

OCI Database Migration Agent Tutorial

Aimed for scenarios where your source database is behind a firewall or there is no direct database connection to OCI, without the need for minimized downtime through online replication.

Purpose statement

This document walks you through all the steps to get you started using Oracle Cloud Infrastructure (OCI) Database Migration (DMS). You will provision a Virtual Cloud Network (VCN), an Oracle Database 19c instance, and an Oracle Autonomous Database (ADB) instance to perform a database migration using DMS.

With DMS we make it quick and easy for you to migrate databases from on-premises Oracle or third-party cloud into Oracle databases on OCI.

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Introduction to OCI Database Migration – DMS

OCI Database Migration (DMS) provides a high performant, self-service experience to achieve migrations, which include:

- Migration of data from on-premises Oracle or 3rd party cloud databases into Oracle databases on OCI
- Logical Online and Offline Migration providing enterprise-level migration with minimal downtime and on-premises to cloud migration
- Based on industry leading GoldenGate replication and Zero Downtime Migration engine

Prerequisites

Please Check [here](#) for the latest copy of this document.

This tutorial is based on settings done in Tutorial 1 – OCI Database Migration End-to-End. Please complete Tutorial 1 first.

DMS Documentation

Please review the documentation here –

<https://docs.oracle.com/en/cloud/paas/database-migration>

Task 0 – Understand New DMS Concepts

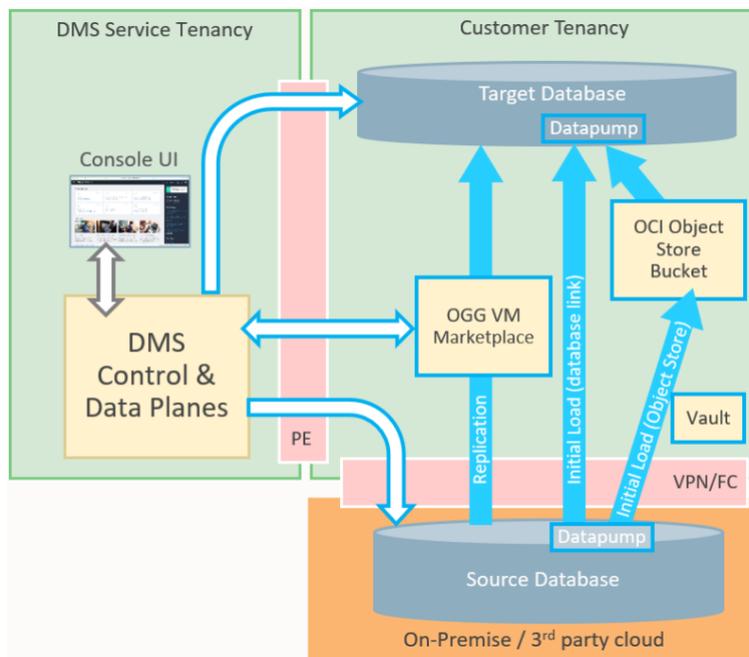
DMS provides a fully managed approach to migrating databases from various locations into OCI-hosted databases.

Migrations can be either one of the following modes:

- **Offline:** The Migration makes a point-in-time copy of the source to the target database. Any changes to the source database during migration are not copied, requiring any applications to stay **offline** for the duration of the migration.
- **Online:** The Migration makes a point-in-time copy and replicates all subsequent changes from the source to the target database. This allows applications to stay **online** during the migration and then be switched over from source to target database.

DMS supports both offline and online mode. In the first release, we currently support Oracle databases located on-premise, in 3rd party clouds, or on Oracle OCI as source and Oracle Autonomous Database shared or dedicated, co-managed databases such as Database Cloud Service on VM, bare metal, or Exadata Cloud Service as targets.

The DMS service runs as a managed cloud service separate from the user's tenancy and resources. The service operates as a multi-tenant service in a DMS Service Tenancy and communicates with the user's resources using Private Endpoints (PEs). PEs are managed by DMS and are transparent to the user.



DMS Simplified Topology

Compartment: A compartment is a collection of related resources (such as cloud networks, compute instances, or block volumes) that can be accessed only by those groups that have been given permission by an administrator in your organization. For example, one compartment could contain all the servers and storage volumes that make up the production version of your company's Human Resources system. Only users with permission to that compartment can manage those servers and volumes.

Data region: A geographical region that's associated with one or more data centers. When you sign up for an Oracle Cloud account, you select a default data region, where your services will be hosted.

DMS Control Plane: Used by DMS end user to manage Migration and Registered Database objects. The control plane is exposed through the DMS Console UI as well as the Rest API.

DMS Data Plane: Managed by DMS Control Plane and transparent to the user. The GGS Data Plane manages ongoing migration jobs and communicates with the user's databases and GoldenGate instance using PEs. The DMS data plane does not store any customer data, as data flows through GoldenGate and Data Pump directly within the user's tenancy.

Migration: A Migration contains metadata for migrating one database. It contains information about source, target, and migration methods and is the central object for users to run migrations. After creating a migration, a user can validate the correctness of the environment and then run the migration to perform the copy of database data and schema metadata from source to target.

Migration Job: A Migration Job displays the state of a given Migration execution, either for validation or migration purposes. A job consists of several sequential phases, users can opt to wait after a given phase for user input to resume with the following phase.

Registered Database: A Registered Database represents information about a source or target database, such as connection and authentication credentials. DMS uses the OCI Vault to store credentials. A registered database is reusable across multiple Migrations.

Task 1 – Setup Compute VM used by DMS Agent

This demo will utilize an OCI Compute VM as the environment to run the DMS Agent.

Note: For simplicity's sake this VM will reuse the VCN as well as the source database of the End-to-End tutorial. For a more realistic environment you can create a VM in a separate VCN/Subnet or even in an external environment outside of OCI. In these cases, you will need to provide a source database in the same network as the Agent VM.

1. To perform this tutorial, you need to have access to an OCI tenancy with access to a region where DMS is released, such as the US-Ashburn-1 region. Please review <https://www.oracle.com/cloud/data-regions/> for available regions.

Open browser with URL <https://console.us-ashburn-1.oraclecloud.com/> or another appropriate region.

2. Log in using your tenancy name and username/password.
3. In the OCI Console Menu, go to **Compute > Instances**
4. Pick a compartment on the left-hand side **Compartment** list. You should use the same compartment as the source database defined in tutorial 1.
5. Click **Create Instance**.
6. Enter the following values, otherwise leave defaults:
 - Name: DMS Agent
 - Choose AD and shape according to your available quota. A 1 OCPU shape is sufficient.
 - Choose same VCN / subnet as source database in tutorial 1
 - Upload or paste public key to access instance later. You can use the same key as Database and GoldenGate instances in tutorial 1.

Close dialog by clicking **Create**.

7. Note the **Public IP Address** of the instance.
8. You will now need to open an SSH terminal to the agent instance. The instructions are for Unix-style ssh command:

```
ssh -i <private_key_file> opc@<agent_public_ip>  
(For example: ssh -i ./id_rsa opc@11.22.33.44)
```

Install necessary system packages through the following commands (Answer yes where necessary):

```
sudo yum install glibc-devel  
sudo yum install expect
```

Task 2 – Create API Key

1. You must create an API key in the OCI console or use an existing one. More information on how to create an API key can be found at:

<https://docs.oracle.com/en-us/iaas/Content/API/Concepts/apisigningkey.htm>

Please be aware that there is a limit of 2 API keys per user.

Please collect the fingerprint and private key file (*.pem) of the API key, you will need it later to configure the agent installer.

2. Transfer the private key file to your agent instance through SFTP or other means.

Task 3 – Create OSS Stream

The DMS Agent requires a Stream object to communicate asynchronously with the service. More information about stream is available at:

<https://docs.oracle.com/en-us/iaas/Content/Streaming/Tasks/managingstreams.htm>

1. In the OCI Console Menu, go to **Analytics & AI > Streaming**.
2. Click **Create Stream**.
3. Enter the following values, otherwise leave defaults:
 - Stream Name: **DMSStream**Click **Create**
4. Wait until Stream becomes active, then open the Stream object from list.
5. Copy the OCID of the stream. You will need it later to configure the agent installer.

Task 4 – Download and Install DMS Agent

This demo will utilize an OCI Compute VM as the environment to run the DMS Agent.

1. In the OCI Console Menu, go to **Migration > Database Migration > Migrations**.

- Click Download Agent in the info box.

Migrations in DMS_LA Compartment

i

An agent is required for migration when a direct connection to a source database is not available.

Download Agent
Learn more

- A file `dmsagentkip_21_XXXXXX.zip` (For example `dmsagentkip_21_210303.zip`) will be downloaded. Transfer the file to your agent instance through SFTP or other means. We will assume that the file is loaded to `/tmp/dmsagentkip_21_210303.zip` on the agent instance.
- Open an ssh terminal to the agent instance.
- Create the following directories:
 - `mkdir ~/agent`
 - `mkdir ~/agent/home`
 - `mkdir ~/agent/base`
 - `mkdir ~/agent/install`
- Unzip the installer using the following command:


```
unzip -q -d ~/agent/install dmsagentkip_21_210303.zip
```

- You must collect the following configuration information to install the DMS Agent:

Name	Example	Where to get
agentName	testagent	Choose name to describe agent
home	~/agent/home	Empty directory for agent home
base	~/agent/home	Empty directory for agent base
ziploc	~/agent/install/dms_home.zip	Location of the Home archive that got unpacked from the Installer archive
region	us-ashburn-1	Region of the DMS service to be used

tenancyId	ocid1.tenancy.oc1.. [...]	OCID of Tenancy where Migrations will be located. Can be found in profile menu of OCI Console
userId	ocid1.user.oc1.. [...]	OCID of User using this Agent. Can be found in profile menu of OCI Console
compartmentId	ocid1.compartment.oc1. [...]	OCID of Compartment where Migrations will be located. Can be found in Identity > Compartments menu of OCI Console.
streamId	ocid1.stream.oc1. [...]	OCID of OCI Streaming Service Stream. Collected earlier when creating the stream object.
userFingerprint	00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00	Fingerprint of API Key to be used with Agent. Collected earlier when creating the API Key.

userPrivateKey	~/agent/agent_api_key.pem	Private Key for API Key to be used with Agent. Collected earlier when creating the API Key.
----------------	---------------------------	---

8. Run the following commands using the information gathered earlier:

```
cd ~/agent/install

./dmsagent_install.sh \
agentName=agentname \
home=home \
base=base \
ziploc=ziploc \
region=region \
compartmentId=compartmentId \
streamId=streamId \
tenancyId=tenancyId \
userId=userId \
userFingerprint=userFingerprint \
userPrivateKey=userPrivateKey
```

9. Observe the output of the script. A sample output of a successful installation is:

```
[opc@dmsagent agent]$ ./install.sh
++ cd /home/opc/agent/install
++ ./dmsagent_install.sh agentName=testagent
home=/home/opc/agent/home base=/home/opc/agent/base
ziploc=/home/opc/agent/install/dms_home.zip region=us-ashburn-1
compartmentId=ocidl.compartment.oc1..xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxx
streamId=ocidl.stream.oc1.iad.xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
tenancyId=ocidl.tenancy.oc1..xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
userId=ocidl.user.oc1..xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
userFingerprint=00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00
userPrivateKey=/home/opc/agent/my_api_key.pem
Mar 17, 2021 1:01:36 AM com.oracle.bmc.Services create
INFO: Registering new service:
Services.BasicService(serviceName=MIGRATIONDEPLOYMENT,
serviceEndpointPrefix=migrations,
serviceEndpointTemplate=https://odms.{region}.oci.{secondLevelDomain})
Mar 17, 2021 1:01:36 AM com.oracle.bmc.Region getEndpoint
INFO: Loaded service 'MIGRATIONDEPLOYMENT' endpoint mappings:
{US_ASHBURN_1=https://odms.us-ashburn-1.oci.oraclecloud.com}
Mar 17, 2021 1:01:36 AM com.oracle.bmc.util.JavaRuntimeUtils
<clinit>
```

```

INFO: Determined JRE version as Java_8
Mar 17, 2021 1:01:36 AM com.oracle.bmc.http.DefaultConfigurator
setConnectorProvider
INFO: Setting connector provider to HttpURLConnectionProvider
Mar 17, 2021 1:01:36 AM com.oracle.zdmcs.MigrationDeploymentClient
setEndpoint
INFO: Setting endpoint to https://odms.us-ashburn-
1.oci.oraclecloud.com
Mar 17, 2021 1:01:36 AM com.oracle.zdmcs.MigrationDeploymentClient
<init>
INFO: Authentication details provider configured for region
'US_ASHBURN_1', but endpoint specifically set to 'https://odms.us-
ashburn-1.oci.oraclecloud.com'. Using endpoint setting instead of
region.
Mar 17, 2021 1:01:36 AM com.oracle.zdmcs.MigrationDeploymentClient
setEndpoint
INFO: Setting endpoint to https://odms.us-ashburn-
1.oci.oraclecloud.com
Mar 17, 2021 1:01:38 AM com.oracle.bmc.ClientRuntime <init>
INFO: Using SDK: Oracle-JavaSDK/1.19.3-preview1-SNAPSHOT
Mar 17, 2021 1:01:38 AM com.oracle.bmc.ClientRuntime <init>
INFO: User agent set to: Oracle-JavaSDK/1.19.3-preview1-SNAPSHOT
(Linux/5.4.17-2036.102.0.2.el7uek.x86_64; Java/1.8.0_281; Java
HotSpot(TM) 64-Bit Server VM/25.281-b04)

DMS Agent OCID:
ocidl.odmsagent.oc1.iad.
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

```

10. After the install has successfully completed, the agent is running, and no further commands are necessary on the agent instance.
11. In case the output is different, please review the log file `~/install/zdminstall.trc` for error messages.
12. Use the following commands to manage the agent, for example after reboot of the instance:
 - Stop: `~/agent/home/bin/dmsservice stop`
 - Start: `~/agent/home/bin/dmsservice start`
 - Check status: `~/agent/home/bin/dmsservice status`
13. In case the agent needs to be deleted, for example after completion of the project, please use the Agent REST API to remove the agent. This can be done using the `oci-curl` script or OCI CLI. Use the following commands to manage agents (Define `$OCID` with respective OCID of compartment or agent):
 - List agents in compartment:

```
oci-curl odms.us-ashburn-1.oci.oraclecloud.com get
"/20200720/agents?compartmentId=$OCID" | python -m json.tool
```
 - Delete agent:

```
oci-curl odms.us-ashburn-1.oci.oraclecloud.com delete "/20200720/agents/$OCID"
```

Task 5 – Create Registered Database for Source CDB

This step is identical to the same step in Tutorial 1. You can reuse the SourcePDB Registered Database object from Tutorial 1. No CDB Registered Database object is needed for Agent-based migration.

For this task you need the following info from the database:

- Source DB Private IP
 - Source DB PDB Service Name
1. In the OCI Console Menu, go to **Migration > Database Migration > Registered Databases**.
 2. Click **Register Database**.
 3. On the page Database Details, fill the following entries, otherwise leave defaults:
 - Name: **SourcePDB**
 - Vault: **DMS_Vault**
 - Encryption Key: **DMS_Key**
 - Database Type: **Database (Bare Metal, VM, Exadata)**
 - Database System: **SourceDB**
 - Database: **sourcedb**
 - Connect String: Change existing string by replacing the qualified hostname with the private IP of the database node. This is important as DMS does not accept FQDNs or hostnames in the connect string. Then replace service name with PDB service name, for example
`10.0.0.3:1521/pdb.subXXXXXXXX.vcndmsla.oraclevcn.com`
 - Subnet: Pick the Subnet that the DB is located in.
 4. Click **Next**.

5. On the page Connection Details, fill in the following entries, otherwise leave defaults:

- Database Administrator Username: **system**
- Database Administrator Password: <Admin password>
- SSH Database Server Hostname: < DB Node Private IP Address>
- SSH Private Key: Select private key file
- SSH Username: **opc**
- SSH Sudo Location: **/usr/bin/sudo**

Click **Register**.

Task 6 – Create Registered Database for Target

This step is identical to the same step in Tutorial 1. You can reuse the TargetATP Registered Database object from Tutorial 1.

1. In the OCI Console Menu, go to **Migration > Database Migration > Registered Databases**.

2. Click **Register Database**.
3. On the page Database Details, fill the following entries, otherwise leave defaults:
 - Name: **TargetATP**
 - Vault: **DMS_Vault**
 - Encryption Key: **DMS_Key**
 - Database Type: **Autonomous Database**
 - Database: **TargetATP**

Click **Next**.

The image displays two screenshots of the 'Register Database' wizard in the OCI console. The left screenshot shows the 'Database Details' step, where the following values are entered: Name: TargetATP, Compartment: DMS_LA, Vault: DMS_Vault, Encryption Key: DMS_Key, Database Type: Autonomous Database, and Database: TargetATP. The right screenshot shows the 'Connection Details' step, where the Database Administrator Username is 'admin' and the Database Administrator Password is masked with asterisks.

4. On the page Connection Details, fill in the following entries, otherwise leave defaults:
 - Database Administrator Username: **admin**
 - Database Administrator Password: *<Admin password>*

Click **Register**

Task 7 – Create Migration

1. In the OCI Console Menu, go to **Migration > Database Migration > Migrations**.
2. Click **Create Migration**.
3. In the page **Add Details**, fill the following entries, otherwise leave defaults:
 - Name: **TestMigration**

- Check **No direct connection to source database**
- Migration Agent: **testagent**
- Vault: **DMS_Vault**
- Encryption Key: **DMS_Key**

Click **Next**

Create Migration Help

1 **Add Details**

2 Select Databases

3 Migration Options

Name: TestAgentMigration

Compartment: DMS_LA

ggstage (root)/DMS_LA

Direct connection to source database
The source database is directly accessible from the Cloud.

No direct connection to source database
Requires you to download and install an agent to use as a bridge to the source database.

Migration Agent in DMS_LA (Change Compartment): testagent

Vault in DMS_LA (Change Compartment): DMS_Vault

Encryption Key in DMS_LA (Change Compartment): DMS_Key

Next Cancel

Create Migration Help

1 Add Details

2 **Select Databases**

3 Migration Options

Source Database

Registered Database in DMS_LA (Change Compartment): SourceCDB

Target Database

Registered Database in DMS_LA (Change Compartment): TargetATP

Previous **Next** Cancel

4. In the page **Select Databases**, fill the following entries, otherwise leave defaults:

- Source Database: **SourcePDB**
- Target Database: **TargetATP**

Click **Next**

5. On the page **Migration Options**, fill the following entries, otherwise leave defaults:

- In Initial Load select **Datapump via Object Storage**
- Object Storage Bucket: **DMSStorage**
- Export Directory Object:
Name: **dumpdir**
Path: **/u01/app/oracle/dumpdir**

6. Click **Create**.

Create Migration Help

1 Add Details

2 Select Databases

3 **Migration Options**

Initial Load

Datapump via Database Link

Datapump via Object Storage

Object Storage Bucket in DMS_LA (Change Compartment): DMSStorage

Export Directory Object

Name: dumpdir

Path: /u01/app/oracle/dumpdir

Task 8 – Validate Migration

In this step you will validate a migration prior to running it. It will check that all associated database and GoldenGate environments are correctly set up.

1. In the OCI Console Menu, go to **Migration > Database Migration > Migrations**.
2. Select **TestAgentMigration**.

- If Migration is still being created, wait until Lifecycle State is Active.
- Click the **Validate** button.
- Click on **Jobs** in the left-hand **Resources** list.
- Click on most recent Evaluation Job.
- Click on **Phases** in the left-hand **Resources** list.
- Phases will be shown and status will be updated as phases are completed. It can take 2 minutes before the first phase is shown.

Database Migration • Migrations • Migration details • Job details

job-20220912173932

Resume Abort Download log Add tags Delete

Job Information Tags

OCID: ...dww5nq Show Copy Type: Evaluation
Created: Mon, Sep 12, 2022, 17:39:32 UTC

Resources

- Phases
- Excluded objects
- Metrics

Name	Status	Duration
Validate target	Completed	12 s
Validate source	Completed	10 s
Validate premigration advisor	Completed	57 s
Validate datapump source settings	Completed	6 s
Validate datapump target settings	Completed	6 s

Showing 5 Items < 1 of 1 >

- If a phase has failed, it will show with status **Failed**. In this case, Click **Download Log** to learn more about the reason of failure. Click **Abort** on a failed job to allow further jobs or deleting of the migration.

Task 9 – Run Migration

After successful validation, a Migration can be run to perform the data transfer.

- In the OCI Console Menu, go to **Migration > Database Migration > Migrations**.
- Select **TestMigration**.
- Click **Start** to begin the migration
- The Start Migration dialog is shown. No phase has been selected to wait for User Input. Click **Start** to begin the Migration.

Start Migration

Are you sure you want to start migration **TestAgentMigration**?

Require User Input After a Phase Before Proceeding

Phase to Pause After

Validate

Start [Cancel](#)

- Click **View Details** in the Info Box above the Migration Name title.



i Migration in progress. See Job details for migration progress.
[View Details](#)

TestAgentMigration

- Job phases are updated as the migration progresses

Database Migration > Migrations > Migration Details > Job Details



i Migration in progress at phase "Export Initial Load" (Phase 3 of 7)

job-20210323023543

[Resume](#) [Abort](#) [Download Log](#) [Add Tags](#) [Delete](#)

Job Information Tags

OCID: ...erija [Show](#) [Copy](#) Type: Migration

Created: Tue, Mar 23, 2021, 02:35:43 UTC

Resources

- Metrics
- Phases**
- Unsupported Objects

Phases

Name	Status	Duration
Validate	Completed	25 s
Prepare	Completed	4 s
Export Initial Load	Started	4 s
Upload Data	Pending	—
Import Initial Load	Pending	—
Post Initial Load	Pending	—
Cleanup	Pending	—

Showing 7 items < 1 of 1 >

- The migration runs through the final cleanup phases and shows as Succeeded when finished. If a phase fails, download the log and review for error messages.

You are now finished with this lab and ready to migrate your databases!

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