

The background of the slide is a photograph of a winding asphalt road through a hilly, dry landscape with golden-brown grass. In the top left corner, there is a decorative graphic with a red background and yellow 'X' patterns. The word "ORACLE" is written in red, uppercase letters.

ORACLE

Migration to Oracle Autonomous Database

Part 3: Migrating

Oracle

DBAs

run the world





MIKE DIETRICH

Vice President
Database Upgrade, Migrations & Patching



mikedietrich



@mikedietrichde.com



<https://mikedietrichde.com>





DANIEL OVERBY HANSEN

Distinguished Product Manager
Database Upgrade, Migrations & Patching

 dohdatabase

 @dohdatabase.com


 <https://dohdatabase.com>



RODRIGO JORGE

Distinguished Product Manager
Database Upgrade, Migrations & Patching

 [rodrigoaraujorge](#)

 [@dbarj.com.br](#)

 <https://dbarj.com.br>



ALEX ZABALLA

Distinguished Product Manager
Database Upgrade, Migrations & Patching



alexzaballa



@alexzaballa.bsky.social



<https://alexzaballa.com>



KLAUS GRONAU

Consulting Member of Technical Staff
Database Upgrade, Migrations & Patching



klaus-gronau-39a43aa9

Find Slides and Much More on Our Blogs



MikeDietrichDE.com

Mike.Dietrich@oracle.com



dohdatabase.com

Daniel.Overby.Hansen@oracle.com



DBArj.com.br

Rodrigo.R.Jorge@oracle.com

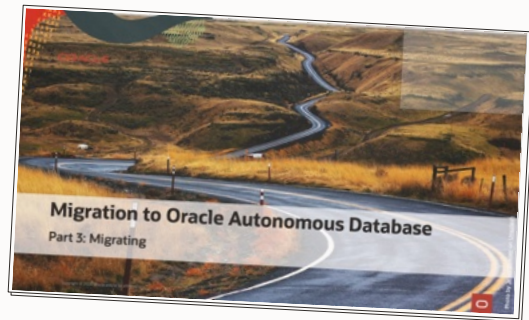


AlexZaballa.com

Alex.Zaballa@oracle.com

Download the Slides

<https://MikeDietrichDE.com/slides>



Virtual Classroom Seminars

Episode 16

(replaces Episode 1 from Feb 2021)

[Oracle Database Release and Patching Strategy for 19c and 23c](#)

115 minutes – May 10, 2023



Episode 17

[From SR to Patch – Insights into the Oracle Database Development process](#)

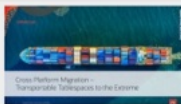
55 minutes – June 22, 2023



Episode 18

[Cross Platform Migration – Transportable Tablespaces to the Extreme](#)

145 min – February 22, 2024



Episode 19

[Move to Oracle Database 23ai – Everything you need to know about Multitenant PART 1](#)

145 min – May 16, 2024



Episode 20

[Move to Oracle Database 23ai – Everything you need to know about Multitenant PART 2](#)

100 min – June 28, 2024



Recorded Web Seminars

<https://MikeDietrichDE.com/videos>

More than 40 hours of technical content,
on-demand, anytime, anywhere



Let's Do This Together



1 PLANNING

Watch [recording](#)
Get [slides](#)



2 PREPARING

Watch [recording](#)
Get [slides](#)



3 MIGRATING

Watch **soon**
Get [slides](#)



4 OPERATING

July 10, 15:00 CET
[Sign up](#)



Recap

What happened in Part 2?



Migration to Autonomous Database is always a **logical** migration

- Move the **data**, not the database

Getting an Overview

1

Estate Explorer



2

Cloud Premigration
Advisor Tool



3

Cloud Migration
Advisor

Getting an Overview

1

Estate Explorer



2

Cloud Premigration
Advisor Tool



3

Cloud Migration
Advisor

▼ **Premigration Advisor Check Details List**

Source Database

Expand All Close All

▼ **Action Required (2 checks)**

▼ OGG Minimal Supplemental Logging Not Enabled

Description: Minimal supplemental logging is not enabled on the Database.

Action: Make sure minimal supplemental logging data is enabled by using executing the SQL command ALTER DATABASE ADD SUPPLEMENTAL LOG DATA; This command can be done while the database is online and no restart is required.

More Details

> Relevant Objects (1 relevant object)

> OGG Replication Not Enabled

> **Review Required (1 check)**

Getting an Overview

2

Cloud Premigration Advisor Tool

Oracle Autonomous Database	Check Name
Serverless	<u>has user defined objects in sys/system</u>
Dedicated	<u>has refs to user objects in sys</u>
Cloud Premigration Advisor Tool	
Source Database	
Action Required	
Solution	
Move objects prior to migration.	
	✓ User Defined Objects in SYS Description: User-defined objects in SYS schemas will not be exported. Action: Recreate required user-defined objects in SYS schemas prior to migration and update any hardcoded references to those objects. Consider dropping any user-defined objects that are no longer required. More Details
	✓ User Defined Objects in SYSTEM Description: User-defined objects in SYSTEM schemas cannot be imported in the ADB. Action: Recreate required user-defined objects in SYSTEM schemas prior to migration or utilize Data Pump schema mapping parameters such as "REMAP_SCHEMA=SYSTEM:xxx" where "xxx" is an existing user in ADB. In either case, any hardcoded references to the user-defined objects from SYSTEM will need to be updated. Consider dropping any user-defined objects that are no longer required. More Details



Evaluate an Oracle Database for compatibility with Autonomous Database

- Use Cloud Premigration Advisor Tool (CPAT)
- Download CPAT from [MOS Note: 2758371.1](#)



Databases - Recap

These are the databases we were going to migrate

Example Databases

In this series, we will use two databases:

- **The Simple Database**

- **The Complex Database**

Example Databases

In this series, we will use two databases:

- **The Simple Database**

Based on standard Oracle schemas



HR: Human Resources
CO: Customer Orders
SH: Sales History

```
@hr_install.sql  
@co_install.sql  
@sh_install.sql
```

- **The Complex Database**

Example Databases

In this series, we will use two databases:

- **The Simple Database**

- **The Complex Database**

Standard schemas and manually created objects



HR: Human Resources

CO: Customer Orders

SH: Sales History



- External Tables
- External Library
- Tables with encrypted columns
- Java Objects
- Tables with XML columns
- XML Schemas
- Tables using Spatial
- Profiles using custom password verification functions
- Tables with ROWID columns
- SQL Patches and SQL Plan Baselines
- Table Clusters
- Jobs using DBMS_JOB
- Scheduler Jobs running external scripts
- Procedure calling DBMS_SHARED_POOL + UTL_HTTP



Fixing

How did we fix the CPAT findings?

CPAT | Simple Database

--migrationmethod **datapump**

▼ Premigration Advisor Report Summary

Report Result

Review Required

Number of schemas analyzed:

3

List of schemas analyzed:


[PDBADMIN, CO, HR]

▼ Report Results Overview

Source Database		Target Database		Migration Method		Additional Tasks	
Action Required	0	Action Required	0	Action Required	0	Action Required	0
Review Required	0	Review Required	<u>1</u>	Review Required	0	Review Required	0
Review Suggested	<u>1</u>	Review Suggested	<u>2</u>	Review Suggested	0	Review Suggested	<u>3</u>
Passed	12	Passed	27	Passed	1	Passed	10

[Return to Table of Contents](#)

Fixing Findings | Simple Database

- 
- Scheduler Jobs
 - Directory Objects
 - Trusted Server Entries
 - Auditing

Fixing Findings

Scheduler Jobs

Source Database

Expand All Close All

Review Suggested (1 check)

Enabled Scheduler Jobs

Description: List scheduler jobs that may interfere with Data Pump export.

Action: Either execute the following SQL statement to ensure no Scheduler Jobs are executing during migration: ALTER SYSTEM SET JOB_QUEUE_PROCESSES=0; -- No restart required or plan the export at a time when it's certain that no scheduler jobs will be executing.

More Details

Relevant Objects (18 relevant objects)

OWNER	JOB_NAME	ENABLED	COMMENTS
SYS	PURGE_LOG	TRUE	purge log job
SYS	PMO_DEFERRED_IDX_MAINT_JOB	TRUE	Oracle defined automatic index cleanup for partition maintenance operations with deferred global index maintenance
SYS	CLEANUP_NON_EXIST_OBJ	TRUE	Cleanup Non Existent Objects in obj\$
SYS	CLEANUP_ONLINE_IDX_BUILD	TRUE	Cleanup Online Index Build
SYS	CLEANUP_TAB_OIT_PMO	TRUE	Cleanup Tables after OIT PMO
SYS	CLEANUP_TRANSIENT_TYPE	TRUE	Cleanup Transient Types
SYS	CLEANUP_TRANSIENT_PKG	TRUE	Cleanup Transient Packages
SYS	CLEANUP_ONLINE_PMO	TRUE	Cleanup after Failed PMO
SYS	FILE_SIZE_UPD	TRUE	Update file size periodically

Fixing Findings

Directory Objects

Target Database

Expand All Close All

Review Required (1 check)

Directories

Description: Directory objects may reference locations that are not accessible in ADB

Action: Recreate the directories on the Autonomous database instance.

More Details

Relevant Objects (7 relevant objects)

OWNER	DIRECTORY_NAME	DIRECTORY_PATH
SYS	DBMS_OPTIM_ADMINDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/dbsms/admin
SYS	DBMS_OPTIM_LOGDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/cfgtlogs
SYS	ORACLE_OCM_CONFIG_DIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/ccr/state
SYS	ORACLE_OCM_CONFIG_DIR2	/u01/app/oracle/product/19.0.0.0/dbhome_1/ccr/state
SYS	SDO_DIR_WORK	
SYS	XMLDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/dbsms/xml
SYS	XSDDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/dbsms/xml/schema

Fixing Findings

Trusted Server Entries

Target Database

Expand All Close All

Review Suggested (2 checks)

Trusted Server Entries

Description: TRUSTED_SERVER entries cannot be migrated to ADB

Action: When migrating via Data Pump specify "EXCLUDE=TRUSTED_DB_LINK" to avoid any exceptions reported by Data Pump during import. Use Oracle Cloud Infrastructure Firewall features to control access to your ADB instance. For more information see <https://docs.oracle.com/en/solutions/deploy-virtual-firewall/index.html>

More Details

Relevant Objects (1 relevant object)

TRUST	NAME
Trusted	All

Default Tablespace is Not DATA

Description: Schema Owner's default tablespace must be 'DATA'.

Action: If a user has quota on multiple tablespaces, ensure that the proper quota is set post migration.

More Details

Relevant Objects (3 relevant objects)

USERNAME	DEFAULT_TABLESPACE
POBADMIN	USERS
HR	USERS
CO	USERS

Fixing Findings

Auditing

Migration Method

Expand All Close All

Review Suggested (3 checks)

Standard Traditional Audit for ADB

Description: Traditional audit, deprecated since 21c, is deprecated starting with 23c. Traditional Audit configurations have been detected in this database.

Action: Delete the traditional auditing configurations using the instructions found in Oracle Support Document ID 2909716.1. The audit_operations value, TRUE, is not correct and should be set to FALSE.

[More Details](#)

Index Organized Tables

Description: Index Organized tables are not allowed in Autonomous databases.

Action: No action require as the tables gets created as non-IOT (regular table).

[More Details](#)

Relevant Objects (1 relevant object)

OWNER	TABLE_NAME
HR	COUNTRIES

Modified Database Parameters for Serverless

Description: The modification of certain Database parameters is not allowed in ADB (Serverless infrastructure).

Action: Please refer to the Oracle Autonomous Database documentation on the parameters that you are allowed to modify. For more information see <https://docs.oracle.com/en/cloud/autonomous-database/adbaug/autonomous-initialization-parameters.html>

[More Details](#)

Relevant Objects (35 relevant objects)

NAME
...datafile_write_errors_crash_instance

CPAT | Simple Database with Online

--migrationmethod all

✓ Premigration Advisor Report Summary

Report Result

Action Required

Number of schemas analyzed:

4

List of schemas analyzed:


[PDBADMIN, CO, HR, C##DBLCMUSER]

✓ Report Results Overview

Source Database		Target Database		Migration Method		Additional Tasks	
Action Required	<u>2</u>	Action Required	<u>1</u>	Action Required	<u>1</u>	Action Required	0
Review Required	<u>1</u>	Review Required	<u>2</u>	Review Required	0	Review Required	0
Review Suggested	<u>1</u>	Review Suggested	<u>2</u>	Review Suggested	<u>1</u>	Review Suggested	<u>5</u>
Passed	17	Passed	33	Passed	6	Passed	15

[Return to Table of Contents](#)

Fixing Findings | Simple Database with Online

- 
- Scheduler Jobs
 - Dictionary Objects
 - Trusted Server Entries
 - Auditing
 - Supplemental Logging
 - Streams Pool Size

Fixing Findings

Supplemental Logging

Source Database

Expand All Close All

Action Required (2 checks)

OGG Minimal Supplemental Logging Not Enabled

Description: Minimal supplemental logging is not enabled on the Database.

Action: Make sure minimal supplemental logging data is enabled by using executing the SQL command ALTER DATABASE ADD SUPPLEMENTAL LOG DATA; This command can be done while the database is online and no restart is required.

[More Details](#)

Relevant Objects (1 relevant object)

SUPP_LOG_DATA_MIN_ENABLED
NO

OGG Replication Not Enabled

Description: ENABLE_GOLDENGATE_REPLICATION init.ora parameter is not set.

Action: Make sure ENABLE_GOLDENGATE_REPLICATION is set to TRUE by using executing the SQL command: ALTER SYSTEM SET ENABLE_GOLDENGATE_REPLICATION=TRUE SCOPE=BOTH; This command can be done while the database is online and no restart is required.

[More Details](#)

Relevant Objects (1 relevant object)

NAME	VALUE
enable_goldengate_replication	FALSE

Fixing Findings

Streams Pool

Source Database

Expand All

Close All

Review Required (1 check)

Streams Pool Size for GoldenGate

Description: Verify the STREAMS_POOL_SIZE amount is large enough for GoldenGate.

Action:

STREAMS_POOL_SIZE has not been pre-allocated. Please execute SQL such as: ALTER SYSTEM SET streams_pool_size=1250M SCOPE=BOTH; -- or larger depending on the number of OGG processes And restart your instance if necessary. Extract interacts with an underlying logmining server in the source database and Replicat interacts with an inbound server in the target database. This section provides guidelines for managing the shared memory consumed by these servers. The shared memory that is used by the servers comes from the Streams pool portion of the System Global Area (SGA) in the database. Therefore, you must set the database initialization parameter STREAMS_POOL_SIZE high enough to keep enough memory available for the number of Extract and Replicat processes that you expect to run in integrated mode. Note that Streams pool is also used by other components of the database (like Oracle Streams, Advanced Queuing, and Datapump export/import), so make certain to take them into account while sizing the Streams pool for Oracle GoldenGate. By default, one Extract requests the logmining server to run with MAX_SGA_SIZE of 1GB. As a best practice, keep 25 percent of the Streams pool available. Therefore, for a single process the minimum STREAMS_POOL_SIZE would be 1.25 GB. For more information see Oracle Support Document ID 2078459.1 and the Oracle GoldenGate documentation.

More Details

Relevant Objects (1 relevant object)

NAME

VALUE

streams_pool_size

0

```
[oracle@db19c cpat]$
```

CPAT | Complex Database

--migrationmethod **datapump**

▼ Premigration Advisor Report Summary

Report Result

Action Required

Number of schemas analyzed:

6

List of schemas analyzed:

[PDBADMIN, CO, HR, MYAPP, C##DBLCMUSER, CPAT_CHECK]

▼ Report Results Overview

Source Database		Target Database		Migration Method		Additional Tasks	
Action Required	0	Action Required	<u>8</u>	Action Required	0	Action Required	0
Review Required	0	Review Required	<u>5</u>	Review Required	<u>1</u>	Review Required	0
Review Suggested	<u>1</u>	Review Suggested	<u>4</u>	Review Suggested	0	Review Suggested	<u>4</u>
Passed	12	Passed	13	Passed	0	Passed	9

[Return to Table of Contents](#)

Fixing Findings | Complex Database



Libraries

Target Database

Expand All

Close All

▼ Action Required (8 checks)

▼ Libraries

Description: The CREATE LIBRARY statement is not allowed on ADB.

Action:

Applications must be updated to remove their dependencies on any listed libraries. Consider using OCI Marketplace EXTPROC Stack Application as a replacement. For more information on OCI Marketplace EXTPROC Stack Application see <https://docs.oracle.com/en/cloud/paas/autonomous-database/serverless/adbsb/user-defined-functions-external.html#GUID-FB998DB9-82DC-455E-ACFA-CE068AB6FC2B> Alternatively, using Functions for business logic previously implemented in external libraries. For more information see <https://docs.oracle.com/en-us/iaas/Content/Functions/>

More Details

▼ Relevant Objects (1 relevant object)

OWNER	LIBRARY_NAME	FILE_SPEC
MYAPP	EXAMPLE_LIB	/home/oracle/libexample.so

System Privileges

Target Database

[Expand All](#)[Close All](#)

System Privileges

Description: Some system privileges used in the source DB are prohibited in the target ADB.

Action: Replace prohibited system privileges with alternatives that are available in ADB, for example, GRANT CREATE JOB TO <USER-WHO-HAD-CREATE-ANY-JOB>; for those schemas in ADB instances. Whether such alternatives are appropriate can only be determined by experts familiar with the applications in question and with testing.

[Hide Details](#)

Name: has_sys_privileges

Migration Methods: DATAPUMP,DATAPUMP_DBLINK,GOLDENGATE

Failure Impact: Operation failures due to system privilege issues.

Scope: SCHEMA

Executed SQL: SELECT GRANTEE, PRIVILEGE FROM SYS.DBA_SYS_PRIVS WHERE grantee NOT IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPSOISSYS','AUDSYS','SYS') AND GRANTEE IN (SELECT USERNAME FROM SYS.DBA_USERS) AND PRIVILEGE IN ('CREATE ANY LIBRARY','CREATE CREDENTIAL','CREATE ANY CREDENTIAL','READ ANY FILE GROUP','CREATE TRANSLATION PROFILE','BACKUP ANY TABLE','CREATE EXTERNAL JOB','CREATE ANY CREDENTIAL')

Relevant Objects (1 relevant object)

GRANTEE	PRIVILEGE
MYAPP	CREATE ANY LIBRARY

XML Objects

Target Database
Expand All Close All

XML Schema Objects

Description:

XML Schema Objects will not migrate.

Action:

Modify your application to not use XML Schema Objects.

Hide Details

Name:

has_xmlschema_objects

Migration Methods:

DATAPUMP,DATAPUMP_OBLINK,GOLDENGATE

Failure Impact:

XML Schemas are not supported in Autonomous Database.

Scope:

UNIVERSAL

Executed SQL:

SELECT OWNER, SCHEMA_URL FROM (SELECT S.OWNER, S.SCHEMA_URL FROM SYS.DBA_XML_SCHEMAS S WHERE OWNER NOT IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS','Y
UNION SELECT S.OWNER, S.SCHEMA_URL FROM SYS.DBA_XML_SCHEMAS S, SYS.DBA_OBJECTS O WHERE S.INT_OBJNAME = O.OBJECT_NAME AND S.OWNER IN ('SYSTEM') AND O.OBJ

Relevant Objects (1 relevant object)

OWNER

SCHEMA_URL

MYAPP

http://www.example.com/warehouses.xsd

XML Tables

Target Database

[Expand All](#)[Close All](#)

XML Type Tables

Description: XMLType Tables will not migrate unless the STORAGE_TYPE is BINARY.

Action: XMLType Tables with CLOB or Object-Relational storage is not supported in Autonomous Database. Change the XMLType storage option to BINARY. When the relevant objects column XMLSCHEMA is not empty this indicates your application uses XML Schema Objects and additional work may be required. For non-schema based storage types, the BINARY storage option must be used. See Oracle Support Document ID 1581065.1 for information converting CLOB columns to BINARY. When migrating via Data Pump specify "TRANSFORM=XMLTYPE_STORAGE_CLAUSE:'BINARY XML'" to transform CLOB to Securefile Binary XML.

[Hide Details](#)

Name: has_xmltype_tables

Migration Methods: DATAPUMP,DATAPUMP_DBLINK,GOLDENGATE

Failure Impact: Any applications relying on XMLType tables not stored as BINARY will fail.

Scope: SCHEMA

Executed SQL: SELECT OWNER, TABLE_NAME, STORAGE_TYPE, XMLSCHEMA, SCHEMA_OWNER FROM SYS.DBA_XML_TABLES WHERE OWNER NOT IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS') AND (XMLSCHEMA IS NOT NULL OR STORAGE_TYPE != 'BINARY') ORDER BY 1,2

Relevant Objects (1 relevant object)

OWNER	TABLE_NAME	STORAGE_TYPE	XMLSCHEMA	SCHEMA_OWNER
MYAPP	XWAREHOUSES	OBJECT-RELATIONAL	http://www.example.com/xwarehouses.xsd	MYAPP

XML Columns

Target Database

[Expand All](#)[Close All](#)

XML Type Columns

Description: Tables with XMLType column will not migrate unless the STORAGE_TYPE is BINARY.

Action: Tables with XMLType columns defined with CLOB or Object-Relational storage are not supported in Autonomous Database. When the relevant objects column XMLSCHEMA is not empty this indicates your application uses XML Schema Objects and additional work may be required. For non-schema types the BINARY storage option must be used. See Oracle Support Document ID 1581065.1 for information converting CLOB columns to BINARY. When migrating via Data Pump specify 'TRANSFORM=XMLTYPE_STORAGE_CLAUSE="BINARY XML"' to transform CLOB to Securefile Binary XML.

Hide Details

Name: has_tables_with_xmltype_column

Migration Methods: DATAPUMP,DATAPUMP,DBLINK,GOLDENGATE

Failure Impact: Any applications relying on XMLType columns not stored as BINARY will fail.

Scope: SCHEMA

Executed SQL: SELECT XTC.OWNER, XTC.TABLE_NAME, XTC.COLUMN_NAME, XTC.STORAGE_TYPE, XTC.XMLSCHEMA, XTC.SCHEMA_OWNER FROM SYS.DBA_XML_TAB_COLS XTC, SYS.DBA_TAB_COLS (ANONYMOUS';APEX_030200';APEX_040000';APEX_040100';APEX_040200';APEX_050000';APEX_LISTENER';APEX_PUBLIC_USER';APEX_REST_PUBLIC_USER';APPOSSYS';AUDSYS'; AND (XTC.XMLSCHEMA IS NOT NULL OR XTC.STORAGE_TYPE != 'BINARY') AND TC.OWNER = XTC.OWNER AND TC.TABLE_NAME = XTC.TABLE_NAME AND TC.COLUMN_NAME = XTC.COLUMN_NAME

Relevant Objects (1 relevant object)

OWNER	TABLE_NAME	COLUMN_NAME	STORAGE_TYPE	XMLSCHEMA	SCHEMA_OWNER
MYAPP	XML_CLOB	XML_DOC	CLOB		

Java Sources

Target Database
Expand All Close All

▼ Java Sources

Description: Java sources will not migrate by default.

Action: Enable the JAVAVM feature on the target system by executing this SQL and then restart your instance `BEGIN DBMS_CLOUD_ADMIN.ENABLE_FEATURE(feature_name => 'JAVAVM');`
`END;` For more information on enabling the JAVAVM feature see the instructions here: <https://docs.oracle.com/en/cloud/paas/autonomous-database/adbsa/autonomous-oracle-java.html#GUID-2516EE33-838D-4270-BE52-30A4F9014E8B>

Hide Details

Name: has_java_source

Migration Methods: DATAPUMP,DATAPUMP_DBLINK,GOLDENGATE

Failure Impact: When the JAVAVM feature is not enabled on the target system, any applications relying on Java objects will fail.

Scope: SCHEMA

Executed SQL: `SELECT OWNER, OBJECT_NAME, OBJECT_TYPE, STATUS FROM SYS.DBA_OBJECTS WHERE OWNER NOT IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS') AND OBJECT_TYPE = 'JAVA SOURCE' ORDER BY 1, 2`

▼ Relevant Objects (1 relevant object)

OWNER	OBJECT_NAME	OBJECT_TYPE	STATUS
MYAPP	HELLOCLASSSRC	JAVA SOURCE	VALID

Java Objects

Target Database

Expand All Close All

Java Objects

Description: Java objects will not migrate by default.

Action: Enable the JAVAVM feature on the target system by executing this SQL and then restart your instance `BEGIN DBMS_CLOUD_ADMIN.ENABLE_FEATURE(feature_name => 'JAVAVM');`
`END;` / For more information on enabling the JAVAVM feature see the instructions here: <https://docs.oracle.com/en/cloud/paas/autonomous-database/adbsa/autonomous-oracle-java.html#GUID-2516EE33-838D-4270-BE52-30A4F9014E8B>

Hide Details

Name: has_java_objects

Migration Methods: DATAPUMP,DATAPUMP,DBLINK,GOLDENGATE

Failure Impact: When the JAVAVM feature is not enabled on the target system, any applications relying on Java objects will fail.

Scope: SCHEMA

Executed SQL: `SELECT OWNER, OBJECT_NAME, OBJECT_TYPE, STATUS FROM SYS.DBA_OBJECTS WHERE OWNER NOT IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS','`
`AND OBJECT_TYPE IN ('JAVA CLASS','JAVA RESOURCES','JAVA DATA') ORDER BY 1, 2`

Relevant Objects (1 relevant object)

OWNER	OBJECT_NAME	OBJECT_TYPE	STATUS
MYAPP	HelloClass	JAVA CLASS	VALID

Common Objects

Target Database

[Expand All](#)[Close All](#)

Common Objects

Description: Common objects are not migrated by Data Pump and are not supported on ADB.

Action: Those common objects needed by applications must be recreated on the target system prior to migration. When targeting ADB the needed common objects must be recreated as local objects. This can be done using DBMS_METADATA.GET_DDL as shown in Oracle Support Document ID 2739952.1

[Hide Details](#)

Name: has_common_objects

Migration Methods: DATAPUMP,DATAPUMP_DBLINK,GOLDENGATE

Failure Impact: Anything dependent on the common objects will fail to be migrated properly.

Scope: INSTANCE

Executed SQL: SELECT USERNAME AS OBJECT_NAME, 'USER' AS OBJECT_TYPE FROM SYS.DBA_USERS WHERE (COMMON='YES' OR UPPER(USERNAME) LIKE 'C##%') AND ORACLE_MAINTAINED <> 'Y' UNION ALL SELECT ROLE AS OBJECT_NAME, 'ROLE' AS OBJECT_TYPE FROM SYS.DBA_ROLES R WHERE (COMMON='YES' OR UPPER(ROLE) LIKE 'C##%') AND ORACLE_MAINTAINED <> 'Y' UNION ALL SELECT UNIQUE PROFILE AS OBJECT_NAME, 'PROFILE' AS OBJECT_TYPE FROM SYS.DBA_PROFILES WHERE COMMON='YES' OR UPPER(PROFILE) LIKE 'C##%' AND UPPER(PROFILE) NOT IN ('ORA_ADMIN_PROFILE','ORA_APP_PROFILE','ORA_MANDATORY_PROFILE')

Relevant Objects (2 relevant objects)

OBJECT_NAME	OBJECT_TYPE
C##DBLCMUSER	USER
C##DBLCMPROFILE	PROFILE

Non-Exported Objects Grants

Source Database

Expand All Close All

Review Required (5 checks)

Non-Exported Object Grants

Description: Not all object grants are exported by Data Pump.

Action: Recreate any required grants on the target instance. See Oracle Support Document ID 1911151.1 for more information. Note that any SELECT grants on system objects will need to be replaced with READ grants; SELECT is no longer allowed on system objects.

Hide Details

Name: has_noexport_object_grants

Migration Methods: DATAPUMP,DATAPUMP,DBLINK,GOLDENGATE

Failure Impact: Object grants required for your application may be missing on the target instance.

Scope: SCHEMA

Executed SQL:

```
SELECT GRANTEE, OWNER AS OBJECT_OWNER, TABLE_NAME AS OBJECT_NAME, PRIVILEGE AS PRIVILEGE, GRANTOR FROM SYS.DBA_TAB_PRIVS WHERE (GRANTEE NOT IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS') AND GRANTEE IN (SELECT USERNAME FROM SYS.DBA_USERS) OR GRANTEE IN (SELECT ROLE FROM SYS.DBA_ROLES WHERE SYS.DBA_ROLES.ORACLE_MAINTAINED <> 'Y' AND ROLE ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS') AND NOT (OWNER = 'SYS' AND TABLE_NAME LIKE 'Q%T%I%_BUFFER' ESCAPE '!') AND (OWNER IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS') ORDER BY GRANTEE, OBJECT_OWNER, OBJECT_NAME, PRIVILEGE, GRANTOR
```

Relevant Objects (1 relevant object)

GRANTEE	OBJECT_OWNER	OBJECT_NAME	PRIVILEGE	GRANTOR
MYAPP	SYS	DBMS_SHARED_POOL	EXECUTE	SYS

Scheduler Jobs

Source Database

[Expand All](#)[Close All](#)

▼ Incompatible Scheduler Jobs

Description: Scheduler Jobs and Programs other than PLSQL_BLOCK or STORED_PROCEDURE are not supported on ADB.

Action: Recreate required Job or Programs using types allowed in ADB.

[Hide Details](#)

Name: has_incompatible_jobs

Migration Methods: DATAPUMP,DATAPUMP_OBLINK,GOLDENGATE

Failure Impact: Scheduler Jobs and Programs types such as EXECUTABLE and EXTERNAL_SCRIPT will not run on ADB

Scope: SCHEMA

Executed SQL:
SELECT OWNER, NAME, TYPE, LOCUS FROM (SELECT OWNER, JOB_NAME AS NAME, JOB_TYPE AS TYPE, 'DBA_SCHEDULER_JOBS' AS LOCUS FROM SYS.DBA_SCHEDULER_JOBS WHERE (ANONYMOUS;'APEX_030200';APEX_040000';APEX_040100';APEX_040200';APEX_050000';APEX_LISTENER';APEX_PUBLIC_USER';APEX_REST_PUBLIC_USER';APPOSSYS';AUDSYS';) AND JOB_TYPE NOT IN ('CHAIN';STORED_PROCEDURE';PLSQL_BLOCK') UNION ALL SELECT OWNER, PROGRAM_NAME AS NAME, PROGRAM_TYPE AS TYPE, 'DBA_SCHEDULER_PROGR' (ANONYMOUS';APEX_030200';APEX_040000';APEX_040100';APEX_040200';APEX_050000';APEX_LISTENER';APEX_PUBLIC_USER';APEX_REST_PUBLIC_USER';APPOSSYS';AUDSYS';) AND PROGRAM_TYPE NOT IN ('STORED_PROCEDURE';PLSQL_BLOCK')) ORDER BY 1, 2, 3

▼ Relevant Objects (1 relevant object)

OWNER	NAME	TYPE	LOCUS
MYAPP	PROCESS_DATA_JOB	EXECUTABLE	DBA_SCHEDULER_JOBS

External Tables

Source Database

Expand All

Close All

External Tables for Serverless

Description: External tables in ADB must be recreated using Object Storage Service or File Storage Service.

Action: Drop the empty imported table. Use the DBMS_CLOUD package to create External Tables using Cloud Object Storage Service or use File Storage Service for more info see <https://docs.oracle.com/en/cloud/paas/autonomous-database/serverless/adbsb/load-oci-file-storage.html#GUID-B9A7E58E-E1C0-4859-B16B-EF88942704BF>.

Hide Details

Name: has_external_tables_serverless

Migration Methods: DATAPUMP,DATAPUMP_DBLINK,GOLDENGATE

Failure Impact: Attempting to create external tables that are neither Cloud Object Storage nor File Storage Service will result in those tables being created as empty non-External tables.

Scope: SCHEMA

Executed SQL: SELECT OWNER,TABLE_NAME,TYPE_OWNER,TYPE_NAME,DEFAULT_DIRECTORY_OWNER,DEFAULT_DIRECTORY_NAME FROM SYS.DBA_EXTERNAL_TABLES WHERE OWNER NOT IN ('ANONYMOUS','APEX_030200','APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APPOSSYS','AUDSYS','

ORDER BY 1, 2

Relevant Objects (1 relevant object)

OWNER	TABLE_NAME	TYPE_OWNER	TYPE_NAME	DEFAULT_DIRECTORY_OWNER	DEFAULT_DIRECTORY_NAME
MYAPP	COUNTRIES_EXT	SYS	ORACLE_LOADER	SYS	EXT_TAB_DATA

Source Database

Close All

Description:

Some packages are either not supported or only partially supported in ADB

Applications referencing unsupported packages must be modified before migration to ADBS; Applications referencing partially supported packages require testing and validation to ensure they only utilize unrestricted functions and procedures.

Name: _____

has refs to restricted packages serverless

Migration Methods:

DATAPUMP,DATAPUMP_DBLINK,GOLDENGATE

Failure impact:

Applications that reference packages that are unsupported or restricted-use on ADB may fail

Scope:

SCHEMA

Executed SQL:

```
SELECT OWNER, NAME, TYPE, REFERENCED_NAME, SUPPORT FROM ( SELECT OWNER, NAME, TYPE, REFERENCED_NAME, 'UNSUPPORTED' AS SUPPORT FROM SYS.DBA_DEPENDENCIES
('ANONYMOUS',APEX_030200,'APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APQPOSSYS','AUDSYS',
AND REFERENCED_NAME IN ('DBMS_DEBUG_JDWP','DBMS_DEBUG_JDWP_CUSTOM','UTL_INADDR','DBMS_SYSTEM','DBMS_SYS_SQL') UNION ALL SELECT OWNER, NAME, TYPE, REFER
('ANONYMOUS',APEX_030200,'APEX_040000','APEX_040100','APEX_040200','APEX_050000','APEX_LISTENER','APEX_PUBLIC_USER','APEX_REST_PUBLIC_USER','APQPOSSYS','AUDSYS',
AND REFERENCED_NAME IN ('UTL_HTTP','UTL_SMTP','UTL_TCP','DBMS_SHARED_POOL','DBMS_PIPE','DBMS_LDAP','DBMS_NETWORK_ACL_ADMIN')) WHERE OWNER <> 'PUBLIC' AND
```

OWNER

NAME

TYPE

REFERENCED_NAME

SUPPORT

MYAPP

GET_HTTP_RESPONSE

PROCEDURE

UTL_HTTP

PARTIALLY SUPPORTED

MYAPP

MANAGE_SHARED_POOL

PROCEDURE

DBMS_SHARED_POOL

PARTIALLY SUPPORTED



Directory Objects Accessibility

Source Database

Expand All

Close All

Directories

Description:

Directory objects may reference locations that are not accessible in ADB

Action:

Recreate the directories on the Autonomous database instance.

More Details

Relevant Objects (9 relevant objects)

OWNER	DIRECTORY_NAME	DIRECTORY_PATH
SYS	DBMS_OPTIM_ADMINDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/rdbms/admin
SYS	DBMS_OPTIM_LOGDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/cfgtoollogs
SYS	EXT_TAB_DATA	/external_data
SYS	ORACLE_OCM_CONFIG_DIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/ccr/state
SYS	ORACLE_OCM_CONFIG_DIR2	/u01/app/oracle/product/19.0.0.0/dbhome_1/ccr/state
SYS	SCRIPT_DIR	/home/oracle/scripts/
SYS	SDO_DIR_WORK	
SYS	XMLDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/rdbms/xml
SYS	XSDIR	/u01/app/oracle/product/19.0.0.0/dbhome_1/rdbms/xml/schema



Connections

What's the best option?

Predefined Database Service Names



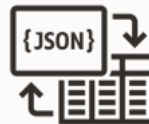
Autonomous DWH

dbname_high
dbname_medium
dbname_low



Autonomous TP

dbname_tpurgent
dbname_tp
dbname_high
dbname_medium
dbname_low



Autonomous JSON

dbname_tpurgent
dbname_tp
dbname_high
dbname_medium
dbname_low

Notes for Importing with Oracle Data Pump

<https://docs.oracle.com/en/cloud/paas/autonomous-database/serverless/adbsb/load-data-data-pump-notes.html>

“For the best import performance use the **HIGH** database service for your import connection and set the parallel parameter to one quarter the number of ECPUs ($.25 \times \text{ECPU count}$).

If you are using OCPU compute model, set the parallel parameter to the number of OCPUs ($1 \times \text{OCPU count}$).”

Connections

For migrations, clearly **TPURGENT** usually provides best results

- For Autonomous Data Warehouse (ADW), you can request this service by creating a Service Request (SR)

Concurrency

Database Service Name	Concurrent Statements with Compute Auto Scaling Disabled	Concurrent Statements with Compute Auto Scaling Enabled
tpurgent	$75 \times \text{number of ECPU's}$	$75 \times \text{number of ECPU's}$
tp	$75 \times \text{number of ECPU's}$	$75 \times \text{number of ECPU's}$
high	3	9
medium	$0.25125 \times \text{number of ECPU's}$ A decimal result is truncated.	$0.75375 \times \text{number of ECPU's}$ A decimal result is truncated.
low	$75 \times \text{number of ECPU's}$	$75 \times \text{number of ECPU's}$

<https://docs.oracle.com/en/cloud/paas/autonomous-database/serverless/adbsb/manage-service-concurrency.html#GUID-6E4DCD27-CDAA-432D-A90B-485C19EF72B0>

Concurrency Limits

Database Service Name	Concurrent Statements with OCPU Auto Scaling Disabled	Concurrent Statements with OCPU Auto Scaling Enabled
tpurgent	$300 \times \text{number of OCPUs}$	$300 \times \text{number of OCPUs}$
tp	$300 \times \text{number of OCPUs}$	$300 \times \text{number of OCPUs}$
high	3	9
medium	$1.26 \times \text{number of OCPUs}$	$3.78 \times \text{number of OCPUs}$
low	$300 \times \text{number of OCPUs}$	$300 \times \text{number of OCPUs}$

<https://docs.oracle.com/en/cloud/paas/autonomous-database/serverless/adbsb/manage-service-concurrency.html#GUID-6E4DCD27-CDAA-432D-A90B-485C19EF72B0>



Storage

What's the best option?



NFS vs Object Storage?

- It depends ...

NFS vs Object Storage

Usually, NFS (or FSS) is recommended over object storage for the migration

- Easy to setup
- Performance seems to be better
- NFS requires "private endpoint access only"
- Object storage's advantage: [pre-authenticated](#)

Private endpoint access only

Restrict access to a private endpoint within an OCI VCN.

Create File System

[Help](#)

This workflow creates a new File System. To get started, choose the type of File System you want to create. Then, you can keep the provided information or click **Edit details** to change it. Click **Create** to finish.

File System for NFS

Create a File System and an associated Export in a Mount Target. You can mount and access the File System as soon as it is created. [Learn more about mounting File Systems.](#) ✓

File System for Replication

Create an unexported File System. Unexported File Systems can be used as target File Systems for replicated data. [Learn more about replication.](#)

High Performance Storage

Use HPMT (High Performance Mount Target)

OPTION	THROUGHPUT	INCLUDED
HPMT-20	up to 20 Gbs	20 TB
HPMT-40	up to 40 Gbs	40 TB
HPMT-80	up to 80 Gbs	80 TB

- <https://docs.oracle.com/en-us/iaas/releasenotes/filestorage/high-performance-mount-targets.htm>
- <https://docs.oracle.com/en-us/iaas/Content/Resources/Assets/whitepapers/file-storage-performance-guide.pdf>



Use High Performance Mount Target during migration for better throughput

- 30 days minimum subscription



Latency

Have a closer look

Connection and latency test tool - adbping (Doc ID 2863450.1)

- Diagnose high-latency issues in customer workloads
- Validate if the ADB service is healthy and not the root cause of latency

Latency

```
[oracle@db19caz adbping]$ ./adbping -u admin -p _____ \
> -s atpaz_high -w \
> /home/oracle/wallet -j /u01/app/oracle/product/19.0.0/dbhome_1/javavm/jdk/jdk8 \
> -d 30
+++Test Summary+++
Test Client: sqlplus
Number of concurrent threads: 1
Duration (secs): 30
SQL executed: select 1 from dual;
Pass: 27 Fail: 0
Test start date: 2025-06-02 15:25:21.517810+00:00
Test end date: 2025-06-02 15:25:52.126871+00:00
SQL Execution Time(ms) : Min:0 Max:10 Avg:1.111 Median:0 Perc90:10 Perc95:10 Perc99:10
Connect + SQL Execution Time(ms) : Min:1115.78 Max:1292.391 Avg:1131.607 Median:1123.914 Perc90:1155.317 Perc95:1155.977 Perc99:1292.391
```

Interpretation of the results

1. Pass/Fail count: Indicates the total number of connections passed/failed in defined duration by the defined number of threads.
2. SQL execution time: Time taken to just execute the SQL. Connection time not included.
For sqlplus, this would be the elapsed time reported by sqlplus.
3. Connect + SQL Execution Time: Time taken to connect and execute SQL.
For sqlplus, this would be the time to connect and run the sql.
For java, it would be time taken to getConnection() and execute the query.
4. Java connection pool stats: Reports the time taken to setup the java connection pool and the initial and max size.
All query executions do a getConnection() and execute the SQL.
5. Perc90, Perc95, Perc99: This is the percentile value indicating 90%, 95% or 99% of the latencies are below the respective value.

Latency

```
[oracle@db19caz adbping]$ ./adbping -u admin -p  \  
> -s atpaz_high -w \  
> /home/oracle/wallet -j /u01/app/oracle/product/19.0.0/dbhome_1/javavm/jdk/jdk8 \  
> -d 30  
+++Test Summary+++  
Test Client: sqlplus  
Number of concurrent threads: 1  
Duration (secs): 30  
SQL executed: select 1 from dual;  
Pass: 27 Fail: 0  
Test start date: 2025-06-02 15:25:21.517810+00:00  
Test end date: 2025-06-02 15:25:52.126871+00:00  
SQL Execution Time(ms) : Min:0 Max:10 Avg:1.111 Median:0 Perc90:10 Perc95:10 Perc99:10  
Connect + SQL Execution Time(ms) : Min:1115.78 Max:1292.391 Avg:1131.607 Median:1123.914  
Perc90:1155.317 Perc95:1155.977 Perc99:1292.391
```

Latency

```
[oracle@db19caz oci]$ ./connping11 -l admin/[REDACTED]@atpaz_high --period=5
```

```
RWP*Connect/OCIPing Release 3.2.1.0 Production on Mon, 02 Jun 2025 15:32:39 UTC
```

```
Connected default database with reconnect to:
```

```
Oracle Database 23ai Enterprise Edition Release 23.0.0.0.0 - for Oracle Cloud and Engineered Systems
```

```
connect:114.25 ms, ociping:0.959 ms, dualping:0.998 ms, sid=55917, inst#=8, time=1.1
```

```
connect:117.93 ms, ociping:1.004 ms, dualping:0.997 ms, sid=43883, inst#=8, time=2.1
```

```
connect:115.45 ms, ociping:1.120 ms, dualping:1.138 ms, sid=13832, inst#=8, time=3.1
```

```
connect:115.62 ms, ociping:1.206 ms, dualping:1.357 ms, sid=13832, inst#=8, time=4.1
```

```
connect mean=115.81, stddev=1.33, min=114.25, max=117.93
```

```
ociping mean=1.07, stddev=0.10, min=0.96, max=1.21
```

```
dualping mean=1.12, stddev=0.15, min=1.00, max=1.36
```



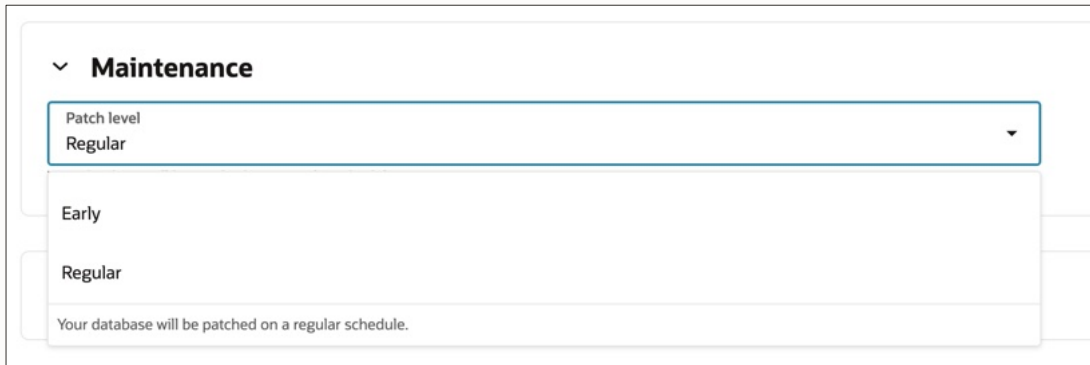
Maintenance

What else do you need to take care on?

Choose Maintenance Plan

Two maintenance plans are available

- You can adjust it later on if needed



The screenshot shows a web interface for configuring a database maintenance plan. A section titled "Maintenance" is expanded, revealing a dropdown menu for "Patch level". The dropdown is currently set to "Regular". Below the dropdown, the text "Your database will be patched on a regular schedule." is displayed.

▼ **Maintenance**

Patch level
Regular ▼

Early

Regular

Your database will be patched on a regular schedule.

Choose Maintenance Plan

Maintenance happens weekly

- Typically, on weekends
- Window will be always the same
- Assigned during creation

Take note for your migration!!

Maintenance

You can obtain information about system events, maintenance, and other important information for the operation of your Autonomous Database instance. [Learn more](#)

Patch level	Regular	Edit
	Your database will be patched on a regular schedule.	
Next maintenance	Sat, Jun 7, 2025, 19:00:00 UTC - 21:00:00 UTC	View history
Target component	Database	

--Query your recent maintenance window on ADB Serverless
--Note: Exact timing for upcoming maintenance
-- window is available 24 hours before.

```
select actual_start_date, actual_end_date,  
       maintenance_status  
from db_notifications  
where type = 'maintenance' and time > sysdate -7;
```

ACTUAL_START_DATE	ACTUAL_END_DATE	MAINTENANCE_STATUS
2025-05-24 19:00:02 GMT	2025-05-24 21:00:24 GMT	Completed

2 hours 22 seconds



If you want to change the maintenance window, you must open an SR

- Only ± 2 hours possible



Data Pump

The simple approach



Data Pump Bundle Patch aren't yet applied in ADB Serverless (*June 2025*)

- You may request one-off fixes via an SR



Allocate a sufficient number of ECPUs

- 32 should be the [minimum](#) when you import



Export: **PARALLEL** 2x of physical cores



Import: **PARALLEL**=ECPUs/4, or higher

- Scale up to the maximum for migrations



Ensure `CLUSTER_DATABASE=TRUE`

- Allows Data Pump workers across nodes

NAME	TYPE	VALUE
cluster_database	boolean	TRUE

Most simple method: Data Pump



Datapump **with Files**



Datapump **with DB Links**

Datapump with **Dump Files**

- More control over parallelism
- Storage Overhead
- No source-target connection interoperability requirement
- Requires Object Storage / File Storage setup

Datapump with DB Links

- Network throughput and latency dependency
- Faster for smaller databases
- Requires DB Link setup
- And there is more ...



Be aware of network link import limitations

- May have a significant impact on performance

Network Link Imports - LOBs

- A network round trip is required for each row with a LOB
- If you have millions of LOB rows and a high latency connection to ADB, this may have a significant negative impact
- Check your latency from source database to ADB instance using
 - [How to measure network latency for Oracle Database applications in OCI \(Doc ID 3008087.1\)](#)
 - [Connection and latency test tool - adbping \(Doc ID 2863450.1\)](#)

```
./ociping -l user/password@myadb_high --period=5
RWP*OCIPing Release 3.2.1.0 Production on Fri, 30 May 2025 15:23:35 UTC
Connected default database to:
Oracle Database 23ai Enterprise Edition Release 23.0.0.0.0 - for Oracle
Cloud and Engineered Systems
0.998 0.0
1.008 1.0
0.987 2.0
0.999 3.0
1.054 4.0
ociping (ms) mean=1.009, stddev=0.023, min=0.987, max=1.054
```

Network Link Imports - Metadata

- A network link import does not import metadata in parallel
- On complex schemas this may have a significant negative impact
- If a network link import is required,
 - Import metadata before migration - CONTENTS=METADATA_ONLY
 - Load rows only during the migration - CONTENTS=DATA_ONLY

ADB Migration Overview



Source: 19c IaaS

- Based on [sample schemas 19.2](#)
- HR, PM, IX, SH and PI
- Some additional objects



ATP Serverless
Oracle 19.27

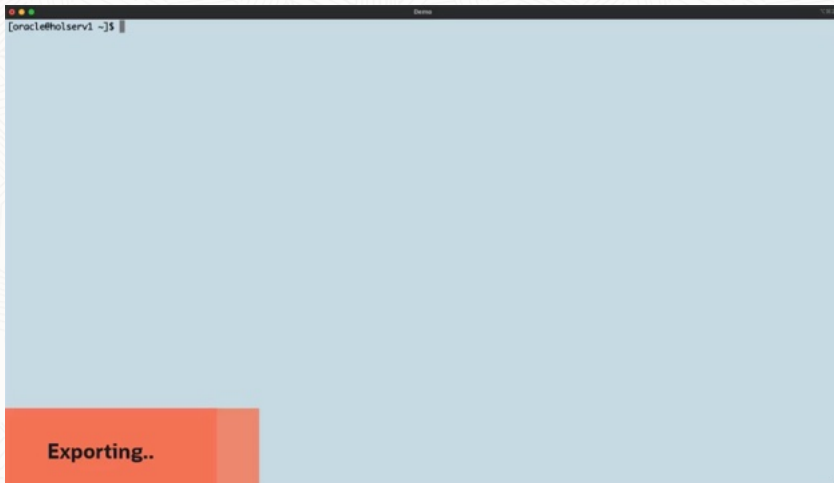


ATP Dedicated
Oracle 19.26

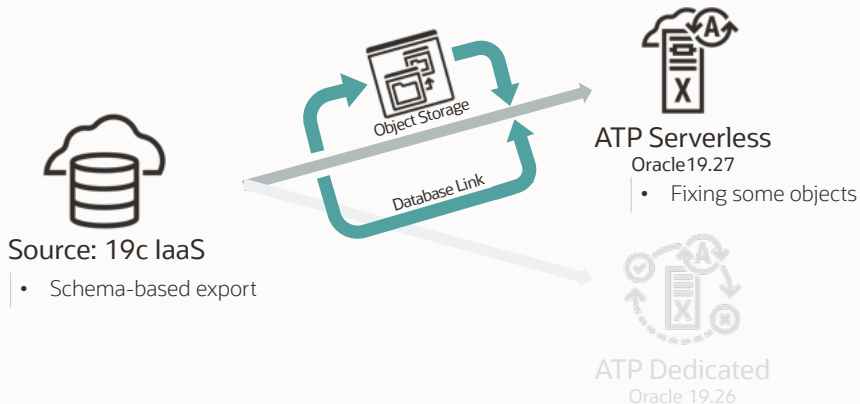
ADB Dedicated | Migration Example



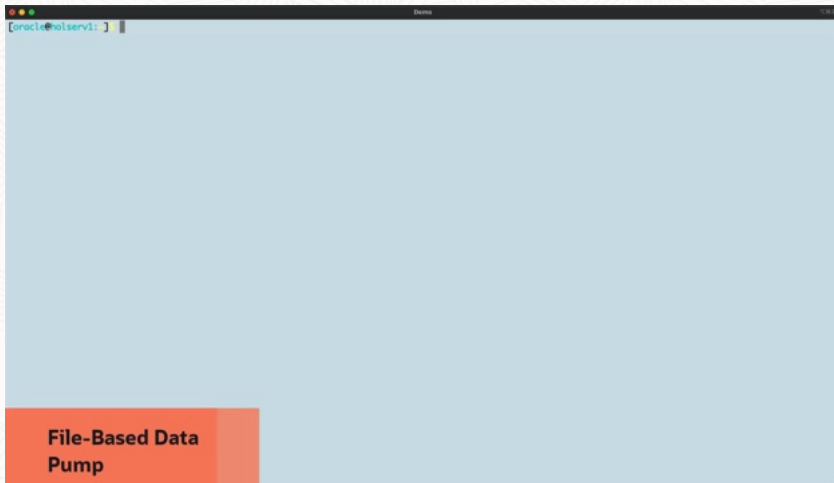
ADB Dedicated | Demo



ADB Serverless | Migration Example



ADB Serverless | Demo





Automation

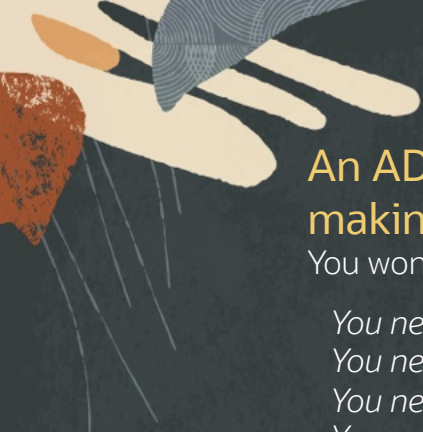
How AMA scripts ease migrations

What is AMA?

Autonomous Database Migration Automation (AMA)

- Simple migration solution for ADB Serverless
- Script based
- Single configuration file
- Migrates in phases
- Can act fully automated

- Not a new product, just a **solution** to ease migrations



An ADB-S migration is a bit like making a movie

You won't start with filming right away

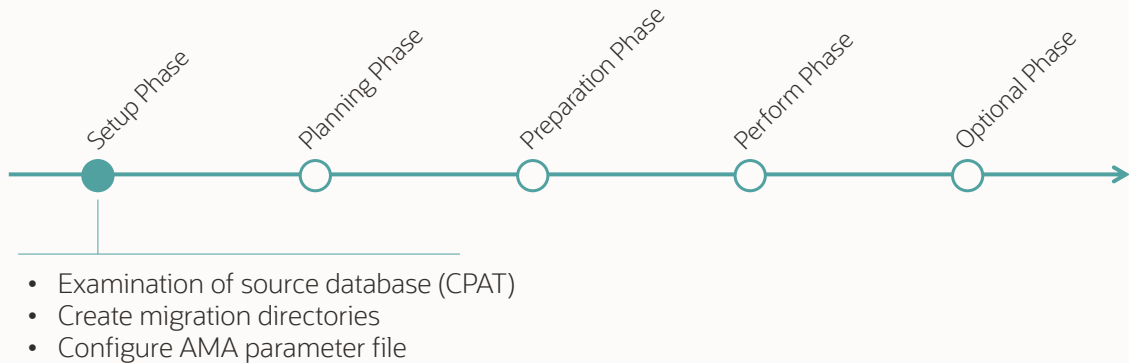
You need a script book
You need to cast actors
You need a film set
You need ...

Now you can start filming your scenes

And then there's plenty of work on editing and cutting the movie



AMA Workflow



- Create migration directories
- Copy parameter file into INPUT
- Edit parameter file and make adjust with your values

```
mkdir -p /home/oracle/CPAT_MIG_SCRIPTS/INPUT  
mkdir -p /home/oracle/CPAT_MIG_SCRIPTS/OUTPUT
```

```
cp CPAT_MIGRATION_PARAMETERS.txt /home/oracle/CPAT_MIG_SCRIPTS/INPUT
```

```
vi /home/oracle/CPAT_MIG_SCRIPTS/INPUT/CPAT_MIGRATION_PARAMETERS.txt
```

Parameter File

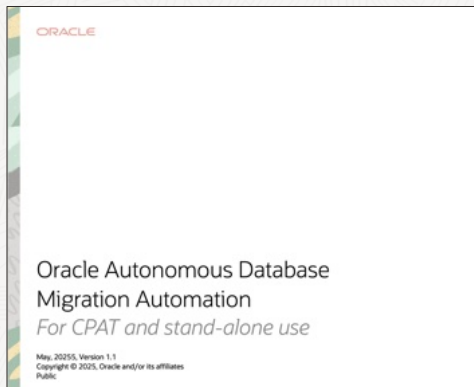
Adjust;

- Connect strings source and target
- Data Pump encryption
- Storage (FSS or Object Store)
- Format: TAB or SCRIPT

Documentation

AMA Documentation is available at request

- Documents the entire flow and all options and parameters



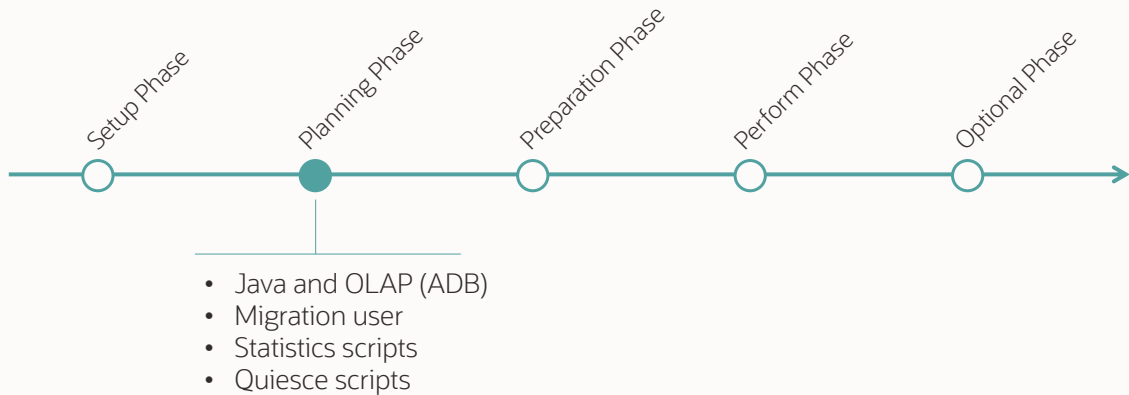
ORACLE	
Table of contents	
Introduction	3
Current Restrictions	3
Workflow	4
Setup	4
Planning Phase	4
Prepare Phase	4
Perform Phase	5
Post Phase	5
Optional Phase	6
How to use AMA	7
Setup and execute AMA	7
How to setup the shared storage	10
Setting up an NFS share for the migration	10
OCI Console	10
Associate Mount Target	15
Linux	15
Windows	15
Setting up an Object Storage Bucket for the migration	15
Pre-Authenticated URIs	16
APPENDIX A - AMA Migration Parameters	16
CONNECT_SRC	16
CONNECT_TGT	16
UID	16
PWD	16
ENCLOSURE_USER	16
DP_ENCRYPTION_PWD	16
USE_FSO_CURL	16
DUMP_OUTPUT_PATH	17
ADB Dump File Storage Related Parameters	17
CONFIG_FILE_FORMAT	17
USE_DP_AIR TRUE	17
DUMP_OUTPUT_DIR	18
APPENDIX B - The AMA Configuration File	19
APPENDIX C - AMA Walkthrough including Output (Linux)	21

AMA Demonstration



Part 1 - Configuration

AMA Workflow



AMA | Planning Phase

On-Prem - Source

Gather stats for SYS / SYSTEM

Create Migration user

Enable restricted session

Set JOB_QUEUE_PROCESSES=0

ADB-S - Target

Enable OLAP / JAVA in ADB-S

```
[oracle@ephx31vm1-jl0sd1 OUTPUT]$ cat __US3BLDW_MIGRATION_CONTROL_FILE.ctl
```

```
---
```

```
---
```

```
--- PLAN PHASE ---
```

```
--- All steps in this phase affect the source database ---
```

```
--- * You can collect the statistics or create the migration user in advance ---
```

```
--- * Get familiar with the restricted session privilege and how to prepare it ---
```

```
--- * shortly before the migration starts make sure no unwanted user is connected ---  
--- to the source database, turn on restricted session and disable the scheduler ---
```

```
---
```

```
---
```

```
##### SOURCE #####
```

```
##### TARGET #####
```

```
PLAN TARGET 00001 01 ..... 00001_US3BLDW_SQL_ENABLE_OLAP_JAVA.sh
```

```
PLAN SOURCE 00002 01 00002_US3BLDW_SQL_OPTIONAL_SOURCE_STATS.sh
```

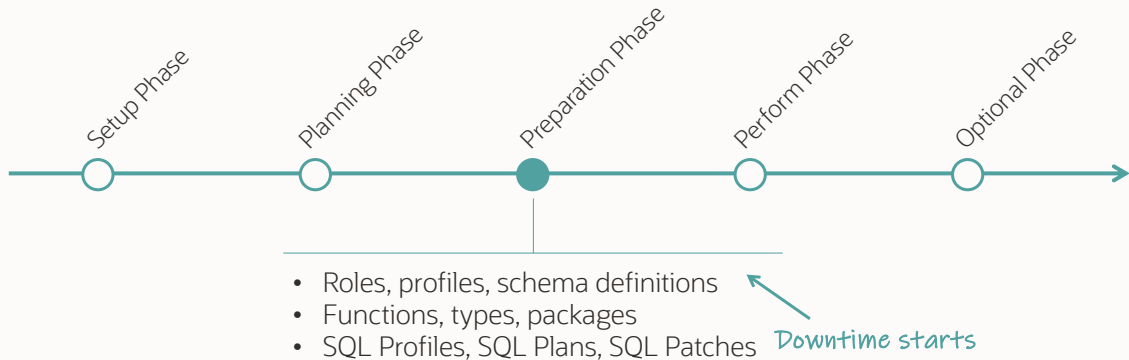
```
PLAN SOURCE 00003 01 00003_US3BLDW_SQL_CREATE_MIG_USER_SRC.sh
```

```
PLAN SOURCE 00004 01 00004_US3BLDW_SQL_SET_JOB_QUEUE_PROCESSES.sh
```

```
PLAN SOURCE 00005 01 00005_US3BLDW_SQL_ENABLE_RESTRICTED_SESSION.sh
```

```
---
```

AMA Workflow



AMA | Preparation Phase

On-Prem - Source

Collect allowed ROLES

Collect PROFILES

Export schema definition

Export FUNCTIONS, TYPES, PACKAGES

Collect SQL Profiles, SQL Plans, SQL Patches

ADB-S - Target

Create ROLES

Create PROFILES

Create storage credential (NFS, Object Store)

Import schema definition

Import FUNCTIONS, TYPES, PACKAGES

Granting migration privileges

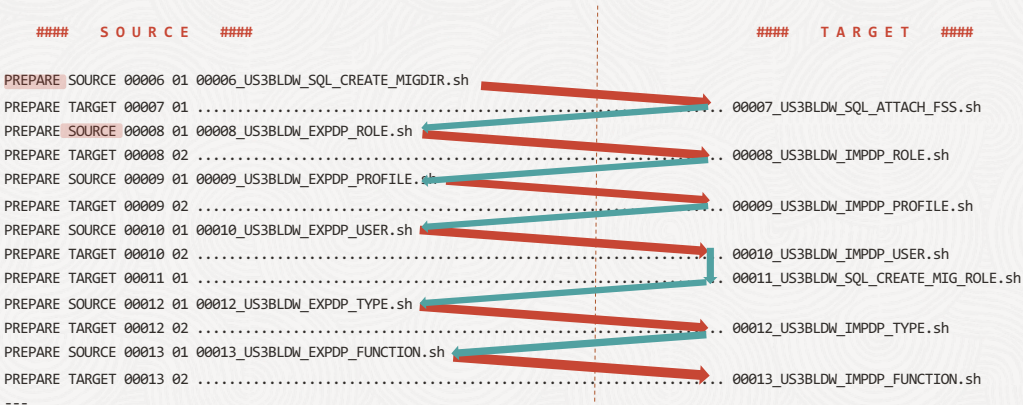
Alter user profiles

Create SQL Profiles, SQL Plans, SQL Patches

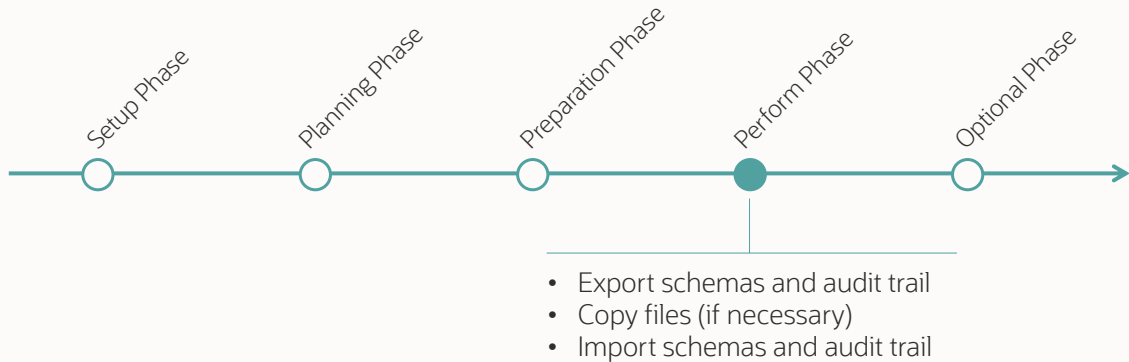
--- PREPARATION PHASE ---

--- All steps in this phase will prepare the source and target database ---

--- The scripts depend on each other, so execute in this phase one script after the other ---



AMA Workflow



AMA | Perform Phase

On-Prem - Source

Export all schemas

Export audit trail



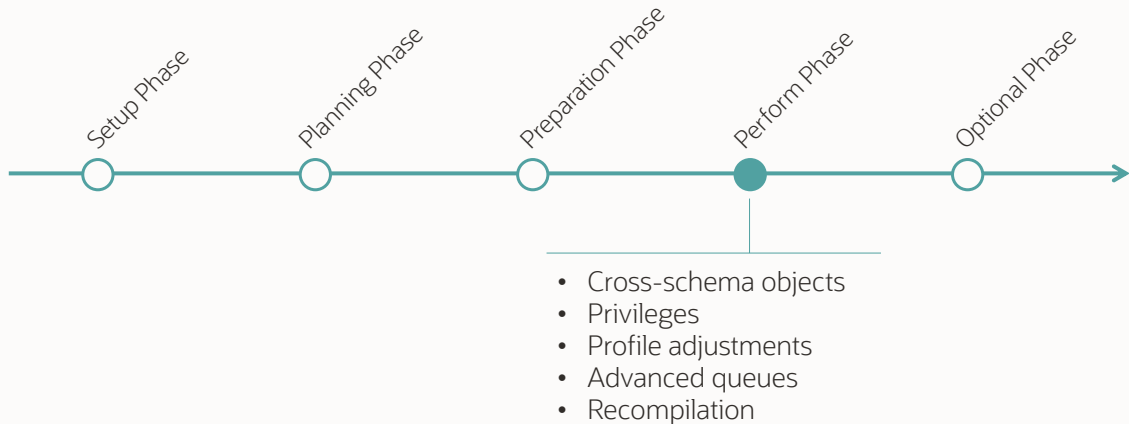
Copy files (if necessary)

ADB-S - Target

Import all schemas

Import audit trail

AMA Workflow



--- **PERFORM PHASE** ---

--- Commonly in this phase nothing depends on each other (except you for example have objects that depend on objects stored in other schema) ---

--- So export jobs can be started in parallel and imports once the export finished ---

####	SOURCE	####	####	TARGET	####
PERFORM SOURCE	00014 01	00014_US3BLDW_EXPDP_AUDIT_TRAILS.sh			
PERFORM TARGET	00014 02	.....		00014_US3BLDW_IMPDP_AUDIT_TRAILS.sh	
PERFORM SOURCE	00015 01	00015_US3BLDW_SQL_GEN_SQL_PROFILE_STAGE_TAB.sh			
PERFORM SOURCE	00015 02	00015_US3BLDW_EXPDP_SQL_PROFILES.sh			
PERFORM TARGET	00015 03	.....		00015_US3BLDW_IMPDP_SQL_PROFILES.sh	
PERFORM TARGET	00015 04	.....		00015_US3BLDW_SQL_APPL_SQL_PROFILE_STAGE_TAB.sh	
PERFORM SOURCE	00016 01	00016_US3BLDW_SQL_GEN_SQL_PATCHES_STAGE_TAB.sh			
PERFORM SOURCE	00016 02	00016_US3BLDW_EXPDP_SQL_PATCHES.sh			
PERFORM TARGET	00016 03	.....		00016_US3BLDW_IMPDP_SQL_PATCHES.sh	
PERFORM TARGET	00016 04	.....		00016_US3BLDW_SQL_APPL_SQL_PATCHES_STAGE_TAB.sh	
PERFORM SOURCE	00017 01	00017_US3BLDW_EXPDP_SCHEMA_FUSION.sh			
PERFORM TARGET	00017 02	.....		00017_US3BLDW_IMPDP_SCHEMA_FUSION.sh	
PERFORM SOURCE	00018 01	00018_US3BLDW_EXPDP_SCHEMA_FUSION_OCSERVER11G.sh			
PERFORM TARGET	00018 02	.....		00018_US3BLDW_IMPDP_SCHEMA_FUSION_OCSERVER11G.sh	
...					

AMA | Perform Phase

On-Prem - Source

ADB-S - Target

FOREIGN KEYS cross-schemas

INDEXES cross-schemas

FUNCTIONAL INDEXES enableing

REVOKE transition privileges

GRANT privs SYS, SYSTEM, CTXSYS, objects

Restore final profiles

Set tablespace quotas

Export network ACLs

Import network ACLS

Enable Advanced Queues

Recompilation

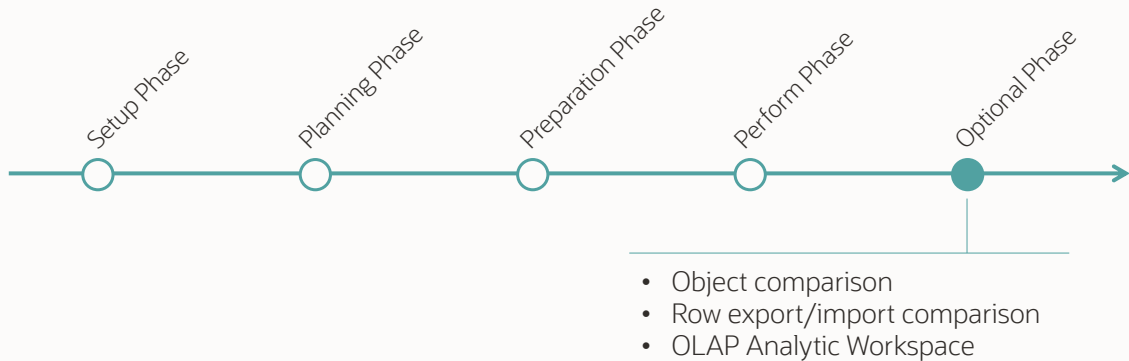
--- POST PHASE ---

--- Here execute again all scripts one after the other as they might have dependencies again ---

####	SOURCE	####	####	TARGET	####
POST TARGET	00082 01			00082_US3BLDW_SQL_REMOVE_MIG_ROLE.sh	
POST TARGET	00083 01			00083_US3BLDW_SQL_SYS_PRIVS.sh	
POST TARGET	00084 01			00084_US3BLDW_SQL_CTXSYS_PRIVS.sh	
POST TARGET	00085 01			00085_US3BLDW_SQL_DATAMINING_PRIVS.sh	
POST TARGET	00086 01			00086_US3BLDW_SQL_OBJECT_PRIVS.sh	
POST TARGET	00087 01			00087_US3BLDW_SQL_ROLE_PRIVS.sh	
POST TARGET	00088 01			00088_US3BLDW_SQL_TBS_QUOTES.sh	
POST TARGET	00089 01			00089_US3BLDW_SQL_DETACH_FSS.sh	
POST SOURCE	00090 01 00090_US3BLDW_EXPDN_NETWORK_ACL.sh				
POST TARGET	00090 02			00090_US3BLDW_IMPDP_NETWORK_ACL.sh	
POST TARGET	00091 01			00091_US3BLDW_SQL_SET_AQ_STATUS.sh	
POST TARGET	00092 01			00092_US3BLDW_SQL_RECOMPILE.sh	

--- END OF MIGRATION ---

AMA Workflow



AMA Demonstration



Part 2 - Migration



Done!!



AMA can run a migration **fully automated**
and **completely unattended**



Works with MS Windows as source database



Database links, directories, external tables, XML binary objects, APEX applications

- Work-in-progress

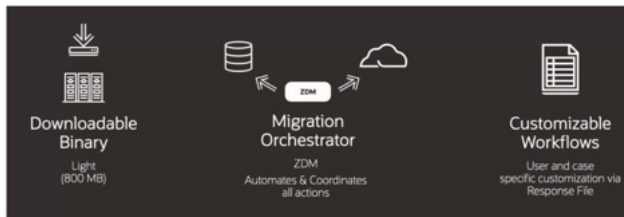


ZDM

Zero Downtime Migration

Oracle Zero Downtime Migration

Oracle Zero Downtime Migration



[Watch on YouTube](#)



DMS

Data Migration Service

Oracle Zero Downtime Migration



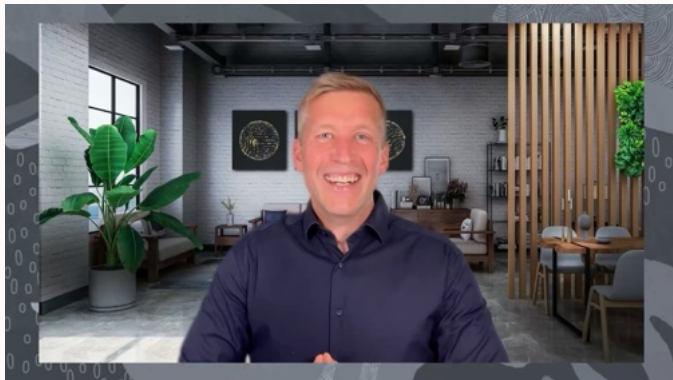
[Watch on YouTube](#)



ADB@Azure

Using ZDM to migrate to Azure

Autonomous Database @ Azure



[Watch on YouTube](#)

Autonomous Database @ Azure

[Zero Downtime Migration documentation](#)

[Exploring NFS Storage Options for Oracle ZDM Migrations to Oracle Database@Azure](#)

[Network topology and connectivity for Oracle Database@Azure - Migration connectivity design](#)

[Step-by-step Guide: Logical **Offline** Migration to ADB-S on Oracle Database@Azure](#)

[Step-by-step Guide: Logical **Online** Migration to ADB-S on Oracle Database@Azure](#)



Success

Validating a migration



How can you proof that no data was lost during the migration?

Validating the Migration

It's a logical migration into a **different** database platform

- ADB performs a lot of transformations:
IOTs to heap tables, external tables to heap tables
- Database links are different:
Uses credentials and a different connection string
- Different kinds of storage:
tablespace, removing table storage customization,
changing to binary XML etc.
- And so on ...



Start by validating
the Data Pump export and import

Import: Release 19.0.0.0.0 - Production on Mon Apr 28 08:49:43 2025
Version 19.27.0.0.0
Copyright (c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.

Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
28-APR-25 08:49:44.678: W-1 Startup took 0 seconds

.
.
.
.

28-APR-25 08:51:05.528: Job "DPUSER"."ADB_MIGR" successfully completed at Mon Apr 28 08:51:05 2025 elapsed 0 00:01:21

Import: Release 19.0.0.0.0 - Production on Mon Apr 28 08:49:43 2025
Version 19.27.0.0.0
Copyright (c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.

Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
28-APR-25 08:49:44.678: W-1 Startup took 0 seconds

.
.
.
.

~~28-APR-25 08:51:05.528: Job "DPUSER"."ADB_MIGR" successfully completed at Mon Apr 28 08:51:05 2025 elapsed 0 00:01:21~~
28-APR-25 08:51:05.528: Job "DPUSER"."ADB_MIGR" completed with 56 error(s) at Mon Apr 28 08:51:05 2025 elapsed 0 00:01:21

--Is this an ignorable error?

ORA-31684: Object type USER:"APPUSER" already exists

--Is this an ignorable error?

ORA-39082: Object type VIEW:"APPUSERS"."MyCaseSensitiveView"
created with compilation warnings

--Is this an ignorable error?

ORA-01653: unable to extend table APPUSER.T1 by 8192

ORA-39171: Job is experiencing a resumable wait

--Is this an ignorable error?

ORA-12899: value too large for column (actual: 3, maximum: 2)

-- How do you deal with large Data Pump import log files?
-- In this example, the Data Pump import log file has almost 200.000 lines

```
$ du -h import.log  
29M    import.log
```

```
$ wc -l import.log  
189931 import.log
```

```
$ python3 dpla.py import.log
```

```
=====
Data Pump Log Analyzer
=====
```

```
...
```

Operation Details

```
~~~~~
```

Operation:	Import
Data Pump Version:	19.22.0.0.0
DB Info:	Oracle Database 19c EE Extreme Perf Release 19.0.0.0.0
Job Name:	DPJOB1
Status:	COMPLETED

Processing:	-
-------------	---

Errors:	1267
ORA- Messages:	1267

Start Time:	2024-04-11 09:30:55
End Time:	2024-04-12 10:33:01
Runtime:	25:03:06

Data Processing

```
~~~~~
```

Parallel Workers:	128
Schemas:	27
Objects:	224755
Data Objects:	188084
Overall Size:	13.16 TB

```
$ python3 dpla.py import.log -e
```

```
=====
Data Pump Log Analyzer
=====
```

```
...
```

```
ORA- MESSAGES DETAILS
```

```
~~~~~
```

```
(sorted by count):
```

Message	Count
ORA-39346: data loss in character set conversion for object COMMENT	919
ORA-39082: Object type PACKAGE BODY created with compilation warnings	136
ORA-39346: data loss in character set conversion for object PACKAGE_BODY	54
ORA-39082: Object type TRIGGER created with compilation warnings	36
ORA-39082: Object type PROCEDURE created with compilation warnings	29
ORA-31684: Object type USER already exists	27
ORA-39111: Dependent object type PASSWORD_HISTORY skipped, base object type USER already exists	27
ORA-39346: data loss in character set conversion for object PACKAGE	18
ORA-39082: Object type PACKAGE created with compilation warnings	10
ORA-39082: Object type VIEW created with compilation warnings	7
ORA-39346: data loss in character set conversion for object PROCEDURE	2
ORA-39082: Object type FUNCTION created with compilation warnings	2

Total	1267

▼

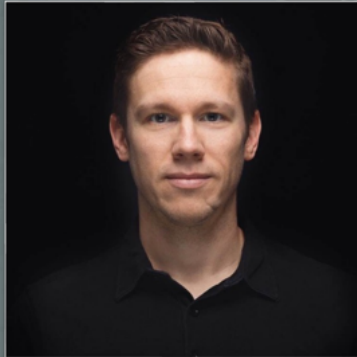
Table Details

Search for Table...

Table	Rows	Size	Seconds	Part	Subpart
SALES.ORDERS	118914251151	1.73 TB	878854	278	4448
SALES.INVOICES	115668171592	4.33 TB	805901	588	9408
SALES.TRANSACTIONS	115720037994	3.61 TB	611891	451	7216
FINANCE.EXPENSES	35091517646	258.14 GB	112962	367	0
MARKETING.CAMPAIGNS	11621627768	458.93 GB	82801	16	0
HR.EMPLOYEES	19433932893	296.19 GB	66156	2254	0
SALES.DOCUMENTS	4743542596	345.97 GB	48117	589	9424
SALES.REPORTS	4744610748	263.63 GB	42904	440	7040
INVENTORY.EQUIPMENT	9824954344	51.01 GB	33290	130	0
HR.PARTNERS	3983265247	83.62 GB	16388	3046	0

Data Pump Log Analyzer

- Free to use
- Download from [GitHub](#)
- Not an official Oracle tool
- Created by [Marcus Doeringer](#)
Our migration superstar





Also, usable for diagnostics
and performance tuning



Then, validate your database



Validate Your Database

1 Objects

2 Rows

3 Data



Validate Your Database

1

Objects

1. Recompile invalid objects
2. Compare number of objects

```
--Generate a list of objects in the source  
--subtract the objects in target to find missing objects
```

```
select owner, object_type, object_name, status  
from    dba_objects@sourcedb
```

minus

```
select owner, object_type, object_name, status  
from    dba_objects;
```

--Constraints are not listed in DBA_OBJECTS

```
select  owner, table_name, count(table_name)
from    dba_constraints@sourcedb
where   constraint_name not like 'BIN%'
group by owner, table_name
```

minus

```
select  owner, table_name, count(table_name)
from    dba_constraints
where   constraint_name not like 'BIN%'
group by owner, table_name;
```



Using Advanced Queueing

- AQ creates some queue structures on demand only
- [Blog post](#)

Validate Your Database

Source database

Queue table

`<queue_table_name>`
`AQ$_<queue_table_name>_E`
`AQ$_<queue_table_name>_I`
`AQ$_<queue_table_name>_T`
`AQ$_<queue_table_name>_F`
`AQ$_<queue_table_name>_C`
`AQ$_<queue_table_name>_D`
`AQ$_<queue_table_name>_G`
`AQ$_<queue_table_name>_H`
`AQ$_<queue_table_name>_L`
`AQ$_<queue_table_name>_P`
`AQ$_<queue_table_name>_S`
`AQ$_<queue_table_name>_V`

Queue
infrastructure

Target database

`<queue_table_name>`
`AQ$_<queue_table_name>_E`
`AQ$_<queue_table_name>_I`
`AQ$_<queue_table_name>_T`
`AQ$_<queue_table_name>_F`



Take into account in comparing source and target database object count

- Understanding How Advanced Queueing (AQ) Objects Are Exported And Imported. (Doc ID [2291530.1](#))



Other objects also change
- like database links and directories

Validate Your Database

- Validate objects using
 - `@?/rdbms/admin/utlrp`, or
 - `@?/rdbms/admin/utlprp n`
- Use `DBA_ERRORS` to find cause of invalidation
- [What Objects Are Created When Creating a Queue Table ? \(Doc ID 224027.1\)](#)
- [Things to Consider When Importing Advanced Queues using Oracle Data Pump](#)



Validate Your Database

1 Objects

2 Rows

3 Data



Validate Your Database

2

Rows

1. Compare number of rows exported and imported
2. Count and compare number of rows



Data Pump keeps tracks of
unloaded and loaded rows

```
cat export.log
```

```
;;;
```

```
Export: Release 19.0.0.0 - Production on Mon Jun 2 13:57:40 2025  
Version 19.27.0.0.0
```

```
Copyright (c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.  
Connected to: Oracle Database 19c Enterprise Edition Release 19.0.0.0 - Production
```

```
.  
. .  
.
```

```
Processing object type SCHEMA_EXPORT/TABLE/CONSTRAINT/CONSTRAINT
```

. . exported "APPUSER"."T1"	119.0 KB	105 rows
. . exported "APPUSER"."T2"	13.29 GB	32411047 rows
. . exported "APPUSER"."T3"	35.20 GB	78910231 rows
. . exported "APPUSER"."T4"	19.02 MB	57174 rows

```
Master table "DPUSER"."SYS_EXPORT_SCHEMA_02" successfully loaded/unloaded
```

```
*****
```

```
Dump file set for DPUSER.SYS_EXPORT_SCHEMA_02 is:  
/home/oracle/dpdir/appuser.dmp
```

```
Job "DPUSER"."SYS_EXPORT_SCHEMA_02" successfully completed at Mon Jun 2 13:58:05 2025 elapsed 0 00:00:23
```

```
grep -w exported export.log | grep -w rows | awk '{print $4,$7}' > exp.txt
```

```
"APPUSER"."T1" 105
```

```
"APPUSER"."T2" 32411047
```

```
"APPUSER"."T3" 78910231
```

```
"APPUSER"."T4" 57174
```

```
grep -w exported export.log | grep -w rows | awk '{print $4,$7}' > exp.txt
```

```
grep -w imported import.log | grep -w rows | awk '{print $4,$7}' > imp.txt
```

```
diff exp.txt imp.txt
```



How do you validate the row count
when using Oracle GoldenGate?

```
spool count_source.log  
select /*+ parallel */ 'APPUSER.T1 ' || count(1) from appuser.t1;  
select /*+ parallel */ 'APPUSER.T2 ' || count(1) from appuser.t2;  
select /*+ parallel */ 'APPUSER.T3 ' || count(1) from appuser.t3;  
select /*+ parallel */ 'APPUSER.T4 ' || count(1) from appuser.t4;
```

Counting Rows

- Requires either a full table or index scan
- Counting rows is usually faster with an index on a NOT NULL column
- Don't use parallel query on small tables
- The bigger the database, the longer it takes



Validate Your Database

1 Objects

2 Rows

3 Data



Validate Your Database

3

Data

1. Ensure data matches on source and target
2. Different techniques
 - Oracle GoldenGate Veridata
 - **DBMS_COMPARISON**
 - **DBMS_CRYPTO** and **STANDARD_HASH**

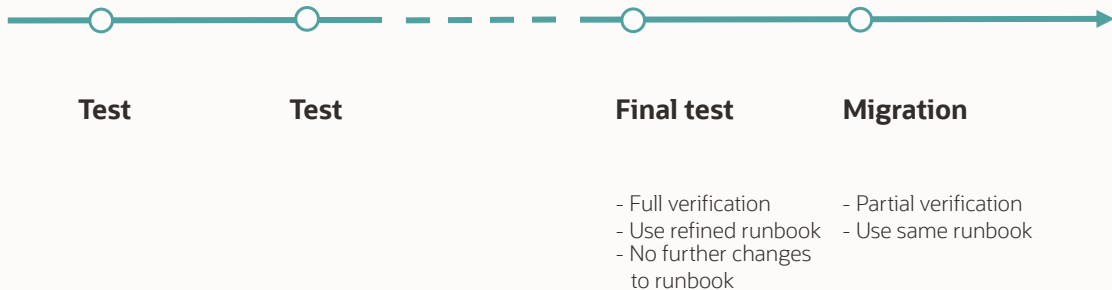
Validate Your Database

- [Oracle GoldenGate Veridata](#)
- [Details on DBMS_COMPARISON, DBMS_CRYPTO and STANDARD_HASH](#)



Do you have time for a full verification
in your migration window?

Full Verification



Partial Verification

You decide on the scope of the partial verification

- Tolerated and maximum downtime
- Data criticality
- Verify entire table or a sample
- Business requirements
- Audit requirements
- Regulations

Partial Verification

Build a plan that satisfies the requirements:

• APPUSER.T1	Business data	Sample 10 %
• APPUSER.T2	Insert-only table	No verification
• APPUSER.T3	Generated data	No verification
• APPUSER.T4	Regulated data	Full verification
• APPUSER.T5	Rarely updated	Verify last 3 months of data



Be sure to automate your verification

- Save the output and log files



Try it out, please!!

- We are looking for reference customers
- Get in touch with us when you tested it

Find Slides and Much More on Our Blogs



MikeDietrichDE.com

Mike.Dietrich@oracle.com



dohdatabase.com

Daniel.Overby.Hansen@oracle.com



DBArj.com.br

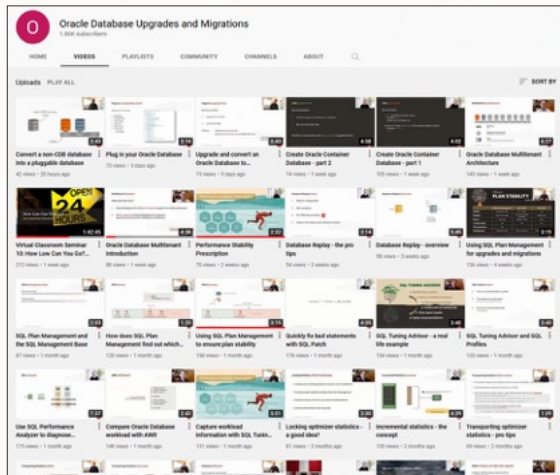
Rodrigo.R.Jorge@oracle.com



AlexZaballa.com

Alex.Zaballa@oracle.com

YouTube | @UpgradeNow



[Link](#)

- 300+ videos
- New videos every week
- No marketing
- No buzzwords
- All tech



Thank You

