_0002	/dev/vdb1	/dev/vdb1	WWN		HEP-0	00:00:32	441179
					DATA_0003	/dev/vdb2	/dev/vdb2	WWN		HEP-0	00:00:37	441179
					DATA_0004	/dev/vdb2	/dev/vdb2	WWN		HEP-0	00:00:34	441179
					DATA_0005	/dev/vdb2	/dev/vdb2	WWN		HEP-0	00:00:38	441179
					DATA_0006	/dev/vdb2	/dev/vdb2	WWN		HEP-0	00:00:36	441179
					DATA_0007	/dev/vdb1	/dev/vdb1	WWN		HEP-0	00:00:33	441179
					DATA_0008	/dev/vdb1	/dev/vdb1	WWN		HEP-0	00:00:33	441179
cloudhch1mach16b.local	CLOUD	1	+FRA/CL005/ONLINELOG/group_1.256.8246385C FRA		FRA_0001	/dev/vdb1	/dev/vdb1	WWN		HEP-1	00:00:42	441179
					FRA_0002	/dev/vdb1	/dev/vdb1	WWN		HEP-1	00:00:40	441179
					FRA_0003	/dev/vdb1	/dev/vdb1	WWN		HEP-1	00:00:44	441179
					REDO_0004	/dev/vdb1	/dev/vdb1	WWN		HEP-0	00:00:3C	441179

Storage Adapter for Oracle Enterprise Manager also provides the following reports to view storage mapping statistics:

- **ASM Disk Group to Storage Mapping Report**

This report provides the mapping between Oracle ASM disk groups and storage devices (LUNs). It also provides the storage utilization information for the ASM disk groups.

- **OS File System to Storage Mapping Statistics Report**

This report provides the mapping between the operating system file system mount points and storage devices (LUNs). It also provides the storage utilization information for the file system.

- **Storage Device to OS Device Mapping Report**

This report provides the mapping between the storage devices (LUNs) and host operating system devices (device files).

- **Storage to Database Mapping Report**

This report provides the mapping of the Hitachi storage systems to the database files.

Database to LUN Mapping Performance Statistics Report

Troubleshoot a persistent performance issue that is affecting database by running the **Database to LUN Mapping Performance Statistics** report.

This report determines the I/O performance statistics for the LUNs being used by database, displaying the following:

- Every LUN used by a database
- The host device
- The LUN ID
- The Hitachi storage subsystem serial number

For each LUN, the following statistics are shown:

- Read I/O
- Write I/O
- Read I/O throughput
- Write I/O throughput

Those statistics can be broken down into random and sequential details.

You can see charts of any given metric over a set period of time, such as the past seven days.

Storage Adapter for Oracle Enterprise Manager also provides the following reports to monitor performance:

- **Database LUN Performance Charts Report**

This report provides a database-level view of LUN I/O performance.

- **LUN Performance Statistics Report**

This report provides storage system's LUN performance.

- **Port Performance Statistics Report**

This report provides storage system's port performance.

Use these reports to view the performance summary and trends.

- **User Selected Host Mapped LUNs Performance Summary and Trend Report**

This report shows performance summary and trend information of LUNs mapped to host systems managed by Oracle Enterprise Manager.

- **User Selected Ports Performance Summary and Trend Report**

This report shows performance summary and trend information of ports mapped to host systems managed by Oracle Enterprise Manager.

Use these reports to view usage statistics.

- **Database Usage Summary Report**

This report provides the database usage summary.

- **LUN Configuration Report**

This report provides the configuration information for storage devices (LUNs) that are mapped to hosts managed by Oracle Enterprise Manager. It also includes a chart that shows the ten largest storage devices (LUNs) mapped to the hosts.

- **Replication Information Report**

This report provides the replication information for storage devices (LUNs) that are mapped to hosts managed by Oracle Enterprise Manager.

- **Storage Configuration Report**

This report provides the information on the configuration and utilization of the storage monitored by hosts where the plug-in is deployed.

- **Storage Statistics Report**

This report provides the configuration information for the Hitachi storage that is configured to hosts managed by Oracle Enterprise Manager.

Hitachi Server Adapter for Oracle Enterprise Manager

Deploying Hitachi Server Adapter for Oracle Enterprise Management provides centralized administration of Hitachi Unified Compute Platform. It has many information publisher reports to monitor the server blades. It uses Hitachi Compute Systems Manager to get information from the chassis.

Here are some Hitachi Cloud Foundation for Oracle Database use cases using this adapter.

Database to Server Blade Mapping Report

To find out the mapping between Oracle databases and the server blades on which the the databases run, use the **Hitachi Compute Blade/LPAR to Database Mapping** report. It shows the chassis name, server blade slot number, and server blade name. Figure 11 shows the report details.

Figure 11

Chassis Name	Server Blade Slot No	Server Blade Name	LPAR No	LPAR Name	Host MAC Address	Host IP Address	Host	Database Name	RAC Database Name	Version
RE4A1UBX1-Y00000544	1	Compute Blade 520HB3	-	+	00:21:f6:70:fb:c3	10.120.1.200	rac0.localdomain	ORCL_ORCL1	ORCL	12cR102
RE4A1UBX1-Y00000544	1	Compute Blade 520HB3	-	-	00:21:f6:06:6a:66	10.120.0.200	rac0.localdomain	ORCL_ORCL1	ORCL	12cR102
RE4A1UBX1-Y00000544	1	Compute Blade 520HB3	-	+	00:21:f6:70:fb:c3	10.120.1.204	rac0.localdomain	ORCL_ORCL1	ORCL	12cR102
RE4A1UBX1-Y00000544	1	Compute Blade 520HB3	-	-	00:21:f6:70:fb:c3	10.120.1.202	rac0.localdomain	ORCL_ORCL1	ORCL	12cR102
RE4A1UBX1-Y00000544	1	Compute Blade 520HB3	-	+	00:21:f6:70:fb:c3	10.120.1.203	rac0.localdomain	ORCL_ORCL1	ORCL	12cR102
RE4A1UBX1-Y00000544	1	Compute Blade 520HB3	-	-	00:21:f6:06:6a:66	169.254.196.140	rac0.localdomain	ORCL_ORCL1	ORCL	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	+	00:21:f6:1c:a6:e3	169.254.101.211	dcloudrac0.hitachilab.local	CLOUD_CLOUD1	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	-	00:21:f6:68:2b:0a	10.120.1.205	dcloudrac0.hitachilab.local	CLOUD_CLOUD1	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	+	00:21:f6:68:2b:0a	10.120.1.207	dcloudrac0.hitachilab.local	CLOUD_CLOUD1	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	-	00:21:f6:1c:a6:e3	10.120.0.202	dcloudrac0.hitachilab.local	CLOUD_CLOUD1	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	+	00:21:f6:a1:b2:58	10.120.1.206	dcloudrac1.hitachilab.local	CLOUD_CLOUD2	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	-	00:21:f6:a1:b2:58	10.120.1.208	dcloudrac1.hitachilab.local	CLOUD_CLOUD2	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	+	00:21:f6:7d:9a:8c	10.120.0.203	dcloudrac1.hitachilab.local	CLOUD_CLOUD2	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	+	00:21:f6:7d:9a:8c	169.254.60.233	dcloudrac1.hitachilab.local	CLOUD_CLOUD2	CLOUD	12cR102
RE4A1UBX1-Y00000544	2	Compute Blade 520HB3	-	+	00:21:f6:a1:b2:58	10.120.1.209	dcloudrac1.hitachilab.local	CLOUD_CLOUD2	CLOUD	12cR102

Server Adapter for Oracle Enterprise Manager also provides the following reports to administer server blades and the chassis.

- **Hitachi Compute Blade Chassis Report**

This report provides the information for the Hitachi Compute Blade chassis managed by the Compute System Manager that is configured for this Hitachi Server Adapter target.

- **Hitachi Compute Blade LPAR Report**

This report provides the information for LPARs on server blades managed by Compute System Manager that is configured for this Hitachi Server Adapter target.

- **Hitachi Compute Blade Report**

This report provides the information for server blades managed by Compute System Manager that is configured for this Hitachi Server Adapter target.

Hitachi Cloud Foundation for Oracle Database Management Server Performance Statistics

Use the management server dashboard report and the management server performance report to determine the configuration and health of management server.

Hitachi Virtual Storage Platform Using Hitachi Storage Adapter for Oracle VM

The Hitachi storage subsystem works seamlessly with the Oracle virtual servers. Virtualize and allocate parts of the hardware based on the real needs of users and applications, you can more effectively use the available computing power, storage space, and network bandwidth. You can add and present more storage to your server pools, as your need for storage increases. You can reduce the amount of storage, if higher storage requirements were only temporary.

Storage Adapter for Oracle VM manages the Hitachi storage subsystem on virtualized machines using Oracle VM.

Clone Oracle VM in Hitachi Cloud Foundation for Oracle Database

To clone Oracle VM, including storage, in Hitachi Cloud Foundation for Oracle Database, use the Oracle VM Manager console to clone the virtual machine then Storage Adapter for Oracle VM uses the Hitachi storage internal subsystem's capabilities to perform the cloning operation.

It is best practice to use Hitachi Storage Adapter for Oracle VM for following tasks:

- Create/Edit/Delete Access Groups
- Create/Edit/Resize/Delete LUN
- Create/Delete a Clone LUN

Validate Oracle VM Server Sizing Using Database Infrastructure Evaluation Tool

As a best practice, use the database infrastructure evaluation tool (DIET) to validate the Oracle database virtual machine configuration to best utilize all resources. You can optimize and lower the total cost of ownership (TCO) of the Oracle environment. This tool provides invaluable information when sizing and converting an existing environment for virtualization or conversion to a cloud environment.

The tool uses Automatic Workload Repository (AWR) reports. It supports a wide variety of Oracle versions, as well as Global RAC AWR reports.

The database infrastructure evaluation tool provides a comprehensive report on your Oracle database I/O profile, bottlenecks, and recommendations. It also provides you with a list of Oracle and Hitachi best practices. With Oracle's virtualized environment, this tool helps to allocate needed resources for virtual machines.

If you want, you can contact a pre-sales expert from Hitachi Data Systems to use DIET.

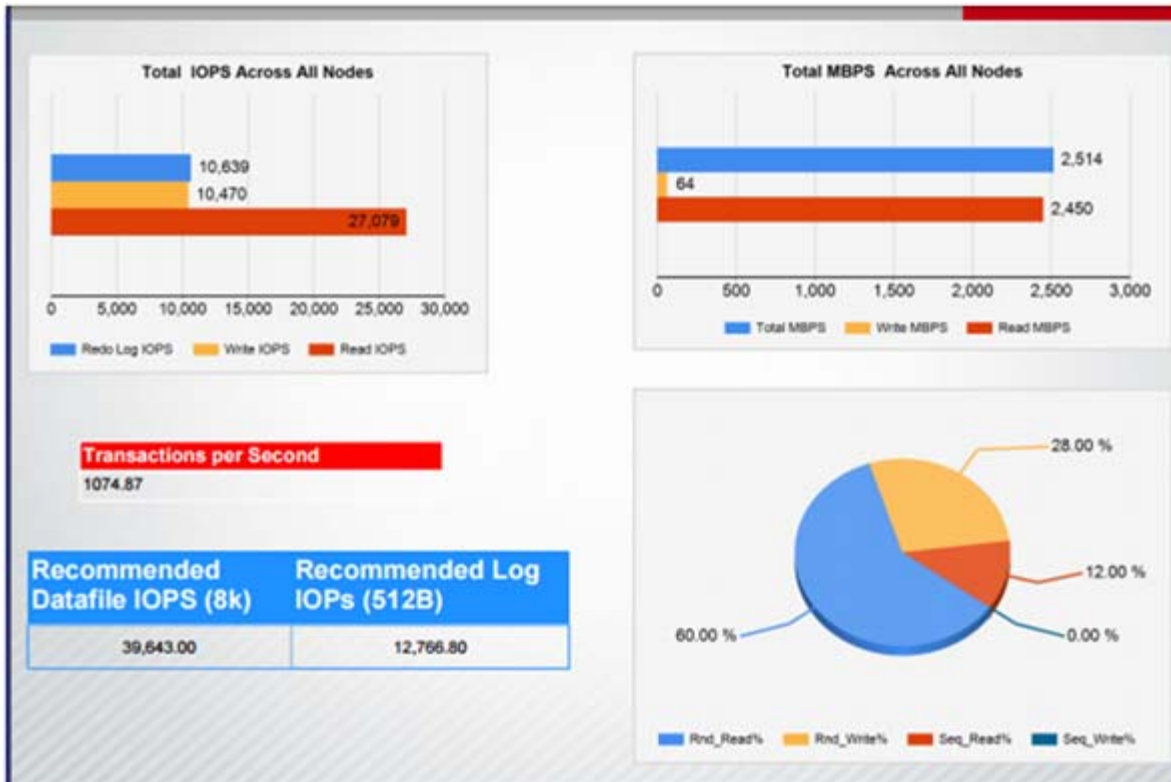
To generate an analysis, do the following.

1. Open vhised01.corp.hds.com in a browser.
2. Register using your email address.
3. From the **DIET Analysis** menu, click **DIET Analysis** and then click **Oracle**.
4. Upload your AWR snapshot report.

The analysis completes in minutes. The reports are sent to email your email address, as well as saved on your account for later review.

Figure 12 on page 27 shows sample output for an I/O profile.

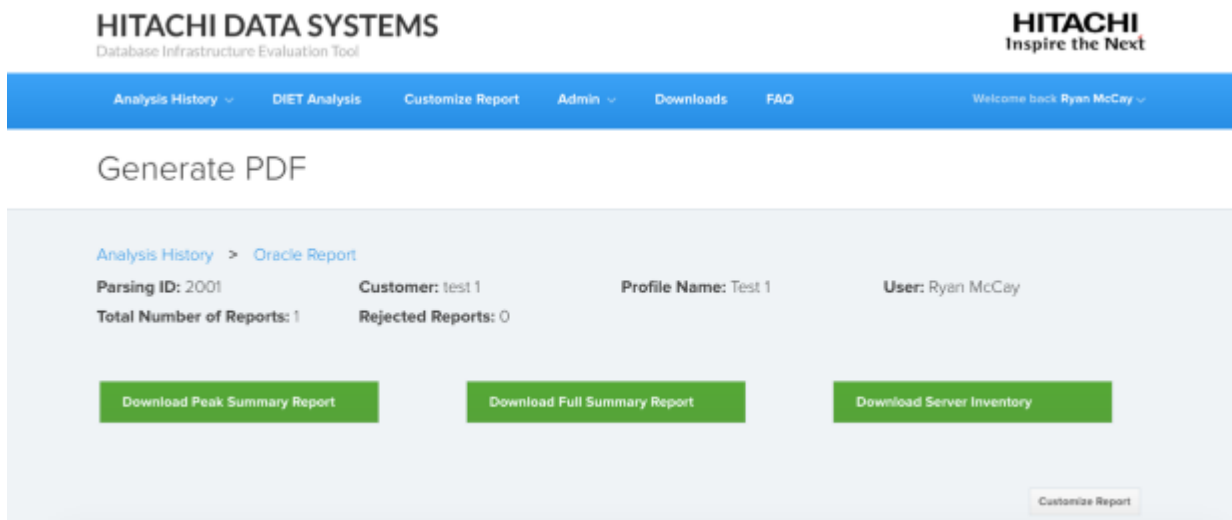
Figure 12



In this example, the peak database CPU percentage average across all nodes is 82%. This indicates a need to add more CPUs for best performance.

Additionally, by filling out the **server inventory report** in the DIET tool (Figure 13, right side), you can input simple server-type information to size the environment based on the spec-int calculation of the existing servers. Use information to convert the server workload to Hitachi spec-int calculations.

Figure 13



Database Deployment

Oracle VM Templates provide an approach to deploy a fully configured software stack by offering pre-installed and pre-configured software images. Use of Oracle VM Templates does the following to help you achieve faster time to market and lower cost of operations:

- Eliminates installation and configuration costs
- Reduces the ongoing maintenance costs

Manual database installation and configuration involves multiple steps, including configuring the following:

- Servers
- Network
- Storage

Multiple things need to happen to deploy the database, including the following:

- Check software requirements.
- Configure Kernel parameters.
- Configure groups and users.
- Install database software.
- If using Oracle Real Application Cluster, install clusterware software.

It takes few days to get the database up and running with the manual install process. If you use Oracle VM Templates, it then takes about 2-3 hours to deploy and configure database. It is best practice to use Oracle VM Templates to speed up database deployment process. For more detailed information, see [How to Use Oracle VM Templates](#).

After you have installed Oracle VM Server and Oracle VM Manager, complete the following tasks to prepare your environment for using Oracle VM Templates:

1. Discover the Oracle VM Server you installed.
2. Create a server pool.
3. Add the discovered server to the server pool.
4. Create a storage repository for storing your Oracle VM resources.
5. Register a storage array using Hitachi Storage Adapter for Oracle VM.
6. Present the repository to the Oracle VM server.
7. Increase CPU and RAM, as needed, after setting up the virtual machine. **Max memory** and **memory** has to match, otherwise you cannot change settings.
8. Use physical disks for the database virtual machines which are mapped 1:1 with LUNs.

Deploy Oracle Database with Applications Using a Custom Template Created on Hitachi Cloud Foundation for Oracle Database

To deploy Oracle database with applications, it usually takes 7 to 10 business days. This includes the manual database installation steps as well as installing latest patch set levels and configuring necessary advanced features.

Achieve rapid provisioning of Oracle Applications using Oracle Enterprise Manager Cloud Control by using the following:

- **Deployment Procedures** with a preconfigured Oracle Database template. This includes gold images of Grid Home, Database Home, and Database files.
- **Oracle application templates** uploaded to Software Library.

Use the self-service portal for Oracle Enterprise Management Cloud Control for provisioning a virtual machine as part of Oracle VM Services. You can deploy entire stack within 2 days without downloading any software or creating storage LUNs.

This is the high-level procedure:

1. Launch **VM Configuration** as a single node or multi-node setup. This step performs these activities.
 - (1) Identify storage and assigns storage to virtual machines based on the database or applications.
 - (2) Perform a format and mounts disk to virtual machine.
 - (3) Configure the kernel parameters.
 - (4) For Oracle RAC virtual machines, assign a private IP address and updates the /etc/hosts file.

Figure 14 is a screen shot of this step.

Figure 14

Name	Value	Description
System Type*	PROD	Choose your system Type (PROD/UAT/DEV)
Choose Server Type*	<input checked="" type="radio"/> Database <input type="radio"/> Application	This field is required to identify whether server is database or application
EBSDB Configuration type	<input checked="" type="radio"/> Multi Node <input type="radio"/> Single Node	This variable is required to identify whether DBApp is RAC/Multi node setup
Primary Host		This is a dynamic parameter and doesn't required any input
Secondary Host		This is a dynamic parameter and doesn't required any input
Machine Size	MEDIUM	Choose the machine size (MEDIUM - 500, SMALL -250 & LARGE - 1500 Users)
Private IP Address of DB Node1	0.0.0.0	Private IP address to setup interconnect for RAC Configuration

2. Using **Deployment Procedure Manager** in Enterprise Manager Cloud Control, click the option to provision. See Figure 15 on page 30.

Figure 15

Provisioning

Deployment Procedure Manager

Procedure Library Procedure Activity Recycle Bin

Procedures are best practices provided by Oracle for various Provisioning and Patching tasks. Procedures created by Oracle cannot be edited, but can be extended.

Search Text Fields Go Advanced Search

Launch Edit Procedure Definition... Create Like Launch

Select	Procedure	Type	Parent	Version
<input type="radio"/>	EBS VM Configurations for Multi Node	User Defined	None	1.49
<input type="radio"/>	EBS VM Configurations for Single Node	User Defined	None	1.2
<input type="radio"/>	EBS 12.2.6 Single node Application Tier	User Defined	None	1.11
<input type="radio"/>	Provision Oracle RAC Database for EBS	Oracle RAC Database Provisioning	None	1.42
<input type="radio"/>	Provision Oracle EBS Database(RAC)	Oracle RAC Database Provisioning	Provision Oracle RAC Database for EBS	
<input checked="" type="radio"/>	Provision Oracle EBS Database(Non RAC)	Oracle Database Provisioning	Provision Oracle EBS Database(Non RAC)	
<input type="radio"/>	Provision EBS 12.2.6 Single node Application	User Defined	EBS 12.2.6 Single node Application Tier	
<input type="radio"/>	Update Linux VM Configurations for EBS	User Defined	EBS VM Configurations for Multi Node	
<input type="radio"/>	Setup EBS 12.2.6 Multi Node Application	User Defined	EBS 12.2.6 Multi Node Application Configuration	

- Designate the installation directories and set any custom database variables. When finished, click **Continue**, review the database provisioning, and **Submit**. See Figure 16.

Figure 16

Provision Oracle EBS Database(Non RAC): Provision Oracle EBS Database(Non RAC): Review

Review the information below and submit the procedure.

Hosts

Host Name	Operating System
etsuab001 Machlab-fo...	Oracle Linux Server release 7.2

Destination locations

Product	Oracle Base	Oracle Home	Normal use
Oracle Database	u01app/EBSUAT	u01app/EBSUAT/app/product/12.1.0.2/010	NC_OS_SSH

Working Directory: /tmp/

Database Installer Parameters

Operating System Groups

Group label	OS Group name
Inventory Group (ORINSTLL)	dba
Database Administrator (OSDBA)	dba
Database Operator (OSOPER) (Opti...	dba

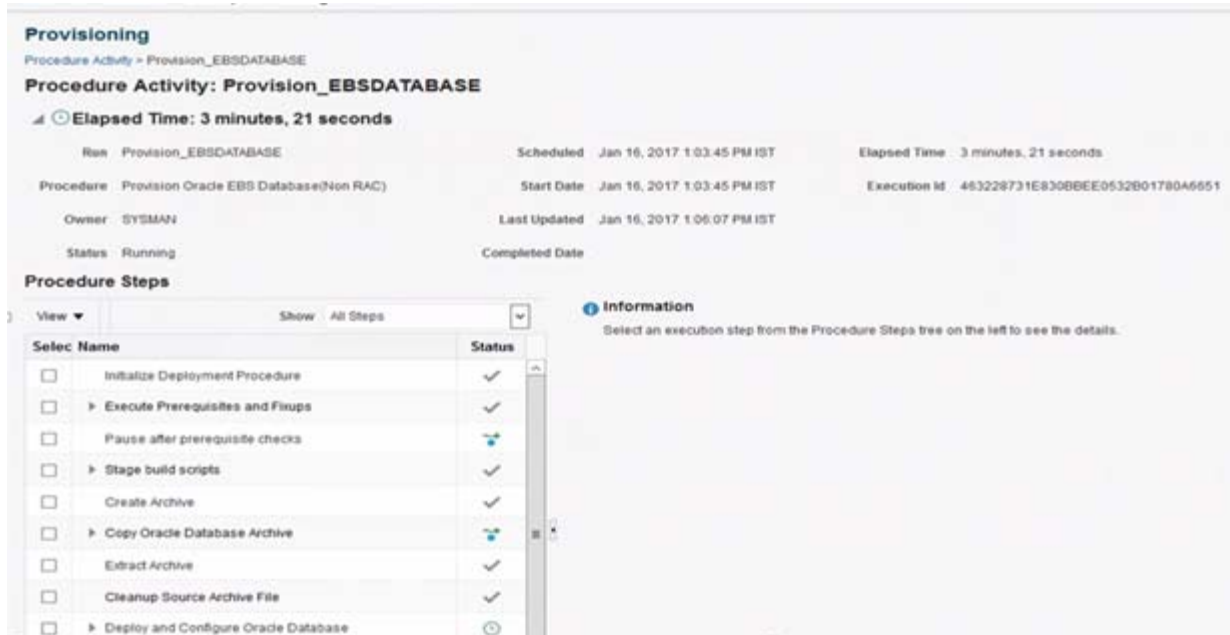
Software Images

Product	Software library location
Oracle Database	Database Provisioning Profiles/12.1.0.2/010/ua4EBS/PROV_Profile_SSH0V16 - Database gold image

Schedule

You can see a detailed status of all activities happening during the provisioning of database. See Figure 17.

Figure 17



Engineering Validation

This is how Hitachi Cloud Foundation for Oracle Database was validated.

Test Methodology

OSWatcher was used to capture performance metrics from Oracle virtual machines during database workload. OSWatcher reports CPU and memory utilization.

Test Results

Table 13 shows the CPU and memory utilization percentages during solution testing for one of the databases. There was no CPU or memory stress noticed during testing cycles.

TABLE 13. TEST RESULTS

Metric	Server	Utilization (%)
CPU Utilizations (%)	App Server1	40
	App server2	21
	DB server1	10
	DB server2	10

TABLE 13. TEST RESULTS (CONTINUED)

Metric	Server	Utilization (%)
Memory Utilizations (%)	App Server1	47.92
	App server2	27.08
	DB server1	72.66
	DB server2	37.50

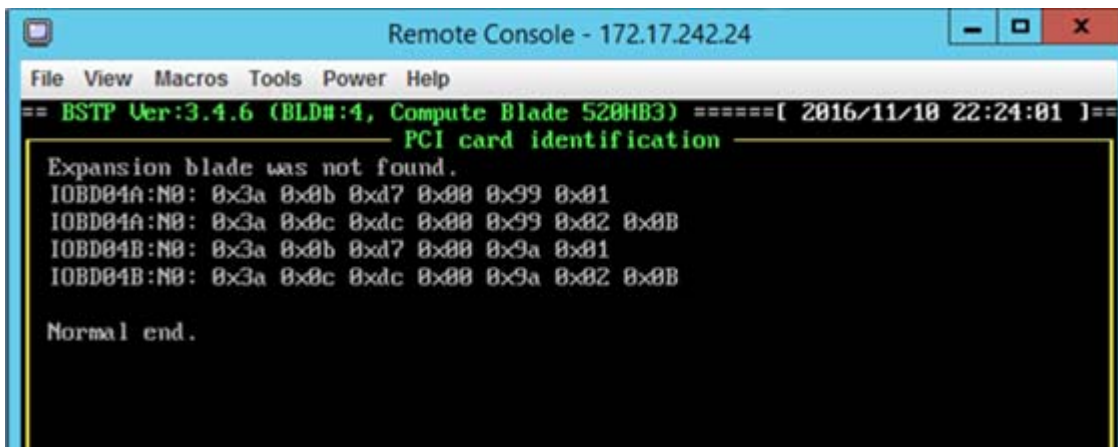
How to Run Hitachi Compute Blade 2500 Series Maintenance Test Program (BSTP)

Run the Hitachi Compute Blade 2500 series maintenance test program (BSTP) to recognize Emulex HBA cards in the web console of Hitachi Storage Navigator and Hitachi Compute Systems Manager.

To run the Hitachi Compute Blade 2500 series maintenance test program (BSTP), do the following.

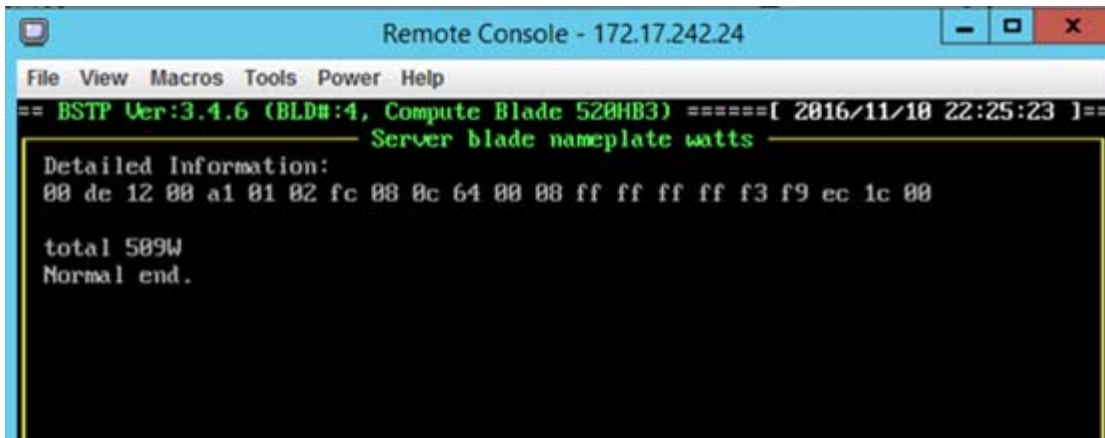
1. Download the microcode for the BSTP installation image (ISO file) from [Support Connect](#) on the Hitachi Data Systems web site.
 - If you do not have an account for Support Connect, then click **Register Here** to create your account.
2. Run the PCI card identification tool.
 - (1) Launch **Remote Console** for the server blade where you need to recognize the Emulex HBA cards.
 - (2) Load the installation image media and boot from the server blade.
Wait for the media to load. This generally it takes about 5 to 10 minutes.
 - (3) When asked **Check the display time correct**, type the following (if correct): y
 - (4) To run the identification tool, from the **Utility** menu, click **FRU Update Tool**, click **PCI Card identification**, and click **OK**.
 - (5) After the utility runs, click **Exit**. Figure 18 shows successful run of the FRU update tool.

Figure 18



3. Run the server blade nameplate watts tool.
 - (1) To run the update tool, Click **Server blade nameplate watts** and then click **OK**.
 - (2) Click **Exit**. Figure 19 shows a successful run of server blade nameplate watts.

Figure 19



4. Close Remote Console.
 - (1) From the main menu, click **Power off**.
 - (2) Remove the installation media.
 - (3) Press Enter.
5. Configure the updated server blade.
 - (1) From the web console for Hitachi Compute Blade 2500, click **Resources**, click **Modules**, and click > **Server Blades**.
 - (2) Click the updated server blade.
 - (3) Click the **BMC** tab and then click **Restart BMC**.
 - (4) When **Confirm** dialog box opens, do the following:
 - i. Select the **Turn sub power off** check box.
 - ii. Click **OK**.

You might see a network error for the server blade remote connection. The connection usually comes back up in 5 to 10 minutes.

If you need to check status of the BMC, then click **Condition** tab to monitor the status.

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 [Services](#) website.

Live and recorded product demonstrations are available for many Hitachi products. To schedule a live demonstration, contact a sales representative. To view a recorded demonstration, see the [Resources](#) website.

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