Oracle Health Insurance
Back Office

Installation, Configuration and DBA Manual

Version 3.44

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CHANGE HISTORY

Release	Version	Changes
10.12.2.0.0	3.19	• Added change history paragraph. • Added links to CPAN download pages for required Perl Modules in Appendix D - Installing Required Perl Modules. • Changed references to configuration templates from Beehive Online • Removed Appendix G – Configuration Oracle Application Server 10G (OHI Back Office)
10.12.3.0.0	3.20	• Added a paragraph about adjusting INITRANS and/or PCTFREE settings to prevent unnecessary lock messages.
10.13.1.0.0	3.21	• Added note that WLS_FORMS managed server must be up to implement configuration settings.
10.13.1.0.0	3.22	• Updated description and references to Oracle Fusion Middleware software to 11g Release 2. • Changed forms settings description to support language dependent keyboard mapping file. • Added description of formParam1 and formParam2 to pass a startup form and keys on the URL for an OHI user interface session. • Added definition of workingDirectory property for formsweb.cfg configuration. Changed location of .env file from $OZG_ADMIN to $OZG_BASE in examples. • Added paragraph about customizing your toolbar icons and signing your own .jar file for toolbar icons.
10.13.1.1.0	3.23	• Added an additional chmod command for Reports configuration as needed for 11gR2 release.
10.13.2.0.0	3.24	• Enhanced the description about the formParam1 and formParam2 parameters. • Added a paragraph about batch scheduler performance and parallelism for using parallel execution of the serial part of a batch request
10.13.2.1.0	3.25	• Added description of new Oracle Scheduler jobs that ‘assist’ the background processing as implemented by the OHI Back Office batch scheduler. • Added instructions about adding application server IP addresses. • Added environment cloning tips. • Web service consumers are now referenced using this correct term. • Made clearer which system parameter specifies maximum number of parallel batch processes.
10.13.3.0.0	3.26	• Added paragraphs about SQL Plan Management (SPM) as a first implementation of this database functionality is supported with this OHI Back Office release. • Also an Appendix that addresses setting up an OEM Metric for SPM space management is added • Added descriptions for the newly introduced background Oracle Scheduler Jobs in the paragraph about the Batch Scheduler • Specified maximum length of 10 for parameter p_mdi_window_label • Adapted references to database software from DB11G2 to DB11204 as for OHI Back Office 10.13.3 database version 11.2.0.4 is the required version
10.13.3.0.0	3.27	• The documentation has been updated regarding the support of SSO for the OHI Back Office user interface users. The SSO appendix regarding this topic has been completely revised. • The Reports Server batch account is no longer described using its former default name but is named referencing where it is meant for.
10.14.1.0.0	3.27	• On a few locations information has been added regarding the new database account (typically OHI_DPS_USER) that is used for execution of dynamic pl/sql. This as a result of a security improvement. • The Appendix for installing the Perl modules has been adapted as for parallel forms compilation some additional modules are required. • The command for setting NLS_LENGTH_SEMANTICS in the server parameter file has slightly been adjusted (scope=spfile instead of scope=both, because of a limitation in the database).
10.14.2.0.0	3.28	• Only some minor textual corrections in the SQL Plan Management paragraphs. • Corrected the <Directory> entry in forms.conf to allow for a dynamic number of digits in the last number of the release version string (?* instead of ????) for viewing the release information. • Added notes to the Globalization paragraph and the NLS_LANG setting paragraph which describes generic character set settings and behaviour regarding this topic. The client character setting used for Forms is discussed over here. • An Appendix is added which describes how to migrate an OHI 10.14.2 database from a non Unicode character set (for OHI typically WE8ISO8859P15) to AL32UTF8.

Release	Version	Changes
10.14.2.1.0	3.29	• Added OHI Data Mart instructions regarding migration to AL32UTF8. • Incorporated changes in AL32UTF8 migration Appendix based on latest experiences.
10.15.1.0	3.30	• Added query to SQL Plan management Appendix to monitor space used by the SPM repository. • Added additional stats gathering instructions in AL32UTF8 Appendix for virtual columns related to function based indexes. • Removed references to Reports and Discoverer • Revised resource management (12c) • Updated 'batch scheduler settings' • Changed database version to 12c and adjusted for the use of a pluggable database • Worked through impact of less files in $OZG_ADMIN ($OZG_BASE/utils, OHIPATCH, etc.) • Corrected spelling errors
10.15.3.0.0	3.31	• Replace OHI Business Intelligence by OHI Data Marts.
10.16.1.0.0	3.32	• Only some small typing errors were changed.
10.16.2.0.0	3.33	• Many changes to describe the configuration of WebLogic and Forms 12c (12.2.1.1.0) • On several locations information has been added regarding the new database account OHI_VIEW_OWNER that is used for the implementation of Virtual Private Database. Removed reference to WLS_REPORTS.
10.16.2.2.2	3.34	• Some minor textual formatting. • Added additional settings in forms.conf for better readability of .log and .out files in Internet Explorer. • Small textual formatting correction on wlst example • Added instance parameter _common_data_view_enabled setting • Added FORMS_LOV_... settings • Described starting user interface outside the browser using javaws • Added attention note to remove serverArgs from formsweb.cfg
10.17.1.0.0	3.35	• Added FORMS_DATETIME_LOCAL_TZ setting. • Added Oracle error when mkstore incompatibility problem occurs • Changed all references to WebLogic and Forms from 12.2.1.1 to 12.2.1.2 including relevant hyperlinks as this version is supported starting with this release. But the Forms 12.2.1.1 release can be used until OHI release 10.17.2.0.0 is installed.
10.17.2.0.0	3.36	• Forms 12.2.1.1 release desupported. • Some minor adjustments in FMW installation instructions. • Changed description of database configuration regarding the use of multiple pluggable databases in a container database.
10.18.1.0.0	3.37	• Adapted because of required database release 12.2.0.1.0 starting with this OHI release. Instructions for installing DBD::Oracle slightly changed. Text is adapted for changes related to the SPM Evolve job, instance parameter settings and AWR. Also the instruction regarding setting NLS_LENGTH_SEMANCTICS has changed. • Missing instructions for creating additional service definitions added.
10.18.1.2.0	3.38	• Changed all references to WebLogic and Forms from 12.2.1.2 to 12.2.1.3 including relevant hyperlinks as this version is supported starting with this release. But the Forms 12.2.1.2 release can be used until OHI release 10.18.2.0.0 is installed.
10.18.1.3.0	3.39	• UTF8 instead of AL32UTF8 for Forms in case of character conversion issues. • Added description of existing accessibility option
10.18.1.4.0	3.40	• Corrected some contradicting information regarding terminal resource files (key mapping description files specified through the `term` parameter in formsweb.cfg as described in the formsweb.cfg configuration paragraph).
10.18.2.0.0	3.41	• Removed C2B references when present in still current text.
10.18.2.1.0	3.42	• Added remark about Oracle Managed Java Client for Client Tier paragraph. • Changed the MEMORY_TARGET and MEMORY_MAX_TARGET advise.
10.18.2.2.0	3.43	• Added chapter regarding Database Vault installation & activation • Batch scheduler description was outdated, where necessary this has been updated to better reflect the current functionality
10.18.2.3.0	3.44	• Removed some deprecated files from $OZG_BASE/conf • Specified which character set is used hardcoded in the installation menu • Small change in Database Vault activation description

CONTENTS

INTRODUCTION

PURPOSE

This document describes the installation and configuration information for Oracle Health Insurance Back Office. This is the working name for a set of Oracle Health Insurance products as provided by Oracle for implementing and executing the core 'Back Office' procesesses of an healthcare (insurance) payer.

TARGET AUDIENCE

This document is intended for database and application server managers and others responsible for installation of Oracle products. Even though various command samples are provided in this document, this document does not at all intend to offer a course in Oracle technology stack management.

TYPOGRAPHIC CONVENTIONS

Given that UNIX/Linux are case sensitive, conventions in this document may differ from the ones included in other Oracle product documentation.

COMMAND SYNTAX

Command syntax is represented in font `monospace.` The following conventions apply to command syntax:

`monospace`
Monospace type indicates OS commands, directory names, user names, path names, and file names.

brackets [ ]
Words enclosed by brackets indicate keys (e.g., Key [Return]). Attention that brackets have a different meaning when used in command syntax.

italics
Italics indicates a variable, including variable parts of the file names. It is also used for emphasizing.

UPPERCASE
Uppercase letters indicate Structured Query Language (SQL) reserved words, initialization parameters and environment variables.

backslash \
Each backslash indicates a command that is too long to fit on one line:

```
dd if=/dev/rdsk/c0t1d0s6 of=/dev/rst0 bs=10b \
count=10000
```

braces { }
Braces indicate mandatory items: `.DEFINE {macro1}`

brackets [ ]
Brackets indicate optional items: `cvtcrt` *`termname [outfile`*`]`

Attention that brackets have a different meaning when used in ordinary text.

ellipses ...
Ellipses indicate a random number of similar items:

`CHKVAL fieldname value1 value2 ... valueN`

italics
Italics indicates a variable. Replace the variable by value:

`library_name`

vertical bar |
The vertical bar allows choosing either braces or brackets:

`SIZE filesize [K|M]`

Naming Products

Whenever Oracle Health Insurance (OHI) Back Office is mentioned in this document, the *entire suite* is intended (containing products like Oracle Insurance Claims Management for Health, Oracle Insurance Policy Management for Health and others).

Internal Document Name

This document has as internal identifier the code CTA13508. In related documentation this internal document name may be used.

Related Documentation

- Oracle Health Insurance Certification on MOS (logon to MOS, choose tab ‘Certifications’, specify product name ‘ Oracle Health Insurance Back Office’ and the relevant veriosn)
- Reading, Writing and Authorizing Oracle Health Insurance Application Files
- Oracle Health Insurance Release Installation

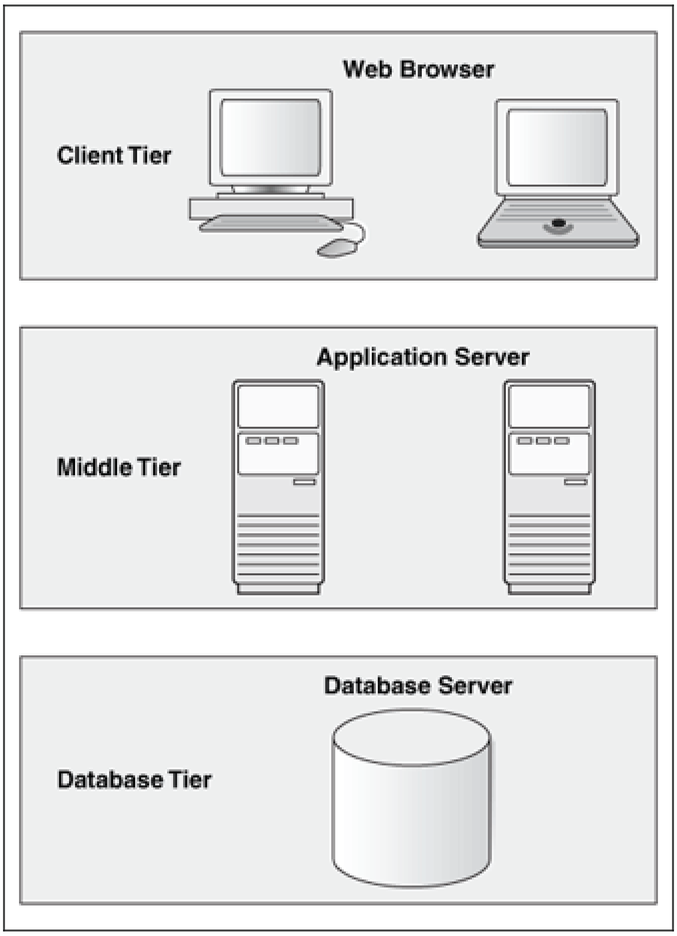
1. COMPONENTS AND REQUIREMENTS

In order to perform a quick and successful installation, a number of requirements have to be met regarding Oracle Software in the system. This chapter describes the requirements for the installation of OHI Back Office, an integrated suite of products. Check to ensure that the system meets these requirements before starting the installation process.

1.1. ARCHITECTURE

The application OHI Back Office is implemented in the so-called *web-architecture*.

This architecture is based on 3 tiers:



1. **Desktop or Client Tier**

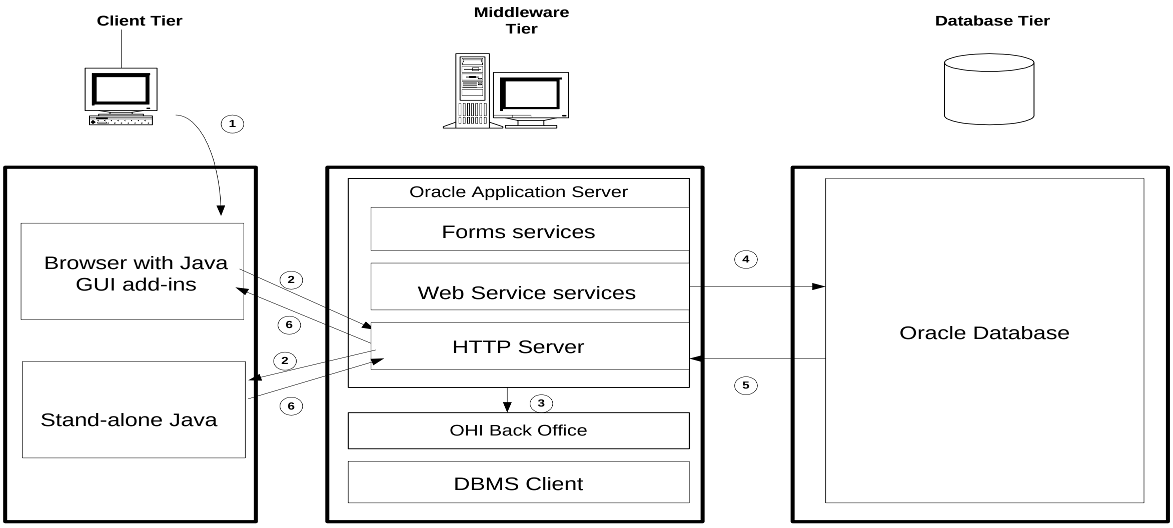
   The client tier, at the top of the image, may contain one of the following two configurations:

   1. A Web browser, where the application is displayed through the Java Plug-In (JPI) or from where it is launched through Java Web Start, requiring Java through an installation of Java Development Kit (JDK) or Java Runtime Engine (JRE).

2. **Middle Tier**
   The Application Server (AS), Database Client and the OHI Back Office application software run on this tier.

3. **Database Tier**
   The Database Server (RDBMS), which contains the OHI Back Office data as well as business logic and business rules, runs on this tier.

☞ **Attention:** This refers to *logical* tiers; the structure does not entail the *physical* implementation of the tiers; the physical aspects and any other relevant details can be implemented on 1 or multiple servers.



Fusion Middleware/Forms 12c introduces new ways to start and run a Forms application on the Client Tier:

Mode	Browser	Java component	Remarks
Applet in browser (traditional)	Required throughout session	JRE + JPI (java browser plugin)	Not supported in all browsers; **supported for OHI**
Embedded JNLP	Required throughout session	JRE + JPI (java browser plugin)	Not supported in all browsers; not supported for OHI
Java Web Start	Only for download of up-to-date JNLP file	JDK or JRE; no JPI (no browser plugin)	All browsers; with Single Sign-On, no Single Sign-Off; **supported for OHI**
Forms Standalone Launcher	Not used	JDK or JRE; no JPI (no browser plugin)	All browsers; no Single Sign-On Requires distribution of command file; not suppored for OHI

With the diminishing support of the JPI (java plugin) in browsers and the ever-tightening security, consider using Java Web Start as an alternative for the traditional plugin-based way of running the OHI Back Office user interface.

This architecture results in the following software layers:

Software layers
OHI Back Office application software
Oracle Application Server software
Oracle Database Client software
Oracle Database Server software
Operating System software

The Application Server, Database Client and Database Server software are also referred to as *Oracle system software*.

Installation of this Oracle system software is required in order to run the OHI Back Office application software.

It is very convenient to install all related Oracle software such as Application Server, Database Client and Database Server under the same operating system user.

☞ **Attention**: If OHI Back Office is used in a RAC environment, then a number of layers will be added. For a complete overview, see appendix B.

1.2. APPLICATION SOFTWARE INSTALLATION

OHI Back Office has to be installed in its' own home directory, separated from the ORACLE_HOME directories which contain the Oracle Database and/or Oracle Application Server software.

Installation of OHI in the same home directory as Oracle system software is not supported.

1.3. RELATED PUBLICATIONS

Additional information regarding Oracle Database and Oracle Application Server software is available in the following documentation for the relevant platform:

- Oracle Database Installation Guide
- Oracle Fusion Middleware Documentation Library

1.3.1. RAC

Additional information regarding Oracle Real Application Clusters software is available in the following documentation for the relevant platform:

- Oracle Clusterware and Oracle Real Application Clusters Installation and Configuration Guide
- Oracle Clusterware and Oracle Real Application Clusters Administration and Deployment Guide

1.3.2. Single Sign On

Single Sign On is supported with OHI Back Office, using the standard functionality of the Oracle system software.

Oracle® Fusion Middleware, Forms Services Deployment Guide 12cRelease 2 (12.2.1), Chapter 9 Using Forms Services with Oracle Access Manager

1.4. SYSTEM REQUIREMENTS

1.4.1. Certification

OHI Back Office is certified for several platforms and specific Database, RAC, ASM, Application Server and browser versions.
Before starting the installation, check if the desired product combination is certified for OHI Back Office.

The certification information is available online:

Certification on My Oracle Support

1.4.2. Hardware Requirements

Depending on e.g. the number of users, the usage type of OHI Back Office and the desired performance, a number of requirements regarding CPU, memory, disk space, networking, etc. have to be met.
A specific sizing advice has to be performed in order to determine the numbers for a specific customer environment. Such a sizing advice can be performed by Oracle.

1.4.3. Configuration of Printer Queues

The printer queues (in fact output queues or output commands or scripts) that will be used for OHI Back Office should be configured and tested under your OS.

This step must be performed on the Middleware Tier.

1.4.4. Software Requirements

OHI Back Office uses the following Oracle system software, which should be installed and configured before OHI Back Office is installed:

1.4.4.1. Database Tier

- Oracle Database Server
- Oracle Database Server patch set (if required)
- Oracle Database Server interim patch(es) (if required)

The installation of the Database software is not described in this manual.

1.4.4.2. Middleware Tier

- Oracle Fusion Middleware WebLogic Server

- Oracle Fusion Middleware Forms and Reports Services
- Oracle Fusion Middleware Forms and Reports Services patch set (if required)
- Oracle Fusion Middleware Forms and Reports Services interim patch(es) (if required)
- Oracle Database Client
- Oracle Database Examples (formerly Companion)
- Oracle Database Client patch set (if required)
- Oracle Database Client interim patch(es) (if required)

Installation and configuration of the Middleware Tier software is described in more detail in Chapter 3.

☞ Attention 1: The version of Oracle Database Client software has to be the same as the Oracle Database Server software version.

☞ Attention 2: Of the Oracle Database Client software the DBMS Utilities and the Precompiler software are required.
To this end, install the Administrator software.
After installation, executables proc, imp, exp, sqlldr and tkprof have to be available in $ORACLE_HOME/bin.

☞ Attention 3: Of the Oracle Database Examples software, the Oracle Database Products software has to be installed (for the Pro*C precompiler demo software).
After installation, directory demo has to be available in $ORACLE_HOME/precomp.

☞ Attention 4: Please consider the fact that if the Examples software is installed on an existing software tree, the required patch set will have to be reinstalled again (because otherwise the older, unpatched utility versions and/or precompiler software will be used).

☞ Attention 5: In case of RAC, a description of the software requirements can be found in Appendix B.

☞ Attention 6: In case of SSO a description of the software requirements can be found in Appendix C.

☞ Attention 7: Oracle Fusion Middleware 12c (12.2.1) has removed the mod_plsql module from the Oracle HTTP Server (OHS). If your custom software uses mod_plsql you will have to find an alternative. See the Oracle Web Tier - Statement of Direction (document ID 1576588.1) on My Oracle Support.

Furthermore, the following additional software is required on the OS:

1. ANSI C compiler
2. Perl
3. `zip` and `unzip` utilities for Unix/Linux
4. JDK

5. `java` utility

1.4.4.3. Client Tier

- For tradional mode with JPI: browser with Java JRE plugin
- For Java Web Start mode: Java JRE or JDK

Please note that with the beginning of 2019 the Oracle Managed Java Client on the desktop will be decommissioned. It is best to have an IT managed Java Client on the desktops that are used to start the OHI Back Office user interface.

For more information please visit:

https://www.oracle.com/technetwork/java/java-se-support-roadmap.html

For exact versions of the required software and patch sets, see:

Oracle Health Insurance Certification information on MOS (which references generic Forms services certification regarding this topic)

1.4.5. Operating System Requirements

For more information on the requirements, please refer to the following platform-specific documentation:

Oracle Database Installation Guide

☞ In case of RAC, please refer to appendix B.

1.4.6. User Interface Requirements

For detailed requirements regarding OHI Back Office and different screen resolutions and Windows settings, see:

Oracle Health Insurance Certification information on MOS

1.5. DISK SPACE AND MEMORY REQUIREMENTS

The Installation Guide provides an elaborate description of the requirements pertaining to Disk Space and memory.

The following table displays the required disk space for OHI Back Office components. These are minimum estimations, not exact calculations.

1.5.1. Database Tier

Product	**Required Disk space (MB)**
Initial OHI Back Office database (*)	5000
Total	5000

1.5.1.1. Middleware Tier

The components marked with (*) are variable and will develop as the number of end users increases.

Product	Required Disk space (MB)
WLS and Forms	5000
Other (Pro*C, OS shell scripts, tools, perl, Java, configuration files)	250
Batch Scheduler output (*)	2500
Batch Scheduler log files (*)	100
OHI Installation directory including several patch levels	6000
Total	13850

For OHI Back Office no additional memory requirements apply, other than the requirements for the Application and Database Server.

For more information on these requirements, please refer to the following (platform-specific) information:

Oracle Database Installation Guide

Oracle Fusion Middleware Documentation Library

☞ In case of RAC, please refer to appendix B.

1.6. RESTRICTIONS

1.6.1. National Language Support (NLS)

OHI Back Office can be used with a set of predefined languages.

However, one restriction has to be considered:

1. The *territory* component of the NLS parameter has to have a final status *before* the application goes live and *may not* be changed. If a change is required, however, this can be requested from OHI Back Office; software may be provided which allows for this change to be implemented.

1.6.2. Real Application Support (RAC) configuration documentation outdated

ATTENTION: This document is not up to date regarding instructions for an Oracle RAC environment. References to RAC, CSR or ASM are still based on database release 10g experiences and might be updated in a future release. As configuring and managing RAC requires additional DBA knowledge this document does not intend to describe this in detail. The documentation is currently only retained to trigger discussions and important management aspects.

1.7. APPLICATION SOFTWARE AND TEMPLATES

1.7.1. Application Software

OHI application software should and may not be modified, conform SLA’s; this would annul the Oracle guarantee.

Reference software is maintained by Oracle and *issued via (patch) releases* and can be recognized by the uppercase prefix and lowercase extension.
Some samples of the reference software include e.g. `OZG_PROC.sh`, `OZG_START_BATCH.sh`, `SYS1107S.sh`, etc.

1.7.2. Templates, Utilities & Sample Scripts

Templates, utilities and sample scripts, however, *can* be altered by customers.
Templates are distributed in releases and are copied to the `$OZG_BASE/conf` directory.
They contain non-generic, often customer-specific settings (e.g. directory paths, host names, etc.) and therefore they cannot be part of the OHI application software.
Templates, utilities and sample scripts can be recognized by the lowercase naming.
Some examples include `ozg_init.env`, `ozg_fmw12c2_main.sh` and `svl.properties.template`.

1.7.2.1. Change History

When customer-specific changes are made in templates, utilities and scripts, it is advised to always keep a history of changes in a uniform way.
Indicate here when something is altered, who made the change and the reason for it.

Example

```
Change history
=========================================================================
Date       Author        Version: Change
---------- ------------- ----------------------------------------------
13-09-2007 M. Koel       1.2: Use of MS Cabinet files is deleted.
```

2. SETTING UP THE ENVIRONMENT

This chapter deals with the preparations of the environment before installing OHI Back Office, after all requirements listed in chapter 1 have been checked and met.

2.1. PERFORMING THE PRE-INSTALLATION TASKS

2.1.1. Creating an OS Account for the OHI Back Office Batch Scheduler

The `batch` account is the OS account that runs the OHI Back Office batch scheduler software.

Log on as `root` under OS and use the operating system user administration utility for creating the `batch` account.

This task has to be performed on the Middleware Tier.

The name `batch` is recommended, but this is not mandatory. A different account name can be used as well.

2.1.2. Assigning Default Shells for the Required OS Accounts

For the OS accounts `batch` and `oracle` the default shell in Unix has to be set to Korn shell (`ksh`), in Linux it has to be set to `bash`.

2.1.3. Creating an OHI Back Office Database

Before OHI Back Office is installed, a database needs to be created because the OHI Back Office installation has to create a number of database accounts, roles and objects in this database.

For OHI Back Office the multitenant database architecture as introduced with database release 12c is a prerequisite and it is expected a pluggable database (PDB) is created within a container database (CDB) for installing the OHI Back Office database objects. As long as only one PDB is used no multi-tenancy license is required.

When this document references the ‘database’ for OHI Back Office the pluggable database is meant unless stated differently.

2.1.3.1. Multiple pluggable databases in one container database

OHI Back Office supports the use of more than one PDB in a CDB. The main advantage is that administration and resource usage is more efficient as they share the same common base.

A number of OHI Back Office-prescribed initialization parameters can also be set at PDB level. When using more than one PDB, it is up to the administrator to decide at which level these initialization parameters will be set. The installation software will only check the value of the parameter regardless of the level that it is set at (CDB$ROOT or PDB).

When changing a parameter value at PDB level it will be available in all existing or new sessions, depending on the parameter involved. When resetting a parameter at PDB level (using alter system reset […]) the parameter defaults to the value set at CDB level or the Oracle default. In that case a restart of the PDB is needed to make the value available.

Overall memory requirements are typically defined at CDB level, so the number of pluggable databases that can be plugged in will be limited by the available resources at CDB level.

2.1.3.2. Unicode Characterset

For all customers the AL32UTF8 character set must be used for the (pluggable OHI) database. This means the container database already needs to be created with this character set. As national character set AL16UTF16 should be chosen (for container and pluggable database).

Although the application uses CHAR for the NLS_LENGTH_SEMANTICS setting per session the database setting can and should remain on BYTE to prevent potential issues with database patches.

After creating the database, **do not set** NLS_LENGTH_SEMANTICS to CHAR, leave it at BYTE for the root container and the OHI Pluggable Database. See also My Oracle Support note 144808.1 for more information about this setting.

The OHI Back Office application sets the NLS_LENGT_SEMANTICS for OHI related sessions automatically to CHAR when the session logs on to the database. This is done by an OHI specific system logon trigger. This is done for the following database accounts:

- The OHI table owner and the OHI batch account
- The OHI user accounts (presence in ALG_FUNCTIONARISSEN is sufficient)
- The accounts that have received a grant on an OHI table owner object (except for SYS & SYSTEM when inappropriate granted) or that are granted a standard OHI role.

2.1.3.3. Install/check database component Oracle JVM

It is required to install Oracle JVM (JServer JAVA Virtual Machine) in the database. If you did not install this you can add it by running some scripts. Consult the Database Reference guide for the relevant script.

With the select statement below you can check whether the JVM is present (for running the statements below it is assumed that you use user SYS or an account with DBA privileges):

```
select comp_id
,      comp_name
,      version
,      status
from   dba_registry
```

This should return a line for comp_id JAVAVM:

```
JAVAVM              JServer JAVA Virtual Machine    12.2.0.1.0                    VALID
```

You should check whether all java objects are valid:

```
select owner
,      object_type
,      status
,      count(1)
from   all_objects
where  object_type like '%JAVA%'
group by
       owner
,      object_type
,      status
order by
       owner
,      object_type
,      status
```

This should return information like:

```
OWNER                          OBJECT_TYPE         STATUS     COUNT(1)
```

```
------------------------------ ------------------- ------- ----------
EXFSYS                         JAVA CLASS          VALID           43
EXFSYS                         JAVA RESOURCE       VALID            1
SYS                            JAVA CLASS          VALID        20017
SYS                            JAVA DATA           VALID          308
SYS                            JAVA RESOURCE       VALID          764
```

Numbers do not have to match exactly. The EXFSYS owned classes are not a requirement, so when they are not shown that is no issue.

Be sure the initialization parameters SHARED_POOL_SIZE and JAVA_POOL_SIZE are large enough (when using automatic shared memory management set minimum values for it which are clearly large enough; for example at least 496Mb and 128Mb respectively; these values are relatively small but may apply to smaller environments running on limited footprint machines).

2.1.3.4. Prepare the OHI owner account for using the Oracle JVM

In order to be able to use the Web Service Call-Out feature from the OHI Back Office application the schema owner has to receive a series of grants for using the Oracle JVM. You only need to do this in a new database,, after you have created the account. Please see document ‘Oracle Health Insurance Release Installation’ for information regarding creating this account (paragraph ‘Installing an initial release’).

In order to implement the grants please execute the following anonymous pl/sql block as user SYS while connected to the pluggable database container (and provide the schema owner name for variable ‘&OHI_OWNER’):

```
declare
  l_schema varchar2(30) := '&OHI_OWNER';
begin
  dbms_java.grant_permission
  (l_schema, 'SYS:java.lang.RuntimePermission',
'accessClassInPackage.sun.util.calendar', '' );
  dbms_java.grant_permission
  (l_schema, 'SYS:java.lang.RuntimePermission', 'getClassLoader', '' );
  dbms_java.grant_permission
  (l_schema, 'SYS:java.lang.RuntimePermission', 'shutdownHooks', '' );
  dbms_java.grant_permission
  (l_schema, 'SYS:java.lang.RuntimePermission', 'setFactory', '' );
  dbms_java.grant_permission
  (l_schema, 'SYS:java.lang.RuntimePermission', 'createClassLoader', '' );
  dbms_java.grant_permission
  (l_schema, 'SYS:java.net.SocketPermission', '*', 'connect,resolve' );
  dbms_java.grant_permission
  (l_schema, 'SYS:java.util.PropertyPermission', '*', 'read,write' );
  dbms_java.grant_permission
  (l_schema, 'SYS:java.util.logging.LoggingPermission', 'control', '' );
end;
```

Also grant the JAVAUSERPRIV system privilege to the schema owner, e.g.:

```
grant JAVAUSERPRIV to &OHI_OWNER
```

2.1.3.5. Install the DBWS callout utility in the OHI schema owner account

The database web service callout utility has to be loaded (once) in the application schema owner account. This should not be installed into the SYS account as described in some kind of notes and blogs! That refers to situations that do not longer apply.

Beware that the correct version of the DBWS callout utility is needed, version 10.1.3.1 until further notice. My Oracle Support document "**DBWS Callout Utilities User's Guide for RDBMS 11.1" (**id 469588.1) describes the installation (you still need to use this for database 12). However, this makes no distinction between a development and deployment situation.

For that reason this paragraph describes what you need to do for deploying the callout utility once (independent of the different web service consumers or newer versions of those service consumers). Only deploy a newer version (if that might become available) after being instructed to do so in a later version of this documentation.

First download the utility: dbws-callout-utility-10131.zip. This is available on the Oracle Technology Network (OTN) at location
http://download.oracle.com/technology/sample_code/tech/java/jsp/dbws-callout-utility-10131.zip.
When the link is broken, it can be found by searching OTN for "dbws-callout-utility-10131.zip".

From this zip the following two files are needed as present in the sqlj\lib folder within the zip:

```
dbwsclientdb11.jar
dbwsclientws.jar
```

These files should be placed on a file system location that is accessible on your database server so the files can be loaded into the database.

Set your database environment and load these files. For example for an environment identified with name 'vohi', owner account 'ozg_owner' with password 'ozg_owner':

```
. ozg_init.env vohi
. ozg_init.env DB12201
loadjava -u ozg_owner/ozg_owner -r -v -f -genmissing dbwsclientws.jar
dbwsclientdb11.jar -fileout load_dbwsclient.log
```

The loadjava command logs on to the database as set by the first ozg_init.env call with username/password combination ozg_owner/ozg_owner. The 2 files are passed as arguments and the result is logged to file load_dbwsclient.log. The load action may take some minutes as several thousand classes are loaded into the schema.

After the –u option you can of course also specify only a username and connect string like `ozg_owner@vohi` which will result in the utility to prompt for the password. Another option is to specify the connect string that references the wallet OHIPATCH <ohienv>_install entry like in '-u /@<ohienv>_install'. The creation of this wallet entry is discussed in the OHI Release installation manual.

Check in your log file whether the load was executed correct; no ORA- errors should occur. At the end of the loadjava command feedback like below should be shown:

```
Classes Loaded: 4060
Resources Loaded: 81
Sources Loaded: 0
Published Interfaces: 0
Classes generated: 62
Classes skipped: 0
Synonyms Created: 0
Errors: 0
```

You can use the SQL query as described in the JVM installation paragraph to check whether the OHI Back Office schema owner now contains several thousands of VALID Java objects.

When the load does not succeed for some reason, reload the files after having resolved the cause (or first drop the classes and reload them afterwards).

For dropping the classes you can use the example commands below:

```
. ozg_init.env vohi
. ozg_init.env DB12201
dropjava -u ozg_owner/ozg_owner -genmissing dbwsclientws.jar
dbwsclientdb11.jar
```

When the dropjava command does not drop all classes (check `user_objects` with `object_type like '%JAVA%'`) because a number of them are generated (because they were missing) you can generate individual drop commands with a command like:

```
select 'dropjava -u ozg_owner/ozg_owner '||
       dbms_java.longname (object_name)
from   user_objects
where  object_type like '%JAVA%' order by 1
```

When these loadjava actions are executed successfully your schema owner is prepared for deploying web service consumers. This deployment is done automatically during OHI release installations.

2.1.3.6. Check database component XML DB

For OHI Back Office it is required to have XML DB installed. As this is a required component starting with database release 12c you do not have to take any action. You can verify the presence of the component using the instructions described in Chapter 2 of the XML DB Developer's Guide.

2.1.3.7. Database Instance Parameters

The following non-hidden (not prefixed by an underscore) database instance parameters have at least to be set according to the conditions specified (these are minimum values); when a parameter is not set according to these conditions an alert or an error may occur, during installation of the OHI database structure. Please see the certification documentation for latest details about hidden parameters or additional different (temporary) settings.

A complete set of parameters and checks/settings that apply can be found in an Appendix of the Oracle Health Insurance Release Installation manual.

Where possible it is advised to implement settings at the PDB level. For some specific parameters this is a requirement as CDB based settings are not visible on the PDB level.

We do advise to not enable fully automated memory management, so leave MEMORY_MAX_TARGET and MEMORY_TARGET zero or do not set them (their default is zero).

Memory settings

```
CDB$ROOT:
JAVA_POOL_SIZE              >= 128M  # multiple of 16Mb
PGA_AGGREGATE_LIMIT         >= 8G    # multiple of 16Mb
PGA_AGGREGATE_TARGET        >= 128M  # multiple of 16Mb
MEMORY_MAX_TARGET           =  0     # is default
MEMORY_TARGET               =  0     # is default
SGA_TARGET                  >= 1024M # multiple of 16Mb
SGA_MAX_SIZE                >= 1096M # multiple of 16Mb

PDB:
SHARED_POOL_SIZE            >= 512M  # multiple of 16Mb
DB_CACHE_SIZE               >= 128M  # multiple of 16Mb
```

Other settings

```
CDB$ROOT:
DB_BLOCK_SIZE                 =  8192  # can be left default
DML_LOCKS                     >= 500
EVENT                         event 10195 not set
PROCESSES                     >= 200

PDB:
AWR_PDB_AUTOFLUSH_ENABLED     =  TRUE
JOB_QUEUE_PROCESSES           >= 10    # Needed for OZGISTAS; default ok
NLS_SORT                      =  BINARY
OPEN_CURSORS                  >= 500
OPTIMIZER_MODE                =  ALL_ROWS
PARALLEL_DEGREE_POLICY        =  MANUAL
PARALLEL_FORCE_LOCAL          =  TRUE
PARALLEL_MAX_SERVERS          >= 8     # 0 when running into parallel issues
PARALLEL_MIN_TIME_THRESHOLD   =  30
REMOTE_DEPENDENCIES_MODE      =  SIGNATURE
SESSION_CACHED_CURSORS        >= 500
STATISTICS_LEVEL              =  TYPICAL *
UNDO_MANAGEMENT               =  AUTO
UNDO_RETENTION                >= 10800 # at least 3 hours

*  = ALL may result in very slow CPU intensive execution of some SQL statements
```

The following parameters are influenced by the environment variables as used by the process of the connecting session. When they are not set or specified the database instance values apply. Below example values are shown for a Dutch environment, you might set them at the database (PDB) level upfront.

```
PDB:
NLS_LANGUAGE               = DUTCH    # Choose the appropriate language
NLS_NUMERIC_CHARACTERS     = ",."  ** # personal choice
NLS_TERRITORY              = ”THE NETHERLANDS”

** = this setting cannot be changed once the application is used
```

2.1.3.8. Database services

It is advised to create at least one service for the pluggable database in order to not fully rely on the default service and to better distinguish between certain usage groups. For that it may even be better to create several services for different usage groups like for example online users, batch processes and web services.
In a RAC environment services are already a familiar concept but on a stand alone environment this may be new.

An example how to create a service:

```
set serveroutput on
begin
  begin
    DBMS_SERVICE.CREATE_SERVICE
    ( service_name => 'vohi'
    , network_name => 'vohi.ohi.oracle.com'
    );
  exception
    when others
    then
      -- easy way to continue when the service already exists
      dbms_output.put_line('Skipped: '||sqlerrm);
  end;
  DBMS_SERVICE.START_SERVICE
  ( service_name => 'vohi'
  );
end;
```

Also make sure a startup trigger like below is created for starting the additional service(s) when the pluggable database is started. Adapt it to your needs. When using RAC you may prefer other options.

```
create or replace trigger ohi_start_services
after startup on database
declare
  e_service_already_started EXCEPTION;
  PRAGMA EXCEPTION_INIT(e_service_already_started,-44305);
begin
  FOR rec IN
  ( SELECT NAME
    FROM   dba_services
    WHERE  NAME like 'vohi%'
  )
  LOOP
    BEGIN
      dbms_service.start_service(rec.NAME);
    EXCEPTION
      WHEN e_service_already_started
      THEN
        --this means the service is already
        --running so no need to crash
        NULL;
    END;
  END LOOP;
end;
```

Beware that when cloning databases you might need to change your service definitions and service startup code.

2.1.3.9. Tablespaces

The following tablespaces have to be created for OHI Back Office data and indexes (OZG_DIM.. is for storing configuration data, OZG_FACT.. is for storing the operational changing data):

```
OZG_DIM_FIN_IND
OZG_DIM_FIN_TAB
OZG_DIM_REL_IND
OZG_DIM_REL_TAB
OZG_DIM_SYS_IND
OZG_DIM_SYS_TAB
OZG_DIM_ZRG_IND
OZG_DIM_ZRG_TAB
OZG_FACT_FIN_IND
OZG_FACT_FIN_TAB
OZG_FACT_REL_IND
OZG_FACT_REL_TAB
OZG_FACT_SYS_IND
OZG_FACT_SYS_TAB
OZG_FACT_ZRG_IND
```

```
OZG_FACT_ZRG_TAB
OZG_LOG_IND
OZG_LOG_TAB
```

The tablespaces have to meet the following requirements:

1. Locally Managed
2. Automatic allocation
3. Automatic Segment Space Management (ASSM)
4. 8K block size

Attention 1: OHI Back Office requires the use of a *default temporary* table space for temporary segments.

2.1.3.10. Other Requirements

Other requirements that will be checked:

- Database CHARACTERSET is AL32UTF8
- PLAN_TABLE must exist
- System statistics must be available
- Direct grants from Secure Application Role `OZG_ROL` are not allowed
- Table settings must be:

PCTFREE = 15% (5% for logging tables)
INITRANS = minimal 4 or 16 (table dependent)

Attention 2: It is *not* permitted to have activated (trace) events in the database in the production environment, unless this has been requested explicitly by OHI Development or Oracle Support Services.

Attention 3: If Database or Application Server settings have been changed which were not advised or prescribed, OHI Development or Oracle Support Services may ask the customer to have these settings reversed if problems occur that may seem to be related to these settings.

The underlying reason is to prevent unnecessary instability risks. When using customized applications this has to be considered as well.

Advice 1: OHI advises the use of *Oracle Resource Management.*

For additional information please see the Resource Management paragraph.

Advice 2: OHI advises the use of *Flash Recovery Area.*
The following parameters have to be set up for this:

`DB_RECOVERY_FILE_DEST`

`DB_RECOVERY_FILE_DEST_SIZE`

Advice 3: OHI advises the use of *Oracle Managed Files.*

The following parameters have to be set up for this:

`DB_CREATE_FILE_DEST`

`DB_CREATE_ONLINE_LOG_DEST_`*n*

Attention 1: If RAC is used, please refer to appendix B.

2.2. SETTING UP THE ENVIRONMENT VARIABLES

OHI applications require the necessary settings for environment variables (so these are *not* database parameters in the initialization/server parameter file) to be included in the file `ozg_init.env`, to be called in the startup file, normally the file `.profile` (or `.bash_profile` in Linux `bash` shell) in the OS login home directory, of the account under which OHI is installed (usually `oracle`).
Log on with the `oracle` account and set up the environment variables according to the instructions in this section.

An example of a call in .profile:

. /u01/app/oracle/product/OHI/admin/ozg_init.env

Setting up the mentioned variables is *mandatory*.

A sample file with the required settings for the OS environment variables is available in the `$OZG_BASE/conf` directory.

Hint: Copy file `ozg_init.env` to the directory `$OZG_ADMIN` (please read the next paragraph about the mandatory directory structure where this directory is introduced and the meaning of this variable later on in this paragraph) and apply the desired settings, using the instructions of this chapter.

2.2.1. Syntax of the Environment Variables

The syntax for setting up environment variables in Korn/Bash shell is as follows:

export variable_name=value

2.2.2. Setting up the Environment Variables

The environment variables required for OHI Back Office consist of 3 subsets:

1. **Variables for Oracle Database Server**
   These variables have to be set up in the Database Tier, according to the instructions in the *Oracle Database Installation Guide*.

2. **Variables for Application Server**
   These variables have to be set up in the Middleware Tier, according to the instructions in the *Fusion Middleware Installation Guides*.

3. **Variables for OHI Back Office**
   These variables have to be set up in the Middleware Tier and partly in the Database Tier, if the Tiers are installed on separate servers.

The following sections provide a more detailed description of the configuration of the *specific* database/application server and OHI Back Office variables, for each variable.

☞ **Attention 1:** *Other* Database and Application Server variables have to be set up analogous to the instructions in the relevant product installation manuals.

☞ **Attention 2:** For specific environment variables for RAC, please refer to appendix B.

2.2.2.1. Globalization Support

The following languages are currently supported and can be setup in a NLS environment variable:

BRAZILIAN PORTUGUESE
CATALAN
CZECH
DANISH
GERMAN
AMERICAN
SPANISH
FINNISH
FRENCH
HUNGARIAN
ITALIAN
DUTCH
NORWEGIAN
POLISH
PORTUGUESE
ROMANIAN
SLOVAK
SWEDISH
TURKISH

From release 10.15.1 and onwards the database character set must be AL32UTF8.

Since release 10.14.2 and onwards it is possible to specify which character set to use for loading input files and creating output files. This functionality is offered so files that are stored in a specific character can to be interpreted as such during loading. Also, output files can be created in in the specified character set.

This functionality is very important to prevent specific characters being lost or misinterpreted when exchanging these files with other parties and/or applications.

The language and territory used as well as the character set used for interpreting character data input by an OCI (Oracle Call Interface API) client or output character data from the database to an OCI client is initially defined by the environment variable NLS_LANG as set in the runtime environment of the client. Typically, this applies to ‘clients’ as the Forms user interface, SQL*Plus or development tools.

For JDBC based clients (for example used by the web services as provided with OHI Back Office) the LOCALE setting typically defines the language, territory and character set used by default. However, when for example SOAP and/or XML messages are passed an ‘encoding’ clause in the message normally specifies the character set in which the message is offered. OHI Back Office functionality will react on such encoding specifications.

2.2.2.2. Setting up the NLS_LANG Variable

This variable must be configured for the desired language, territory and character set for use by client tools such as Oracle Forms. It can be overruled, see later in this manual.

For a Dutch implementation this is typically:
`”DUTCH_THE NETHERLANDS.WE8MSWIN1252”.`

For Mexican implementations this is typically:

`”SPANISH_MEXICO.WE8MSWIN1252”.`

When and how to prevent ORA-12713 errors in the user interface

When the database uses AL32UTF8 as character set it can store many more characters than are supported by the character sets as specified in the possible NLS_LANG values described above. When data is retrieved from the database, it is converted to the client character set (as specified by NLS_LANG). Because the client character set in NLS_LANG is a subset of the database character set AL32UTF8, some special characters, when present in a retrieved value, cannot be converted to an equivalent in the client character set. These characters will be replaced by the default ‘unknown’ character for that character set (typically a square or an inverted question mark).

This can occur in any application (Forms, SQL*Plus, SQL*Developer, DataPump) that retrieves data from the database while using a client character set other than AL32UTF8. In the Forms user interface the use of such a ‘limited’ client character set can also result in exceptions throwing the ORA-12713 message. This happens when such an ‘unknown’ character is present in a string variable passed from PL/SQL within the database to PL/SQL code within the Forms module (through an assignment). This seems to be a PL/SQL limitation which can be circumvented by passing the data from the database to Forms through a query. If you run into such errors it is an option to contact OHI to check whether such a code change is feasible (if it is, a bug can be registered to repair this).

Such ‘unknown’ characters have been stored in the database by a client with a different client character set, that is not a subset of the current client character set.

Some examples:

- loading files, like claims files, which are specified in a different character set
- web service calls with a message encoded in a UTF-8 character set
- Database import with a different setting for NLS_LANG during the import session
- SQL*Plus insert script with a different setting for NLS_LANG during the session

NOTE: With the database character set AL32UTF8, the characters should have been stored correctly if the encoding of the passed values and the specified character set did match with each other. It is just the conversion during the retrieval that cannot handle the characters correctly.

If you encounter such conversion issues, consider using the client character set AL32UTF8. Because the client character set is then equal to the database character set, no conversion will occur. This will prevent the conversion issues as well as the ORA-12713 errors in Forms. However, a direct consequence is that all characters supported by AL32UTF8 can be entered with the client. That is because the client character set also determines the characters that can be inserted with the client. This may lead to conversion issues in other places, when the data is retrieved, e.g. when files need to be delivered in a more restrictive character set (for example because an external party cannot support AL32UTF8 based files and requires WE8ISO8859P15 characters). This may result in loss of characters replaced by the default ‘unknown’ character during that retrieval process. So please be aware of such consequences and carefully determine what your requirements are and what measures you must implement to minimize character set conversion issues.

NOTE: Unfortunately, Forms 12.2.1.2 and higher cannot use AL32UTF8 as the client character set (as defined by NLS_LANG) without recompilation of all Forms, Libraries and Menus with that NLS_LANG setting. This is not supported by the Forms compilation options in OHIPATCH. Therefore, we suggest using client character set UTF8 instead for Forms.

UTF8 is a binary subset of AL32UTF8 (meaning the internal storage of all characters in UTF8 is the same as in AL32UTF8) that will suffice for all European languages.

To specify UTF8 for use in the Forms user interface you can specify an NLS_LANG value in the servlet.env files as described later in this document. This will overrule any optional setting in ozg_init.env.

An example value for a Dutch environment:

```
NLS_LANG=DUTCH_THE NETHERLANDS.UTF8
```

Be aware that using UTF8 for the client character set is no guarantee that all UTF-8 characters are displayed correctly in Forms. The fonts used by Forms may not support specific characters. Typically, several symbols are not supported by the default fonts mapped for your java runtime environments. For example, characters like ‘ᛟᛞ’ show up in Forms as ‘□□’. But no ORA-12713 will occur; this is just a font mapping issue in the applet. More information can be found in bug 2720366 (which is closed as not being a Forms bug).

☞	MOS Doc ID 158577.1 does contain much additional info about NLS_LANG aspects. It also describes it is best to use the character set that is used on the client platform. This means that the Forms client does normally not need to be set to (AL32)UTF8. It is best to set it to the codepage of your main client platform (probably Windows). MOS document 179133.1 describes the standard code pages used by Windows and the corresponding Oracle character set.

To specify the client character set in other clients than Forms, set NLS_LANG and/or DBMS_LANG in the generic part of ozg_init.env. Note NLS_LANG has to be configured on the Middleware Tier *and* the Database Tier. See the next paragraph.

2.2.2.3. Setting up the DBMS_LANG Variable

This variable specifies a value that is used to set the NLS_LANG variable for use by the database tools (such as Import, Export, SQL*Plus, SQL*Loader etc.) and software. When these tools are called from OHI software the (OHI specific) DBMS_LANG value is used to overrule the value of NLS_LANG (described in the previous paragraph).

It specifies the default language and character set to run these tools in, meaning that for example .log and .out files as created by batches that run in SQL*Plus will by default be created in this character set. Specific output files, such as created from ‘batch runs’ or .xml files, can be created in a different character set. This different character set can be specified at different levels:

- By a Back Office parameter as overall default.
- At module specific level.
- As parameter for the batch request that produces the file.

DBMS_LANG is also used as default when reading or interpreting files (for example a SQL*Plus script that may contain non-standard ASCII characters in a parameter or column value).

Possible values are identical to these given for NLS_LANG.

This variable has to be configured on the Middleware Tier *and* the Database Tier.

Attention: As a database administrator you will typically set environment variables for the database software by running ozg_init.env, resulting in the DBMS_LANG value being used to set the NLS_LANG value. In that way it determines the language and character set used by utilities as export and SQL*Plus.

If you want this to show up in the same language and character set as used for the terminal setting you may want to overrule the NLS_LANG after a call to ‘. ozg_init.env’ or make sure your locale is set to comply with NLS_LANG.

Suppose you use the value below for NLS_LANG:
`”DUTCH_THE NETHERLANDS.WE8ISO8859P15”.`

When you have your locale set to LANG=en_US.UTF-8 diacritic characters (like ë in ‘geëxporteerd’) may show up incorrectly because the terminal uses UTF-8 characters while the utilities use the single byte Latin characters set as specified by NLS_LANG.

You may change your locale setting to ‘nl_NL.iso885915’ to show them correctly or after the call to ozg_init.env set NLS_LANG to:
`”AMERICAN_AMERICA.AL32UTF8”.`

Hint: The language, territory and character settings as used by OHIPATCH cannot be influenced. A hardcoded NLS_LANG value is used to make sure installation files are always interpreted in the correct character set (WE8ISO8859P15) and with the expected territory setting. The language used will always be (American) English.

2.2.2.4. Setting up the NLS_DATE_FORMAT Variable

This variable has to be configured for the desired date format. For the Dutch implementation this is normally `DD-MM-RRRR`.

This variable has to be configured on the Middleware Tier *and* the Database Tier. This setting cannot be changed once OHI Back Office is used.

2.2.2.5. Setting up the NLS_NUMERIC_CHARACTERS Variable

This variable has to be configured for the desired combination for decimal and group separator. For the Dutch implementation this is normally: “**`, .`**”.

This variable has to be configured on the Middleware Tier *and* the Database Tier. This setting cannot be changed once OHI Back Office is used.

2.2.2.6. Setting up the NLS_SORT Variable

This variable has to be set on `BINARY` for performance reasons.

This variable has to be configured on the Middleware Tier *and* the Database Tier.

2.2.2.7. Setting up the TNS_ADMIN Variable

This variable has to be configured to the directory which includes the Oracle Net files.
On the application server (on which no Listener runs) this includes files `tnsnames.ora` and `sqlnet.ora`, on the database server (on which the Listener does run) the file `listener.ora` will also be present.

This variable has to be configured on the Middleware Tier *and* the Database Tier.

Because both Tiers have an Oracle Home directory for database software, we recommend using `$ORACLE_HOME/network/admin` for ease of management but you may also opt for a central location on a network share (which makes the functioning of your environment dependent on the availability of that network share!).

2.2.2.8. Setting up the OZG_ORATAB_OZG Variable

This variable has to specify the entry in `$ORATAB` which refers to the home (root) directory of the OHI Back Office software. Typically this is an entry in `$ORATAB` with name OZG (or nowadays often OHI) referencing a line like:

```
OHI:/u01/app/oracle/product/OHI:N
```

It will be used to determine the location for OZG_ROOT.

This OZG_ORATAB_OZG variable has to be configured on the Application Middleware Tier *and* the Database Tier.

2.2.2.9. Setting up the OZG_ORATAB_DB12201 Variable

This variable has to specify the entry in `$ORATAB` which refers to the home directory of Oracle 12*c* R2 (12.2.0.1) Database software.

This variable has to be configured on the Middleware Tier *and* the Database Tier.

2.2.2.10. Setting up the OZG_ORATAB_FRS12213 Variable

This variable has to specify the entry in `$ORATAB` which refers to the home directory of the Oracle 12*c* R2 Forms & Reports Service software. This is the Oracle Home directory of the Fusion Middleware 12c Release 2 installation.

This variable has to be configured on the Middleware Tier..

2.2.2.11. Setting up the OZG_ORATAB_WLS12213 Variable

This variable has to specify the entry in `$ORATAB` which refers to the home directory of the Oracle WebLogic Server software (the `wlserver` directory within the Fusion Middleware home).

This variable has to be configured on the Middleware Tier.

2.2.2.12. Setting up the OHI_FRSHOME Variable

This variable specifies which Forms Oracle Home is used for an environment when an OHI release supports more than one Forms release (which is for example the situation for the OHI 10.17.1 release).

This variable has to be configured on the Middleware Tier.

2.2.2.13. Setting up the OZG_ORATAB_IDM10G Variable

This variable has to specify the entry in `$ORATAB` which refers to the home directory of Oracle 10*g* Identity Management Infrastructure

This variable is *optional* and applies only if SSO is used.

2.2.2.14. Setting up the OZG_ORATAB_OMS10G Variable

This variable can be used to specify the entry in `$ORATAB` which refers to the home directory of Oracle Enterprise Manager Management Server.

This variable is *optional* and can be configured on the Middleware Tier *and/or* the Database Tier. (in which Oracle Enterprise Manager Management Server is set up).

2.2.2.15. Setting up the OZG_ORATAB_OMA10G Variable

This variable can be used to specify the entry in `$ORATAB` which refers to the home directory of Oracle Enterprise Manager Management Agent.

This variable is *optional* and can be configured on the Middleware Tier *and/or* the Database Tier. (in which Oracle Enterprise Manager Management Agent is set up).

2.2.2.16. Setting up the OZG_ORATAB_CRS10G2 variable

This variable can be used to specify the entry in `$ORATAB` which refers to the home directory of the Oracle Clusterware.

This variable is *optional* and applies only if RAC is used. If this parameter is set, then this has to be chosen for all nodes.

2.2.2.17. Setting up the OZG_ROOT Variable

This variable has to specify the home directory of OHI :

```
export OZG_ROOT=`dbhome $OZG_ORATAB_OZG`
```

This variable has to be configured on the Middleware Tier *and* the Database Tier.

2.2.2.18. Setting up the OZG_ADMIN Variable

This variable has to specify the directory in which OHI administration and configuration files are located: `$OZG_ROOT/admin`.

This variable has to be configured on the Middleware Tier *and* the Database Tier.

2.2.2.19. Setting up the PATH Variable

The directory in `$OZG_ADMIN` has to be included in the `PATH` variable.

This variable has to be configured on the Middleware Tier *and* the Database Tier.

2.2.2.20. Setting up the OZG_BASE Variable

This variable has to be configured to specify the home directory of OHI Back Office for the current environment (more than one OHI Back Office can exist next to each other within one OHI home directory; it is typically referring to a folder with the name of `$TWO_TASK` within `$OZG_ROOT`): `$OZG_ROOT/$TWO_TASK`.

This variable has to be configured on the Middleware Tier.

2.2.2.21. Setting up the OZG_PATCH Variable

This variable has to be configured to specify the directory in which the OHI (patch) releases have to be downloaded and installed: `$OZG_ROOT/patch.`

This variable has to be configured on the Middleware Tier.

2.2.2.22. Setting up the FORMS_PATH Variable

This variable has to be configured for the directory in which the OHI Back Office runtime Forms modules are located for the current environment: `$OZG_BASE/bin`.

This variable has to be configured on the Middleware Tier.

2.2.2.23. Setting up the FORMS_USER_DATE_FORMAT Variable

This variable, which indicates the date format used in screens, has to be configured on `DD-MM-RRRR.`

This variable has to be configured on the Middleware Tier.

2.2.2.24. Setting up the FORMS_SCROLL_ALL_BUT_ONE Variable

This variable, which is user-friendly when scrolling through records in a multi-record block in a screen, has to be set to `TRUE.`

This variable has to be configured on the Middleware Tier.

2.2.2.25. Setting up the FORMS_TRACE_PATH Variable

This variable has to be set up to specify a directory in which the dump files due to crashes of the Forms runtime executables have to be located.

This variable has to be configured on the Middleware Tier.

2.2.2.26. Setting up the FORMS_FLAG_DIFFERENT_SUBORD Variable

This variable has to be set to 1.

2.2.2.27. Setting up the FORMS_DATETIME_LOCAL_TZ

This variable has to be set to GMT so it equals to the default value of FORMS_DATETIME_SERVER_TZ being GMT. This prevents time differences within screens.

2.2.2.28. Setting up the OCR_BACKUP Variable (Only in Case of

RAC)

This variable is used for creating a backup of the Oracle Cluster Registry and has to be configured on a location of a shared file system.

This variable has to be configured on *each* RAC node.

2.2.2.29. Setting up the OVD_BACKUP Variable (Only in Case of RAC)

This variable is used for creating a backup of the Oracle Voting Disk and has to be configured on a location of a shared file system.

This variable has to be configured on *each* RAC node.

2.2.2.30. Setting up the OZG_OUT Variable

This variable has to be configured to specify the *physical* directory in which the OHI Back Office batch scheduler writes the output, e.g. `$OZG_BASE/out`.

This variable can be used in the system parameters for OHI Back Office subsystem SYS (“System”); screen `SYS1010F`.

This variable has to be configured on the Middleware Tier.

2.2.2.31. Setting up the OZG_LOG Variable

This variable has to be configured to specify the *physical* directory in which the OHI Back Office batch scheduler writes the log files, e.g. `$OZG_BASE/log`.

This variable can be used in the system parameters for OHI Back Office subsystem SYS (“System”); screen `SYS1010F`.

For a detailed description of the use of OS environment variables for use in the output and log path of the OHI Back Office batch scheduler, please refer to the following document:

Reading, writing and authorising of OHI application files

This variable has to be configured on the Middleware Tier.

2.3. SETTING UP THE OHI DIRECTORY STRUCTURE

Under operating system user `oracle`, the following *mandatory* directory structure (the “custom” directory being an exception) has to be created under the `$OZG_BASE` directory on the Application Server. The OHI application source files and executables for each OHI Back Office environment (so for each ‘environment’ directory) require a separate environment subdirectory structure:

```
$OZG_ROOT                 #Oracle Health Insurance install directory
         /admin           #Configuration files            = $OZG_ADMIN
         /patch           #(Patch)releases                = $OZG_PATCH
         /environment     #Directory for each environment = $OZG_BASE
                          #Can occur n times in 1 $OZG_ROOT
                  /bin    #Forms
                  /conf    # Template directories and ohipatch.conf
                  /help   #Online help documentation
                  /install#DDL scripts
                  /java   #Java files
```

```
/log    #Batch scheduler log files
/out    #Batch scheduler output
/report #obsoleted files for Oracle Reports.
/sh     #OS shell scripts
/sql    #SQL modules
/utils  #utilities typically used during installs
/xml    #XML files
/custom #Custom Development managed files
```

2.3.1. bin

This directory contains all OHI Back Office Forms (Forms, Menus, Forms Libraries, Reference Forms and Object Libraries), Pro*C software and application logos.

2.3.2. conf

This directory contains the configuration file for the installation menu OHIPATCH and subdirectories with templates.

2.3.3. help

This directory contains all OHI Back Office online help documentation, which can be accessed from the application.

2.3.4. install

This directory contains all OHI Back Office DDL scripts e.g. tables, constraints, indexes and triggers.

These scripts are used to partition or compress large tables at any moment of your choice (this is possible only for tables characterized by OHI Back Office as *to be partitioned/compressed*).

2.3.5. java

This directory contains all OHI Back Office Java files.

☞ **Attention:** Certification and/or keystores which are possibly required for secure connections on the Internet, have to be located in the `$OZG_BASE` directory of the relevant environment.

2.3.6. report

The contents of this directory are no longer used after phasing out Oracle Reports in OHI BackOffice 10.15.1

2.3.7. sh

This directory contains all OHI Back Office OS shell scripts and SQL*Loader control files.

2.3.8. sql

This directory contains all OHI Back Office SQL modules.

2.3.9. utils

This directory contains the software for the installation menu OHIPATCH and some other perl and shell utilities used during installation. Some of those are also used at runtime.

The directory `$OZG_BASE/utils` has to contain the following files on the application server.

Filename	**Purpose**
d12c2*	Utilities to convert and compile forms sources.
OZG_GIF.jar	OHI Back Office jarfile for Oracle Application Server.
OHI_CMD.pl	Perl command file to set correct environment when executing Oracle utilities and executables.
OHIPATCH.pl	OHI Back Office Perl installation menu for installing major releases, patch sets and interim patches.
OHIPLIB.pm	OHI Back Office Perl library module.
OHILOGSCAN.plp	Utility to scan installation log files.
OHI_JPI.htm	Configuration file for Forms Java Plugin implementation.
OHI_WEBSTART.jnlp	Configuration file for Forms Webstart

ohirf34w_nl-NL.res;
ohirf34w_en-US.res;
	OHI Back Office Forms Terminal Resource File (for configuring keyboard mappings) for one or several languages. These are not all required, just put over here the one(s) you need. The named files can be found in the $OZG_BASE/conf/Back-Office folder. See the paragraph about forms configuration for more information.

2.3.10. xml

This directory contains all OHI Back Office XML files.

2.3.11. Custom

This directory contains custom development managed files. For instance files that are processed by custom developed, so non system-native, scripts should be placed here or in a subdirectory of this directory. The “custom” directory is not mandatory, however the naming is prescribed.

Additionally, the following 2 directories have to be created.
Normally, these are created as subdirectories of `$OZG_BASE. It` is permitted to create these directories in a different physical location:

2.3.12. log

This directory contains all OHI Back Office batch scheduler log files (see the environment variable `$OZG_LOG`).

The OS users `oracle` and `batch` have to have write privileges for this directory.

2.3.13. out

This directory contains all OHI Back Office batch scheduler output files (see the environment variable `$OZG_OUT`).

The OS users `oracle` and `batch` have to have write privileges for this directory.

Using the OS user `oracle`, create the following *mandatory* directory structure in `$OZG_ROOT` on the Middleware Tier for the OHI Back Office application tools & utilities and releases:

2.3.14. admin

This directory contains the environment setting script ozg_init.env and some OHI Back Office files that need to be shared over multiple OHI environments.

Attention: If the Database Tier and the Middleware Tier have been installed on different servers, the directory `$OZG_ROOT/admin` *also* has to be created on the Database Tier.
In that case there is a `$OZG_ADMIN` directory on the application server(s) *and* a `$OZG_ADMIN` directory on the database server(s).

These directories can*not* be shared; the content of the directories is be different; also the content of the configuration files *in* the directories is different.

The directory `$OZG_ADMIN` has to contain the following files on the application server.
The directory `$OZG_ADMIN` on the database server contains only the files that are marked with (***).

Filename	**Purpose**
ozg_init.env (***)	Environment file for OHI Back Office settings.
ozg_main.sh (***)	OS command file for starting/stopping the complete Oracle environment; Oracle system- and OHI Back Office software.
ozg_fmw12c2_main.sh	OS command file for starting/stopping the Forms/Reports application server environment.
ozg_batch_start.sh	OS command file to start OHI Back Office batch schedulers for all environments.
ozg_batch_stop.sh	OS command file to stop OHI Back Office batch schedulers for all environments.
ozg_oracle_start.sh (***)	OS command file to start all Oracle software on the system.
ozg_oracle_stop.sh (***)	OS command file to stop all Oracle software on the system.

2.3.15. patch

This directory contains all OHI (patch) releases which have to be installed.
This directory only applies to the application server(s).

2.4. INSTALLATION OF OHI BACK OFFICE APPLICATION LOGOS

OHI Back Office uses 2 logos (which are loaded dynamically at runtime):

- **OZGIMG01.gif**
  Is displayed on the OHI Back Office start screen OZGSTART.
  Size: 390 x 160 pixels
- **OZGIMG02.gif**
  Is displayed on the OHI Back Office Info screen OZGABOUT.
  Size: 120 x 45 pixels

The logos have to be placed in directory `$OZG_BASE/bin` on the Middleware Tier. If they cannot be found an error message will be shown during startup of the user interface.

Initial logos are available in the `$OZG_BASE/conf` folder; the customer is free to replace these logos with private company logos; the only requirement is that the naming has to be maintained.

2.5. SETTING UP UNIVERSAL ORACLE OS SCRIPTS

2.5.1. oratab

In file `$ORATAB` (normally `/etc/oratab` or `/var/opt/oracle/oratab`) entries *have to be* included (Oracle home directories for the relevant software) for the following products.

Be sure to use transparent naming of the entries put in ORATAB. The best way is to name the entry the same as the directory where the software is stored. There can be exceptions for this, it is not an obligation.

The codes that are used for the entries can be selected freely (but they have to be indicated in uppercase characters). By means of variables `$OZG_ORATAB_*` in `$OZG_ADMIN/ozg_init.env` the entries become available in the environment:

1. **Oracle Fusion Middleware Forms & Reports Services**

   Sample code: `FRS12213`

2. **Oracle Database**
   If the Middleware Tier.and the Database Tier are installed on 1 server, the entry refers to the Database Server software home, otherwise to the Database Client software home on the application server.

   Sample code: `DB12201`

3. **OHI**
   This entry identifies an OHI installation, containing one or more environment specific installations. It will be used to determine the root folder for OHI installations ($OZG_ROOT).

   Sample code: `OHI` (previously `OZG`)

The following entries are optional:

4. Oracle Enterprise Manager Management Agent

   Sample code: `OMA10G`

5. Oracle Enterprise Manager Management Server

   Sample code: `OMS10G`

Sample entries in $ORATAB

```
...
DB12201:/ozg/app/oracle/product/12.2.0.1/db_1:N
WLS12213:/u01/app/oracle/product/frs12213/wlserver:N
FRS12213:/u01/app/oracle/product/frs12213:N:
OHI:/u01/app/oracle/product/OHI:N

...
```

Sample corresponding variables $OZG_ADMIN/ozg_init.env

```
...
export OZG_ORATAB_DB12201=DB12201
export OZG_ORATAB_WLS12213=WLS12213
export OZG_ORATAB_FRS12213=FRS12213
export OZG_ORATAB_OZG=OHI
...
```

The aforementioned entries in `ozg_init.env` are used by means of the standard Oracle utilities `dbhome` and `oraenv`.
It is of importance that no other `oratab` is indicated in these utilities; ensure to check that `$ORATAB` in these files (available in `/usr/local/bin` and the `$ORACLE_HOME/bin` directories) does not refer to a non-existing `oratab` file.
When reference is made to a non-existing `oratab` file, this can be modified in the relevant utilities, or a symbolic link can be created for the non-existing `oratab` file which refers to the correct `oratab` file.

To specify the Forms Oracle Home to be used, for OHI releases which support two versions simultaneously, add an entry like below:

```
export OHI_FRSHOME=$OZG_ORATAB_FRS12213
```

2.5.2. oraenv

For certain (older) versions of `oraenv` error message `"unlimited: bad number"` may be encountered, or the execution of `oraenv` may get stuck (on `exec $ORACLE_HOME/bin/osh`).
In that case the workaround as described in My Oracle Support note 1023496.6, has to be introduced.

2.6. INSTALL ADDITIONAL PERL MODULES

In order to use the OHI installation menu `OHIPATCH`, it is required to install additional Perl modules.

It is *mandatory* to install these modules *before* starting an initial installation of OHI software.
The installation menu will not work until these modules are installed.
For installation instructions, see Appendix D – Installing required Perl modules.

2.7. CUSTOMIZING TOOLBAR ICONS

When you are using the Online HTTP Link it is possible to define your own icons for the HTTP link buttons, so it becomes easier to distinguish their functionality. The GIF files should be added to a custom created jar file based on the OZG_GIF.jar file as delivered with the OHI Back Office application.

In order to use your own custom file please adjust the ‘archive’ setting as described in the paragraph about configuring your forms environment. In the paragraph about virtual directories the location of the jar file (normally OZG_GIF.jar) is described.

To create a jar file of your own use the following command:

```
jar -cvf OZG_GIF_CUSTOM.jar *.gif
```

This will put all .gif files in your folder in the file OZG_GIF_CUSTOM.jar.

2.7.1. Signing a .jar file

If you create a new .jar file it is necessary to sign it to prevent security messages constantly appearing when the .jar file is downloaded by a browser from the application servers.

The following commands offer you a way to do this in a less secure way. With the tightened security of the Java plugin in the browser as implemented during security updates in 2013 and later this requires you to lower the security level of the Java plugin. For production use this is of course not acceptable but it may help in testing.

To prevent security problems the file should be signed with an official certificate acquired by your organization.

Instructions for testing with a less secure approach:

- Copy the file from your Oracle Forms Oracle home folder and create a local version:

  ```
  cp $ORACLE_HOME/forms/templates/scripts/sign_webutil.sh
  my_sign_webutil.sh
  ```
- Adjust your local copy and at least specify a value for DN_CN and keystore password and private key password for variables KEYSTORE_PASSWORD and JAR_KEY_PASSWORD.
- Sign your custom jar file using your custom script:
  ```
  . ozg_init.env FRS12C2
  my_sign_webutil.sh OZG_GIF_CUSTOM.jar
  ```

  Beware that your keystore typically is located in file `$HOME/.keystore`. As soon as it is created you need to use the same password for subsequent signing calls.
- After signing copy the .jar file to the appropriate location where it can be downloaded by the Forms sessions started by users.

3. CONFIGURATION ORACLE FUSION MIDDLEWARE SOFTWARE FOR OHI BACK OFFICE

This chapter describes the configuration of the Oracle Forms and Reports components of the Oracle Fusion Middleware (OFM) product “Oracle Forms and Reports Services” (FRS) as it is needed for the OHI Back Office application. .

3.1. INSTALLATION AND INITIAL CONFIGURATION NECESSARY SOFTWARE

This installation has been verified on a Linux platform. Other platforms are currently not certified nor supported.

3.1.1. Acquire the Software

Make sure you download the correct software for your platform. As only the 64 bit platform is supported download the following components:

1. Oracle WebLogic Server "FMW Infrastructure 12c" (12.2.1.3) for All Platforms This is available as download on Oracle Software Delivery Cloud.
2. Oracle Forms and Reports 12c (12.2.1.3) for Linux x86-64, also available from the Oracle Software Delivery Cloud. We will refer to this product as FRS.
3. Optional: Oracle WebLogic Server 12.2.1.3 Generic Installer for Oracle WebLogic Server and Oracle Coherence. This is also available as download on Oracle Software Delivery Cloud.

☞ Attention:

> Forms 12c requires the FMW Infrastructure, which includes OPSS (Oracle Platform Security Services) database objects. If you plan to install OHI Service Layer Web Services (SVL) or OHI HTTP Service Layer (HSL), you may want to use the Oracle WebLogic Server 12.2.1.3 Generic Installer to install those products in a different home potentially on a different application server.

It is assumed you have a 64bit JDK for your platform available. Please make sure you use a certified JDK version. Check for certified versions on support.oracle.com. Oracle Forms and Reports 12c (12.2.1.3) is certified with JDK 1.8.0_131+

Currently no other Oracle software is required (the Installer will check on most OS requirements) but it may be that required patches are added later. Please consult the OHI certification information on My Oracle Support (MOS) for this.

3.1.2. Install Oracle WebLogic Server

OHI Back Office uses only the Forms Services of the Oracle FMW product stack.
For the 12c ‘application server’ it is required to install the Oracle WebLogic Server (WLS). The WLS installation creates a Middleware home directory structure. After you have installed WLS you can install FRS.

Fusion Middleware 12c does not have a “Forms & Reports Stand-alone” installer, as once existed with older versions. FRS 12c requires a WLS installation of the type “FMW

Infrastructure”. FRS itself is dependent on some components within this FMW Infrastructure which itself require (and are dependent on) Oracle Platform Security Services (OPSS). OPSS in turn requires certain database schemas to be available for Security data and for auditing. These schemas are installed in an available database by running the Repository Creation utility (RCU) for each WLS/FMW Forms domain.

The result is a FMW installation that is linked to c.q. depends on database contents. If we install the OPSS and Audit schemas in the OHI BO database (the same PDB), that will impact the way OHI Back Office environments can be cloned. We can no longer simply copy (plugout and plugin) an OHI BO database from one environment to another environment, if the FMW Domain is different. The FMW Managed Server (typically named WLS_FORMS) will not start if the corresponding OPSS and Audit schemas are not available using the original JDBC connectors that are part of the target FMW installation.

Several alternatives exist, to prevent this dependency:

- Install the OPSS and Audit schemas in a separate PDB in the same CDB as the OHI BO PDB. Do not clone the OPSS PDB. This requires a multi-tenancy license.
- Install the OPSS and Audit schemas in a separate database (CDB+PDB). Do not clone the OPSS database. This requires some more server memory and management effort.
- Adapt the clone procedure: execute extra activities to link the target FMW Domain to the cloned OHI BO PDB to.
- Rerun the config.sh, connect to new DB, get RCU config, modify passwords, etc.

From OHI perspective it is strongly advised to use a separate database for creating the OPSS schemas as these schemas belong to a WLS Forms configuration and not to a specific OHI environment. You may choose for one single or a few relatively high available databases to contain several sets of OPSS schemas, with different prefixes per set, for all WLS Forms configurations. The database version of this database may differ from the OHI database version and should be certified as ‘Target Database for RCU’ for FMW Infrastructure.

For all documentation describing the Oracle Fusion Middleware environment, concepts, installation requirements, installation process, etc. please see:

Oracle Online Documentation Library Middleware 12c Release 2 (12.2.1): WebLogic Server available online at

https://docs.oracle.com/middleware/12213/wls/index.html

Oracle Online Documentation Library Middleware 12c Release 2 (12.2.1): Oracle Forms and Reports, available online at

https://docs.oracle.com/middleware/12213/formsandreports/index.html

Oracle Fusion Middleware System Requirements and Specifications 12c (12.2.1.3.0) (document E955659-01): https://docs.oracle.com/en/middleware/lifecycle/12.2.1.3/sysrs/

Install, Patch and Upgrade Oracle Fusion Middleware 12c:
http://docs.oracle.com/middleware/12213/cross/installtasks.htm
http://docs.oracle.com/middleware/12213/cross/upgrade.htm

☞ Attention:

> An upgrade is not described in this manual and you should use the installation instructions as provided with the OHI release that facilitates the upgrade. It is good to know though that the upgrade from Oracle Forms and Reports 12.2.1.2 to 12.2.1.3 is an "out of place" upgrade when considering the installation of the Oracle Home and requires a new directory structure for the new Middleware Home. You may choose however for an "out of place" or "in place" upgrade of your domain folder structure. For the OPSS schema structure only an "in place" upgrade is supported. For more details see the mentioned documentation "Install, Patch and Upgrade Oracle Fusion Middleware 12c".

For the top level Middleware home we will use variable `$MW_HOME` to refer to it. As name we will use `frs12213` (**F**usion **M**iddle**w**are **12*c*** 12.2.1.3.0 for Forms and Reports 12.2.1.3.0) as for example in `/u01/app/oracle/product/frs12213`. This is the top level folder in the directory structure which contains a subfolder wlserver for the Weblogic Server (WLS) software.

This means the Middleware home is also the Oracle Home for the Forms installation, another option is not supported.

A FMW home will always contain one WLS home, which will be identified with variable `$WL_HOME`. As said this is named `wlserver` (resulting in `/u01/app/oracle/product/frs12213/wlserver`).

Both environment variables `$MW_HOME` and `$WL_HOME` are set automatically when the WLS environment scripts are run (called by `setWLSEnv.sh` as present in `$WL_HOME/server/bin`).

To start the installation, check you are running a certified Java JDK (not a JRE):

```
java -version
```

and then execute this command, using the `oracle` account:

```
java -jar fmw_12.2.1.3.0_infrastructure.jar
```

☞ **Attention:**
It is assumed the java bin directory is present in your PATH, otherwise prefix the executable name with the relevant path, like for example:

```
/usr/java/jdk1.8.0_131/bin/java –jar
fmw_12.2.1.3.0_infrastructure.jar
```

This is typically needed when you have configured an existing older JDK for a previous FMW installation as the default.

☞ **Attention:**
Before you start the installer, make sure the following environment variables are not set:

- `ORACLE_HOME`
- `LD_LIBRARY_PATH`

Remove any other ORACLE_HOME directories from the PATH variable

When you have started the installer please follow the instructions below. If this is the first installation on the machine you will be asked to specify an inventory location.

- Installation Location: Specify a new location for the Fusion Middleware home, e.g. `/u01/app/oracle/product/frs12213`
- Installation Type: Fusion Middleware Infrastructure (no examples)
- Proceed with the prerequisite checks and finish the software install

3.1.3. Install Oracle Forms and Reports Services

After installation of the WebLogic Server software the FRS product must be installed.

For exact versions of the required Oracle application software and patch sets, see:

Certfication tab on My Oracle Support for product Oracle Health Insurance Back Office

Within the FMW home the FMW product FRS will be installed, with its own subdirectories in this same home folder. You must specify the same Oracle Home as where the FMW Infrastructure installation was installed in.

Summary of the installation steps for FRS:

- Set your environment:

```
. /u01/app/oracle/product/frs12213/wlserver/server/bin/setWLSEnv.sh
```

- Check and when necessary adapt your environment variables:

  `ORACLE_HOME` (empty)

  `ORACLE_BASE` (e.g. /u01/app/oracle/product)

  `JAVA_HOME` (set to directory of a certified Java 1.8 JDK)

- Unzip the downloaded distribution file. Locate file fmw_12.2.1.3.0_fr_linux64.bin and cd to that directory.
- Start the installer with the command:

  ```
  ./fmw_12.2.1.3.0_fr_linux64.bin
  ```

- Decide what to do regarding Auto Update
- Select the FMW Home that was created during the installation of Weblogic Server and specify the same folder for the Forms and Reports product, e.g. `/u01/app/oracle/product/frs12213`
- Installation Type: Forms and Reports Deployment
- Proceed with the installation steps (and implement failing prerequisites if needed) until the installation is finished.

After this you might need to install the patches as indicated in the Certification Form. At the moment of publication of this manual no required patches are known.

3.1.4. Run the Repository Creation Utility

Before you can create a Forms Domain, you must run the Repository Creation Utility (RCU) to create database schemas and objects for Oracle Platform Security Services (OPSS) and Auditing.

This is a mandatory step, even if you are not using Single Sign-On or OWSM. The Forms installation does not directly use these schemas, but the Weblogic Admin Server and the Managed Server WLS_FORMS will not start if these objects are not present.

For requirements for the database where the RCU creates the schema definitions you can use the link below:

https://docs.oracle.com/en/middleware/lifecycle/12.2.1.3/sysrs/product-specific-memory-and-disk-space-requirements.html#GUID-A5BAA99B-E383-4063-9EF7-BA963CF472A1

If the link is broken please look into chapter ‘System Requirements and Specifications’, paragraph ‘Product-Specific Memory and Disk Space Requirement’, section ‘Repository Creation Utility Requirements, RCU Requirements for Oracle Database’ in document Oracle® Fusion Middleware System Requirements and Specifications.

Summary of the installation steps when running the RCU:

- Set your environment:

  ```
  . /u01/app/oracle/product/frs12213/wlserver/server/bin/setWLSEnv.sh
  ```

- Just to be sure set your NLS_LENGTH_SEMANTICS to BYTE (for in case it is CHAR):

  ```
  export NLS_LENGTH_SEMANTICS=BYTE
  ```

- Start the installer:

  ```
  $WL_HOME/../oracle_common/bin/rcu
  ```

- Select “Create Repository” and “System Load and Product Load”.
- Enter the Database Connection Details (typically connect as a regular DBA, i.e. SYSTEM)
- Select “Create new prefix” and enter for example “SRV1FRS1” (or a more meaningful prefix, maximum length is 12 characters, see the remark below) or “FRSD2” to identify the domain name chosen later in this documentation (underscores are not allowed). Next select the following Components:
  - "Common Infrastructure Services" (mandatory)
  - “WebLogic Services” (mandatory)
  - “Oracle Platform Security Services” (this will add 3 others: Audit Services, Audit Services Append, Audit Services Viewer)

  ☞Attention:

  Do not include any indication of the OHI environment in the prefix but do consider a prefix that easily identifies this specific domain in this specific Forms installation on this specific application server as this might enable you to create several OPSS schema sets in one (central?) database.

- Enter password(s) for schemas.
- Map Tablespaces:
  You may want to store the objects of the different schemas in the same tablespace. You may want to specify a different name for a specific tablespace or for the dedicated Temp Tablespace.
  Optionally, first create a different tablespace using the button "Manage Tablespaces". Then change the "Default Tablespace" and “Temp Tablespace” for the different "Schema Owners".
- Proceed with creating the schemas (this should not take more than one to two minutes).

As a result the selected database will contain the specified schemas.

3.1.5. Configure Forms and Reports domain

When the installation of the repository objects is finished the creation of an Oracle Forms and Reports Domain can start. Only Forms Services will be configured. The resulting WLS Domain will contain the artifacts below but before starting the configuration please take notice of the attention points below:

- the *java components*
- the Admin Server
- the Managed Server(s) (JVM's) for running the Forms Service,
- the *system components* such as the Oracle HTTP server (OHS).

☞Attention:

In case you were familiar with older Forms versions, the concept of an "Oracle Instance" for Forms does not exist in FMW 12c, instead a "Forms Instance" folder structure is created within the Forms domain folder.

☞Attention:

When you have experience with older Forms versions, it is good to know OPMN no longer exists in FMW 12c, the Node Manager instead is used to manage 'system components'.

☞Attention:

You have a choice for the Node Manager:

- Use one Node Manager for each Domain (the default choice in WLS 12c)
- Use the same Node Manager for multiple (or all) Domains.

In the step "Advanced Configuration", check, "Node Manager" to specify an existing Node Manager of the same Weblogic version.

☞Attention:

To avoid port conflicts with other components/servers in any other FMW installations on the same server make sure you know the ports used by your current configuration and design a practical port assignment configuration. You can enter these ports when running the configuration Wizard.

- In the step "Advanced Configuration" below, check "Admin Server", "Node Manager", "Topology" and "System Components". This will give you the opportunity to enter port numbers for all relevant components.

☞Attention:

If you will run on a standalone application server machine and the environment is only used by a small user community (typically a custom development or test environment) you can remove the cluster during the Wizard step "Coherence Clusters". That step only becomes available if you check "Managed Servers, Clusters and Coherence" in the step "Advanced Configuration". For production environments and environments used for testing the production situation always select the clustered option because this offers much more flexibility and ease of use when more than one Managed Server is needed: the cluster can easily be extended when the Forms 'application' is deployed on the cluster instead of a specific Managed Server.

Before starting the FRS configuration make sure you implement the necessary settings in your environment:

- ozg_init.env:
  an entry for OZG_ORATAB_FRS12213 should be present which looks like the settings in the template file in the `$OZG_BASE/conf/generic` folder. Most important is that the additional settings for this environment are set like DOMAIN_NAME, DOMAIN_HOME and FORMS_INSTANCE. Choose a useful domain name which corresponds with the prefix for the OPSS schemas earlier created through running RCU.
- It is expected the file `oratab` (referred to by variable `$ORATAB`) contains an entry for the identifier identified by OZG_ORATAB_FRS12213 but also for OZG_ORATAB_WLS12213 (see again the template file or their definitions earlier in this manual).

When these settings are present in ozg_init.env please switch to the FRS environment settings through:

```
. ozg_init.env $OZG_ORATAB_FRS12213
$ORACLE_HOME/oracle_common/common/bin/config.sh
```

When you run the configuration tool please take note of the following remarks

- Create Domain, choose to create a new domain:
  - Domain Location:
    The default location is `$MW_HOME/user_projects/domains/base_domain`, where base_domain is as well the location as the name of the domain. You may want to choose a location outside the directory of the Middleware home. Beware, in the template script ozg_init.env it is assumed to be located within the Middleware home directory when you do not change DOMAIN_HOME. Make sure the value of DOMAIN_NAME and DOMAIN_HOME match the value you choose overhere.

    Instead of the default value `base_domain` we will use domain name `frs_d2` (frs_d2 for Forms and Reports Services domain 2 for release 12cR2) and refer to this name in later documentation steps.
- Product Templates, Choose option 2 and 3 from the list below, as the first option is by default required and the rest is selected when you select Oracle Forms:
  1. Basic Weblogic Server Domain - 12.2.1.3.0 [wlserver]
  2. Oracle Forms - 12.2.1.3.0 [forms]
  3. Oracle HTTP Server (Collocated) - 12.2.1.3.0 [ohs]
  4. Oracle Enterprise Manager - 12.2.1.3.0 [em] (automatically added)
  5. Oracle JRF - 12.2.1.3.0 [oracle_common] (automatically added)
  6. Weblogic Coherence cluster Extension - 12.2.1 [wlserver] (automatically added)
- Application Location:
  - The default folder name is derived from earlier input. You may want to choose a location outside the directory of the Middleware home, in a separate applications folder.
- Administrator Account:
  - Specify a username/password combination for the domain to be created to manage it later through the console with this username/password combination.
- Domain Mode and JDK:
  - Domain Mode: ‘Production’

  - JDK: check this is a 1.8 JDK
- Database configuration type:
  - AutoConfiguration Options: RCU Data
  - Vendor: Oracle
  - Driver = Oracle's Driver (Thin) for Service connections
  - Enter the details to connect to your RCU database
  - Schema Owner = <earlier chosen prefix>_STB (i.d. FRS_D2_STB)
  - Button "Get RCU configuration"
- Component Datasources:
  - Check the values for the Schemas and if needed enter the passwords you have given during the RCU step. They will be used in the next step to test the datasource connections.
- Advanced Configuration:
  - You can choose to manually add Managed Server(s) and the cluster later, from the Administration Console, or have them created by this Wizard.
Overhere, we describe the second option, running the Wizard.
  - To specify a specifc port, a different name or enable SSL for the Admin Server, check the option “Administration Server”.
  - To specify a user name and password for the new Node Manager or for an existing Node Manager, check the option “Node Manager”.
  - To specify Managed Server(s) names, ports and SSL, specify the cluster or Coherence details, check the option “Topology”.
  - Check the option “System Components” to add an Oracle HTTP Server (OHS). This is required for OHI Back Office, to facilitate for example downloading files.
  - Check the option “Deployments and Services” to define machines (including port number used by the Node Manager) and target deployments.

Depending on the selection in the steps above, several other steps will be enabled.

- Administration Server:
  - Check the default name and modify if needed
  - Check the default port and modify if needed
- Node Manager:
  - Specify the type of the Node Manager and the credentials
- Managed Servers:
  - Check the default name WLS_FORMS and modify if needed
  - Check the default port and modify if needed
  - Add more Forms Servers if needed, giving each a unique and free port number
- Clusters:
  - Check the default name of the Weblogic Cluster and modify if needed
  - Enter HTTP Frontend details, if applicable for your architecture

- Skip Server Templates and Dynamic Servers unless you do want to use this
- Assign Servers to Clusters:
  - Move your Forms Managed Server(s0 to the right to include them in the cluster, if applicable
- Coherence Clusters:
  - This cannot be removed
  - Make sure the name is unique
- Machines:
  - Make sure you use the tab “Unix Machine” for Unix/Linux servers (remove ‘regular’ machines in the Machine tab if presenty) and create a new Unix machine if not present and enable it. The “Name” does not have to match the host name
  - Choose the port nr for the machine as this will be the port number for the Node Manager
- Assign Servers to Machines:
  - Move the server(s) to the correct Machine(s)
- Move on with ‘Next’ through Virtual Targets and Partitions (use them if appropriate) until System Components is active (it will become visible if it was not yet shown)
- System Components:
  - Unless you have a custom architecture (e.g. with Frontend Host Capture), add a System Component with Component Type = OHS and as name for example “ohs1”.
    To be able to do this it was required that you selected “Oracle HTTP Server (Collocated) - 12.2.1 [ohs]” in the step “Templates” and “System Components” in the step “Advanced Configuration”.
  - When you choose ‘Next’ an extra configuration option OHS Server will appear
- OHS Server:
  - Enter the details of the Admin Host, where the Node Manager runs. The Admin Port number is not the port where the Node Manager listens (default 5556) but must be a new, unique, port.
  - The Listen Address, the Listen Port and the SSL Listen port specify the address the users will use to access OHI Back Office.Assign System components:
- Assign System Components:
  - Move the system components to the correct Machine
- Skup Deployments Targeting & Services Targeting unless you want to change something overhere
- Configuration Summary
  - Proceed with ‘Create’ to create the complete domain structure

When you apply the configuration it usually takes some minutes for executing all the steps.

Make sure you save the configuration results at the end as reported in the configuration report. Especially the URL of the Admin Server Console (../console) which can be used to derive the EM Console (../em) and should be saved for later use.

Before doing any further specific environment configuration, you should check the created domain installation, by starting the components:

☞Attention:

Variable ORACLE_HOME is not set by the scripts supplied with Weblogic. The Weblogic scripts use WL_HOME and MW_HOME. Only ozg_init.env will set ORACLE_HOME to the same value as MW_HOME.

☞Attention:

Environment variable DOMAIN_HOME is set by the script `$MW_HOME/user_projects/domains/frs_d2/bin/setDomainEnv.sh` and points to `$MW_HOME/user_projects/domains/frs_d2`

☞Attention:

Repeatedly executing $DOMAIN_HOME/bin/setDomainEnv.sh will keep on expanding EXTRA_JAVA_PROPERTIES with repeated values. You may want to unset EXTRA_JAVA_PROPERTIES before calling $DOMAIN_HOME/bin/setDomainEnv.sh

- Set the Weblogic environment:

  ```
  . $WL_HOME/server/bin/setWLSEnv.sh
  ```

  Where WL_HOME, if defined, is e.g. `/u01/app/oracle/product/fmw12c2`
- Start the Node Manager:

  ```
  . $MW_HOME/user_projects/domains/frs_d2/bin/startNodeManager.sh
  ```

- Start the Admin Server:

  ```
  $MW_HOME/user_projects/domains/frs_d2/startWebLogic.sh
  ```

  This will ask for the weblogic password.
- Connect to the Admin Server console at:
  `http://<server>:<port>/console`
  Where <port> is the port of the Admin Server, e.g. 7001.
- Start the Managed Server WLS_FORMS.
- Test access without OHS to the WLS_FORMS Managed Server:

  ```
  http://<server>:<port>/forms/frmservlet
  ```

  Where <port> is the port of WLS_FORMS, e.g. 9001

☞Attention:

We have not configured OHS for Forms yet, so the Forms Managed Server is not yet accessible over OHS.

If you encounter issues in the steps above, solve those first. If you can access the console and the Forms Server, shutdown all the components:

- Use the Admin Console to shutdown the Forms Managed Server.
- Use the Admin Console to shutdown the Admin Server

- Stop the Node Manager:
    - $DOMAIN_HOME/bin/stopNodeManager.sh

☞Attention:

Weblogic now supplies stop scripts for the Node Manager. There is no longer a need to kill the Node Manager process. Starting and stopping will be discussed in more detail later.

3.2. CONFIGURE ORACLE HTTP SERVER

In a standard FRS installation an Oracle HTTP Server (OHS) is installed and configured.

The following settings must be modified in the configuration file for OHI Back Office to work correctly. Restart the HTTP Server after implementing these changes.

This assumes you named the Oracle HTTP Server “ohs1”.

3.2.1. Prepare script startup

To start the HTTP Server from the command line, issue the following command and type the node manager password when prompted.

First time:

```
$DOMAIN_HOME/bin/startComponent.sh ohs1 storeUserConfig
```

Subsequent stop and start calls can be made without the extra parameter and without specifying any node manager password.

- Start HTTP Server:

```
$DOMAIN_HOME/bin/startComponent.sh ohs1
```

- Stop HTTP Server.

```
$DOMAIN_HOME/bin/stopComponent.sh ohs1
```

The HTTP Server must be started once, for the directories associated with "ohs1" instance to be created.

3.2.2. Register the forms URL

The web tier is not configured by default, so you will need to do the following.

Copy and edit the forms.conf config file to the "moduleconf" directory under the "ohs1" instance:

```
cp $MW_HOME/forms/templates/config/forms.conf
$DOMAIN_HOME/config/fmwconfig/components/OHS/instances/ohs1/moduleconf/
```

```
vi
$DOMAIN_HOME/config/fmwconfig/components/OHS/instances/ohs1/moduleconf/forms.c
onf
```

Activate the section for the `cluster` and change the host and port to match the WLS_FORMS properties. If you created more than one Managed Server for Forms, register all of them.

```
 <Location /forms>
```

```
      SetHandler   weblogic-handler
      WebLogicCluster host1:port1<<,host2:port2>><<,host3:port3>>
      DynamicServerList OFF
 </Location>
```

☞ Attention:

After this initial setup, you can use the Oracle Fusion Middleware Control (`<hostname>:<AdminServer port>/em`) to make further changes to *.conf files present in folder `$DOMAIN_HOME/config/fmwconfig/components/OHS/instances/ohs1`.

Unfortunately this does not work for forms.conf which is located in subfolder moduleconf and which is included dynamically.

You can access these *.conf files using the following path:

Target Navigation (Tree icon) -> HTTP Server -> ohs1.

From the dropdown “Oracle HTTP server”, choose Administration > Advanced Configuration.

On the Advanced Server Configuration page, choose a conf file in the Choose a File pull down Menu.

3.2.3. Register Virtual Directories

In the same configuration file `$DOMAIN_HOME/config/fmwconfig/components/OHS/instances/ohs1/moduleconf/forms.conf`, the Virtual Directory Mapping `/OHI/` has to be implemented to support the physical mapping to directory `$OZG_ROOT`.

This Virtual Directory Mapping can subsequently be used in formsweb.cfg for files that need to be downloaded by the user browser, e.g. the `OZG_GIF.jar` file which contains the icons for the button bar in top of the OHI Back Office user interface screens.

Sample setting:

```
Alias /OHI/ "/u01/app/oracle/product/OHI/"
```

3.2.4. Allow acess to the Release Documentation

To allow users to view the release documentation (via screen “Raadplegen release informatie” /”Consult release information”), the following settings have to be added in `forms.conf`.

Adapt the location for your installation.

```
# OHI BO: for Release documentation
<Directory "/u01/app/oracle/product/OHI/patch/1?.??.?.?.*/doc/">
  Options Indexes MultiViews
  AllowOverride None
  Require all granted
</Directory>
```

This code enables the `/doc` directory of OHI (patch) releases (always in format `19.99.9.9.9999`) can be viewed in a browser.

☞ Attention:

`forms.conf` is the file you created in the previous step. It is located in the `$DOMAIN_HOME/config/fmwconfig/components/OHS/instances/ohs1/moduleconf` folder.

Because of this complex path, we advise creating a symbolic link to it in $OZG_ADMIN, after that directory has been created, described later in this document.

3.2.5. Allow acess to application components

☞Attention:

Because OHS is based on Apache 2.4 in FMW 12c, (instead of 2.2 in FMW 11g) the syntax of commands in `httpd.conf` and `forms.conf` has changed. The security has also been tightened. All files that need to be downloadable need to have their directory registered with explicit permissions.

☞Attention:

These entries are needed for each OHI BackOffice environment if you use explicit environment names. When you use a wildcard (replace /vohi/ by /*/ in the syntax below) for the environment name you enable this once for multiple environments.

To allow users to download essential parts of the application the following settings have to be added in `forms.conf`. Adapt the location for your installation.

```
# OHI BO: for online help
<Directory "/u01/app/oracle/product/OHI/vohi/help/">
  Options Indexes MultiViews
  AllowOverride None
  Require all granted
</Directory>
# OHI BO: for batch scheduler log files
<Directory "/u01/app/oracle/product/OHI/vohi/log/">
  Options Indexes MultiViews
  AllowOverride None
  Require all granted
</Directory>
# OHI BO: for batch scheduler output
<Directory "/u01/app/oracle/product/OHI/vohi/out/">
  Options Indexes MultiViews
  AllowOverride None
  Require all granted
</Directory>
# OHI BO: for JNLP and icon file
<Directory "/u01/app/oracle/product/OHI/vohi/utils/">
  Options Indexes MultiViews
  AllowOverride None
  Require all granted
</Directory>
```

In order to have a better readability of .log and .out files in Internet Explorer it is also wise to add lines like these in `forms.conf`.

```
# for better readability of text files in Internet Explorer
<IfModule mime_module>
  AddType text/plain .out
  AddType text/plain .log
</IfModule>
```

3.3. CONFIGURE FORMS SERVER

This paragraph describes how to configure your Forms Server environment.

You may want to have a running WLS_FORMS Managed Server so you can quickly test your changes. WLS_FORMS does not require a restart for those changes to take effect.

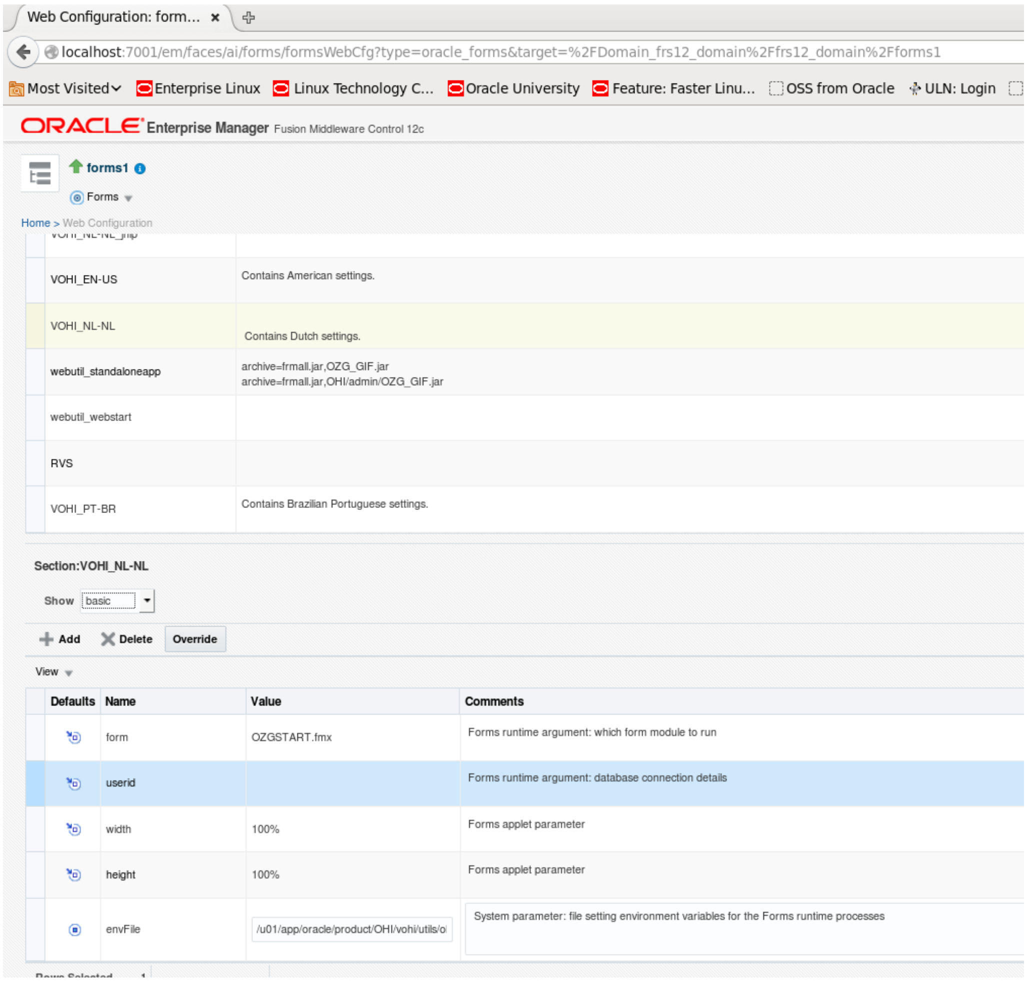
3.3.1. Configure general settings in formsweb.cfg

Configuration file formsweb.cfg in folder `$DOMAIN_HOME/config/fmwconfig/servers/WLS_FORMS/applications/formsapp_12.2.1/config` now has to be configured for the environment-specific settings.

This file can be edited manually but it is also possible to change this using Oracle Enterprise Manager Fusion Middleware Control. The `<hostname>:<AdminServer port>/em` URL can be used to start this console.

An example of the page where the configuration parameters can be changed is shown below. The WLS_FORMS server needs to be running.

You can access the page using the following steps: Target Navigation (Tree icon) -> Forms -> forms1. From the dropdown “Forms”, choose “Web Configuration”.


Web Configuration: form...
localhost:7001/em/faces/ai/forms/formsWebCfg?type=oracle_forms&target=%2FDomain_frs12_domain%2Ffrs12_domain%2Fforms1
Most Visited
Enterprise Linux
Linux Technology C...
Oracle University
Feature: Faster Linu...
OSS from Oracle
ULN: Login
ORACLE Enterprise Manager Fusion Middleware Control 12c
forms1
Forms
Home > Web Configuration

VOHI_EN-US	Contains American settings.
VOHI_NL-NL	Contains Dutch settings.

webutil_standaloneapp	archive=frmall.jar,OZG_GIF.jar
	archive=frmall.jar,OHI/admin/OZG_GIF.jar

webutil_webstart	
RVS	
VOHI_PT-BR	Contains Brazilian Portuguese settings.

Section:VOHI_NL-NL

Show basic

Defaults	Name	Value	Comments
	form	OZGSTART.fmx	Forms runtime argument: which form module to run
	userid		Forms runtime argument: database connection details
	width	100%	Forms applet parameter
	height	100%	Forms applet parameter
	envFile	/u01/app/oracle/product/OHI/vohi/utils/o	System parameter: file setting environment variables for the Forms runtime processes

The <default> configuration will be inherited by all other configurations, so generic changes can be added over there. Specific configurations with different settings can be created to support different environment settings, for example to run with different colors, a different page title or other different characteristics as described later.

The settings itself are grouped logically together. The group name used in the screen will be used to help in finding where to specify the setting.

☞Attention 1:

When upgrading an existing OHI Back Office environment, do not copy the existing formsweb.cfg from your old environment. Always use the file formsweb.cfg as delivered with the FRS installation as a starting point and merge your changes from the existing old environment into it, either by editing the file on the Operating System or by using the console.

☞Attention 2:

You need to remove the parameter serverArgs from the <default> configuration (or comment it out directly in the file). If you forget this specific startup actions will not work and Java Web Start will not load the icons for the button bar.

The table below shows the parameters which require a setting for the use of OHI Back Office. These can best be specified in the default configuration because they are usually identical for each OHI BO environment. You can always override them for configurations that need a different setting. Be sure you adapt file paths and names to your actual server setup!

The column “Group” is only relevant when using the console.

Parameter name	Group	Value	Comment
Form	Basic	OZGSTART.fmx	First window to open when forms application is started (fixed value).
term	advanced	/u01/app/oracle/product/OHI/vohi/utils/ohirf34w_nl-NL.res	This defines which keyboard mapping file to use. In the example it is defined as ohirf34w_nl-NL.res (delivered as default configuration resource file for Dutch key descriptions). Use a definition file for the language you like to use. OHI delivers some example mapping files in $OZG_BASE/conf/Back-Office which you should copy manually to your $OZG_BASE/utils folder and possibly adapt when needed. These standard files may be updated when you install a new OHI release. When you want to use different mappings for different environments please use the "term" setting as documented in the next paragraph.

The following parameters apply to the Java Plugin (JPI) for the browser that actually runs the applet which is used for displaying the user interface. It is possible to use static or dynamic versioning. Static versioning mandates an exact version of the JPI to be installed on the workstation, whereas dynamic versioning just states a minimum version and every higher version will also do.

☞Attention:

Different browsers react differently to these settings. The ever stricter security for Java Plugins also requires different settings for different JPI versions. The settings below work for Internet Explorer with JPI 1.8.92.

Dynamic versioning means value clsid:8AD9C840-044E-11D1-B3E9-00805F499D93 for JPI_CLASSID while static versioning uses clsid:CAFEEFAC-<major version>-<minor version>-<patch version>-ABCDEFFEDCBA as format.

The JPI_CODEBASE value should be a URL to a file to download the required version, but it is not more than a placeholder.

We advise to set these values also in the default environment.

Parameter name	Group	Value	Comment
jpi_classid	Plugin	clsid:CAFEEFAC-0018-0000-0092-ABCDEFFEDCBA	The ClassID of the Sun JVM to use (Internet Explorer specific). Static versioning is used.
jpi_codebase	Plugin	jpi_codebase=http://example.com/somewhere/jre-8u40-windows-i586.exe#Version=1,8,0,40	Specifies a download location if desired.
jpi_download_page	Plugin	http://www.oracle.com/technetwork/java/javase/downloads	Download location of the latest JRE installer

⚠ **Attention:** If a newer version of the Java Plugin is to be used, then the relevant JPI tags in file `formsweb.cfg` have to be changed.

The following parameters are optional. Values are given but are not required. Normally these settings are applied to the default configuration but you can implement these differently for each (OHI BO) environment. This is typically done by implementing different sections within the forms web configuration (`formsweb.cfg`), which is done in the next paragraph.

Parameter name	Group	Value	Comment
splashScreen	Applet	no	Specifies the .GIF file that should appear before the applet appears. Set to NO for no splash. Leave empty to use the default splash image.
logo	Applet	no	Specifies the .GIF file that should appear on the righthand corner of the Forms menu bar. Set to NO for no logo. Leave empty to use the default Oracle logo.
background	Applet	no	Specifies the .GIF file that should appear in the background. Set to NO for no background. Leave empty to use the default background.
separateFrame	Applet	false	If set to false the applet will appear within the browser window. If set to true the applet will appear as separate MDI window.
width	Applet	100%	Default width of the plugin. A percentage value uses all available browser space. Values above 100% will activate a scrollbar. Omitting the percentage sign means a size in pixels.
height	Applet	99%	Default height of the plugin. Values above 100% will activate a scrollbar.
dontTruncateTabs		False	Specify true if you do want tab names to be written in full (meaning less tabs are visible when there are many)
clientDPI	<unlisted>	100	100 enforces the standard size (compatible with earlier releases). **If not set the screens are a little smaller than in older releases which may result in prompts or characters partially invisible, also in 12c.**

3.3.2. Configure Environment Specific Settings in formsweb.cfg

Customer and/or OHI BO environment-specific entries in formsweb.cfg have to be set up depending on the actual situation.

Create a new section for each environment. This new section (commonly called a “named configuration”), which inherits the settings from the default section, will be referred to in the URL the user uses to start the application.

Overrule at least the following variables:

Parameter name	Group	Value	Comment
envFile	basic	/u01/app/oracle/product/OHI/vohi/ohi_servlet_wls_VOHI_NL-NL.env	Specifies the environment specific file that contains environment specific environment settings. FORMS_PATH and NLS_LANG are examples. It is wise to store these files in the $OZG_BASE location.
formParams	<unlisted>	p_mdi_window_label=OHIVM	OHI specific variable which is used in the title of the MDI window (only visible if separateFrame=true). Maximum length for the label is 10 characters.
pageTitle	html	OHI Test Environment	The title for the browser page which is used for this environment.
term	advanced	/u01/app/oracle/product/OHI/vohi/utils/ohirf34w_nl-NL.res	Optional: When a specific keyboard mapping is needed per environment specify this in the term parameter. You can create language specific keyboard mappings per environment in this way.
workingDirectory	Advanced	/u01/app/oracle/product/OHI/vohi	The directory should specify the same folder as $OZG_BASE. This is necessary for the online help and for tracing purposes.
archive	Plugin	frmall.jar, /OHI/vohi/utils/OZG_GIF.jar	Forms applet archive setting for other clients (fixed value). Uses the alias in forms.conf
baseHTMLjpi	Html	/u01/app/oracle/product/OHI/vohi/utils/OHI_JPI.htm	Location of OHI environment specific base HTML file for use with the Java Plugin: OI_JPI.htm. Delivered in $OZG_BASE/utils.

When using the console, be sure to apply each separate change to prevent losing them when switching to a new group of settings.

3.3.2.1. Java Plugin versus Java Web Start

As described in Chapter 1 the Fusion Middleware/Forms 12c release is used to introduce a new way to start and run a Forms application on the Client Tier for OHI Back Office. Now two options are supported:

Mode	Browser	Java component	Remarks
Applet in browser (traditional)	Required throughout session	JRE + JPI (java browser plugin)	Not supported in all browsers; supported for OHI
Java Web Start	Only for download of up-to-date JNLP file	JDK or JRE; no JPI (no browser plugin)	All browsers; with Single Sign-On, no Single Sign-Off; supported for OHI

By using separate sections in formsweb.cfg for both ways of running the user interface this can easily be supported. The Java Web Start mode requires some extra configuration parameters in formsweb.cfg:

Java Web Start:

Parameter name	Group	Value	Comment
basejnlp	--	/u01/app/oracle/product/OHI/vohi/utils/OHI_WEBSTART.jnlp	File as delivered with OHI BO in $OZG_BASE/utils.
webstart		Enabled	Enable Java Web Start
envVirtualFolder		/OHI/vohi	Maps the OHS virtual folder for the environment. This variable is only used by OHI_WEBSTART.jnlp.

The referenced file OHI_WEBSTART.jnlp is delivered with OHI Back Office and is based on `$DOMAIN_HOME/config/fmwconfig/components/FORMS/instances/forms1/server/base.jnlp`. It references a file OHI_EXTENSIONS.jnlp which is also delivered. Botf files are located in $OZG_BASE/utils.

The OHI BackOffice user interface can now be started outside the browser through a link in the browser with the URL that specified the section in formsweb.cfg that contains the above parameters where webstart=enabled is specified:

```
http://<server>:<port>/forms/frmservlet?config=<config name>
```

The look and feel is similar to the traditional Java Plugin mode, but the browser window can be closed or re-used for other purposes after the application window displays.

It is also an option to even start the user interface outside the browser by the command below, embedded in a command file or in a shortcut:

```
javaws http://<server>:<port>/forms/frmservlet?config=<config name>
```

This simply uses the javaws executable from the local Java Runtime Environment (JRE) and expects it can be found in a folder specified in the PATH environment variable.

3.3.2.2. Accessibility

To make OHI Back Office more accessible for the visually impaired, a parameter was introduced in “Theme” M-3053 in 2012. When this parameter is set, the OHI session will no longer skip the read-only fields during keyboard navigation. That way, a screen reader program will make the user aware of the existence of those fields.

This parameter can be set in two different ways:

1. The user adds the parameter to the URL for the application:

```
http://<server>:<port>/forms/frmservlet?config=<config name>& p_navigate_all=Y
```

2. The user uses a separate configuration in the URL for the application:

```
http://<server>:<port>/forms/frmservlet?config=<config name2>
```

For both options, configuration is needed in the file formsweb.cfg

`For option 1:`

Add p_navigate_all to "otherparams" setting in the default section:

```
otherparams=obr=%obr% record=%record% tracegroup=%tracegroup% log=%log% term=%term%
ssoProxyConnect=%ssoProxyConnect% p_navigate_all=%p_navigate_all%
```

Of course, this setting can also be made for specific named configurations only, by copying the original setting for `otherparams` from the default section to the named configuration sections you want to modify and adding the `p_navigate_all=%p_navigate_all%` only there.

`For option 2:`

Create a new named configuration <config name2> section by copying an existing section, and add the following line in that section:

```
otherparams=obr=%obr% record=%record% tracegroup=%tracegroup% log=%log% term=%term%
ssoProxyConnect=%ssoProxyConnect% p_navigate_all=Y
```

3.3.3. Configure Environment variables in *.env files

☞Attention:

When upgrading an existing OHI BackOffice environment, do not simply copy your existing <environment>.env from your old environment. Always use the file default.env as delivered with the FRS installation as a starting point and merge your changes from the existing old environment into it, either by editing the file on the Operating System or by using the console.

☞Attention:

Environment variable ORACLE_INSTANCE is no longer used.

An environment file as indicated by the envFile setting defines at least the environment specific values for the following environment variables:

```
#-------------------------------------------------------
TWO_TASK=vohi
#-------------------------------------------------------
#
#-------------------------------------------------------
OZG_LOG=/u01/app/oracle/product/OHI/vohi/log
OZG_OUT=/u01/app/oracle/product/OHI/vohi/out
#-------------------------------------------------------
#
#-------------------------------------------------------
FORMS_PATH=/u01/app/oracle/product/OHI/vohi/bin
FORMS_TRACE_DIR=/u01/app/oracle/product/OHI/vohi
# Specify which language, territory settings and
# character set to use
NLS_LANG=DUTCH_THE NETHERLANDS.WE8MSWIN1252
#-------------------------------------------------------
```

You need to create an *.env file for each environment c.q. envFile setting in formsweb.cfg. Each environment file should be based on the default.env file which is delivered in folder:

```
$DOMAIN_HOME/config/fmwconfig/servers/WLS_FORMS/applications/formsapp_
12.2.1/config
```

In the example setting above, a file $OZG_BASE/ozg_servlet_wls_vohi_NL-NL.env is referenced. That file contains settings for Dutch-speaking users.

From the settings in default.env you should normally comment out:

```
ORACLE_HOME

ORACLE_INSTANCE

TNS_ADMIN (should already be set in environment)

FORMS_PATH (set it at the bottom of the file)

FORMS_MODULE_PATH

FORMS_RESTRICT_ENTER_QUERY

PATH
```

You can specify other environment settings in the .env file, like a different value for NLS_LANG in case a multi-language environment is configured. For more information about values for NLS_LANG please see the paragraph about setting up the NLS_LANG variable.

3.3.3.1. Cancel long running queries

When you want to offer functionality to the Forms users to cancel long running queries a set of three environment variables can be used to influence this behavior:

```
FORMS_LOV_INITIAL=10000

FORMS_LOV_MINIMUM=1500

FORMS_LOV_WEIGHT=0
```

The first two variables are in milliseconds and the values as described are already present in the provided `ozg_init.env` template file. However, you might want to change this for a specific environment by overruling them in that environments .env file.

The first parameter specifies how long a query should at least run before the cancel query dialogue button appears. The second setting determines a minimum polling interval to check whether the query already provided an answer.

The third parameter specifies how to prolong the time between the subsequent Cancel Query pollings. FORMS_LOV_WEIGHT has an effect in proportion to the average speed of a round trip between the Java client and Forms server. Therefore, the slower the round trips are, the longer a particular value of FORMS_LOV_WEIGHT will delay making another time-consuming round trip to the Cancel Query window.

For much more detail about these and some other settings please read MOS document 138159.1.

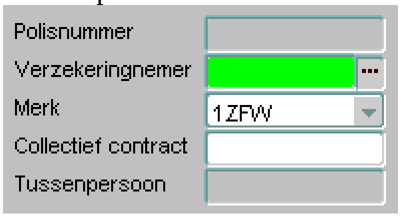
3.3.4. Configure Registry.dat

Using Oracle Enterprise Manager Fusion Middleware Control it is possible to specify specific aspects of the look and feel of the application. The page is started from the dropdown “Forms”, option “Font and Icon Mapping”. The file is located in

$DOMAIN_HOME/config/fmwconfig/servers/WLS_FORMS/applications/formsapp_12.2.1/config/oracle/forms/registry/Registry.dat

You can define whether an LOV button should appear at the right side of an item when a list of values function is defined for this item.

See the picture below for such a button on the active second field:



Polisnummer

Verzekeringnemer

Merk: 1 ZFW

Collectief contract

Tussenpersoon

To do so, specify `true` for the `app.ui.lovButtons` setting.

Be aware that the users need to know about this setting because the look and feel slightly changes. Also note that the button may temporarily cover part of a directly following field when the cursor is in the field.

On the same page c.q. in the same file, the required field visual attribute should be set to highlight **required fields**:

Please specify `true` for the `app.ui.requiredFieldVA` setting.

Adapt the color setting, for example to: 255,242,203

The result in the file will be:

```
app.ui.lovButtons=true

app.ui.requiredFieldVA=true

#    The background color is specified as an RGB triple.

app.ui.requiredFieldVABGColor=255,242,203
```

3.3.5. Using extra startup parameters

Suppose the section in formsweb.cfg is named VOHI_NL-NL. These environment settings are applied within Forms by using a URL like:

```
http://myhost.example.com:8890/forms/frmservlet?config=VOHI_NL-NL
```

If you want to add additional startup parameters to pass to the startup form you can use the parameters formParams, formParam1 and formParam2.Note that formParams, formParam1 and formParam2 have been added in the serverArgs part of OHI_JPI.htm.

In this way you can specify a form and data context to start a specific form and query data in that form. You need to specify both the form and the data by means of parameters p_context_form and p_context_keys.

A fictitious call could be like this one:

```
http://myhost.example.com:7777/forms/frmservlet?config=VOHI_NL-
NL&formParam1=p_context_form=REL1234F&formParam2=p_context_keys=bl1_co
de=AB;bl1_nr=99
```

Within OHI Back Office, the button ‘Module Info’ on the Info screen will show a list of potential queryable fields. Block name and field name should be concatenated with an underscore.

If you use these startup parameters to enter a condition for a field that is not a primary key, OHI Back Office will show a warning that the specified condition can slow down the query. That warning can be suppressed by adding the string ‘^!^’ to the condition value.

A more realistic example is shown below, where the condition on block `rel` field `n_sofi_nr` does not result in a warning because of the postfix added to the fictitious value `234234234`:

```
http://slc00tpo.us.oracle.com:8891/forms/frmservlet?config=VOHI_NL-
NL&formParam1=p_context_form=REL1001F&formParam2=p_context_keys=rel_n_
sofi_nr=234234234^!^
```

3.4. CONFIGURE SECURITY AND MANAGE STARTUP/SHUTDOWN

For production environments some basic actions should be executed to ensure a minimum level of robustness and security.

At least the communication with the console ports should be encrypted and the startup and shutdown should be automated. Automatic restart of servers in case of crashes is a requirement.

For this purpose a template script is delivered to automate starting and stopping of WebLogic Server and the additional Forms and Reports services components.

In principle you should use the node manager process to start WebLogic Server processes. This will be configured in such a way that these servers will be automatically restarted in case of failures of processes. The steps for accomplishing that are described below as guidance, but there are other ways to do this.

The template script connects to the Admin Server to execute shutdown commands, because there are experiences and known problems when stopping the servers via the Node Manager: this may result in hangs of the shutdown actions.

3.4.1. Node Manager - Additional User Definition

We advise setting up an additional user for the Node Manager process. This is especially useful for potential integration with Enterprise Manager. The user name is typically “nodemanager”.

Make sure you have a running Admin Server (use `$DOMAIN_HOME/bin/startWebLogic.sh` if needed). The port is the Admin Server port (default 7001but probably different for your environment).

The steps to create the additional user for if you did not specify one during the domain creation Wizard:

```
. ozg_init.env $OZG_ORATAB_FRS12213
$MW_HOME/oracle_common/common/bin/wlst.sh
connect('weblogic','<pw>','t3://<host>:<port>')
edit()
startEdit()
secConfig = cmo.getSecurityConfiguration()
secConfig.setNodeManagerUsername('nodemanager')
secConfig.setNodeManagerPassword('<nodemanager pwd>')
save()
activate()
disconnect()
exit()
```

Make a note of the username and password.

3.4.2. Node Manager - Change Properties File

In order to enable automatic restart of failed/failing Admin or Managed servers you should enable crash recovery for the Node Manager as well as execution of start and stop scripts.

This is done by setting the properties ‘`CrashRecoveryEnabled`’, ‘`StartScriptEnabled`’ and ‘`StopScriptEnabled`’ in `$DOMAIN_HOME/nodemanager/nodemanager.properties` to `true` (if you use the domain based Node Manager). The start script will implement the necessary domain environment settings.

3.4.3. Secure Storing of Credentials

In order to prevent having to specify an unencrypted username and password in scripts it is advised to store the `weblogic` and `nodemanager` credentials in a set of secure files.

The commands below save the credentials for both user definitions in two files per user (a credential file and an accompanying key file).

User weblogic:

Encrypted in file `$OZG_ADMIN/weblogic_frs_d2-WLSConfig.properties` which can be decrypted by WLST using the key file `$OZG_ADMIN/weblogic_frs_d2-WLSKey.properties`.

User nodemanager:

Encrypted in file $OZG_ADMIN/nodemanager-WLSConfig.properties which can be decrypted by WLST using the key file $OZG_ADMIN/nodemanager-WLSKey.properties.

☞ Attention:

> If you are running FRS 11g on the same server, be sure to choose different file names for 11g and 12c if you configure 12c for the same environment as where 11g is still running. Don’t overwrite the files for the 11g installation. Also make sure the files you specify do not exist, or you will get an error message that is hard to interpret.

Run the commands below while you have an Admin Server process running. The port is the Admin Server port (typically 7001).

```
. ozg_init.env $OZG_ORATAB_FRS12213
$MW_HOME/oracle_common/common/bin/wlst.sh
lvOZGAdmin=os.environ.get("OZG_ADMIN")
connect('weblogic','<pw>','t3://<host>:<port>')
storeUserConfig(userConfigFile=lvOZGAdmin+'/weblogic_frs_d2-
WLSConfig.properties',userKeyFile=lvOZGAdmin+'/weblogic_frs_d2-
WLSKey.properties')
disconnect()
exit()
```

Run the commands below while you have a Node Manager process running (use `$DOMAIN_HOME/bin/startNodeManager.sh` for starting).

```
. ozg_init.env $OZG_ORATAB_FRS12213
$MW_HOME/oracle_common/common/bin/wlst.sh
lvDomainHome=os.environ.get("DOMAIN_HOME")
lvDomainName=os.environ.get("DOMAIN_NAME")
lvOZGAdmin=os.environ.get("OZG_ADMIN")
nmConnect('nodemanager','<pw>','<host>','<port>',lvDomainName,lvDomain
Home)
```

```
storeUserConfig(userConfigFile=lvOZGAdmin+'/nodemanager-WLSConfig.properties',userKeyFile=lvOZGAdmin+'/nodemanager-WLSKey.properties',nm='true')
nmDisconnect()
exit()
```

To make sure the Node Manager can start the Admin Server you need to store the credentials of the weblogic user once more: store them in the file `$DOMAIN_HOME/servers/AdminServer/security/boot.properties`.

Please create this file and add two lines as shown:

username=weblogic
password=<Password>

The first time the Admin Server is started this file will be encrypted. As a result of this the credentials of the weblogic user are stored twice. Be aware of that when you change the password.

3.4.4. Server Lifecycles – Starting/Stopping Server Instances

It is advised to use the provided template script ozg_fmw12c2_main.sh (this can be found in the `$OZG_BASE/conf` folder) to start and stop the Fusion Middleware WebLogic Server Forms services.

Please make sure you adapt this script: remove carriage returns at the end (make sure to store it as Unix script), give execute permissions and adapt the first hard coded call to ozg_init.env so it contains the correct file path for your system.

You can start the FMW WLS environment using:

$OZG_ADMIN/ozg_fmw12c2_main.sh start

☞ **Attention:** When you get errors during startup of the WLS_FORMS server and the server log file reports authentication errors, please startup manually by connecting to the AdminServer through WLST and issue the `start('WLS_FORMS')` command. This will update the files in `$DOMAIN_HOME/servers/<SERVER>/data/nodemanager` directory. It might be such files are outdated.

And stopping is similar:

$OZG_ADMIN/ozg_fmw12c2_main.sh stop

This script takes care of starting and stopping the following processes:

- WebLogic processes
  - NodeManager
  - AdminServer
  - WLS_FORMS (ManagedSserver)
- Oracle HTTP Server

When you start and stop the environment with the provided template script the Admin Server may already be started when issuing the start command after the stop command (indicated by message `Error Starting server AdminServer: weblogic.nodemanager.NMException: Server 'AdminServer' has already been started`) because of the way it has been stopped: during the stop the wlst session will be disconnected and the script continues with stopping the NodeManager process. When this is executed fast the NodeManager assumes the AdminServer was still running and restarts it during the NodeManager start.

After a server reboot without a graceful shutdown you will receive messages saying the Admin Server and the Managed Server are already started. This is done again by the NodeManager, which takes considerably longer to start in such situations..

It is advised to incorporate the calls to the template script `ozg_fmw12c2_main.sh` within the `ozg_oracle_start.sh` and `ozg_oracle_stop.sh` template scripts so your environment can be started and stopped automatically when `ozg_main.sh` is called within a service definition.

3.4.5. Securing Console Communication

In order to protect your console access it is advised to secure the communication to the console port. This is described in the WebLogic Server documentation.

3.5. LIMITING RUN-TIME FOOTPRINT OF WLS SERVERS

As described in the Chapter 2 "Starting and Stopping Servers" of the manual "Oracle® Fusion Middleware Administering Server Startup and Shutdown for Oracle WebLogic Server" the server processes can be started with an option to limit their footprint. This will limit their resource usage.

The option "wlx" starts all services except:

- Enterprise JavaBeans (EJB)
- Java EE Connector Architecture (JCA)
- Java Message Service (JMS)

If you only run Forms Services you can run Weblogic with this limited footprint by editing file `$DOMAIN_HOME/bin/setDomainEnv.sh`.

Add the following lines behind the complete statement `EXTRA_JAVA_PROPERTIES=" -Xms512m -Xmx1024m`…. followed by the `export` (so after the export statement):

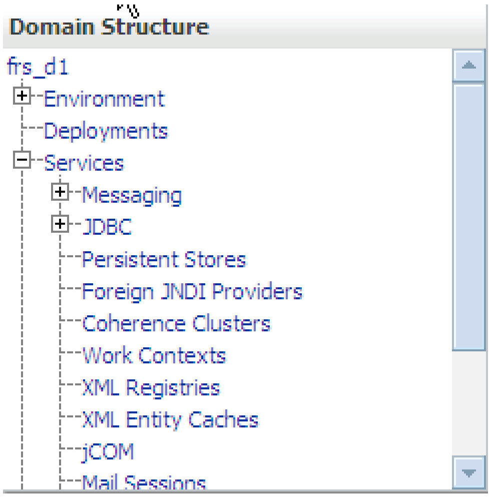
```
EXTRA_JAVA_PROPERTIES="-DserverType=wlx ${EXTRA_JAVA_PROPERTIES}"
export EXTRA_JAVA_PROPERTIES
```

Be sure the line is added before the line where `JAVA_PROPERTIES` is set using this setting `EXTRA_JAVA_PROPERTIES`.

When you restart your server processes this setting is applied.

You can notice whether this setting is active by checking in the Administration console if "Messaging" services are available.

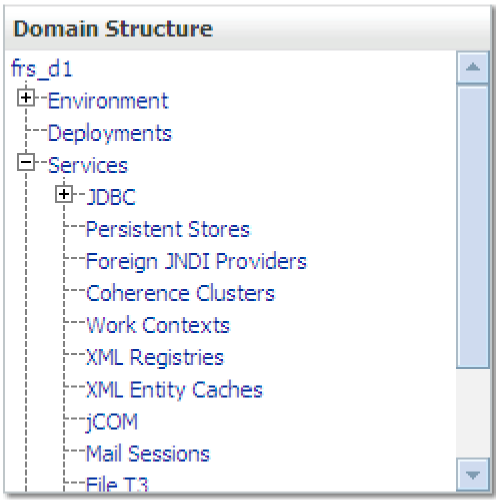
The picture below shows them:



Domain Structure

- frs_d1
  - Environment
  - Deployments
  - Services
    - Messaging
    - JDBC
    - Persistent Stores
    - Foreign JNDI Providers
    - Coherence Clusters
    - Work Contexts
    - XML Registries
    - XML Entity Caches
    - jCOM
    - Mail Sessions

And this is the picture when the footprint is limited:



Domain Structure

- frs_d1
  - Environment
  - Deployments
  - Services
    - JDBC
    - Persistent Stores
    - Foreign JNDI Providers
    - Coherence Clusters
    - Work Contexts
    - XML Registries
    - XML Entity Caches
    - jCOM
    - Mail Sessions
    - File T3

The “Messaging” branch below “Services” is now missing.

3.6. IMPROVING STARTUP TIME OF WEBLOGIC

It might be that you experience intermittent delays when starting the WebLogic environment. This can be caused by the Random Number Generation functionality which may block until sufficient “noise” is generated (in fact an Entropy issue occurs). If your environment exhibits this behavior you can test by multiple executions of the line below where random info is read from the random “generator”. If one or more of these calls experience delays you may change to using /dev/urandom. There is a lot of discussion whether this is less secure or not so if you are not sure do not change this in a sensitive environment (production?).

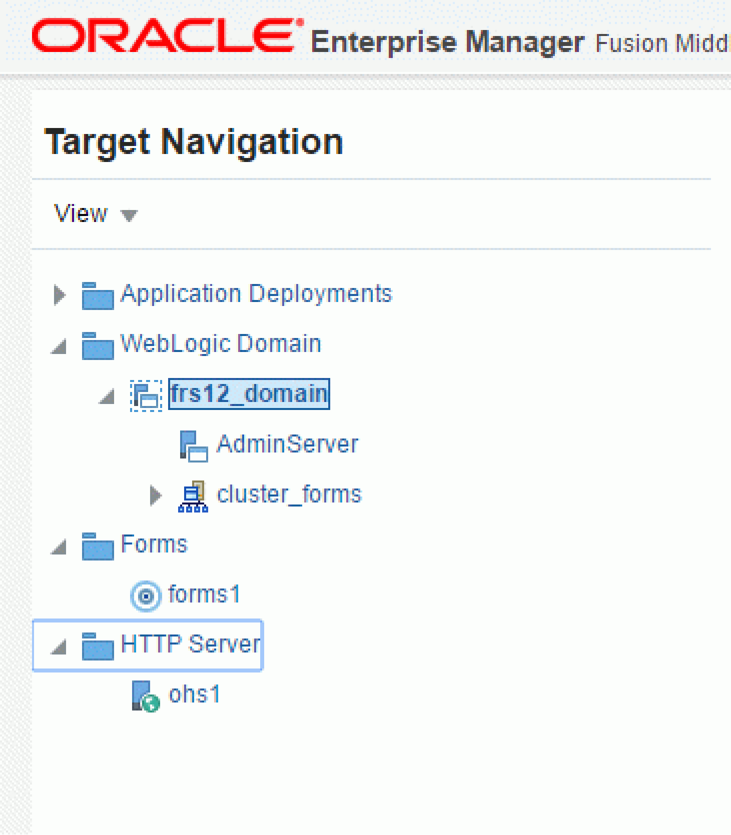
```
head -n 1 /dev/random > tmp.tmp
```

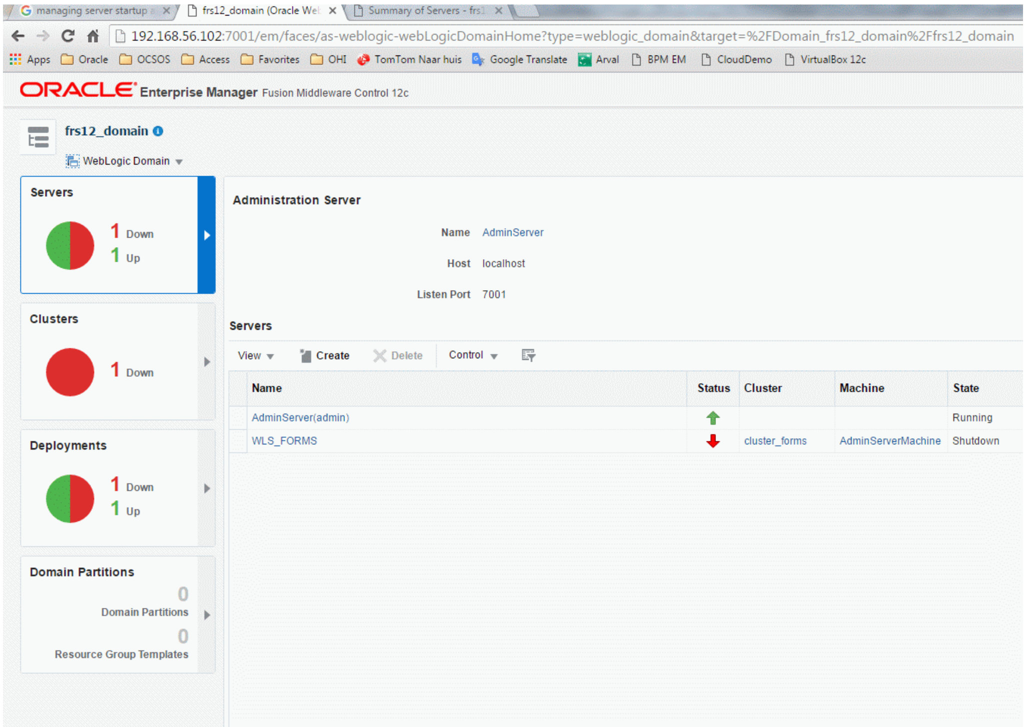
For more information about this topic please see MOS document 1574979.1.

3.7. ADDING MANAGED SERVERS TO ‘CLUSTER_FORMS’

If you have chosen a cluster setup during the configuration of the Forms services, you will have a Weblogic cluster named “cluster_forms”.

In EM control this will show up like:





192.168.56.102:7001/em/faces/as-weblogic-webLogicDomainHome?type=weblogic_domain&target=%2FDomain_frs12_domain%2Ffrs12_domain

Administration Server

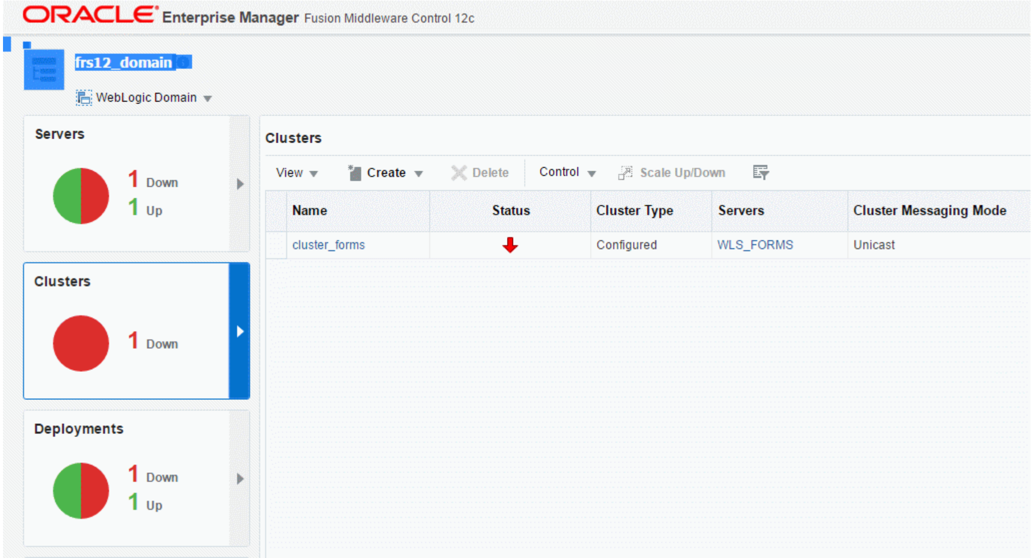
Name AdminServer

Host localhost

Listen Port 7001

Servers

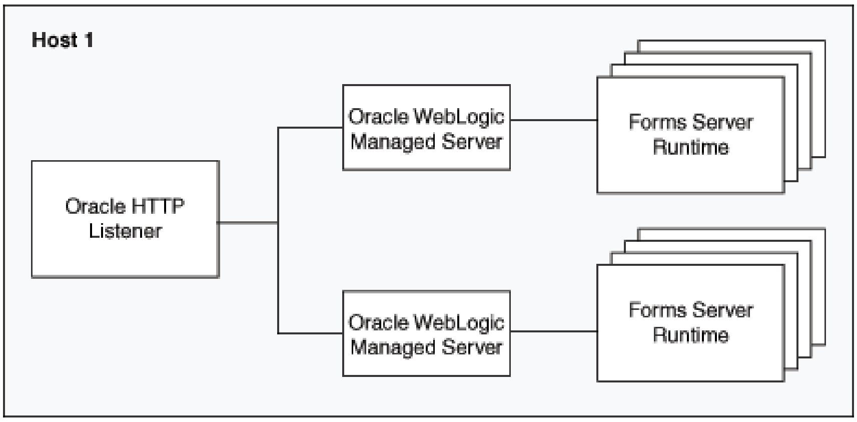
Name	Status	Cluster	Machine	State
AdminServer(admin)	↑			Running
WLS_FORMS	↓	cluster_forms	AdminServerMachine	Shutdown



Name	Status	Cluster Type	Servers	Cluster Messaging Mode
cluster_forms	↓	Configured	WLS_FORMS	Unicast

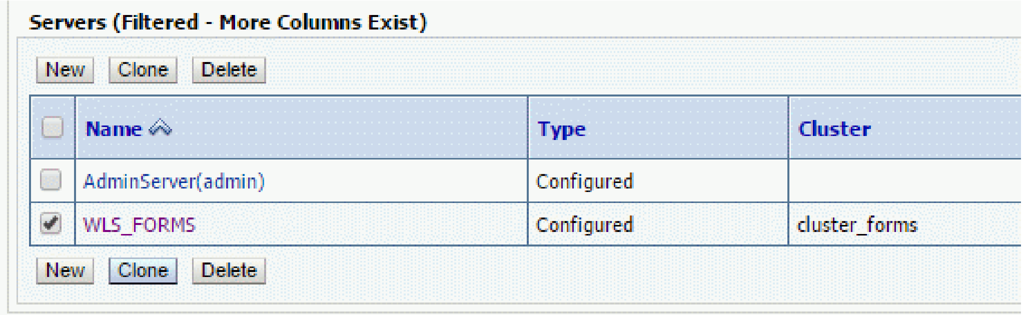
Your user community may generate more load than one Managed Server can handle with the default setup. The steps for tuning the Forms Listener servlet are similar to steps for tuning any high throughput servlet application. You have to take into account resource management and user needs for optimal tuning of your particular Forms Services configuration. For more information, see Oracle Fusion Middleware Performance Guide.

If tuning does not solve the issues, one of the options is setting up additional Managed Servers and load balance the requests. This is described in the Forms Services Deployment Guide. A potential configuration is shown below:



Additional Managed Servers can be added to the cluster ‘cluster_forms’ in several ways, eg.

- creating a new server manually and adding it to the cluster
- cloning an existing Managed Server, using the Clone option in the Control tab in the Administration Console:



Servers (Filtered - More Columns Exist)

☐	Name	Type	Cluster
☐	AdminServer(admin)	Configured	
☑	WLS_FORMS	Configured	cluster_forms

You need to specify a new name and port for the new Managed Server.

☞ **Attention:** In the WebLogic Server Basic license, the use of the WebLogic Server Administration Console for cloning a Managed Server instance is not permitted.

When the new Managed Server has been added to the cluster it can be started. It should be added to the ozg_fmw12c2_main.sh script.

In order to make sure the requests are balanced over the available Managed Servers the Oracle HTTP Server settings have to be adapted in `$DOMAIN_HOME/config/fmwconfig/components/OHS/instances/ohs1/moduleconf//forms.conf`.

Please change the WebLogicCluster line and add the additional servers like in the example below:

```
<Location /forms>
   SetHandler weblogic-handler

   WebLogicCluster host1:port1,host2:port2

   DynamicServerList OFF

</Location>
```

Of course you need to restart the OHS afterwards to enable these settings.

3.8. UNDERSTANDING THE BATCH SCHEDULER

This section briefly describes the functioning of the batch scheduler.

3.8.1.1. Batch scheduler

The OHI Back Office batch scheduler is a Pro*C daemon (a continuous process), implemented as a single process that runs on the application server. If there is more than one application server it is possible to start a process per application server (please see this paragraph for more information regarding this).

The process is implemented by an executable named SYSS004S.

OHI Background 'jobs'

The batch scheduler is 'assisted' by Oracle Scheduler database job processes, job scheduler processes executing OHI related background maintenance tasks implemented with the job scheduler as present in the database.

OHI uses several scheduler job types:

- A master job that takes control over the other OHI job executions. This job is always active.
- Cleanup redundant/obsolete units of work of the batch scheduler (for jobs that did not finish all their collected work units due to a time constraint or failure).
- Process business event handlers for near real time events. At least one job is always active; more than one job can be active. The number of jobs is determined by a Back Office parameter and can be dynamically adjusted when the parameter value is changed. When the master job executes housekeeping (normally each batch scheduler polling interval), the changed value is picked up.

- Purge messages from the event handler (stored in ALG#MELDINGEN, table alias MEL, identified by column EDE_ID not being null) that passed the retention period (specified by a Back Office parameter).
- Purge trace messages from ALG#TRACE_SESSION (alias TSS) and ALG#TRACE_LOG (alias TLG) that passed the retention period (specified by a Back Office parameter).
- Purge payment messages form FSA#BET_VERKEER_REGEL_LOGGING (alias BLG) that passed the retention period (specified by a Back Office parameter).
- Evolve SQL Plan Baselines as created when using SQL Plan Management (for more information about using SQL Plan Management please see information later in this manual).

You can query these jobs (and their execution interval) through the USER_SCHEDULER_JOBS view in the OHI application owner account.

When the OHI Back Office batch scheduler starts, these scheduler jobs are started or scheduled when not yet present. When the stop command is issued for the batch scheduler, the trigger on the updated record in ALG_BATCH_SCHEDULERS will issue the stop command for all background jobs. So be sure a graceful stop is executed by calling OZG_STOP_BATCH.sh if these jobs need to be prevented from starting on their next intervals.

Scheduled 'batch' processes

The OHI Back Office batch scheduler *iteratively performs* the following activities for the OHI Back Office application requested scripts:

1. Starting the new script requests
2. Checking the ongoing script requests

This process of starting and checking can be influenced by means of a number of settings in the application (screen System/Management/General/System parameters (in Dutch: *Systeem/Beheer/Algemeen/Systeemparameter,* tab page *Batch scheduler*) (for a more elaborate description of the batch scheduler functionality, see the description of Business Function SYSS004S in the Oracle Designer Repository).

One of the settings is the *Polling interval*; during this period the batch scheduler "sleeps" and will only be woken up by a newly created request. Scheduled script requests will not wake up the batch scheduler and will therefore not be started until the polling interval has passed.

1 - Starting new script requests

When incoming script requests (newly created or already planned) have to be started, first there is a check to see if the maximum number of parallel script requests has been reached or not.

In order to determine this number (to be set up in OHI Back Office by means of *Max. parallel script requests*) the number of script requests with status `Start` and R`unning` is summed.

If this maximum number has not yet been reached, the new script request can be started (although this may not occur if the request is for a master process and the maximum nr has almost been reached, in such a case there always remains spare capacity for sub process requests as otherwise processing may stop because no actual work is done anymore).
If the maximum number has been reached, the script request to be started will still have status W`aiting`.

The remaining "capacity" (this means the number of script requests that can still be started) can be retrieved in the log file of the batch scheduler `($OZG_LOG/<batch account>_<sid>_<host>.log`) when it runs in *verbose* mode.

If no script requests are created in the *Polling interval* period, and if therefore no new script requests have to be started, the batch scheduler will proceed with activity 2: check the ongoing script requests.

2 - Checking the ongoing script requests

Regarding the started processes (= "ongoing script requests") 2 matters are checked:

1. Has the script request been started within the margin?
2. Is a script request with status "Running" (ongoing) indeed still active?

Re 1. Has the script request been started within the margin?

If the batch scheduler observes a script request in table `ALG_SCRIPT_AANVRAGEN` waiting to be started, then the status will have the value `W (Waiting).`
If the request has to be started, then the batch scheduler will change the status to `Start` and the process will be started on the OS.
The data of the started process can be found in the log file of the batch scheduler if it runs in *verbose* mode.

An example of a script request process of the type ‘sqlplus’:

```
15:31:12:nohup nice -19 $OZG_BASE/utils/OHI_CMD.pl sqlplus -l -s /
@$OZG_BASE/sql/ZRG4032S $OZG_OUT/manager/12779968.out 12779968
>$OZG_LOG/manager/12779968.log 2>&1 & echo $!
```

The script *itself* will (by means of the generic startup code) set the status of the relevant script request to `Running`.
If the status transition `Start->Running` has not occurred within the configured period (batch scheduler setting *Start delay*), the "Bijzonderheden" (Details) section of the script request will display the following message*“job niet gestart binnen marge”* (job not started within the margin). The status of the script request will then be set to “`Failed”`.

Normally, the script will be started: the process has been started already, but it simply has not reached the startup code yet within the specified "*start delay”.*
Once the script is ready it will then set the status of the relevant script request to `Ready` or `Error` (= functional error).
Any **ERROR** *message “job not started within the margin”* will then be changed into an **INFO** message.

What are the possible causes of a script not starting in time?

1. **Start delay too low**
   This setting has been configured so low that the server cannot activate the script fast enough.
2. **Server capacity insufficient**
   The server is loaded so heavily that it takes long before a script is activated.

Re 2. Is a script request with status "Running” indeed still active?

If the script request has status `Running`, then the batch scheduler will perform a check on the OS or in the database (depending on the type of script) to ensure that a process is indeed still active for this script request.

If it turns out that this process is no longer active, then the script request is considered to have `Failed`; the process has not been finalized correctly (given that the end code in which the status is set to `Ready` or E`rror` has not been executed).

At the end of this check phase, the batch scheduler will check if the Oracle Scheduler job for processing real time events is still running. If not, it will be restarted.

After performing the above checks (= activity 2 – *Checking the ongoing script requests*) the batch scheduler will proceed with activity 1 (*Starting new script requests*), etc.

3.8.1.2. Different types of batches

The scripts started by the batch scheduler can be of different types, such as a *SQL module*, *Perl script* or *OS shell script*.

3.8.1.3. See also

For tuning the batch scheduler see the explanation in ‘batch scheduler settings’.

4. INSTALLATION OHI BACK OFFICE APPLICATION SOFTWARE

Installation of the OHI Back Office application software consists of the following steps:

4.1. CREATING ACCOUNTS & AUTHORIZATION

In order to create the required database accounts and roles and to assign the correct authorizations, the OHI Back Office installation script `OZGI001S.sql` has to be run via SQL*Plus under account `SYS`.

This script creates an Oracle database schema which contains OHI Back Office objects. The standard name for this schema is: `OZG_OWNER`.

Additionally, for object authorization a secure database role is created: `OZG_ROL`.

For security reasons, another account is created that will execute dynamic pl/sql code with limited privileges at runtime. The standard name for this account is: `OHI_DPS_USER`. The password of this account should be specified during the installation but the application does not need to know it as a proxy connect will be used when a logon to this account is needed.

To support the Virtual Private Database (VPD) implementation an additional account is created that owns duplicate view definitions of the non-VPD related views owned by `OZG_OWNER`. The (fixed) name for this account is: `OHI_VIEW_OWNER`. The password of this account should be specified during the installation but the application does not need to know it as a proxy connect will be used when a logon to this account is needed.

A separate account is created for the OHI Back Office batch scheduler. The standard name for this account is: `BATCH`. If necessary, it is possible to use a different account name; the name of the account to be used has to be registered in the System parameters.

Finally, all required authorizations will be distributed.

4.1.1. Security of the batch scheduler account

Access to the batch scheduler account is arranged by means of a Secure External Password Store (SEPS). This SEPS feature uses an Oracle Wallet. A SEPS can store one or more username/password combinations in an encrypted file.

The wallet will be used to pass the username/password combination for the batch account during batch processing.

Before the wallet can be used to pass credential information to the database for Oracle Net connections, the Oracle Net client must know where to look for the wallet. This is specified in the `sqlnet.ora` file as the `WALLET_LOCATION` parameter and should specify the directory location of the wallet created in the next chapter.

In this example we will create the wallet in the `$ORACLE_HOME/network/admin` directory on the application server, so the following entries need to be added to the `sqlnet.ora` file:

```
WALLET_LOCATION =
(SOURCE =
   (METHOD = FILE)
       (METHOD_DATA =
       (DIRECTORY = /u01/app/oracle/product/12.2.0.1/db_1/network/admin)
   )
)
SQLNET.WALLET_OVERRIDE = TRUE
SSL_CLIENT_AUTHENTICATION = FALSE
```

These settings cause all sqlplus /@<db_connect_string> statements to use the information in the wallet at the specified location to authenticate to the database. The <db_connect_string> identifies a username/password combination in the wallet, if present. So a connect string which is known in the wallet identifies exactly one username/password combination.

The wallet itself consists of two files, ewallet.p12 and cwallet.sso. The last one contains the actual username/password combinations and must be protected with correct operating system access rights: any OS user who can read the wallet can use it to connect to the accounts stored in the wallet! Only the OS user `batch` and the oracle software owner need this file access.

Create the wallet using the syntax 'mkstore -wrl [wallet_location] -create'. The example below creates it in the current directory (identified with '.'):

```
mkstore -wrl . –create
```

The two files that implement the store (ewallet.p12 and cwallet.sso) are now created. You will be asked to define a password to protect the contents of the wallet. This password will be asked whenever you access the wallet with management commands.

Store a credential using:

```
mkstore -wrl [wallet_location] -createCredential
[db_connect_string] [username] [password]
```

A credential consists of a combination of a database alias (a.k.a. `db_connect_string`), username and password. The alias must be a known 'service name alias', a TNS entry, in tnsnames.ora; so add it to the tnsnames.ora if necessary.

The simplest way to use this mechanism is to create an entry for the existing environment database alias, for example for 'acct' or 'prod'. However, this means that every OS user who uses for example the syntax 'sqlplus /@acct' (and has operating system read access to the wallet files) will connect as user batch to the acct environment.

When you want to make it clearer that a specific alias identifies the username/password combination for the batch account it might be a good idea to use an alias like 'acct_batch' and store the username/password for this connect string.

For a RAC environment this should be the way to go to have a specific service identifying the node(s) on which the batch scheduler (and the batches) should run.

If you use a connect string that is different from the standard connect string, the start and stop commands for the batch scheduler require this special connect string as additional parameter (see later).

Here is an example, assuming the wallet is in the current directory, a specific connect string is used and the password of the batch account is 'ohibo':

```
mkstore -wrl . -createCredential prod_batch batch ohibo
```

This requires an entry `prod_batch` in `tnsnames.ora` that determines the database that the wallet entry will connect to.

Instead (or additionally) you can add an entry for the 'regular' Oracle Net alias, which is prod in the example below:

```
mkstore -wrl . -createCredential prod batch ohibo
```

In these examples, the entries `prod` and `prod_batch` in `tnsnames.ora` are equal, except for their names.

If you are using OHI Data Marts, you need to create a credential for the alias that is used as database identification for the Data Marts database in the Data Marts related batches (e.g. ZRGOE01S, ZRGOS01S and ZRGOD01S).

IMPORTANT: If you do use a different connect string to identify the batch username/password combination for the Data Marts batch user be aware that the 'application users' should use this new connect string to define the connection to the Data Marts database. Inform them about this!

Use the following syntax to show a list of currently defined credentials:

```
mkstore -wrl [wallet_location] -listCredential
```

Use the following syntax to change an existing credential:

```
mkstore -wrl [wallet_location] -modifyCredential
[db_connect_string] [username] [password]
```

An example for when the password of the batch account above has changed to ohibo2010, issue the following command:

```
mkstore -wrl . -modifyCredential prod_batch batch ohibo2010
```

Finally, use this syntax to remove a credential:

```
mkstore -wrl [wallet_location] -deleteCredential
[db_connect_string]
```

So credential prod_batch can be removed by issuing:

```
mkstore -wrl . -deleteCredential prod_batch
```

⚠ **Attention:**

Make sure you do not edit a wallet that is used in a FMW 11g environment with tools from a later environment (DB12201, FRS12213). This will make the wallet unusable in the FMW 11g environment (ORA-12534: TNS: operation not supported errors during Forms generation will occur). An implicit upgrade is executed that is incompatible with FMW 11g. Execute `. ozg_init.env` FRS11G2 before issuing the mkstore commands. The mkstore command will show you its' version, e.g. `Oracle Secret Store Tool : Version 11.1.1.7.0`

⚠ **Attention:** When using Forms 12c it is fine to use mkstore of the database 12c Oracle Home as well as of the Forms Oracle Home as both are version 12. The mkstore of Forms 12c is located in the $ORACLE_HOME/oracle_common/bin folder.

⚠ **Attention:** When connecting to the database as OS user oracle using the syntax ‘sqlplus / as sysdba’, read access to the wallet file cwallet.sso is needed if the wallet is activated in the active sqlnet.ora file, even when TWO_TASK is unset. So make sure both the OS user which is owner of the oracle sofware as well as the batch user have read access but other users not.

It is possible to further prevent unauthorized use of the batch scheduler account(s) by creating a logon database trigger for the batch account. Since database version 11.1.0.7 this trigger is no longer *mandatory*.

4.1.1.1. Details

The Oracle batch account has database role OZG_ROL_BATCH to have access to the OHI Back Office database objects stored within the table owner.

The database batch account is authorized by means of the wallet file as this specifies the password for the database account. So if someone gets hold of the wallet files he/she can log in with ‘/@<alias>’ instead of by entering a username/password combination, from any workstation that is connected to the network, and impersonate the batch account. So it is clear access to the wallet files must be limited.

When you know someone has ‘stolen’ the wallet you can of course change the password of the batch account but you can also limit unauthorized access pro-actively in a different way as described now.

This security risk can be mitigated by checking, in a logon database trigger, the IP address of the client session for the Oracle `batch` user. If the IP address is not included in the list of permitted IP addresses, the session will be refused and the database connection will be aborted. In this way the administrator has an additional means to prevent improper use of the batch account.

4.1.1.2. Example

As an example, this is a logon trigger for a fictitious situation:

Batch user	`batch` (in the database, OS user may differ)
Permitted servers	Local connection on the database server 144.21.160.66 (database server) 144.21.160.68 (application server via Oracle*Net)

The matching trigger code is included here (and is also available in the `$OZG_BASE/conf` folder in file ozg_on_logon_batch.treg):

```
create or replace trigger batch.ozg_on_logon_batch
after logon on batch.SCHEMA
begin
  /* Perform optional IP checks as mentioned in the OHI Back Office
Installation Guide */
  declare
    l_addr varchar2(100) := sys_context('userenv','ip_address');
  begin
    if nvl(l_addr,'local') not in ('local'
                                  ,'144.21.160.66'
                                  ,'144.21.160.68')

    then
      raise_application_error('-20001','Connection refused');
    end if;
  end;
end ozg_on_logon_batch;
/
```

4.1.1.3. Implementation of limitative Logon Trigger

The implementation of the logon trigger that limits unauthorized access is as follows:

- Determine the name of the database batch account
- Determine the servers with their IP addresses that have access to the batch account
- Modify the trigger code from the sample for your situation
- Create the trigger using a user with DBA privileges (e.g. `SYS` or `SYSTEM`).
  If the trigger is not created under the `batch` user then it will *not* be activated when logging on!

4.2. INSTALLATION OF THE APPLICATION

There are a number of ways to install the application, of which the most important ones include:

4.2.1. An Initial Installation

This is the case if the database contains an empty schema (created as described in the previous paragraph) in which all objects will be installed from scratch.

In order to create the OHI Back Office objects for the owner account `OZG_OWNER` and to locate the application sources, an OHI Back Office initial release has to be installed.
A description can be found in the following document:

OHI Installation of releases

4.2.2. A Copy of an Existing Installation

This is the situation when an existing environment is copied to the new environment and consists of two main parts

1. Transfer the database objects of the application to another database.
2. Transfer the application server objects (by means of copying the `$OZG_BASE` directory, and afterwards modifying a number of settings; see the following paragraphs).

4.3. CONFIGURE AUTHORIZED APPLICATION SERVERS

After the database objects have been installed you need to register in the database which application server is allowed to start the OHI Back Office user interface against this database. The IP address of the application server (or servers) has (have) to be saved in the database for security reasons.

The ‘granted’ ip addresses will be stored in table ALG#IP_ADRESSEN.

There are pl/sql packaged procedures to assist you in adding or deleting addresses:

- "Owner".ALG_IAS_PCK.INS("IP address") for adding a new IP address.
- "Owner".ALG_IAS_PCK.DEL("IP address") for deleting an existing IP address.

Use these routines while connected to the database as the OHI BackOffice schema owner or as a privileged administrator account. Finish the transaction with a commit to make a change permanent.

4.4. COMPILE AND CHECK APPLICATION SOFTWARE

4.4.1. Compilation

Now compile all relevant application objects (database and application server side). To do this, execute the following activities in the OHI Back Office installation menu:

1. Activity 120 for the compilation of database objects (e.g. packages and procedures in the database) and creating synonyns as well as updating grant privileges.
2. Activities 800 and 810 for the compilation of client objects (e.g. screens and menus)

A description can be found in the following document:

OHI Installation of releases

4.4.2. Check

Now check the findings of OHI Back Office Object Check (via installation menu activity 900) or by starting a script request in the application (and process the findings). The latter requires a running batch scheduler and a correct directory configuration (see later).

4.5. CONFIGURING DIRECTORIES

Use screen “System/Management/General/System parameter” to configure directories for reading and writing OHI Back Office application files (such as output of script requests, online help information and release documentation).

For the virtual directories be sure to specify the correct port of the Oracle HTTP Server (OHS), or make the entries relative to the HTTP Server by starting them with /OHI (the virtual root folder configured in OHS).

☞ **Attention:** If RAC is used then the directories have to be created on a shared file system.

For a detailed description see:

Reading, Writing and Authorising OHI Back Office application files

4.6. REGISTERING BATCH SCHEDULER ACCOUNT

The name of the batch scheduler account (normally `batch`) has to be registered in the system parameters (screen "System/Management/General/System parameter", tab page "Batchscheduler", item "Batch account").

5. COMPLETING THE INSTALLATION

This chapter describes the completion of installation of OHI Back Office.

5.1. SYNONYMS FOR DATABASE LINKS

If synonyms have to be created for objects regarding database links (e.g. for OHI Data Marts and/or GL objects), then the database link has to meet the following requirements:

1. The domain has to be included in the database link (e.g. `prod.world` instead of `prod`);
2. The database link has to have the same name as the global name of the database.

5.2. STARTING OHI BACK OFFICE BATCH SCHEDULER

The OHI Back Office batch scheduler can now be started; see Starting.

5.3. CHECKING THE INSTALLATION

The technical installation now has to be tested in order to determine whether or not it has been successful.

The minimal requirements to be tested include:

- OHI Back Office User Interface
  - Access to batch request log and output files
  - Access to online help
  - Access to release documentation
  - Menu authorization
- OHI Back Office batch scheduler
  - Functionality
  - Output
  - Messages in batch scheduler log file
  - Messages in log files of script requests
  - Availability of log and out directories for all users
  - Availability of database accounts for users of log and out directories
- Starting/stopping the complete OHI Back Office environment (including Database Server, Application Server, and OHI Back Office batch scheduler)
- Checking the log files (see also Checks)

5.4. CREATING BACKUPS

After testing the installation, a full cold backup has to be created for the relevant file systems of the application server. A full backup of the database is also required, using your preferred method.

☞ **Attention:** In case of RAC: Because ASM is used the use of RMAN is mandatory when it comes to the database. RMAN in combination with ASM is further described in appendix B.

This may be a good time to test your backup and restore procedure for the environment.

5.5. ACTIVATING JOBS

The regular jobs for administration now have to be activated.
See the following chapters for possible jobs in the area of Oracle and OHI Back Office.

5.6. INSTALLATION ORACLE DESIGNER

OHI Back Office metadata is still available as an Oracle Designer Repository dump file with each OHI Back Office major release. This dump file can be imported in an Oracle Designer Repository.

In a future release, still to be determined, this dump file will no longer be delivered.

6. ORACLE ADMINISTRATION RELATED TO OHI BACK OFFICE

The OHI Back Office application runs on an Oracle database, and uses Application Server runtime software.
Administration of this environment is the responsibility of the DBAs of the customer.

⚠ **Attention:** As mentioned earlier on, this document does not intend to provide instructions in terms of the Oracle Database & Application Server administration.
The DBA's of the customer should have sufficient knowledge, skills and experience in order to perform this administration task in a correct way.
If the administration is not performed correctly, Oracle can provide no guarantees as to the correct functioning of the OHI Back Office application.

In order to emphasize the importance, the most significant points of interest involving Oracle Database & Application Server administration *related to* OHI Back Office are mentioned here *explicitly*.
The following enumeration is therefore a *minimal set of mandatory tasks and activities, which are required for the correct implementation of* OHI Back Office, and they should *not* be considered as a "manual" for the DBA's. Evidently, each activity mentioned has to be tested and documented extensively.

Chapter 8 provides experience and advice as to how the administration could and should be performed. The administration activities described provide a good start.

6.1. BACKUP & RECOVERY

6.1.1. General

File system backups for the application server and output files are not described but are of course important.

There are various options to create a database backup.

☞ Oracle recommends the use of Recovery MANager as a database backup tool.

☞ If ASM is used as a shared storage solution, the use of Oracle RMAN is mandatory.

Since the *10g* release of the DBMS, Oracle provides the possibility to use a Flash Recovery Area (FRA) for storing backup related data.

☞ Oracle recommends using FRA, particularly for a faster recovery of the Database.

Ensure proper backup and restore procedures for the software used (e.g. Database, Application Server, ASM, RAC, OHI Back Office, etc.) and the relevant file systems;

Testing and checking of the backup and restore procedures is considered a standard procedure for system management, and has to be performed on a regular basis.

When it comes to using hot or cold backups, no specific requirements apply in combination with OHI Back Office.

6.1.2. RAC (paragraph is not updated for database 12c!)

In an Oracle RAC environment some additional requirements apply.

In addition to the database backup, a backup has to be created of the Oracle Cluster Registry (OCR) and the Oracle Voting Disk (OVD).

This is particularly important when nodes have to be added or deleted.

To this end the environment has to be configured by means of `ozg_init.env CRS10G`.

This sets two environment variables. The links refer to the descriptions:

1. OCR_BACKUP
2. OVD_BACKUP

Use the command `ocrconfig -export $OCR_BACKUP` to create an export of the Oracle Cluster Registry.

Command `dd` creates a backup of the Voting Disk.

For example dd if=<naam voting_disk> or=$OVD_BACKUP.

Ensure that the backups are available on the shared disk.

6.2. STARTUP AND SHUTDOWN

6.2.1. Order

- After starting the database listener and the database, the OHI Back Office batch scheduler has to be started;
- Before the database is shut down, the OHI Back Office batch scheduler has to be stopped;

6.2.2. Automation of Startup/Shutdown

- It is highly recommended to restart/shutdown the Oracle system software automatically during startup/shutdown of the relevant servers;

6.2.3. Checks

- Check of the various Oracle system software files, e.g. trace files, alert files, audit files, AS log files `error_log*, access_log*, default-web-acces.log, em-web-acces.log, , ipm.log`, `application.log` (Forms!)) etc.
- Check the OHI Back Office batch scheduler log files for possible errors;
- Check cause(s) for failed script requests (status M (failed)).

6.2.4. RAC

In an Oracle RAC environment some additional requirements apply.

In an Oracle RAC environment two or more instances may be active.

An important issue is that starting and stopping an Oracle RAC environment is performed in a slightly different manner than a single instance environment.

☞ Use the `srvctl` command to start and stop RAC components *instead of* `SQL*Plus`.

When starting instances with `SQL*Plus`, services are not always started automatically as well. If afterwards these services are started manually, then CRS is not aware of these services.

6.3. PERFORMANCE TUNING AND MONITORING

- OHI Back Office uses the Oracle *cost-based optimizer*; to this end it is mandatory that regular jobs are run which e.g. perform the following tasks: Collecting *statistics* for *tables* and *indexes*, collecting *system statistics*, collecting statistics for the SYS schema.
  For the OHI Back Office tables, *monitoring* is selected by default, which allows for *stale* statistics to be used.
- Regular tracing of activities in order to recognize performance bottlenecks.
- Deployment of the right disk settings for Oracle; e.g. keeping in consideration RAID levels, striping, controllers etc.;
- Performing regular checks of OS, Oracle and application performance by using the relevant diagnostics tools;
- Monitoring network performance, memory, disk I/O, disk space etc.
- Configuring and implementing Oracle Resource Management;
- Monitoring SPM repository growth, execution of evolve tasks, purging of baselines;
- etc.

☞ **Advice:** Oracle recommends using Enterprise Manager Cloud Control for the active day to day monitoring.

6.3.1. RAC

☞ Oracle recommends using Enterprise Manager Cloud Control for managing and monitoring an Oracle RAC environment.

To this end an Oracle Enterprise Manager *Management Pack* license is required as an extra option.

In an Oracle RAC environment one or more instances can be active.

For Database Management this entails more emphasis on performance monitoring.

In an Oracle RAC environment the most important performance issues to be recognized include the following:

- Performance of the Interconnect
  As a guideline this is maximum 5ms.
- Performance of the Global Cache

If errors are encountered in terms of performance when using OHI Back Office in an Oracle RAC environment, the delivery of performance data will continue in the same way as described in section Collecting Performance Data.

Additional information regarding RAC Performance Monitoring can be found in the following documentation:

Oracle Clusterware and Oracle Real Application Clusters Administration and Deployment Guide, chapter 13 ‘Monitoring Performance’.

6.3.2. Rebuilding Indexes

In our experience, few indexes ever need rebuilding.

Conditions for rebuild would be

- Large free space (generally 50%+), which indexes rarely reach, *and*
- Large selectivity, which most index accesses never reach, *and*
- Response times are adversely affected, which they rarely are.

Therefore the OHI general advice on rebuilding is:

- Do not rebuild indexes.
- Use `REBUILD` if the whole index structure is very poorly fragmented.
- Use `COALESCE` to reduce index fragmentation in a portion of the index.
- Use `SHRINK` to reduce index fragmentation in a portion of the index and the actual blocks associated to the index.

6.4. USING SQL PLAN MANAGEMENT

The OHI Back Office application supports the use of SQL Plan Management (SPM) functionality to reduce the possibility that SQL statements ‘suddenly’ execute a lot slower than before because of a changed execution plan. This paragraph describes the current support.

6.4.1. Introduction

A short introduction is given to SQL Plan Management in combination with the Oracle Health Insurance Back Office application.

6.4.1.1. SQL Plan Management

These paragraphs describe how OHI BO supports the SQL Plan Management (SPM) feature of the Oracle RDBMS. A customer can enable SPM for OHI BO to achieve SQL execution plan stability, thereby generally preventing that execution plans for SQL statements change until it has been proven the change is an improvement. This plan stability is needed as these changes could sometimes be for the worse and might be caused by for instance:

- the installation of a new database (and thus optimizer) version,
- the installation of a major patch set for the database (for instance an SPU),
- changes to optimizer statistics for a table based on its changed contents,
- other types of changes:
    - system statistics and system settings (e.g. db_cache, pga_aggregate_target),
    - optimizer related changes in the spfile,
    - schema and metadata definitions (new/modified indexes and/or constraints),
    - SQL profile creation,
- the adaptive cursor sharing feature,
- the cardinality feedback feature.

All of the above can introduce a change in the execution plan of a SQL statement during a hard parse. Typically a changed plan will perform at least as good as the previously used execution plan for the SQL statement. However, every now and then the change encompasses a regression. And depending on the OHI BO process in which this regression occurs, the change can cause a significant performance issue and from that lead to a service disruption. To prevent this, SPM is introduced in the OHI BO application.

6.4.1.2. Prerequisites

The following settings are advised for SPM:

- *Optimizer_use_sql_plan_baselines needs to be set to FALSE*
  Setting this parameter to FALSE at the instance level, may seem strange. However, OHI supports the use of SPM on a database session-by-session basis. OHI BO will set this initialization parameter to TRUE in those sessions that are configured to use SPM. This is done via ‘alter session’ statements embedded in OHI BO application software.
- *We advise following defaults for the two SPM configuration parameters:*
  SPACE_BUDGET_PERCENT → 30%
  PLAN_RETENTION_WEEKS → 60 weeks
  SPM stores its data in the SYSAUX tablespace. The percentage parameter value denotes the threshold of storage used in SYSAUX by SPM above which the instance will write warnings to the alert.log file of the database. Depending on the size and usage of the SYSAUX tablespace on your site, you can increase the percentage threshold. The second parameter specifies the number of weeks during which execution plans will be retained by SPM. This parameter should be set to at least a full year.

  You can set these parameters within the OHI pluggable database through commands like:

  ```
  exec dbms_spm.configure('SPACE_BUDGET_PERCENT',30);
  exec dbms_spm.configure('PLAN_RETENTION_WEEKS',60);
  ```

  You can query the configured values through dictionary view DBA_SQL_MANAGEMENT_CONFIG.

  You can monitor the space usage approximately by using the query below for occupant SQL_MANAGEMENT_BASE (SMB, SQL Management Base):

  ```
  select occupant_name
  ,      space_usage_kbytes
  ,      to_char
         (100*space_usage_kbytes/
           (sum(space_usage_kbytes) over ())
         ,'990D9')
         ||'%' percent
  from   v$sysaux_occupants
  order by
         2 desc
  ```

  Beware that the percentage can become more than the specified percentage as this is only used to trigger the writing of warnings.

- *Following object and system privileges are required by OHI BO's owner schema:*
  - execute on sys.dbms_shared_pool
  - administer sql management object

6.4.2. Enabling SPM for OHI BO

6.4.2.1. User interface and WS support for SPM

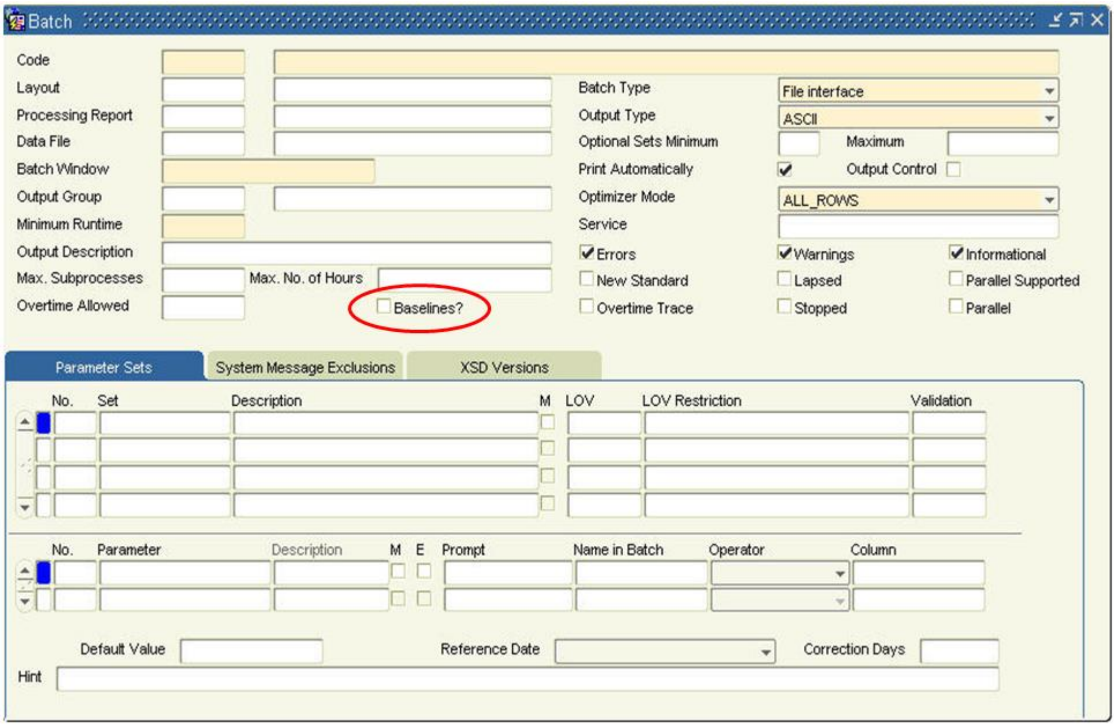
OHI BO supports SPM for Forms modules and web services by means of a Back Office parameter specifying to enable or disable this (application wide).

6.4.2.2. Enabling SPM for a specific Batch definition

It is possible to enable the use of SPM baselines for plan stability at the level of individual batch definitions. This is done in the batch screen module (SYS1008F), which can be found from the menu via the following path (when running with English as application language): *System* -> *Management* -> *Module* -> *Batch* -> *Batch*.

Figure 2.1 shows a screenshot of this module. Near the middle it has the 'Baselines?' checkbox. By unchecking this, you ensure that later runs of this batch will not be using the SPM feature. When this is checked all future runs will issue the following two statements at the beginning of the run:

- `alter session set optimizer_use_sql_plan_baselines = true;`
- `alter session set optimizer_capture_sql_plan_baselines = true;`



Batch Type: File interface
Output Type: ASCII
Print Automatically ☑
Output Control ☐
Optimizer Mode: ALL_ROWS
☐ Baselines?
☑ Errors
☑ Warnings
☑ Informational
☐ New Standard
☐ Lapsed
☐ Parallel Supported
☐ Overtime Trace
☐ Stopped
☐ Parallel

Figure 2.1: The Batch Management page (SYS1008) with baselines checkbox.

6.4.2.3. Enabling SPM for the whole database

Instead of using the Back Office parameter and script definitions for activating SPM it is possible and allowed to specify the use of SPM instance-wide by setting the two initialization parameters for this:

- optimizer_capture_sql_plan_baselines
- optimizer_use_sql_plan_baselines

When these are set to true all processes within the database will be using SPM.

6.4.3. SPM Maintenance and Administration

Introduction of the SPM feature for OHI BO requires little attention of the application DBA. However, there are a few topics that the DBA should be aware of. These are addressed in this paragraph.

6.4.3.1. Monitoring SYSAUX Tablespace Usage

SPM uses a repository (SQL management base, SMB) of execution plans that are to be used for executing the application SQL statements. This repository is stored in the SYSAUX tablespace. The Oracle DBMS monitors the space usage of this repository. It will signal when the storage of the SPM repository has reached the threshold value as specified by the SPACE_BUDGET_PERCENT parameter discussed in the ‘Prerequisites’ paragraph. This is done by writing a message to the instance’s alert.log file.

```
Tue Oct 22 04:20:04 2013
SPM: SMB space usage (...) exceeds ...% of SYSAUX size (...).
```

The DBA shuold monitor the appearance of this message in the alert.log file. A way to do this is by introducing a monitoring metric using OEM Cloud Control, see the Appendix for setting this up. Whenever this message appears you should ensure that SYSAUX still has enough room to cater for the storage growth of the SPM repository: either extend the tablespace, or increase the threshold value when enough free space is still available in the tablespace.

6.4.3.2. Monitoring OHI Evolve Job results

When batch jobs or other sessions run in ‘SPM mode’, not only will they use the execution plans that are stored in the SPM repository, but they can also introduce new execution plans into the SPM repository. SPM will prevent the use of these new execution plans until they have been proven to be at least equal to, or better than, the existing execution plans in the SPM repository. Validating that it is okay to use these new plans is called ‘evolving’ these plans.

The OHI BO application automatically evolves new plans through a daily OHI Evolve job. This is implemented through a background job as described for the batch scheduler. A Back Office parameter is present to specify the number of days between actual executed evolves (usually set at 1) so the actual load can be planned to occur only once in a specified number of days. This can be used to postpone evolves during for example a period where all capacity is needed or you do not want other execution plans.

The results of this (normally daily) evolve job are recorded in the `alg#sql_baselines_log` table. It is advised that the DBA monitors the contents of this table on a regular (e.g. weekly) basis to validate that the evolve job is doing its work correctly. You can do this by checking the output of this query:

```
select *
from   alg#sql_baselines_log
where  action = 'EXCEPTION'
```

There should be no exceptions reported. If there are, please log a service request with OHI support.

6.4.3.3. Disabling the ‘standard’ Evolve Job

The database contains a standard advisor job as one of the jobs within the Automatic SQL Tuning Task. Starting with database release 12.2 this job will be enabled and will execute evolve actions for enabled and not yet accepted plans. These evolve actions do interfere with the OHI backgroun maintenance job and disturb a correct working. And as the OHI job currently contains more relevant functionality it is very strongly advised to disable the standard job. Unfortunately this task cannot be disabled separately so the current only way to prevent the task interferes is by giving it no time to do its work.

To disable the task execute:

```
DBMS_SPM.set_evolve_task_parameter
( task_name => 'SYS_AUTO_SPM_EVOLVE_TASK’
, parameter => 'TIME_LIMIT’
, value => 0
);
```

You can check in the days after this action the execution actually fails as intended by querying the executions:

```
select *
from   dba_advisor_executions
where  task_name = 'SYS_AUTO_SPM_EVOLVE_TASK’
order by
       execution_start desc;
```

6.4.3.4. Undoing results of OHI Evolve Job

You can undo the results of the most recent evolve job. In an exceptional situation, support may request you to do this. Evolve jobs are identified by a run_id. First you would need to determine the run_id value of the most recent evolve job. The following query will do this.

```
select max(run_id)
from   alg#sql_baselines_log
```

Using that run_id’s value, execute the following packaged procedure, followed by a commit:

```
alg_qbl_pck.undo_evolve([run-id value]);
commit;
```

6.4.3.5. Packing SPM repository

OHI Support may request you to deliver the contents of the SPM repository. OHI Support may require the contents of your repository in order to resolve a performance related service request. Upon such request, execute the following packaged procedure.

```
alg_qbl_pck.export_baselines
```

This procedure will ‘pack’ your SPM repository into a table **`alg#sql_baselines_stage`**. Using datapump export you should then export this table into a dump file. This dump file can be sent to OHI support.

6.5. INSTALLATION, CONFIGURATION, UPGRADE, MIGRATION AND VERSION CONTROL

- Installation of new releases and patches for Oracle Database and Application Server, possibly by means of Rolling Upgrades.
- Installation of new releases and patches for OHI;
- Planning upgrades and migrations;
- etc.

6.5.1. RAC

- If setup correctly, CRS will automatically start and stop the components required for the cluster (incl. database and listeners); check this configuration of dependencies by means of `crs_stat`;
- Use `crsctl check cluster` to check all nodes in CRS.
- Use `ocrcheck` to check the integrity of OCR (and mirror);
- Use before and after the different stages of the installation process the Cluster Verification Utility `cluvfy`.
- See installation and configuration for further information regarding the installation.

6.6. ACCESS CONTROL AND SECURITY PRIVILEGES

- Access control of the relevant OS accounts (e.g. `root`, `oracle` and `batch`);
- Access control of the default Oracle database accounts (e.g. `SYS` and `SYSTEM`).
- Access control of the OHI Back Office Oracle database accounts (e.g. `OZG_OWNER` and `MANAGER`);
- Changing the passwords a.s.a.p. (after the initial installation);
- Configuring a password algorithm and validity duration, in other words setting up a policy in terms of password management;
- Access control when OHI Back Office is implemented in a web-based architecture on intranet or the Internet;
- File access. A good practice for better protection would be to use umask 037 and assign all files in the $OZG_ROOT folder structure to a special OHI group which is also the primary group of the batch account. This requires manual

- Monitoring security alerts (http://otn.oracle.com/deploy/security/alerts.htm).
- etc.

6.7. SPACE AND STORAGE MANAGEMENT

- Managing the available and required disk space;
- Managing storage settings for objects;
- Shrinking objects (e.g. based on Segment Shrink Advisor);
- Managing the size of various Oracle system software files, e.g. trace files, alert files, audit files, AS log files `error_log*, access_log*, default-web-acces.log, em-web-acces.log, OPMN log files etc.`
- Managing the size of OHI Back Office Batch scheduler log and output files in `$OZG_LOG` and `$OZG_OUT`.
- etc.

6.8. LICENSE CONTROL

- Checking license issues for the installation of new releases and/or patches or the use of certain options and/or tools;
- etc.

6.9. NETWORKING

- Making use of Oracle Net *dead connection detection* by means of configuring parameter `SQLNET.EXPIRE_TIME` in file `sqlnet.ora` with a value larger than zero. For more information please see the Net Services Reference manual as being part of the standard database documentation.
- etc.

6.9.1. RAC

- For RAC environments it is crucial that the different nodes have the exact same system time; it is highly recommended to use NTP in this case (Network Time Protocol).
- If in an Oracle RAC environment an instance is positioned in restricted mode (= required for the installation of OHI (patch) releases), then the services for that instance will be stopped (by the Oracle Clusterware, only in case of *dynamic registration* with the listener). Connection to the instance will still be possible via:
    1. `SID`; this is to be used for connecting to the container database for executing DBA tasks; if tasks need to be executed for the pluggable database the session needs to switch to this PDB container.
    2. Service Name; if this is used, which is necessary for OHIPATCH.pl to connect, then `tnsnames.ora` has to be modified in the connect string (see also My Oracle Support note 301099.1).
       Between the `CONNECT_DATA` and `SERVICE_NAME` entries the following has to be added:
       (UR=A)

Remark: Working with service names is preferred.

7. OHI BACK OFFICE MANAGEMENT

The management activities for OHI Back Office can be subdivided into tasks for System management/DBA and tasks for creating new application users.

7.1. SYSTEM MANAGEMENT/DBA

7.1.1. Oracle Environment

On the OS server *myhost* (a representative name for the servers on which OHI Back Office is run) the OS account `oracle` is the owner of the OHI Back Office files.

The OS account `batch` is the owner of the OHI Back Office batch scheduler.

Script `$OZG_ADMIN/ozg_main.sh` can be used in the boot sequence and backup sequence of the OS server in order to stop and start the complete OHI Back Office environment (this means DBMS, AS, OHI Back Office batch schedulers, OEM etc.).

7.1.1.1. Starting

Under OS account `root` enter the following command:

```
ozg_main.sh start
```

7.1.1.2. Stopping

Under OS account `root` enter the following command:

```
ozg_main.sh stop
```

This script uses the scripts `ozg_oracle_start.sh/ozg_batch_start.sh` and `ozg_oracle_stop.sh/ozg_batch_stop.sh` to stop/start all Oracle related processes and batch schedulers.

☞ If the Database Tier and Middleware Tier are installed on different servers, then script `ozg_main.sh` has to be available on both servers.

☞ For using RAC other start and stop scripts are used. For more information see appendix B.

7.1.2. Clients

The user interface of the application OHI Back Office can be started on a client PC or Terminal client via a browser by means of an URL like:

http://<host>:<port>/forms/frmservlet?config=Prod

It is recommended to configure a DNS server that enables all relevant clients in the network to access the relevant host. If a DNS server is used then it is not required to manage the local host files on each client PC.

Additionally, it is recommended to position all relevant URLs for OHI Back Office on a company portal or homepage, in order to simplify the implementation and management.

The value of parameter config refers to the configuration as it can be found in file $DOMAIN_HOME/config/fmwconfig/servers/WLS_FORMS/applications/formsapp_12.2.1/config/formsweb.cfg.

7.1.3. OHI Back Office Database

The following provides an overview of the 5 general OHI Back Office database accounts and *initial* passwords with their usual usernames (you may use other usernames but initial installation scripts use this and this documentation will refer to these account names):

1. `OZG_OWNER/<specified during installation>`
   Owner account for the OHI Back Office data structure.

2. `OHI_VIEW_OWNER`
   Account that holds duplicates of all view definitions owned by the `OZG_OWNER` account to support the Virtual Private Database (VPD) implementation, except for the views that are related to this VPD implementation itself.

3. `OHI_DPS_USER/<specified during installation>`
   Account that executes the dynamic pl/sql code, using correct and allowed object privileges, that can be configured within the application.

4. `MANAGER/<specified during installation>`
   OHI Back Office application manager with full menu authorization.

5. `BATCH/<specified during installation>`
   Owner account for the OHI Back Office batch scheduler.

7.1.4. OHI Back Office Batch Scheduler

The OHI Back Office batch scheduler handles script requests which are submitted by the end users of the OHI Back Office application.

7.1.4.1. Starting

Service Name Versus Environment Name

Under OS account `batch` enter the following command for the environment in question; the Environment Name of the environment for which the batch scheduler has to be started is provided as a parameter.

```
 . ozg_init.env environment_name
 $OZG_BASE/sh/OZG_START_BATCH.sh environment_name
```

The script will start for 1 environment, 1 batch scheduler on 1 server.

It is possible to use a separate service name next to an environment name. This is typically useful when a Secure External Password Store is used with a name which is different from the environment name and which identifies the batch username/password combination. This service name can be passed as ‘connect’ parameter:

```
. ozg_init.env environment_name
$OZG_BASE/sh/OZG_START_BATCH.sh -connect service_name environment_name
```

Verbose Mode

By means of parameter `-verbose` (optional) it is possible to start the batch scheduler in *verbose* mode; in this mode extra information is written in the log file, which allows for any problems or questions to be examined:

```
 . ozg_init.env environment_name
 $OZG_BASE/sh/OZG_START_BATCH.sh -verbose -connect service_name environment_name
```

Retention Period for Log Files

When starting the batch scheduler, the last (optional) parameter is the retention term (in days) of the log files of the batch scheduler.
By default this is 7 days.

```
   . ozg_init.env environment_name
  $OZG_BASE/sh/OZG_START_BATCH.sh environment_name 14
```

7.1.4.2. Stopping

Under OS account `batch` enter the following command for the relevant environment:

```
. ozg_init.env environment_name
$OZG_BASE/sh/OZG_STOP_BATCH.sh environment_name
```

Or when a separate service name is used to connect to the user batch:

```
. ozg_init.env environment_name
$OZG_BASE/sh/OZG_STOP_BATCH.sh -connect service_name environment_name
```

The script will stop for 1 environment, all batch schedulers on all servers.

In the overall scripts `ozg_batch_start.sh/ozg_batch_stop.sh`, which are called by `ozg_main.sh`, the aforementioned calls are included to start/stop *all batch schedulers for all environments on 1 server*.

☞ The OHI Back Office batch scheduler runs on the Middleware Tier.

💡 See Appendix A - configuration multiple batch schedulers for the implementation of *multiple* batch schedulers in case multiple application servers are allocated.

☞ For the configuration of the batch scheduler in an Oracle RAC environment, please refer to appendix B.

7.1.4.3. OHI Back Office batch scheduler Output and Log Files

OHI Back Office recommends to regularly clear the OHI Back Office batch scheduler output files in the directory `$OZG_OUT` and the OHI Back Office batch scheduler log files in the directory `$OZG_LOG`.

7.1.5. Changing Settings

7.1.5.1. Changing Software Trees

In a standard configuration, after the installation of OHI Back Office, the Oracle environment is setup in the Application Server software tree.

In order to configure the Oracle environment in the 12cR2 Database Server software tree (in a configuration for which the Database Tier and Middleware Tier are installed on the same server), the following script can be used:

. ozg_init.env $OZG_ORATAB_DB12201

In order to reset the environment for the 12c R2 Application Server software tree, the following calls can be used:

Example:

. ozg_init.env $OZG_ORATAB_FRS12213

7.1.5.2. Changing Environments

In order to configure the OS environment for a specific environment for which the Application Service software tree is used, the following commands can be used, e.g.:

```
. ozg_init.env prod # configuring the prod environment settings

. ozg_init.env test # configuring the test environment settings
```

In order to configure the OS environment for a specific environment for which the Database software tree is used (e.g. for startup/shutdown of the instance), the following commands can be used, e.g.:

```
. ozg_init.env $OZG_ORATAB_DB12201 # configuring the 12c database software
. ozg_init.env prod                # configuring the prod service_name.

. ozg_init.env $OZG_ORATAB_DB12201 # configuring the 12c database software
. ozg_init.env test                # configuring the test service_name
```

In the above situation the first call will recognize the passed name identifies a database Oracle Home and will clear the $TWO_TASK variable (whatever it is) while retaining the $ORACLE_SID). The second call will set both $ORACLE_SID and $TWO_TASK to the passed environment name. After that a call like `sqlplus ozg_owner/ozg_owner` will use the environment name in $TWO_TASK to connect to the specified service name set by the second call to ozg_init.env.

When it is needed to connect to the root container of the container database, for example to execute instance management actions like starting the instance, the commands above should be used in the opposite order and specify the name of the instance of the container database:

```
. ozg_init.env CDB01                # configuring the SID name
. ozg_init.env $OZG_ORATAB_DB12201 # configuring the 12c database software
```

In the above situation the first call will set both $ORACLE_SID and $TWO_TASK to the passed instance name. The second call will recognize the passed name identifies an database Oracle Home and will clear the $TWO_TASK variable (while retaining the $ORACLE_SID).

A call like `sqlplus / as sysdba` will connect to the root container. By means of `alter session set container=<pdb_name>` the to SYS connected session can be changed to the specified pluggable database.

7.1.6. Adding New OHI Back Office Application Environments

When a new OHI Back Office application environment within an existing software environment is required, the following steps have to be performed in the Middleware Tier:

1. Add a batch scheduler start command for the new environment in `$OZG_ADMIN/ozg_batch_start.sh`.
2. Add a batch scheduler stop command for the new environment in `$OZG_ADMIN/ozg_batch_stop.sh`.
3. Configure a new environment *`ENV_NAME`* in `$DOMAIN_HOME/config/fmwconfig/servers/WLS_FORMS/applications/formsapp_12.2.1/config/formsweb.cfg` by means of the Enterprise Manager control application for the Forms and Reports services.
4. Add an ozg_servlet_wls_<ENV_NAME>.env file with appropriate settings in $OZG_ADMIN (if you referenced this location in the variable.
5. Create a new application directory `$OZG_ROOT/`*`environment_name`* and complete it with the relevant OHI Back Office application software.
6. Install the OHI Back Office application software for the relevant environment.

7.2. CREATING NEW APPLICATION USERS

The following steps have to be performed when configuring a new end user for the OHI Back Office application:

7.2.1. Creating an Oracle Account

First of all, an Oracle account has to be created in the pluggable database for the new end user. Subsequently, the required system privileges have to be assigned to the new account.
This step can be performed by means of the `CREATE USER` command in SQL*Plus as user `SYS` or `SYSTEM` while connected to the pluggable database.

Example

```
create     user         scott
identified by           tiger
default    tablespace   users
temporary  tablespace   temp
quota      unlimited on users
/
grant create session to scott
/
grant alter session to scott
/
```

☞ If OHI Back Office is configured with SSO the user must be created in the Oracle Internet Directory, see section Configuring Database Authentication

7.2.2. Creating Directories for the New User

For each new end user directories have to be created in the Middleware Tier for OHI Back Office batch scheduler output files and OHI Back Office batch scheduler log files. These files need to be downloadable from the Forms application, c.q. the users' browser.
This has to be performed under OS account `batch`:

```
mkdir $OZG_OUT/<new account>
mkdir $OZG_LOG/<new account>
```

<new account> is the name of the Oracle account of the new end user, in *lower case*.

Example

```
mkdir $OZG_OUT/scott
mkdir $OZG_LOG/scott
```

☞ If a RAC environment is used then the directories have to be created on a shared file system. For more information see appendix B.

7.2.3. Storing Application Authorization

Now the new end user can be authorized for application OHI Back Office. In order to create the authorizations, start the application and log on as `MANAGER`.

1. Create a “Functionaris” (executive) for the new end user in screen “Systeem/Beheer/Autorisatie/Gebruiker” (system/management/authorization/user).
2. Now assign the required roles by means of menu authorization in the same screen. The standard menu role `MANAGER_ROL` has full menu authorization; other roles can be created and set up as desired.
3. Close the application, restart it and log on as the new end user in order to test the newly created account.
   If desired, the user settings can be modified by means of screen “Bewerken/Instellingen” (Edit/Settings).
4. It is optional to configure the required functional application authorization (company access, authorization for administrative organizations, brands etc.)

7.3. INSTALLATION OHI (PATCH) RELEASES

The installation process of OHI (patch) releases is described in the OHI Release Installation Manual and is performed on the Middleware Tier:

Oracle Health Insurance Installation of Releases

For new customers this and any other relevant details will be shown by Oracle in a knowledge transfer session.

7.4. CLONING AN OHI BACK OFFICE ENVIRONMENT

During the lifecycle of an OHI Back Office environment the wish may come up to copy an environment to a new environment or to overwrite an existing environment with another existing environment. In short we refer to this as ‘cloning’ an environment.

As technical setup and configuration may differ a lot between customers and technical infrastructures there is no standard way to describe this. Next to that the impact on interfaces with other applications and systems is environment specific.

For this reason only some generic guidelines can be given regarding what should be done to clone an OHI Back Office environment.

7.4.1.1. Definition of an ‘Environment’

When an OHI Back Office environment should be cloned we expect the pluggable database, application server configuration and accompanying file system storage should be ‘cloned’: a copy should be made so it can run under a different ‘name’ (alias).

7.4.1.2. Identical Technology Stack

For cloning to succeed it is expected the ‘OHI contents’ are moved to a technical infrastructure that is identical, meaning it contains identical database and application server software, including the patches installed for this technology stack.

7.4.1.3. Database ‘copy’

It is expected the pluggable database itself can be cloned (physical or virtual using for example storage technology) and started using a different name (export and import might be an option but requires a special approach and is much more time consuming; cloning a pluggable database is fairly easy).

7.4.1.4. Clone ‘approach’

In rough lines the following actions should be executed to clone an OHI Back Office environment:

1. Determine a source environment that is stable (stopped or frozen) and can be ‘copied’.
2. Choose an appropriate new name for the new environment (use useful naming conventions).
3. Make sure you have a container database to plug the pluggable database in to.
4. Copy/clone the pluggable database and copy clone the application server file system with the OHI software. This is typically the $OZG_BASE folder structure. Make sure it is copied to an environment where $OZG_ADMIN is based on the same or newer releases of OHI Back Office.
5. Copy/clone additional file system structures as used by your environment (typically locations identified by $OZG_OUT and $OZG_LOG and file system locations you have defined in database directories), for as far as you need historic input and output files.
6. Choose the pluggable database name and create it using the new name (typically partly identical to the application server environment, the name of the $OZG_BASE folder).
7. Create at least a service to connect to the pluggable database and consider deleting the services that were previously used, for the old name. Do not forget to change the startup trigger that starts these services, if needed (depends on the way the trigger is created).
8. Adapt the servlet .env files (it is assumed you store them in $OZG_BASE): change the name when it contains the environment name; change the settings in the .env file where they contain environment specific settings such as TWO_TASK or a file system location.
9. Change the WebLogic Server configuration for Forms and Reports so that new environment entries are present for all environment specific variables.
10. Adapt/add tnsnames.ora entries and wallet entries so they are present for the new environment.
11. Update startup/shutdown scripts that contain environment specific entries.
12. Update ozg_init.env if you have environment specific settings in there.

13. Update/add IP addresses if the IP address of the application server that will be used is unknown.
14. When you are able to startup the pluggable database make sure you update the environment specific entries in tables ALG_SYSTEEM_PARAMETERS and ALG_BO_PARAMETERWAARDEN (this can be done through the System Parameter and Back Office parameter screen when you have configured the application server for the new environment; when you update the database you may script this for efficiency reasons). Typically the settings for the batch scheduler and file locations may have to change.
15. Update the database directories you may have configured for output so they reflect the different output location if that is environment specific.
16. Deploy the Connect to Back Office and Service Layer web services if they are needed for this environment.
17. Change database links if relevant.
18. Implement any additional changes for custom code (using dynamic code within OHI or using custom code schema owners or other interfaces).
19. Thoroughly check whether you are complete. Especially when you made a clone from a production environment, in which case you should be sure there is no interaction with any production functionality.

Make sure you understand the process above and identify any possible omissions. Test whether all functionality is working correct. After this publish the name, URL’s, WSDL’s, etc. of this environment to your ‘user community’.

8. REFERENCES FOR ACTIVE MANAGEMENT OF OHI BACK OFFICE

In this chapter a possible approach is proposed as to 'actively manage' the OHI Back Office. This has to be used at the time that OHI Back Office is successfully configured and operational.

Active management entails the undertaking of preventive actions so as to prevent performance problems, in particular as a consequence of passive management. It also strives to simplify the search for the cause of performance problems when they do occur. Additionally, a number of matters are tackled to apply active space management.

In case performance issues are encountered, a suggestion is made for handling the issue.

The target group for this chapter is the OHI Back Office database manager, the DBA for an OHI Back Office environment. For Unix managers, the chapter could be useful to get the hang of the database management section of this chapter in particular. For functional application managers with a highly technical interest, certain sections could function as an illustration with respect to the cause of performance problems (and probably also possible solutions).

This chapter does not focus on the background of the techniques used. Sufficient documentation regarding this matter can be found elsewhere. Main goal is to provide sufficient information to handle the fundamental issues, even if not much expertise is available regarding the subject. Experts in certain subareas would want, and can collect better or more detailed information at times.

The setup has been selected so that acquired practical experiences are shared. As expected, the chapter is an evolving section of this document which will be further elaborated in the future (based on numerous acquired experiences, both internally at Oracle and externally at OHI Back Office customers). In that sense it will never be finished and always be open for improvement (and therefore also for comments and possible suggestions).

The setup is based on an OHI Back Office database. The content cannot simply be applied to an OHI Data Marts (open policy) environment given that additional or different matters may be applicable.

ATTENTION: No rights can be derived from this chapter. It is just a matter of advice (unless specifically indicated differently). This is to be used at your own risk.

8.1. PERFORMANCE GENERAL

In this chapter some general sizing guidelines are given regarding the OHI Back Office application.

8.1.1. Memory and CPU

The following graphs provide minimum guidelines for the required CPU and memory capacity for OHI Back Office.

The guidelines are based on internal and particularly external key figures of used equipment and test results. No computed values are involved. The values, such as the ones of the equipment of various customers in the first months of 2009 can be found in a graph. Based on additional customer-specific information and an estimate of the trend to be recognized, subsequently, a certain trend line can be defined. When using the customer key figures, it is important to understand that each customer runs more or less customer specific additional workload on the server in question, in addition to the OHI Back Office application. The graph figures should therefore not be followed blindly, but they could be used as an extra tool for sizing a server configuration.

8.1.1.1. Memory

In terms of memory, for each OHI Back Office user *at least* 20MB has to be available, but in reality users sometimes clearly require more when they use multiple sessions and screens.

RAC

In case of RAC Oracle recommends setting up the following extra allocations per node:

1. 10% extra buffer cache
2. 15% extra shared pool

8.1.1.2. CPU

With respect to the number of CPUs, historically a *maximum* of 100 users has to be considered for each CPU. However, considering the multi core and multi threading techniques nowadays available exceeding this number is possible.

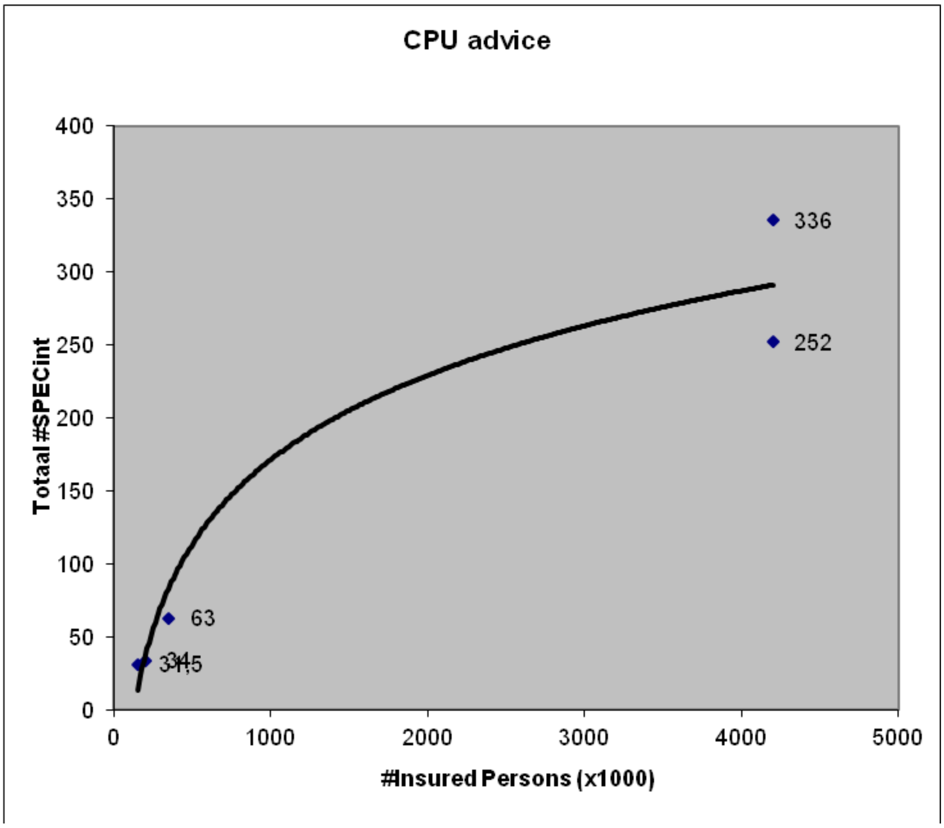
The CPU use is expressed in SPECint2006 benchmark values, which indicates the CPU capacity based on certain integer actions. This is not really a benchmark considered as representative for an application such as OHI Back Office, but it provides something to hold on to when comparing the CPU capacity of certain servers. Given that this value is available for a rather large diversity of equipment, this benchmark is applied. Transaction-oriented benchmark values would be preferable, but this is available for too few equipment in order to establish a thorough comparison of the equipment as is the case for the various customers.

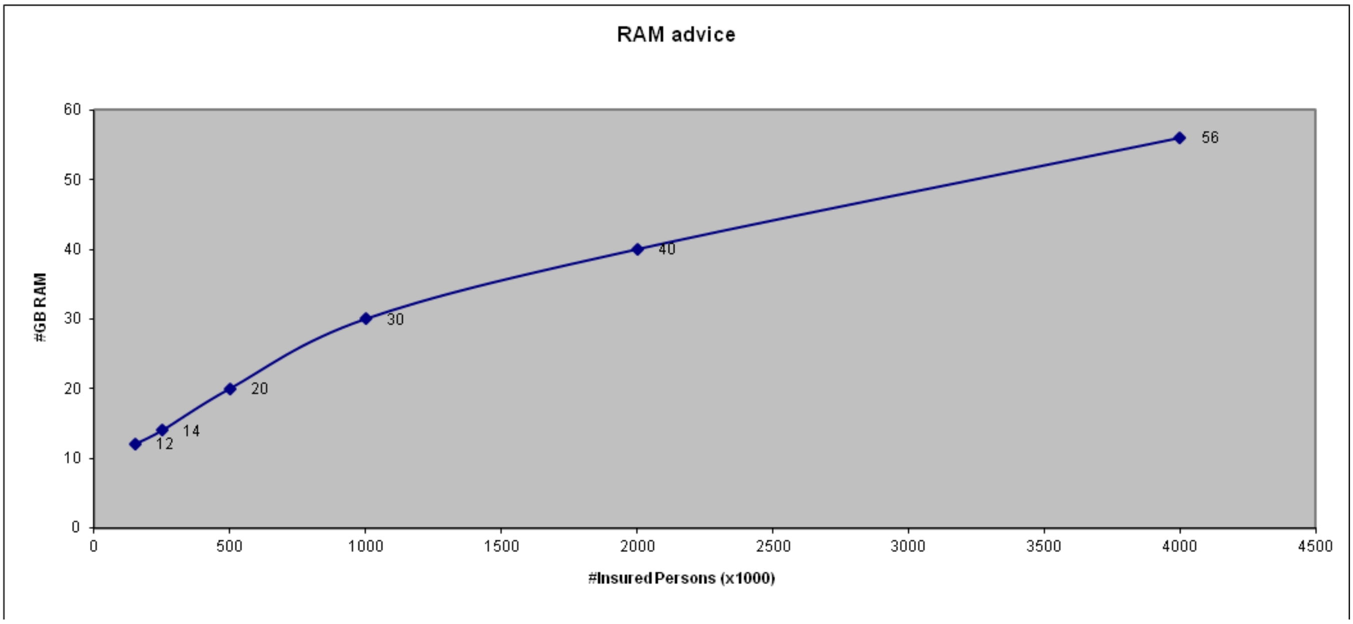
On site http://www.spec.org/cpu2006 information can be found regarding the benchmark applied.

By means of http://www.spec.org/cgi-bin/osgresults?conf=cpu2006 it is possible to search for the benchmark values for certain types of servers. The figures used in the following CPU graph are the result of the value of field CINT2006 *rates*. For example Sun Fire E6900 with 16 dual core processors. The SPECint_rate2006 value for this server is 288.

The figures are based on combined database and application server allocation on a single server. However, for a separated database and application server, both servers will have to meet almost all of these criteria as the daytime work will primarily focus on the application server and the nighttime work primarily on the database server.

If RAC is used, Oracle recommends counting for each OHI Back Office RAC platform (i.e. all nodes together] with at least 10% extra CPU (SPECint).





8.1.2. I/O

With respect to I/O throughput it is possible to establish that a random I/O on a data file for OHI applications may take on average at the most about 5ms. More than 5ms can be considered as a potential bottle neck and cause for unwanted delay of the application response times.

In AWR output this is the column `Av Rd(ms)` in the `Tablespace IO Stats overview`

8.2. PERFORMANCE & MANAGEMENT OF THE OHI BATCH SCHEDULER

The OHI Back Office ‘batch scheduler’ is the component that starts and monitors ‘batch requests’. Its role is vital in processing the important batch and background processes of the application. Good tuning of the settings is required in order to maximize the use of available system capacity while preventing online usage response times degrade. This needs quite some attention and asks for a good insight in available system capacity, requirements of the ‘business’ and impact of changing certain database and application settings that influence this processing.

8.2.1. Parallellism used in batch requests

An important goal of the batch scheduler is to run the jobs that execute batch requests in parallel with each other. Over the years a new mechanism has been introduced for batch requests. Batch module definitions that are based on this ‘Renewed’ mechanism (this can be recognized by looking up this property in the batch module definition screen SYS1008F) do implement a standard way of workload distribution, over parallel processes, which consists of 2 phases:

First phase - Workload gathering

During the first phase the main process starts up and determines a smaller or larger amount of work units. Normally this is the ‘serial phase’ of processing a batch request.

Second phase - Workload execution

When all work units are determined by the main process this process creates a number of subprocess batch requests to execute the workload in parallel. These subprocesses are started for the same ‘main’ batch request and pick up units of work as long as there are units left and a possible maximum time limit is not exceeded. The main process monitors this until all parallel subprocesses are stopped.

The first phase, the workload gathering, is typically the lighter part of the batch request execution and is normally processed by a single process (‘serial’) in quite a limited amount of time after which the real ‘worker subprocesses’ start doing the actual work in parallel.

Parallelizing the first phase

However, for some batch requests this first phase can be time consuming because quite complicated conditions might need to be checked to determine which units of work need to be executed. For these jobs functionality has been introduced since release 10.13.2 of OHI Back Office to ‘parallelize’ the workload gathering. This is why for some batch request definitions parallel execution of the workload gathering ‘query’ is supported. Whether this is supported is defined by the ‘Parallel Supported’ property in the SYS1008F screen.

If this parallelism is supported it can be activated providing that the database settings have been set in such a way that this can be supported. Make sure activating this for a batch definition is only done when the database parameters described below are configured to support parallelism and that these settings have proven, during representative tests, to speed up the processing.

To support this parallelism during the first phase, starting with release 10.13.2 a setting of PARALLEL_MAX_SERVERS larger than zero is supported. Since that release a database trigger is introduced which disables by default parallel execution, so parallel execution (in fact ‘parallel query’) needs to be activated explicitly.

Before activating the parallel execution please make sure IO calibration inside the database has been performed. This is described in the ‘Oracle Database Performance Tuning Guide’ in the chapter about ‘I/O Configuration and Design’, the paragraph ‘I/O Calibration inside the Database’.

Also take notice of paragraph ‘Tuning General Parameters for Parallel Execution’ as present in the chapter ‘Using Parallel Execution’ within the ‘Oracle Database VLDB and Partitioning Guide’.

When you want to use this functionality please follow these recommendations:

- Specify a value larger than zero for PARALLEL_MAX_SERVERS but make sure not more than 25 to 50 percent of the original maximum number of parallel processes (specified as system parameter, in table ALG_SYSTEEM_PARAMETERS, column BATCH_MAX_PROCESSEN) for the OHI batch scheduler is specified. And be sure to decrease the value of this system parameter that specifies this number of parallel processes.
  This parameter does not have to be reduced with an equal percentage because it is expected that the parallel execution by the database will be used a lot less than the parallel sub processes functionality of the batch scheduler. But beware not to overload the system with parallel execution processes next to parallel batch request processes and start with conservative settings.
- If you are using RAC set PARALLEL_FORCE_LOCAL to TRUE (this will be checked during installations and the ‘OHI object validation’).
- Specify a value MANUAL or AUTO for PARALLEL_DEGREE_POLICY (LIMITED is not supported) and know what this means. Setting to AUTO activates the automatic degree of parallelism (auto DOP) functionality.
- Specify the value TRUE for PARALLEL_ADAPTIVE_MULTI_USER.
- Optionally change the PARALLEL_MIN_TIME_THRESHOLD parameter.

The above settings enable you to use 12cR2 automatic degree of parallelism functionality, which enables statement queuing and in-memory parallel execution, or to stick with pre 11gR2 parallel execution functionality. It is advised to only use automatic degree of parallelism functionality if you have tested this does not have negative impact on other processes. In case of doubt, do not enable it as only a few batches may benefit from it.

By enabling adaptive parallelism, the system can reduce the degree of parallelism to prevent an overload of the system. As a consequence, response times may vary.

To prevent parallel execution processes are flooding the system when auto DOP is used the parameter PARALLEL_DEGREE_LIMIT may be set to a non-default value. Default the limit will be CPU based but as OHI environments have been seen to be sometimes read IO constrained, a setting to IO may be preferred in your environment.

8.2.2. Batch scheduler settings

The batch scheduler settings are maintained with screen module SYS1010F. You can locate this module using the online help.

These are the most important parameters:

- Max parallel subprocesses
  The maximum number of subprocesses allowed to start for executing a task. Many high-volume batches consist of a dispatcher which distributes its work to worker processes. The maximum number of subprocesses per request applies to the dispatcher and its worker processes.
  Note that the dispatcher creates the sub processes by creating a batch request for each worker process.
- Max parallel batch requests
  The maximum number of batch requests that are allowed to execute simultaneously. It

limits the total number of running requests and includes the subprocesses (see above). The corresponding system parameter is ALG_SYSTEEM_PARAMETERS.BATCH_MAX_PROCESSEN

8.2.2.1. Sizing BATCH_MAX_PROCESSEN

The value of this parameter is very important since it contributes to the throughput of the batch processes. If this parameter is set too low, not enough work will be executed. If set too high, the database performance may suffer to the point that end users can no longer use the OHI Back Office application.

A rule of thumb is to calculate the initial value for BATCH_MAX_PROCESSEN as 2 x the number of CPU threads in the database nodes used for batch processing.

Examples:

- Single database node with 2 quad-core CPU's and 2 threads per core.
  Number of threads: 16 (2x4x2).
  Initial value for BATCH_MAX_PROCESSEN: 32 (16x2)
- RAC configuration with 2 database nodes for batch processing.
  Each node has 2 hex-core CPU's and 2 threads per core.
  Number of threads for 2 servers: 48 (2x2x6x2)
  Initial value for BATCH_MAX_PROCESSEN: 48 (24x2)

The reason to limit BATCH_MAX_PROCESSEN to twice the number of CPU threads is to reduce the amount of time waiting for IO.

Note that these are initial values and expect to revise these values as you get more insight in the actual use and performance of your configuration.

Also keep in mind that database resource management may be implemented to throttle the database instance. In that case the calculated initial value for BATCH_MAX_PROCESSEN may be on the high side.

8.3. PERFORMANCE DATABASE

This section elaborates on the various aspects of performance of OHI Back Office. Important settings are assigned but utilities are also offered that may be of assistance when zooming in on possible performance issues.

The objective is to provide an overview as to how it is possible to monitor and possibly improve the performance of OHI Back Office.

By getting familiar with a normal performance and by collecting data about it, in case of actual performance problems it is easier to zoom in on the cause and nature of the problem. Especially if reference measures of a representative period with a normal/acceptable performance are available.

8.3.1. Database Settings

A smooth performance of OHI Back Office starts with optimally setting up and configuring a number of database settings.

8.3.1.1. Initialization Parameters

It is of importance to configure some crucial parameters in a correct manner. We list the parameters that are particularly of importance and for some cases we recommend possible values. Also many other parameters can be configured, but at least the following are of importance for the performance of OHI Back Office.

☞ With respect to the installation of OHI (patch) releases, different settings apply. See the following document for more details (a complete listing of database parameter requirements is present in an Appendix):

Oracle Health Insurance Installation of releases

The Most Crucial Parameters

There are 2 parameters that are very significant as they determine the greater part of the SGA:

- `DB_CACHE_SIZE (=Ym)`
  Use this instead of old parameter `DB_BLOCK_BUFFERS`. Specify the size of the buffer cache in multiples of 16MB, with a minimum suggestion of 128MB. As a guideline use a value of about 100MB per 50,000 insured persons in OHI Back Office. For environments with smaller numbers of insured persons, a clearly higher value has to be applied. For very large numbers - millions - this number can be adjusted.

- `SHARED_POOL_SIZE (=Ym)`
  Therefore it is best to also specify multiples of 16MB. A nice guideline to start with is 5 MB per user in case of 100 users, however, with a minimum of 512 MB. For several hundreds of users it is possible to take a somewhat lower value.

Use the ‘Advice’ button in *Oracle Enterprise Manager* (OEM)*/Cloud Control* to get a picture of the correctness of the configuration after the database has been used for a couple of hours (!) representatively. A good time is e.g. by the end of the morning of a typical weekday.

Currently complete use of Automatic (Shared) Memory Management is not advised. If activated make sure sufficient minimum values are set for `DB_CACHE_SIZE`, `SHARED_POOL_SIZE` as well as `SGA_TARGET` (and also for `PGA_AGGREGATE_TARGET`, but more about that parameter follows).

Parameters for SQL Tuning

The parameters in `v$sys_optimizer_env` are of importance in order to activate the *Cost Based Optimizer* properly for OHI Back Office.

Parameters for Session Memory Allocation

There are various parameters to activate the allocation of memory for sessions, the allocation of the working memory. In the past it was possible to reserve a certain amount of memory per type of operation. However, it is possible to specify a target for all sessions together depending on the size of the total volume of working memory. The latter is normally preferred and is performed by means of the following PGA parameter.

- `PGA_AGGREGATE_TARGET (=Ym)`
  It is recommended to use this setting to keep the total volume of working memory within certain limits. An automatic conversion takes place to the working memory allocation per session. The total target volume can become larger temporarily, but the memory is kept within certain limits. This has as the advantage that an objective can be set for all sessions together. A possible drawback is that specific optimization for a certain objective is not possible. This ordinarily is not required anyway. As a guideline, a reservation of 5 MB per user can be kept for e.g. about 200 users. A multiple of 16 is not required.

- `PGA_AGGREGATE_LIMIT (=Ym or Zg)`
  It is recommended to use this setting to specify an explicit maximum limit in order to prevent a default is determined which may be too low for certain actions of to prevent operating system limits are hit. For typical production OHI workloads a size of 4Gb as minimum is advised for this limit.

For several of these parameters it is also possible to obtain some advice for optimization of this configuration by clicking the 'Advice' button. Advice can only be used after a representative load of the database has taken place. It is also possible to simply check if the PGA 'cache hit percentage' lies above 90% and if the maximum PGA volume and current volume do not exceed the objective by too much. Otherwise the value has to be revised upward.

Instead of automatically assigning working memory, it is possible to assign specific memory for certain operations by means of the so-called `......_AREA_SIZE` parameters. These parameters are used only if the parameter `WORKAREA_SIZE_POLICY` is set to `MANUAL`. If the last parameter has not been set then this will be set to `AUTO` by default when `PGA_AGGREGATE_TARGET` has a value that is greater than zero. It is recommended to use the following parameters only for certain purposes and to activate them by temporarily setting `WORKAREA_SIZE_POLICY` to `MANUAL`. For OHI Back Office it is no longer needed to set this parameter to MANUAL, you can leave it to the default value AUTO.

- `WORKAREA_SIZE_POLICY (=manual)`
  Set to manual in order to have the following parameter values be used. Otherwise, set to `auto` or do not configure it at all.

- `SORT_AREA_SIZE (=`*`Y`*`)`
  Configure this parameter explicitly in case of very heavy sorting operations that have to be optimized extra. During the installation of an OHI Back Office major release, sometimes e.g. indexes are created on very large tables that benefit in case of a large value for this parameter. This could lead to a difference in throughput time of several factors when creating index (e.g. 2 hours may become 30 minutes). It is recommended to set the value to e.g. 50MB or 250MB (specified in bytes) in case very heavy sorting operations have to be expedited temporarily. The relevant quantity of memory is allocated per session in case this is required, so a value of 50 MB is not desirable when users log on (but in that situation WORKAREA_SIZE_POLICY normally will be set again to AUTO). Otherwise, for certain sorting operations an unexpected high volume of memory could be allocated.

- `HASH_AREA_SIZE (=`*`Y`*`)`
  Configure this parameter explicitly as this may for example benefit heavy join operations during OHI release installations.

Both the sort and hash area size parameters can be retained during normal runtime operation of the applications as the workarea size parameter setting at auto will result in ignoring these parameters during normal use.

Parameters for Rollback (undo) Space

Management of the rollback space has to be automated by Oracle. The quantity of rollback space rendered available determines the throughput time for some batches as well. It is recommended to allocate some GBs of rollback space (or to allow for having this much space available by means of e.g. auto-extendable data files for the relevant table space).

The following parameter values are recommended:

- `UNDO_RETENTION (=10800)`
  This value indicates the time to Oracle as to how long the rollback space should not be overwritten to provide a long-term statement - read 'consistent' - image. This value is provided in seconds. 3 hours would be an appropriate value. If sufficient rollback space is available (to be assessed via Oracle Enterprise Manager/Cloud Control) and based on one hour settings (or more) 'snapshot too old' messages pop up, then the software has to be adapted to it (an incident message has to be reported).

Parameters for parallel execution

When for batch execution parallelism is wished for the initial phase of batches please consult the previous paragraph about Batch Scheduler Performance and the optional use of parallel execution by enabling this through certain parameter settings.

Please note that parallel execution is disabled by default when an OHI related session logs on. Parallel query, ddl and dml are disabled. This is done by the OHI specific logon trigger for the following accounts:

- The OHI table owner and the OHI batch account
- The OHI user accounts (presence in ALG_FUNCTIONARISSEN is sufficient)
- The accounts that have received a grant on an OHI table owner object (except for SYS & SYSTEM when inappropriate granted) or that are granted a standard OHI role.

8.3.2. Statistics

The statistics definitions have been changed since 10*g*. The 12c standard job is recommended for collecting statistics. This job handles collecting statistics of all schemes and for the dictionary statistics. The job will collect the statistics in the *maintenance window* for all objects in the database. The job determines the order of the database objects for which the statistics require altering. In that way, the most important statistics are defined at the moment that a *maintenance window* is closed.

8.3.2.1. System Statistics

For determining the optimum way to perform an SQL statement, the database uses a so-called execution plan. Depending on the postulated optimization objective for performing SQL statements - providing the first part of the result as soon as possible (`FIRST_ROWS_10 optimizer_mode`) or minimizing the time to determine all results (`ALL_ROWS optimizer_mode`), a different plan could be preferred.

In order to determine these ‘execution plans’, the ‘Cost Based Optimizer’ (CBO) may keep in consideration the speed of I/O of the system and the speed of the processors (the CPUs) of the server. To this end so-called ‘system statistics’ are required.

ATTENTION: The Cost Based Optimizer (CBO) is used by default to optimize the SQL statements as performed by the database. This is arranged via the aforementioned instance parameter.

8.3.2.2. What are System Statistics?

Up until database release Oracle 8*i* the Cost Based Optimizer considered the most appropriate execution plan for determining the I/O costs.

As of the launch of Oracle 9*i*, not only does the CBO have to keep account of the I/O costs, but also the CPU costs and the estimated required time table space (see 3 new columns in table `PLAN_TABLE`: `CPU_COST`, `IO_COST` and `TEMP_SPACE`).

The CBO since 9i can deal with CPU costs that are based on actual system characteristics, that allows for cost estimation for comparison of the complexity of planning which can take place that is close to reality.

A statement that requires relatively little (physical) I/O, but that uses a lot of CPU because many database blocks have to be accessed in cache, could clearly benefit from system statistics because the outcome of the required time for a certain plan is closely related to reality (in the past CPU and I/O used to be as expensive in a calculation, while in reality I/O is much more expensive, or more slow than CPU, although this might differ per machine used).

Therefore, the criteria for making the choice for most likely best execution plan can be established more reliably by the CBO.

8.3.2.3. Collecting System Statistics

Introduction

In order to optimize the performance of the CBO, the system statistics have to be collected again if the configuration or the use of the system undergoes clear changes (e.g. because the data is increasing and/or the database files are moved to a different location).

Collecting system statistics refers to an analysis of the database activity by Oracle during a certain period of time that is representative for the average database load (and the system as a whole).

Not having system statistics could result in choices for incorrect (or low performance) execution plans (if there are no records in table `AUX_STATS$` under user `SYS` then there are no system statistics).

Standard Values:

It is therefore possible to immediately create direct system statistics if these are not there yet, even though no representative load is involved. A number of standard settings are used (which are better than no statistics at all). To this end it is possible to indicate that statistics have to be determined without there being a representative 'workload'.

Since DBMS 10*g* this is by default performed by instance startup.
It is possible to perform this manually by means of the following (SQL*Plus) command, under `SYS` (just like all other commands that follow afterwards):

```
exec dbms_stats.gather_system_stats('NOWORKLOAD')
```

☞ **Attention:** For OHI Back Office environments the `NOWORKLOAD` option (method *Standard values*) is the recommended setting for collecting system statistics, until further notice. This relates to negative experiences with respect to the actual collecting of system statistics.

Actually Measured Values

Subsequently, at the moment a representative load is involved 'verzamelen' (collect) can be activated. Collecting can be activated by entering the following command e.g. at 10 a.m.:

```
exec dbms_stats.gather_system_stats('START')
```

When closing the collecting around 3 p.m., the command will run:

```
exec dbms_stats.gather_system_stats('STOP')
```

ATTENTION: In the meantime the instance should not be stopped. Otherwise the user has to restart collecting the statistics all over.

☞ **Attention:** Until further notice, the method of actually measured values should not be used, unless this is requested explicitly by OHI Development or Oracle Support Services.

Status Definition

By means of the following SQL*Plus commands it is possible to request the status of the collection system statistics

```
col sname format a20
col pname format a15
col pval2 format a30

select * from aux_stats$;
```

If the statistics are defined without a representative work load, this results in:

```
SNAME                PNAME                PVAL1 PVAL2
-------------------- --------------- ---------- --------------------
SYSSTATS_INFO        STATUS                     NOWORKLOAD
SYSSTATS_INFO        DSTART                     10-26-2004 13:59
SYSSTATS_INFO        DSTOP                      10-26-2004 13:59
SYSSTATS_INFO        FLAGS                    1
```

If afterwards collecting is activated, this provides the following output:

```
SNAME                PNAME                PVAL1 PVAL2
-------------------- --------------- ---------- ----------------
SYSSTATS_INFO        STATUS                     MANUALGATHERING
SYSSTATS_INFO        DSTART                     10-26-2004 14:01
SYSSTATS_INFO        DSTOP                      10-26-2004 14:01
SYSSTATS_INFO        FLAGS                    1
SYSSTATS_TEMP        SBLKRDS             125167
SYSSTATS_TEMP        SBLKRDTIM           391710
SYSSTATS_TEMP        MBLKRDS              97238
SYSSTATS_TEMP        MBLKRDTIM            73860
SYSSTATS_TEMP        CPUCYCLES           467124
SYSSTATS_TEMP        CPUTIM             1434067
SYSSTATS_TEMP        JOB                      0
SYSSTATS_TEMP        MBRTOTAL            759624
```

In that case initial values have been entered for certain values that are defined. If afterwards collecting is stopped then this could result in the following output:

```
SNAME                PNAME                PVAL1 PVAL2
-------------------- --------------- ---------- ----------------
SYSSTATS_INFO        STATUS                     COMPLETED
SYSSTATS_INFO        DSTART                     10-26-2004 14:01
SYSSTATS_INFO        DSTOP                      10-26-2004 14:04
SYSSTATS_INFO        FLAGS                    1
SYSSTATS_MAIN        SREADTIM             8.381
SYSSTATS_MAIN        MREADTIM              .626
SYSSTATS_MAIN        CPUSPEED                36
SYSSTATS_MAIN        MBRC                     4
SYSSTATS_MAIN        MAXTHR                  -1
SYSSTATS_MAIN        SLAVETHR                -1
```

What can be derived from this is that collecting statistics is based on a period of 3 minutes. In case the statistics collection is not successful the line with value `STATUS` for column `PNAME` could have value `BADSTATS` for column `PVAL2`, as represented below:

```
SNAME                PNAME                PVAL1 PVAL2
-------------------- --------------- ---------- ----------------
SYSSTATS_INFO        STATUS                     BADSTATS
SYSSTATS_INFO        DSTART                     10-25-2004 22:41
SYSSTATS_INFO        DSTOP                      10-25-2004 22:41
SYSSTATS_INFO        FLAGS                    1
SYSSTATS_MAIN        SREADTIM                -1
SYSSTATS_MAIN        MREADTIM                -1
SYSSTATS_MAIN        CPUSPEED               221
SYSSTATS_MAIN        MBRC                        -1
SYSSTATS_MAIN        MAXTHR                      -1
SYSSTATS_MAIN        SLAVETHR                    -1
```

In such cases, the collection of statistics has to be restarted.

Deleting System Statistics

For disabling/deleting system statistics

```
exec dbms_stats.delete_system_stats
```

is sufficient (in case this is desirable for whatever reason).

Committing is not required for the above actions.

System Statistics and Execution Plans

Collecting system statistics does *not* nullify the execution plans in the cache, as opposed to *editing the table statistics.* For existing SQL statements for which an execution plan was available, after the creation of system statistics no new execution plans will be defined again right away. These have to be deleted from the 'cache' first (for testing purposes it is possible to add an extra space to a statement to stress that a plan is defined again for that statement after the system statistics have been changed).

8.3.2.4. Table Statistics

In addition to having system statistics available, it is more important to have current table (and index) statistics collected. The Cost Based Optimizer uses the statistics of tables and indexes (e.g. how many records are included in a table, what is the division of values in a column, how many records are there in an index) to identify the execution plan that best meets the optimizer requirements. To this end, these statistics, in case they are estimates, have to lie near the actual content of the table (and index). The statistics could be 'estimated' based on a part of the content of a table or 'calculated' when going through the table content entirely.

In order to establish representative statistics, they have to be updated on a regular basis if the table content changes. Tables that undergo changes more and more often when considering their total content have to be modified more regularly in terms of statistics than tables of which the content remains rather static. When a new OHI release is installed, for the adapted tables even the definition of statistics has to be performed again.

In order to abstract from this issue, a 'table monitoring' functionality has to be used in the database. Oracle keeps track of how many changes (inserts, updates, deletes) are performed on the data in a table. This data is used in certain utilities to determine statistics 'automatically' for the tables that require this. 'Temporary' tables (tables that are not permanent but that can store data only during a session) are dealt with in a different way.

Considering that there are various complicating factors for adequately collecting table statistics, script `OZGISTAS.sql` is included in the reference software. This script is called during the installation of a new release. The script is modified if changed understandings encourage doing so.

When determining the statistics, Oracle decides about which part of the table (the number of records of the total number of records) the statistics are defined. Whether this takes place based on an estimate or on a small percentage of the data of the table or based on an actual calculation of 100% of the data, the choice is up to the standard software.

The script implements required OHI settings (such as preventing and/or dropping column histograms, locking the statistics for certain tables, etc.) and uses spare runtime to collect statistics.

The script can only be run by the user who requires his objects to be analyzed. It contains two input parameters. Both of them are mandatory.

Parameter 1 involves the number of hours during which the script can run; providing a value is mandatory.

Parameter 2 involves the environment in which the script runs. Possible values include `OBD` (=OHI DATA MARTS) and `OZG` (=OHI Back Office).

When called by the installation menu (OHIPATCH) these are passed automatically.

8.3.2.5. Data Dictionary Table Statistics

Since a 10*g* database the creation of dictionary statistics is *mandatory*; to this end `dbms_stats.gather_dictionary_stats` procedure can be used under `SYS` account.

For a database with only OHI Back Office objects this takes about fifteen minutes. Should the data dictionary have experienced a lot of changes since the previous time the statistics were defined, then of course it is advisable to determine the statistics again in the aforementioned way.

8.3.2.6. Fixed Objects Statistics

Since the 10*g* database the creation of statistics is also mandatory for so-called “fixed objects”; this allows to use `dbms_stats.gather_fixed_objects_stats` procedure under `SYS` account.

At the moment, conditions for collecting these statistics include:

1. The SGA size and the `init.ora` database parameters have to be stable.
2. The system has to have a representative load.

8.3.2.7. Dividing I/O - if Possible

In the past it was common to divide the I/O over physical disks by dividing the often used table spaces and data files as well as across the available disks.

At present logical volumes and certain RAID levels are used mostly, for which the division of the I/O is assigned to the controller(s) (of which all sorts of variants are possible). In general this should guarantee a suitable I/O division, certainly considering the availability of fast read and write caches with intelligent algorithms to activate the content.

One of the few options that remain is the division across multiple controllers if these are available. For an I/O bottleneck problem this could offer a solution.

If there is a possibility for that, it is in any case desirable to locate the redo log files on a separate and fast I/O device. It would be even better to put each redo log group on a separate device or in any case successive redo log groups (e.g. even groups on disk 1 and odd groups on disk 2).

The archived redo logs (if these are used) have to be written to a separate device as well, so that the other I/O do not form an obstruction.

This two last recommendations are not strictly necessary, but first of all they have to be considered if the transaction speed slows down and if statistics show that the redo log actions tend to reduce the speed. After all, a database on which read actions take place does not easily experience problems with slow write actions with the redo logs.

8.3.2.8. Resource Management – Session Prioritization

The OHI Back Office database is used by online users, batch processes, web services, etc. Some of these batch processes are long-running, requiring minutes or even hours of processing. Such processes can sometimes claim 100% of a processor for long periods of time.

If there are many long-running batch processes, they will keep the database resources busy and may leave insufficient resources for other sessions. As a result, for example the online or web service performance may suffer.

It then becomes necessary to prioritize these sessions over the batch processes. There is no point in prioritizing sessions at the operating system level: if an Oracle session has acquired memory latches and its associated process is given lower priority, other database processes needing these latches are forced to wait until the low-priority process has eventually finished.

The recommended way for prioritizing such sessions is to use Oracle's resource management options. The Oracle documentation describes in detail how to manage the many kinds of database resources of which CPU is just one type of resource.

For the purpose of OHI Back Office our minimal recommendation is to prioritize online and other potential interactive sessions over (long-running) batch processes.

At this point you should be aware that Oracle by default distinguishes three groups of resource consumers:

- SYS_GROUP (sessions of SYS or SYSTEM)
- BATCH_GROUP (sessions of BACKUP, COPY)
- OTHER_GROUPS (any other session which does not map to an existing resource consumer group)

By putting the OHI batch user into BATCH_GROUP we can set its priority relative to the other resource consumer groups.

The prioritization of resource consumer groups is handled by resource plans.

Note that in Oracle 12c in multitenant mode, there are two types of resource plans:

- PDB resource plan
  A resource plan for managing resources within a pluggable database (PDB). In multitenant mode, the OHI Back Office data and its resource consumer groups will reside in a PDB.
- CDB resource plan
  This resource plan applies to the container database. It is used to manage resources between PDB's.

In other words, to prioritize BATCH_GROUP relative to OTHER_GROUPS we need a PDB resource plan.

The default PDB resource plan is MIXED_WORKLOAD_PLAN. Since this resource plan changes with different versions of the Oracle database you may want to create your own PDB resource plan.

Note that an Oracle 12c PDB resource plan has a number of restrictions compared to Oracle 11g:

- PDB resource plans cannot have a multilevel scheduling policy
- PDB resource plans cannot have more than 8 consumer groups
- PDB resource plans cannot have subplans.

The following example of a PDB resource plan limits BATCH_GROUP (containing the batch sessions) at 20% if there is contention for resources. This plan prioritizes SYS_GROUP (containing the SYS and SYSTEM sessions) over OTHER_GROUPS, which in turn has priority over BATCH_GROUP.

```
begin
  dbms_resource_manager.create_simple_plan
  (
    simple_plan       => 'OZG_PLAN'
  , consumer_group1 => 'SYS_GROUP
  , group1_percent  => 100
  , consumer_group2 => 'OTHER_GROUPS'
  , group2_percent  => 80
  , consumer_group3 => 'BATCH_GROUP'
  , group3_percent  => 20
  );
end;
/
```

CDB resource plans are used in Oracle 12c to manage the priorities of pluggable databases relative to one another. By default each PDB is given 1 share. Allocate more shares to a PDB to give it more resources if needed.

However, also in Oracle 12c it is not possible to manage the resources across multiple container databases on the same server. In that case you typically may use the Instance Caging functionality. See the standard Oracle database documentation for details.

Finally, if you are creating scheduling windows (for example a ‘batch’ window and a ‘daytime’ window) it is advisable to explicitly set the resource plan for these windows, because the default resource plan may not be suitable.

Finally note that the script OZGI002S.sql which was used to assign the OHI batch user to LOW_GROUP is now obsolete because LOW_GROUP is not used in Oracle 12c anymore.

8.3.3. Collecting Performance Data

This section discusses the resources which can be activated to collect performance data.

8.3.3.1. Operating System Utilities

Simple use of some general operating system utilities (Unix based) will be discussed in some sections. These can be used to acquire insight into the load of the server(s). There are many more options, sometimes these are better and more advanced, but these tools allow for an initial impression of where the bottleneck is located in most cases.

vmstat

By means of e.g. ‘`vmstat 5`’ it is possible to acquire insight into memory-related statistics every 5 seconds, amongst which page swapping (a value of 300 seconds, or 5 minutes, could also be useful to assess the average load in a screen during a longer period; an hour consists of 12 lines).

Whether or not page swapping takes place can be derived from the value in front of the column ‘sr’ (scan rate) in the group page. If this has a constant value in hundreds or higher, swapping is clearly involved (the value has to be compared with the number of available pages). Additionally, for the CPU load the percentage of idle time is represented. If idle is nearly continuously close to 0, then the CPU is heavily loaded.

With regard to group 'procs', the number under r(un queue), b(locked) and (can be run but s)w(apped) is very interesting for an initial impression. Values not equal to zero indicate that processes are not serviced right away.

For more information, see the manual pages.

iostat

By means of for example ‘`iostat 5`’ the default output is given. In order to zoom in on I/O problems, specific options have to be used, but the four columns under CPU provide insight as to whether or not waiting for I/O is required. Column 'w' under CPU provides the percentage of the time required for I/O,

By means of ‘`iostat –xc 5 10`’ it is possible to have overviews provided of the average service time 10 times during 5 seconds, the busy percentage etc. of all devices including how the CPU time is used. A busy device could possibly be relieved by distributing the database files better across the devices (if the database files are an explanation for the load of the devices).

sar

By means of the `sar` utility it is possible to register statistical data with a certain interval in a simple way. The data can be converted into readable reports by means of the same utility.

In order to optimize the use of this a set up is required with an interval of e.g. 10 minutes of 'recording' (24 *7). This allows reasonably well for zooming in on longer peak periods and in this way data involving half an hour can be compared with statistical data on a database level (this will be discussed at a later stage).

By means of the following 2 lines in the `crontab` for `sar` (user sys on a Sun Solaris system) every 10 minutes recording can be made that are converted into a readable report at the end of the day (11:55 p.m.)

```
0,10,20,30,40,50 * * * * /usr/lib/sa/sa1
```

```
55 23 * * * /usr/lib/sa/sa2 -s 0:00 -e 23:50 -i 600 –A
```

CPU load for previous period (all ‘snapshots’ of the day):

```
sar
```

Reading memory use for previous period:

```
sar –r
```

Reading swapping of previous period:

```
sar –w
```

Reading the actual load five times every 10 seconds:

```
sar 10 5
```

Of course there are advanced tools to implement monitoring of the system. However, because of a comparison with other customers and installations and simply rendering available data to Oracle in case of performance problems, it is desirable to always have sar monitoring activated. The overhead is very limited and the advantage is that this allows for tracing the cause of performance problems faster because sometimes certain causes can be excluded.

top/topas/prstat

By means of a tool such as `prstat, top or topas` (or other system utilities) it is possible to retrieve which processes are used by most CPUs rather fast. Especially if certain processes are slow or if the CPU use on the server level is high, then it is possible to zoom in on the processes that require most CPU.

In case of frequent performance problems, it could also be desirable for Oracle to use such a utility. Access to one of these utilities (available via the ‘remote connect’ account) could speed up the process.

swap

By means of the `swap` command, certain data can be retrieved involving the swap memory. This could be desirable in case swapping seems to be involved.

Listing out the swap memory:

swap –l

Summary of the swap use:

swap –s

OS Watcher

Oracle’s OS Watcher (OSW) is a collection of UNIX shell scripts intended to collect and archive operating system and network metrics to aid support in diagnosing performance issues. Information on how to setup and use OS Watcher can be found in the following My Oracle Support notes:

My Oracle Support note 301137.1, OS Watcher users guide

My Oracle Support note 461053.1, OS Watcher graph users guide

8.3.3.2. Database Monitoring

Oracle Enterprise Manager

For monitoring the database for recent activities there are various options. Particularly, by using the Oracle Enterprise Manager (OEM) in combination with an OEM repository and configured agent processes, a lot of useful information can be retrieved.

It is highly recommended in that case to use OEM and to have its (web) user interface available for OHI Development to inventory the performance problems rather fast.

Automatic Work load Repository

Therefore we choose to collect data periodically in a relatively easy way, so that comparisons can be made between data of various customers. In case of more general performance problems, this data allows for the possibility to obtain a clear view as to the bottlenecks in the database (presuming that there are any). Therefore we use information from AWR, the Automatic Workload Repository, which is installed by default and configured since DBMS 10*g*. AWR creates periodic ‘snapshots’ of the database statistics automatically and stores them in the SYSAUX table space. Reports can be released on these snapshots in tables.
By default one snapshot is created every hour on the CDB level. Every night a job runs which automatically removes snapshots taken more than 7 days ago (the default retention setting).

OHI advices to create snapshots at the PDB level at least each 20 minutes, but preferred is 10 minutes, and use a retention period of at least 45 days. This can be enabled through:

```
dbms_workload_repository.modify_snapshot_settings
(retention => 45*24*60,interval => 10)
```

This consumes more PDB specific SYSAUX space but can be very helpful to investigate problems (and look for example whether they also occurred the previous month in the same way). The current settings for AWR at the PDB level can be queried using the dictionary view AWR_PDB_WR_CONTROL.

Beware for an interval value of +40150 00:01:00.0 in the column SNAP_INTERVAL as this means once in 40150 days. This is a problem in the earlier 12.2 database code occurring after plugging a PDB out and in.

To enable automatic snapshot creation at the PDB level the parameter AWR_PDB_AUTOFLUSH_ENABLED should be set to TRUE. This OHI specific advise is opposite to the standard Oracle advise given in the manual but does help a lot when investigating OHI database specific performance issues.

8.3.3.3. RAC

In a RAC environment, each AWR snapshot gathers information regarding all instances in the cluster. This data can be aggregated in a database wide AWR RAC report.

AWR – Reporting Statistics

When statistics are collected, they can be used to run reports about certain periods. These periods are characterized by a 'start' snapshot and an 'end' snapshot (identified by numbers; a list of snapshot periods with identifying numbers is displayed by each AWR utility that requires the snapshot numbers).

By means of report script `awrrpt.sql` it is possible to create a general report about a certain period. If a problem is encountered during a certain period, then it is useful to limit the period to be reported to a time span that keeps the problematic period to a minimum. If a reduced speed was experienced from 9:45 a.m. to 11:55 a.m. then it would be recommended to run the report for the period 9 a.m. to 12 p.m. (provided that snapshots were only made once an hour).

If a name for the file requested in which the report is 'spooled' then it would be useful to apply the standard proposed naming.

All sorts of statistic information is displayed in the relevant report. Additionally, various lists are provided of the heaviest SQL and PL/SQL statements.

For the statements for which there are uncertainties regarding the legitimacy of their load on the database, it is possible to create a more detailed report by means of a separate script `awrsqrpt.sql`. In this case the identifying hash value (SQL ID) has to be provided which is reported for each statement (in the report created with `awrrpt.sql).` Identifying ‘wrongful heavy' statements will ordinarily be performed by the development department of OHI Back Office (the development team) after an AWR report is delivered.

However, it is not necessary to examine problem statements that may be present in the OHI Back Office application as customer of OHI Back Office. The OHI Back Office development team should normally perform this task. By means of the AWR reports and any specific reports pertaining to certain statements, the development team can focus on pertinent solutions for any problems.

ADDM Report

When AWR reports are delivered to the development department for OHI Back Office, then for the relevant snapshot range also the ADDM (Automatic Database Diagnostics Monitor) report has to be delivered, which provides advice regarding the AWR collected data; to this end, script `addmrpt.sql` has to be run.
This script performs an ADDM analysis for the relevant range and creates a report about it.
In order to display the report of the *last* ADDM analysis, script `get_latest_addm.sql` can be used; this script does *not* first perform an analysis.

RAC

In a RAC environment, an ADDM report node is specific; for the different nodes therefore different ADDM reports have to be collected.

8.3.3.4. Tracing Sessions

Whereas AWR is used to collect all of the database data, in certain cases it may be desirable to zoom in on a specific process or a certain database session. Certainly when a specific session causes problems and no general problems are detected.

For such a session, creating so-called 'trace files' is recommended. Even though this is generally a known process, some indications are provided as to how to deal with tracing.

Setting a Session to Trace Mode

Activating tracing in a session is relatively easy by entering the following command:

```
alter session set sql_trace = true;
```

However, sometimes it may be required to set an ongoing session to trace mode. This is possible by entering command:

```
execute dbms_system.set_sql_trace_in_session(&sid,&serialnr, true)
```

This has to be performed with an account that has relevant rights.

While doing so, it is necessary to determine the values for `'sid'` and `'serial#'`. These can be retrieved from view `(G)V$SESSION` and by means of column `USERNAME` it is usually possible to create a selection for the user sessions that are slow.

However, users who have opened multiple screens from the menu in OHI Back Office will have multiple sessions in the database. When a slow action in a screen has to be traced, it is possible to do as follows:

- Start the screen from the menu (or the calling screen once it appears in the start-up screen).
- As a first action, before performing the slow action, determine the 'sessionID': Start the Information window by means of the Help menu and the Info menu option. Determine the value of 'sessionID'. This value identifies a session by means of column `AUDSID` in `(G)V$SESSION`. As long as the 'problem screen' does not close, this value will remain constant and by means of selecting `SID` and `SERIAL# from (G)V$SESSION` the values can be determined:

```
select sid
,      serial#
,      (select spid
        from   v$process p
        where  p.addr = s.paddr
       )
       oracle_process
from   v$session s
where  audsid = &sessionid
```

- Use the `sid` and `serial#` values in order to perform the above command and to set the session to trace mode.
- Perform the slow action.
- Check the trace directory to see if a trace file has been created with the name oracle_process number as provided by the above query.
- Close the screen (the trace file will be closed which would render the information complete and therefore easier to use).

In case a screen is already blocked by a long-term action and if it is still desirable to trace the session, try to identify it in the following way:

- Determine which oracle process uses a lot of CPU in the relevant database (by means of a peak-like tool). If there is no such process then the problem is supposedly not located in the database but in the forms. It is possible that the forms process consumes a lot of CPU. The database session does not have to be traced in that case.

- By means of the following query, it is possible to determine which sessions the relevant user has in the database. The oracle process that consumes a lot of CPU should have the ID available in the list of process numbers in the 'SQL_Net' column as provided in this query.

```
select row_number() over (order by b.process)||'.' as row_number
,      b.osuser        osuser
,      b.username      user
,      b.sid           sid
,      b.serial#       serial#
,      b.program       program
,      b.process       UNIXpid
,      d.spid          SQL_net
,      a.sql_text      sqltext
from   v$sqlarea       a
,      v$session       b
,      v$process       d
where  b.sql_address = a.address (+)
and    b.paddr       = d.addr
and    b.username    = upper('&&usr) /* Oracle database account of the user
*/
and    b.osuser      = 'oracle' /* f60webm processen are running under the
Unix account "oracle" */
order  by row_number() over (order by b.process)||'.'
/
```

- Use all sid and serial# combinations that match the 'heavy' oracle process in order to set the relevant sessions to trace mode.
- Check if a trace file appears (see above). If this is not the case, then it is possible that the session requires a lot of time with a single SQL statement. Only after the statement provides results or if the session starts with other statements then a trace file will appear (for heavy statements in batches this may be the cause if no trace file appears, for screens this is the case less frequently).

For running batch processes, searching the sessions based on a username is not a solution if multiple batches run at the same time. The batches all run under the same Oracle user, often referred to as `BATCH`. Also the batch scheduler runs under this Oracle user and has to be recognized. This is possible because the relevant session in column `MODULE` of `V$SESSION` has a value that starts with `SYSS004S`. This session should therefore not be traced.

If multiple sessions are active in the user batch, it is possible to identify the correct session by selecting the ID process the session has under Unix. If everything goes right, the session will return as a heavy Oracle process in a tool that displays the top sessions (see above). The process ID that matches the Oracle process can then be used to select the correct values from the `V$SESSION` and `V$PROCESS` view by means of the following statement:

```
select sid
,      serial#
,      process
,      username
from   v$session s
where  s.paddr = (select addr
                  from   v$process
                  where  spid = &oracle_proces_id
                 )
```

Should several heavy Oracle processes run, request the start time of the heavy processes by means of ps command (`ps –eaf | grep <procesid>`) and compare this with the start time of the script requests as displayed in the screen. This will have to be about the same as the start time of the running script request. In this way it can often be determined which Oracle process matches which script request.

Trace File Points of Attention

Some points of attention

- If a session is set to trace mode then normally a trace file will be created in the location provided by means of the initialization parameter `DIAGNOSTIC_DEST` (within a subdirectory 'trace' deep within the directory structure designated by this location setting).
- The names of the trace files normally have the form `<$ORACLE_SID>_ora_<process_id>.trc`. In this case the process_id can be determined by means of column `SPID` from view `V$PROCESS` (see previous section). For MTS sessions the process id of the 'server' process will be used (a so-called Sxxx process, S001 for server process 1, etc.). Such a server process will also write statements of other sessions to the trace file. An MTS configuration is not as usable for tracing sessions.
- By means of the initialization parameter `MAX_DUMP_FILE_SIZE` a limit can be set for the size of trace files (in system block processes or in KB or MB). If this limit is set rather low (some MBs e.g.), then it is possible that trace information can be registered only for the first few minutes of an action, because afterwards the maximum volume is reached for the trace file. In order to trace a slow action in a screen this is generally not a problem, for tracing a slow batch sometimes hundreds of MBs of data per hour could be written already. Therefore it is of importance that these parameters are set to e.g. unlimited or to a high value when tracing long-term batch processes (and of course sufficient space has to be available on the volume on which the trace file will be written; if necessary use a symbolic link for the relevant directory for writing the trace files in a different location which has sufficient space available).
- If a trace file is filled up then it is no longer possible to get the writing of the trace information started by setting the parameter value higher dynamically. Only once a new session is started trace information will be written again.
- However, tracing may also be activated while no trace information is written (see the previous remark about tracing a screen which has been blocked for a longer period). Often the cause is that the session is occupied for a longer period with one and the same SQL statement and does not retrieve records (yet in case of a select statement). No trace information will be written in that case. This could be the case for batches if an SQL statement is included which would have a result only after a couple of hours. Whether or not this is concerned can usually be verified by assessing if the session has been occupied with the same SQL statement for a long time in Oracle Enterprise Manager.
- If possible, it is desirable to have the trace file as complete as possible. Particularly for the slow screen actions it is possible to close the screen after 'reproducing' a slow action after which even the trace file is closed. This will also contain certain counting information that could be useful for assessing the trace file. Also for the batch it is recommended to have a trace file about the entire process that is as complete as possible, but usually this is not possible due to the size. Or it is not possible because the batch has been running for too long and does not end.

Formatting a Trace File

When a session is set to trace mode and the trace file containing the trace information has been identified, then it is desirable to format it in a format what is easily readable and useful. It is possible to already format a trace file while it is still being created. If possible, it would be better to wait until it is entirely ready.

Formatting has to take place via utility `'tkprof'`. The version that is located in the database bin directory of `ORACLE_HOME` has to be used. Switch therefore in advance the environment settings to the correct `ORACLE_HOME`.

In order to get the heaviest statements of the trace file on top in the formatted output, it is of importance to apply good sorting techniques. This optimizes the output because in that case it is not necessary to look for the slowest statements very long and therefore slow statements are missed less easily.

Useful sorting can be done on the sum of the elapsed times of parse, executing and fetching. In that way most long-term statements will for sure end up on top in the output. For this, parameter value '`sort=prsela,exeela,fchela`' is very useful. An example of call:

```
tkprof ontw_ora_7222.trc trace.txt explain=ozg_owner/ozg_owner
sort=prsela,exeela,fchela
```

Some points of attention:

- Run `tkprof` under the account that has relevant rights for the objects used, for example the owner account of OHI Back Office. Or use an account that has `SELECT ANY TABLE` rights.
- Given that `tkprof` determines execution plans for the statements in the trace file at the moment on which `tkprof` is running, then it is important that nothing in the database is changed between the creation of the trace file and running `tkprof` (for example, the table statistics do not have to be updated in the meantime).

8.3.3.5. Statements – Determining Execution Plan

In case certain SQL statements are slow then it is desirable to examine the execution plan by consulting the explain plan output in which the execution plan is represented. By means of tkprof the execution plan is represented for the statements by default in the trace file. But it could also be desirable to assess a change in a statement in terms of execution plan.

In order to determine an execution plan it is important to have access to the right `PLAN_TABLE`. For this, the global temporary `PLAN_TABLE` has to be used. To facilitate this it is *mandatory* to remove any available `PLAN_TABLE` tables under all schemes. The following action list can be used to obtain this:

- Select the owners of the existing PLAN_TABLEs:

  ```
  select owner from dba_tables where table_name='PLAN_TABLE'
  ```

- Remove the `PLAN_TABLEs` for the various owners.
- Remove any public and private synonyms for `PLAN_TABLE` if they refer to a `PLAN_TABLE`.

Assessing the execution plans of slow statements is something that has to be performed by the development team of the OHI Back Office application and will not be discussed further in this document.

8.3.3.6. Check Index Use

It could be desirable to check if certain indexes are used. For this, it is required to activate the relevant monitoring for an index:

```
alter index &index_name  monitoring usage
```

Via `view v$object_usage` it is possible to trace if an index is used.

By default this is not required and the development team of OHI Back Office will be asked to activate this if required for studying a certain performance problem.

8.3.3.7. Use of SQL Access Advisor

Since release 2007.02 script `OZGTUNES.sql` (available in `$OZG_BASE/sql`) is available, a report can be created for a (problematic) SQL statement.
This can be run if it turns out that e.g. based on an AWR report an SQL statement leads to many problems.

The script starts the *SQL Access Advisor* and hereby generates information that contains advice regarding the steps to be taken in order to optimize the SQL statement performance. The output can be sent along with the rest of the mandatory information for incident notifications of performance problems. The OHI Development can then probably solve the problem faster.

Parameters `OZGTUNES.sql`

1. The ID of the SQL statement about which information/advice has to be printed.
2. Optional: the logical name of the directory (= directory object in the database). If nothing is indicated then `OZG_TMP` is used.
3. Optional: product with permissible values `OZG` (=OHI Back Office) and `OBD` (OHI Data Marts). Parameter influences advice: either OLTP or datawarehouse. If nothing is indicated then `OZG` is used.

Examples of Possible Calls

```
@OZGTUNES ax0ufbmack2cg " "
```

This command writes file ax0ufbmack2cg.out to OZG_TMP with product OZG (OLTP).

```
@ OZGTUNES ax0ufbmack2cg " OBD
```

Writes file ax0ufbmack2cg.out to OZG_TMP with product OBD (datawarehouse).

```
@ OZGTUNES ax0ufbmack2cg OZG_DIR "
```

Writes file ax0ufbmack2cg.out to OZG_DIR with product OZG (OLTP).

```
@ OZGTUNES ax0ufbmack2cg OZG_DIR OBD
```

Writes file ax0ufbmack2cg.out to OZG_DIR with product OBD (datawarehouse).

8.3.3.8. SQL Profiles

Using the *SQL Tuning Advisor* it is possible to store SQL Profiles for specific statements. It is allowed to store SQL Profiles.

8.3.4. Assess Settings during 'Regular' Performance

This component will be developed in greater detail at a later stage.

8.3.4.1. Database

Components to be checked:

- Hit rate of the buffer cache. At least 90%, but preferably more than 95%.
- The same for shared pool.
- Checking the PGA settings

8.3.5. Preventive Application Management Actions

This component will be developed in greater detail at a later stage.

Issues to be considered:

- Max number of batches
- Max number of processes for splitters
- Using splitters

8.3.6. Examining Performance Problems

In case there actually are complaints about performance it is recommended to zoom in on the problem before drawing conclusions as to a possible cause. In this section a description can be found about a possible approach that can be applied.

8.3.6.1. Finding out the Scope

When performance problems occur it is important to first find out the extent of the problems at the moment they are encountered (the problem perhaps only occurs during certain periods, also these periods are of importance):

- Does everyone experience the problems on all locations regardless of the operation?
- Is it possible for the problem to be encountered in various workstations but does it only occur when logging in on the system with a certain name?
- Is the slowness related to the location (only certain workstations or PCs)?
- Does the slowness occur only in certain sections of the application?
- Can the slowness be detected only if a certain action is performed on the data?
- At the moment the problem occurs, is it just OHI Back Office that has a slow performance on the PC or are all of the actions in the relevant workstation(s) experiencing this problem?

If the problem is time-driven it is of importance to note down the exact time (up to the minute with a note specifying where the time is read; the clock of the system could differ by a couple of minutes).

With the answers to these questions the scope can be determined. This would probably lead to one of the following delineations:

- A PC-specific problem is involved.

  In these cases the problem can be caused by the hardware, the network connection, the operating system, certain applications that run on the PC, alternative settings on the PC or, more tricky, a combination of these problems.
  It is typical that the problem is encountered on one PC regardless of the user that logs in or the application and that the same user experiences no problem on other PCs.
- The problem is related to the network.

  Only certain workstations in a specific section of the building or a specific building experience this problem.
  Typically, the problem is not encountered when the same user performs the same operations on workstations in a different section of the building.
- The problem is related to the server (database and/or application server).

  All applications on the server(s) experience the problem. In that case, via monitoring utilities it is possible to check that the server is overloaded at a certain point (too much swapping/paging is involved; the server is occupying nearly 100% CPU all the time or is waiting for I/O regularly; or a combination of the above).
  Typically, all users experience problems with the slowness in the applications that run on the relevant server and all server applications are rather slow.
- It is either a database or a general application problem.

  All actions on the relevant database are performed relatively slowly (generally speaking this will result in a server problem but in that case particularly the database actions will cause

problems).
Typically, one particular application runs very slowly instead of other applications that run on the same server (if available).

On the outside it is often hard to make a distinction between the server and the application-specific database problems.

- The problem is caused by a problem in the application.

  The problem is only encountered during certain actions. Depending on the gravity of the problem, only the relevant action experiences problems in performance or other components of the application are burdened by it as well because the database and/or server is overloaded.
  Typically, some of the actions in the application are performed at a normal speed, but certain actions are much slower than before (if there is a frame of reference).

The problem is caused by wrong application use.

Typically, new users are involved or users who perform certain actions for the first time. Or a function is involved that is used for the first time since its introduction. Chances for incorrect use of certain functions or wrong expectation are the highest.

The problem is caused by a certain bottleneck in the infrastructure of the application.

Typically, for these problems no clear general overloading can be observed. A possible cause could be that many processes change the same file (outside of the database). An example, which actually did occur, involved many user sessions that wrote many messages at the same time in the Apache log files.

8.3.6.2. Zooming in on Problems

In order to figure out the cause of the performance problems experienced, the following suggestions are made:

- Checking the workstation: What is the CPU load of the PC like (e.g. use a 'task manager' to monitor the CPU load; if it is near 100% and this is not caused by the application process then usually this could be a reason).
- Does the relevant action (execute it as similarly as possible) run comparably slowly in a different workstation? If not, does it make a difference if the same account is used in a different workstation?
- Is a peak or an overload encountered on the server?
  - Is there hardly or no idle CPU time?
  - Is 'waiting for I/O' involved?
  - Is there a high paging or swapping rate and do all active processes insufficiently fit in the work memory of the server?

  In case of one or more of these phenomena, the cause has to be ascertained.
  In case of a heavy CPU load the processes that cause the problems have to be defined as well as the application/database they belong to.
  In case of a high I/O rate, the processes that cause the problem have to be checked (as well as the application they belong to).
  If the memory use is too high, then what has to be checked is if there are certain processes that require large amount of memory or if the number of processes is higher than normally. The cause for that problem will then have to be ascertained.

- If no peak load is experienced, is there a clearly heavy process available at the moment the performance problems are experienced? Apparently the relevant operation is then very heavy and requires to be zoomed into.
- In case certain processes are heavy (a lot of I/O, CPU or memory usage) the kind of process has to be ascertained: For OHI Back Office only a few types of processes can be recognized:
  - an Oracle client process that handles the SQL and PL/SQL work;
  - a forms server process that runs on the server and that matches the applet screen processes that run on the workstations;
  - a batch 'client' process (SQL*Plus, SQL*Loader, import/export or shell process).

  In almost all cases the Oracle client process, which matches a certain database, will be the culprit. At times a web forms server process may crash or spin (users should never have such processes run for more than few CPU percentages; if this happens, it has to be killed). If the Oracle client process is identified then by means of the process ID it is possible to determine which database session matches it, after which it is possible to examine the relevant database session further.
- If a certain process is identified as the culprit it can be examined further. For Oracle client processes additional tools are available without problems, for other processes even the source will have to be examined.
  Oracle client processes can be set to trace mode so that the produced trace file can be assessed afterwards by formatting it with `tkprof`. Additionally, it is possible to zoom in to the SQL statements that perform the process and to have a look at the statistics in Oracle Enterprise Manager or by means of a different tool.

In the future zooming in on problems will be focused on what appear to be encountered in the database. If research shows that the problem is to be found elsewhere, then this section will probably not be of any further use.

Before continuing, the changes made since the problem has occurred will also have to be discussed further:

- Has the frequency increased?
- Is there a new version of a component of the total 'stack' technology (hardware and software) in use?
- Have multiple changes been implemented (this makes it more tricky to have a clear view as to the cause, which would call for making as many changes as possible successively rather than simultaneously).
- Is it for certain that the problem has not occurred before?
- Is the problem related to time periods? In other words, is the problem encountered during the beginning or the end of the week, the month or the year?

The more information available, the more plausible certain causes may be or the more easily others can be excluded.

8.3.6.3. Search the Oracle Database for a General Problem

At a certain moment a general database problem can be questionable. In that case it has to be clear that no other causes are involved:

- No additional users are involved which would stretch the limits of the machine.
- There is sufficient physical memory available or, not too much swapping is taking place.
- There are no processes that are more prominent in terms of consumption.

If this impression of having problems with the entire database performance persists, then the general database matters should be focused on. Particularly, the AWR output which reports on the slow period could be useful.

Now examine the following:

- Is the problem an I/O problem:
  - do the service times in AWR no longer correspond with the 'good' periods?
  - has the buffer hit percentage clearly decreased?
- Are there any unusual events in the top 5 of the wait events with a substantially higher waiting period than normally?

In case e.g. a latch problem is involved, then this is to be zoomed into. There could be numerous other problems like this. An initial approach is to search on My Oracle Support for similar problems.

Generally, general database problems - not caused by some specific processes - do not tend to cause application problems that easily. A parameter setting value that is too low would more likely be a cause to a problem.

8.3.6.4. Search Oracle Sessions for Problems

If it is clear that certain sessions are perceived as top processes, they require to be examined. At a later stage, more information will be provided about a possible approach, using the previously described possibilities.

8.3.7. Notifying Performance Problems

If performance problems occur which are caused by an OHI Back Office operation, then when notifying a performance incident the following information is mandatory:

1. ADDM report
2. AWR report in HTML-format
3. Output of Object check (see *Installation manual*, *Oracle Health Insurance (patch) releases* on Beehive Online; start the Object check via the *application menu* so that the *runtime* checks are performed!)
4. In case of `ORA-00600/07445` error messages; the number of the Service Request logged with Oracle Support Services for the database product, and the corresponding alert- & tracefiles

Based on this information it is possible to ask for more information with respect to specific SQL statements; subsequently, in that case a delivery of the following will be requested:

1. AWR SQL report in HTML-format
2. Output of OZGTUNES.sql

For more information, see Collecting Performance Data

8.4. PERFORMANCE APPLICATION SERVER

This section briefly discusses the performance of Oracle Forms Services.

8.4.1. Load Balancing Oracle Forms

In order to implement Load balancing for Oracle Forms (the screen interface component of OHI Back Office) the following My Oracle Support notes can be used:

294749.1 : Troubleshooting WebForms Tuning / Performance / Time out Problems

8.5. PREVENT UNNECESARY LOCK MESSAGES

The OHI Back Office application implements an intensive locking strategy to safeguard consistency of the data and a watertight business rule mechanism. This is a unique and distinguishing characteristic of the OHI Back Office application. But it may mean that you need to adapt table storage settings to prevent 'preventable' (unnecessary) lock messages that can occur due to high concurrency load.

What do we mean with this? First follows a short explanation of some concepts.

- A table consists of a number of database blocks.
- An active transaction on a database block (having a lock or posted update, delete or insert on a record in the block that is not yet committed or rolled back) requires a transaction entry in that block.
- A transaction entry requires approximately 23 bytes in a block (the exact nr of bytes is operating system dependent).
- In each block there are a number of initially reserved transaction entries in the block header.
- When there are more transaction entries needed than initially reserved the free space in a block can be used for additional 'dynamically' allocated transaction entries.
- When a new transaction on a database block cannot acquire a transaction entry due to a lack of free space this is handled in the same way as if a lock on a record cannot be acquired. Depending on the executed statement the statement fails or hangs/waits until the transaction entry can be acquired.

What does this mean?

- When you have a lot of concurrent sessions that execute transactions on the same block (this is table and process dependent) and the free space in the block is already quite exhausted by former updates of records that consumed the free space, it may be a next session raises an exception during an attempt to lock data with a NOWAIT clause.
- Even though the record to be locked is not actually locked the exception is thrown that the 'resource is busy', meaning the lock cannot be obtained.
- This is no 'real' lock but a message indicating there is transaction congestion within the block.
- It is very hard to distinguish these lock messages from actual lock messages, where the data was locked by another session.

When you expect processes suffer from these unnecessary lock messages and these messages do obstruct your processes, you should adjust storage parameters for the table where this occurs. You have the option to increase the INITRANS setting for the table involved and/or increase the PCTFREE setting.

The INITRANS value determines the initially reserved number of transaction entries in the block header of a block where PCTFREE determines the amount of space to keep free in a block for row length increase. Inserts are allowed as long as that PCTFREE is obeyed.

Currently within OHI Back Office minimum values of 4 or 16 are implemented for the INITRANS setting, depending on the table. You may increase this value; OHI Back Office will implement the 4 or 16 as a minimum value during release installations. These values are based on an assumption that the maximum nr of parallel sub processes that is used is in the range 16 to 20. If you clearly use more parallel sub processes it might be needed to increase your actual setting for certain tables proportionally when you expect ‘lock’ messages occur because of a to low initrans setting.

You should trade off whether you want to reserve additional space in a block for transaction entries, which cannot be used for actual data storage, against the chance and implications of an unnecessary lock message due to high number of concurrent processes.

Do not blindly set high values on all tables, this will cost you valuable storage space and increase your IO rate. Only implement higher values on tables that clearly suffer from this issue.

If you are not sure whether a table suffers from this problem please contact OHI Support and ask for assistance in identifying potential problematic tables (this is dependent on your database block size, the order and way you run processes and the parallel degree you implement for batch processes).

As from release 2013.01.0.0000 / 10.13.1.0.0 onwards a message (as logged by a batch process) that a record is locked, occurring when an attempt to lock the record fails, will in most cases show the table involved in situations where that was not yet shown in older releases. This can help in identifying tables that may suffer from this issue. Typically this information is not present when a lock attempt fails due to an unavailable transaction entry but this does not mean that when this info is absent this is always caused by this problem. Other improvements and investigation may help in identifying the failing statement and whether your environment suffers from this problem.

Beware that when you adjust the INITRANS or PCTFREE setting the new values will only be applied to newly acquired blocks. All already acquired blocks do implement the original settings. A reorganization of the table (for example by moving the table) is needed to implement the new settings on existing blocks.

8.6. ANTICIPATE PREVENTIVE RESOURCE MESSAGES

If a certain type of resource is insufficiently available (memory, free disk space, free table space, reserved memory space for extra database sessions, etc.) error messages may be encountered in the application.

The objective of this section is to discuss a number of matters as to how preventive action can be undertaken to prevent certain resource-related messages as much as possible.

In a subsequent phase, this section will be worked out further based on practical experiences. The following indicates the type of matters involved.

8.6.1. Prevent Database Management Messages

By use of active management certain database messages can be prevented. Therefore attention will be paid to the following subjects:

- Active space management for data and index storage
- Auto space management
- Redo and temporary space management
- Monitor the file system space (particularly swap space)
- Processes parameter

- Undo parameter settings
- Session cached cursors

8.6.2. Other Points of Special Interest

Additionally, attention will be paid to the following remaining related matters:

- Number of parallel processes
- Monitoring batch jobs
- Advice to application managers with regard to batches
- Error messages in batch scheduler log
- Compiling sources as a preventive measure
- Locks

9. INSTALLING AND CONFIGURING ORACLE DATABASE VAULT FOR OHI BACK OFFICE

ATTENTION: This functionality is still under construction and not yet available for general use.

Starting with OHI Back Office release 10.18.2.2.0 an OHI Back Office specific implementation of Oracle Database Vault is supported. This is a licensed option with the Oracle Database Enterprise Edition to implement more restrictive access to database objects.

9.1. DATABASE VAULT FOR OHI – ORGANISATIONAL IMPACT

Typically Database Vault is used to prevent privileged, generic database administration accounts, can be used to access or manipulate OHI data as the OHI data is considered as ‘sensitive data’.

Usually such ‘DBA’ accounts have privileges to access all data in all database objects. As these more technical privileged accounts may be used by people in a service organisation, which is possibly externalized from the organization that uses the OHI application, there is less control over who can use these privileges. This while it is well known the OHI tables contain sensitive person identifying data as well as health and financial information regarding these persons, so very privacy sensitive information. As such it may be that security policies and legal obligations cannot be fulfilled when such generic accounts can fully access this sensitive data.

For these situations OHI supports the implementation of Oracle Database Vault, which means there will be a clear segregation of duties:

- Database administrators will typically execute the day to day database administration and management tasks.
- Application administrators will manage the access to the application data and as such will also be responsible for account and access management. This means at least creating and dropping user accounts, granting privileges and fulfilling unlock and password reset requests. As such only the application administrators can grant access to the application data and will know and control the credentials of accounts that provide access to the application data.

This has quite some impact on database and application management tasks, due to the segregation of duties. The following principles should be adhered to:

- The passwords of the Database Vault management accounts (‘owner’ and ‘account manager’ account, including backup accounts for these) may only be known to the application administrators after the Database Vault implementation has been activated (passwords typically have to be reset when these accounts were created by the database administrators).
- Only the application administrators create new accounts and may implement actions like reset, unlock and lock of a database account.
- Specifying passwords for ‘datasource’ accounts (for example for web services), wallet accounts, etc. must be done by the application administrators. Depending on which administrators implement application maintenance tasks this may mean that passwords have to be provided in ‘shared screen’ sessions, where the database administrator may

execute technical configuration and the application administrator needs to provide the passwords for accounts when prompted for.

- The OHI accounts that can be used through a wallet that is restrictively accessible on application server level, but as such typically available for privileged operating system and database accounts, need extra protection. Having access to the wallet may not lead by default to having access to the sensitive data.
- Dual handed tasks should always remain dual handed (no password handover should occur unless directly reset afterwards).
- A robust and secure auditing of all database vault related command executing is required.

9.2. PREPARING YOUR DATABASE ENVIRONMENT FOR IMPLEMENTING DATABASE VAULT

This paragraph will describe how to install, configure and enable the Database Vault option for your OHI database. This is necessary before an OHI specific implementation, meaning a pre-defined OHI specific realm to protect the OHI data from being accessed through regular DBA accounts, can be activated.

9.2.1. Installing Database Vault

Check the Oracle Documentation for the installation instructions.

The database vault components need to be installed on both the root container as well as in the pluggable database. You need both Oracle Label Security (OLS) and Database Vault (DV) although you do not need a license for OLS when it is only used for DV.

Check whether these components are present in your root container and pluggable database(s) by querying from within the root with opened pluggable database(s):

```
select comp_name, status, schema, other_schemas , con_id
from   cdb_registry where comp_id in ('OLS','DV')
order by
       con_id, comp_name
```

A possible result (query CDB_PDBS when you do not know which container id value belongs to which pluggable database):

COMP_NAME	STATUS	SCHEMA	OTHER_SCHEMAS	CON_ID
Oracle Database Vault	VALID	DVSYS	DVF	1
Oracle Label Security	VALID	LBACSYS		1
Oracle Database Vault	VALID	DVSYS	DVF	3
Oracle Label Security	VALID	LBACSYS		3

When DV is not present in your target container (check the CON_ID column above) or not valid run the scripts to create these components in the relevant container database (root, OHI pluggable or both).

The scripts to create the OLS and DV components are respectively:

@?/rdbms/admin/catols.sql

@?/rdbms/admin/catmac.sql

Before running these scripts determine the number of invalid objects to check if you need to recompile objects after running these scripts. You can use the following query for this:

```
select con_id, owner, count(1)
from   cdb_invalid_objects
group by
       con_id, owner order by 1,2
```

Run these scripts as SYS while connected to the relevant pluggable container.

The status of OLS can be queried through CDB_OLS_STATUS while the status of DV can be queried through CDB_DV_STATUS.

Typically your 12.2 created CDB$ROOT container will already have OLS and DV installed and you only need to install this in the PDB.

Run both scripts in sqlplus while connected to the target container (CDB$ROOT and/or some pluggable database container) and make sure you spool the result for in case a failure occurs.

In the example below, parameter 1 and 2 are explicitly undefined before starting catmac.sql for in case you have some sqlplus containing startup script which uses startup parameters. These undefine commands will not fail when you do not have this.

Parameter 1 specifies the default tablespace for the created users (usually ‘SYSAUX’) and the second parameter specifies the temporary tablespace (usually ‘TEMP’). The question mark notation is used to identify the database 12.2 Oracle Home.

To be clear, this is what it may look like when running the catmac.sql script:

```
Enter value for 1: SYSAUX
Enter value for 2: TEMP
```

You may run the scripts with the commands as shown below:

```
spool dv_install
@?/rdbms/admin/catols.sql
undefine 1
undefine 2
@?/rdbms/admin/catmac.sql
spool off
```

Or, as non-interactive (scriptable) alternative:

```
spool dv_install
@?/rdbms/admin/catols.sql
undefine 1
undefine 2
@?/rdbms/admin/catmac.sql SYSAUX TEMP
spool off
```

Rerun the CDB_REGISTRY query above to check OLS and DB are installed and valid.

9.2.2. Configuring Database Vault for CDB$ROOT

Check the Oracle Documentation for the registration instructions, meaning the configuration and enablement for the root container.

As part of the registration process, the Database Vault administrative accounts must be created.

These are user accounts that are granted Database Vault DV_OWNER and DV_ACCTMGR roles. As a safety measure, Oracle recommends that you create backups of these user accounts (for in case the password of the primary account is lost and must be reset).

ATTENTION: Passwords should be specified/changed by the ‘future’ Database Vault manager team, typically a different team than the DBA team that will manage the database.

This should be done in the root container database by creating common accounts. Not in a pluggable database. Choose your own usernames for the Database Vault administrative accounts. You may use the example commands below.

```
GRANT CREATE SESSION, SET CONTAINER TO c##dbv_owner_root
IDENTIFIED BY &password_root CONTAINER = ALL;

GRANT CREATE SESSION, SET CONTAINER TO c##dbv_owner_root_backup
IDENTIFIED BY &password_root_bkp CONTAINER = ALL;

GRANT CREATE SESSION, SET CONTAINER
TO c##dbv_acctmgr_root
IDENTIFIED BY &password_am_root CONTAINER = ALL;

GRANT CREATE SESSION, SET CONTAINER
TO c##dbv_acctmgr_root_backup
IDENTIFIED BY &password_am_root_bkp CONTAINER = ALL;
```

After these accounts are created, configure the primary Database vault users:

```
BEGIN
  CONFIGURE_DV
  ( dvowner_uname   => 'c##dbv_owner_root'
  , dvacctmgr_uname => 'c##dbv_acctmgr_root'
  );
END;
/
```

When you run into the error below please close your pluggable database and re-execute the command:

```
ORA-65048: error encountered when processing the current DDL
statement in pluggable database <pdb_name>
……
ORA-65092: system privilege granted with a different scope to
'DBA'
……
```

The roles DV_OWNER and DV_ACCTMGR must be granted manually to both backup users:

```
grant DV_OWNER to c##dbv_owner_root_backup;
grant DV_ACCTMGR to c##dbv_acctmgr_root_backup;
```

Recompile invalidated objects in the root container:

```
@?/rdbms/admin/utlrp
```

After this the view CDB_DV_STATUS should show ‘true’ as status for the DV_CONFIGURE_STATUS record for the root container.

9.2.3. Enable Database Vault in CDB$ROOT

Next we need to enable Database Vault in the root container. Connect as user c##dbv_owner_root and execute the following command to enable Database Vault:

```
exec dbms_macadm.enable_dv;
```

Continue with a restart of the root container database.

After this the view CDB_DV_STATUS should also show ‘true’ as status for the DV_ENABLE_STATUS record for the root container.

9.2.4. Configure Database Vault in the PDB

The view CDB_DV_STATUS will show Database Vault is not yet configured and enabled in the pluggable database. It is an option to reuse the common DV accounts as created in the root container. We might prefer a solution where local accounts are created as this provides a more robust implementation because these accounts are stored within the pluggable databsae.

For configuring connect as SYS in the PDB and run the example commands below.

```
GRANT CREATE SESSION TO dbv_owner_root
IDENTIFIED BY &password_root;

GRANT CREATE SESSION TO dbv_owner_root_backup
IDENTIFIED BY &password_root_bkp;

GRANT CREATE SESSION TO dbv_acctmgr_root
IDENTIFIED BY &password_am_root;

GRANT CREATE SESSION TO dbv_acctmgr_root_backup
IDENTIFIED BY &password_am_root_bkp;
```

After these accounts are created, configure the primary Database Vault users:

```
BEGIN
  CONFIGURE_DV
  ( dvowner_uname   => 'dbv_owner_root'
  , dvacctmgr_uname => 'dbv_acctmgr_root'
  );
END;
/
```

Recompile invalidated objects in the pluggable database:

```
@?/rdbms/admin/utlrp
```

9.2.5. Enable Database Vault in the PDB

To conclude we need to enable Database Vault also the pluggable database. Only do this when you actually are going to implement Database Vault for OHI Back Office in the next step. If you do activate Database Vault while not implementing it for OHI Back Office you may already run into some ‘ORA-01031: insufficient privileges’ symptoms when not proceeding with the implementation and for example running OHIPATCH step 120.

Connect as user dbv_owner_root in the pluggable database and execute the following command to enable Database Vault:

```
exec dbms_macadm.enable_dv;
```

Next reopen the pluggable database.

After this the view CDB_DV_STATUS should also show ‘true’ as status for the DV_ENABLE_STATUS record for the pluggable database.

Connect again as user dbv_owner_root in the pluggable database and execute the following command to enable proxy connect by the OHI object owner:

```
exec dbms_macadm.authorize_proxy_user('&ohi_object_owner',
'OHI_VIEW_OWNER');
```

Topics that need further details:

- AUDIT….. FAIL ONLY (to reduce overhead)

9.3. ACTIVATE THE OHI BO SPECIFIC REALM

The database preparations need to ready at this point. Starting with OHI release 10.18.2.2.0 functionality within OHI is contained to create a tailored realm. This paragraph describes how.

9.3.1. Create OHI realm access role

Create within your PDB, while connected with DBA privileges (so typically a DBA team member does this), the role OHI_REALM_ACCESS and grant this role to the OHI Back Office object owner with admin option. This must be done before the OHI realm is created.

This role will typically be granted to custom development users (see next step).

```
create role ohi_realm_access;
grant ohi_realm_access to &ohi_object_owner with admin option;
```

Execute privileges on a few OHI objects needs to be granted to Database Vault related accounts. The role OHI_REALM_ACCESS needs to be granted to all custom development users by executing a specific packaged procedure for this.

Please execute the commands below while connected as the OHI object owner. The code below uses the local Database Vault root owner account. Adapt this if you have used a different account name. Also adapt the revoke from SYS if you did not create the role using the SYS account.

```
grant execute on alg_db_vault_pck to dbv_owner_root;
grant execute on alg_dv_allow_owner_access_fnc to dvsys;
revoke ohi_realm_access from sys;
exec alg_security_pck.grant_realm_access_role;
```

9.3.2. Grant inherit privilege and create the OHI specific realm

The commands below need to be run as the Database Vault root owner account in the pluggable database. The first command is needed in order to use the root owner privileges by the OHI packaged procedure that is run afterwards, it allows that package to run with root owner privileges.

Connect as the Database Vault root owner in the pluggable database and execute the following accounts (again dbv_owner_root is used, adapt if you use a different accounts name).

```
grant inherit privileges on user dbv_owner_root to
&ohi_object_owner;
set serveroutput on
exec alg_db_vault_pck.cre_ohibo_realm;
```

When the last call has finished the OHI specific Database Vault realm with name ‘OHI Data Protection’ is created. You can check the presence by quering the view DBA_DV_REALMS.

9.4. USING THE OHI BO SPECIFIC REALM

As mentioned earlier a clear segregation of duties is needed for a safe and secure implementation of restricted access to the OHI data. Restrictive and structural password management is one of the key elements in this.

A future version of this paragraph will be worked out in more detail and cover:

- Privileged OHI accounts
- Functional user accounts
- Password policies
- Auditing
- Personal or person trackable accounts

10. UNINSTALLING OHI BACK OFFICE

The de-installation of OHI Back Office consists of the following activities:

- Remove the OHI Back Office pluggable database(s) and potentially also the containing container database;
- Uninstalling the Oracle Database and Application Server software on the Database, Middleware and Client Tiers (if this Oracle system software is not used by other software any longer);
- Deleting directory `$OZG_ROOT`;
- Deleting the OS account `batch`;
- Deleting the OS account `oracle` (if this is no longer used by other software);
- Cleaning the file system.

APPENDIX A – CONFIGURATION OF MULTIPLE BATCH SCHEDULERS

For the same OHI (database) environment multiple batch schedulers can be launched for different application servers. For the OHI database provided no more than one batch scheduler can be active per application server. If for example four applications servers are available, then a maximum of 4 batch scheduler processes can be started for the same database, on each server one.

The work between the different batch schedulers is not divided. This means that the first batch scheduler will be the active and subsequent started schedulers will only become active if the earlier started scheduler crashes. So the additional started schedulers act as ‘standby’ schedulers to take over the work only when needed. As the load on the application server of the OHI batch work is quite limited this is a pragmatic way of offering higher availability.

In case of multiple batch schedulers it is important that the output and log information is written to a central location, so that when consulting the log/output from the OHI Back Office application it does not matter on which application server the batch process has run. For this purpose a SAN can be used. An alternative is the use of NFS, for which one of the servers renders a directory available for creating log and output files.

USE OF NFS PARTITION

This section discusses how batch scheduler processes can store their log and output files in the same directory structure on different servers. In this process one server renders a directory available, which is the NFS *server*. Other servers may 'share' this directory they are the NFS *clients*.

Activities of NFS Server

Enter the required command as `root` to render available the desired directory as NFS share.

Share Command under Sun Solaris

Under Sun Solaris `share` is used to have a directory used as NFS partition. The easiest form of this command is:

```
share <directory>
```

If directory `$OZG_BASE` is rendered available, then the Solaris command is:

```
share $OZG_BASE
```

Share Command under IBM AIX

Under IBM AIX exportfs is used to render available a directory as NFS partition. The easiest form of this command is:

```
exportfs <directory>
```

If directory `$OZG_BASE` is rendered available, then the AIX command is as follows:

```
exportfs $OZG_BASE
```

Security

The above commands provide read-write access to all hosts and for all users. The manuals of the Operating System used by you contain the information required to improve the security.

Activities of NFS Client

On servers that function as NFS client, the NFS share has to be uploaded.
The first step entails defining the mount point:

```
mkdir -p <mountpoint>
```

Afterwards the remote NFS partition has to be uploaded

```
mount -F nfs <host>:<directory> <mountpoint>
```

If for example directory `/u01/app/oracle/product/OHI/prod` has to be uploaded on server myhost as `/u01/app/oracle/product/OHI/prod` then the command will look as follows:

```
                           mount -F nfs \
myhost:/u01/app/oracle/product/OHI/prod \ /ozg/app/oracle/product/OHI/prod
```

STARTING / STOPPING THE BATCH SCHEDULER

Starting the Batch Scheduler

For each server only one batch scheduler can be active for a given database. If the batch scheduler process is activated, the batch scheduler reserves a user lock for the given application server. If a batch scheduler process is active on the given server, the user lock is already occupied and the newly requested batch scheduler process will abort starting.

If successful, the batch scheduler registers as an active process. This means that in `table ALG_BATCHSCHEDULERS` flag `IND_ACTIEF` of the row matching the application server is set to J.

In the following example the batch schedulers are active on servers `myhost1` and `myhost2`.

The query below…

```
select server
,      ind_actief
,      pid
from   alg_batchschedulers
/
```

…provides in that case the following result:

```
SERVER     I        PID
---------- - ----------
myhost1    J      17015
myhost2    J      11098
```

Stopping the Batch Scheduler

The active batch scheduler checks the row matching the process in table `ALG_BATCHSCHEDULERS` periodically. If column `IND_ACTIEF` is set to `N`, then the batch scheduler will stop.

The active batch scheduler is stopped on server `myhost` by means of the following SQL statement:

```
update alg_batchschedulers
set    ind_actief = 'N'
where  server     = 'myhost'
/
```

Script `OZG_STOP_BATCH.sh` notifies *all* batch scheduler processes of a certain environment to stop, by performing the following statement:

```
update alg_batchschedulers
set    ind_actief  = 'N'
where  ind_actief != 'N'
/
```

PROCESS LOAD BALANCING MECHANISM

Functionality

The active batch scheduler process uses a process load balancing mechanism in order to determine how many new main process and subprocess script requests can be processed.

For this reason, the following information is required:

1. The maximum number of (main- and sub) processes that may be started (as configured in system parameter `BATCH_MAX_PROCESSEN`, #batch_max_processes).
2. At least a quarter of this total capacity is 'reserved' for 'main' processes (rounded upwards to the firs whole number, #batch_max_main).
3. The number of active main processes started by the batch scheduler (#active_main_processes)
4. The number of active subprocesses started by the batch scheduler process (#active_sub_processes)

The mechanism returns the available number of process 'slots' for main- and total nr of processes.

1. Main = #batch_max_main – #active_main_processes
2. Total = #batch_max_processes – (#active_main_processes + #active_sub_processes)

Example

Imagine the following situation:

- The value of `BATCH_MAX_PROCESSEN` is 100
- 10 main processes running, 70 sub processes active (total 80 running)
- 20 main requests and 30 sub request want to start

…then we can see the following nr of processes can be started.

Main capacity available: 25 – 10 → 15

Total capacity available: 100 – 80 → 20

Depending on the request order of the requests at most 15 main and 5 sub requests will be started or 0 main requests and 20 sub requests. Reason for limiting the 'main process' capacity is that the sub processes normally do most of the work and for these always capacity should be available to prevent the batch scheduler starts 100 main processes and there are no 'slots' for doing the actual work, meaning the batch work will actually come to a halt.

APPENDIX B - INSTALLATION & CONFIGURATION OF OHI IN A RAC ENVIRONMENT

This Appendix is outdated and is only maintained for reference purposes. See the RAC restriction paragraph.

INTRODUCTION

This chapter describes the installation and configuration of OHI Back Office in an Oracle RAC environment.

This chapter only applies for customers who would like to migrate their current OHI Back Office 'single instance' environment to an Oracle RAC environment.

Via the Oracle website, under the denominator *Oracle By Example (OBE) Series*, it is possible to listen to free Mini Lessons in order to learn how to use the different features of the Oracle Database.

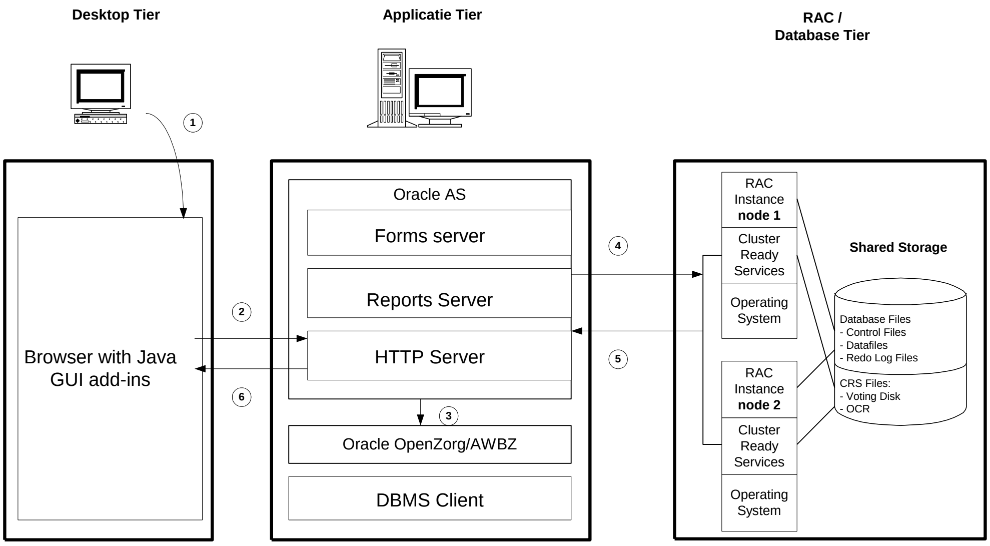
There are e.g. training sessions for RAC, ASM, Clusterware and Manageability.

RELATED PUBLICATIONS

See Related publications/RAC.

ARCHITECTURE

The following provides a general overview of the architecture.



Some remarks about the architecture:

1. Deploying RAC alone is ***not*** a complete High Availability solution. If e.g. a SAN (Storage Area Network) breaks down, RAC does ***not*** offer protection and having a second SAN (stretched cluster situation) could provide a solution.

   For an overview of the Oracle Maximum Availability Architecture see documentation that can be found through the link below:

   http://www.oracle.com/technetwork/database/features/availability/oracle-database-maa-best-practices-155386.html

2. For additional information on shared storage solutions, see the following My Oracle Support note (which is one of the reasons why ASM is the only certified choice):

📄 183408.1 : Raw Devices and Cluster File systems With Real Application Clusters

☞ Oracle recommends using ASM as a Shared Storage solution for the Database Files and a Shared RAW device for the Oracle Cluster Registry and the Voting Disk.

3. In terms of availability and performance Oracle recommends using at least two Host Bus Adaptors and at least two Network Interface Cards per server/node.

4. In case of RAC, Oracle recommends to separate the Application tier from the RAC / Database tier. This supports the Oracle Grid Strategy.

HARDWARE AND SOFTWARE REQUIREMENTS

In order to run OHI Back Office in an Oracle RAC environment, the following software has to be installed completely:

Cluster Layer:

- Oracle Clusterware (consult Oracle Health Insurance Certification Form for required version and interim patches)

Database Tier:

- Oracle Database Server (consult Oracle Health Insurance Certification Form for required version and interim patches)

SIZING AND PERFORMANCE

SYSAUX Tablespace

In case of RAC more space is required in the `SYSAUX` tablespace; in order to determine its size, use script `$ORACLE_HOME/rdbms/admin/utlsyxsz.sql`.

Instance Memory

In case of RAC Oracle recommends to set up extra allocations per node; see memory advice RAC.

INSTALLATION AND CONFIGURATION

This section describes the installation steps that are required for configuring an Oracle RAC environment for OHI Back Office that has to be performed as a preparation for migration.

The steps have to be performed by the customer and go as follows:

1. Installation of the OS
   Check if the kernel settings correspond with the values prescribed in the “Oracle® Database Oracle Clusterware and Oracle Real Application Clusters Installation Guide”.

2. Configuration of the network

   Keep in mind that RAC require at least three network interfaces:

   - Public Interface – used for regular network traffic
   - Virtual (Public) Interface – used for failover and RAC management
   - Private Interface – used for the Interconnect

   ☞ Oracle recommends using the interconnect network cards of at least 1 Gigabyte Ethernet and these have to be connected to a switched network, preferable on a separate switch.

   ⚠ Attention: As of Release **2007.02** the use of ***Net Service*** names is mandatory. For this release, these have to be the same as `$ORACLE_SID` and `$OZG_BASE`.

3. Configuration of the shared storage.
   ASM and OCFS are supported. See the specific documentation for additional information.

4. Ensure that the Oracle user can log in automatically via ssh.

5. Move the OHI Back Office RAC installation and configuration scripts to the `$OZG_ADMIN` directory.

6. Install the Oracle Cluster Ready Service and any patch sets. See also the Certification Form **2007.02.0000 (RAC)**.

7. Install the Oracle DBMS and any patch sets. See also the Certification Form **2007.02.0000 (RAC)**.

MIGRATION

The following describes the steps that have to be taken to migrate a single instance database to an Oracle RAC environment.

This section is an addition to chapter 3.

In order to migrate an OHI Back Office Single Instance Database to an Oracle RAC environment, the following conditions have to be met:

1. OHI Back Office Release 2007.01.0000 has been installed.

2. ASM has to be used.

3. For ASM, Recovery MANager has to be used as a backup restore tool.

4. The steps described in section 14.5 have been completed successfully.

☞ This section presumes ASM as a Shared Storage solution. Other migration options as well as choices for shared storage will not be described in this manual.

For additional information, see the relevant installation and configuration manuals.

Creation of an ASM instance

Create an ASM instance with the following parameters:

INSTANCE_TYPE = ASM

ASM_DISKSTRING = ‘ ‘

☞ Parameter `ASM_DISKSTRING` is customer-dependent and has to contain a reference to the shared storage.

This parameter is additionally intended to exclude disks that are not to be used.

☞ In case of Linux `ASM Lib` can be used for managing an ASM environment.

The RPMs are downloaded from Oracle Technet via the following URL:

http://www.oracle.com/technology/tech/linux/asmlib/index.html

Creation of ASM disk groups

For OHI Back Office the following disk groups have to be created:

OZG_DG_DATA

OZG_DG_FRA

☞ Oracle recommends ASM mirroring (normal redundancy), also external mirroring is supported.

☞ The `OZG_DG_FRA` disk group (for Flash Recovery Area) is optional.

Migrating the database to ASM

For migrating the current OHI Back Office database to ASM the following whitepaper can be used:

Oracle Database 10*g* Migration to Automatic Storage Management

This is available on OTN via the following link:

www.oracle.com/technology/deploy/availability/pdf/Technical_WP_ASM_Migration.pdf

Check

Check if the files that are migrated to ASM have been moved to the correct disk group.

Migrating single instance to RAC

This section provides a description of how a single instance can be migrated to an Oracle RAC environment.

This calls for using the Database Configuration Assistant, abbreviated as `dbca`.

☞ Oracle recommends performing the RAC migration by means of the *Database Configuration Assistant* (`dbca`).

1. For database type select the Oracle Single Instance Database. Subsequently select Manage Templates
2. Create a template while retaining data of the 'single instance' database.
3. Option

   ```
   create a database template / from existing database (structure as well
   data)
   ```

☞ For ASM databases a different structure will have to be selected.

4. Choose the desired Database Instance, specify a name and possibly a description.
5. Subsequently, in this case, select the option: Maintain the file locations.
   The template will be stored in the

   ```
   $ORACLE_HOME/assistants/dbca/templates.
   ```

6. Afterwards restart dbca but now with the database type Oracle Real Application Cluster Database.
7. From the list of nodes select the nodes that will be part of the cluster.
8. Subsequently select the template created in step 1.
9. For option Storage Mechanism choose the Cluster File System.
10. For option Specify File Locations for Database Files to be created select

    ```
    Use Database File Locations from Template.
    ```

11. `Dbca` will subsequently convert the single instance database to an Oracle RAC environment

    - - For each instance a separate redo log and undo log will be created.
    - - For each instance a new `init.ora` will be created.
    - - For each instance a password file will be created.

    During the conversion the following report may appear:

    ```
    ORA-28010 cannot expire external or global accounts
    ```

    This report can be ignored. `dbca` lets all accounts expire.

12. Check if all instances are active by means of the following query:

    ```
    SELECT    *
    FROM      v$active_instances
    ```

13. After migration, check which accounts have expired with the following query and also restore any other relevant details:

    ```
    SELECT    username,
              lock_date,
              expiry_date
    FROM      dba_users;
    ```

Migrate database to a different platform.

If the current OHI Back Office environment runs on a different platform than the RAC environment, migration can be performed by means of Transportable Tablespaces.

To recapitulate briefly, the following steps have to be performed:

1. check if both the source and destination are available in the list of supporting platforms, as well as the `endian_format`.

   ```
   SELECT *
   FROM   v$transportable_platform
   ```

2. Check if the tablespaces are ‘self contained’ by means of the procedure

   `dbms_tts.transport_set_check`.

3. Set the tablespace to read only
4. Export the tablespace metadata
5. Perform the tablespace / data file conversion so that the 'endianness’ is the same.

   This conversion has to be performed through RMAN by means of commands `convert tablespace`, or `convert datafile`.

   For an extended description of these commands, see:

   Oracle® Database Backup and Recovery Advanced User’s Guide 10*g* Release 2

6. Copy the data files to the RAC platform
7. Import the tablespace metadata

A description of steps 2, 3,4, and 7 can be found in section database_reorganisation.

RAC PARAMETERIZATION

If OHI Back Office is used in an Oracle RAC environment then extra parameters will be configured for RAC in the parameter file.

☞ Oracle recommends the use of an spfile in an Oracle RAC environment.

The advantage of an spfile is the joint use by multiple instances as well as the dynamic modification of the parameters.

If ASM is used, then the spfile will also have to be moved to ASM.

Spfiles of ASM instances are moved to the local file system.

The following parameters have to be configured to the indicated values.

When using an spfile a cluster consist of 2 nodes is presumed.

Mandatory RAC instance parameters:

CLUSTER_DATABASE_INSTANCES=
REMOTE_LISTENER =
LOCAL_LISTENER =
<INSTANCE1>.INSTANCE_NUMBER =
<INSTANCE2>.INSTANCE_NUMBER =

<INSTANCE1>.THREAD =
<INSTANCE2>.THREAD =
<INSTANCE1>.UNDO_TABLESPACE =
<INSTANCE2>.UNDO_TABLESPACE =

☞ The aforementioned mandatory RAC instance parameters are completed during the `dbca` RAC migration.

☞ If ASM is used as shared storage, then parameter CONTROL_FILES has to refer to a valid ASM Disk group.

Mandatory ASM instance parameters:
ASM_DISKGROUPS = ozg_dg_data
DB_CREATE_FILE_DEST = ‘+ozg_dg_data’
DB_CREATE_ONLINE_LOG_DEST = ‘+ozg_dg_data’

Optional ASM instance parameters, if an FRA is used:
DB_RECOVERY_FILE_DEST = ‘+ozg_dg_fra’
DB_RECOVERY_FILE_DEST_SIZE =

☞ For the value of parameter `DB_RECOVERY_FILE_DEST_SIZE` take the size of the database including the generated archive log files on the busiest day and multiply this by 2 for an extra margin.

☞ If ASM is *not* used then FRA has to be located on a shared file system.

WORKING WITH SERVICES

OHI Back Office uses services in an Oracle RAC environment. These have to be configured after the RAC installation.

For OHI Back Office two services have to be identified which are listed in the following table.

Service name	**Preferred Instance**	**TAF Policy**
OLTP	All available nodes	none
BATCH	Preferred on n ode 1 Available on the other nodes	none

☞ Oracle recommends using `dbca` for defining the services.

☞ Ensure that for OHI Back Office the *Connection Load Balancing Goal* is set to “Long” for both services.

BATCH PROCESSING

In an Oracle RAC environment it is possible to run the batch processing across multiple nodes. OHI Back Office *requires*, however, running the batch processes (= the `BATCH` service) on *one node*. This has to do with unnecessary 'block pings' between multiple instances. The nodes have to run on a server with the most memory and the biggest CPU capacity.

☞ For future releases of OHI Back Office, there is a possibility to assign batches dynamically to services that could run across one or multiple nodes.

FAILOVER

If all conditions for RAC Installation and Configuration are met, the failover test is the last step that has to be performed.

Attention that OHI Back Office does not support a full Transparent Application Failover.

This has to do with the fact that the PL/SQL variables and package states used by Oracle Forms are lost in case of instance failure.

Therefore OHI Back Office will provide the following messages in case of an instance failure:

FRM-21011 PL/SQL Unhandled Exception Program Error

ORA-03113: End of File on Communication Channel

FRM-40655 SQL error forced rollback : clear form and re-enter transaction.

This is predictable behavior and the user will have to start a new connection with an active instance.

☞ OHI Back Office recommends ***not*** configuring TAF considering that TAF offers no added value in a Forms environment.

MANAGEMENT

Backup and Recovery

See Backup & Recovery/RAC.

Startup and Shutdown

See Startup & Shutdown/RAC.

Networking

See Networking/RAC.

Performance Tuning and Monitoring

See Performance Tuning & Monitoring/RAC.

APPENDIX C - INSTALLATION & CONFIGURATION OF SSO IN OHI BACK OFFICE

INTRODUCTION

This chapter describes the installation and configuration of Single Sign On (SSO) for OHI Back Office and applies only to customers who would like to synchronize their OHI Back Office database users to the Oracle Internet Directory to enable SSO authentication.

As of release 10.13.2 OHI Back Office was certified (again) to work with SSO. As configuration is quite some work this Appendix is updated and released as update on the 10.13.3 documentation. For later releases this documentation is not updated, not verified and may be incorrect.

Attention: Release 10.13.2 (and later releases) will only support SSO connections to exclusive database schemas per user. In a later not yet planned release, support may be added for shared schemas too.

Attention: With release 10.13.2 SSO is only supported using the Oracle Internet Directory (OID). This is a requirement enforced by the underlying product Oracle Forms as this can only support SSO through the use of OID.

Attention: OHI Back Office release 10.13.2 is only certified with password based database authentication for the SSO account.

Attention: The provided description is for installing and configuring the minimal required components for providing SSO. This is not a complete SSO solution, additional directory services should be provided by additional products. As a customer is free of choice in the selection of a directory product that offers the additional services integration with OID is customer specific.

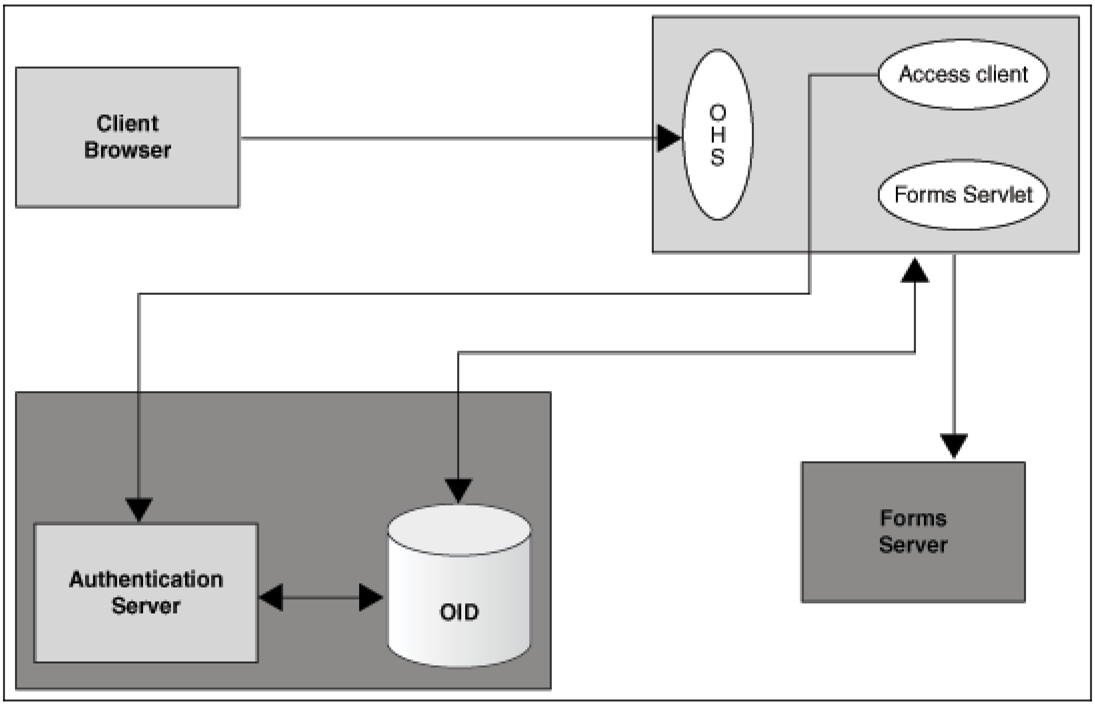
Attention: This information has not yet been updated to reflect possible changes as introduced by OHI release 10.15.1 and later OHI releases, database 12c and the use of a pluggable database. Next to that the documentation is also not adapted to reflect the impact of WebLogic/Forms 12c on the SSO configuration. If you need to know the latest situation please contact OHI Support, mention this paragraph and ask for a status update.

RELATED PUBLICATIONS

See #Related_Publications_SSO

ARCHITECTURE

The following picture provides a general overview of the architecture (it is taken from the standard forms documentation).



Global explanation of the architecture:

- User starts OHI Back Office in a Browser Session by accessing an Oracle HTTP Server (OHS) provided URL that contacts the Forms Servlet.
- If the user is not yet validated, redirection takes place to the Authentication Server (Oracle Access Manager, OAM) with the use of the HTTP Server Module `mod_osso`, this is the Access Client (webgate is an alternative but is not used in the this document).
- The user is authenticated by the Authentication Server through the Oracle Internet Directory (OID), an LDAP based Directory Server that contacts an underlying database.
- If authentication has succeeded, the Authentication Server provides a cookie for the user's browser.
- When the user is authorized the Forms Servlet retrieves the database credentials from the OID Directory Server to startup the Forms Server process that logs on into the database.
- The OHI Back Office application checks whether the user definition is still valid and if so activates the secure application role.

HARDWARE AND SOFTWARE REQUIREMENTS

OHI Back Office with SSO has been certified with the following software configuration:

- Forms & Reports Services 12cR2 (12.1.2.1.0) – in short FRS
- Oracle Identity Management 11g (11.1.1.7.0) – in short OIDM
- Oracle Identity and Access Management 11g (11.1.1.7.0) – in short OIAM

☞ In the Oracle Fusion Middleware 11g Release 1 (11.1.1.7.0) documentation library manuals for Oracle Identity Management are available. Separate installation guides for OIDM and OIAM are present next to an Administrator guide for Oracle Internet Directory (OID).

☞ SSO integration must be manually added with the existing Forms Services, see the Installation Guide for Oracle Forms and Reports Services 12.2.1, Appendix D, as well as the Deployment Guide for Forms Services, Chapter 9. Both are present in the Oracle Forms and Reports documentation library.

☞ In the user's browser, the security settings must be configured in a way that it can accept cookies.

INSTALLATION INSTRUCTIONS

Instructions now follow on how to setup a sample environment for implementing Single Sign On in combination with OHI Back Office on Oracle Linux. As each customer infrastructure landscape is different these are merely meant to implement a possible environment. This should be adapted to the actual circumstances and requirements.

It is advised to use these instructions to setup a Proof of Concept environment to determine how to implement the actual production SSO configuration.

Configuration choices

An environment has been setup on a separate server with the following characteristics:

Oracle Linux 6.3 x86_64 (OL)
Oracle Database EE 11.2.0.4 (DB)
Java JDK 1.7.0_45 (JDK)

Based on this environment the documentation has been created as a guidance to setup your own environment.

The following software was used to setup a separate isolated SSO environment.

WebLogic Server 10.3.6 (WLS)
Oracle Internet Directory 11.1.1.7.0 (OID)
Oracle Access Manager 11.1.1.7.0 (OAM)
Oracle Fusion Middleware Repository Creation Utility 11.1.1.7.0 (RCU)

⚠ Attention: For setting up this environment a new separate WebLogic Server installation should be used. So do not re-use a WLS environment that is used for the Forms and Reports Services for OHI Back Office. This results in irresolvable conflicts.

⚠ Attention: Wherever a hostname is needed make sure you use fully qualified domain names (<hostname>.<domainname>). Make sure each host is reachable with its fully qualified domain name.

⚠ Attention: It is assumed you have already setup Oracle Linux, database software and the JDK. For the other components overview instructions are given.

Please make sure you have downloaded the following components (or similar for your platform).

JDK: jdk-7u45-linux-x64.rpm (if not already installed)
WLS: wls1036_generic.jar
OID (Oracle Identity Management 11g Patch Set 6, OIDM): V37386-01.zip
OAM (Oracle Identity and Access Management 11g, OIAM): V37393-01_1of2.zip and V37393-01_2of2.zip
RCU: V37394-01.zip

Make sure you extract the zip files to a location from which the install files can be run.

Create separate OID and OAM supporting database

Basic steps to create an empty database that will be used for storing the different schemes needed by Oracle Internet Directory and Oracle Access Management.

It is assumed you have a database 11.2.0.4 Oracle Home prepared and have set the environment for this.

1. Make sure the listener is already running
2. Start $ORACLE_HOME/bin/dbca (database configuration assistant)
3. Choose Create a Database, next choose Custom Database
4. Enter a database name (i.e. OIAM) and sid (i.e. OIAM or OIAM1)
5. Decide what you want regarding use of Enterprise Manager
6. Decide what you want to use for passwords
7. Determine database file location
8. Configure FRA, decide about archiving
9. Deselect all db components, deselect all standard db components, do select JVM
10. Memory:
    Determine your memory settings, use at least1024M and enable AMM
    Sizing: block size 8k, processes >= 500
    Character Sets: use Unicode - AL32UTF8 (default), National Character Set – AL16UTF16 (default), Default Language – American (default), default Territory – US (default)
    Connection Mode: Dedicated Server mode (default)
    All Initialization Parameters, show Advanced Parameters:
    aq_tm_processes >= 1
    db_cache_size >= 64m
    java_pool_size >= 128m
    open_cursors >= 500
    session_cached_cursors >= 100
    sga_max_size >= 960m
    sga_target >= 960m
    shared_pool_size >= 192m
11. Adapt your storage settings if wished.

12. Create the database.
13. When you have used 11.2.0.4 to create database make sure you execute the following grant:
    grant execute on DBMS_REPUTIL to PUBLIC;

Create supporting database schemas

The Repository Creation Utility is used to create the required schema structures.

1. Change directory (cd) to the RCU home folder.
2. Start/Run '. /bin/rcu'
3. Choose 'Create Repository'
4. Connection Details:
   Database type – Oracle Database
   Hostname/Port/Service name – the details of the newly created db
   Username/Password – use SYS with its password, connect as SYSDBA
5. Select Components:
   Create a new prefix, i.e. OIAM1
   Within Identity Management, select
   - Oracle Internet Directory (schema owner ODS, cannot be changed)
   - Oracle Access Manager (schema owner OIAM1_OAM); results also in auto selection of Audit Services (schema OIAM1_IAU)
6. Set passwords for the schemas (including auxiliary schema ODSSM and OIAM1_IAU_APPEND and OIAM1_IAU_APPEND and OIAM1_IAU_VIEWER).
7. Leave the tablespaces default or change them.
8. Run the actions.

Install WebLogic 10.3.6

A new Middleware Home is created by running the WebLogic installer.

1. Change directory to the installation .jar
2. Run 'java -Xmx1024m -d64 -jar wls1036_generic.jar'
3. Create a new Middleware Home (i.e. /u01/app/oracle/product/mw1036
4. Choose Install Type 'Custom'
5. Choose Products and Components:
   - Select ALL components for "Weblogic Server" product except (deselect!) "Server Examples"and "Evaluation Database"
   - Select "Oracle Coherence" with component "Coherence Product Files" but without (deselect!) "Coherence Examples"
6. Select the proposed JDK (should be the jdk1.7.0_45 version you started the installer with)
7. Choose the default proposed locations for the product installation directories and install.
8. At the end do not run the "Run Quickstart" option

Install and Configure Oracle Internet Directory 11.1.1.7

The software for OID is now installed and configured.

1. Change directory to where the OIDM software is extracted, to folder 'Disk1'.
2. Start './runInstaller'
3. Choose Installation Type 'Install and Configure'
4. Make sure 'Prerequisite Checks' are met
5. Create New Domain: weblogic with <password>, domain name oid_d1

6. Specify Installation Location:
   - Oracle Middleware Home: i.e. /u01/app/oracle/product/mw1036
   - Oracle Home Directory: oid11117
   - Weblogic Server Directory: /u01/app/oracle/product/mw1036/wlserver_10.3
   - Oracle Instance Location: /u01/app/oracle/product/mw1036/user_projects/instances/oid_i1
   Oracle Instance Name: oid_i1
7. Configure Components; configure at least ‘Oracle Internet Directory’ next to the 2 required (not changeable) components; Clustered is not used.
8. Specify whether you want to use Auto Port Configuration
9. Specify Schema Database - Use Existing Schema:
   - Connect String: <hostname>:1521:OIAM
   - Schema Name: ODS (not changeable)
   - Password: password configured for user ODS
10. Create Oracle Internet Directory:
    - Realm example: i.e. dc=ohi,dc=oracle,dc=com
    - Administrator Password: define password
11. Run the installation, the script with root privileges when needed and the domain configuration
12. Afterwards verify the installation and configuration:
    - Change directory to the instance folder you specified and run ‘./bin/opmnctl status’. Four processes should show status ‘alive’ (3 times and oid1 ias-component and an EMAGENT ias-component).
    - Check the browser URL’s for the ‘…/console’ (Managed Server ‘wls_ods1’ should be running), ‘…/em’, Oracle Directory Services Manager (‘…/odsm’) and Oracle Directory Configuration & Management (‘…/odsm-config

Install and Configure Domain for Oracle Access Manager 11.1.1.7

The software for OAM is now installed and configured.

1. Change directory to where the OIAM software is extracted, to folder ‘Disk1’.
2. Start ‘./runInstaller’ and specify the folder where the JDK is located (i.e. /usr/java/jdk1.7.0_45).
3. Make sure ‘Prerequisite Checks’ are met
4. Specify Installation Location:
   - Oracle Middleware Home: i.e. /u01/app/oracle/product/mw1036
   - Oracle Home Directory: oam11117
5. Run the installation
6. After the installation make sure the earlier created database as well as the AdminServer of the created domain (oid_d1) are running
7. Change directory to the Oracle Home directory you just created (i.e. /u01/app/oracle/product/mw1036/oam11117)
8. Start ‘./common/bin/config.sh’
9. Choose ‘Extend an existing WebLogic domain’
10. Select WebLogic domain directory: /u01/app/oracle/product/mw1036/user_projects/domains/oid_d1’
11. Extend with following optional products:
    Oracle Access Manager with Database Policy Store – 11.1.1.3.0 [oam11117]
12. Configure JDBC Component Schema:
    - Select OAM Infrastructure
    - Specify earlier created schema OIAM1_OAM and specify password
    - Enter the instance name (i.e. ol6ohi), host name and port where the database resides

- Do not change any other settings
- When pressing Next the test should be successful.

13. Select Optional Configuration: select Managed Servers, Clusters and Machines
14. Change the default name oam_server1 in the second line in wls_oam1, change listen address in the hostname and change the listen port to one higher than the wls_ods1 port
15. Configure Clusters: do nothing
16. Configure Machines: do nothing
17. Assign Servers to Machines: assign the wls_oam1 server to the host
18. Extend the domain
19. After the installation is finished check whether the Oracle Access Manager console can be reached by starting the URL for <host>:<adminserverport>/oamconsole (using the weblogic credentials); if not please restart the full environment (see next steps)

At this moment you have installed all software. When you want to restart the associated processes the following list might be useful:

1. Make sure the used database and associated listener are up and running.
2. Start the nodemanager of the WebLogic installation (<WL_HOME>/server/bin/startNodeManager.sh
3. Start the AdminServer of the oid_d1 domain (<…>/user_projects/domains/oid_d1/startWebLogic.sh)
4. Logon to the console and start the wls_ods1 and wls_oam1 Managed Servers
5. Start the OPMN managed processed (<…>/user_projects/instances/oid_i1/bin/opmnctl startall)

Configure OAM to use OID as backend Identity Store

Execute the following steps to let Oracle Access Managed use Oracle Internet Directory as backend Identity Store. Beware to adapt the values used below so they reflect the correct values for your organization.

Create a new OAM administrator account

1. Open the Oracle Directory Services Manager through URL <host>:<wls_ods1 port>/odsm
2. Choose option ‘Connect to a Directory’ to create a new connection via suboption ‘Create A New Connection’:
   - Directory Type: OID
   - Name: OHI LDAP11117
   - Server: your host
   - Port: 3131
   - SSL Enabled: Enabled
   - User Name:cn=orcladmin
   - Password: your OID administrator password

   If you receive an error saying the SSL connection cannot be established it may be that you did not use a fully qualified name for your server (including domain name).
3. Create a new static group entry in “cn=Groups, dc=ohi, dc=oracle, dc=com”(or whatever you created). Beware you data tree shows the hierarchy from right to left, starting with ‘dc=com’ in this example. Make “cn=OCS_PORTAL_USERS” active and use the right mouse menu option ‘Create’:
   - press the + icon to add Object Class “groupOfUniqueNames”

- parent of the entry “cn=Groups, dc=ohi,dc=oracle,dc=com”
Mandatory properties:
- cn: “oamadmin_group”
- Relative Distinguished Name: cn

4. Create a new user entry in “cn=Users, dc=ohi, dc=oracle, dc=com”:
   - add Object Class “inetOrgPerson”
   - parent of the entry “cn=Users, dc=ohi,dc=oracle,dc=com”
   Mandatory properties:
   - cn: “oamadmin”
   - sn: “oamadmin”
   - Relative Distinguished Name: cn
5. Add optional attributes to oamadmin user:
   - Select “cn=oamadmin,cn=Users, dc=ohi,dc=oracle,dc=com” and select tab Attributes
   - press the + icon to add Optional Attributes ‘uid’ and ‘userPassword’
   - uid: oamadmin
   - userPassword: <a new password for the oamadmin user>
   press Apply
6. Make oamadmin member of oamadmin_group:
   - select “cn=oamadmin_group,cn=Groups, dc=ohi,dc=oracle,dc=com” and select tab Group
   - add member: “cn=oamadmin,cn=Users,dc=ohi,dc=oracle,dc=com”
   press Apply

<u>Configure WebLogic to use new LDAP</u>

1. Logon to the WebLogic Administration console (<your host>:7001/console)
   - Lock & Edit
2. Add a new authentication provider:
   - Select Security Realms > myrealm > tab Providers > New
   - Name: OID_Authenticator
   - Type: OracleInternetDirectoryAuthenticator
   - OK
   - Select newly created Authentication Provider “OID_Authenticator”
   - set Configuration / Common/ Control Flag: SUFFICIENT
   - Save
   - set Configuration / Provider Specific / Host: <your host>
   - set Configuration / Provider Specific / Port: 3131 for SSL, 3060 for non SSL; of course SSL is advised
   - set Configuration / Provider Specific / Principal: cn=orcladmin
   - set Configuration / Provider Specific / Credential: <orcladmin password>
   - set Configuration / Provider Specific /SSLEnabled: Active of Inactive (see your port)
   - set Configuration / Provider Specific /User Base DN: “cn=Users,dc=ohi,dc=oracle,dc=com”
   - set Configuration / Provider Specific /Group Base DN: “cn=Groups,dc=ohi,dc=oracle,dc=com
   - Save
3. Reorder Authentication Providers:
   - Select Security Realms > myrealm > tab Providers > Reorder
   - Change order in:
   → DefaultAuthenticator
   → IAMSuiteAgent
   → OID_Authenticator
   → DefaultIdentityAsserter
   - OK
   - Activate Changes

Register the OID Server as a new User Identity Store for OAM

1. Logon to the Oracle Access Manager console (<your host>:7001/oamconsole, use the weblogic domain credentials)
2. Add a new user identity store:
   - System Configuration tab > Common Configuration Panel > Data Sources > User Identity Stores > Actions Menu: Create
3. Create User Identity Store:
   - Store Name: OIDIdentityStore1
   - Store Type: OID: Oracle Internet Directory
   - Enable SSL: depending on what you specified earlier
   - Location: <your hostname>:<your (non)SSL port>
   - Bind DN: "cn=orcladmin"
   - Password: <your orcladmin password>
   - User Name Attribute: cn
   - User Search Base: "cn=Users,dc=ohi,dc=oracle,dc=com"
   - Group Search Base: "cn=Groups,dc=ohi,dc=oracle,dc=com"
   - Press "Test Connection" (right upper corner) – should be successful
   - Apply (results in Confirmation that store has been created successfully)
4. Designate it as the System Store:
   - reopen/select the User Identity Store OIDIdentityStore1
   - activate 'Set as system store' (under Default and System Store Options)
   - just a little lower press + for the Access System Administrators to add System Administrator Roles
   - search on "oam*" with type "All"
   - add both found "oamadmin"(User) and "oamadmin_group"(Group)
   - Apply → Results in *Warning: This store has been chosen as System Store, to make it functional you need to manually change the ID Store settings at OPSS level and configure the IDMDomainAgent.*
   - When pressing OK a Validate Administrator popup appears, validate with username "oamadmin"and corresponding password; at the top of the shown page a Confirmation is shows that the ODIdentityStore1 is modified successfully.
5. Set the pre-configured LDAP Authentication Module to use the new User Identity Store:
   - System Configuration tab > Access Manager Settings Panel > Authentication Modules > LDAP Authentication Module > LDAP > Actions menu: Open (make sure a tab LDAP is opened on the right side)
   - for User Identity Store select "OIDIdentityStore1"
   - Apply

Restart OAM and test Single Sign On

Now it is time to test the configuration:

1. Logon to the Oracle Access Manager console (<your host>:7001/oamconsole), at first use the weblogic domain credentials; this should fail
2. Now logon using the 'oamadmin' account and password as previously created; this should succeed.
3. Close the tab but do not close the browser and test whether you do not have to logon again. You should be able to access the OAM console pages directly.
4. Search the session you are using:
   - select System Configuration > Common Configuration Panel > Session Management > Actions menu: Open [You may run into a bug that the Open option is not active; navigate to another option that can be opened and navigate back; the Open option

should now have become active]
- on the right tab ‘Session Management’ use Match ‘Any’, User ID Starts with ‘oam’, press Search; your session should show up
- select the session and delete (using the Red cross); you will be immediately logged out

Correct ODS and OAM issues

Without the correction below, using ssoDynamicResourceCreate will result in:
Forms/OID RAD setup delivers FRM-93370: error reading the Resource Access Descriptor for update

See also MOS document:
Unable To Access Forms Using Rad (Doc ID 1316272.1)

The following solution is proposed:

1. Open the Oracle Directory Services Manager through URL <host>:<wls_ods1 port>/odsm
2. Choose option ‘Connect to a Directory’ and connect to the previously created connection OID – OHI LDAP11117
3. Browse to Distinguished Name: cn=Common,cn=Products,cn=OracleContext
4. Change (or add if empty) attribute orclSubscriberSearchBase to dc=ohi,dc=oracle,dc=com (probably you only have to put dc=ohi in front of it)
5. Apply changes

Without the correction below, using SSO on the Forms host will result in:
"FRM-93330: Fatal authentication error: User does not have proper credentials configured in Oracle Internet Directory. Contact your system administrator."

See also MOS document:
OSSO-SUBSCRIBER-DN Header Returns DC=EXAMPLE,DC=COM (Doc ID 1390192.1)

The following solution is proposed:

1. Logon to the Oracle Access Manager console(<your host>:7001/oamconsole) using the oamadmin account
2. Navigate to the Policy Configuration tab. Expand the Application Domains line, within it expand the entry for your forms hostname. Select and expand Authentication Policies and navigate to the Protected Resource Policy node. Select the Open option in the ‘toolbar’ (the folder icon).
3. On the right select the ‘Responses’ tab and select the Add option (green ‘+’ button):
   - Name: osso-subscriber-dn
   - Type: header
   - Value: dc=ohi,dc=oracle,dc=com

   Press Apply

   This should result in a confirmation like:
   Authentication Policy, Protected Resource Policy, modified successfully

OHI Environment setup

The actions to enable SSO within the OHI Back Office forms environment are described now.

Associate Forms with Oracle Internet Directory

1. Logon to the Enterprise Manager of the forms domain (typically <host>:<admin serverport forms domain>/em)
2. Navigate in the left tree control to the Farm_frs_d<x>, within it Forms and select ‘forms’
3. On the right select in the Forms drop down menu option ‘Associate/Disassociate OID’
4. Select the ‘formsapp’ line and click ‘Associate’:
   - OID Host: New OID Host
   - New OID Host: <your OID/OIAM host>
   - New OID Port: 3131 (for SSL, otherwise your non SSL port)
   - Username: ”cn=orcladmin
   - Password”<orcladmin password>
   - Use SSL Port: Enable (in case of SSL)

   Confirmation should be shown when the Forms application formsapp has been successfully associated with the OID host.
   Make sure the OID processes are all up and the firewall is not blocking the used port!

   When the association succeeds a new file `FormsOIDConfig.xml` will be created on the Forms host in folder `$DOMAIN_HOME//config/fmwconfig/servers/WLS_FORMS/applications/formsapp_12.2.1/config`.

   On the OID host the Directory Services Manager will show a new LDAP entry under “cn=Forms, cn=Products,cn=OracleContext”. It looks like orclApplicationCommonName=formsappd36-a708-f050acc46509. This is a unique reference to the formsapp servlet, which will later be used in RAD’s. This unique reference number is also present in the xml file on the Forms host.
5. When you need to disassociate and this is not possible through the Enterprise Manager console, it is possible to enforce this by deleting configuration lines in the created xml file. See the empty file `FormsOIDConfig.xml.jmxori`.
   More information can be found in the MOS document:
   How to Disassociate OID Host From a Forms Application When OID is Inaccessible (Doc ID 1130053.1)

<u>Generating the Access Client osso.conf file for Oracle Access Manager</u>

A. Logon to the Oracle Access Manager console(<your host>:7001/oamconsole) using the oamadmin account
B. Navigate to the System Configuration tab. Open the Access Manager Settings panel. Select and expand SSO Agents and navigate to the OSSO Agents node. Select the Open option in the Actions menu.
C. On the right OSSO Agents tab select the ‘Create OSS Agent’ button.
   - Name: <your forms host>
   - Token Version: v3.0 (default)
   - Base URL: http(s)://<your forms host>:<your forms URL port>
   - Auto Create Policies: Enabled
   - Admin Id: leave empty
   - Admin Info: leave empty

   Press Apply

   This should result in a Confirmation like the one below:
   OSSO agent ol6ohi.ohibo.oracle.com created successfully.
   Artifacts are generated in following location :
   /u01/app/oracle/product/mw1036/user_projects/domains/oid_d1/output/ol6ohi.ohibo.oracle.com

D. Copy the generated osso.conf file to folder `$ORACLE_INSTANCE/config/OHS/<OHS_INSTANCE>`.

   An example command:

```
scp
/u01/app/oracle/product/mw1036/user_projects/domains/oid_d
1/output/ol6ohi.ohibo.oracle.com/osso.conf
oracle@ol6ohi.ohibo.oracle.com$DOMAIN_HOME/config/fmwconfi
g/components/OHS/instances/ohs1/moduleconf/
```

Enable `mod_osso` in the OHS directives configuration

1. Create a file mod_osso/conf in folder `$ORACLE_INSTANCE/config/OHS/<OHS_INSTANCE>/moduleconf`

   Contents:

```
LoadModule osso_module
${ORACLE_HOME}/ohs/modules/mod_osso.so
<IfModule mod_osso.c>
OssoIpCheck off
OssoSecureCookies off
OssoIdleTimeout off
OssoConfigFile osso.conf
#
# Insert Protected Resources: (see Notes below for
# how to protect resources)
#
#______-
#
# Notes
#
#______-
#
# 1. Here's what you need to add to protect a resource,
# e.g. <ApacheServerRoot>/htdocs/private:
#
<Location /private>
require valid-user
AuthType Osso
</Location>
</IfModule>
```

2. Add the following lines to the beginning of the forms.conf file (that is located in the same folder):

```
<IfModule !mod_osso.c>
LoadModule osso_module ${ORACLE_HOME}/ohs/modules/mod_osso.so
</IfModule>
<IfModule mod_osso.c>
OssoHTTPOnly off
</IfModule>
```

3. Restart the WLS_FORMS Managed Server as well as the front-end OHS:
   - Logon to the console of the forms Admin server, shutdown and start the WLS_FORMS server (or arrange this in a different way)
   - restart the Oracle HTTP server instance:

```
$ORACLE_INSTANCE/bin/opmnctl restartproc ias-
component=<OHS_INSTANCE>
```

The forms should still work fine as before.

OHI Environment - activate SSO

In the paragraphs below the Single Sign On functionality will finally be activated.

Change the formsweb configuration parameters

The parameters as described below can be defined either in the general part or the environment specific part (‘sections’, identified with the ‘config=’ parameter in the URL to start a forms environment).

The following parameters define the behavior:

A. **ssoMode**
   - false (default) : SSO disabled, normal username/password login form is active
   - true (= mod_osso) : SSO enabled through mod_osso method (used by OHI), RAD is used
   - webgate : SSO enabled through webgate method (not described/tested)
B. **ssoProxyConnect**
   - yes (default): RAD is used as database proxy user, for the SSO user (cn=<username>)
   - no: RAD is user as normal database username/password
C. **ssoDynamicResourceCreate**
   - true (default): When RAD does not exist, user will be able to add dynamically
   - false: No dynamic creation of RAD
D. **ssoErrorUrl**
   When ssoDynamicResourceCreate is disabled, and RAD cannot be found, user is redirected to this URL.
E. **ssoCancelUrl**
   When ssoDynamicResourceCreate is enabled, and RAD creation is cancelled by the user, user is redirected to this URL.

Implement the following changes in your formsweb.cfg (`$DOMAIN_HOME/config/fmwconfig/servers/WLS_FORMS/applications/formsapp_12.2.1/config/formsweb.cfg`) file.

```
ssoMode=true
ssoProxyConnect=no
ssoDynamicResourceCreate=true
ssoErrorUrl=/OHI/admin/ssoError.html
ssoCancelUrl=/OHI/admin/ssoCancel.html
```

The last two variables specify 2 files you should create in $OZG_ADMIN with an informative message. It is assumed alias OHI is defined in your OHS configuration as described in the Virtual Directories paragraph.

The ssoError message could be:

Your account is known and you logged on successfully but you have no access to this environment and it is not allowed to identify yourself with your database account (Dynamic Resource Create for a Resource Access Descriptor is not enabled for this environment).

The ssoCancel message could be:

Your account is known and you logged on successfully but you cancelled the dynamic creation of a Resource Access Descriptor for this environment.

Create a SSO user – add a user definition to the Directory

1. Open the Oracle Directory Services Manager (ODSM) through URL <host>:<wls_ods1 port>/odsm
2. Choose option ‘Connect to a Directory’ and connect to the previously created connection OID – OHI LDAP11117
3. Browse to Distinguished Name: cn=Users,dc=ohi,dc=oracle,dc=com
4. Choose the create option and create a new (user) entry:
   - add Object Class: inetOrgPerson
   - parent of the Entry: “cn=Users, dc=ohi,dc=oracle,dc=com”
5. Mandatory Properties:
   - cn: manager (common name, used as logon/account name for SSO)
   - sn: manager (surname)
   - Relative Distinguished Name: cn
   press Next

   Status message should show:
   The new entry "cn=manager,cn=Users, dc=ohi,dc=oracle,dc=com" has been created successfully. Click the "Finish" button to exit the wizard.

6. Add optional attributes to the user ‘manager’:
   - uid: manager
   - userPassword: <a password, does not need to be the db password>
   press Apply (you will get error messages when the password does not meet the policies)
7. Informational: Select ‘Show All’ for the Views option on the top right corner of the Attributes tab and look for attribute **orclguid**, which value will be used later.

Create a user Resource Access Descriptor (RAD) for OHI Back Office dynamically

1. Open the URL to startup OHI Back Office using a formsweb configuration that has SSO enabled with Dynamic Resource Creation activated.
2. Logon with user ‘manager’ and the specified password as you defined within Oracle Directory Services Manager.
3. You will be redirected to the ‘Create Resource Access Descriptor’ page for Forms Application <URL config= parameter value>
4. Add the RAD connection details manually (in fact the forms logon data). You need to enter database user, password and database/service name. This data needs to be entered correct as this cannot be corrected by the end user in a later stage.
   If an error is made the forms popup will show with an invalid username/password error (ORA-01017). When OK is pressed the correct database credentials can still be entered but the RAD cannot be corrected.

Informational

In ODSM (see previous instructions for how to start) the RAD can be found.

1. After logon browse to “cn=Extended Properties, cn=OracleContext, dc=ohi,dc=oracle,dc=com”
2. A new child entry is created with orclownerguid=<value of orclguid attribute for the earlier created ‘cn=Users’ entry>
3. When this entry is expanded a detail with cn=Resource Access Descriptor is shown. When that entry is expanded there are three optional attributes shown that contain the database account data:
   - orclFlexAttribut1: contains the database/service name
   - orclUserIDAttribute: contains the database username

- orclPasswordAttribute: contains the password of the db user

Under this node, additional user specific RAD’s can be created in container cn=Resource Access Descriptor.

The first RAD can be used to create other user specific RAD’s.

For more information see MOS document:
How to Create an OID User and Associate a RAD with the User Using LDAP Commands (Doc ID 1475601.1)

Testing

Test1: Verify whether your Single Sign On functionality works as expected.

1. Restart your browser and logon to the OHI Back Office application using the URL with config parameter value that will use SSO and specify the ‘common name’ manager for the Directory user entry you created including the password you specified.
2. Close the OHI Back Office application.
3. Refresh the browser screen, using the OHI Back Office startup URL again.

   The application should be restarted without reentering the user credentials.

Test2: Test logging out.

1. Startup the application as in the previous test.
2. Open the URL to logout your Single Sign On session, use URL <OAM host>:<oam port>/oam/server/osso_logout
3. Restart the OHI Back Office application. You will be redirected again to the screen to enter your Single Sign-On credentials.

Add default RAD

Instead of having to create many user specific RAD’s for all user/OHI Back Office combinations, it is possible to create one default RAD per OHI environment. When the user specific RAD is not available, the default RAD will be used to logon to OHI BO.

In the following MOS document it is described how to set this up:
How to Create Default Resource Access Descriptors (RADS) for Forms 11g (Doc ID 1390533.1)

It is described now how this can be setup for OHI Back Office specific.

1. Specify `ssoProxyConnect=true` in the relevant formsweb.cfg entry.
2. Create a special Proxy database in the OHI Back Office database:
   create user ohimidtier identified by <password>;
   grant create session to ohimidtier;
3. Determine the orclownerguid for the default RAD entry. Enter commands like below on your forms server:
   ```
   . ozg_init.env FRS12213
   ldapsearch -h <your OIAM host> -p <(non)SSL port> -D
   cn=orcladmin -b "cn=Extended Properties,cn=OracleContext"
   -s one "objectclass=*" dn orclownerguid -q -U 1
   ```

   The argument –U 1 specifies to use SSL mode, adapt this if you do not use SSL mode. This will result in a response to provide the cn=orcladmin password and will return the orclownerguid to use:
   ```
   Please enter bind password:
   orclownerguid=8da1c26fca6e10cae0340800208d6360,
   cn=Extended Properties,cn=OracleContext
   ```

```
orclownerguid=8da1c26fca6e10cae0340800208d6360
```

4. Create a default RAD ldap file on the Forms server with similar contents as below. Make sure the first line is in the file on one line, the second line should start with orclresourcetypename. Adapt the orclownerguid with your actual retrieved value. Also adapt VOHI_NL-nl_SSO to your resource name (on 2 locations) and adapt the database username if you use another name as well as the database/service name (orclflexattribute1).

   ```
   dn: orclresourcename=VOHI_NL-
   nl_SSO+orclresourcetypename=OracleDB, cn=Resource Access
   Descriptor
   ,orclownerGUID=8da1c26fca6e10cae0340800208d6360,
   cn=Extended Properties ,
   cn=oraclecontext,dc=ohi,dc=oracle,dc=com
   orclresourcetypename: OracleDB
   orclflexattribute1: vohi
   orcluseridattribute: ohimidtier
   orclownerguid: 8da1c26fca6e10cae0340800208d6360
   orclusermodifiable: true
   orclpasswordattribute: <midtierPwd>
   orclresourcename: VOHI_NL-nl_SSO
   objectclass: top
   objectclass: orclresourcedescriptor
   ```

5. Load the default RAD ldap file by executing the commands below.

   ```
   . ozg_init.env FRS12213
   ldapadd -h <your OIAM host> -p <(non)SSL port> -U 1 -D
   cn=orcladmin -q -f ./add_default_rad.ldif
   ```

   A password will be asked, provide the cn=orcladmin password.

   A message like the one below should be returned:
   adding new entry orclresourcename=VOHI_NL-nl_SSO+orclresourcetypename=OracleDB, cn=Resource Access Descriptor ,orclownerGUID=8da1c26fca6e10cae0340800208d6360, cn=Extended Properties , cn=oraclecontext,dc=ohi,dc=oracle,dc=com

6. For all database users make sure they can connect through the proxy user. As example the user manager is granted in this way:

   ```
   alter user manager grant connect through ohimidtier;
   ```

7. For testing with user manager to connect while no RAD is present the existing RAD must be deleted. Use ODSM to navigate to the correct orlcownerguid entry within the cn=Extended Properties node. Use the right mouse menu to delete the entry (make sure you select the correct entry belonging to manager) including its subtree (the second delete option). If you do not execute this while ssoProxyConnect=true is specified you will no longer be able to connect because of the existing user specific RAD.

8. If you want to create user specific RAD’s you should look into a way to create them by importing .ldif files. An existing RAD may be exported and changed (where the tree level where to export may be dependent on your situation) to include the data and especially the orclownerguid of the new user.

For the last step an example content of an .ldif file that contain all the three levels for one RAD is (make sure that the dn lines are on one line if you use this example):

```
dn: orclownerguid=EF495F638510B1CBE040A8C067380C6A,cn=Extended
Properties,cn= oracleContext,dc=ohi,dc=oracle,dc=com
orclownerguid: EF495F638510B1CBE040A8C067380C6A
objectclass: top
objectclass: orclreferenceobject
seealso: cn=manager,cn=users,dc=ohi,dc=oracle,dc=com

dn: cn=Resource Access
Descriptor,orclownerguid=EF495F638510B1CBE040A8C067380C6A,cn=Extended
Properties,cn=oracleContext,dc=ohi,dc=oracle,dc=com
orclownerguid: EF495F638510B1CBE040A8C067380C6A
objectclass: top
objectclass: orclcontainer
objectclass: orclauxiliaryguid
cn: Resource Access Descriptor

dn: orclresourcename=VOHI_NL-
nl_SSONP+orclresourcetypename=OracleDB,cn=Resource Access
Descriptor,orclownerguid=EF495F638510B1CBE040A8C067380C6A,cn=Extended
Properties,cn=oracleContext,dc=ohi,dc=oracle,dc=com
orclusermodifiable: true
orcluseridattribute: manager
orclresourceviewers: orclApplicationCommonName=formsappd36-a708-
f050acc46509, cn=Forms,cn=Products, cn=OracleContext
orclownerguid: EF495F638510B1CBE040A8C067380C6A
objectclass: top
objectclass: orclresourcedescriptor
orclpasswordattribute: manager
orclflexattribute1: vohi
orclresourcename: VOHI_NL-nl_SSONP
orclresourcetypename: OracleDB
```

<u>Informational</u>

- When you want to connect to a user through the proxy user in the database you can use syntax like ‘connect ohimidtier[manager]’ (this connects to the user manager).
- Each user that connects to the OHI Back Office user interface through a proxy user will have an additional session. This consumes a little more memory (although this is quite moderate, about 2Mb per session).
- You can revoke database password access from a database user by defining it as ‘identified globally’ (example: `alter user manager identified globally`). As long as you do not setup Enterprise User Security such a user cannot logon to the database directly.
- You should determine whether to use a default Resource Access Descriptor (RAD) for all users or a user specific RAD for each user.
- When using default RAD’s you cann**ot** use a SSO account name that is different from the corresponding database account, the names must match. While you can let these differ when using user specific RAD’s.
- For each ‘Configuration entry’ in formsweb.cfg, meaning ‘Sections’ in terms of the Enterprise Manager console in which forms settings are configured, a separate RAD is needed as the name of such a section is part of the ‘Distinguished Name’ (dn) for such a RAD. This means that when you do not use a Default RAD you will have to create user specific RAD’s for each section in the formsweb.cfg (when SSO is used).

- It is advised to only use dynamic RAD creation if you can provide clear instructions for your users as well as additional services to correct RAD's when they are created wrongly (specifying a wrong password or wrong/empty database/service identifier). For regular users it is probably wise not to offer this functionality.
- These instructions only describe the enablement of Single Sign On. Synchronization with for example other directories like Active Directory, provisioning of users, self service for users (for changing their SSO password, request additional access, etc.), etc. need to be filled in also. This is typically very customer specific and may require additional Identity Management products. It may be an option to migrate your OHI Back Office database to use Enterprise User Security. As long as each OHI user retains a private account and logs on directly or through a proxy user this is supported (although direct database usage of OHI Back Office user accounts offers no functionality and is for that reason strongly discouraged).
- Only use SSO for OHI Back Office 'end users', users that use the UI of the application. The batch account, custom code accounts, the OHI schema owner, web service accounts (Service Layer) etc. do still require database authentication.

SOME IMPORTANT REMARKS REGARDING THE CONFIGURATION OF OHI BACK OFFICE SSO ENVIRONMENT

Planning the (LDAP) Directory Tree

Before one can replicate the database users to the Oracle Internet Directory, one must make some decisions about the Directory Tree setup.

☞ For more information about implementing the Directory Tree, consult the person, or department responsible for the Directory Server Administration.

Migrating Database Users to Oracle Internet Directory

For migrating the current database users to Oracle Internet Directory, there are several options. It is possible to create a utility that migrates the user definitions basically using ldapsearch and ldapadd commands.

It is also possible to set up the database users in Oracle Internet Directory with the help of the database functionality called Enterprise User Security. If you choose this method, ease of administration is gained. For more information on using Enterprise User Security, refer to the Oracle Fusion Middleware Administrator's Guide for Oracle Internet Directory 11g Release 1.

If that is done, one can use the Oracle supplied User Migration Utility (`umu`), which is available as part of the Oracle Database Server installation.

The `umu` tool will generate random passwords for the database and the directory.

For more information regarding the UMU utility, see the manual:
Oracle Database Enterprise User Security Administrator's Guide, Appendix A.

Another way to migrate local database users to Enterprise Users is by executing the following command:

```
ALTER USER <username> IDENTIFIED GLOBALLY AS ‘<user DN in OID>’;
```

One condition to this method is that every user must be manually added to the Oracle Internet Directory.

☞ Before implementing SSO determine an approach to what extend you will implement this. Will this purely be for the production OHI Back Office environment, will it be for all OHI Back Office environments, will it be more enterprise wide, etc? Determine whether you want to retain database access for the end users (probably not), determine how you want to implement which password policies, in which way you want to provision accounts, etc.

An implementation plan that describes all requirements, decisions, risks, migration approaches, the integration scope and hardware as well as software consequences is required before the implementation is started.

Oracle Internet Directory Single Point of Failure

Important to know is that if all the application users are located in the Oracle Internet Directory, OID becomes a single point of failure. Therefore it is advised to have for example a second (standby) OID environment available in case the first one becomes unavailable or provide a different way of securing high availability.

☞ Oracle recommends implementing some form of High Availability for the Oracle Internet Directory.

Integration with other LDAP Directory Servers

Integration with other LDAP Directory Servers like Microsoft Active Directory is possible through more than one option.

This is explained in the document Oracle Fusion Middleware Integration Overview for Identity Management Suite.

☞ At this moment the Oracle Internet Directory is the only Directory Server that can be certified for OHI Back Office, as it is required by the used Forms technology, therefore OID is a required component.

DATABASE CONFIGURATION

For using SSO on the OHI Back Office database level, some configuration actions are needed for the Database and Oracle Net Services. For providing OHI Back Office SSO functionality for the user interface, this is not required.

If you want database level SSO it is strongly advised to use Enterprise User functionality. The previous instructions do not provide information how to set this up. High level steps now follow.

Prepare OID with the required schemas for database SSO

Please consult the standard documentation. The RCU steps described are insufficient.

Creating the ldap.ora

First Oracle Net Services must be configured so that the database can find the Directory Server.

One can configure the `ldap.ora` with the use of Net Configuration Assistant (`netca`).

In `netca` choose Directory Usage Configuration and for Directory type choose Oracle Internet Directory, and after that choose the correct OracleContext.

Registering the Database in OID

With the use of `dbca`, the database must be registered in the Oracle Internet Directory so that the database can login to it.

The following values must be filled:

```
User DN          directory superuser (e.g. orcladmin)
Password
Wallet password
```

DBCA creates a wallet and stores it in the $ORACLE_BASE/admin/Oracle_SID/wallet

This wallet is used to secure the connection between the database and the directory.

Database Parameter ldap_directory_access

Change the database parameter `ldap_directory_access` in the `pfile`, or `spfile`.

For OHI Back Office, `password` is the only supported value at this moment.

Configuring Database Authentication

For Database authentication, OHI Back Office SSO uses the Oracle Internet Directory to store User Identities.

A new user must be created the following way if you want to use authentication on the database level:

```
CREATE USER <username> IDENTIFIED GLOBALLY AS ‘<user DN in OID’>;
```

And needs only the create and alter session privilege:

```
GRANT GREATE SESSION TO <username>;
GRANT ALTER SESSION TO <username>;
```

If you do not need database level authentication you might omit database level integration with OID (as mentioned earlier, this is not required for OHI Back Office user interface SSO and discouraged.

SSO SYSTEM ADMINISTRATION

Managing (Enterprise) Users

When the database users are migrated to the Oracle Internet Directory the best way to administer those users is by means of Oracle Identity Manager. This provides a web-based interface where the OID Administrator, and/or end-users can manage their accounts. But when you use other identity management products you may of course use other options.

Monitoring the Single Sign-On Server

One can monitor following items of the SSO Server from the WLS Enterprise Manager console:

- Status of the SSO server;
- Number of logins, successful logins and failed logins.

Administering the Oracle Internet Directory

One can administer the Oracle Internet Directory with the Oracle Directory Services Manager (ODSM).

There are some important issues regarding the administration of the Oracle Internet Directory:

1. Password policy management

   In case a certain password policy is enabled for the superuser account (`orcladmin`) and the account becomes locked, it can be unlocked by the ODS user with the use of the `oidpasswd` tool with the following parameters:

   ```
   oidpasswd [connect=<OID schema database connect string>]
   unlock_su_acct=true
   ```

   The utility is located in the ldap/bin folder of the OID Oracle Home. My Oracle Support Note: 370247.1 gives a good explanation how to unlock the OID superuser account.

2. Statistics gathering

   After an initial load, or significant changes in the OID Directory Data, one must update the Oracle Directory Server (ODS) statistics. This can be achieved by running the `oidstats.sql` script that is located in the `OID_HOME/ldap/admin/` directory with the following parameters:

   ```
   sqlplus ods/ods_password@connect_string @oidstats.sql
   ```

For more information about administering OID see the manual Oracle Internet Directory Administrator's Guide.

APPENDIX D - INSTALLING REQUIRED PERL MODULES

INTRODUCTION

The following additional Perl modules need to be installed for the OHI installation menu `OHIPATCH` to work.
Some modules are also used by OHI application software.

All modules can be retrieved from www.cpan.org, the links are provided in the table below. Minimum versions are shown that have been verified to work well. Newer versions usually should work. Oracle does not provide support on Perl modules.

Set	Installation order	Name of CPAN Perl module	Version
		File::NCopy	0.34
		File::Remove	0.34
		Shell::Source	0.01
		Term::ReadKey	2.30
1	1	Test::Simple	1.001002
	2	File::Path	2.09
	3	Parallel::ForkManager	1.06
	4	DBI	1.607
	5	DBD::Oracle	1.74

☞ **Note 1:** The `gcc` compiler is required for installation of the `Term::ReadKey` module on SunSolaris.

☞ **Note 2:** All modules *in a set* should be installed in a *specific order*, as indicated in the table above.

☞ **Note 3:** Installing module `Term::ReadKey` on Oracle Enterprise Linux can give errors during generating the module.
See Term::ReadKey issue.

MANUAL INSTALLATION PROCEDURE

The following steps have to be followed to install each module. The steps must be executed by `root`.

1. Download the zip file concerned to the application server which will run the installation menu and place it in a temporary directory, e.g. `$TMP`.
2. Unzip the zip file into a temporary directory with `unzip`.
3. Navigate to the directory created for the module.
4. Generate instructions for the installation by running the make file:

```
perl Makefile.PL
```

5. Run `make` to create the blib installation directory:

   ```
   make
   ```

6. Test the functionality of the module with

   ```
   make test
   ```

7. Install the module with

   ```
   make install
   ```

8. Delete the temporarily created directory.

Example

The following is an example installation of the `Term::ReadKey` module on IBM AIX:

```
# unzip term.zip # *** step 2 ***
Archive:  term.zip
   creating: TermReadKey-2.30/
  inflating: TermReadKey-2.30/genchars.pl
  inflating: TermReadKey-2.30/Makefile.PL
  inflating: TermReadKey-2.30/Configure.pm
  inflating: TermReadKey-2.30/test.pl
  inflating: TermReadKey-2.30/ReadKey.pm
  inflating: TermReadKey-2.30/META.yml
  inflating: TermReadKey-2.30/ReadKey.xs
  inflating: TermReadKey-2.30/ppport.h
  inflating: TermReadKey-2.30/MANIFEST
  inflating: TermReadKey-2.30/README
 extracting: TermReadKey-2.30/blib/lib/Term/.exists
  inflating: TermReadKey-2.30/blib/lib/Term/ReadKey.pm
 extracting: TermReadKey-2.30/blib/lib/auto/Term/ReadKey/.exists
  inflating: TermReadKey-2.30/blib/lib/auto/Term/ReadKey/autosplit.ix
 extracting: TermReadKey-2.30/blib/arch/auto/Term/ReadKey/.exists
  inflating: TermReadKey-2.30/blib/arch/auto/Term/ReadKey/ReadKey.so
 extracting: TermReadKey-2.30/blib/arch/auto/Term/ReadKey/ReadKey.bs
 extracting: TermReadKey-2.30/blib/man3/.exists
  inflating: TermReadKey-2.30/blib/man3/Term::ReadKey.3pm
  inflating: TermReadKey-2.30/Makefile
 extracting: TermReadKey-2.30/pm_to_blib
  inflating: TermReadKey-2.30/cchars.h
  inflating: TermReadKey-2.30/ReadKey.o
  inflating: TermReadKey-2.30/ReadKey.c
 extracting: TermReadKey-2.30/ReadKey.bs
# cd TermReadKey-2.30 # *** step 3 ***
# ls
Configure.pm  Makefile.PL   ReadKey.o     cchars.h      test.pl
MANIFEST      README        ReadKey.pm    genchars.pl
META.yml      ReadKey.bs    ReadKey.xs    pm_to_blib
Makefile      ReadKey.c     blib          ppport.h
# perl Makefile.PL # *** step 4 ***
Writing Makefile for Term::ReadKey
# make # *** step 5 ***
cc -c   -D_ALL_SOURCE -D_ANSI_C_SOURCE -D_POSIX_SOURCE -qmaxmem=16384 1506-507
(W) No licenses available. Contact your program supplier to Running
Mkbootstrap for Term::ReadKey ()
chmod 644 ReadKey.bs
rm -f blib/arch/auto/Term/ReadKey/ReadKey.so
LD_RUN_PATH="" ld  -bhalt:4 -bM:SRE -
I:/usr/local/lib/perl5/5.8.0/aix/CORE/per
chmod 755 blib/arch/auto/Term/ReadKey/ReadKey.so
```

```
cp ReadKey.bs blib/arch/auto/Term/ReadKey/ReadKey.bs
chmod 644 blib/arch/auto/Term/ReadKey/ReadKey.bs
Manifying blib/man3/Term::ReadKey.3
# make test # *** step 6 ***
PERL_DL_NONLAZY=1 /usr/local/bin/perl "-Iblib/lib" "-Iblib/arch" -w test.pl
1 .. 8
ok 1
ok 2
ok 3
ok 4
ok 5
ok 6
ok 7
ok 8
# make install # *** step 7 ***
Installing
usr/local/lib/perl5/site_perl/5.8.0/aix/auto/Term/ReadKey/ReadKey.so
Installing
usr/local/lib/perl5/site_perl/5.8.0/aix/auto/Term/ReadKey/ReadKey.bs
Files found in blib/arch: installing files in blib/lib into architec
Installing /usr/local/lib/perl5/site_perl/5.8.0/aix/auto/Term/ReadKey/autos
Installing /usr/local/lib/perl5/site_perl/5.8.0/aix/Term/ReadKey.pm
Installing /usr/local/man/man3/Term::ReadKey.3pm
Installing /usr/local/man/man3/Term::ReadKey.3
Writing /usr/local/lib/perl5/site_perl/5.8.0/aix/auto/Term/ReadKey/.packlis
Appending installation info to /usr/local/lib/perl5/5.8.0/aix/perllocal.pod
# cd ..
# rm -Rf TermReadKey-2.30 # *** step 8 ***
```

MORE AUTOMATED INSTALLATION PROCEDURE

You can use CPAN to install modules, as this is more convenient. However, this requires your application server to be connected somehow to the internet. When internet access is enabled you only need to specify a module. Other required modules are automatically selected.

An example (when logged on as root!):

```
# cpan
CPAN] install Parallel::ForkManager
```

(modules File::Path for example will be automatically installed as dependency)

SPECIFIC INSTALLATION INSTRUCTIONS FOR DBD::ORACLE

To connect to the Oracle database, the Perl `DBI` module is used (independent database interface/access module), together with the Perl `DBD::Oracle` module (driver for Oracle databases).

This last module performs a *connection test* on the database.
To be able to successfully perform this test, as part of installing `DBD::Oracle`, perform following steps:

Prerequisites

First install the Perl modules (if not already installed!):

1. Test::Simple

2. DBI

Specific Set up for Root Account before Installing DBD::Oracle

As `root` user, now perform following steps to correctly indicate the Oracle OCI (Oracle Call Interface) environment for the connection test.
This is done by setting `$TWO_TASK` to a relevant database, and `$ORACLE_HOME` to the database (client) software:

```
. <path to $OZG_ADMIN>/ozg_init.env
. ozg_init.env $OZG_ORATAB_DB12201
. ozg_init.env <ENV>
export ORACLE_USERID=<OHI account>/<password OHI account>
export LD_RUN_PATH=$ORACLE_HOME/lib
```

10.1.1.1. Example

(For this example, it is presumed `ozg_owner` is the OHI application owner account set up in the `PROD` database; the Oracle environment will therefore have to be set to `PROD`)

```
. /u01/app/oracle/product/OHI/admin/ozg_init.env
. ozg_init.env $OZG_ORATAB_DB12201
. ozg_init.env PROD
export ORACLE_USERID=ozg_owner/ozg_owner
export LD_RUN_PATH=$ORACLE_HOME/lib
```

32-/64-bit

Be sure to use the right Perl version; when using 64-bit Oracle Database (Client) software, you should use the 64-bit version of Perl.

When switching from 32-bit to 64-bit, all of the Perl modules mentioned in the table in the Introduction paragraph, need to be reinstalled.

The Perl version can be checked with `file /usr/bin/perl` or `perl -v` (or `-V`).

AIX

On AIX both versions will be installed on your system; by switching Perl symbolic links it is possible to switch 32/64-bit. This is done as `root`, and is documented on your system (usually `/usr/opt/perl5/README`); ask system administrators for more info on your local system.

SunSolaris

When there's no 64-bit Perl on your local SunSolaris system, you can install the modules using 32-bit Perl (see the file `README.64bit.txt` in your local Perl installation).
For that, when installing `DBD::Oracle`, you should set following environment variables

```
  export LD_LIBRARY_PATH=$ORACLE_HOME/lib32
  export LD_RUN_PATH=$ORACLE_HOME/lib32
```

and set up the make file using

```
  perl Makefile.PL -m $ORACLE_HOME/rdbms/demo/demo_rdbms32.mk
```

Install DBD::Oracle

Now install `DBD::Oracle` by following the standard installation procedure for Perl modules; see paragraph Installation procedure.

AIX

On AIX, following error during the `make test` phase may be ignored:

```
t/32xmltype.............ok 3/4Unsupported named object type for bind parameter
at t/32xmltype.t line 71.
```

Linux

On Linux, following error during the `make test` phase may be ignored:

```
t/56embbeded...........ok 2/5DBD::Oracle::db do failed: ORA-00600: Interne
foutcode, argumenten: [kothc_uc_md5:lxerr], [], [], [], [], [], [], []. (DBD
ERROR: OCIStmtExecute) [for Statement "CREATE or replace TYPE
table_embeda_type as varray(10) of varchar(30) "] at t/56embbeded.t line 48.
```

Change OZG_DBDHOME variable in ozg_init.env

After (re-)installing `DBD::Oracle` the environment variable `OZG_DBDHOME` exported in `ozg_init.env` must be set to the oratab variable of the database it has been built with.

For example, when built with the 12cR2 version of the database, `ozg_init.env` should contain:

```
export OZG_DBDHOME=$OZG_ORATAB_DB12201
```

TERM::READKEY ISSUE

When installing the mandatory Perl modules on a Linux server a problem can occur with installing module `Term::ReadKey`. A workaround for this problem is to download and install the precompiled package.
The package for RedHat5 or OEL5
`perl-TermReadKey-2.30-3.el5.rf.x86_64.rpm` can be downloaded from:

http://rpmfind.net/linux/rpm2html/search.php?query=perl-TermReadKey

APPENDIX E - INSTALLATION CHECKLIST

Following is a *quick reference checklist* for installing an OHI Back Office environment. The hyperlinks refer to the relevant paragraphs in this document.

1 – Prerequisites

- Check OHI Back Office certification
- Check hardware & software requirements
- Check OS requirements (for both Database & Application Server)
- Download all required software (OS, Database, Application Server, OHI, Perl, Java, etc.)
- Install & configure OS
- Install additional required Perl modules

10.1.1.2. Validation

Validate OS requirements by starting Oracle Universal Installer; all requirements should have been met.

2 – Install Database

- Install Oracle Database Server
- *Install All Product Languages*
- Install Oracle Database Examples (formerly Companion)
- Install Oracle Database Server patch set
- Install Oracle Database Server interim patches
- Apply Oracle Database Server workarounds for open bugs
- Configure Oracle Database Server
- Create an OHI Back Office database

10.1.1.3. Validation

Use OEM and/or OPatch to see if all interim patches are installed.
Are all workarounds mentioned in the Certification notes implemented?

Check the Database languages.

```
. ozg_init.env <Net Service Name>
. ozg_init.env DB12201
sqlplus sys as sysdba
```

Enter a command that generates a message, for example:

```
SQL> exec dbms_output.put_line(1)
```

This command returns the message

```
PL/SQL procedure successfully completed.
```

Check if this message is in the correct language.

Check if the NLS_NUMERIC_CHARACTERS is set correctly.

3 – Install Application Server

- Install WebLogic Server
- Install Oracle Fusion Middleware Forms and Reports Services
- Install Oracle Fusion Middleware Forms and Reports Services patchset
- Install Oracle Fusion Middleware Forms and Reports Services interim patches
- Initial Configuration Forms and Reports services
- Detailed Configuration of Forms Services

10.1.1.4. Validation

Check the connection to the database and the version of the database client.

```
. ozg_init.env $OZG_ORATAB_DB12201
. ozg_init.env <Net Service Name>
sqlplus sys as sysdba
```

Check the version of import and export utility and the Pro*C compiler.

```
. ozg_init.env $OZG_ORATAB_DB12201
. ozg_init.env <Net Service Name>
imp help=y     => check version number
exp help=y     => check version number
proc -version => check version number
```

Check the version of the Developer software.

Use the following command to ensure the Oracle*Forms software is valid and check the version.

```
$OZG_BASE/utils/OHI_CMD.pl frmcmp_batch.sh -help
```

Check if the NLS_NUMERIC_CHARACTERS is set correctly.

4 – Prepare OHI Back Office Installation

- Set up configuration templates (`ozg_init.env`)
- Set up directory structure

10.1.1.5. Validation

Check if Operating System specific settings are correct.

For Linux

```
. ozg_init.env $OZG_ORATAB_FRS12213
```

LD_LIBRARY_PATH must be set

For AIX

```
. ozg_init.env
```

MALLOCTYPE must be set

OBJECT_MODE must be set

```
. ozg_init.env $OZG_ORATAB_DB12201
```

LIBPATH must be set

```
. ozg_init.env $OZG_ORATAB_FRS12213
```

LIBPATH must be set

LDR_CNTRL must be set

```
                        . ozg_init.env $OZG_ORATAB_OWB10G
```

LIBPATH must be set

```
                        . ozg_init.env $OZG_ORATAB_OMA10G
```

LIBPATH must be set

```
                        . ozg_init.env $OZG_ORATAB_OMS10G
```

LIBPATH must be set

Check if the Perl installation software compiles without errors, and check the Perl version.

```
. ozg_init.env $OZG_ORATAB_DB12201
. ozg_init.env <Net Service Name>
perl –version
perl -c $OZG_BASE/utils/OHIPLIB.pm
perl -c $OZG_BASE/utils/OHIPATCH.pl
```

Check if the installation menu can be started.

```
$OZG_BASE/utils/OHIPATCH.pl <Net Service Name>
```

Fill the parameters and a release.

If the menu options appear, the following is correct:

- Perl libraries
- Developer version
- database connection

5 – Install OHI Back Office

- Perform installation
- Configure the application
- Set up logo’s
- Set up Forms Terminal Resource file

10.1.1.6. Validation

Test following URLs to check the valid configuration of the HTTP server.

```
http://<server>:<port>/forms/frmservlet?config=<env>
http://<server>:<port>/OHI/<env>/bin/OZGIMG01.gif
http://<server>:<port>/OHI/<env>/bin/OZGIMG02.gif
http://<server>:<port>/OHI/admin/logo.gif
```

Start the application; use the URL:
http://<server>:<port>/forms/frmservlet?config=<env>

Now check:

- The images on the startform and Info screen;
- Icons on iconic toolbar;

- Availability release documentation => Double click on release in the *Releases* screen;
- Availability of Online Help (F1 key);
- Correct language of Forms messages (for example in login screen);
- Running Batch scheduler;
- Run script => *Valideren Business Rules;*
- Check logfiles of scripts;
- Run *Object Validation* => Parameter = B (Both database and filesystem)
  Ensure no errors are reported.

APPENDIX F – MIGRATE OHI DATABASE CHARACTER SET TO AL32UTF8

Last Updated: May 27, 2015

INTRODUCTION

Oracle Health Insurance customers with a longer history typically have their database still using character set WE8ISO8859P15 to store characters. This character set is limited in supporting the storage of special characters while this is increasingly needed in a more and more international world. Intermediate parties are more and more exchanging data encoded in a Unicode character set, a character set which can contain many more different characters.

For this reason it is decided all customers should use a Unicode character set to store data in their OHI database starting release 10.15.1 of OHI. For the Oracle database used by OHI this will be character set AL32UTF8.

When the OHI database in use is already using AL32UTF8 as character set this Appendix is irrelevant. Beware that character set AL32UTF8 for OHI has already been supported since about 8 years.

An easy way to determine the database character set is executing the following query:

```
select  dbpr.property_value db_charset
from    database_properties dbpr
where   dbpr.property_name = 'NLS_CHARACTERSET'
```

Appendix Purpose

This appendix describes the migration of an OHI database to use the AL32UTF8 characterset. It will be a mandatory action for all OHI customers to migrate their OHI databases in the period release 10.14.2 is being used. This document will help prepare and execute this migration. It should be used as add on existing Oracle Documentation, explaining specifically the OHI database situation.

Target Audience

This appendix is intended for database managers and others responsible for installation and maintenance of OHI related Oracle products.

Small history on Characterset

The characterset is the mapping between electronic numbers (using bits) and its logical representation of readable characters. The first characterset used in Oracle Databases was US7ASCII (United States – 7 bits – American Standard Code for Information Interchange). It could map/store 2^7 = 128 different characters.

In a later stage, when more different characters needed to be stored inside the database, more dedicated charactersets were introduced. These were using a combination of 8 bits to represent a character. In Western Europe the standard Oracle database character set to be used became WE8ISO8859P1, mapping 2^8 = 256 different characters. With the duplication of available ‘mapping space’, all common West European special characters were able to be addressed uniquely.

The main difference between characterset WE8ISO8859P1 and WE8ISO8859P15, the character set used for OHI databases which do not yet use AL32UTF8, is the EURO sign, which was not present in the P1

Most older customers of OHI are running their databases in characterset WE8ISO8859P15.

Why is the migration needed?

Business Data is becoming more international focussed. For example, a name of a person can hold special characters as typically used in some region of the world. Business applications need to store these names exactly, without regional naming conversions. The OHI database needs to cope with these characters. The OHI database will use the international standard Unicode mapping, which is implemented in Oracle database characterset AL32UTF8.

How will the character set migration be performed?

The Oracle database development group has built a toolkit to perform character set database migrations to Unicode. The OHI database migration will be using this standard Oracle tool: Database Migration Assistant for Unicode version 2.0, in short ‘DMU’. Please read the DMU documentation as mentioned in the reference paragraph.

All OHI databases (Back Office, Data Marts and Self Service) need to be migrated when the current database character set is not AL32UTF8.

When migrations of these different OHI product databases are not executed during the same maintenance window, it is strongly advised to migrate the database for Data Marts and Self Service prior to migrating the Back Office database. As typically data from Back Office is ‘replicated’ to the other two databases this prevents the Back Office database contains characters which cannot be stored in the Data Marts or Self Service database.

When must the migration take place?

The OHI database migration can start AFTER release 10.14.2 has been installed on an environment. The migration must successfully be performed BEFORE release 10.15.1 can be installed (release 10.15.1 will only support AL32UTF8 database character sets).

It is expected the database is migrated while still running as 11.2.0.4 database, so before the upgrade to DB12c is started.

Who will need to take what action?

The Oracle DBA at the customer will need to execute the largest part of the migration. When data cleansing[1] is needed, business analysist will be needed to decide what to do with the current data. Of course, the whole scenario and end result needs to be tested thoroughly.

It is advised to start early with planning and performing partial actions and collect results of for example scans, as modifying/correcting data on this level could potentially have a big impact when not performed with care.

Next to that input and output ‘streams’ may be affected and need to be tested on correct handling of especially the less common characters.

---

1) Cleansing: modifying data (manually or scripted) to be mapped to AL32UTF8, when the DMU tool cannot make an automatic mapping.

Scenario phases in this document

This document is separated into the following four phases:

1. Phase Prepare & (pre) Scan
2. Phase Data Cleansing
3. Phase (repeated) Scan & Convert
4. Phase Cleanup

DMU References

- Oracle DMU 2.0 Documentation Library: http://www.oracle.com/technetwork/database/database-technologies/globalization/dmu/documentation/index.html
- OTN Database Migration Assistant for Unicode – 'Learn More' (portal page): http://www.oracle.com/technetwork/database/database-technologies/globalization/dmu/learnmore/index.html
- MOS 1637455.1 - Known Issues With The Database Migration Assistant for Unicode (DMU) Tool version 2.0
- MOS 788156.1 - AL32UTF8 / UTF-8 (Unicode) Database Character Set Implications

NLS References

- MOS 158577.1 - NLS_LANG Explained (How does Client-Server Character Conversion Work?)
- MOS 229786.1 - NLS_LANG and web servers explained

Questions & Answers

This paragraph discusses some questions that came up during a discussion of this migration with customers.

Support of Guaranteed Restore Points

The use of Flashback Database through the use of Guaranteed Restore Points during the use of the DMU tool is supported. For more information please read:
MOS Doc ID 1947587.1: Flashback DB and DMU to Convert Characterset to Unicode (AL32UTF8) and Revert Back.

Impact on DataGuard standby database

The question is whether it is required to rebuild a DataGuard standby database after the application of the DMU tool on the primary database. Of course one should question itself about the best approach for when there is a problem during the usage of the DMU tool but it is supported to have the DMU tool running and applying its changes also on a physical (!) standby database. On a logical standby database this is not supported.

More information can be found in:
MOS Doc ID 1124165.1: Changing Primary Database Character Set without Recreating Data Guard Physical Standbys

PHASE 1 – PREPARE & SCAN

In order to perform a quick and successful installation, a number of requirements have to be met regarding Oracle Software in the system. This chapter describes the requirements for the installation of OHI Back Office, an integrated suite of products. Check to ensure that the system meets these requirements before starting the installation process.

Installing and running the DMU tool[2]

The DMU version 2.0 tool is available for download on Oracle Support through patch number 18392374. The tool itself is a Java program, which can run on many platforms. It requires Java SE Development Kit installed, version 6 or 7.

For best performance it is advised to install and run the DMU tool on the database server platform (when using RAC on one of the nodes). You will need a graphical session to run the tool, like for the Universal Installer (for example an X11 session).

To install the DMU, extract the downloaded archive into any target folder/directory using a un-ZIP utility for your platform, example:

```
$ unzip p18392374_20_Generic.zip -d /home/oracle
```

On Unix-based Operating Systems, grant execution rights to the extracted /dmu/dmu.sh script, example:

```
$ chmod u+x /home/oracle/dmu/dmu.sh
```

Before starting the DMU tool, set the environment variable LANG to “en_US.iso885915”. This is needed for the internal conversion of PLSQL source code within the OHI database to be migrated successfully.

```
$ export LANG=en_US.iso885915
```

☞	**WARNING**: Be sure to set this LANG environment variable each time you start the DMU tool. To prevent you forget this, you could add the line above in the dmu.sh startup script.

Prepare and cleanup target database

Please validate and/or implement the following actions (unless stated otherwise you should connect as sysdba to the database):

- Check presence or install patch 11795985 on the Oracle Home that is used by OZGPATCH.pl (application server side). This is mandatory for running OZGPATCH for OHI Back Office 10.14.2 with database character set AL32UTF8. Consult certification information on MOS.

---

2) http://www.oracle.com/technetwork/database/database-technologies/globalization/dmu/learnmore/start-334681.html

- Communication between the DMU tool and the target database is using the PL/SQL package SYS.DBMS_DUMA_INTERNAL, which is not installed by default in the database. Before running the DMU tool, install this package by running installation script using a SQL*Plus session, connected as sysdba to the target database.

  ```
  $ sqlplus / as sysdba
  SQL> @?/rdbms/admin/prvtdumi.plb
  ```

- It is a good common practice to perform the migration on a clean starting point, having none (or only known) invalid objects in the database. Use the example queries below to find invalid objects:

  ```
  SQL> select count(*) from dba_objects where status <> 'VALID';

  SQL> select owner, object_type, count(*) from dba_objects where
  status<>'VALID' group by owner, object_type;

  SQL> select owner||'.'||object_type||'.'||object_name from
  dba_objects where status<>'VALID' order by 1;
  ```

  Try making all objects valid, using the global recompile script :

  ```
  SQL> @?/rdbms/admin/utlrp.sql
  ```

☞	**NOTE**: Registering all known invalid objects before running the DMU tool conversion can help in finding phantom problems after the conversion.

- Cleanup the recycle bin, for example with:

  ```
  SQL> purge recyclebin;
  SQL> purge dba_recyclebin;
  ```

- Be sure the external table file (might be needed for loading OHI files) is present, as this will prevent the DMU scan to report an read error on table `<OZG_OWNER>.ALG#XFILES_EXT`, for example with:

  ```
  SQL> !touch /tmp/ALG#XFILES_EXT.tmp
  ```

- For better performance please experiment with the following instance parameter <u>during</u> the usage of the DMU tool as depending on your environment and the phase used less or more optimal execution plans may be chosen:

  ```
  parallel_max_servers
  ```

  For example during the actual convert (Phase 3) index rebuilds can benefit from parallel execution (parallel_max_servers > 0) but during scanning (Phase 1) you already specify how many parallel DMU processes should be used where each process should execute its SQL serial (parallel_max_servers = 0).

- Stop all client processes and (remote) connections to the database, like FMW FormsServlet, OHI Batch Scheduler and Oracle Enterprise Manager Agent (OMA). Restart the database in restricted mode, to prevent unwanted or unknown connections.
- After stopping the OMA, the `SYS.REG$` table of the monitored database must be empty. If there are still rows in this table you might have data which cannot be converted thus

preventing the migration. Read “Lossy or Convertible Conversion Data in SYS.REG$ Table (Doc ID 1490394.1)” for the solution.

If the registration in `SYS.REG$` is coming from the OEM agent then execute:

```
SQL> truncate table SYS.REG$;
```

- For OHI Back Office only:
  As the queue tables of OHI may result in issues during the actual conversion the two OHI queues should be dropped and recreated after the migration has been completed. Dropping these queues will prevent the correct working of queued event processing and batch processing if you do want to use the database later on while not having recreated the queues. You only need to drop the queues if you have plans to actually migrate the same database later on to the AL32UTF8 character set. If you will only use the database for scanning purposes without actually starting the conversion you may leave them present. But do delete them before a scan if after the scan you want to proceed with the conversion.

  Logon to the database as OHI table owner and execute the pl/sql block below to drop the queues and associated payload types:

```
$ sqlplus <OHI Owner>
begin
  alg_ddl_pck.aq
  ( p_name              => 'ALG_EVENT_QUEUE'
  , p_table             => 'ALG#EVENT_QUEUE_TAB'
  , p_type              => 'ALG_EDE_PAYLOAD_TP'
  , p_actie             => 'D'
  );
  alg_ddl_pck.aq
  ( p_name              => 'SYS_BATCH_QUEUE'
  , p_table             => 'SYS#BATCH_QUEUE_TAB'
  , p_type              => 'SYS_BATCH_QUEUE_TYPE'
  , p_actie             => 'D'
  );
  execute immediate
  'drop type SYS_BATCH_QUEUE_TYPE';
  execute immediate
  'drop type ALG_EDE_PAYLOAD_TP';
end;
/
```

  For recreating the queues please read the instructions for when the conversion is completed.

Run DMU Scan

The following actions need to be executed:

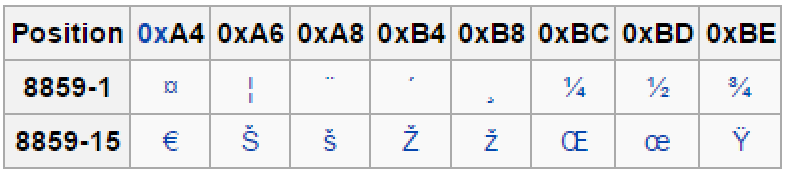
- Set the LANG environment variable and startup the DMU tool:

```
$ export LANG=en_US.iso885915
$ /home/oracle/dmu/dmu.sh
```

- Create a New Database Connection, using SYSDBA credentials. Put in connection details and test the connection. Input given will be stored encrypted on the file system in the hidden ~/.dmu directory.

- Open the connection and install the DMU repository in the target database.
  All scan, cleansing and migration actions performed on the target database will be stored in this repository. Select the following options :
    - Choose the task to install the repository in migration mode.
    - Target characterset for migration: AL32UTF8 (mandatory for OHI)
    - Select the tablespace for repository (default SYSAUX)

- **Assumed Database Characterset**
  You have an option to specify an ‘Assumed Database Characterset’ for the whole database. Please read carefully the documentation about when setting the Assumed Database Characterset ‘overall’ may be needed (page 6-8, paragraph ‘Setting the Assumed Character Set’). You may also set it per column (before or after scanning). For most OHI customers setting the Assumed Database Characterset is expected not to be needed. If you need to set it the Assumed Database Characterset value would typically be WE8MSWIN1252 (this is the character set as usually used in the NLS_LANG setting for the Oracle Forms sessions and corresponding to the character set that is typically used on Dutch PC’s, for in case ‘pass through’ has been used). Experience has shown that setting it can help and does not harm that much as typically WE8MSWIN1252 is mostly a superset of WE8ISO8859P15 except for the characters that are different between WE8ISO8859P1 (8859-1) and WE8ISO8859P15 (8859-15):



Position	0xA4	0xA6	0xA8	0xB4	0xB8	0xBC	0xBD	0xBE
8859-1	¤	¦	¨	´	¸	¼	½	¾
8859-15	€	Š	š	Ž	ž	Œ	œ	Ÿ

  If you do set the Assumed Database Character the characters shown above may be misinterpreted. This might do most harm for the Euro sign (it may be interpreted as the WE8ISO559P1 character as shown in the small table above) but one can question how often that will be stored as part of OHI data and how harmful that will be.

  The Assumed Database Characterset setting for the whole database can be achieved on the properties page/tab of the connected database; the settings for the migration can be changed and provided.

  On the “General” subtab the Current and Target Database Character Set are unchangeable but the Assumed Database Characterset can be provided.
  The migration will convert all known characters from the current set to the target set. Unknown characters found within the current characterset will need conversion too. By setting the Assumed Characterset the DMU tool will try to find a match through this assumed character as ‘current characterset’ to use for the migration (the Assumed Characterset overrules the original characterset).
  When you do not want to specify the Assumed Characterset for the whole database you can set it per column. To implement this, do select the column in the object navigator, choose for the ‘Cleansing Editor’ and when the column values are shown do ‘select’ the column header. This activates the Character Set poplist in which you change the Assumed Characterset for that column.

  Do not forget to apply or save each change!

- [Optional/Free to use]: Tune the scan performance on the “Scanning” tab.
  Changing the number of scanning processes and/or buffer size can significantly impact performance. Recommended default is to have one scan process per CPU core. Do not

forget to apply the change.

- Start the database scan – search for issues that affect migration/conversion.
  The wizard can be started in several ways; one way is from the Menu → Migration → Scan Database.
    - The welcome screen will provide info on the Assumed Character Set (check = WE8MSWIN1252).
    - Specific Scan Parameters can be given for the run, defaults are copied.
      Leave the “Collect rowids only according to 'Rowids to Collect[3]' table property” as default.
    - Within the Objects Selection step leave the default to select all objects to be scanned (in this run). Later runs can be fine tuned to Exclude already Scanned objects with the button.
    - The Scan Details screen will show the DMU choice on how and which Rowids to Collect and on splitting large tables into chunks. Leave on default.
    - On pressing Finish in the Wizard, the database Scan Progress is shown as a separate tab in the tool. It scans through all database stored objects with characters inside (Tables, Materialized Views, PLSQL Sources, etc.) searching in definitions and actual column data on (non)conversion issues.
      The scan will report its time it took to perform the scan, and all objects should have been 100% scanned OK.
      Before continuation, any problem with the scan will need to be investigated and solved, before a re-scan is performed
      (See MOS note 1637455.1 with known issues).

PHASE 2 - DATA CLEANSING

The scan of the database in the previous phase finds all character conversion issues preventing a successful migration. Before the migration can start, all these issues need to be addressed e.g. solved. The DMU tool gives an easy way and complete overview on finding, addressing and solving these issues. This chapter describes some guidelines to perform the data cleansing. Knowledge of the actual OHI data is needed to make the correct decisions to perform the cleansing.

Database Scan Report

The report that was created during the scan can be opened in several ways. One way is from the Menu → Migration → Database Scan Report.

The report is a matrix of objects showing counters per object (type/table/column) on found (non)conversion issues. Counters are summed on its parent/group level, showing icons immediate telling if the object(or group) contains problems. Drilling down on object groups will show more granularities/details and will let you zoom in on the problems.

☞	**NOTE**: The goal of the data cleansing phase is to have all objects to be convertible (with a green tick in front of object/group). Otherwise the migration cannot be started.

---

[3] Collecting the rowids for character conversion issues will speed up data cleansing later as the affected row can be found easier, like an index. This collection of rowids is stored into the repository.

The output of the report can be filtered, whereas the filter option “With Some Issues” followed by “Expand all” seems to be the most useful to look for issues.

The output can be exported as html (through the button at the right side of the filter drop down list).

☞	**NOTE**: Filtering in the Database Scan Report can result in sub-optimal queries on the DMU repository tables in the OHI Back Office database, resulting in slow response in the DMU window. A main cause can be the value 25 for instance parameter optimizer_index_cost_adj. This slow performance can possibly be prevented by setting the database parameter "optimizer_index_cost_adj" temporary to the value 100. By executing "alter system set optimizer_index_cost_adj=100 scope=memory" as sysdba the setting is only set in memory for the current running instance, preventing to forget to return the parameter to its original value (as required for OHI Back Office) after the DMU migration.

Default the following columns are shown (can be changed for more information)

- Need No Change (scheduled) → Reported number of “cells” with **found** mapping between current and target Character Set, where the binary representation **does not** change = No action needed
- Need Conversion (scheduled) → Reported number of “cells” with **found** mapping between current and target Character Set, where the binary representation **needs to** change = No action needed
- Invalid Representation (scheduled) → Reported number of “cells” where **no mapping can be found automatically** = **Action needed**
- Over Column Limit (scheduled) → Reported number of “cells” where the (future) **converted** data will be larger in (byte)size than the column size defined = **Action needed**
- Over Type Limit (scheduled) → Reported number of “cells” where the (future) **converted** data will be larger in (byte)size than the **maximum** column size = **Action needed**

Data Dictionary issues

Implement all recommendations from paragraph “Prepare and Cleanup Target Database“. See MOS note 1637455.1 for other known issues.

Application Schema issues - <OHI_OWNER>

The installation of OHI release 10.14.2 converts all relevant BYTE column definitions to CHAR length, excluding “Over Column Limit” and “Over Type Limit” issues.

However “Invalid Representation” issues are likely to appear. As this is customer data, this data needs to undergo cleansing (manual conversion/repair of the issues found) at the customer site. There is no automatic way of converting this by OHI conversion scripts. Where this was possible this has already been done.

Application Schema issues - <OTHER>

Issues on other application schema's which reside on the same OHI database will be the complete responsibility of the customer. This can involve writing data (DML) conversion as well as object (DDL) conversion scripts.

☞	**TIP**: Question yourself if problematic data (a row with which contains an invalid representation) is still relevant and if the row could be deleted completely, as this is the easiest way to cleanse (providing the application allows this).

☞	**NOTE**: Beware that typically the data dictionary objects remain based on BYTE length definitions. This is expected behavior and identical with a database created from the start based on character set AL32UTF8.

Solving Invalid Representation issues

Invalid Representation issues are most likely caused by pass-through inserts[4] in the past. It means that the current stored binary code for a character is unknown (has no mapping) to the existing database characterset. Conversion cannot take place as it is unknown to the DMU tool what character is needed.

Sometimes it is easy to see which character is meant, as humans can interpret the context of the data easier. Manual correction might be doable in this case. The DMU tool can help in finding these issues easily, and the built in DMU editor can make the necessary modifications.

But cleansing manually can be very time consuming, error prone and must be done with precaution as data must remain consistent and behold its integrity. All issues are stored in the DMU repository after the DMU Scan action has been performed. The following queries can help finding and correcting these issues.

Example statement to find INVALID rows, after DMU scan:

```
select su.name "OWNER", so.name "TABLE", sc.name "COLUMN", de.row_id
from system.dum$exceptions de, sys.obj$ so, sys.user$ su, sys.col$ sc
where de.type = 8
and de.obj# = so.obj#
and de.obj# = sc.obj#
and so.owner# = su.user#
and de.intcol# = sc.segcol#
```

Example statement to locate invalid chars in plsql source objects, after DMU scan:

```
select ss.obj#, ss.line, ss.source, so2.name "SOURCENAME"
from system.dum$exceptions de, sys.obj$ so, sys.user$ su, sys.col$ sc,
sys.source$ ss, sys.obj$ so2
where de.type = 8
and de.obj# = so.obj#
and de.obj# = sc.obj#
and so.owner# = su.user#
and de.intcol# = sc.segcol#
```

---

4) Pass Through cause and effect is explained in detail in MOS note 158577.1

```
and su.name='SYS'
and so.name='SOURCE$'
and sc.name='SOURCE'
and de.row_id = ss.rowid
and ss.obj# = so2.obj#
```

Example statement to create a script to show all INVALID rows:

==> Character “129” will be replaced with “252”

==> Character “144” will be replaced with “201”

```
select 'select '||sc.name||' as '||sc.name||'_NOW,
replace(replace('||sc.name||',chr(129),chr(252)),chr(144),chr(201)) as
'||sc.name||'_NEW from '||su.name||'.'||so.name||' where
rowid='||chr(39)||de.row_id||chr(39)||';' "CMD_SELECT"
from system.dum$exceptions de, sys.obj$ so, sys.user$ su, sys.col$ sc
where de.type = 8
and de.obj# = so.obj#
and de.obj# = sc.obj#
and so.owner# = su.user#
and de.intcol# = sc.segcol#
```

Example commands to create a script to update all INVALID rows:

==> Triggers on tables will be disabled

==> Character “129” will be replaced with “252”

==> Character “144” will be replaced with “201”

==> Triggers on tables will be enabled

```
set heading off
set feedback off
select 'alter table '||su.name||'.'||so.name||' disable all triggers;'
"CMD_DISABLE_TRIGGERS"
from system.dum$tables dt, sys.obj$ so, sys.user$ su
where dt.invalid > 0
and dt.obj# = so.obj#
and so.owner# = su.user#;

select 'update '||su.name||'.'||so.name||' set
'||sc.name||'=replace(replace('||sc.name||',chr(129),chr(252)),chr(144),chr(20
1)) where rowid='||chr(39)||de.row_id||chr(39)||';' "CMD_UPDATE"
from system.dum$exceptions de, sys.obj$ so, sys.user$ su, sys.col$ sc
where de.type = 8
and de.obj# = so.obj#
and de.obj# = sc.obj#
and so.owner# = su.user#
and de.intcol# = sc.segcol#;

select 'alter table '||su.name||'.'||so.name||' enable all triggers;'
"CMD_ENABLE_TRIGGERS"
from system.dum$tables dt, sys.obj$ so, sys.user$ su
where dt.invalid > 0
and dt.obj# = so.obj#
and so.owner# = su.user#;

select 'commit;' from dual;
```

Solving Over Column Limit issues

This means that the data stored in the field will become longer than defined in the new situation, after conversion to the new character set. Most likely this is caused by some single to double or multi byte character expansions during the conversion.

The OHI data model objects have been changed to define CHAR lengths in all relevant column definitions, preventing over column limit issues in the OHI schema objects.

For this reason commands like below have been executed during release installation activities:

```
alter table alg_example_tab modify (column_text varchar2(12 char));
```

Other application schema's which reside on the same OHI database will need the same conversion or data needs to be truncated to fit into the defined limit.

Solving Over Type Limit issues

This issue is comparable with the “Over Column Limit”, except the field data after conversion will become longer than possible to store given the maximum size of the type definition. The only solution left will be truncating/adapting data to fit within the type limit.

Solving a Discoverer issue for OHI Data Marts

When you are migrating the character set of the OHI Data Marts database and still using Oracle Discoverer you may run into an issue regarding data in the End User Layer tables. There are two names in the hierarchy table which result in an over Column Limit issue if you do not take action. You can use the statement below to ‘repair’ this:

```
update eul5_hierarchies
set    hi_name = convert(hi_name, 'US7ASCII')
where  length(convert(hi_name,'AL32UTF8')) > 100
```

Cleansing process

After the DMU Scan has run, all issues will be shown in the DMU tool. All issues need investigation and a proper cleansing solution needs to be found and executed on the data. After cleansing the scan has to be rerun. Only after all issues have been addressed and solved, the next phase “Conversion” can commence.

PHASE 3 - SCAN & CONVERT

This paragraph describes the actual conversion of the database to use AL32UTF8 as database character set. It starts with sanity checks and explains the steps of the conversion. For details on the conversion see the available documentation of the DMU tool.

Sanity Checks

The following sanity checks will help preventing known issues. They are repeated as typically time will have gone by between the first scan action, the issues detected and measures taken to resolve them and the actual conversion.

- Is the OHI version on 10.14.2?
- Does a (recent) backup exist?

- Has environment variable NLS_LENGTH_SEMANTICS not been set to CHAR or BYTE, as it should be left to the OHI application code to set it to CHAR?
- No unnecessary connections to the database (web services & batch scheduler)?
- No (or known) INVALID objects?
- Is the DBA_RECYCLEBIN empty?
- Is the SYS.REG$ table empty? (OMA agent down)
- Is the DMU tool started with environment variable LANG set?
- DMU initial Scan all OK?
- Did you drop the two AQ queues and associated types?

For OHI Data Marts be sure to stop and exit all Oracle Warehouse Builder components, including the Control Center Service. To stop the OWB Control Center run the stop_service.sql script. In SQL*Plus, run the following command:

```
$ sqlplus <OWB SYS OWNER>
SQL> @OWB_HOME/owb/rtp/sql/stop_service.sql
```

A return value of ‘Not Available’ indicates that you successfully stopped the service.

Stop the browser from running:

- On Windows - OWB_HOME\owb\bin\win32\stopOwbbInst.bat
- On UNIX - OWB_HOME/owb/bin/unix/stopOwbbInst.sh

When you are using a RAC database you need to change the database during the conversion phase to prevent error DMU-00121. For this execute:

- `alter database set cluster_database=false scope=spfile;`
- `srvctl stop database -d <db identifier>`
- `srvctl start instance -d <db identifier> -i <instance to use identifier>`

Database Migration/Conversion

On the “Converting” subtab of the Properties tab of the connected database, the conversion process can be tuned. Changing the number of converting processes and/or Degree of Parallelism can impact performance. Recommended default is to have one converting process per CPU core. Do not forget to apply the change.

Leave all other Converting properties on default.

The Database Migration wizard can be opened on several ways, one way is from the Menu → Migration → Convert Database (it may take a minute or more to startup this new tab).

This will show you a new tab ‘Conversion Details’ showing all five steps that will be executed. The wizard itself will start when you press the ‘Convert’ button in the right lower corner.

Starting the wizard without all conversion issues resolved (detected in phase 2) will result in an error. When there are unexpected database connections this will be reported when trying to start the wizard.

The DMU conversion wizard will:

- Guide the user to perform a Re-Scan of the database for the latest status
- Generate SQL statements needed for conversion (during Processing)

- Execute the generated SQL statements
    - Execute Pre-Conversion Tasks
    - Convert Application Tables
    - Convert System Tables
    - Alter Database Character Set to AL32UTF8
    - Execute Post-Conversion Tasks

During the execution phase, the SQL statements can be viewed in the DMU tool and progress can be monitored. The duration of the conversion of the application tables is mostly determined by the size of your database. An OHI database with small amounts of data (typical a test environment with mostly configuration data) can be converted in less than half an hour on a relatively simple server (dual core, 4 threads).

☞	**NOTE**: ORA-00604: “error occurred at recursive SQL level 1” could be thrown during the “Execute Post-Conversion Tasks”. Try to solve the issue reported, like enlarging data or undo tablespaces. ORA-00060: “deadlock detected while waiting for resource” could be thrown as multiple processes are running. Always continue with “Retry” (as “Skip” will leave unconverted data).

The DMU tool will report the time it needed to convert the database.

When the Convert task is finished successfully execute the following actions:

- Logout the DMU tool connection to the database and restart the database (use restricted mode when necessary to prevent unwanted sessions).
- Recreate the queue types and queues that were dropped before starting the conversion. For this you need sources from the ‘install’ folder of the 10.14.2.0.0 release.

```
$ cd $OZG_PATCH/10.14.2.0.0/install
$ sqlplus <OHI Owner>
SQL>set serveroutput on
SQL>@ALG_EDE_PAYLOAD_TP.tps
SQL>@ALG_EDE_PAYLOAD_TP.tpb
SQL>@SYS_BATCH_QUEUE_TYPE.tps
SQL>@SYS_BATCH_QUEUE_TYPE.tpb
SQL>@ALG_EVENT_QUEUE.ins
SQL>@SYS_BATCH_QUEUE.ins
```

```
begin
  alg_object_info_pck.object_info
  ( p_c2=>'TYPE BODY', p_c3=>'ALG_EDE_PAYLOAD_TP'
  , p_c4=>null,p_c5=>null, p_c6=>null,p_c7=> '4.17'
  , p_prl_code=>'OZG', p_product=>'OZG');
  alg_object_info_pck.object_info
  ( p_c2=>'TYPE', p_c3=>'ALG_EDE_PAYLOAD_TP', p_c4=>null
  , p_c5=>null, p_c6=>null, p_c7=>'4.17'
  , p_prl_code=>'OZG',p_product=>'OZG');
  alg_object_info_pck.object_info
  ( p_c2=>'TYPE BODY',p_c3=>'SYS_BATCH_QUEUE_TYPE'
  , p_c4=>null,p_c5=>null,p_c6=>null,p_c7=>'4.16'
  , p_prl_code=>'OZG',p_product=>'OZG');
  alg_object_info_pck.object_info
  ( p_c2=>'TYPE',p_c3=>'SYS_BATCH_QUEUE_TYPE',p_c4=>null
  , p_c5=>null, p_c6=>null,p_c7=>'4.16'
  , p_prl_code=>'OZG',p_product=>'OZG');
  commit;
end;
/
```

- Make all objects valid, using the global recompile script and after that make sure no new objects remain invalid (compare the list with the results you detected during the preparation phase).

```
$ sqlplus / as sysdba
SQL> @?/rdbms/admin/utlrp.sql
```

- Meanwhile gather dictionary statistics as these have become STALE:

```
$ sqlplus / as sysdba
SQL> exec dbms_stats.gather_dictionary_stats
```

- Optionally use the example queries below to find invalid objects (logon with SYSDBA privs):

```
SQL> select count(*) from dba_objects where status <> 'VALID';

SQL> select owner, object_type, count(*) from dba_objects where
status<>'VALID' group by owner, object_type;

SQL> select owner||'.'||object_type||'.'||object_name from
dba_objects where status<>'VALID' order by 1;
```

- When you have a RAC database reverse the action previously done and make it a cluster database again:
  - `alter system set cluster_database=true scope=spfile;`
  - `srvctl stop database –d <db identifier>`
  - `srvctl start database –d <db identifier>`

- Implement the impact of correct length semantics setting for OHI stored pl/sql code (the call to alg_compile_invalid with parameter p_enforce_type_compile requires OHI release

10.14.2.1.0 or higher). This step appeared to be necessary to prevent runtime errors (ORA-22814):

```
$ sqlplus <OHI Owner>
SQL>set serveroutput on
exec alg_compile_invalid(p_enforce_type_compile => true)
$ sqlplus / as sysdba
SQL> @?/rdbms/admin/utlrp.sql
```

- Restart the DMU tool and make connection to the database.
  - Install the repository in validation mode
    You can choose to overwrite the existing repository, or backup the existing repository first for later analysis.
  - Run a scan to see if all characters are converted. Normally this should be the situation. If not, you might need to investigate the cause and decide the migration failed, meaning you might have to revert to a backup and start all over (in a worst case situation).

Startup OZGPATCH.pl and run step 900. This will probably show a nr of indexes that are located in the wrong tablespace. Cause is the DMU tool that might have dropped some indexes during the migration and does rebuild them in the default tablespace of the OHI owner instead of using the original tablespace.
You can best rebuild these indexes manually (and activate parallel execution up front by setting parallel_max_servers to an appropriate value larger than zero again):

```
$ sqlplus <OHI Owner>
SQL> alter index <index name> rebuild tablespace <target_TS>
parallel;
```

- If you have custom scheduler jobs please be aware that these jobs might still have an unwanted value for NLS_LENGTH_SEMANTICS. The value should be CHAR but might still be BYTE. During installation of 10.14.2.0.0 it has been asked to changed the setting for this parameter but this does not affect existing scheduler jobs. When you query DBA_SCHEDULER_JOBS the column NLS_ENV contains the NLS environment settings used during the creation of the job. It is wise to recreate your job definitions (drop the job and create it again) for custom jobs to prevent the NLS_LENGTH_SEMANTICS parameter value may result in errors for your jobs somewhere in the future.
  For OHI jobs (OWNER is the OHI schema owner) this is automatically arranged as part of the patch set 10.14.2.2 installation.
  Please be aware that typically jobs owner by SYS and potential other standard database accounts keep on having value BYTE for NLS_LENGTH_SEMANTICS, this value should not be changed.
- During the conversion the DMU tool may have recreated a number of tables on which Function Based Indexes may be present. These indexes will be recreated and statistics will be gathered for these indexes but this will result in missing column statistics for the related hidden virtual columns for the related tables. And these missing statistics may lead to less well performing execution plans as chosen by the Cost Based Optimizer. Tests have shown that jobs like ZRG3009S (claims processing) and ZRG6127R (policy sheet) may suffer from this.

  To prevent this from occurring run a script like this below as OHI schema owner to collect the missing statistics (as of release 10.15.1 this will be done automatically by the stats gathering step of OZGPATCH/OHIPATCH).

```
set serveroutput on
begin
  for rec in
  ( select table_name, count(1) nr_cols
    from   user_tab_cols
    where  hidden_column='YES'
    and    virtual_column='YES'
    and    last_analyzed is null
    group by
           table_name
    order by
           table_name
  )
  loop
    dbms_output.put_line
    (rec.table_name||' #columns: '||rec.nr_cols);
    dbms_stats.gather_table_stats
    (user,rec.table_name,degree=>4);
  end loop;
end;
```

Adapt the value for (parallel) degree to a value appropriate for your system (make sure parallel_max_servers is larger than zero) to speed up the collection of the statistics. Use a test system to determine how many tables will be involved and how much time will be needed for this step (can be some hours).

- Restart all services (batch scheduler, forms, agent, etc...) and execute a typical smoke test, do the basis functionalities work?

For OHI Data Marts, start the Control Center using the start_service.sql script.

```
$ sqlplus <OWB SYS OWNER>
SQL> @OWB_HOME/owb/rtp/sql/start_service.sql
```

A return value of ‘Available’ indicates that you successfully started the service. If the service fails to start, run the start_service.sql script again.
If the service fails to start after two attempts, run the service_doctor script to determine the cause using the following command:

```
$ sqlplus <OWB SYS OWNER>
SQL> @OWB_HOME/owb/rtp/sql/service_doctor.sql
```

The return value should indicate that the service script is accessible to the database server.

☞	**From MOS Doc ID 158577.1**: This document describes more about NLS_LANG settings. Amongst others, it states: “Set the client NLS_LANG to the characterset that your client is actually *using*. Not to the characterset you *want* to use.” Please read the NLS_LANG paragraph in the second chapter of this manual for more information.

PHASE 4 - CLEANUP

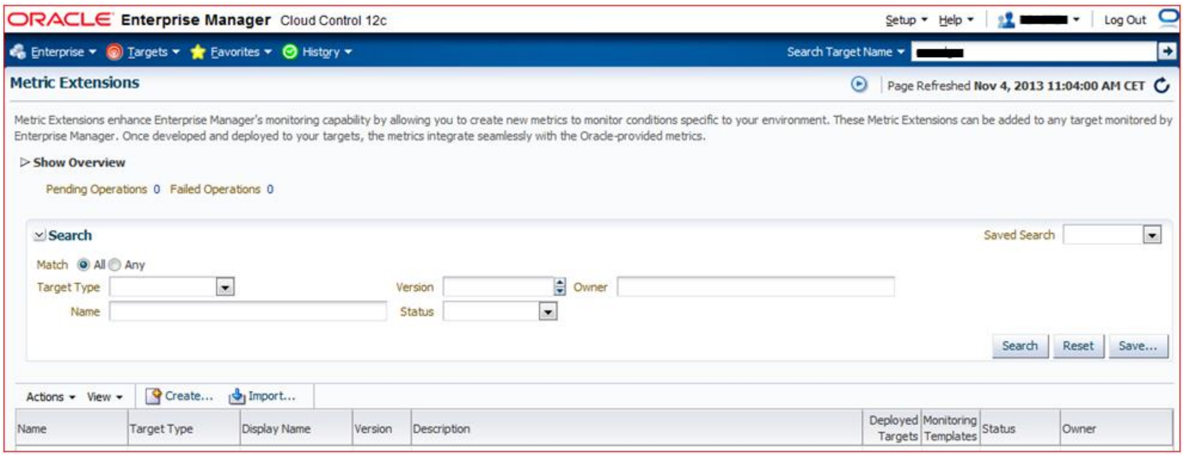
After an own chosen timeout, the DMU repository (or repositories when the backup is created before validation mode) can be removed from the database.
Use the DMU tool to remove the repository/repositories.

The DMU tool itself can also be removed from the host by removing the OS files from the file system.

APPENDIX G – SETTING UP OEM METRIC FOR SQL PLAN MANAGEMENT

In this appendix we will explain how to create a (new) metric extension to check SYSAUX tablespace overrun for the SQL Plan Base Management usage.

- Log in Cloud Control
- Go to the main menu “Enterprise”, next “Monitoring”, next “Monitoring Extensions”.
- Click Create button.



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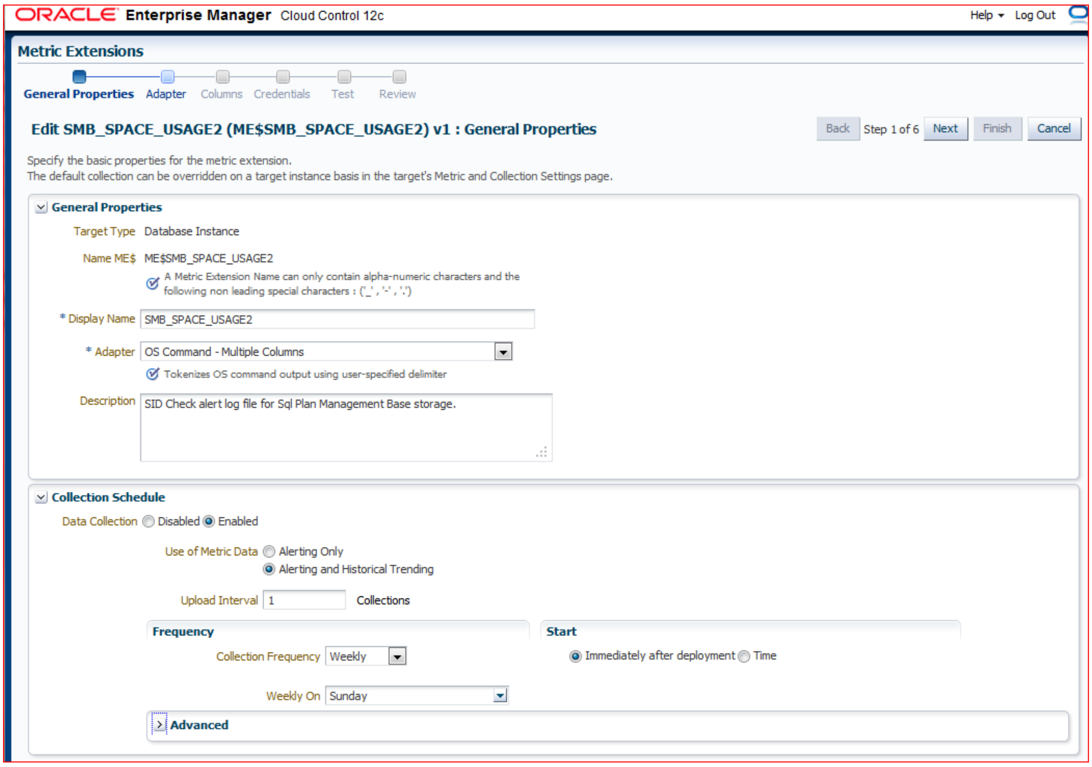
Metric Extensions enhance Enterprise Manager's monitoring capability by allowing you to create new metrics to monitor conditions specific to your environment. These Metric Extensions can be added to any target monitored by Enterprise Manager. Once developed and deployed to your targets, the metrics integrate seamlessly with the Oracle-provided metrics.

Pending Operations 0 Failed Operations 0

- Enter the Display Name. In this example we used “SMB_SPACE_USAGE2”.
- For Adapter use “OS Command – Multiple columns”.
- Enter a description, optional.
- For “Collection Schedule” you can use “Data Collection” “Disabled” during tests phase and enable it later on.



Edit SMB_SPACE_USAGE2 (ME$SMB_SPACE_USAGE2) v1 : General Properties

Specify the basic properties for the metric extension.
The default collection can be overridden on a target instance basis in the target's Metric and Collection Settings page.

General Properties

Target Type: Database Instance
Name ME$: ME$SMB_SPACE_USAGE2
A Metric Extension Name can only contain alpha-numeric characters and the following non leading special characters : ('_' , '-' , '.')
* Display Name: SMB_SPACE_USAGE2
* Adapter: OS Command - Multiple Columns
Tokenizes OS command output using user-specified delimiter
Description: SID Check alert log file for Sql Plan Management Base storage.

Collection Schedule

Data Collection: ○ Disabled ● Enabled
Use of Metric Data: ○ Alerting Only ● Alerting and Historical Trending
Upload Interval: 1 Collections

Frequency

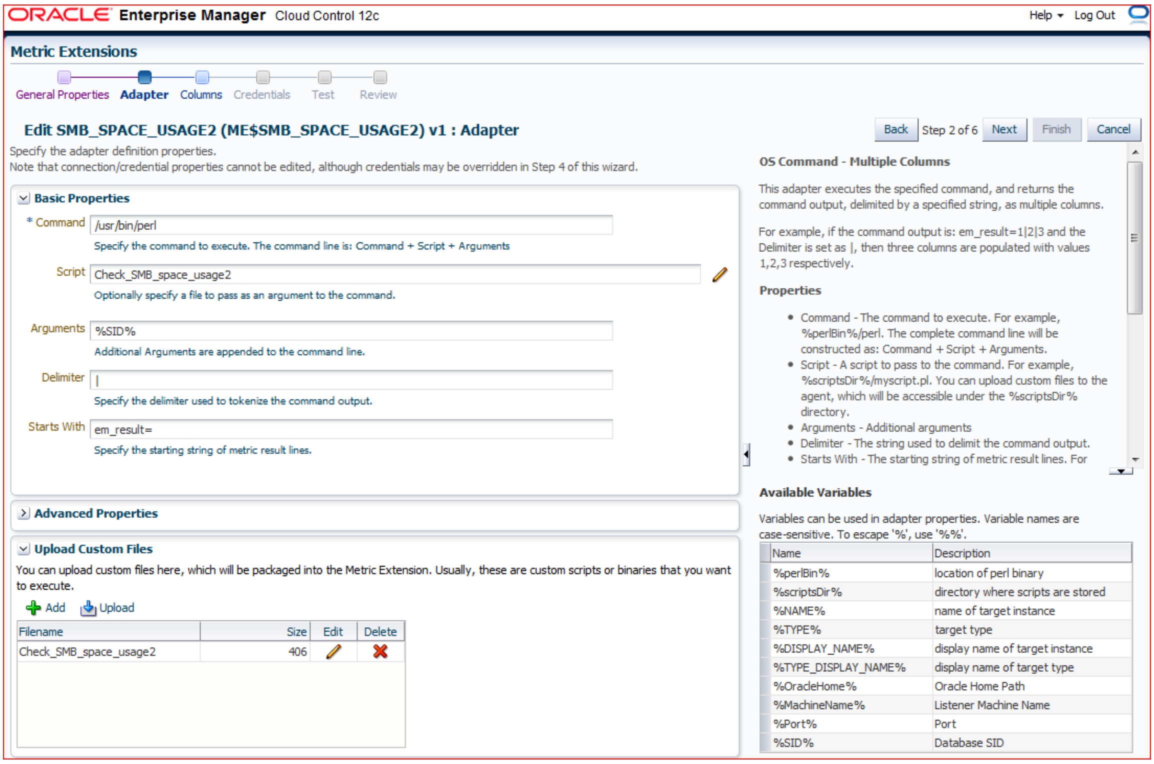
Collection Frequency: Weekly
Weekly On: Sunday

Start

● Immediately after deployment ○ Time

Advanced

- Click “Adapter” on the left top or “Next” on the right top.



Edit SMB_SPACE_USAGE2 (ME$SMB_SPACE_USAGE2) v1 : Adapter

Specify the adapter definition properties.
Note that connection/credential properties cannot be edited, although credentials may be overridden in Step 4 of this wizard.

Basic Properties

* Command: /usr/bin/perl
Specify the command to execute. The command line is: Command + Script + Arguments
Script: Check_SMB_space_usage2
Optionally specify a file to pass as an argument to the command.
Arguments: %SID%
Additional Arguments are appended to the command line.
Delimiter: |
Specify the delimiter used to tokenize the command output.
Starts With: em_result=
Specify the starting string of metric result lines.

Advanced Properties

Upload Custom Files

You can upload custom files here, which will be packaged into the Metric Extension. Usually, these are custom scripts or binaries that you want to execute.

Filename	Size	Edit	Delete
Check_SMB_space_usage2	406	✎	✗

OS Command - Multiple Columns

This adapter executes the specified command, and returns the command output, delimited by a specified string, as multiple columns.

For example, if the command output is: em_result=1|2|3 and the Delimiter is set as |, then three columns are populated with values 1,2,3 respectively.

Properties

- Command - The command to execute. For example, %perlBin%/perl. The complete command line will be constructed as: Command + Script + Arguments.
- Script - A script to pass to the command. For example, %scriptsDir%/myscript.pl. You can upload custom files to the agent, which will be accessible under the %scriptsDir% directory.
- Arguments - Additional arguments
- Delimiter - The string used to delimit the command output.
- Starts With - The starting string of metric result lines. For

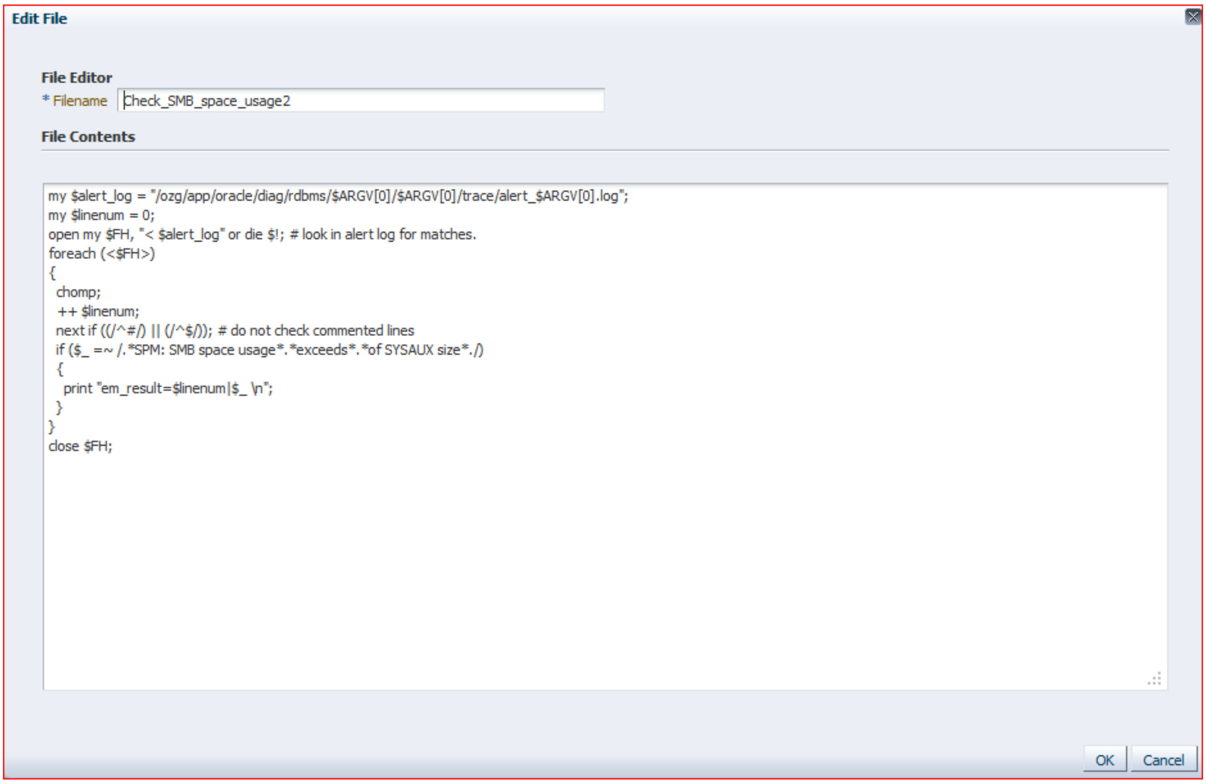
Available Variables

Variables can be used in adapter properties. Variable names are case-sensitive. To escape '%', use '%%'.

Name	Description
%perlBin%	location of perl binary
%scriptsDir%	directory where scripts are stored
%NAME%	name of target instance
%TYPE%	target type
%DISPLAY_NAME%	display name of target instance
%TYPE_DISPLAY_NAME%	display name of target type
%OracleHome%	Oracle Home Path
%MachineName%	Listener Machine Name
%Port%	Port
%SID%	Database SID

- For this script Perl is used.
- Use a local Perl executable. The available Perl executable in the variable might not work as expected.

- Enter the script name, in this example “Check_SMB_space_usage2”.
- Enter arguments used in the script: “%SID%”
- Enter the script output delimiter: “|” (vertical bar).
- Specify the output starting string: “em_result=”
- Click “Add” button to add the script lines.



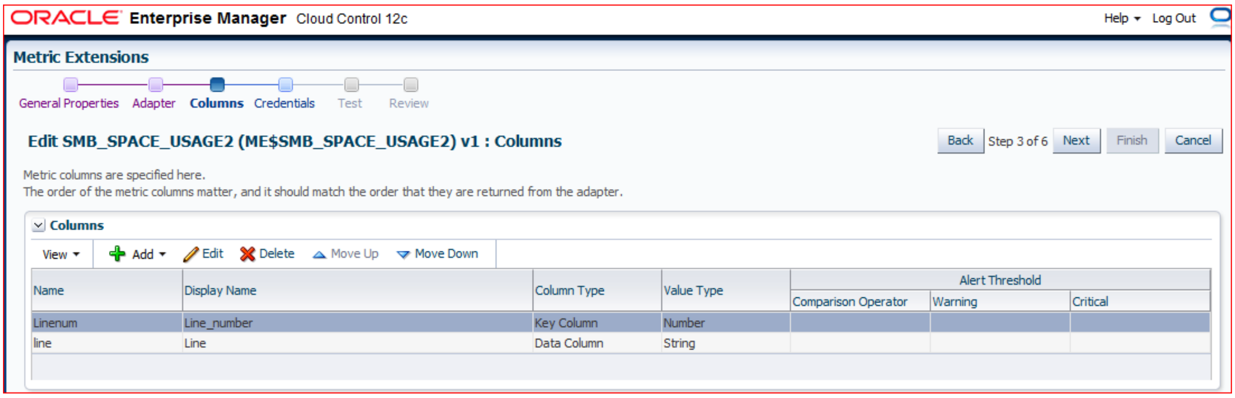
File Contents

* Filename: Check_SMB_space_usage2

```
my $alert_log = "/ozg/app/oracle/diag/rdbms/$ARGV[0]/$ARGV[0]/trace/alert_$ARGV[0].log";
my $linenum = 0;
open my $FH, "< $alert_log" or die $!; # look in alert log for matches.
foreach (<$FH>)
{
 chomp;
 ++ $linenum;
 next if ((/^#/) || (/^$/)); # do not check commented lines
 if ($_ =~ /.*SPM: SMB space usage*.*exceeds*.*of SYSAUX size*./)
 {
  print "em_result=$linenum|$_ \n";
 }
}
close $FH;
```

```
my $alert_log =
"/u01/app/oracle/diag/rdbms/$ARGV[0]/$ARGV[0]/trace/alert_$ARGV[0].log";
my $linenum = 0;
open my $FH, "< $alert_log" or die $!; # look in alert log for matches.
foreach (<$FH>)
{
  chomp;
  ++ $linenum;
  next if ((/^#/) || (/^$/)); # do not check commented lines
  if ($_ =~ /.*SPM: SMB space usage*.*exceeds*.*of SYSAUX size*./)
  {
    print "em_result=$linenum|$_ \n";
  }
}
close $FH;
```

- Click “OK” to safe the script.
- Click “Columns” on the top left or “Next” on the right.

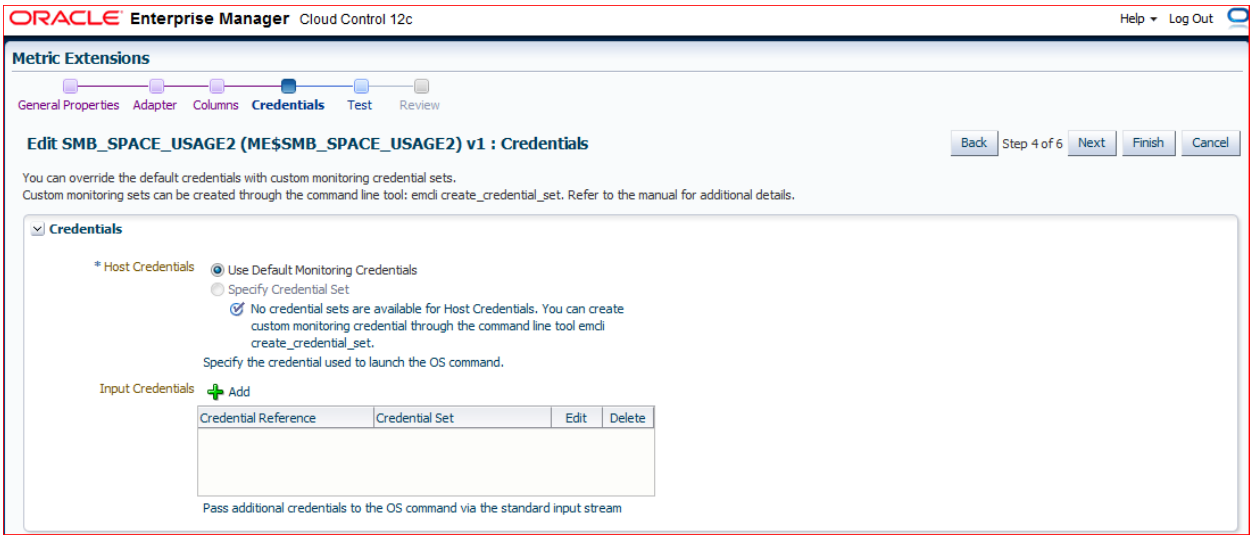


Edit SMB_SPACE_USAGE2 (ME$SMB_SPACE_USAGE2) v1 : Columns

Metric columns are specified here.
The order of the metric columns matter, and it should match the order that they are returned from the adapter.

Name	Display Name	Column Type	Value Type	Alert Threshold		
				Comparison Operator	Warning	Critical
Linenum	Line_number	Key Column	Number			
line	Line	Data Column	String			

- Create columns as shown in the picture above.
- Click “Add” & “New Column” and enter the details
- Name: Linenum, Display Name: Line_number, Column Type: Key column, Value type: Number
  Name: Line, Display Name: Line, Column Type: Data column, Value type: String
- Click “Credentials” on the left top or “Next” on the top right.



Edit SMB_SPACE_USAGE2 (ME$SMB_SPACE_USAGE2) v1 : Credentials

You can override the default credentials with custom monitoring credential sets.
Custom monitoring sets can be created through the command line tool: emcli create_credential_set. Refer to the manual for additional details.

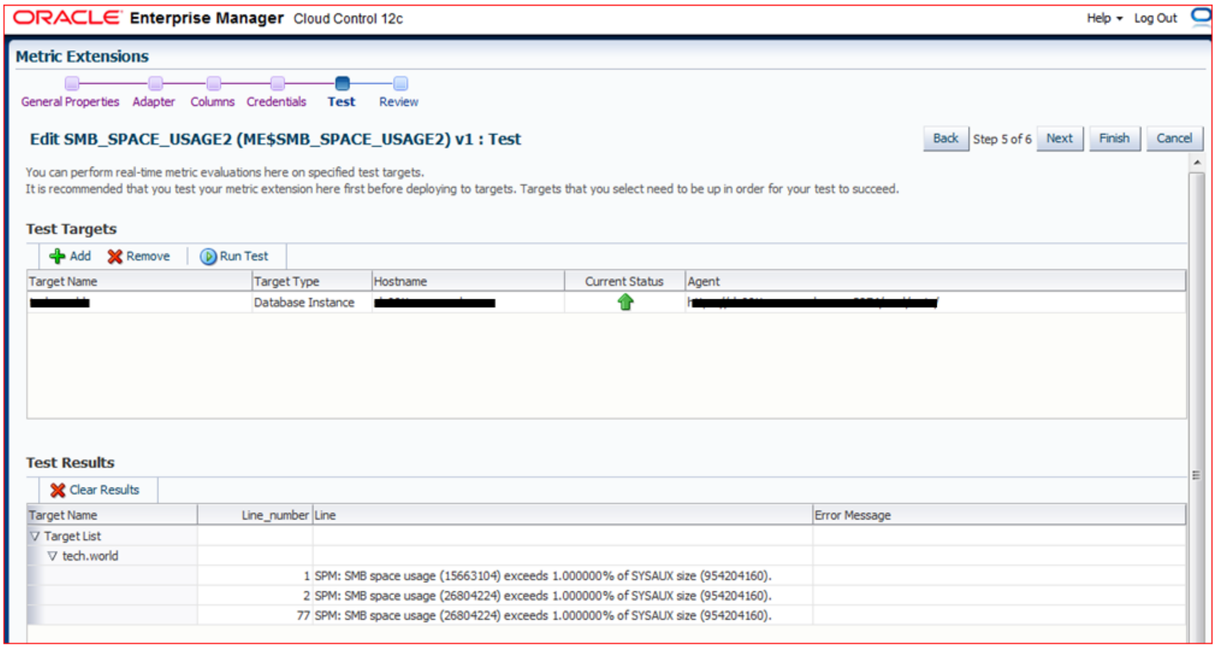
* Host Credentials
● Use Default Monitoring Credentials
○ Specify Credential Set
No credential sets are available for Host Credentials. You can create custom monitoring credential through the command line tool emcli create_credential_set.
Specify the credential used to launch the OS command.

Input Credentials

Credential Reference	Credential Set	Edit	Delete

Pass additional credentials to the OS command via the standard input stream

- Use the default credentials or set other known credentials.
- Click “Test” on the top left or “Next on the top right.



Edit SMB_SPACE_USAGE2 (ME$SMB_SPACE_USAGE2) v1 : Test

You can perform real-time metric evaluations here on specified test targets.
It is recommended that you test your metric extension here first before deploying to targets. Targets that you select need to be up in order for your test to succeed.

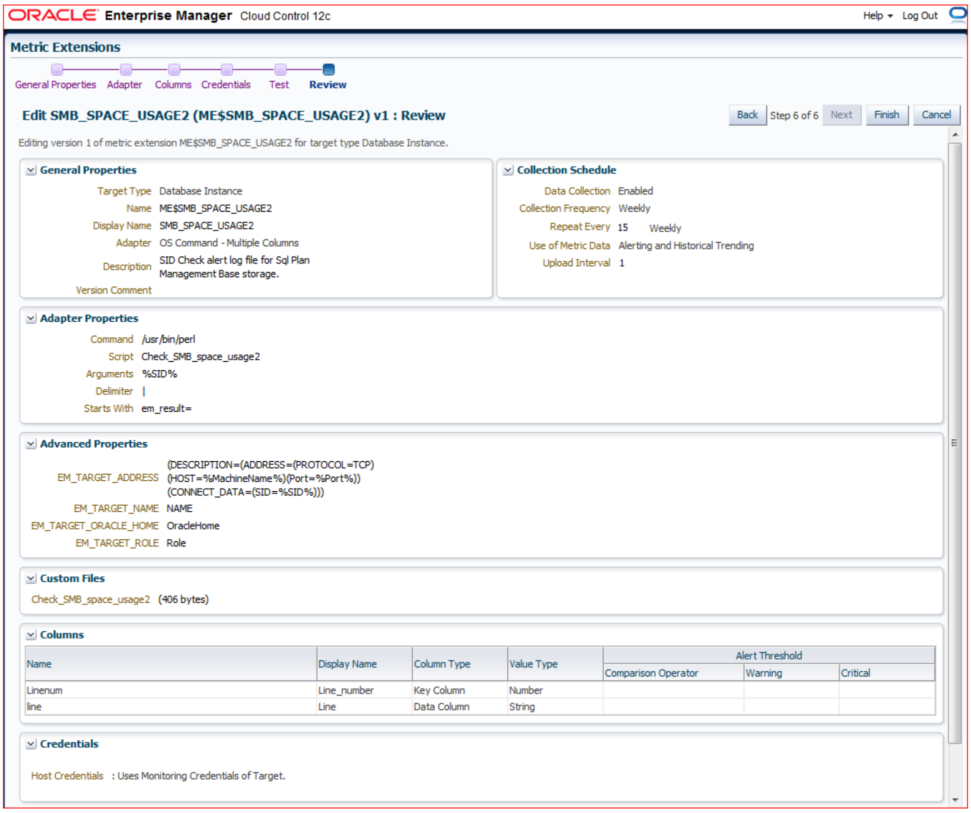
Test Targets

Target Name	Target Type	Hostname	Current Status	Agent
[redacted]	Database Instance	[redacted]	⇧	[redacted]

Test Results

Target Name	Line_number	Line	Error Message
▽ Target List			
▽ tech.world			
	1	SPM: SMB space usage (15663104) exceeds 1.000000% of SYSAUX size (954204160).	
	2	SPM: SMB space usage (26804224) exceeds 1.000000% of SYSAUX size (954204160).	
	77	SPM: SMB space usage (26804224) exceeds 1.000000% of SYSAUX size (954204160).	

- Click “Add” to add a test environment.
- When a test environment is present you may run a test using the “Run Test” button.
- Click “Finish” when done.
- Next step is to deploy the metric and add more environments to it to be checked for.
- Also the Data Collection disabled in the beginning can be enabled and set.



Edit SMB_SPACE_USAGE2 (ME$SMB_SPACE_USAGE2) v1 : Review

Editing version 1 of metric extension ME$SMB_SPACE_USAGE2 for target type Database Instance.

General Properties

Target Type Database Instance
Name ME$SMB_SPACE_USAGE2
Display Name SMB_SPACE_USAGE2
Adapter OS Command - Multiple Columns
Description SID Check alert log file for Sql Plan Management Base storage.
Version Comment

Collection Schedule

Data Collection Enabled
Collection Frequency Weekly
Repeat Every 15 Weekly
Use of Metric Data Alerting and Historical Trending
Upload Interval 1

Adapter Properties

Command /usr/bin/perl
Script Check_SMB_space_usage2
Arguments %SID%
Delimiter |
Starts With em_result=

Advanced Properties

EM_TARGET_ADDRESS (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=%MachineName%)(Port=%Port%))(CONNECT_DATA=(SID=%SID%)))
EM_TARGET_NAME NAME
EM_TARGET_ORACLE_HOME OracleHome
EM_TARGET_ROLE Role

Custom Files

Check_SMB_space_usage2 (406 bytes)

Columns

Name	Display Name	Column Type	Value Type	Alert Threshold		
				Comparison Operator	Warning	Critical
Linenum	Line_number	Key Column	Number			
line	Line	Data Column	String			

Credentials

Host Credentials : Uses Monitoring Credentials of Target.