

# Hitachi Solution for Databases using Oracle Cloud for a XaaS Foundation

Best Practices Guide

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# Feedback

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## Revision History

Revision	Changes	Date
MK-SL-155-00	Initial release	July 1, 2019

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# Hitachi Solution for Databases using Oracle Cloud for a XaaS Foundation

## Best Practices Guide

This document is intended to be used as a reference for deploying Oracle Cloud for a XaaS Foundation. The intent of this document is to review how hybrid cloud can be integrated with existing on-premises environment and identify migration options and methodologies into the Oracle Public Cloud with central monitoring. This document discusses:

- Disaster recovery and database migration methodologies
- Virtual Machine migration in an Oracle Cloud Infrastructure
- Central monitoring with hybrid cloud agent management

## Hardware Components

Table 1 lists the hardware components used for the Hybrid cloud tests and deployments.

TABLE 1. HARDWARE COMPONENTS

Hardware	Detailed Description	Firmware/Version	Quantity
Hitachi Virtual Storage Platform G900	<ul style="list-style-type: none"> <li>■ Two controllers</li> <li>■ 8 × 16 Gb/s Fibre Channel ports</li> <li>■ 512 GB cache memory</li> <li>■ 32 × 1.9 TB SSDs plus 2 spares</li> <li>■ 4 × 3 TB, 7.2k RPM SAS drives</li> </ul>	88-01-04-60/00	1
Hitachi Advanced Server DS220 servers	<ul style="list-style-type: none"> <li>■ 2 Intel Xeon Gold 6140 CPU @ 2.30 GHz</li> <li>■ 768 GB (64 GB × 12) DIMM DDR4 synchronous registered (buffered), 2666 MHz</li> </ul>	BIOS: 3A10.H3 BMC: 3.75.06 CPLD: 10*	2
	<ul style="list-style-type: none"> <li>■ 2 dual port 25 GbE NIC Intel XXV710 cards</li> <li>■ 1 dual port 10 GbE NIC Intel X527-DA2 OCP mezzanine card**</li> </ul>	Driver: i40e Version: 2.1.14-k Firmware: 6.02 0x80003620 1.1747.0	
	<ul style="list-style-type: none"> <li>■ 2 Emulex LightPulse LPe31002-M6 2-Port 16 Gb/s Fibre Channel adapter</li> </ul>	11.4.204.25	
Hitachi Advanced Server DS120 server	<ul style="list-style-type: none"> <li>■ 2 Intel Xeon Silver 4110 CPU @ 2.10GHz</li> <li>■ 256 GB (32 GB × 8) DIMM DDR4 synchronous registered (buffered), 2666 MHz</li> <li>■ Additional hardware dependent on boot option***</li> </ul>	BIOS: 3A10.H8 BMC: 4.23.06 CPLD: 10	2
	<ul style="list-style-type: none"> <li>■ 2 Dual Port 25 GbE NIC Intel XXV710 card</li> </ul>	Driver: i40en Version: 1.3.1	
	<ul style="list-style-type: none"> <li>■ 2 Emulex LightPulse LPe31002-M6 2-port 16 Gb/s Fibre Channel adapters</li> </ul>	11.4.204.27	

TABLE 1. HARDWARE COMPONENTS (CONTINUED)

Hardware	Detailed Description	Firmware/Version	Quantity
Brocade Fibre Channel G620 switches	<ul style="list-style-type: none"> <li>■ 48 ports SFP+ and 4 QSFP ports Fibre Channel switch</li> <li>■ 16 Gb/s SFPs</li> <li>■ Brocade hot-pluggable SFP+, LC connector</li> </ul>	v8.2.0b	2
Cisco Nexus 93180YC-EX	<ul style="list-style-type: none"> <li>■ 48 × 10/25 GbE SFP+ ports</li> <li>■ 6 × 40/100 Gb/s quad SFP (QSFP28) ports</li> </ul>	BIOS: version 07.61 <ul style="list-style-type: none"> <li>■ NXOS: version 7.0(3)I4(7)</li> </ul>	2
Cisco Nexus 3048TP	<ul style="list-style-type: none"> <li>■ 1 GbE 48-Port Ethernet switch</li> </ul>	<ul style="list-style-type: none"> <li>■ BIOS: Version 4.0.0</li> <li>■ NXOS: version 7.0(3)I4(7)</li> </ul>	1

\*CPLD version 10 wasn't tested but it is supported at the server level.

\*\*The solution has been tested with PCIe and OCP Mezzanine NIC cards. It is recommended to use all PCIe cards for consistency and better NIC bonding options.

\*\*\*SATADOM, SAN boot, or local boot can be used for the boot option.

## Software Components

Table 2 lists the software components for compute nodes, and Table 3 lists the components for Management nodes for the Hybrid cloud tests and deployments.

TABLE 2. SOFTWARE COMPONENTS FOR COMPUTE NODES

Software	Version	Function
Oracle VM	3.4.5	Oracle virtualization software
Oracle Enterprise Linux	7.5	Guest operating system
Oracle 12c Database	12c Release 2(12.2)	Database software

TABLE 3. SOFTWARE COMPONENTS FOR MANAGEMENT NODES

Software	Version	Function
Oracle VM Manager	3.4.5	Oracle virtualization management 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	Hitachi storage and server OEM plugins
Virtual SVP (vSVP) software from Hitachi	Microcode dependent	Storage management software
VMware ESXi	6.7.0 Build 10302608	VMware ESXi is for management nodes
VMware vCenter Server	6.7.0 Build 10302608	Management cluster

### Architecture Diagram

Hitachi Solution for Database with Oracle Cloud for a XaaS foundation includes one or more of the following components:

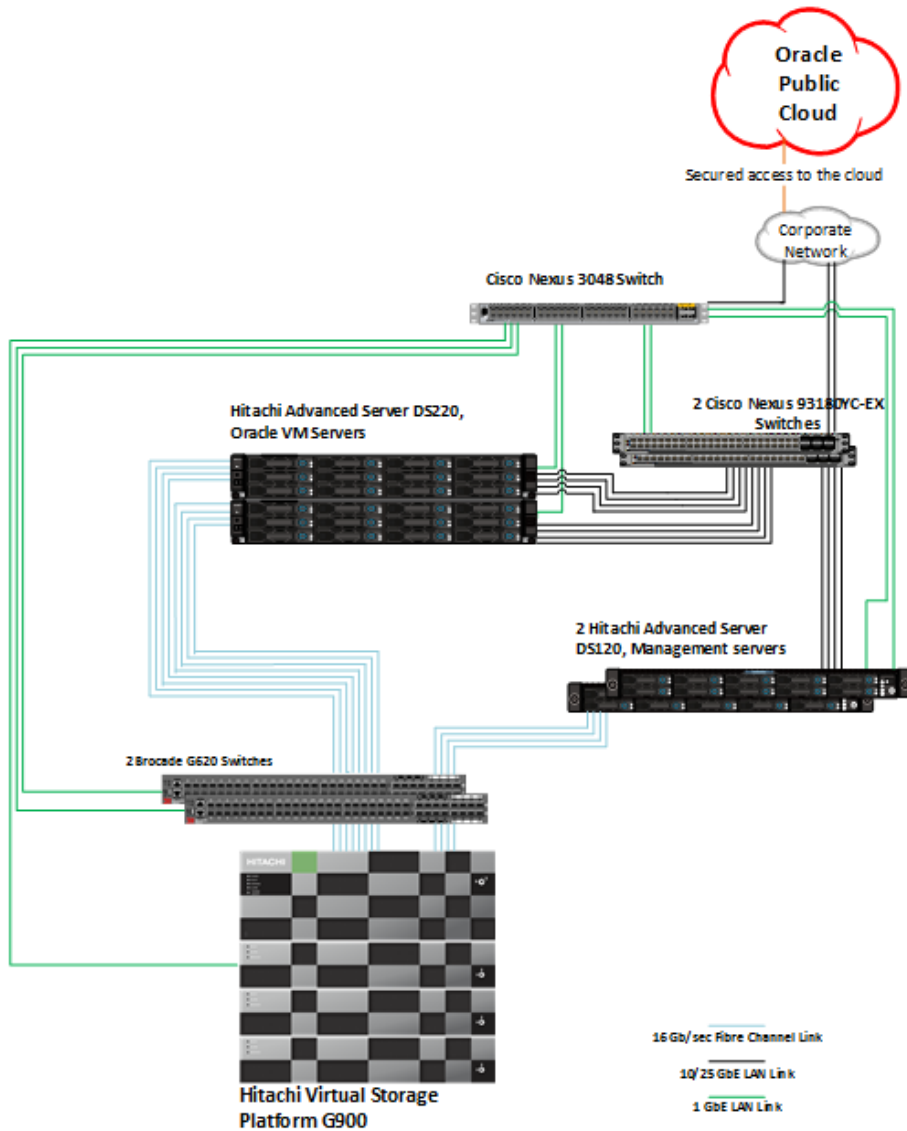
- Hitachi Advanced Server DS220 servers
- Hitachi Advanced Server DS120 servers
- Hitachi Virtual Storage Platform G900 (VSP G900)
- Brocade G620 16 Gb/s SAN infrastructure
- Cisco 10/25 GbE LAN infrastructure

Figure 1 shows the high-level infrastructure for this solution.

The configuration of Virtual Storage Platform G900 and Hitachi Advanced Server DS220 has the following characteristics:

- Fully redundant hardware
- Dual fabric connectivity between hosts and storage

**Figure 1**



To avoid any performance impact to the production database, Hitachi Vantara recommends using a configuration with the following:

- A dedicated storage system for the production database
- A dedicated storage system for storing backup data, if needed

Uplink speed to the corporate network depends on the customer environment and requirements. The Cisco Nexus 93180YC-EX switches can support uplink speeds of 40 GbE, 100 GbE, or higher if trunked when more bandwidth is required.

## Server and Application Architecture

Hitachi Advanced Server DS220 servers are used to create a server pool in OVM. The server pool provides flexibility to use as much resource as needed to create database or application virtual machines.

This provides the compute power for the Oracle database to handle complex database queries and large volumes of transaction processing.

Hitachi Advanced Server DS120 servers are used to manage the Oracle Virtual Machine environment using Hitachi's management software and adapters as well as Oracle management software as mentioned in Table 3. The management nodes leverage VMware ESXi with the availability of a number of management software in OVA format as well as ESXi's management cluster functionalities.

Table 4 describes the details of the DS220 and DS120 server configuration used for the tests.

TABLE 4. HITACHI ADVANCED SERVER DS220 AND DS120 SERVER SPECIFICATIONS

Hitachi Advanced Server	Server Name	Role	CPU Core	RAM
DS220	ovs1	Oracle VM Server	36	768 GB (64 GB × 12)
	ovs2	Oracle VM Server	36	768 GB (64 GB × 12)
DS120	ESXi1	Management server 1	16	256 GB (32 GB × 8)
	ESXi2	Management server 2	16	256 GB (32 GB × 8)

## Disaster Recovery and Database Migration Methodologies

You need disaster recovery plans to keep business continuity for mission critical production systems. It helps prevent data loss and avoid single point of failure. By default, Hitachi's architecture for OVM provides a number of disaster recovery and migration capabilities. With the integration to Oracle Public Cloud, Hitachi's architecture goes one step further in providing customers a resilient and reliable hybrid cloud architecture.

Here are some benefits of Oracle Public Cloud:

- Simple deployment model
- On-demand instantaneous elastic DR site
- No capex, low opex
- Elastic compute and storage for data protection

You can migrate your on-premises Oracle Database to an Oracle Cloud Infrastructure Database service database using a number of different methods that use several different tools. Some of the characteristics and factors to consider when choosing a migration method are described in the sections that follow.

## Migration Considerations

- On-premises database version
- Cloud database version
- On-premises host operating system and version
- On-premises database character set
- Quantity of data, including indexes
- Data types used in the on-premises database
- Storage for data staging
- Acceptable length of system outage
- Network bandwidth

### *Migration Connectivity Options*

You have several connectivity options when migrating your on-premises databases to the Oracle Cloud Infrastructure. The options are listed below in order of preference.

- **FastConnect:** Provides a secure connection between your existing network and your virtual cloud network (VCN) over a private physical network instead of the Internet.
- **IPSec VPN:** Provides a secure connection between a dynamic routing gateway (DRG) and customer-premise equipment (CPE), consisting of multiple IPSec tunnels. The IPSec connection is one of the components forming a site-to-site VPN between a VCN and your on-premises network.
- **Internet gateway:** Provides a path for network traffic between your VCN and the Internet.

Many methods exist to migrate Oracle databases to the Oracle Cloud Infrastructure Database service. Which of these methods apply to a given migration scenario depends on several factors, including the version, character set, and platform endian format of the source and target databases.

### *Migration Methods*

Several migration methods are available with Oracle Public Cloud. Below are some of the key methods:

- Create a Backup in the Cloud
- Data Pump Conventional Export/Import
- Data Pump Full Transportable
- Data Pump Transportable Tablespace
- Remote Cloning a PDB
- Remote Cloning Non-CDB
- RMAN Cross-Platform Transportable PDB
- RMAN Cross-Platform Transportable Tablespace Backup Sets
- RMAN Transportable Tablespace with Data Pump

- RMAN DUPLICATE from an Active Database
- RMAN CONVERT Transportable Tablespace with Data Pump
- SQL Developer and INSERT Statements to Migrate Selected Objects
- SQL Developer and SQL\*Loader to Migrate Selected Objects
- Unplugging/Plugging a PDB
- Unplugging/Plugging Non-CDB
- For more details click [here](#).

Among all methods, the most commonly used techniques are Data Pump and Transportable Tablespaces. Data Pump can be used for smaller databases and it is a very simple process. The Transportable Tablespaces method is used for databases that are larger and more complex. Both methods are used for cross-version and cross-OS platform migration. For the customer's production environment running in on Oracle XaaS cloud foundation, it makes more sense to choose a method that is very quick to deploy and serves as a backup repository on the Oracle Public Cloud. We have no need to change any database version, character set version, or any operating system version or type. When there is a need to deploy a non-production instance on the public cloud, a nightly backup can be used to spin up the instance in a few clicks. The migration method "By Creating a Backup in the Cloud" is best suitable in these scenarios.

### Migration Method: By Creating a Backup in the Cloud

We have tested migration by creating a backup in the cloud. Customers can leverage Oracle Public Cloud to keep backups in the cloud which can be used in case of disaster as well as to instantaneously set up a non-production environment when needed. We have used a single instance database for validation. The same process applies for RAC database as well.

#### *Database Configuration*

- Single Instance Database
- Non-CDB
- Version: 12.2.0.1.0
- Size: 512 GB

Here are the high level steps to create an instance in the cloud using backup:

- Verify compatibility for scripted migration
  - Compatibility matrix is provided [here](#)
- RMAN configuration to autobackup controlfile and spfile
  - RMAN> CONFIGURE CONTROLFILE AUTOBACKUP ON;
- Run CLI (Command Line Interface) installer to install backup module
  - To run the installer script, run this following command: `bash -c "$(curl -L https://raw.githubusercontent.com/oracle/oci-cli/master/scripts/install/install.sh)"`
- Setup the Config File and SSH key pair
  - The `oci setup config` command helps to create the required API key pair and creates the config file.
- Add API Keys for the user created on Oracle Public Cloud

- Setup environment variables for either TDE-enabled or non-TDE database and run the “*create\_backup\_from\_onprem*” CLI script
  - *For a non-TDE database:*
    - export AD=<destination\_availability\_domain>
    - export C=<destination\_compartment\_OCID>
    - export ORACLE\_SID=<ORACLE\_SID>
    - export ORACLE\_HOME=<ORACLE\_HOME>
    - export PATH=\$PATH:\$ORACLE\_HOME/bin
    - export LC\_ALL=en\_US.UTF-8
    - export ORACLE\_UNQNAME=<source\_DB\_unique\_name>
    - rm -rf /home/oracle/migrate/onprem\_upload
    - cd /home/oracle/migrate/bin/oci-cli-scripts/
    - ./create\_backup\_from\_onprem --config-file /home/oracle/migrate/config.txt --display-name <example\_display\_name> --availability-domain \$AD --edition ENTERPRISE\_EDITION\_EXTREME\_PERFORMANCE --opc-installer-dir /home/oracle/migrate --tmp-dir /home/oracle/migrate/onprem\_upload --compartment-id \$C --rman-password <password>
  - *For a TDE-enabled database:*
    - export AD=<destination\_availability\_domain>
    - export C=<destination\_compartment\_OCID>
    - export ORACLE\_SID=<ORACLE\_SID>
    - export ORACLE\_HOME=<ORACLE\_HOME>
    - export PATH=\$PATH:\$ORACLE\_HOME/bin
    - rm -rf /home/oracle/migrate/onprem\_upload
    - cd /home/oracle/migrate/bin/oci-cli-scripts/
    - ./create\_backup\_from\_onprem --config-file /home/oracle/migrate/config.txt --display-name <example\_display\_name> --availability-domain \$AD --edition ENTERPRISE\_EDITION\_EXTREME\_PERFORMANCE --opc-installer-dir /home/oracle/migrate --tmp-dir /home/oracle/migrate/onprem\_upload --compartment-id \$C
- Create a new database using the backup in the cloud

Figure 2 shows successful deployment of a database on the Oracle Public Cloud.

**Figure 2**



For more details click [here](#).

## CLI Use and Troubleshooting

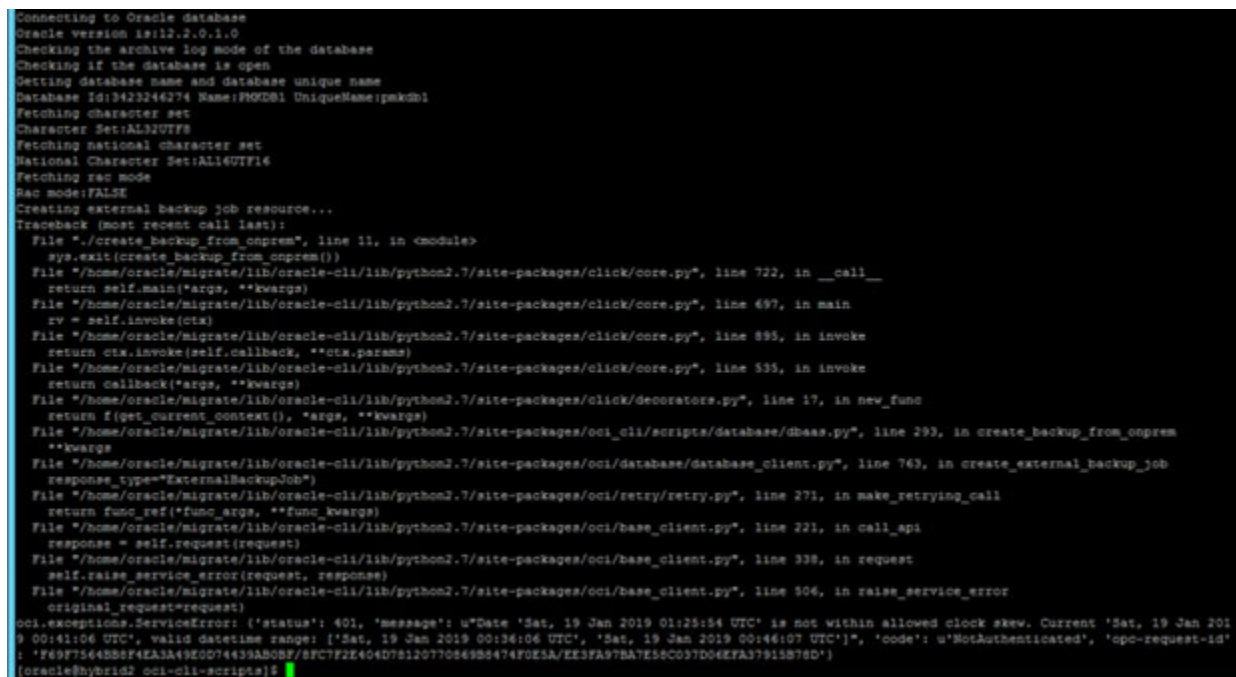
Below are some resolutions for issues found during our testing for migrating backup in the cloud while using the CLI.

### Issue 1

CLI script “create\_backup\_from\_onprem” fails with the following error as shown in Figure 3.

```
oci.exceptions.ServiceError: {'status': 401, 'message': u'Date 'Sat, 19 Jan 2019 01:25:54 UTC' is not within allowed clock skew. Current 'Sat, 19 Jan 2019 00:41:06 UTC', valid datetime range: ['Sat, 19 Jan 2019 00:36:06 UTC', 'Sat, 19 Jan 2019 00:46:07 UTC']', 'code': u'NotAuthenticated'}
```

Figure 3



```
Connecting to Oracle database
Oracle version is:12.2.0.1.0
Checking the archive log mode of the database
Checking if the database is open
Setting database name and database unique name
Database Id:3423246274 Name:PROD01 UniqueName:pakdb1
Fetching character set
Character Set:AL32UTF8
Fetching national character set
National Character Set:AL16UTF16
Fetching nrc mode
Nrc mode:FALSE
Creating external backup job resource...
Traceback (most recent call last):
  File "./create_backup_from_onprem", line 11, in <module>
    sys.exit(create_backup_from_onprem())
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/click/core.py", line 722, in __call__
    return self.main(*args, **kwargs)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/click/core.py", line 697, in main
    rv = self.invoke(ctx)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/click/core.py", line 895, in invoke
    return ctx.invoke(self.callback, **ctx.params)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/click/core.py", line 535, in invoke
    return callback(*args, **kwargs)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/click/decorators.py", line 17, in new_func
    return figet_current_context(), *args, **kwargs)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/oci_cli/scripts/database/dbaaS.py", line 293, in create_backup_from_onprem
    **kwargs
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/oci/database/database_client.py", line 763, in create_external_backup_job
    response_type="ExternalBackupJob")
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/oci/retry/retry.py", line 271, in make_retrying_call
    return func_ref(*func_args, **func_kwargs)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/oci/base_client.py", line 221, in call_api
    response = self.request(request)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/oci/base_client.py", line 338, in request
    self.raise_service_error(request, response)
  File "/home/oracle/migrate/lib/oracle-cli/lib/python2.7/site-packages/oci/base_client.py", line 506, in raise_service_error
    original_request=request)
oci.exceptions.ServiceError: ('status': 401, 'message': u'Date 'Sat, 19 Jan 2019 01:25:54 UTC' is not within allowed clock skew. Current 'Sat, 19 Jan 2019 00:41:06 UTC', valid datetime range: ['Sat, 19 Jan 2019 00:36:06 UTC', 'Sat, 19 Jan 2019 00:46:07 UTC']', 'code': u'NotAuthenticated', 'opc-request-id' : '7e9f7564082f42334920074433AB08F/8FC7F2E404D78120770849B474F0E3A/EE3FA97BA7E58C037D04EFA37915878D')
[oracle@hybrid2 ~]$
```

### Resolution:

This status code is returned if the client's clock is skewed more than 5 minutes from the server's clock. The solution is to adjust the clock on the on-premises server.

### Issue 2

The CLI script “create\_backup\_from\_onprem” fails with the following error as shown in Figure 4.

Failed to run opcInstaller

Figure 4

```
Oracle version 19c12.2.0.1.0
Checking the archive log mode of the database
Checking if the database is open
Setting database name and database unique name
Database ID:1623246274 Name:PMO001 UniqueName:pmo001
Fetching character set
Character Set:AL32UTF8
Fetching national character set
National Character Set:AL16UTF16
Fetching row mode
Row mode:FALSE
Creating external backup job resource...
Created external backup job resource with ID: ocid1-@backup-oci-lad-abuwlj4trvsnwkrqgr4r936u4f6ast21e2422h1j3ner3hodtqvwg
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Creating external backup job resource...
Waiting for completion of external backup job...
Uploading parameter logs
Setting up ovm install
Executing command: java -jar /home/oracle/migrate/ocm_install.jar -host https://wefc0jctstorage.us-east-1.amazonaws.com/v1/dbbackuplad -ocid '1w8wQn3h3W8dPC8w' -ocpPass cRed
ocd passwrd' -wallstdr /home/oracle/migrate/ocpm_upload -libDir /home/oracle/migrate/ocpm_upload -confFile /home/oracle/migrate/ocpm_upload/ocpm001.ora -contains 1w8wQn3h3
W8dPC8w
Deleting incomplete backup
Failed to run ocmInstaller ocm/java -jar /home/oracle/migrate/ocm_install.jar -host https://wefc0jctstorage.us-east-1.amazonaws.com/v1/dbbackuplad -ocid '1w8wQn3h3W8dPC8w' -
ocpPass '1w8wQn3h3W8dPC8w' -wallstdr /home/oracle/migrate/ocpm_upload -libDir /home/oracle/migrate/ocpm_upload -confFile /home/oracle/migrate/ocpm_upload/ocpm001.ora -contai
ner 1w8wQn3h3W8dPC8w
oracle@hyrid1-oci-all-ec2ip18
```

Resolution:

The server needs to be in transparent proxy to make a connection to the cloud for backup because the CLI doesn't have any parameters to pass the proxy server and port.

## Virtual Machine Migration in Oracle Cloud Infrastructure

Oracle VM is a platform that provides a fully equipped environment that enables you to leverage the benefits of virtualization technology and to deploy operating systems and application software within a supported virtualized environment. Customers can deploy enterprise applications such as Oracle databases, Middleware, and Applications as well as many non-Oracle applications on the cloud. Oracle Cloud Infrastructure offers pre-packaged images for Oracle VM. By instantiating these images, you can create an Oracle VM architecture in minutes.

Here are high level steps to setup OVM infrastructure on the Oracle Public Cloud:

- Step 1: Prepare the Oracle Cloud Infrastructure Environment
- Step 2: Create and configure the Oracle VM manager instance using the Oracle provided OCID image
- Step 3: Set up the Oracle cloud infrastructure environment for Oracle VM server
- Step 4: Create the Oracle VM server instances using the Oracle provided OCID image
- Step 5: Setup the Oracle cloud infrastructure environment for Oracle VM virtual machines

Customers can leverage Oracle Pubic Cloud's OVM infrastructure for disaster recovery or transfer some of the load from the on-premises datacenter to the cloud. We have tested successful entire VM migration to the cloud infrastructure. On-premises VMs need virtual disks used for data storage. The VM migration process is the same as you would do on-premises.

For more details on how to setup OVM infrastructure and limitations click [here](#).

Here are some tips for faster setup of the Oracle cloud infrastructure environment to minimize some issues and perform quick troubleshooting:

When creating Virtual Cloud Network(VCN), select CREATE VIRTUAL CLOUD NETWORK PLUS RELATED RESOURCES to avoid possible SSH connection issues.

Create Security Lists to allow all required ports for Ingress and Egress to avoid any communication issues between Oracle VM Manager instance and Oracle VM Server instance.

Use the readily available Oracle provided OCID image from the same region where you are setting up Oracle cloud infrastructure for faster deployment of OVM manager and OVM server.

Oracle provides different types of shapes as the VM configuration available for your Oracle Public Cloud account. If you are planning to use certain types of configurations for certain regions, make sure they are available to you or request a total count ahead of time to avoid any delays.

Creating an Internet gateway in VCN allows access to Oracle VM manager via SSH, console, or command-line interface from clients. It creates an Oracle VM Manager instance as a bastion host for all Oracle VM Server instances managed by Oracle VM Manager. Apart from gateway and security list setup, Oracle VM Manager OCID image has its own set of firewall rules so if you need to download any OVM templates and configure databases, you will need to allow additional HTTP port access in the firewall.

## Central Monitoring with Hybrid Cloud Management

With Oracle Hybrid Cloud, you can use the Enterprise Manager Cloud Control console to administer both your on-premises and Oracle Cloud deployments. Oracle Hybrid Cloud lets on-premises Enterprise Manager administrators monitor and manage cloud services using the same Oracle Enterprise Manager tools they use to monitor, provision, and maintain Oracle Databases, Engineered Systems, Oracle Applications, Oracle Middleware, and a variety of third-party systems.

These are the high level steps to enable Hybrid Cloud Management:

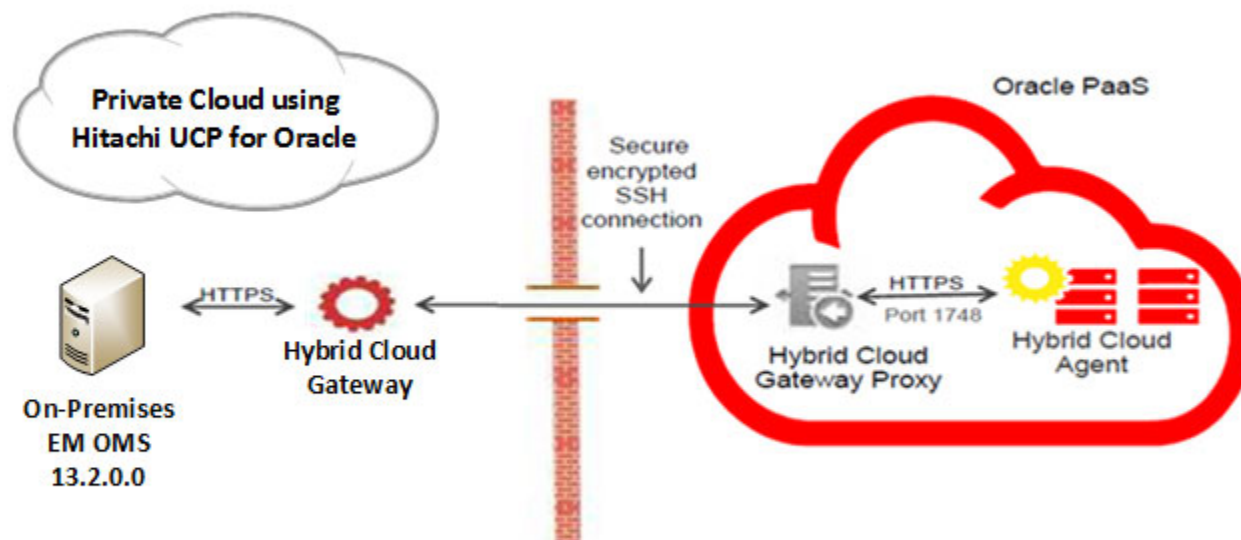
Step 1 Make sure an on-premises Agent can communicate with the Oracle Cloud via SSH

Step 2: Configure an on-premises Agent to serve as a Gateway

Step 3: Deploy Agents on Oracle Cloud VMs to communicate with the on-premises Gateway

Figure 5 shows the workflow of Hybrid cloud management using Oracle Enterprise manager. More detailed steps can be found [here](#).

Figure 5

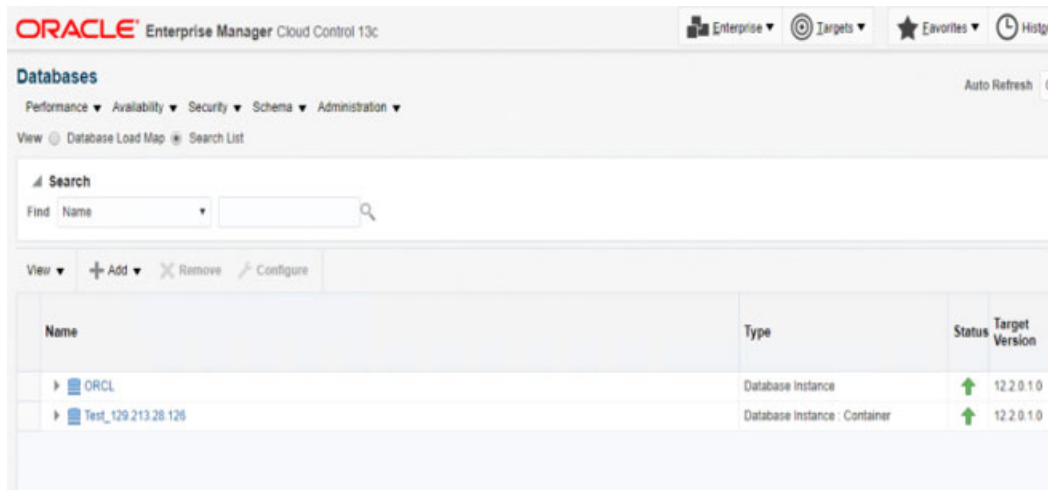


Here are some best practices and observations while working with Hybrid Cloud agents

1. Use the 'opc' user account to install the agent and setup named credentials with SSH keys.
2. Make sure the cloud host domain name is oracle.com, oraclecloud.com, or oraclecloud.internal. If needed, update /etc/sysconfig/network, /etc/resolv.conf, and /etc/hosts files to update one of those domains.
3. Open ports 22, 1748, and 3872 for communication between on-prem and Oracle Public Cloud hosts. Ports must be open at 3 places.
  - Customer n-premises firewall
  - Ingress/Egress Security List rules at Oracle Public cloud's Virtual Cloud Network
  - Oracle Public Cloud hosts' internal firewall
4. If database targets are monitored, then open an additional port 1521(or other) and make sure a listener is up and running.
5. For any issues encountered during installation, it is best to wipe off everything and start all over again to avoid any port conflict issues.

Figure 6 and Figure 7 show screenshots of on-premises database and Oracle Public Cloud database central monitoring through OEM software installed at the customer's on-premises datacenter.

**Figure 6**



The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The main heading is "Databases" with a sub-heading "Performance ▾ Availability ▾ Security ▾ Schema ▾ Administration ▾". Below this, there are navigation options: "View Database Load Map Search List". A search bar is present with the text "Find Name" and a search icon. Below the search bar, there are action buttons: "View ▾", "+ Add ▾", "X Remove", and "Configure". The main content is a table with the following columns: "Name", "Type", "Status", and "Target Version".

Name	Type	Status	Target Version
ORCL	Database Instance	↑	12.2.0.1.0
Test_129.213.28.126	Database Instance - Container	↑	12.2.0.1.0



Oracle Public Cloud can be used as a capacity buffer for on-premises Oracle XaaS Cloud Foundation and provides extra capacity during peak times if needed, thus optimizing utilization of the on-premises infrastructure.

OEM 13c installed at customer's on-premises datacenter can be used for central monitoring of databases running at on-premises as well as at Oracle Public Cloud with quick hybrid agent deployment.

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