

# Oracle® Database Migration Assistant for Unicode

Release Notes

Release 2.1.1

E71235-04

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This document contains important information for Oracle Database Migration Assistant for Unicode Release 2.1.1 that is not included in the regular documentation.

The product name Oracle Database Migration Assistant for Unicode is often abbreviated as DMU throughout this document, in other Oracle documentation, and on Oracle websites.

This document may be updated after it is released. To check for updates to this document and to view other Oracle documentation, refer to the Documentation section on the Oracle Technology Network (OTN) website:

<http://www.oracle.com/technetwork/database/database-technologies/globalization/dmu/overview/index.html>

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## Changes between Releases 2.1.1 and 2.1

The DMU repository definition has been updated in the DMU 2.1.1 release. If you have an existing repository installed with an older DMU release, you will need to upgrade or re-install the repository using DMU 2.1.1 before you can perform any migration tasks with the DMU 2.1.1 software.

## New Features in Release 2.1.1

The following changes are for Release 2.1.1:

- DMU 2.1.1 supports Java SE Development Kit (JDK) versions 7 and 8. Install one of the supported JDK versions for your platform before using the DMU software.
- A new option has been provided for the pattern-based cleansing feature to control the scope of the pattern-based replacement operation. You can now choose to apply pattern-based cleansing to the rows containing problem data only or to all the rows of the target columns. By default, DMU applies the pattern-based cleansing to the rows containing problem data only.
- DMU 2.1.1 supports Oracle Database versions 11.2.0.4 and later as *Extended Support* for the earlier database versions has ended.

## Changes between Releases 2.1 and 2.0

The DMU repository schema has been updated in the DMU 2.1 release. If you have an old repository installed with the DMU 2.0 release, then you will need to upgrade the repository using DMU 2.1 before you can perform any migration tasks with the DMU 2.1 software.

### New Features in Release 2.1

The following changes are for Release 2.1:

- DMU 2.1 offers a solution to achieve a near-zero downtime migration to Unicode by leveraging the DMU migration functionality in conjunction with the Oracle GoldenGate replication technology. Using DMU 2.1 and Oracle GoldenGate 12.1.2.1.0 or later, you can set up a migration procedure that utilizes DMU to accomplish scanning, cleansing, and conversion of the database, while relying on Oracle GoldenGate to capture and replicate incremental data changes that take place during the migration process.

DMU also generates the required Oracle GoldenGate configuration files to ensure that all the incremental data is replicated correctly by taking into consideration any scheduled data cleansing actions already defined to address convertibility issues.

- You can now export a DMU migration profile from one database instance and import it into another database instance created as a clone of the original instance. The DMU migration profile contains general information about the database, user-specified migration settings for scanning and conversion operations, and any scheduled cleansing actions.

This feature can be particularly useful for reusing and fine-tuning migration settings during the trial migrations where end-to-end migration procedure is rehearsed in the test environment using a snapshot of the production database.

- In addition to the Scan Report, Problem Data Report feature has been introduced to allow the detailed information about the data in the database objects containing convertibility issues to be generated into a spreadsheet file. Problem Data Report can be convenient for reviewing the data issues with users who may not have access to the DMU interface and also for record-keeping purposes.
- DMU 2.1 can detect and upgrade any existing DMU 2.0 repository in the database to the DMU 2.1 format and preserve the migration information so that the upgrade process is mostly transparent to the user without having to re-install the repository again.

- The format and content of DMU log files have been enhanced to facilitate diagnostics collection and trouble-shooting usage issues.

## Supported Configurations

The latest support information for Oracle Database Migration Assistant for Unicode is available in the *Supported Configurations* document on the OTN website:

<http://www.oracle.com/technetwork/database/database-technologies/globalization/dmu/learnmore/index.html>

## Installation Instructions

The installation instructions for Oracle Database Migration Assistant for Unicode are available in the *Getting Started* document on the OTN website:

<http://www.oracle.com/technetwork/database/database-technologies/globalization/dmu/learnmore/index.html>

## Requirements for using DMU

This section describes the following requirements for using the DMU software:

- [General Database Requirements](#) (page 3)
- [Database Convertibility Requirements](#) (page 5)
- [Database Space Requirements](#) (page 5)

## General Database Requirements

The database must meet certain requirements to be supported by the DMU. These requirements are:

- The database character set must be ASCII-based, therefore, databases running on the EBCDIC-based platforms IBM z/OS and Fujitsu BS2000 are not supported.
- The package `SYS.DBMS_DUMA_INTERNAL` must be installed in the database.

The script `?/rdbms/admin/prvtdumi.plb` to create the package is available as part of the database installation. You must create the package manually by running the script from the Oracle home of the database. See the installation instructions for details.

- Oracle Database Vault must be disabled before starting the migration process, because DMU is not certified to work with it, when it is enabled.
- The database must be opened in read/write mode.
- DMU supports the migration of Oracle pluggable databases (PDBs) in Oracle Database 12c release. If you are using the new PDB feature to consolidate databases with different database character sets, then note that every PDB must have a database character set that is compatible with that of the container database (CDB) which the PDB is being plugged into. Compatible means that the character set has to be the same or the PDB's character set must be a binary subset of the CDB's character set, and both have to be single-byte or both have to be multibyte.

Oracle's recommended best practices approach for such consolidation is to use the Unicode character set AL32UTF8 for the new CDB and its PDBs. AL32UTF8 provides a uniform superset character set that can support character data in any language, thus allowing maximum compatibility among databases with different legacy character sets to be consolidated.

To consolidate databases with different character sets:

1. Create a CDB with the database character set AL32UTF8 and the national character set AL16UTF16. If most of the databases to be consolidated use the national character set of UTF8, then use UTF8 instead of AL16UTF16.
2. For each non-CDB to be consolidated:
  - a. Upgrade it to Oracle Database 12c in case it uses Oracle Database version that is earlier to 12c.
  - b. Migrate its database character set to AL32UTF8 using DMU.
  - c. Migrate its national character set to the national character set of the CDB (AL16UTF16 or UTF8). Contact Oracle Support to find out how to do this migration.
  - d. Use the upgraded and migrated non-CDB to create a PDB.

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**See Also:**

*Oracle Database Administrator's Guide* for information about creating a PDB using a non-CDB.

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If you have already consolidated your databases using a non-Unicode character set and need to migrate your existing PDBs to Unicode, then you can do so using DMU as explained in the following steps:

1. Create or identify an AL32UTF8 CDB into which the migrated PDBs are to be plugged.
2. For each PDB to be migrated:
  - a. Use the DMU to scan the PDB and resolve any reported convertibility issues while it is still plugged into the original non-Unicode CDB.
  - b. Unplug the PDB to be migrated and plug it into the target AL32UTF8 CDB (this will put the PDB into restricted mode due to the character set incompatibility).
  - c. Use the DMU to convert the PDB to Unicode.
  - d. Restart the converted PDB in unrestricted mode.

This approach allows for an efficient and predictable consolidation process, which reduces the downtime window requirement.

For performing scanning and cleansing operations on a PDB, you can connect to PDB from the DMU as a database user having SYSDBA privilege in the local PDB. For performing conversion operations on a PDB, you must connect to PDB using

the DMU as either the SYS user or a common user having SYSDBA privilege in both the local PDB and the CDB.

### Database Convertibility Requirements

Additional requirements pertain to databases that the DMU should convert. Without meeting these requirements, the DMU can still be used for scanning and cleansing the database. The requirements are:

- All database objects, including auxiliary objects created by standard PL/SQL packages, such as DBMS\_RULE, DBMS\_DATA\_MINING, or DBMS\_WM, must be named using only characters from the ASCII character set. In other words, the data dictionary of the database cannot contain non-ASCII characters except in a few selected tables.

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**See Also:**

Section "Migrating Data Dictionary Contents" in *Oracle Database Unicode Migration Assistant Guide*

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- No OLAP analytical workspaces, other than predefined system workspaces and certain predefined Oracle Applications workspaces, can exist in the database.
- No flashback data archives can exist in the database.
- No data to be converted can reside in a read-only or offline tablespace.
- Neither cluster key columns nor partitioning key columns can be defined with character length semantics.
- No convertible data can be present in tables in the recycle bin.
- No convertible data can be present in a reference partitioning key column.
- No convertible data can be present in ANYDATA/ANYDATASET columns.

### Database Space Requirements

The migration process requires free space in the database. The free space is required in the following areas:

- Migration repository

Repository tables store DMU internal state information, scan results, scheduled cleansing actions, conversion plan details, and collected rowids for convertible, or problematic, or both rows in scanned tables. Oracle recommends that you create a separate tablespace for the migration repository.

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**See Also:**

*Oracle Database Unicode Migration Assistant Guide* for more information about creating a separate tablespace for the migration repository.

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- Data conversion

Data that is converted from a legacy character set to AL32UTF8 or UTF8, and which does not consist of ASCII characters only, usually expands in size, because the UTF-8 encoding of a character usually has more bytes than the legacy character set encoding of the same character. Moreover, the conversion method "Copy data using CREATE TABLE AS SELECT" converts data in a table while creating a copy of the table with the SQL statement CREATE TABLE AS SELECT. After the copy is created, the source table is dropped but for some time both tables exist simultaneously. Therefore, additional space is required to accommodate copies of tables converted using this conversion method.

To view an estimation of the amount of free space needed per tablespace to accommodate the data expansion and the temporary space for CREATE TABLE AS SELECT, right-click the database node in the Navigator pane of the DMU and select Properties. On the opened Database Properties tab, select the Scanning subtab. Click the Estimate Tablespace Extension button at the bottom of the page to calculate the minimum and maximum space requirements for each tablespace. The minimum tablespace extension is calculated by taking into account the post-conversion data size expansion and the temporary space requirement of the largest table converted using the "Copy data using CREATE TABLE AS SELECT" method. The maximum tablespace extension is calculated by taking into account the post-conversion data size expansion and the temporary space requirements of the first n largest tables converted using the "Copy data using CREATE TABLE AS SELECT" method where n is the number of conversion worker threads.

Use the reported extension information to estimate the order of magnitude of the required free space but use the autoextend feature of database data files to ensure that tablespaces can expand if required.

## Known Issues and Limitations

This section describes known issues and limitations.

### Creating DMU Diagnostic Packages on Oracle Database 12.1.0.1 PDBs

The Create Diagnostic Package functionality does not work on PDBs in Oracle Database 12.1.0.1.0 when the PDB has an incompatible character set with the CDB character set due to a known database bug (reference: Bug 17384878).

### Non-ASCII Characters in PDB PL/SQL Definitions

If the PDB to be migrated contains non-ASCII characters in PL/SQL objects, triggers, and view definitions, then the DMU conversion SQL generation operation fails with ORA-6502 for Oracle Database 12.1.0.1.0 (reference: Bug 16488610). The workaround is to remove the non-ASCII characters from the definitions and re-scan the data dictionary before generating the conversion SQL statements.

### Editing ANYDATASET Columns with Collections

The cleansing editor cannot properly display ANYDATASET columns containing varrays or nested tables (reference: Bug 11692435).

To cleanse data in such columns, you need to update the problematic values or use larger built-in content types, depending on the reported issue. You can use the ANYDATASET and ANYDATA OCI, or PL/SQL, or both APIs to access, decompose, edit, and rebuild ANYDATASET values.

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**See Also:**

- *Oracle Database PL/SQL Packages and Types Reference* for information on the ANYDATASET and ANYDATA Oracle-supplied types and their methods that comprise the ANYDATASET PL/SQL API.
  - *Oracle Call Interface Programmer's Guide* for information on the OCIAnyDataSet and OCIAnyData interfaces that comprise the ANYDATASET C API.
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**LOB Segment Attributes**

Due to the Oracle Database bugs #5577093, #5983283, and #6677390, LOB segments in tables converted by the conversion method "Copy data using CREATE TABLE AS SELECT" may lose the storage attribute RETENTION and get the storage attribute PCTVERSION. Run the following SQL statement to restore the expected attribute:

```
SQL> ALTER TABLE table_name MODIFY LOB (lob_name) (RETENTION)
```

**Scheduled Cleansing from CHAR to VARCHAR2**

When a scheduled cleansing action is defined to migrate a CHAR column to VARCHAR2 data type, the scan results may incorrectly report over type limit issues, even if the post-conversion length fits within the VARCHAR2 data type limit. If you can confirm that the post-conversion data size fits within the VARCHAR2 data type limit in the cleansing editor, then the workaround is to set the "Allow Conversion of Data with Issues" column conversion property to "Yes" so that the conversion feasibility test on this column can be bypassed. This issue is fixed in Oracle Database 11.2.0.3 release (reference: Bug 12868420).

**Column-level Character Set Tagging in Multibyte Databases**

Due to a restriction in the DMU server-side data scanning function, DMU does not allow character set tagging for character length semantics columns when the database character set is multibyte and Oracle Database version is 11.2.0.3 or earlier. If such tagging is necessary, consider temporarily switching the column to byte length semantics for the duration of the migration (reference: Bug 13242969).

**Editing Columns with Shift-sensitive Character Data**

The cleansing editor currently does not support editing data in columns which are tagged with shift-sensitive character sets. You can still view the data details for cells in these columns using the data viewer (reference: Bug 14241789).

**Replacement Characters Reported as Invalid for UTF8 Target Character Set**

For Oracle Database 10.2, when source character set is multibyte and target character set is UTF8, the '?' character is incorrectly reported as invalid in the scan results. For Oracle Database 11g releases up to 11.2.0.3, if the data being scanned contains the '?' character followed by any non-ASCII character, then it is incorrectly reported as invalid when the source character set is multibyte and the target character set is UTF8. If you can confirm that there is no other invalid data in the column, you can set "Allow Conversion of Data with Issues" property on this column to "Yes" so that the conversion feasibility test on this column can be bypassed (reference: Bug 14530511).

### **Scanning Shift-sensitive Data without Shift Characters**

If a column tagged with a shift-sensitive character set contains data that does not include any shift-in or shift-out characters, and the target migration character set is UTF8, the DMU scan may hang due to a known bug. You can work around the issue by adding shift characters into the input data (reference: Bug 14580879).

### **Flashback Data Archives for Tables with Convertible Data**

Before the migration to Unicode, purge the flashback data archive for storing data from tables with convertible data, because the binary representation of the historic character data in these tables may become invalid under the Unicode database character set.

### **PL/SQL Procedure Parameter Names Ending with Non-ASCII Characters**

If a PL/SQL procedure has a parameter name ending with a non-ASCII character, the DMU post-conversion phase may fail to replace the PL/SQL procedure after the database character set is changed to Unicode. This is due to a known Oracle Database bug (reference: Bug 20714938). The workaround is to drop the procedure before changing the character set and restore it after changing it.

### **PL/SQL Modules Containing Character Length Semantics Attributes**

After the migration to Unicode, run the SQL scripts `utlirp.sql` and `utlirp.sql` in order to invalidate and recompile all PL/SQL modules in the database so that any internal length limits for types containing character length semantics attributes are adjusted properly based on the new Unicode database character set. Alternatively, you can recompile only those standalone and PL/SQL types that have character length semantics attributes. However, there is no easy method to identify all such types, as types can be nested or embedded in PL/SQL.

### **Zone Maps Defined on Tables with Converted Character Data**

It is recommended to rebuild the zone maps defined on the converted tables after the migration as the binary representation of the character data stored in those tables may have changed.

### **Important Security Considerations**

Unless you install the DMU on a host system to which only you and appropriately authorized people have access, you need to take precautions to protect the DMU installation and the DMU configuration files. Otherwise, unauthorized access to the files could compromise security of the databases to which you connect with the DMU.

After you have uncompressed the archive file with the DMU installation, ensure that all uncompressed files and directories are writable only to you and other authorized operating system users. The DMU does not come with an installer that could set the file permissions automatically. Removing the write privilege from unauthorized users is very important because such users with access to the DMU host could modify the DMU files to make the DMU execute arbitrary SQL statements when the DMU is later started with `SYSDBA` credentials. Such SQL statements could compromise database security.

If you select the Save Password check box when creating a database connection, the password you specify is saved in an obfuscated form in a password file named



wallet.sso in your user directory. Because obfuscation is a reversible operation, use this feature only for passwords to test databases with no production data or only if the DMU is installed on a very well protected host. Ensure that the password file is readable only by you.

On UNIX systems, the file is in the directory \$HOME/.dmu/. On Microsoft Windows, the file is in the directory %APPDATA%\DMU\.

This release of the DMU requires that you connect to a database specifying a database user with the SYSDBA privilege. This user will have full access to DMU repository objects. Do not grant any privileges on any of the DMU tables or PL/SQL packages to any database user, except in cases documented explicitly in the DMU documentation.

## Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

## Access to Oracle Support

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