



# Oracle Zero Downtime Migration 21c



Technical Brief

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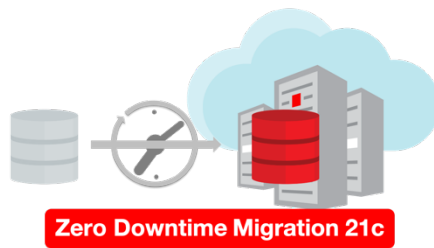
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Due to the nature of the product architecture, it may not be possible to safely include all features described in this document without risking significant destabilization of the code.

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## INTRODUCTION

Oracle customers are moving Oracle workloads into the Oracle Cloud or onto Engineered Systems at a growingly rapid pace. However, migrating workloads has been a source of challenges for many years. In particular, migrating database workloads from one system to another or into the Cloud is easier said than done.

Based on years of experience of migrating Oracle workloads, Oracle has developed Zero Downtime Migration (ZDM). ZDM is Oracle's premier solution for a simplified and automated migration experience, providing zero to little downtime for the production system and depending on the migration scenario. ZDM allows you to directly and seamlessly migrate your on-premises Oracle Databases to and between any Oracle-owned infrastructure, which includes Exadata Database Machine On-Premises, Exadata Cloud at Customer (ExaCC) and Oracle Cloud Infrastructure. Oracle ZDM supports a wide range of Oracle Database versions, and – as the name implies –, ensures that there is minimal to no production database impact during the migration.

ZDM follows the principles of Oracle Maximum Availability Architecture<sup>1</sup> (MAA) and incorporates products such as GoldenGate and Data Guard to ensure High Availability and an online migration workflow that leverages technologies such as the Recovery Manager, Data Pump and Database Links.

Oracle Zero Downtime Migration 21c introduces a wide array of features and functionality, new migration methodologies, support for more targets in the Cloud and On-Premises, and provides more flexibility for users to migrate their databases according to their needs. Oracle users migrating to multitenant-based databases in the Cloud or Exadata, can now leverage ZDM's capability to convert Non-CDB databases to Pluggable Databases.

Furthermore, Oracle ZDM now supports Oracle Autonomous Database as a Cloud Target, allowing customers to move their existing workloads into Oracle's premier database cloud service, leveraging its self-driving, self-securing and self-repairing capabilities. Oracle ZDM migrates on-premises databases to Oracle Autonomous Transaction Processing and Oracle Autonomous Warehouse, both on Shared and Dedicated offerings.

This technical brief provides an overview of Oracle Zero Downtime Migration 21c, the latest version, explaining its underlying workflow and how you can use it for an efficient and seamless migration of your Oracle Databases.

For more information on Oracle Zero Downtime Migration please visit ZDM's product website.<sup>2</sup>

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<sup>1</sup> <http://oracle.com/goto/maa>

<sup>2</sup> [Http://www.oracle.com/goto/zdm](http://www.oracle.com/goto/zdm)

# ZERO DOWNTIME MIGRATION

## Architecture

Oracle Zero Downtime Migration (ZDM) is the Oracle Maximum Availability Architecture (MAA)-recommended solution to migrate Oracle Databases to the Oracle Cloud. ZDM has been designed with the goal of keeping the migration process as simple as possible and to ensure the least impact on production workloads. The source database to be migrated can be on-premises, deployed on Oracle Public Cloud Gen 1 or Oracle Cloud Infrastructure. The target database may be deployed in a Database Cloud Service on Oracle Cloud Infrastructure (OCI) Virtual Machine, Exadata Cloud Service, Exadata Cloud at Customer or Autonomous Database. ZDM automates the entire migration process, reducing the chance of human errors. ZDM leverages Oracle Database-integrated high availability (HA) technologies such as Oracle Data Guard and GoldenGate and follows all MAA best practices that ensure no significant downtime of production environments.

In order to support the database migration workflow, ZDM leverages features and functionality from Oracle's Fleet Patching and Provisioning (FPP) framework<sup>3</sup> such as FPP's job scheduler capabilities, giving you full control to schedule, pause and resume any database migration task. ZDM also leverages FPP's evaluation mode to validate the migration process and detect possible failure conditions, before the migration starts. ZDM includes audit capabilities during and post migration, also, ZDM distributes its migration process in distinctive phases, allowing for users to customize the workflow, adding user action scripts at any desired step.

## Database Support and Supported Configurations

Oracle ZDM supports Oracle Database versions 11.2.0.4, 12.1.02, 12.2.0.1, 18c, 19c & 21c. ZDM's physical migration workflow requires the source and target databases to be in the same database release. Starting with ZDM 21c, the Logical Migration workflow supports cross-version migration, thus providing an in-flight upgrade while migrating to the Oracle Cloud.

Oracle ZDM supports Oracle Databases hosted on Linux operating systems. The source database can be a single instance database migrating to a single instance or an Oracle RAC database, or it can be a RAC One Node / RAC database, migrating to a RAC database. Oracle ZDM supports Oracle Database Enterprise & Standard Edition as source databases.

Oracle ZDM allows for the source database to be a non-CDB or a container database (CDB) with one or more Pluggable Databases (PDBs). Starting with release 21c, Oracle ZDM allows for non-CDB databases to be migrated to Pluggable Databases on the fly, hence allowing for full conversion and adding more versatility to the migration workflow.

## Migration Paths

ZDM supports on-premises databases to be migrated to a variety of Oracle Cloud Database Services and to the Exadata Database Machine On-Premises:

- Oracle Database Cloud Service
  - Bare Metal
  - Virtual Machine
- Oracle Exadata Cloud Service
- Oracle Exadata Cloud at Customer
- Oracle Autonomous Database
  - Autonomous Transaction Processing (Dedicated and Shared)
  - Autonomous Data Warehouse (Dedicated and Shared)

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<sup>3</sup> [www.oracle.com/goto/fpp](http://www.oracle.com/goto/fpp)

## Benefits

- **Simple & Efficient**
  - Oracle ZDM automated workflow makes it seamless to move your Oracle on-premises database to the Oracle Cloud. By eliminating the need for manual configurations and operations, Oracle ZDM ensures an error-free and efficient migration to Oracle Cloud or Oracle Engineered systems on-premises in general.
- **Highly Available**
  - Oracle ZDM is Oracle Maximum Availability Architecture compliant, the tight integration with Oracle Database technologies such as Oracle Data Guard and Oracle GoldenGate ensures that your migration completes with zero downtime and no production impact.
- **Flexible**
  - You can directly migrate your Oracle Database to the Oracle Cloud and the Exadata Database Machine On-Premises from various source databases depending on your requirements and business needs.
- **Validation**
  - Oracle ZDM performs extensive checks prior and post migration; allows for pausing and resuming your migration tasks if required; and includes an evaluation mode to preempt any issues during your database migration.
- **Cost Effective**
  - The Oracle ZDM engine is available at no extra cost.

## WHAT'S NEW IN ORACLE ZERO DOWNTIME MIGRATION 21C ?

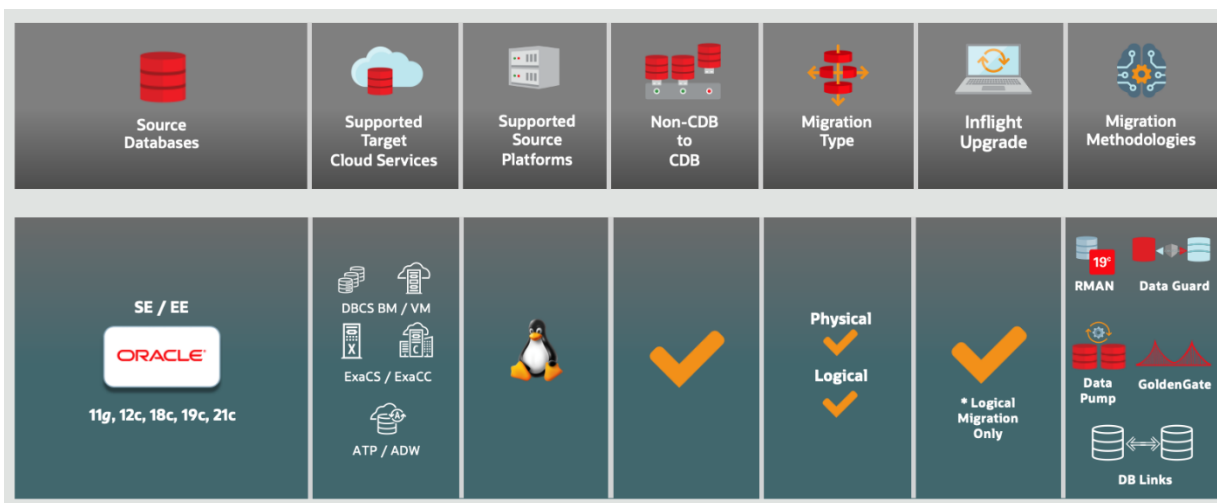
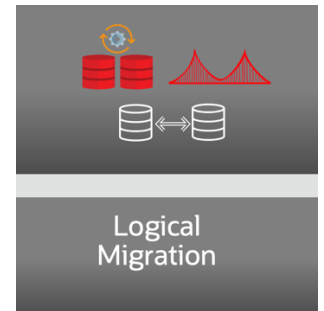


Figure 1 – Oracle Zero Downtime Migration 21c Features and Supported Sources & Targets

## Logical Migration

Oracle ZDM 21c introduces a Logical Migration workflow leveraging Oracle Data Pump, Database Links and Oracle GoldenGate. It offers a variety of architectural combinations, each one tailored to different customer needs and particular use cases:

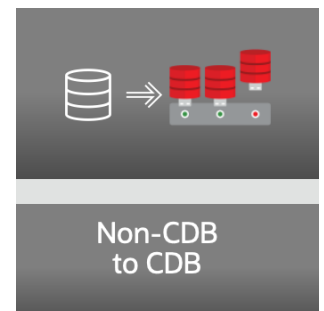
- Logical Offline Migration
  - using Data Pump and Database Links
  - Using Data Pump and Backup Location
- Logical Online Migration
  - using GoldenGate, Data Pump and Database Links
  - using GoldenGate, Data Pump and Backup Location



## Non-CDB to CDB Migration

Non-CDB to CDB Migration is now supported in both Oracle ZDM's physical and logical migration workflows.

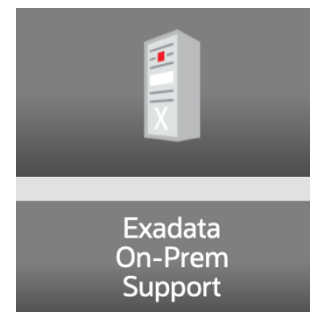
Non-container based databases will be automatically converted to a Pluggable Database upon migration, thus enabling customers to migrate directly to Oracle Cloud Infrastructure services where multitenant databases are the default. Further time is saved by performing the migration and conversion during the same workflow.



## Exadata On-Premises as a Target

Starting with Oracle ZDM 21c, customers can migrate their existing databases running on any Linux platform to Exadata, using ZDM's physical migration workflow.

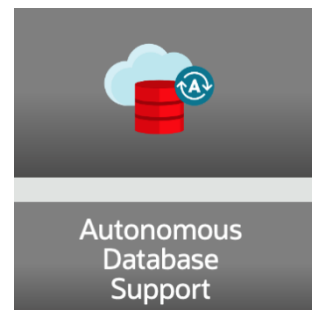
Existing databases can be migrated using either an online (using RMAN and Data Guard) or offline (using RMAN only) migration methodology.



## Autonomous Database Support

Customers can now easily move their on-premises databases to Autonomous Database (ATP or ADW) as a target in Oracle ZDM 21c.

ZDM supports migration to Autonomous Database (Dedicated and Shared) through its logical migration workflow.



## Pre-Migration Advisor

Oracle ZDM 21c introduces a pre-migration advisor that analyzes the source database regarding feature compatibility between the source and target database. The advisor issues suggestions for any required changes for the Data Pump operations that take part in the logical migration workflow.

The logical migration workflow runs the Pre-Migration Advisor by default, although it can be skipped if customers so desire.



Pre-Migration  
Advisor

## Lighter ZDM Home

The Oracle ZDM software home is now lighter and more compact. Users will notice the difference already when downloading the binaries, which are about a 5<sup>th</sup> of the previous version's size. ZDM installation and deployment has also been optimized and trimmed, allowing for an even faster instantiation of your first migration.



Lighter ZDM  
Home

## Migration Over Database Links

Database Links support for logical migration is now part of Oracle Zero Downtime Migration. This methodology eliminates the requirement for a backup location and provides both online and offline migration workflows.

ZDM leverages Databases Links to establish a direct connection between the source database and the target database on the desired target system (Oracle Cloud or Exadata). Oracle Autonomous Transaction Processing Dedicated does not support migration with this methodology.



DB Link  
Support



## MIGRATION WORKFLOWS

### Physical Migration

- **Offline Migration**
  - ZDM physical offline migration leverages Oracle Recovery Manager and migrates the database using a backup and restore methodology. Customers can use this method when migrating to Oracle Database Cloud Services Virtual Machines, Exadata Cloud Service, Exadata Cloud at Customer and Exadata Database Machine On-Premises.

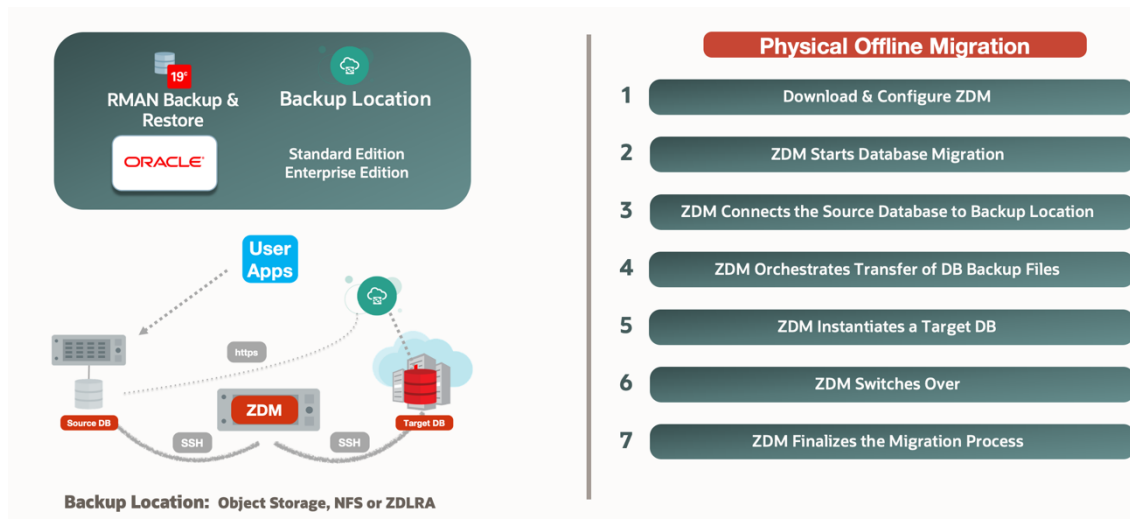


Figure 2 – Step-by-Step Physical Offline Migration

- **Online Migration**
  - ZDM physical online migration leverages Oracle Recovery Manager and Oracle Data Guard. Customers should use this method when a highly available migration and minimizing any possible impact is a priority. Customers can use this method to migrate to Oracle Database Cloud Services Virtual Machines, Exadata Cloud Service, Exadata Cloud at Customer and Exadata Database Machine On-Premises.

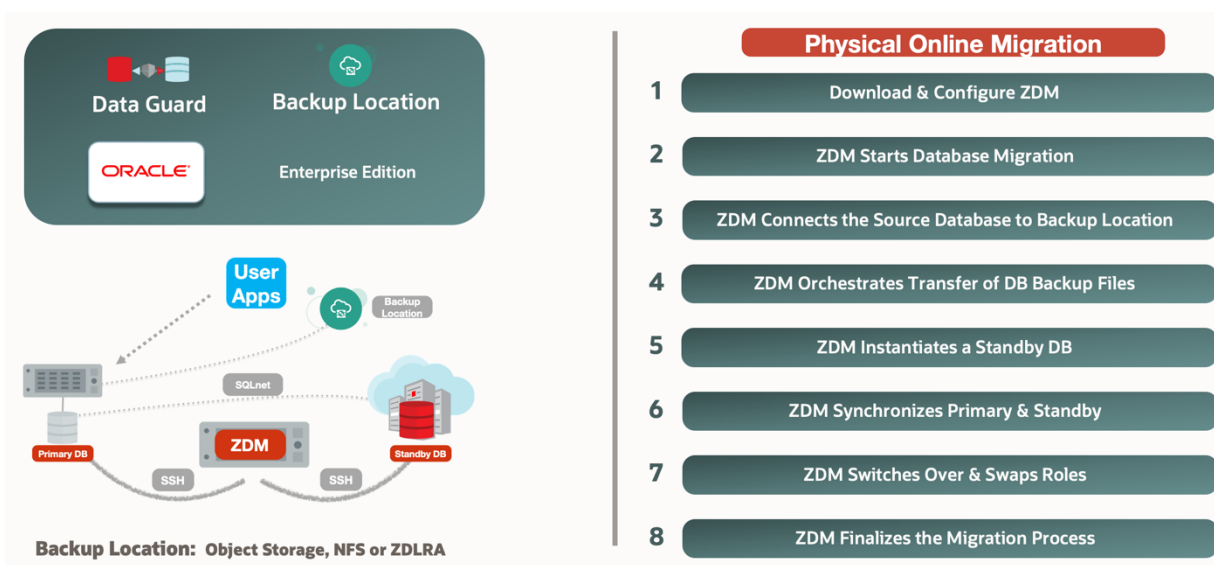


Figure 3 – Step-by-Step Physical Online Migration

## Logical Migration

Oracle ZDM 21c introduces logical migration as part of its migration methodologies. The logical migration workflow leverages Oracle Data Pump, Database Links and GoldenGate, customers have four workflow possibilities tailoring to their scenarios and needs.

### Logical Offline Migration

- **Offline Migration with Data Pump and Backup Location**
  - ZDM logical offline migration with Data Pump and Backup Location offers customers a simple yet efficient method to migrate their databases to the Oracle Cloud. The backup location can be the Object Storage for OCI migrations and NFS or the Recovery Appliance for Exadata Cloud at Customer and Exadata On-Premises.

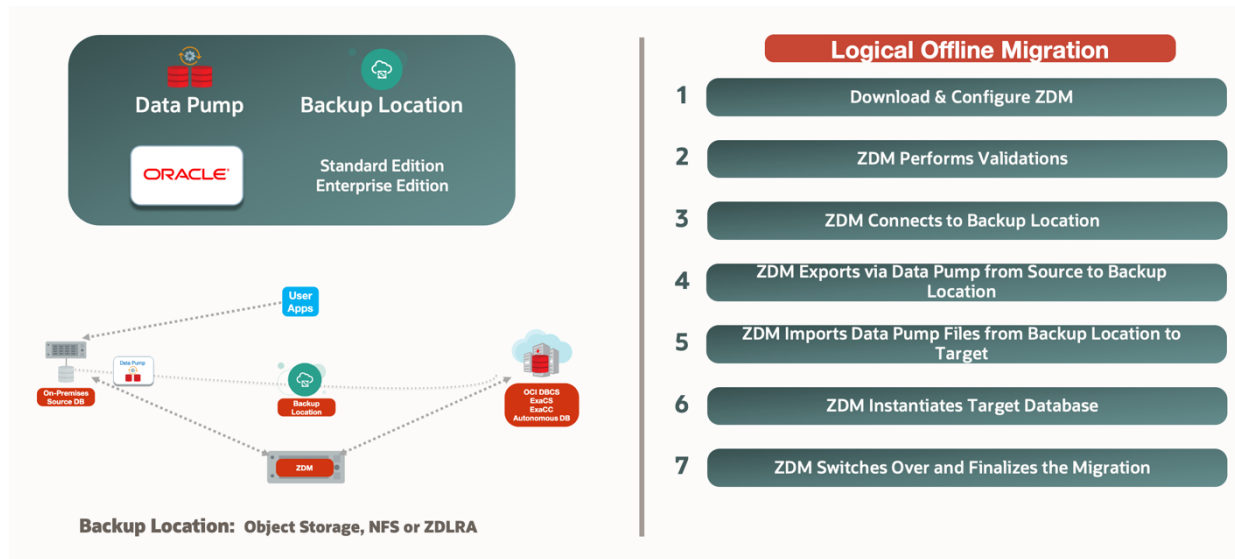


Figure 4 – Step-by-Step Logical Offline Migration with Data Pump and Backup Location

- **Offline Migration with Data Pump and Database Links**
  - ZDM offline logical migration can also leverage Database Links to establish a direct connection between the source database and the target database in the Oracle Cloud, thus eliminating the need for a backup location.

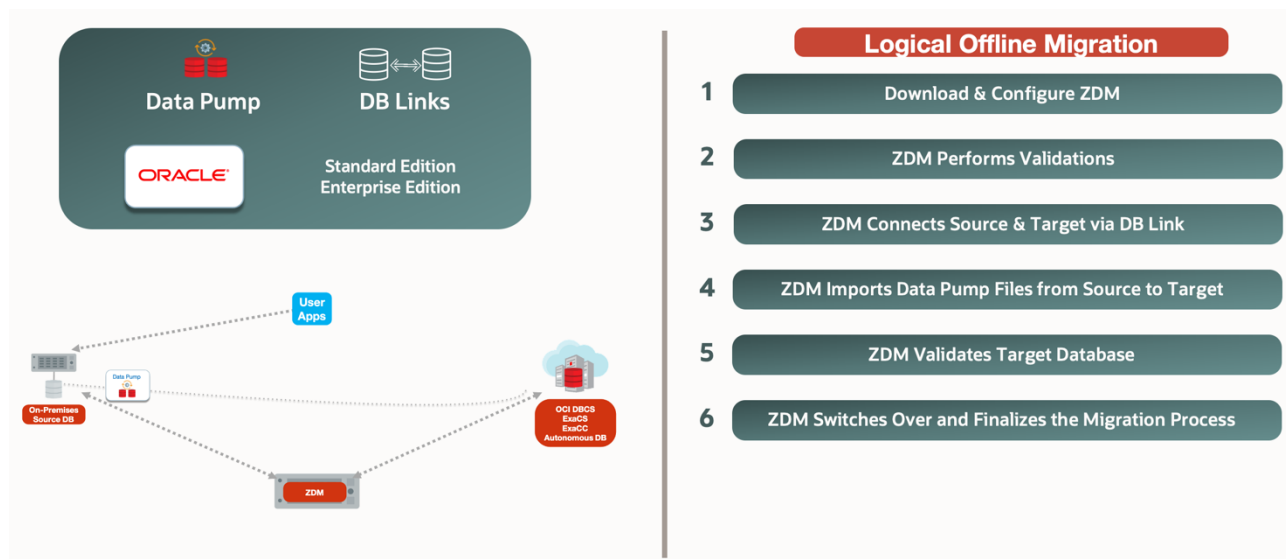


Figure 5 – Step-by-Step Logical Offline Migration with Data Pump and Database Links.

## Logical Online Migration

- **Online Migration with Data Pump, GoldenGate and Database Links**
  - Oracle ZDM leverages a GoldenGate hub that will help synchronize both the source and target database while providing a highly available migration. Database Links are used for a direct connection between source and database target while the instantiation of the target database is done via Data Pump.

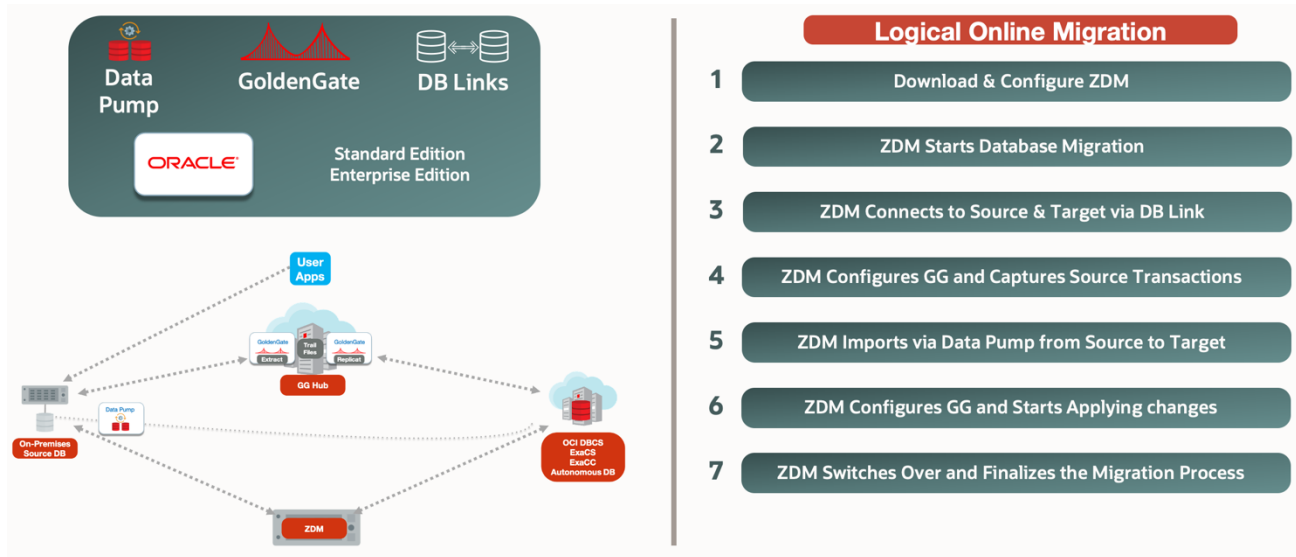


Figure 6 – Step-by-Step Logical Online Migration with Data Pump, GoldenGate and Database Links.

- **Online Migration with Data Pump, GoldenGate and Database Links**
  - Customers can also leverage a designated backup location instead of using a direct Database Link between the source and the target database. Migration to OCI-based databases will use the Object Store, whereas migrations to Exadata Cloud at Customer can choose between an external NFS filer or the Recovery Appliance as a backup location.

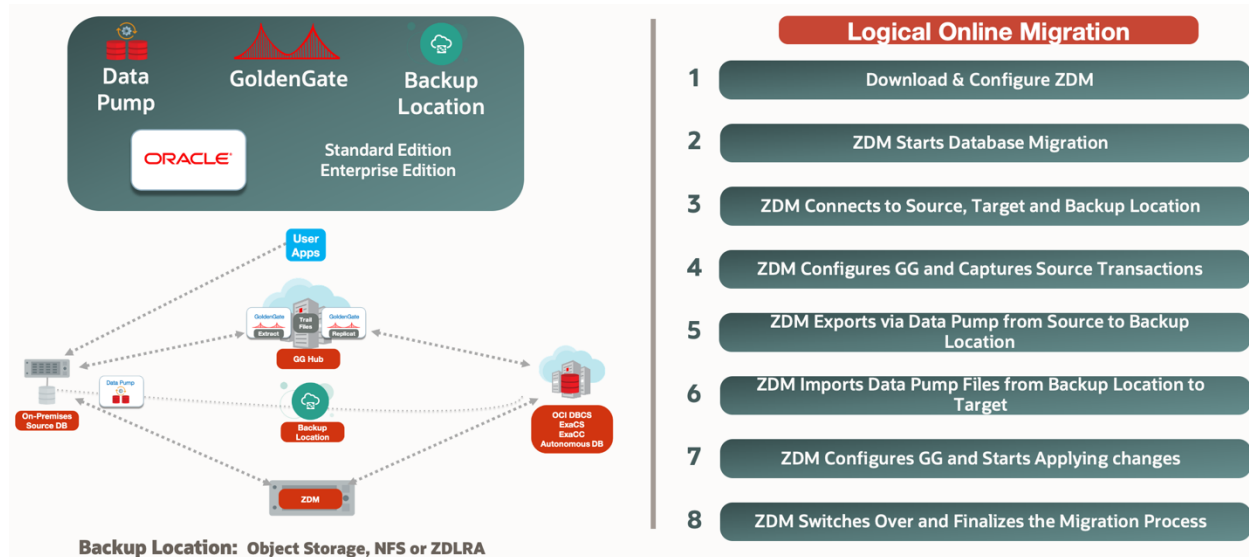


Figure 7 – Step-by-Step Logical Online Migration with Data Pump, GoldenGate and Backup Location

## SUMMARY

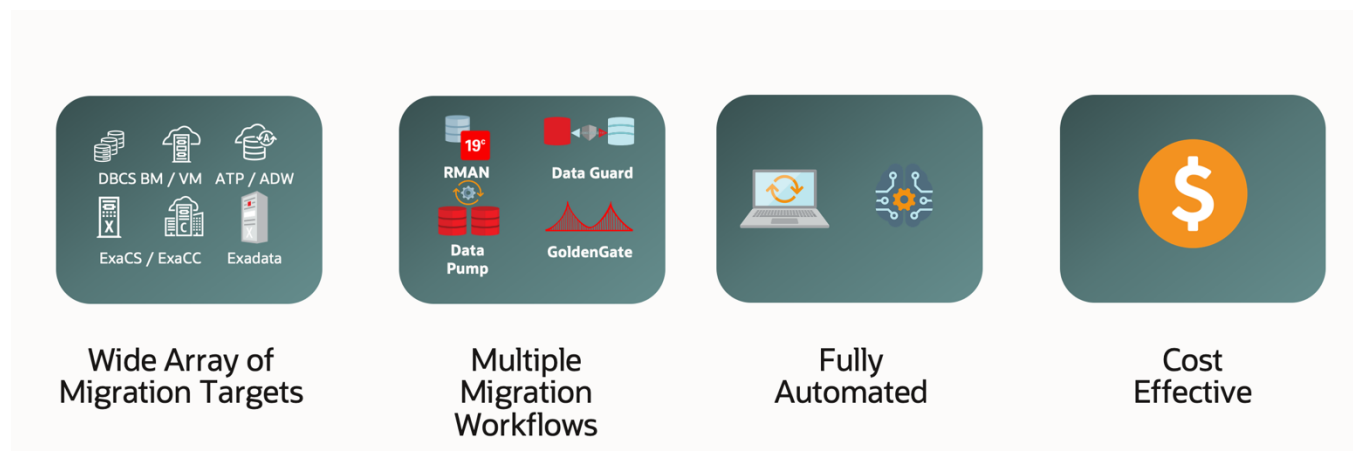
Oracle Zero Downtime Migration is Oracle's premier and automated solution for database cloud migration. Oracle ZDM provides customers a direct and seamless migration for their on-premises Oracle Databases to Oracle Cloud and Exadata Database Machine, supporting a wide range of Oracle Database versions as sources and Oracle Database Cloud Services as targets.

Oracle ZDM supports Standard Edition and Enterprise Edition Oracle Databases, offering different migration approaches ranging from offline backup and restore, over Data Pump and Database Links-based migrations, to using technologies such as Data Guard and GoldenGate for physical as well as logical migration workflows.

Migration to the Oracle Cloud can be achieved in as little as six simple steps, for offline migrations and eight steps for online based migrations. In any scenario, Oracle ZDM provides a Maximum Availability Architecture-compliant migration, ensuring high availability, data protection, and disaster recovery for your migration journey to the Oracle Cloud.

Oracle ZDM offers fleet level migrations, catering to all single instance, Oracle RAC and RAC One Node database migration scenarios, making it the Best In-Class solution for moving your databases to the Oracle Cloud and Exadata. It provides:

- A wide array of migration targets
- Multiple migration workflows
- Fully automated migrations
- Cost-effective migration support



*Figure 8 – Oracle Zero Downtime Migration – Best In-Class Solution for Database Migration*

For more information, step-by-step guides and product documentation please visit the Oracle Zero Downtime Migration website under: [www.oracle.com/goto/zdm](https://www.oracle.com/goto/zdm)

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