

Oracle® Database Free Installation Guide



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Oracle Database Free Installation Guide, 23ai for Linux

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Preface

This guide explains how to install and configure Oracle Database Free on Linux x86–64 and Linux for Arm (aarch64).

This guide also provides information about resources available to develop applications and how to remove the database software.

- [Audience](#)
- [Documentation Accessibility](#)
- [Command Syntax](#)
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Audience

This guide is intended primarily for application developers who are either developing applications or converting applications to run in the Oracle Database environment.

Oracle Database Free is a free version of the world's most advanced database. Oracle Database Free is easy to install, easy to manage, and easy to develop with. With Oracle Database Free, you use an intuitive, browser-based interface to administer the database, create tables, views, and other database objects, import, export, and view table data, run queries and SQL scripts, and generate reports.

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

Oracle customer access to and use of Oracle support services will be pursuant to the terms and conditions specified in their Oracle order for the applicable services.

Command Syntax

Refer to these command syntax conventions to understand command examples in this guide.

Convention	Description
\$	Bourne or BASH shell prompt in a command example. Do not enter the prompt as part of the command.
%	C Shell prompt in a command example. Do not enter the prompt as part of the command.

Convention	Description
#	Superuser (root) prompt in a command example. Do not enter the prompt as part of the command.
monospace	UNIX command syntax
backslash \	A backslash is the UNIX and Linux command continuation character. It is used in command examples that are too long to fit on a single line. Enter the command as displayed (with a backslash) or enter it on a single line without a backslash: <pre>dd if=/dev/rdsb/c0t1d0s6 of=/dev/rst0 bs=10b \ count=10000</pre>
braces { }	Braces indicate required items: <pre>.DEFINE {macro1}</pre>
brackets []	Brackets indicate optional items: <pre>cvtcrt termname [outfile]</pre>
ellipses ...	Ellipses indicate an arbitrary number of similar items: <pre>CHKVAL fieldname value1 value2 ... valueN</pre>
<i>italic</i>	Italic type indicates a variable. Substitute a value for the variable: <pre>library_name</pre>
vertical line	A vertical line indicates a choice within braces or brackets: <pre>FILE filesize [K M]</pre>

Related Documents

To help you with your development efforts, consult the books in the development category of the [Oracle Database documentation set](#).

For more information, see these documents in the Oracle Database documentation set:

- *Oracle Database SQL Language Reference*
- *Oracle Database PL/SQL Language Reference*
- *Oracle Database PL/SQL Packages and Types Reference*
- *Oracle Database JSON Developer's Guide*
- *Oracle Database Development Guide*
- *Oracle Database Administrator's Guide*
- *Oracle Database SecureFiles and Large Objects Developer's Guide*
- *Oracle Database Object-Relational Developer's Guide*

- *Oracle Database Concepts*
- *Oracle Database Sample Schemas*
- [Oracle APEX Documentation](#)
- [Application Development with Oracle Database](#)

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
<code>monospace</code>	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Introduction

Oracle Database Free is a fully free edition of the Oracle Database.

Development Environments

Oracle Database Free supports the following development environments:

- **Java:** Develop and deploy modern database-bound Java Web applications (Servlets), modules (Microservices) or standalone Java frameworks using the Oracle JDBC Driver, the Universal Connection Pool (UCP), and the Database-embedded JVM (for in-place, server-side processing).

Visit <https://www.oracle.com/database/technologies/appdev/jdbc.html> for more information.

- **C and C++ :** Developers can use Oracle Call Interface (OCI) and Oracle C++ Call Interface (OCCI) to create high performance programs accessing Oracle Database Free. ODBC and the ODPI-C wrapper over OCI are also usable.

Visit <https://www.oracle.com/database/technologies/appdev/oci.html> for more information.

- **.NET, Visual Studio, and Visual Studio Code:** Developers can use Oracle Data Provider for .NET (ODP.NET) for C# and VB.NET data access to any Oracle Database. At design-time, they can use Oracle Developer Tools for Visual Studio or Oracle Developer Tools for VS Code for full development life cycle support.

Visit <https://www.oracle.com/database/technologies/appdev/dotnet.html> for more information

For walk-throughs on creating a .NET application with Oracle Database Free:

Visit <https://www.oracle.com/tools/technologies/quickstart-dotnet-for-oracle-database.html>

The walk-throughs cover several development scenarios, including with VS Code, Visual Studio, and command line.

- **Oracle SQL Developer:** Oracle SQL Developer is a graphical version of SQL*Plus that gives database developers a convenient way to perform basic tasks. You can connect to any target Oracle Database Free schema using standard Oracle database authentication. Once connected, you can perform operations on objects in the database.

Download and install Oracle SQL Developer from:

<https://www.oracle.com/database/sqldeveloper/>

- **Oracle SQL Developer Web:** Included with Oracle REST Data Services, Oracle SQL Developer Web is the web-based version of Oracle SQL Developer that enables you to run queries and scripts, create database objects, build data models, and monitor database activity.
- **Oracle Developer Tools for VS Code:** This free Visual Studio Code extension enables you to edit and run SQL and PL/SQL for Oracle Database and Oracle Autonomous Database.

Download and install Oracle Developer Tools for VS Code from the Visual Studio Code Marketplace:

<https://marketplace.visualstudio.com/items?itemName=Oracle.oracledevtools>

- **Oracle Application Express:** Oracle Application Express (APEX) is a rapid web application development tool for the Oracle database.

Download and install Application Express from:

<https://www.oracle.com/database/technologies/appdev/rest.html>

- **Oracle REST Data Services (ORDS):** ORDS makes it easy to develop modern REST interfaces for relational data in the Oracle Database and the Oracle Database JSON Document Store.

Download and install ORDS from:

<https://www.oracle.com/database/technologies/appdev/rest.html>

- **SODA** (Simple Oracle Document Access) APIs that let you develop NoSQL-style applications against collections of JSON documents. Native language SODA drivers are available for common languages.

Visit <https://docs.oracle.com/en/database/oracle/simple-oracle-document-access/> for more information.

Scripting Languages

You can use **scripting languages** such as:

- **Python**

The `python-oracledb` driver is a Python programming language extension module allowing Python programs to connect to Oracle Database.

Visit <https://oracle.github.io/python-oracledb/> for more information.

- **Node.js**

The `node-oracledb` driver allows Node.js applications to access Oracle Database.

Visit <https://oracle.github.io/node-oracledb/> for more information.

- **PHP**

Access Oracle Database with the PHP OCI8 extension or the PDO_OCI Driver. PHP OCI8 and PDO_OCI are part of the PHP open source project.

Visit <https://www.php.net/oci8> for more information on PHP OCI8 and https://www.php.net/pdo_oci for more information on PDO_OCI.

- **Go**

Access Oracle Database using the open source `godror` driver.

Visit <https://pkg.go.dev/github.com/godror/godror> for more information.

- **ROracle**

ROracle is an open source R package supporting a DBI-compliant Oracle driver based on the high performance OCI library.

Visit <https://www.oracle.com/database/technologies/roacle-downloads.html> for more information about ROracle.

- **Ruby**

Build Ruby and Ruby on Rails applications using the `ruby-oci8` driver or JRuby with the Oracle Enhanced Adapter for ActiveRecord.

Visit:

– <https://www.rubydoc.info/gems/ruby-oci8/> for information about `ruby-oci8`.

- <https://www.jruby.org/> for information about JRuby.
- <https://github.com/rsim/oracle-enhanced> for information about Oracle Enhanced Adapter.

- **Rust**

The open source `rust-oracle` driver lets Rust programs access Oracle Database.

Visit <https://crates.io/crates/oracle> for more information.

- **Others**

Accessing Oracle Database Free from other languages is possible using community drivers.

Oracle Call Interface (OCI) Demonstration Programs

A set of OCI demonstration programs and their corresponding project files are available in the `demo` subdirectory of Oracle home after an Oracle Database Free installation.

You can run these OCI demonstration programs to familiarize yourself with the steps involved in developing OCI applications. Oracle Database Free does not support generating the client shared library. The build option in `demo_rdbms.mk` is not valid for Oracle Database Free. You can compile and link application and demo programs with the provided header files. Because the object (`.o's`) and archive (`.a's`) libraries are not available in the installed location, you cannot use `genclntsh` and `genclntst`.

Examples

You can download and install Oracle Database Examples in an existing Oracle home to view the product demonstrations.

See Examples Installation Guide for more information about products available on the Oracle Database Examples

Examples are also available from <https://github.com/oracle/oracle-db-examples>

Learn More About Oracle Database Free

- Oracle Database Free home page:
<https://www.oracle.com/database/free/>

- Oracle Database Free Discussion Forum:

You can search the Oracle Database Free Discussion Forum for answers to problems already discussed and post new questions to the community for answers.

<https://forums.oracle.com/ords/apexds/domain/dev-community/category/oracle-database-free>

2

Requirements

You must have `root` user credentials to install Oracle Database Free.

The system must meet the following software requirements:

- [System Requirements](#)
- [Swap Space Requirements](#)
- [Server Component Kernel Parameter Requirements](#)
- [Supported Oracle Linux 8 Distributions on Linux for Arm \(aarch64\)](#)

System Requirements

This table lists the system requirements for Oracle Database Free.

Table 2-1 Oracle Database Free System Requirements

Requirement	Value
Operating system	See Oracle Database Installation Guide for Linux for the list of supported Linux distributions and the minimum operating system requirements for each x86-64 Linux platform.
Network protocol	The following protocols are supported: • IPC • UDP • TCP/IP • TCP/IP with SSL Note: If you have a firewall running, ensure that all the required ports are open. See Oracle Database Component Port Numbers and Protocols for a list of port numbers and protocols configured for Oracle Database components.
RAM	1 GB RAM minimum. 2 GB RAM recommended.
Disk space	10 GB minimum.
Linux for Arm (aarch64) processor	Oracle Database 23ai Linux for Arm (aarch64) requires a CPU capable of Neoverse N1. Oracle recommends using a server with a minimum of Ampere Altra or Ampere Altra Max CPU.

Swap Space Requirements

For Oracle Database Free, Oracle recommends a minimum swap space of 2 GB or twice the size of RAM, whichever is less.

Server Component Kernel Parameter Requirements

The Oracle Database Preinstallation RPM checks your system for kernel parameter settings. If the kernel parameter values of your system are less than the values listed in this table, then

the Oracle Database Preinstallation RPM sets the recommended minimum kernel parameter values for you.

The values set in the `/etc/sysctl.d/97-oracle-database-sysctl.conf` file persist on system restarts.

Table 2-2 Kernel Parameter Settings Required for Oracle Database Free

Kernel Parameter	Setting
<code>semmsl</code>	250
<code>semms</code>	32000
<code>semopm</code>	100
<code>semmni</code>	128
<code>shmmax</code>	4398046511104
<code>shmmni</code>	4096
<code>shmall</code>	1073741824
<code>file-max</code>	6815744
<code>aio-max-nr</code>	1048576
<code>ip_local_port_range</code>	9000–65500
<code>panic_on_oops</code>	1
<code>rmem_default</code>	262144
<code>rmem_max</code>	4194304
<code>wmem_default</code>	262144
<code>wmem_max</code>	1048576

Related Topics

- [Changing Kernel Parameter Values Manually](#)

Supported Oracle Linux 8 Distributions on Linux for Arm (aarch64)

Use the following information to check supported Oracle Linux 8 distributions:

Table 2-3 Linux for Arm (aarch64) Oracle Linux 8 Minimum Operating System Requirements

Item	Requirements
Oracle Linux 8	Starting with Oracle Database 23ai Release 23.5, the Linux for Arm (aarch64) operating system is supported with the following minimum supported version: Oracle Linux 8.6 with Unbreakable Enterprise Kernel 7: 5.15.0-205.149.5.1.el8uek.aarch64 Note: Oracle recommends that you update Oracle Linux 8 to the latest available release level.

Table 2-3 (Cont.) Linux for Arm (aarch64) Oracle Linux 8 Minimum Operating System Requirements

Item	Requirements
Packages for Oracle Linux 8	Install the latest released versions of the following packages: Subscribe to the Oracle Linux 8 channel on the Unbreakable Linux Network, or configure a yum repository from the Oracle Linux yum server website, and then install the Oracle Database Preinstallation RPM, <code>oracle-database-preinstall-23ai</code>. The Oracle Database Preinstallation RPM, <code>oracle-database-preinstall-23ai</code>, automatically installs all required packages listed in the table below, their dependencies for Oracle Grid Infrastructure and Oracle Database installations, and also performs other system configuration. If you install the Oracle Database Preinstallation RPM, <code>oracle-database-preinstall-23ai</code>, then you do not have to install these packages, as the Oracle Database Preinstallation RPM automatically installs them. <code>bc</code> <code>binutils</code> <code>elfutils-libelf</code> <code>gcc</code> <code>gcc-c++</code> <code>glibc</code> <code>glibc-devel</code> <code>ksh</code> <code>libaio</code> <code>libaio-devel</code> <code>libgcc</code> <code>libgfortran</code> <code>libibverbs</code> <code>libnsl</code> <code>libnsl2</code> <code>libstdc++</code> <code>libstdc++-devel</code> <code>libxcb</code> <code>libX11</code> <code>libXau</code> <code>libXi</code> <code>libXrender</code> <code>libXtst</code> <code>make</code> <code>policycoreutils</code> <code>policycoreutils-python-utils</code> <code>smartmontools</code> <code>sysstat</code>

3

Licensing Restrictions

For more information on licensing details, see *Oracle Database Database Licensing Information User Manual*

This section covers the following topics:

- [Oracle Database Free CPU Limitations](#)
- [Oracle Database Free Installation and Runtime Restrictions](#)
- [Oracle Database Free User Data Limitations](#)
- [Oracle Database Free RAM Limitation](#)

Oracle Database Free CPU Limitations

Oracle Database Free limits itself automatically to two cores for processing. For example, on a computer with 2 dual-core CPUs (four cores), if a large number of database clients try to simultaneously run CPU-intensive queries, then Oracle Database Free will process the queries at the rate of just two cores even if more CPU capacity is available.

Oracle Database Free Installation and Runtime Restrictions

Oracle Database Free restricts itself to only one installation per logical environment. The logical environment can either be a virtual host such as a VM or container, or a physical host. If you attempt to start more than one Oracle Database Free installation in such a logical environment, then an `ORA-00442: Oracle Database Free single instance violation error` is displayed and your database will not start.

This does not affect any existing installation or new installations of Oracle Database Standard Edition 2 or Oracle Database Enterprise Edition.

Oracle Database Free User Data Limitations

The maximum amount of user data in Oracle Database Free cannot exceed 12 GB. If the user data grows beyond this limit, then the system displays an `ORA-12954: The request exceeds the maximum allowed database size of 12 GB error`.

Oracle Database Free RAM Limitation

The maximum amount of RAM for Oracle Database Free cannot exceed 2 GB, even if more is available.

Related Topics

- [Database Memory Management Methods](#)

4

Installing Oracle Database Free

Learn how to install Oracle Database Free using RPM packages.

An RPM-based installation performs preinstallation checks, extracts the database software, reassigns ownership of the extracted software to the preconfigured user and groups, maintains the Oracle inventory, and runs all root operations required to configure the Oracle Database software for a single-instance Oracle Database creation and configuration.

The RPM-based installation process detects when the minimum requirements for an installation are not met and prompts you to finish these minimum preinstallation requirements.

This section covers the following topics:

- [Installing Oracle Database Free Using RPM Packages](#)
- [Performing a Silent Installation](#)
- [Setting Oracle Database Free Environment Variables](#)

Installing Oracle Database Free Using RPM Packages

Perform the following steps to install and configure Oracle Database Free using RPM packages.

Before you install Oracle Database 23ai Free, uninstall any existing Oracle Database XE or Oracle Database Free or database with the SID `XE` or `FREE` from the target system. See, [Deinstalling Oracle Database Free](#).

Oracle Database Free installation uses approximately 9 GB disk space under `/opt`. If this disk partition does not have the required disk space available, you must add space or mount an alternative partition as `/opt/oracle`. This disk partition is the defined as Oracle base where the software and database will reside.



Note:

The Oracle Database Free installation does not support symbolic links (symlinks) for `/opt/oracle`.

- [Installing Oracle Database Free RPM for Linux x86-64](#)
- [Installing Oracle Database Free RPM on Linux for Arm \(aarch64\)](#)

Installing Oracle Database Free RPM for Linux x86-64

1. Log in as the `root` user.
2. Install the Oracle Database Preinstallation RPM.

Oracle Linux 8 and Oracle Linux 9

```
dnf -y install oracle-database-preinstall-23ai
```

Red Hat Enterprise Linux 8

- a. Go to the Oracle `yum` site:

https://yum.oracle.com/repo/OracleLinux/OL8/appstream/x86_64/

- b. Download the latest 23ai Oracle Database Preinstallation RPM. For example, `oracle-database-preinstall-23ai-1.0-2.el8.x86_64.rpm`
- c. Install the latest Preinstallation RPM. For example:

```
dnf -y install oracle-database-preinstall-23ai-1.0-2.el8.x86_64.rpm
```

Red Hat Enterprise Linux 9

- a. Go to the Oracle `yum` site:

https://yum.oracle.com/repo/OracleLinux/OL9/appstream/x86_64/

- b. Download the latest 23ai Oracle Database Preinstallation RPM. For example, `oracle-database-preinstall-23ai-1.0-2.el9.x86_64.rpm`
- c. Install the latest Preinstallation RPM. For example:

```
dnf -y install oracle-database-preinstall-23ai-1.0-2.el9.x86_64.rpm
```

Note:

- The Oracle Database Preinstallation RPM automatically creates the Oracle installation owner and groups. It also sets up other kernel configuration settings as required for Oracle Database installations. If you plan to use job-role separation, then create the extended set of database users and groups depending on your requirements.
- Review the RPM log files to determine the system configuration changes. For example, review `/var/log/oracle-database-preinstall-23ai/results/orakernel.log`.
- Use the `-y` option if you want `dnf` to skip the package confirmation prompt.
- See [About DNF](#) for more information about the `dnf` command.

3. Access the Oracle Database Free software download page:

<https://www.oracle.com/database/technologies/free-downloads.html>

4. Download the `oracle-database-free-23ai-23.8-1.el8.x86_64.rpm` or `oracle-database-free-23ai-23.8-1.el9.x86_64.rpm` RPM file required for performing an RPM-based installation to a directory of your choice.
5. Install the database software.

For Oracle Linux 8 and Red Hat Enterprise Linux 8

```
dnf -y install oracle-database-free-23ai-23.8-1.el8.x86_64.rpm
```

For Oracle Linux 9 and Red Hat Enterprise Linux 9

```
dnf -y install oracle-database-free-23ai-23.8-1.el9.x86_64.rpm
```

The installation of the Oracle Database software is now complete.

Installing Oracle Database Free RPM on Linux for Arm (aarch64)

1. Log in as the `root` user.
2. Install the Oracle Database Preinstallation RPM.

Oracle Linux 8

```
dnf -y install oracle-database-preinstall-23ai
```

Note:

- The Oracle Database Preinstallation RPM automatically creates the Oracle installation owner and groups. It also sets up other kernel configuration settings as required for Oracle Database installations. If you plan to use job-role separation, then create the extended set of database users and groups depending on your requirements.
- Review the RPM log files to determine the system configuration changes. For example, review `/var/log/oracle-database-preinstall-23ai/results/orakernel.log`.
- Use the `-y` option if you want `dnf` to skip the package confirmation prompt.
- See [About DNF](#) for more information about the `dnf` command.

3. Access the Oracle Database Free software download page:
<https://www.oracle.com/database/technologies/free-downloads.html>
4. Download the `oracle-database-free-23ai-23.8-1.el8.aarch64.rpm` RPM file required for performing an RPM-based installation to a directory of your choice.
5. Install the database software.

For Oracle Linux 8

```
dnf -y install oracle-database-free-23ai-23.8-1.el8.aarch64.rpm
```

The installation of the Oracle Database software is now complete.

Creating and Configuring an Oracle Database

The configuration script creates a container database (`FREE`) with one pluggable database (`FREEPDB1`) and configures the listener at the default port (1521).

You can modify the configuration parameters by editing the `/etc/sysconfig/oracle-free-23ai.conf` file.

The parameters set in this file are explained in detail in the silent mode installation procedure: [Performing a Silent Installation](#).

To create the database with the default settings:

1. Log in as `root` using `sudo`.

```
sudo -s
```

2. Run the service configuration script:

```
/etc/init.d/oracle-free-23ai configure
```

At the command prompt, specify a password for the `SYS`, `SYSTEM`, and `PDBADMIN` administrative user accounts. Oracle recommends that your password should be at least 8 characters in length, contain at least 1 upper case character, 1 lower case character, and 1 digit [0-9].

 See Also:

The same password will be used for these accounts. The password should conform to the Oracle recommended standards. See Oracle Database Security Guide for more information about guidelines for securing passwords

After the configuration completes, the database and listener are started.

Table 4-1 Configuration, Database Files and Logs Location

File Name and Location	Purpose
<code>/opt/oracle</code>	Oracle base. This is the root of the Oracle Database Free directory tree.
<code>/opt/oracle/product/23ai/dbhomeFree</code>	Oracle home. This home is where the Oracle Database Free is installed. It contains the directories of the Oracle Database Free executables and network files.
<code>/opt/oracle/oradata/FREE</code>	Database files.
<code>/opt/oracle/diag subdirectories</code>	Diagnostic logs. The database alert log is <code>/opt/oracle/diag/rdbms/free/FREE/trace/alert_FREE.log</code>
<code>/opt/oracle/cfgtoollogs/dbca/FREE</code>	Database creation logs. The <code>FREE.log</code> file contains the results of the database creation script execution.
<code>/etc/sysconfig/oracle-free-23ai.conf</code>	Configuration default parameters.
<code>/etc/init.d/oracle-free-23ai</code>	Configuration and services script.

 Note:

If a host does not have any IP address other than loop back address assigned (typically in a docker or in an another container environment), Oracle Net Configuration Assistant (Oracle NETCA) may fail during the installation with the error No valid IP Address returned for the host `hostname` in `netca trace log`. Please assign an IP address and retry the configuration.

Performing a Silent Installation

You can install Oracle Database Free using silent mode. You can use this mode to perform an embedded install of Oracle Database Free with your application, or unattended operation.

To perform a silent installation, you must enter a password for the administrative accounts as a parameter to the script, or specify it in the configuration file.



Note:

The database is configured with the default settings. It is not necessary to modify these parameters unless you have specific requirements. Make a copy of the configuration file `/etc/sysconfig/oracle-free-23ai.conf` before modifying it. Make your modifications after the RPM install and before configuring the database.

1. Create a wrapper shell script to perform the silent installation. The script should contain commands similar to the following:

For Oracle Linux 8

```
#!/bin/bash

yum -y install /downloads/oracle-database-free-23ai-23.8-1.el8.x86_64.rpm
> /free_logs/FREEsilentinstall.log 2>&1

/etc/init.d/oracle-free-23ai configure >> /free_logs/FREEsilentinstall.log
2>&1
```

For Oracle Linux 9

```
#!/bin/bash

yum -y install /downloads/oracle-database-free-23ai-23.8-1.el9.x86_64.rpm
> /free_logs/FREEsilentinstall.log 2>&1

/etc/init.d/oracle-free-23ai configure >> /free_logs/FREEsilentinstall.log
2>&1
```

For Oracle Linux 8 on Linux for Arm (aarch64)

```
#!/bin/bash

yum -y install /downloads/oracle-database-free-23ai-23.8-1.el8.aarch64.rpm
> /free_logs/FREEsilentinstall.log 2>&1

/etc/init.d/oracle-free-23ai configure >> /free_logs/FREEsilentinstall.log
2>&1
```

Alternatively, you can enter the password in the script, such as:

```
(echo "password"; echo "password"); | /etc/init.d/oracle-free-23ai  
configure >> /free_logs/FREEsilentinstall.log 2>&1
```

Replace *password* with a password that is secure. The password entered should be at least 8 characters in length, contain at least 1 uppercase character, 1 lower case character, and 1 digit [0-9].

2. Make the wrapper script executable.

```
chmod +x myscript.sh
```

3. Run the script as root using `sudo`.

```
sudo ./myscript.sh
```

The Oracle Database free Oracle home is `/opt/oracle/product/23ai/dbhomeFREE`

For details of the installation, review the `/free_logs/FREEsilentinstall.log` file.

The `/etc/sysconfig/oracle-free-23ai.conf` configuration file sets the following:

- `LISTENER_PORT`: A valid listener numeric port value for the database listener. Do not specify any value for automatic port assignment.
- `CHARSET`: Character set of the database. This is set to `AL32UTF8`.
- `DBFILE_DEST` Database file directory. By default, the database files are stored in the Oracle base `/opt/oracle/oradata` subdirectory. You can also create your own database file directory. However, the permissions for this file path should be owned by the `oracle` user.
- `SKIP_VALIDATIONS`: Skip validation for memory and disk space. Default is `false`.
- `CONFIGURE_TDE`: Set `CONFIGURE_TDE=true` to configure Transparent Data Encryption (TDE). The default value is `false`.
- `ENCRYPT_TABLESPACES`: Leave this value empty for user tablespaces. Set this value to `ALL` for encrypting all the tablespaces. For specific tablespaces, use `SYSTEM:true,SYSAUX:false`. Default value is empty.

 Caution:

When you modify and save a file containing the plain text password, provide the ownership of the file only to the Oracle software installation owner (`oracle`) user. Change the permissions on the file to `600`. Oracle recommends that database administrators or other administrators delete or secure such files containing plain text passwords when they are not in use.

 Note:

The password should conform to the Oracle recommended standards. See Oracle Database Security Guide for more information about guidelines for securing passwords

The database creation logs are located under Oracle base in the `/opt/oracle/cfgtoollogs/dbca/` subdirectory.

Setting Oracle Database Free Environment Variables

After you install and configure Oracle Database Free, set the environment before you use Oracle Database Free.

Use the `oraenv` and `coraenv` scripts to set your environment variables.

For example, to set your environment variables in Bourne, Bash, or Korn shell without being prompted by the script, log in as the Oracle user and run the following commands:

```
export ORACLE_SID=FREE
export ORAENV_ASK=NO
. /opt/oracle/product/23ai/dbhomeFree/bin/oraenv
```

These commands display an output similar to the following:

```
ORACLE_HOME = [] ? /opt/oracle/product/23ai/dbhomeFree
The Oracle base has been set to /opt/oracle
```

For C shell:

```
setenv ORACLE_SID FREE
setenv ORACLEENV_ASK NO
source /opt/oracle/product/23ai/dbhomeFree/bin/coraenv
```

5

Configuring True Cache on Oracle Database Free

To configure True Cache on Oracle Database Free, set up Oracle Database Free on the primary node and then configure True Cache in another True Cache node.

- [Licensing for True Cache](#)
- [Set Up Oracle Database Free Primary Database](#)
- [Configuring Oracle Database Free True Cache](#)

Licensing for True Cache

True Cache licensing is based on the edition of Oracle Database that you're using for both the primary database and True Cache.

See [Permitted Features, Options, and Management Packs by Oracle Database Offering](#) in the *Oracle Database Licensing Information User Manual*.

Set Up Oracle Database Free Primary Database

Before you configure Oracle Database Free True Cache, install and set up the Oracle Database Free primary database on the primary node.

To set up Oracle Database Free primary database:

1. Install Oracle Database Free using RPM packages and then create and configure the primary database using the steps described in [Installing Oracle Database Free Using RPM Packages](#).
2. Ensure that a primary database is running on the primary node in archive logging (ARCHIVELOG) mode.

The primary database must be in ARCHIVELOG mode to ship redo log files to the True Cache node. Oracle DBCA verifies that the primary database is in ARCHIVELOG mode.

If the primary database is not in ARCHIVELOG mode, restart it in mount mode, run the `ALTER DATABASE ARCHIVELOG` command, and open the primary database again.

Note:

Don't set `LOG_ARCHIVE_CONFIG` and `LOG_ARCHIVE_DEST_n` on the primary database. True Cache automatically configures these for the primary database.

Configuring Oracle Database Free True Cache

After you set up the primary database, configure Oracle Database Free True Cache on the True Cache node.

To configure Oracle Database Free True Cache:

1. Install only the Oracle Database Free software using the RPM packages. See, [Installing Oracle Database Free RPM](#).

 Note:

Do not create and configure the database on the True Cache node.

2. Log in as the `oracle` user.
3. Copy the password file `/opt/oracle/product/23ai/dbhomeFree/dbs/orapwFREE` from the primary database node to the True Cache node under a temp location `/opt/oracle/tmp`.
4. Run Oracle DBCA to complete the True Cache configuration.

```
./dbca -silent -createTrueCache -gdbName FREE -sourceDBConnectionString  
primary.example.com:1521/FREE.example.com -passwordFileFromSourceDB /opt/  
oracle/tmp/orapwFREE
```

Enter the password for the Oracle Database Free primary database.

```
Enter Remote DB SYS user password:  
password
```

5. To configure database application services for True Cache, see [Create Database Application Services on the Primary Database](#)
6. To verify the True Cache configuration, see [Verifying the True Cache Configuration](#)

Related Topics

- [Using Oracle True Cache in Your Applications](#)

6

Connecting to Oracle Database Free

Connecting Locally using OS Authentication

When you install Oracle Database Free, the oracle user is granted SYSDBA privileges. You can use the following commands to connect to the database.

```
$ cd $ORACLE_HOME/bin
$ ./sqlplus / as sysdba
```

These commands connect you to the root container `CDB$ROOT` of the multitenant database (CDB) as database user `sys`. This method of connecting to the database works even if the Net Services listener is not running.

An output similar to the following confirms that you are now connected to the database.

```
SQL*Plus: Release 23.0.0.0.0 - Production on Sat Apr 06 03:27:05 2024
Version 23.4.0.24.05
```

```
Copyright (c) 1982, 2024, Oracle. All rights reserved.
```

```
Connected to:
Oracle Database 23ai Free Release 23.0.0.0.0 - Develop, Learn, and Run for
Free
Version 23.4.0.24.05
```

Type `exit` to quit SQL*Plus

```
SQL>EXIT
```

Net Services Listener and Default Services

The Net Services database listener for Oracle Database Free allows you to connect to the database over TCP/IP from the same machine or other machines on the network. The configuration of the Listener can be viewed using the following commands run from the command prompt:

```
$ cd $ORACLE_HOME/bin
$ lsnrctl status
```

```
LSNRCTL for Linux: Version 23.0.0.0.0 - Production on 26-MAR-2024 08:35:46
```

```
Copyright (c) 1991, 2024, Oracle. All rights reserved.
```

```
Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP) (HOST=dbhost.example.com)
(PORT=1521)))
STATUS of the LISTENER
-----
```

```

Alias                LISTENER
Version              TNSLSNR for Linux: Version 23.0.0.0.0 - Production
Start Date           26-MAR-2024 08:35:46
Uptime               0 days 0 hr. 5 min. 7 sec
Trace Level          off
Security             ON: Local OS Authentication
SNMP                 OFF
Default Service      FREE
Listener Parameter File /opt/oracle/product/23ai/dbhomeFree/network/admin/
listener.ora
Listener Log File    /opt/oracle/diag/tnslsnr/dbhost/listener/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=dbhost.example.com) (PORT=1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc) (KEY=EXTPROC1521)))
Services Summary...
Service "FREE.dbhost.example.com" has 1 instance(s).
  Instance "FREE", status READY, has 1 handler(s) for this service...
Service "FREEXDB.dbhost.example.com" has 1 instance(s).
  Instance "FREE", status READY, has 1 handler(s) for this service...
Service "dbhost.example.com" has 1 instance(s).
  Instance "FREE", status READY, has 1 handler(s) for this service...
Service "freepdb1.dbhost.example.com" has 1 instance(s).
  Instance "FREE", status READY, has 1 handler(s) for this service...
The command completed successfully

```

The output from the `lsnrctl` command shows values of a number of important parameters:

- the port the listener listens on
- the list of services registered with the listener
- the name of the configuration file used by the listener
- the name of the log file

You must specify a service when connecting to the database through the listener. The default services created by Oracle Database Free are `FREE` and `FREEPDB1`. The Oracle Database Free service connects you to the `root` container of the database (`CDB$ROOT`) and the `FREEPDB1` service connects you to the default pluggable database `FREEPDB1`, created during installation. For each new pluggable database (PDB), there is a new default service created with the same name as the PDB.



Note:

If you shut down the Oracle Database Free instance, then the `lsnrctl` status command does not show any services that you can connect to.

Connecting to Oracle Database Using Easy Connect Naming Method

You can connect to the database using the following Easy Connect strings:

- Multitenant container database: `host[:port]`
- Pluggable database: `host[:port]/service_name`

`FREEPDB1` is the service name defined for the first PDB created by default. You can replace `FREEPDB1` with the name of another PDB you want to connect to.

Specifying the port is optional when the listener is setup with the default port 1521. You must specify the port number if you use another port.

Connection strings for local connections were provided on the final screen of the install. If you are connecting from a remote computer, you must enter the `hostname` (where Oracle Database Free is installed) instead of `localhost`.

The Net Services database listener must be running on the database host of the specified port for the connections to succeed.

For example, you can connect to the `root` container of the database from a client computer with SQL*Plus using the following commands:

```
$ cd $ORACLE_HOME/bin
$ ./sqlplus system@dbhost.example.com:1521
```

You can connect to the default PDB `FREEPDB1` using the following commands:

```
$ cd $ORACLE_HOME/bin
$ ./sqlplus system@dbhost.example.com:1521/FREEPDB1
```

Replace `dbhost.example.com` with your database host name. If required, replace 1521 with the port number the listener listens on. You can replace `FREEPDB1` with the name of another PDB that you want to connect to.

To shorten connect strings or to avoid hard coding of the host name and the port in the application code and DBA scripts, you can define an alias for the connect string in the configuration file `ORACLE_HOME/network/admin/tnsnames.ora` on the database clients. See [Configuring the Local Naming Method](#) for more details.

Related Topics

- [Connection Strategies for Database Applications](#)
- [Understanding Oracle Net Services](#)
- [Multitenant Architecture](#)

7

Starting and Stopping Oracle Database Free

You can start and stop the database manually or set it to automatically start when the system shuts down or starts.

Shut Down and Start-Up Using SQL*Plus

You can shut down and start the database using SQL*Plus.

To shut down the database, log in as the `oracle` user with its environment variables set for access to Oracle Database Free, and run the following SQL*Plus command:

```
$ sqlplus / as sysdba
SQL> SHUTDOWN IMMEDIATE
```

To start the database:

```
SQL> STARTUP
SQL> ALTER PLUGGABLE DATABASE ALL OPEN;
```

Automating Shutdown and Start-Up

Oracle recommends that you configure the system to automatically start Oracle Database Free when the system starts, and to automatically shut it down when the system shuts down.

To automate the start up and shutdown of the listener and database, run the following commands as `root`:

```
$ sudo -s
```

For Oracle Linux 8 and Oracle Linux 9:

```
# systemctl daemon-reload
# systemctl enable oracle-free-23ai
```

Shutting Down and Starting Up Using the Configuration Services Script

After you configure the listener, log in as `root` using `sudo` and run the Configuration Services Script to check the status of the database and listener.

```
$ sudo -s
# /etc/init.d/oracle-free-23ai status
```

The output of this command is similar to the following:

Status of the Oracle FREE 23ai service:

```
LISTENER status: RUNNING  
FREE Database status: RUNNING
```

Run the following commands as `root` using `sudo`.

```
$ sudo -s
```

Oracle Linux 8 and Oracle Linux 9:

To start the listener and the database:

```
# systemctl start oracle-free-23ai
```

To stop the database and the listener:

```
# systemctl stop oracle-free-23ai
```

To stop and start the listener and the database:

```
# systemctl restart oracle-free-23ai
```

Related Topics

- [Altering the Open Mode of a PDB Using STARTUP and SHUTDOWN](#)

8

Moving from Previous Versions of Oracle Database XE or Free to Oracle Database Free

This topic explains how to export and import data between Oracle Database 21c Express Edition (XE) and Oracle Database 23ai Free.

- [Exporting and Importing Data between Oracle Database 21c XE and Oracle Database 23ai Free](#)
- [Exporting and Importing Data between Different Versions of Oracle Database 23ai Free](#)

Note these points before you start the export and import process:

- You cannot use Oracle Database Upgrade Assistant (Oracle DBUA) to perform an upgrade.
- You cannot use Oracle Database Configuration Assistant (Oracle DBCA) to plug PDBs of previous versions to Oracle Database Free.
- Oracle Database 18c XE users must first move to 21c XE (See, [Moving from Previous Versions of Oracle Database XE to XE 21c](#)), and then export data from 21c XE to import them into Oracle Database 23ai Free.

Exporting and Importing Data between Oracle Database 21c XE and Oracle Database 23ai Free

Learn how to export and import data between Oracle Database 21c Express Edition (XE) and Oracle Database 23ai Free.

Exporting Data

To export data from your 21c XE database:

1. As the `root` user, create a `/opt/dump` directory on the local file system for the `DUMP_DIR` directory object.

```
mkdir /opt/dump
chown -R oracle:oinstall /opt/dump
chmod -R 760 /opt/dump
```

2. Perform the following steps for each pluggable database (PDB). The steps in this section are for the PDB `xepdb1`.
 - a. Set the `ORACLE_HOME` and `ORACLE_SID` environment variables.

```
export ORACLE_SID=XE
export ORACLE_HOME=/opt/oracle/product/21c/dbhomeXE
```

- b. Connect to the 21c XE database as user `SYS` using the `SYSDBA` privilege as the `oracle` user, and switch the container to `xepdb1`.

- c. Create the directory object `DUMP_DIR` and grant `READ` and `WRITE` privileges on the `DUMP_DIR` directory to the `SYSTEM` user.

```
/opt/oracle/product/21c/dbhomeXE/bin/sqlplus / AS SYSDBA
SQL> ALTER SESSION SET CONTAINER=xepdb1;
SQL> CREATE DIRECTORY DUMP_DIR AS '/opt/dump';
SQL> GRANT READ, WRITE ON DIRECTORY DUMP_DIR TO SYSTEM;
```

- d. Export data from your 21c XE PDB `xepdb1` to the dump folder.

```
/opt/oracle/product/21c/dbhomeXE/bin/expdp system/
system_password@dbhost.example.com:1521/xepdb1 full=Y
directory=DUMP_DIR dumpfile=expdb21c_xepdb1.dmp
logfile=expdb21c_xepdb1.log
```

Note:

- Replace `dbhost.example.com` with your database host name. If required, replace `1521` with the port number the listener listens on.
- The default PDB name created is `xepdb1` in 21c and `freepdb1` in 23ai.

3. Deinstall Oracle Database 21c XE if you plan to install 23ai Free on the same system. See [Deinstalling Oracle Database XE](#) for more information
4. Install Oracle Database 23ai Free.

Importing Data

To import data to your Oracle Database 23ai Free, perform the following steps for each PDB. The steps in this section are for importing data from PDB `xepdb1` to `freepdb1`.

1. Set the `ORACLE_HOME` and `ORACLE_SID` environment variables.

```
export ORACLE_SID=FREE
export ORACLE_HOME=/opt/oracle/product/23ai/dbhomeFree
```

2. Connect to the 23ai Free database as user `SYS` using the `SYSDBA` privilege as the `oracle` user and switch the container to `freepdb1`.
3. Create the directory object `DUMP_DIR` and grant `READ` and `WRITE` privileges on the `DUMP_DIR` directory to the `SYSTEM` user.

```
/opt/oracle/product/23ai/dbhomeFree/bin/sqlplus / AS SYSDBA
SQL> ALTER SESSION SET CONTAINER=freepdb1;
SQL> CREATE DIRECTORY DUMP_DIR AS '/opt/dump';
SQL> GRANT READ, WRITE ON DIRECTORY DUMP_DIR TO SYSTEM;
```

4. Import data to the 23ai Free PDB `freepdb1` from the dump folder created during the export operation.

```
/opt/oracle/product/23ai/dbhomeFree/bin/impdp system/  
system_password@dbhost.example.com:1521/freepdb1 full=Y directory=DUMP_DIR  
dumpfile=expdb21c_xepdb1.dmp logfile=impdb23ai_freepdb1.log
```

 Note:

- Replace `dbhost.example.com` with your database host name. If required, replace `1521` with the port number the listener listens on.
- The default PDB name created is `xepdb1` in 21c and `freepdb1` in 23ai.

Ignore the following errors:

- ORA-31684: Object type TABLESPACE:"UNDOTBS1" already exists
- ORA-31684: Object type TABLESPACE:"TEMP" already exists
- ORA-31684: Object type TABLESPACE:"USERS" already exists
- ORA-31684: Object type USER:"PDBADMIN" already exists
- ORA-39083: Object type PROC_SYSTEM_GRANT failed to create with error:
- ORA-29393: user EM_EXPRESS_ALL does not exist or is not logged on
- ORA-39083: Object type NETWORK_ACL:TABLE:NACL\$ACE_EXP failed to create with error:
- ORA-01007: Reference to a variable not in SELECT clause.
- ORA-39342: Data Pump did not import dependent objects for NETWORK_ACL due to the previous error
- ORA-01007: Reference to a variable not in SELECT clause.

Exporting and Importing Data between Different Versions of Oracle Database 23ai Free

Learn how to export and import data between different versions of Oracle Database 23ai Free.

 Note:

Oracle Database 23.x Free can refer to 23.2 or later releases.

Exporting Data

To export data from Oracle Database 23.x Free:

1. As the `root` user, create a `/opt/dump` directory on the local file system for the `DUMP_DIR` directory object.

```
mkdir /opt/dump
chown -R oracle:oinstall /opt/dump
chmod -R 760 /opt/dump
```

2. Perform the following steps for each pluggable database (PDB). The steps in this section are for the PDB `freepdb1`.

- a. Set the `ORACLE_HOME` and `ORACLE_SID` environment variables.

```
export ORACLE_SID=FREE
export ORACLE_HOME=/opt/oracle/product/23c/dbhomeFree
```

- b. Connect to the 23.x Free database as user `SYS` using the `SYSDBA` privilege as the `oracle` user, and switch the container to `freepdb1`.

- c. Create the directory object `DUMP_DIR` and grant `READ` and `WRITE` privileges on the `DUMP_DIR` directory to the `SYSTEM` user.

```
/opt/oracle/product/23c/dbhomeFree/bin/sqlplus / AS SYSDBA
SQL> ALTER SESSION SET CONTAINER=freepdb1;
SQL> CREATE DIRECTORY DUMP_DIR AS '/opt/dump';
SQL> GRANT READ, WRITE ON DIRECTORY DUMP_DIR TO SYSTEM;
```

- d. Export data from your 23.x Free PDB `freepdb1` to the dump folder.

```
/opt/oracle/product/23c/dbhomeFree/bin/expdp system/
system_password@dbhost.example.com:1521/freepdb1 full=Y
directory=DUMP_DIR dumpfile=expdb23c_freepdb1.dmp
logfile=expdb23c_freepdb1.log
```

Note:

- Replace `dbhost.example.com` with your database host name. If required, replace 1521 with the port number the listener listens on.
- The default PDB name created is `freepdb1` in 23ai.

3. Deinstall Oracle Database 23.x Free if you plan to install 23ai Free on the same system. See [Deinstalling Oracle Database Free](#) for more information

4. Install Oracle Database 23ai Free.

Importing Data

To import data to your Oracle Database 23ai Free, perform the following steps for each PDB. The steps in this section are for importing data from 23.x Free PDB `freepdb1` and overwriting to the same PDB `freepdb1` in 23ai Free.

1. Set the ORACLE_HOME and ORACLE_SID environment variables.

```
export ORACLE_SID=FREE
export ORACLE_HOME=/opt/oracle/product/23ai/dbhomeFree
```

2. Connect to the 23ai Free database as user SYS using the SYSDBA privilege as the oracle user and switch the container to freepdb1.
3. Create the directory object DUMP_DIR and grant READ and WRITE privileges on the DUMP_DIR directory to the SYSTEM user.

```
/opt/oracle/product/23ai/dbhomeFree/bin/sqlplus / AS SYSDBA
SQL> ALTER SESSION SET CONTAINER=freepdb1;
SQL> CREATE DIRECTORY DUMP_DIR AS '/opt/dump';
SQL> GRANT READ, WRITE ON DIRECTORY DUMP_DIR TO SYSTEM;
```

4. Import data to the 23ai Free PDB freepdb1 from the dump folder created during the export operation.

```
/opt/oracle/product/23ai/dbhomeFree/bin/impdp system/
system_password@dbhost.example.com:1521/freepdb1 full=Y directory=DUMP_DIR
dumpfile=expdb23c_freepdb1.dmp logfile=impdb23ai_freepdb1.log
```

 Note:

- Replace dbhost.example.com with your database host name. If required, replace 1521 with the port number the listener listens on.
- The default PDB name created is freepdb1 in 23ai.

Ignore the following errors:

- ORA-39342: Data Pump did not import dependent objects for NETWORK_ACL due to the previous error
- ORA-31684: Object type TABLESPACE:"UNDOTBS1" already exists
- ORA-31684: Object type TABLESPACE:"TEMP" already exists
- ORA-31684: Object type TABLESPACE:"USERS" already exists
- ORA-31684: Object type USER:"PDBADMIN" already exists
- ORA-31684: Object type DIRECTORY:"DUMP_DIR" already exists

9

Deinstalling Oracle Database Free

When you deinstall Oracle Database Free, all components, including data files, the database, and the software, are removed.

If you want to save your data files but remove the Oracle Database Free software and database, then first export the data before you deinstall.

Because the deinstallation process removes all files from the directory in which Oracle Database Free is installed, back up any files from the directory (if needed) before you deinstall. The database will no longer be operational after deinstallation.

Run the procedure in this topic as `root` or with `root` privileges.

```
sudo -s
```

Run the following commands to deinstall Oracle Database Free:

- Delete all the Oracle Database Free data files, the listener, and configuration files. After this operation, only logs and the Oracle home software remains.

```
/etc/init.d/oracle-free-23ai delete
```

- This command removes the software. After this operation, some content under Oracle base `/opt/oracle` will remain and you can manually delete it.

```
yum remove oracle-database-free-23ai
```

- (Optional) If you only installed Oracle Database Free on the system and have no further Oracle Database software installed, you can also remove the Oracle Database Preinstallation RPM:

```
yum remove oracle-database-preinstall-23ai
```

- To delete the downloaded RPM files:

```
rm oracle-database-preinstall-23ai*  
rm oracle-database-free-23ai*
```

10

Reporting Security Vulnerabilities

If you find any security vulnerabilities with Oracle Database Free, then email a description of the issue to Oracle at secalert_us@oracle.com.

Include the following information in your email:

- A complete description of the problem.
- The version of Oracle Database Free you are using.
- The platform on which you are running Oracle Database Free.
- Any scripts or examples that may be helpful in tracking down the security problem.

Globalization Support

Oracle Database Free is configured by default to process character data in all supported languages simultaneously:

- The database is created with the Unicode `AL32UTF8` character set. `AL32UTF8` is the recommended database character set suitable for storing data in practically any language. Multiple languages can be mixed even in a single character value. While not a recommended option, you can modify the `CHARSET` parameter in the `/etc/sysconfig/oracle-free-23ai.conf` configuration file to any other supported database character set before running `/etc/init.d/oracle-free-23ai configure`.

Supported database character sets are listed in tables A-4 and A-6 in Appendix A of the *Oracle Database Globalization Support Guide*. Character sets from Table A-4 are preferred over character sets from Table A-6 because they contain more comprehensive character repertoires.

- Oracle Database Free supports the same globalization features that Oracle Database Enterprise Edition (EE) provides.

Setting Language and Locale Preferences for Client Connections

Configure client applications connecting to an Oracle Database according to your locale preferences and your I/O device character set.

You must configure client applications connecting to an Oracle Database according to your locale preferences and your I/O device character set. If your applications do not have their own specific methods to configure locale preferences, then the method you use to configure an Oracle database client connection depends on the access API you use to connect to the database. Check your application documentation, before you configure locale preferences for your applications.

For applications that connect to Oracle Databases using Oracle Call Interface (OCI) use `NLS_LANG` and other client settings with names that start with `NLS_` to set the locale conventions and client character set for Oracle Database sessions. It is important that you set the character set part of the `NLS_LANG` value properly. The Oracle character set whose name you set in `NLS_LANG` must correspond to the character encoding used by your I/O devices. For Linux, it is the character encoding of the terminal or terminal emulator, and usually corresponds to what the `locale` command reports. For Microsoft Windows, it is either the ANSI Code Page (for GUI applications), such as `WE8MSWIN1252`, or the OEM Code Page (for Console mode applications), such as `US8PC437`. By doing this, the OCI API is notified about the character set of data that it receives from the application. OCI can then convert this data correctly to and from the database character set.

You can specify `NLS_LANG` and the other NLS settings as environment variables. On Microsoft Windows, you can also specify them as Registry settings. Environment variable values take precedence over Registry values.

Oracle Universal Installer sets a default value for the `NLS_LANG` setting in Registry when it creates a new Oracle home on Microsoft Windows. The `NLS_LANG` value is based on the language of the Windows user interface, which is the language of Windows menu items and

dialog box labels. The installer does not set NLS_LANG on Linux and other UNIX system-based operating systems.

 Caution:

Failure to set the client character set correctly can cause data loss.

Java applications that connect to Oracle Databases by using Oracle JDBC do not use NLS_LANG. Instead, Oracle JDBC maps the default locale of the Java VM in which the application runs to the Oracle Database language and territory settings. Oracle JDBC then configures the connected database session using these settings. Because Java works internally in Unicode, the client character set is always set to Unicode. Unless an application explicitly changes it, the default locale of the Java VM is set based on the locale of the user operating system on which the Java VM runs. Check your Java VM documentation for information about configuring the Java VM default locale.

 Note:

In 3-tier architecture deployments, application servers that are database clients can have settings in their configuration files that specify the NLS_LANG value or the Java VM locale. Check the documentation accompanying these servers.

 See Also:

Oracle Database Globalization Support Guide for more information about configuring user locale preferences