

Oracle Health Insurance Back Office

OHI Data Management Technical Reference Guide

version 2.8

Part number: F25156-01

December 11, 2019

Copyright © 2013, 2019, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this software or related documentation is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS

Programs, software, databases, and related documentation and technical data delivered to U.S. Government customers are “commercial computer software” or “commercial technical data” pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, duplication, disclosure, modification, and adaptation shall be subject to the restrictions and license terms set forth in the applicable Government contract, and, to the extent applicable by the terms of the Government contract, the additional rights set forth in FAR 52.227-19, Commercial Computer Software License (December 2007). Oracle USA, Inc., 500 Oracle Parkway, Redwood City, CA 94065.

This software is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications which may create a risk of personal injury. If you use this software in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure the safe use of this software. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software in dangerous applications.

Oracle is a registered trademark of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners.

This software and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

Where an Oracle offering includes third party content or software, we may be required to include related notices. For information on third party notices and the software and related documentation in connection with which they need to be included, please contact the attorney from the Development and Strategic Initiatives Legal Group that supports the development team for the Oracle offering. Contact information can be found on the Attorney Contact Chart.

The information contained in this document is for informational sharing purposes only and should be considered in your capacity as a customer advisory board member or pursuant to your beta trial agreement only. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described in this document remains at the sole discretion of Oracle.

This document in any form, software or printed matter, contains proprietary information that is the exclusive property of Oracle. Your access to and use of this confidential material is subject to the terms and conditions of your Oracle Software License and Service Agreement, which has been executed and with which you agree to comply. This document and information contained herein may not be disclosed, copied, reproduced, or distributed to anyone outside Oracle without prior written consent of Oracle. This document is not part of your license agreement nor can it be incorporated into any contractual agreement with Oracle or its subsidiaries or affiliates.

CHANGE HISTORY

Release	Version	Changes
10.14.2.0.0	1.3	<ul style="list-style-type: none"> Added change history paragraph Changed product name Small textual changes
10.15.1.0.0	1.4	<ul style="list-style-type: none"> Changes for database 12C Small textual changes
10.15.3.0.0	1.5	<ul style="list-style-type: none"> Added remark for VPD and the created database user for SS/DM Added advise for parameter parallel_degree_level for subset export as well as disabling archivelog mode
10.16.1.0.0	1.6	<ul style="list-style-type: none"> Added remark about deferred segment creation Added OHI Data Marts support
10.16.2.0.0	1.7	<ul style="list-style-type: none"> Added changes for OEM 13C Added work-around for subset definition import bug 19828552
10.16.2.2.0	1.8	<ul style="list-style-type: none"> Pre-processing masking script SDM0001S.pl made compulsory (bug 25252355)
10.17.1.0.0	1.9	<ul style="list-style-type: none"> Added paragraph 4.2 about masking flex fields
10.17.1.3.0	2.0	<ul style="list-style-type: none"> Adjust paragraph 3.4, adding creating the subset rule definition file Removed workaround for bug 23249155
10.17.2.0.0	2.1	<ul style="list-style-type: none"> Updated prerequisites; OEM 13C R2 is now certified
10.18.1.0.0	2.2	<ul style="list-style-type: none"> Added masking voor OHI Data Marts Updated prerequisites; Supported version of database plugin changed to 13.2.2.0
10.18.2.0.0	2.3	<ul style="list-style-type: none"> No changes except part number.
10.18.2.2.0	2.4	<ul style="list-style-type: none"> Slightly adjusted the recommendations for IO calibration
10.18.2.3.0	2.5	<ul style="list-style-type: none"> Added pre masking step Added 2 known issues
10.19.1.0.0	2.6	<ul style="list-style-type: none"> Added option for configuration only subset Some minor textual corrections and changes
10.19.1.1.0	2.7	<ul style="list-style-type: none"> Updated prerequisites; OEM 13C R3 is now certified
10.19.2.0.0	2.8	<ul style="list-style-type: none"> No changes, republished with new part number.

Contents

1	Introduction	5
1.1	Subsetting and Masking	5
1.2	Prerequisites	8
1.3	Known issues	8
1.4	Oracle Database Plug-in	10
2	High Level Design	11
2.1	Subsetting Process	11
2.2	Data Masking Process	12
3	Detailed Process - Subsetting	14
3.1	Provision Source Database to be Subset	14
3.2	Define Policy or Claim line Selection in the Source Database	15
3.3	Generate and import Subsetting Application Data Model into OEM	18
3.4	Generate and Import Subsetting Definitions into OEM	22
3.5	Generate Subset Export File	27
3.6	Provision Target Database	32
3.7	Import Export File	33
3.8	Run the Post Import Script File	34
3.9	Install and Configure Other Custom Localizations	35
4	Detailed Process - Data Masking	36
4.1	Prepare to-be-masked Database (Target Database)	36
4.2	Masking flex fields	36
4.3	Generate and import Data Masking Application Data Model into OEM	37
4.4	Import Data Masking Definitions into OEM	42
4.5	Generate Masking Script	43
4.6	Run Masking Script on Target Database	46
5	OHI Data Marts subset	49
5.1	Prepare OHI Data Marts data-store	49
5.2	Loading OHI Data Marts	50

1 Introduction

Welcome to the technical reference guide for the Oracle Health Insurance Back Office suite (OHI BO and OHI DM) Data Management application. This reference guide is intended to help you in using the data subsetting and data masking functionality as provided by the OHI Data Management product for OHI Back Office and OHI Data Marts.

1.1 Subsetting and Masking

This guide describes how you can create a subset of a given OHI BO data store. The subset contains less data than the given data store but at the same time is still fully functional for the OHI BO application (that is all data integrity and consistency rules are upheld). Using data subsetting you create smaller versions of, for instance, production-size OHI BO databases. These smaller databases can then be provisioned to development teams, test teams, or deployed in user-acceptance environments. Through data subsetting you can significantly reduce the total amount of disk storage required to support the various, and often many, non-production OHI BO environments in your organization.

There is no separate subset process for an OHI DM environment, instead a OHI DM subset environment for an OHI BO subset environment needs to be created through an initial full load of the OHI BO subset.

Next to data subsetting, this guide describes how OHI BO and or OHI DM data stores can be masked. Due to privacy regulations, organizations are obliged to deal with privacy sensitive data in a secure manner. Production environments usually have stringent data access control and auditing mechanisms in place to ensure that only those who need to access privacy sensitive data can do so. Typically those accessing the various non-production environments are not authorized to see privacy sensitive data or the data access control and auditing mechanisms are less stringent, or even absent, in these environments. With data masking you can mask (scramble, anonymize, pseudonymize) the privacy sensitive data elements in non-production OHI BO and/or OHI DM environments. Development and test teams that use these masked environments are therefore not able to see privacy sensitive data. The masked data store is still fully functional for the OHI BO and/or OHI DM application (that is all data integrity and consistency rules are upheld).

The intended audience for this technical reference guide is the DBA-group that administers the various OHI BO and OHI DM environments inside an organization. This technical reference guide contains four chapters.

1. *Introduction*

The chapter you are currently reading. This chapter introduces you to the data subsetting and data masking packages of the OHI BO application.

2. *High Level Design*

In chapter 2 you find a high level design of the data subsetting and data masking processes as they have been designed to operate on a data store of the OHI BO application.

3. *Detailed Design*

In chapters 3 and 4 you find a step-by-step description of the data subsetting and data masking processes. By following these steps you can create a subset of the OHI BO application data store and mask this data store.

Data subsetting and data masking is implemented through functionality as provided through additional packs in Oracle Enterprise Manager (OEM). Both functionalities are accessed through the Quality Management submenu under the Enterprise menu of the Oracle Enterprise Manager. In this submenu you will find three items to access the subsetting and masking packs:

1. Application Data Modeling
2. Data Subsetting Definitions
3. Data Masking Definitions

See Figure 1.1 for a screenshot of this submenu.

Both the data subsetting and data masking packs depend upon an Application Data Model (ADM). ADMs are managed in the Application Data Modeling menu. An ADM captures all tables of the OHI BO data store involved in the subsetting and data masking processes. For these tables the ADM defines:

- *The referential relationships between these tables*
Subsetting and masking processes use these to "walk through" the data model.
- *The type of table*
Tables can either be of type transactional or config (configuration). The transactional tables are usually subsetting and the config tables are usually not subsetting.
- *Sensitive columns*
Columns marked as sensitive in the ADM have a masking format defined for them in the masking pack.

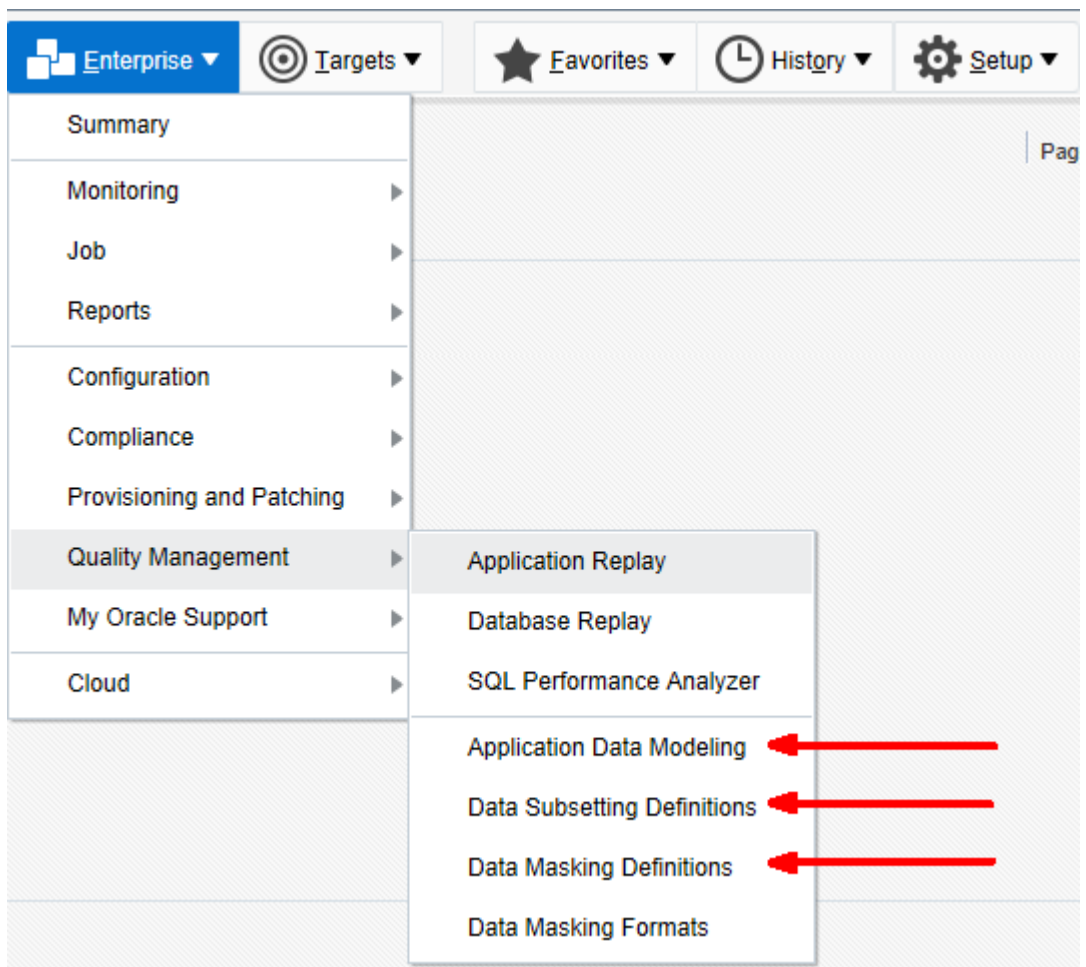


Figure 1.1: The Quality Management submenu in OEM13c.

Note: The OHI BO masking process does not make use of the Data Masking Formats (the last entry in the submenu).

1.2 Prerequisites

The OHI BO Data Management data subsetting and masking processes require the following components:

- *OHI BO environment with the appropriate release*
This environment is usually a dedicated copy of your production environment.
- *OEM Cloud Control 13c release 3, version 13.3.0.0.0*
- *Oracle Database Plug-in release 13.3.1.0.0*

See section 1.3 for instructions on how to check and upgrade this component.

Note: In order to use the subsetting and masking packs (which are part of the Oracle Database Plug-in), you must have a license for these two packs.

It is recommended to use a dedicated OEM Cloud Control instance for use with subsetting and masking. A production monitoring instance of OEM Cloud Control might require a different release of the Database Plug-in which is not certified for use in combination with subsetting and masking.

1.3 Known issues

For the 10.18.2.3.0+ release there are 2 known issues with the subsetting solution which need additional attention.

Database incorrectly compiles XML processing packages

Due to a database 12.2 issue, packages that contain an xmltable with columns construction in a cursor and which are compiled using reuse settings, with a session that runs with nls_length_semantics in byte, do use byte length semantics for these cursors. They may lead to ORA-06502 errors (also named 'value errors') when processing XML files by the OHI application when strings contain more byte than the maximum allowed character length.

Due to the way a subset environment is created this may typically occur in such an environment when no action is taken.

To prevent this it is best recompile these packages in a preventive action. For doing this run the following pl/sql block as the OHI table owner when the subset action is finished.

```
begin
  -- run as OHI table owner, enable serveroutput when you like feedback;
  -- script might take between 30 - 90 seconds, depending on environment capacity;
  -- code can be rerun without problem if you are not sure whether it is still needed;
  dbms_output.enable(null); -- remove limit on output buffer
  for rec in
    (select 'alter '||obj.object_type||' '||obj.object_name||' compile reuse settings' as cmd
     from   dba_objects obj
     where  obj.owner = user
     and    obj.object_type = 'PACKAGE'
     and    obj.object_name like 'Z_____X%PCK')
  loop
    execute immediate rec.cmd;
```



```

order by
    obj.object_name
,
    obj.object_type
)
loop
    dbms_output.put_line(rec.cmd);
    execute immediate rec.cmd;
end loop;
end;

```

When you are not sure whether the action is necessary or already has been executed there is no harm in running it more than once.

As the cause of this problem lies in the database it is not sure yet whether a work-around will be applied to a future release of the subsetting code or that a mandatory database patch will be required.

Preventing/Repairing ERROR: COLUM – Property difference messages for ...TAB_ID columns

Step 900 of OHIPATCH, the object validation step, may show ERROR messages indicating that ...TAB_ID columns are nullable Y instead of N.

To prevent these type of messages database patch 28357349 needs to be applied to the database Oracle Home of both the source and the target Oracle Home environment (when they differ). This needs to be done before the subset process is started.

When you forgot this the error can be repaired afterwards by running the following code block as OHI table owner afterwards.

```

declare
    cursor c_tab
    is
    select col.column_name
    ,      col.table_name
    ,      tab.id
    from   user_tab_cols col
    ,      user_tables tbl
    ,      alg_tabellen tab
    where  col.column_name like '____TAB_ID'
    and    col.virtual_column <> 'YES'
    and    tbl.table_name = col.table_name
    and    tab.naam = tbl.table_name
    and    tab.ind_ruleframe = 'J'
    ;

    type l_record_tabtype
    is table of c_tab%rowtype
        index by binary_integer;
    l_rv l_record_tabtype;
begin
    open c_tab;
    fetch c_tab
    bulk collect
    into l_rv;
    close c_tab;

    for i in 1 .. l_rv.count
    loop
        dbms_output.put_line
        ( 'ALTER TABLE '||l_rv(i).table_name||' DROP COLUMN '||l_rv(i).column_name);
        execute immediate
        'ALTER TABLE '||l_rv(i).table_name||' DROP COLUMN '||l_rv(i).column_name;
    end loop;
end;

```

```
dbms_output.put_line
( 'ALTER TABLE '||l_rv(i).table_name||' ADD ('||l_rv(i).column_name||
' NUMBER(14) GENERATED ALWAYS AS (' || l_rv(i).id ||') VIRTUAL NOT NULL )');
execute immediate
'ALTER TABLE '||l_rv(i).table_name||' ADD ('||l_rv(i).column_name||
' NUMBER(14) GENERATED ALWAYS AS (' || l_rv(i).id ||') VIRTUAL NOT NULL )';
end loop;
alg_compile_invalid;
end;
/
```

1.4 Oracle Database Plug-in

You should ensure that the data subsetting and data masking packs are at the required release level for OHI BO subsetting and masking by installing the Oracle Database Plug-in release 13.3.1.0.0.

Select Setup → Extensibility → Plug-ins and verify the version that is installed on the Management Server. See Figure 1.2.

Cloud					
Databases					
Oracle Database	13.3.1.0.0	13.3.1.0.0	13.3.1.0.0	5	Enterprise Manager for Oracle Database provides comprehensive management for Oracle Database and related targets such as Real Application Cluster, Automatic Storage Management (ASM) etc.

Figure 1.2: Verifying current version of database plug-in.

If the required version is not yet installed and not visible in the Latest Available column, you can use the Self Update functionality of OEM13c to download the new version. See Figure 1.3.

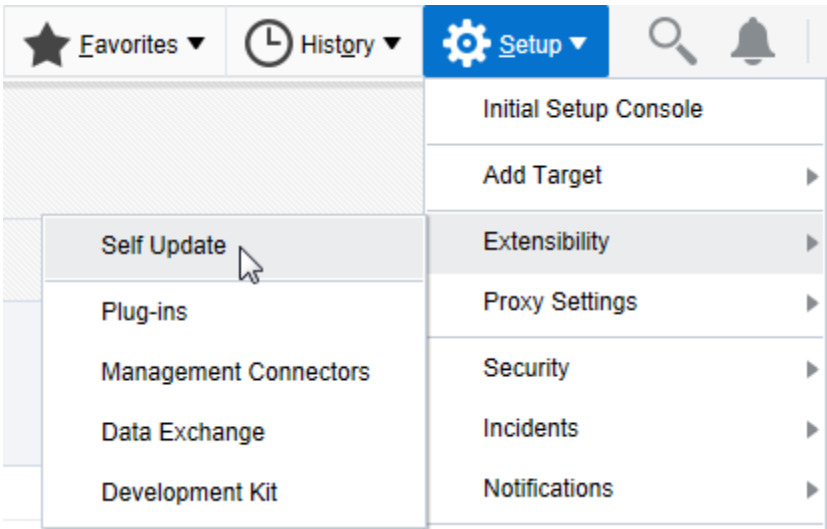


Figure 1.3: OEM13c Self Update.

Please note that during upgrade of the Oracle Database Plug-in on the Management Server you are required to schedule downtime of the OEM13c instance.

2 High Level Design

This chapter contains a high level overview of the data subsetting and data masking processes as they apply to the OHI BO application.

2.1 Subsetting Process

Subsetting in general can be performed in two distinct modes:

1. *All data that is not part of the subset is deleted from an existing data store.*
In this case database reorganization is required after running the subset process to reclaim the empty free space in the data files.
2. *All data that is part of the subset is exported from an existing data store.*
The export file is imported into an empty (smaller) database after running the subset process.

The OHI BO subsetting process as supported and implemented through the OHI Data Management product implements the second mode.

Before starting with the subset process, you first have to import two XML-files into OEM:

- The ADM xml file holding a description of the OHI BO tables to be subset. This file is named *SDM_OHI_[release]_SUBSET_ADM.xml*. This file should be generated through a utility that is part of the OHI Data Management product and delivered in an OHI Back Office release.
- The subsetting xml file holding the specification of the subset process. This file is named *SDM_OHI_[release](_CONFIG)_SUBSET_DEF.xml* (where “_CONFIG” is only used if a configuration only subset is created). This file is another main component of the OHI Data Management product and also needs to be generated by a utility that is delivered in an OHI Back Office release.

Through the subsetting pages in OEM you can start the export job. This export job creates a dump file that contains the relevant subset of the source OHI BO data store. You then have to prepare an empty target OHI BO data store in a smaller database. Finally run an import job to load the subset into this smaller database. Figure 2.1 shows a high level overview of this process.

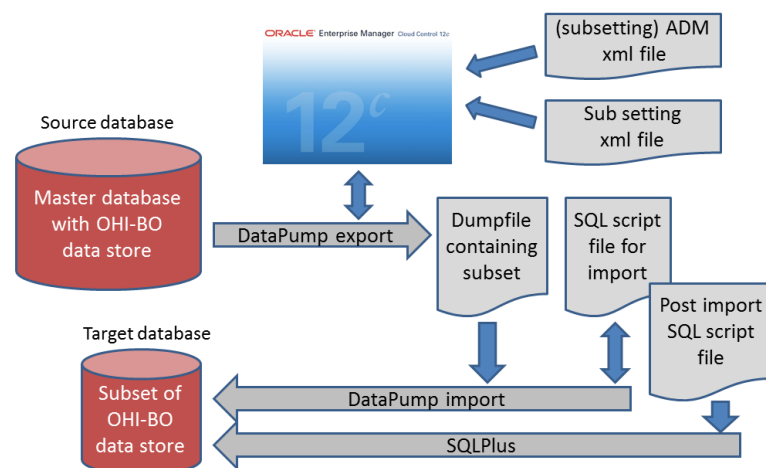


Figure 2.1: High level overview of subsetting process.

Next to the dump file, the subsetting export job also generates a SQL script file for import and a post import SQL script file (as shown in Figure 4). This import SQL script file contains the commands that import the dump file into the empty subset database. This script file can be run using SQL*Plus. The post import SQL script file needs to be run after the data pump import has completed.

Note: The source database needs to be a quiescent database, as the export job runs for some time and the dump file needs to be a read-consistent snapshot of the source database. The source database is usually a dedicated RMAN copy (or Dataguard copy opened in snapshot standby mode) from your production environment.

The target database needs to be correctly prepared before starting the import job. This is described in Chapter 3.

2.2 Data Masking Process

Data masking is performed in-place. The masking process is run on a source database, which is then masked. Before starting the masking process, you first have to import two XML-files into OEM:

- The ADM xml file holding the tables, their relationships and sensitive columns to be masked (named *SDM_OHI_[release]_MASK_ADM.xml* for OHI BO and *SDM_OHI_{release}_MASK_DM_ADM.xml* for OHI DM).
Note that this is a dedicated ADM xml file for Masking; it is not the same ADM xml file as mentioned in Section 2.1 which is used for subsetting. This ADM xml file should be generated.
- The masking xml file holding a data masking definition (DMD) for each sensitive column (named *SDM_OHI_[release]_MASK_DEF.xml* for OHI BO and *SDM_OHI_{release}_MASK_DM_DMD.xml* for OHI DM). The definition xml for OHI BO is part of the OHI Data Management product and delivered in a Back Office release. The definition xml for OHI DM should be generated.

Through the masking pages in OEM you can start a job that generates a masking script. This masking script can be run from SQL*Plus and performs the actual masking of the sensitive columns in the target database. Figure 2.2 shows a high level overview of this process.

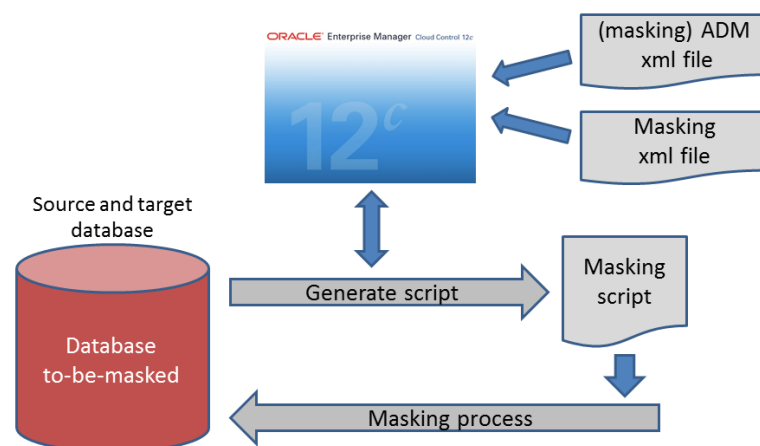


Figure 2.2: High level overview of masking process.

Chapter 4 contains a detailed description of the data masking process.

3 Detailed Process - Subsetting

As mentioned in Chapter 2.1 you need to acquire the two XML files that describe how the OHI BO data store is to be subset, before starting the subsetting process.

- Subsetting application data model (*SDM_OHI_[release]_SUBSET_ADM.xml*)
- Subsetting definitions (*SDM_OHI_[release](_CONFIG)_SUBSET_DEF.xml*)

As part of the subsetting process you need to generate the ADM xml, and import both this generated ADM and the subsetting definition into OEM.

3.1 Provision Source Database to be Subset

The subsetting process starts by designating a source database as the database from which the subset is to be created. Oracle strongly advises that you do not use a live production database for the following reasons:

- The subsetting process places considerable load on the source database.
- The data pump export sub process that performs the subset extraction, needs a single read consistent snapshot of the source database. Therefore, if you use a non-quiescent database as the source database, the data pump export produces more load as rollback segments are heavily used to recreate a read-consistent snapshot.
- Subsetting can run in a *delete* mode as mentioned in Section 2.1. You run the risk of accidentally choosing the *delete* mode instead of the *data pump export* mode as described in step 6 of the subsetting process. In which case you would submit a job that starts deleting data from your live production database.

You would usually use a dedicated RMAN backup copy of the production database as your subsetting source database. Another alternative could be to use a Data Guard (snapshot) environment of your production database.

Note: As part of the subsetting process, you have to load a few test data management packages into the source database. This implies that the Data Guard environment has to be converted into a Snapshot Standby database first. When the subsetting process has completed, you can convert the Data Guard environment back into a (Physical) Standby database. See the "Data Guard Concepts and Administration" guide for more information.

Separate database user and 'temporary' tablespaces for subsetting

We recommend to create a separate database user and separate tablespace(s) (which can be deleted afterwards and is 'temporary' in that sense) for running the subset export process with. The subset export creates temporary working tables during the subsetting job. These tables are created in the *default tablespace* of the user credentials you supply when submitting the subset export job.

The default tablespace might need up to tens of Gb's for an OHI Back Office database of a few terabytes. The temporary tablespace may grow much more, sizing advice is given later on in this document.

The user can be created as follows:

```
create user <USER> identified by <PASSWORD> default tablespace <SCRATCH TABLESPACE>
temporary tablespace <TEMP TABLESPACE THAT MAY GROW; SEE LATER>;
grant dba to <USER>;
grant execute on DBMS_AQADM to <user>;
```

By employing a separate database user and separate tablespace for its objects and potentially also a separate TEMP tablespace, you can easily reclaim the disk space occupied by the working tables and temporary segments by dropping these tablespaces afterwards.

For performance reasons it is best to de-activate all maintenance background jobs to prevent for example a parallel statistics gathering job uses unnecessary resources that delay the subset process.

Note: When Virtual Private Database (VPD) is activated in the OHI Back Office scheme this database user needs to be exempt from the VPD policies to be able to collect all required data.

This can be done as follows:

```
grant exempt access policy to <user>
```

3.2 Define Policy or Claim line Selection in the Source Database

OHI BO subsetting can be used to create two kinds of subsets:

- A 'configuration only' subset. This is a 'subset' copy where all policy, claim, person and financial data is not copied but only the OHI configuration data is copied (fully). One can also refer to this as a 0% transactional subset and 100% configuration subset.
- A 'regular' subset where a selection of the 'transactional data', policies and/or claims related data, is copied from the source environment next to the 100% configuration subset.

In a 'configuration only' subset no policy or claim line selection in the source database is required. If it is required to also include transactional data in the subset, a policy or claim line selection within OHI Back Office can be used to determine which rows should be included in the subset.

In this section the setup of the policy selection is explained in more detail, but a claim line selection can be used as well and works in a similar way.

A policy selection is a set of policy numbers. Typically you should determine a representative set of policies to be included in your target subset environment as this forms the base of the data that will be transferred to the subset database. All policy related data, including relevant claims, will be incorporated in the subset. So determining a well thought over policy selection is an important aspect in setting up your subset environment.

So you have to create a policy selection that includes all relevant policy numbers that need to be in the subset. There are two ways you can do this:

- 1. Use the OHI Back Office Policy Selection window to setup a policy selection.
- 2. Use SQL*Plus to directly populate the underlying two tables of a policy selection.

Figure 3.1 shows the Policy Selection window. You have to enter a name for the policy selection (this name will be input for one of the steps later on). The description is optional. All other items can be left empty or at their default value. In the second block you enter all required policy numbers.

Policy	Policyholder	Group Contr.	Broker	Target Group

Seq. No.	Branded Product	Coverage Structure	YD Struc.	YD Step	Care Obligation

Unique policy selection name
Record: 1/1

Figure 3.1: The Policy Selection window.

The two underlying tables for the Policy Selection screen are depicted in Figure 3.2. They are:

- **VER#POLICY_SELECTIONS_** (Dutch name **VER_POLIS_SELECTIES**), and
- **VER#POL_PER_POS_** (Dutch name **VER_POL_PER_POS**).

It might be more convenient to use a SQL tool, such as SQL*Plus, to create the necessary rows manually in these tables.

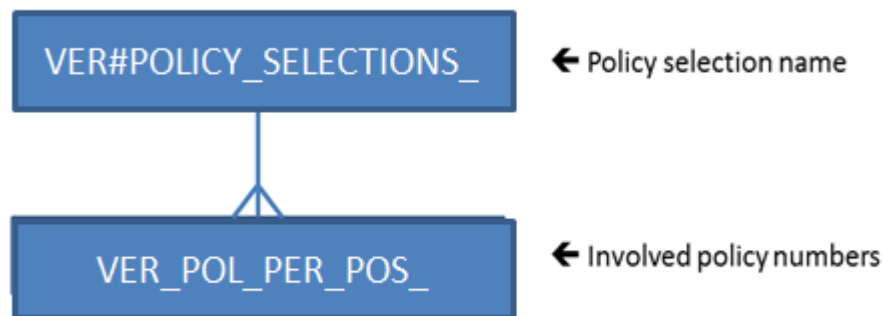


Figure 3.2: Policy selection tables.

For example, the following two insert statements set up a policy selection named **SAMPLE_OF_5_PERCENT** that holds a random sample of 5% of the total number of policies available in the source database.

```

insert into ver#policy_selections_ (name) values('SAMPLE_OF_5_PERCENT');

insert into ver#pol_per_pos_ ( pos_id, pol_num )
select ( select id from ver#policy_selections_ where name = 'SAMPLE_OF_5_PERCENT' )
      , num
from ver#policies_ SAMPLE(5);

commit;

```

For running these statements you need an account with (temporary) insert privileges on these tables unless you use the OHI BO table owner account, which is strongly discouraged given the security impact.

Note: The subsetting process uses a policy selection named **OHI_SDM_POS_SUBSET** internally. This name is reserved by the OHI BO subsetting development team. You cannot use this name as it would interfere with the subsetting process.

3.3 Generate and import Subsetting Application Data Model into OEM

The ADM contains the data model for the OHI BO application. This model is used by the subsetting process to calculate the subset. The ADM is specific to an OHI BO release and must be generated for each new release. Prior to importing you should make sure that the ADM to be imported corresponds with the OHI BO release installed for the source database.

To generate the ADM for subsetting, connect with SQL*Plus to the source database. Invoke the following command (as OHI Back Office table owner):

```
exec sdm_adm_drv_pck.write_adm_files('DB_DIR');
```

Replace DB_DIR with the database directory of your choice.

Two files will be written to this directory:

- *SDM_OHI_[release]_MASK_ADM.xml*
- *SDM_OHI_[release]_SUBSET_ADM.xml*

Once these files have been generated, you may want to transfer these to a file system that is accessible from your Desktop, so you can import them using Enterprise Manager. Open the *Application Data Models* page. See Figure 3.5.

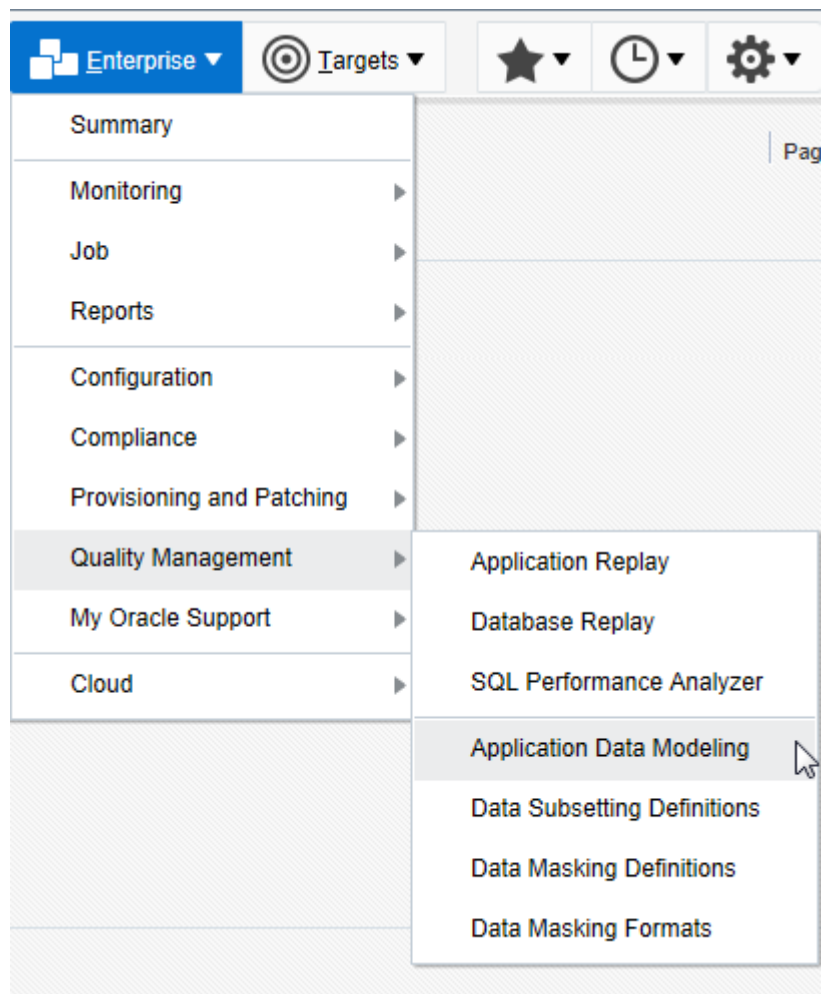


Figure 3.5: Open Application Data Models

Make sure the ADM XML file is on your local desktop. Then select Actions → Import → File from Desktop. See Figure 3.6.

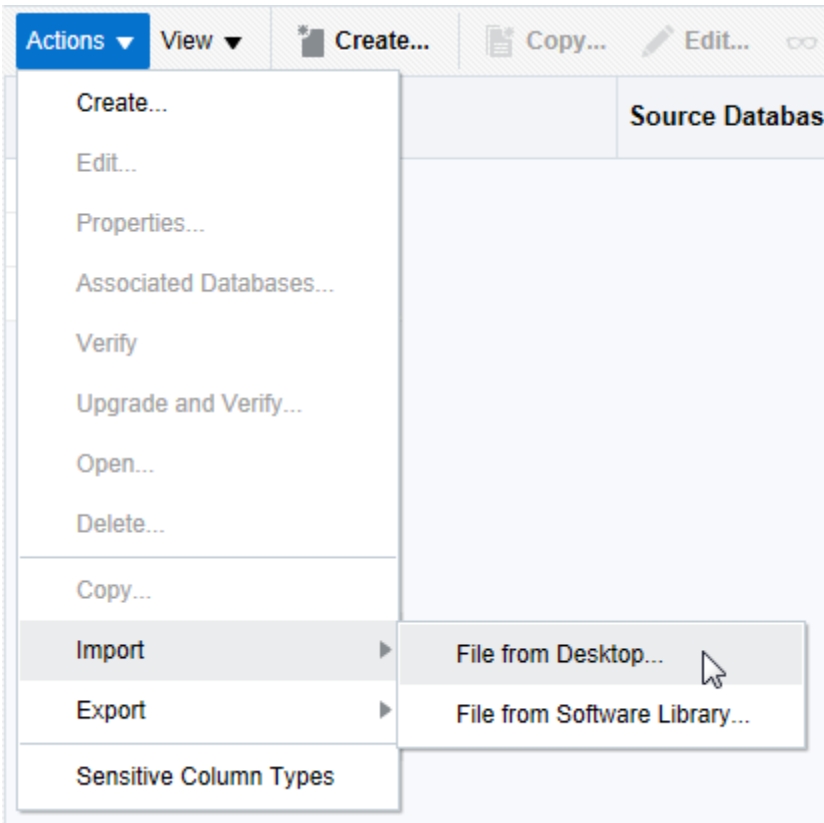


Figure 3.6: Starting the File from Desktop import.

Next enter a name for this ADM. Specifying the release number as part of the name of the ADM will help identify the correct ADM later on. Enter a description and select the subsetting source database. Then press Choose File and navigate to the ADM XML file on your local desktop. Finally press the OK button to start the import. See Figure 3.7.

A screenshot of the 'Import' dialog box. It contains fields for 'Name', 'Description', and 'Source Database'. The 'Name' field is 'ADM OHI-BO 10.16.2.0.0 Subsetting', the 'Description' is 'Application Data Model Subsetting for 10.16.2.0.0', and the 'Source Database' is 'CDB02_slc00rxk.us.oracle.com_BDSUBMASK02'. There is a 'File' field with 'SDM_OHI_1016200_SUBSET_ADM.xml' and an 'Update...' button. 'OK' and 'Cancel' buttons are at the bottom right.

Figure 3.7: Specifying Subsetting ADM XML file to be imported.

The ADM import process may take a while.

After the import process has completed, the ADM must be verified against the source database. Select the imported ADM in the list of available ADMs. Then select Actions → Verify, and click Create Verification Job. See Figure 3.8.


Summary of Results by Associated Database				
View ▾	* Create Verification Job...	Associated Databases...		
Name	Type	Source Database	Status	Most Recent Job Status
 CDB02_slc00rxk.us.oracle.com...	Pluggable Database	✓		

Figure 3.8: Create Verification Job.

Make sure to **uncheck** Synchronize Application Data Model before submitting, see Figure 3.9.

Create Verification Job ✕

General


* Job Name

VERIFY_APP_DATA_MODEL_41

Job Description

Options

☐ Synchronize Application Data Model

 **TIP** Verify will synchronize the application data model with the database by refreshing referential relationships from the data dictionary. Additional schemas and objects will be included as referential relationships require. If unchecked, only model object validation will occur.

Schedule

Start

☒ Immediately
☐ Later

(UTC+01:00) Amsterdam - Central European Time (CET)

Grace Period

☐ Do not run if it cannot start within

1

^

▼

hours

▼

of the scheduled start time

Figure 3.9: Uncheck Synchronize Application Data Model.

When the verification job has completed, you need to check the verification results. For this select the ADM from the list of available ADMs, and select Action → Verify. Now select the row with the database that you associated with the verification job. Look at the Verification Results. It should say: No verification results. See Figure 3.10.

Summary of Results by Associated Database				
View ▼	* Create Verification Job...	Associated Databases...		
Name	Type	Source Database	Status	Most Recent Job Status
CDB02_slc00rxk.us.oracle.com...	Pluggable Database	✓	✓ Valid	Succeeded
Verification Results				
View ▼				
Problem	Application	Short Name	Schema	Object
No verification results				

Figure 3.10: Checking verification results.

3.4 Generate and Import Subsetting Definitions into OEM

The subsetting definitions XML file contains all the rules to create a subset of OHI Back Office. To generate the definition file for subsetting, connect with SQL*Plus to the source database. Invoke the following command (as OHI Back Office table owner):

```
exec sdm_subset_drv_pck.write_file
( pi_directory => 'DB_DIR'
, pi_config_only => 'Y or N'
, pi_including => 'Y or N'
);
```

Replace DB_DIR with the database directory of your choice.

For pi_config_only (default value is 'N'), you can enter:

- Y: when a configuration only subset is required (no policies and claims)
- N: when a subset is required with transactional data and configuration data

pi_including (default value is 'Y') only works when pi_config_only is 'Y', you can enter:

- Y: brokers and group contracts are included in the configuration only subset
- N: brokers and group contracts are not included in the configuration only subset

Once this file has been generated, you may want to transfer this to a file system that is accessible from your Desktop, so you can import them using Enterprise Manager.

The subsetting definitions XML file is imported from the Data Subset Definitions page. Navigate to this page by selecting Quality Management->Database Subset Definitions as shown in Figure 3.11. Make sure you have the XML file loaded on your desktop.

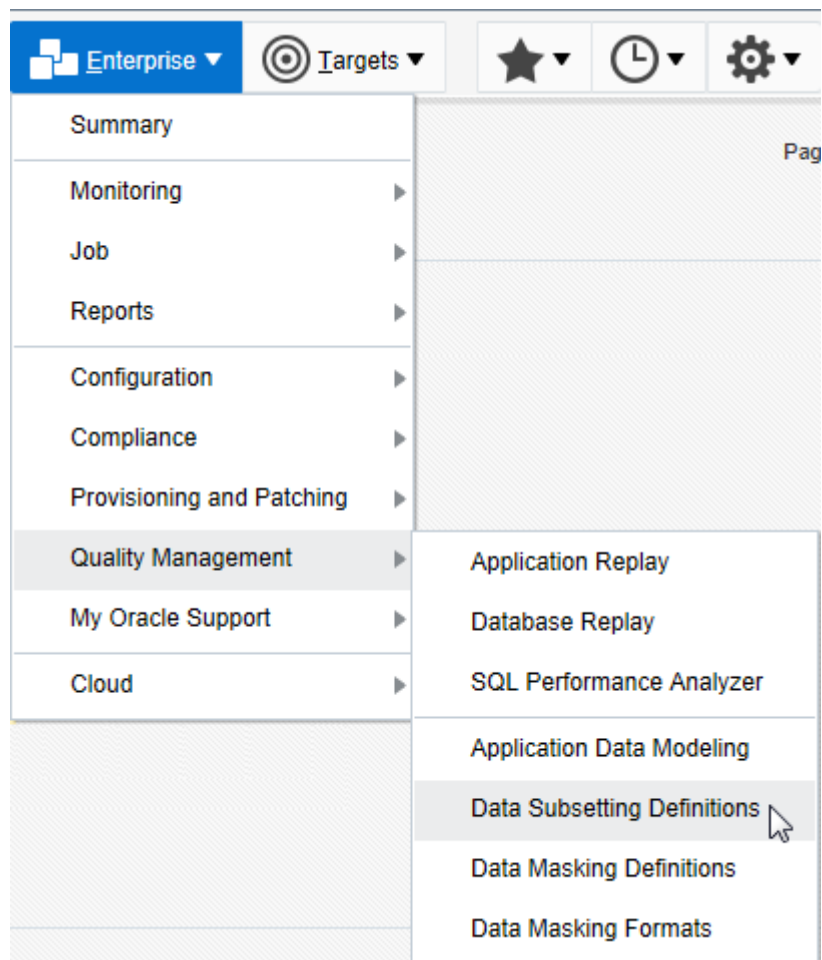


Figure 3.11: Open Data Subset Definitions

Select Actions → Import → File from Desktop in the Data Subset Definitions page. See Figure 3.12.

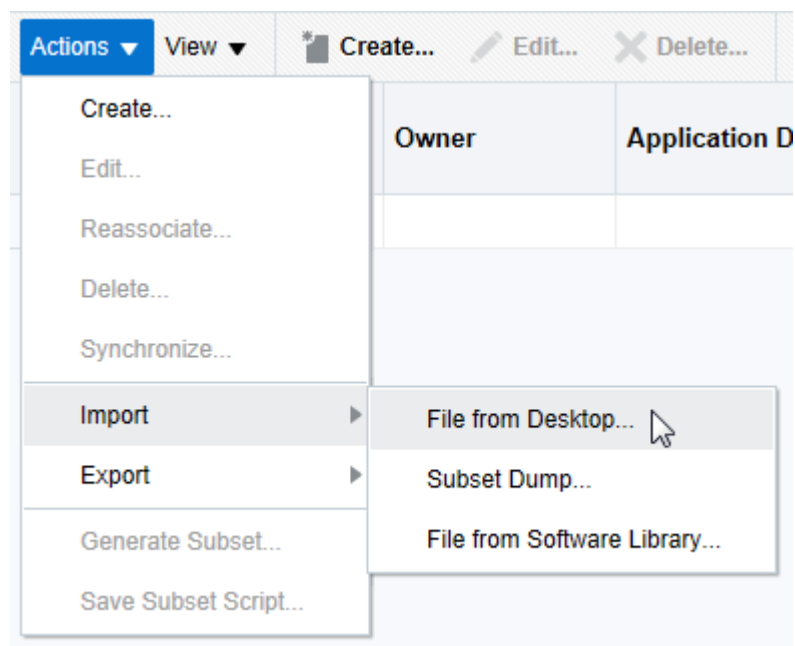
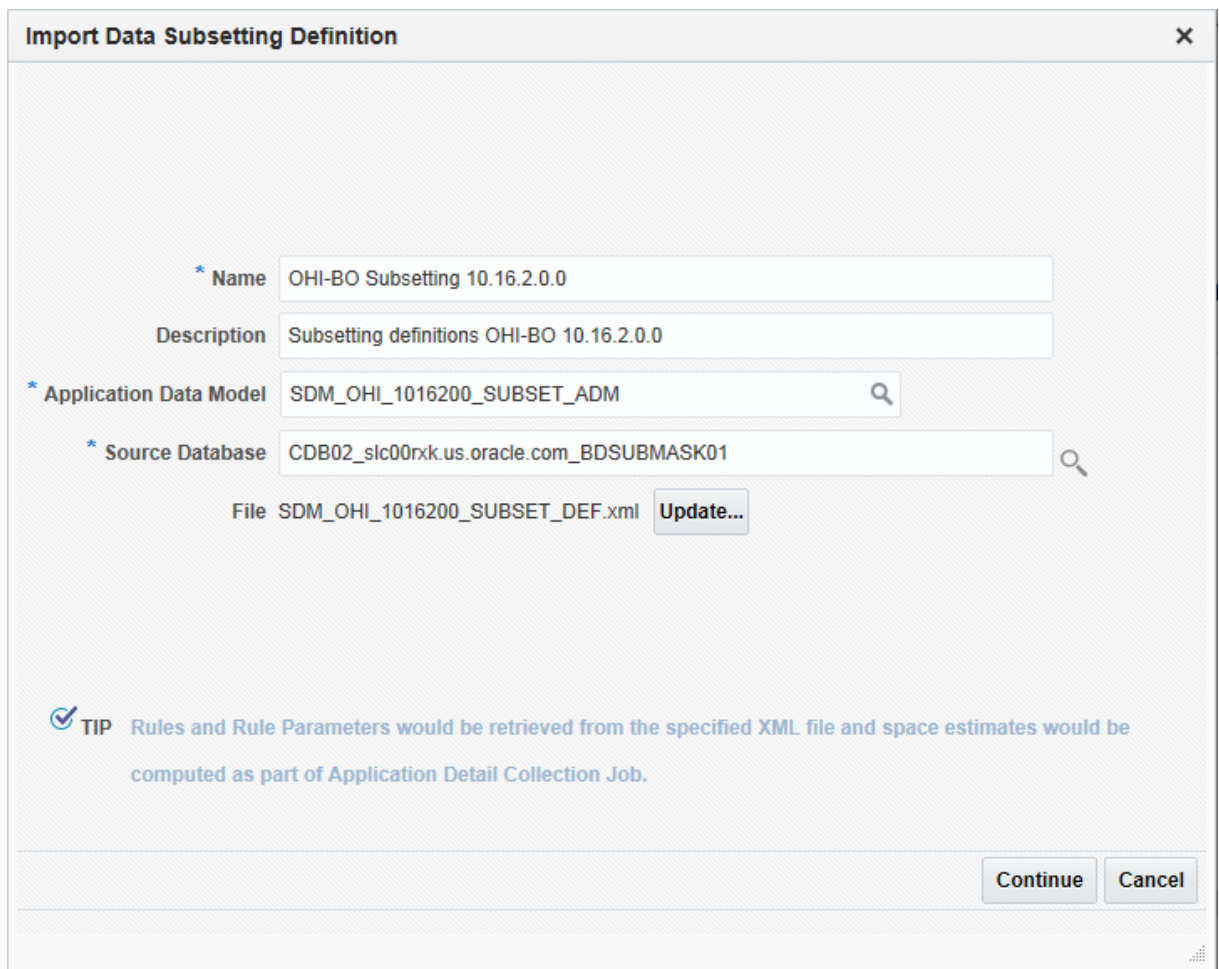


Figure 3.12: Starting the File from Desktop import.

In the Import Data Subset Definition page enter a name (preferably include release name here too) and optionally a description. Select the **corresponding ADM** and select the source database. Finally select the subsetting XML file from your local desktop and press the Continue button. See Figure 3.13.



The dialog box titled "Import Data Subsetting Definition" contains the following fields and controls:

- Name:** OHI-BO Subsetting 10.16.2.0.0
- Description:** Subsetting definitions OHI-BO 10.16.2.0.0
- Application Data Model:** SDM_OHI_1016200_SUBSET_ADM (with a search icon)
- Source Database:** CDB02_slc00rxk.us.oracle.com_BDSUBMASK01 (with a search icon)
- File:** SDM_OHI_1016200_SUBSET_DEF.xml (with an **Update...** button)

A tip section at the bottom left states: **TIP** Rules and Rule Parameters would be retrieved from the specified XML file and space estimates would be computed as part of Application Detail Collection Job.

At the bottom right, there are **Continue** and **Cancel** buttons.

Figure 3.13: Import Data Subset Definition.

Specify the subset user credentials of the source database in the next page and press the Submit button. See Figure 3.14.

Data Subsetting Definition Properties: Schedule Application Detail Collection

General

* Job Name: APP_DETAIL_COLLECT

Job Description:

Credentials

Credential: ☐ Preferred ☒ Named ☐ New

Credential Name: SYS-ACCOUNT

Credential Details

Attribute	Value
Username	sys
Password	*****
Role	sysdba

[More Details](#)

Schedule

Start: ☒ Immediately ☐ Later (UTC+01:00) Amsterdam - Central European Time (CET)

Grace Period: ☐ Do not run if it cannot start within 1 hours of the scheduled start time

Back Submit Cancel

Figure 3.14: Specifying credentials for import job.

A job is created to import the subsetting definitions from the XML file. Verify the job succeeded. This job should only run for a couple of minutes.

Note: When there is a need to import the subset definition for a second time after a subset export has been run, purging the internal SDM selection tables will speed up the import job. During the import, an estimation on the size of the subset is performed. When these internal tables are filled, this estimation will take a considerable amount of time.

The internal SDM tables can be purged with the following command (as OHI Back Office table owner):

```
exec sdm_util_pck.purge_sdm_data;
```

3.5 Generate Subset Export File

Recommended database configuration during export

Before starting the actual export job, the source database should be configured to maximize performance. The following parameters are recommended (and deviate from parameters required for OHI Back Office runtime):

- `parallel_degree_limit = IO`
To limit the number of parallel query workers to the optimum found during **IO Calibration**. This calibration must be performed before setting this parameter to 'IO' (see below).
- `parallel_max_servers` - default value (>1), to enable parallel query during subset export
- `parallel_degree_level` - default value (100), as reducing the Degree Of Parallelism as wished for OHI Back Office during regular use is not wanted for this export job
- `optimizer_mode` – default value (ALL_ROWS)
- `optimizer_index_cost_adjust` – default value (100)

With respect to memory allocation, make sure the SGA (in particular the BUFFER_CACHE value) and PGA (for in-memory sorting and hash-area) are generously sized. As an indication: for a high volume environment (5+ TB database size) an `sga_target` of 16GB and a `pga_aggregate_target` of 12GB are found to be suitable values. These values of course depend on several system properties and the optimal values should be determined when running the subset export. The Memory Advisor included in Oracle Enterprise Manager can be a guide to find the optimum.

It is also advisable to disable the archivelog mode, when active, on the source database prior to starting the export job.

IO Calibration

To effectuate the '`parallel_degree_limit=IO`' setting, IO Calibration needs to be performed. This needs to be done at the CDB\$ROOT container level and not in the PDB.

There are a number of ways to perform this calibration. One way is to start the IO Calibration from OEM: navigate to the 'Performance Home' of the database, click on the "I/O" tab and click the "I/O Calibration button" (see Figure 3.15). After specifying the number of disks and the maximum tolerable latency (10ms minimum), the calibration is started. The calibration process will take about 15 minutes.

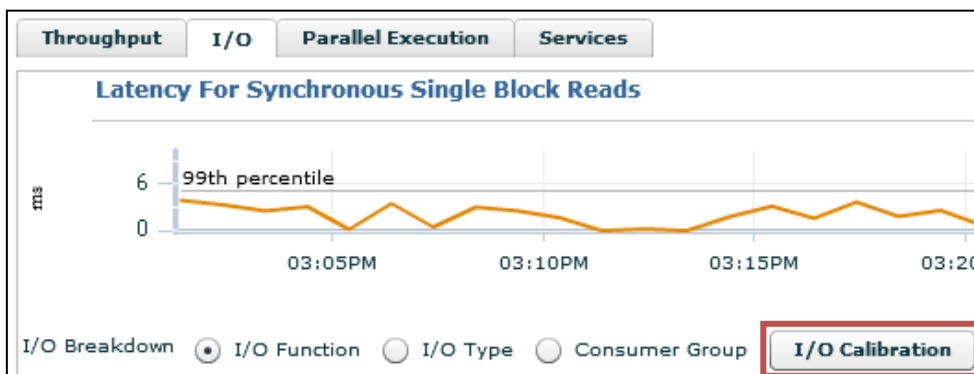


Figure 3.15: Start IO Calibration from OEM

Another possibility is to start calibration from SQL*Plus. See

<https://docs.oracle.com/en/database/oracle/oracle-database/12.2/tgdba/IO-configuration-and-design.html#GUID-7B16A2D4-F360-4271-9F26-B4DCEC36FD89> for more information.

In MOS note **“Automatic Degree of Parallelism in 11.2.0.2 (Doc ID 1269321.1)”** a method is described to set the IO calibration data manually, without the need to run the IO Calibration. This could be useful when the used production-copy runs in a CDB\$ROOT container on hardware with different characteristics where you do not want or cannot execute IO calibration for. Whether the described method can still be used in a 12.2 database is unclear.

Temporary tablespace requirements

Make sure the temporary tablespace of the subset user (so the tablespace that is specified as temporary tablespace during the create user command and not its ‘scratch’ tablespace) is set to auto extend, and enough disk space is available for it to grow. During the export, tables can be written to temp space first before being written to the export file. This can consume large amount of temp space. As a guideline: make sure the temporary tablespace can hold at least the “subset %” of the size of the largest application table. For example, 0.05 times the largest application table when a 5% subset is created.

When using multiple worker threads during export, temporary table space can be claimed by each worker. Multiply the subsetted size of the largest table by the number of workers.

$$\begin{aligned} TEMP\ size \approx & (\#workers) * (size\ of\ largest\ application\ table) \\ & * (estimated\ subset\ fraction) \end{aligned}$$

For example, when using 2 worker threads for a 5% subset and the largest table being 1000GB: expect $2 * 1000 * 0.05 = 100\text{GB}$ of required temporary tablespace.

Submitting the export job

The generation of the subset export file can now be started. From the Data Subset Definitions page select the subset definition to use for generating the subset and then select Actions → Generate Subset. See Figure 3.17.

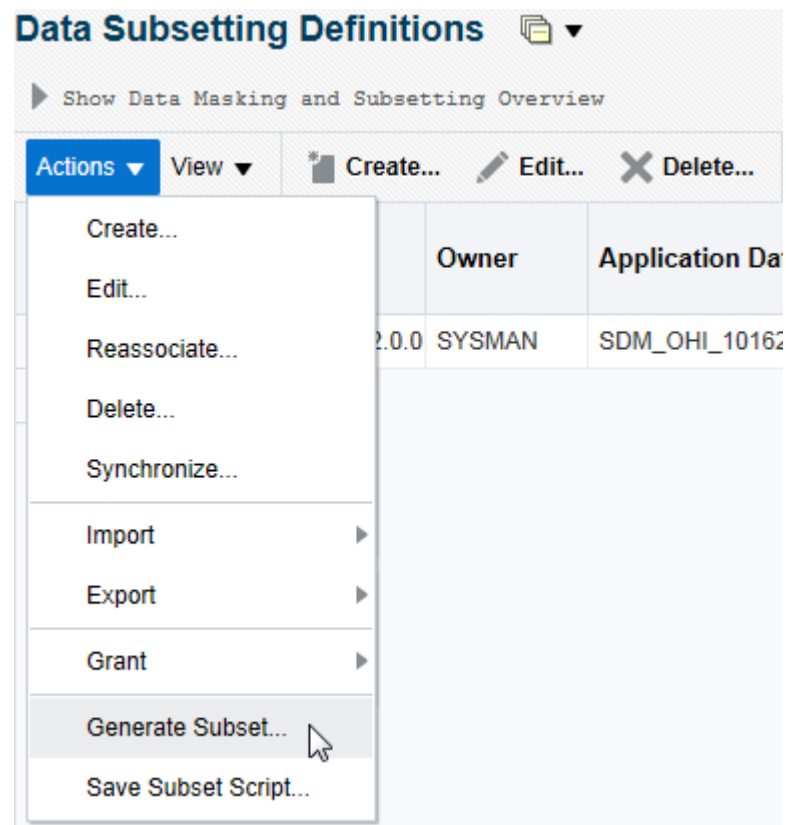


Figure 3.17: Generate Subset.

Specify the database from which the subset is to be exported (this is called the target database here). Keep the 'Create Subset By' radio button default (Writing Subset Data to Export Files). Select the database and host credentials and if applicable, specify the name of the policy or claim line selection as created in step 2 (Section 3.1.2) to drive the subset generation (for a configuration only subset, enter "null" for both selections). Then press the Continue button. See Figure 3.18.

Generate Subset: General

Generate: SDM_OHI_1016200_SUBSET_DEF

* Target Database

CDB02_slc00rxc.us.oracle.com_BDSUBMASK01

Create Subset By

☒ Writing Subset Data to Export Files

☐ Deleting Data From a Target Database

Database Credentials

Credential

☐ Preferred ☒ Named ☐ New

Credential Name

SYS-ACCOUNT

Credential Details

Attribute	Value
Username	sys
Password	*****
Role	sysdba

More Details

Host Credentials

Credential

☐ Preferred ☒ Named ☐ New

Credential Name

ORACLE_SYSMAN_SUDO

Credential Details

Attribute	Value
UserName	oracle
Password	*****
Privilege Type	SUDO
Run As	root

More Details

Rule Parameters

View

Name	Value	Comments
DRC_SEL	null	Claim Line Selection
POL_SEL	SAMPLE_OF_5	Policy Selection

<

>

Continue

Cancel

Figure 3.18: Specify general parameters for subset process.

You enter the data pump parameters in the next page and specify the directory object that data pump must use to create the dump file in. This must be an existing directory object (one that the DBA must have created on beforehand, using the CREATE DIRECTORY command) inside the source database and the OHI BO application owner schema, usually OZG_OWNER, must have read/write access on this directory object.

Provide the export file name, maximum file size and the number of worker threads that data pump must use whilst querying the source database and generating the export files.

The maximum file size should not be set too low, because the total export size is limited by the nr of files, which is 100 files maximum to be used and those files should together be large enough to contain the subset export dump. This means the exported database dump should fit into 100 *

{maximum file size}. Hence the default file size of 100M accommodates for a 10G maximum export size.

Consider setting the number of worker threads to 2. Depending on the number of available CPU's and IO capacity it will decrease the time needed for the export. When using two workers the table data is exported in parallel.

Make a choice between the subset only or full database including subset export. The first will only replace the OZG_OWNER scheme and expects the rest of the schemes to be present, e.g. the custom development schemes, the (webservice) user schemes etc. Typically this will be used when you want to load the subset in an already cloned instance. The second will export import the whole database.

note: Advise for OHI Back Office is to select the first option: "Only subset data".

Please note that the Advanced Compression and Advanced Security licenses are required in order to use the compress and encrypt options. Specify the log file name and press the Continue button. See Figure 3.19.

Generate Subset: Parameters

Subset Directory ☒ Select a directory on target database to save subset scripts and dump file
 ADMIN_DIR
 (/ohi/oraBase/product/db12102/rdbms/admin/)

☐ Select a custom directory path on target database to save subset scripts and dump file

☐ External directory(clustered/shared file system or ASM) for faster export dump
 External Directory ADMIN_DIR
 (/ohi/oraBase/product/db12102/rdbms/admin/)

* Export File Name EXPDAT%U.DMP

* Maximum File Size (MB) 100

* Maximum Number of Threads 1

Export File Contents ☒ Only Subset Data
☐ Full Database Export Along With Subset Data

☐ Enable Dump File Compression
☐ Enable Dump File Encryption

Encryption Password

Confirm Encryption Password

☒ Generate Log File

Log File Name EXPDAT.LOG

Back Continue Cancel

Figure 3.19: Specify data pump parameters for the subset process.

Finally schedule the job and submit it. See Figure 3.20.

Generate Subset: Schedule

General

* Job Name: GENERATE_SUBSET_6

Job Description:

Schedule

Start: ☒ Immediately ☐ Later (UTC+01:00) Amsterdam - Central European Time (CET)

Grace Period: ☐ Do not run if it cannot start within 1 hours of the scheduled start time

Back Submit Cancel

Figure 3.20: Schedule and submit the subset process job.

This job generates the following:

- *One or more data pump export files and a corresponding log file*
These contain the subset of the data in the source database.
- *An import sql script (tdm_import.sql)*
This script contains the commands that are used later to import the data pump export files
- *A post import sql script (tdm_post_script.sql)*
This script contains commands that must be run on the target database after the data pump import has completed.

Once the subset generation job has completed, check the data pump log file for any errors.

Note: don't forget to revert the changes made to the database parameters when (re-)using the source database again as an OHI Back Office runtime or standby environment.

3.6 Provision Target Database

The data pump export that was created in the previous step, will have to be imported into a smaller target database. The export contains a user-mode export of the owner-schema of the OHI BO application. This is usually the OZG_OWNER schema. You have to prepare an 'empty' target database so that this user-mode export file can be successfully imported.

- *Make sure the database is loaded with the required options.*
Those are currently the XDB and JVM options.
- *Make sure the instance is running with all the required (s)pfile settings.*
Refer to the Oracle Health Insurance - Installation, Configuration and DBA Manual to verify these settings.
- *Make sure the database has all the necessary OHI BO tablespaces.*
In addition to the SYSTEM, TEMP, UNDO, USER and SYSAUX tablespaces, there are currently eighteen required application tablespaces (ozg_fact_rel_tab, ozd_fact_rel_ind, etc.). Create these as small tablespaces and ensure that they can grow (autoextend on).
- *Make sure the database has the required OHI BO schemas and roles.*
Running script `$OZG_BASE/sql/OZGI001S.sql` will create these. The import job ensures that these schemas and roles receive all the object privileges again.
- *Optionally create your own custom schemas and roles.*
When your OHI BO environments have additional (custom) schemas, roles or both that have object grants from the OHI BO application owner schema, the import job successfully restores the object grants to these schemas also, provided that they are created in advance.

It is also advisable to disable the archivelog mode on the target database prior to starting the import job.

Note 1: It might be an idea to use a copy of an existing OHI BO database of the same OHI release as target database, drop all objects within the OHI BO owner schema (use an efficient ordering preventing exceptions and unnecessary invalidations), and possibly recreate or resize the OHI BO related tablespaces.

Note 2: The above describes only the database-side of the target environment. Of course you also need a client environment (contents of \$OZG_BASE) with the forms, reports, batch scheduler and so forth. This client environment can simply be a one-on-one copy of the client environment for the source.

3.7 Import Export File

The subset can now be loaded into the target database that was prepared in the previous section. You have to transfer the export dump files from the source database host to the target database host and create a directory object in the target database that points to the directory on the host holding the export files. Also transfer the `tdm_import.sql` and `tdm_post_script.sql` scripts that were generated in step 6.

Next start up SQL*Plus on the target host, connect as SYS and start the *tdm_import.sql* script. This script creates a few objects and then requests two inputs: the state of the schemas and the directory object name. Select option 2 for the first input and enter the name of the directory object that holds the export files. See Figure 3.21.

```
...
Chose the state of the schemas from below:
1 - None of the schemas exist.
2 - A part or all of the schemas exist.
3 - The schemas exist with complete metadata but no data.
enter choice (1/2/3): 2
Enter directory object name: MY_DUMP_DIR
...
```

Figure 3.21: Enter data pump import parameters.

Errors are logged during the import which causes objects in the OHI BO application schema to remain invalid due to a known issue in the way the subsetting pack interacts with data pump. These errors are resolved by the post import script.

You supplied a password for the application owner schema (typically OZG_OWNER) during preparation of the target database (as described in the previous Section). The *tdm_import.sql* script drops this schema and has it recreated by the data pump import process. This means that you lose the password that you have supplied: after the import, it is again set to the password that was in place in the source environment.

3.8 Run the Post Import Script File

It is assumed this step is run from the application server that is prepared for the target environment as a connection to the OHI BO table owner account is maded using the wallet. OHI environment variables should be present.

Start SQL*Plus on the application server for the target database, connect as SYS and run the post import script: *tdm_post_script.sql*. To run the post import script on the target, first set the environment correctly, i.e.:

```
. ozg_init.env <env>
. ozg_init.env $OZG_ORATAB_DB12201
```

Make sure the [SID]_install wallet entry exists and connects to the OHI BO table owner schema of the target database (you may want to reset the application owner password in the target database at

this stage).

After running this script all stored PL/SQL objects should be valid. You now have a subset of the OHI BO data store. Note however that some tasks still remain. For instance, you still need to set up the application users. This target database will have the ALG#USERS_ table contents (Dutch name: ALG_FUNCTIONARISSEN) of the source database. You may want to update this table and create the corresponding Oracle application user schemas for it.

As a final verification you can run the object check script for the OHI BO application (script *SYS9006S*). Note: This script assumes that the batch scheduler has been started. Whether the client and database are in a correct state is verified by Script *SYS9006S*.

3.9 Install and Configure Other Custom Localizations

Any adjacent schemas containing for instance custom code and data should be installed and configured as the last step for local customizations. If you need to subset the custom data also you need to develop your own custom subset implementation for this.

4 Detailed Process - Data Masking

Contrary to subsetting, where an empty target database is filled with a subset of data, the data masking process executes "in-place" within an existing OHI BO or OHI DM data store. As mentioned in Section 2.2 you need to acquire the two XML files that describe how the OHI BO or OHI DM data store is to be masked before starting the masking process.

For OHI BO the following files apply:

- Masking application data model OHI BO (*SDM_OHI_[release]_MASK_ADM.xml*)
- Data masking definitions OHI BO (*SDM_OHI_[release]_MASK_DEF.xml*)

For the OHI DM datastore the following files apply:

- Masking application data model OHI DM (*SDM_OHI_[release]_MASK_DM_ADM.xml*)
- Data masking definitions OHI DM (*SDM_OHI_[release]_MASK_DM_DMD.xml*)

4.1 Prepare to-be-masked Database (Target Database)

Data masking can be performed on a full-size OHI BO or OHI DM data store, or on a subset OHI BO or OHI DM data store.

Note: A subset of an OHI DM data store can be obtained by performing an initial load of a subset OHI BO environment, see chapter 5. Typically that OHI BO data store is or is not masked and normally determines whether OHI DM is masked or not. Masking an OHI DM data store is typically used for a full sized OHI DM environment.

Obviously the masking process takes more time on full-size data stores. During masking, tables with sensitive columns are temporarily duplicated (this is further explained in Section 4.4). For this reason it is necessary to check that tablespaces holding the table segments either have enough free space available, or are able to grow (autoextend) during the masking process. Upon completion of data masking a database (or tablespace) reorganization of some kind would have to be performed to reclaim the then remaining free space. Oracle describes an approach in Section 4.6 to prevent having to execute such reorganization.

Before masking the target database, it is advisable to create a backup of the database. Also depending upon the size of the archivelog destination file system, it may be advisable to disable archive logging during the masking process, and re-enable it afterwards.

4.2 Masking flex fields

Flex fields are flexible, like the name says, and your organization can determine for what they are used and what stored in it. As such it may be that certain flex fields contain sensitive information that should also be masked.

In the OHI BO application it is possible to indicate if the value for a specific flex field should be masked. In window ZRG7019F (Flex field) the indication “Mask?” can be set to “Yes” in order to mask the value for this flex field. If set to “No” (default value) masking will not take place. Masking the OHI DM application will also mask according to this setup in OHI BO.

Note: The value of a flex field can be steering for processes like the claims processing. Masking of these flex fields can undo this and will lead to unpredictable and/or undesirable results. Therefore, the advice is to mask only those flex fields that are actual privacy-sensitive.

4.3 Generate and import Data Masking Application Data Model into OEM

The ADM contains the data model for the OHI BO or OHI DM application. This model is used by the masking process to identify the sensitive columns and relationships between the tables. The ADM is specific to an OHI BO or OHI DM release and must be generated using the source database. Prior to importing you should make sure that the ADM to be imported corresponds with the OHI BO or OHI DM release installed at the source database.

To generate the ADM for masking OHI BO, connect with SQL*Plus to the source database. Invoke the following command (as OHI Back Office table owner):

```
exec sdm_adm_drv_pck.write_adm_files('DB_DIR','MASK');
```

Replace DB_DIR with the database directory of your choice.

When the MASK parameter is specified only one file will be written to this directory:

- *SDM_OHI_[release]_MASK_ADM.xml*

The data masking definition (DMD) file for OHI BO (*SDM_OHI_[release]_MASK_DEF.xml*) is part of the OHI BO release.

To generate the ADM and DMD for masking OHI DM, connect with SQL*Plus to the source database. Invoke the following command (as OHI Data Marts table owner):

```
exec sdm_dm_drv_pck.write_files('DB_DIR');
```

Replace DB_DIR with the database directory of your choice.

Two files will be written to this directory:

- *SDM_OHI_[release]_MASK_DM_ADM.xml*
- *SDM_OHI_[release]_MASK_DM_DMD.xml*

Once these files have been generated, you may want to transfer these to a file system that is accessible from your Desktop, so you can import them using Enterprise Manager.

However, before importing these files into the Enterprise Manager please execute the following command as the database table owner:

```
exec sdm_dml_pck.fill_all_dummy;
```

This will fill some dummy data into the masking tables used for masking of personal data like names and addresses. During the masking process this will be replaced with the seeded data. Not executing this step will create errors during the import of the masking definition file like:

“The SQL expression is invalid. Specify substitution columns within percentage signs, for example %EMPID% where EMPID is the column name. Substitution columns must exists in the masked table.”

Open the *Data Discovery and Modeling* page. See Figure 4.1.

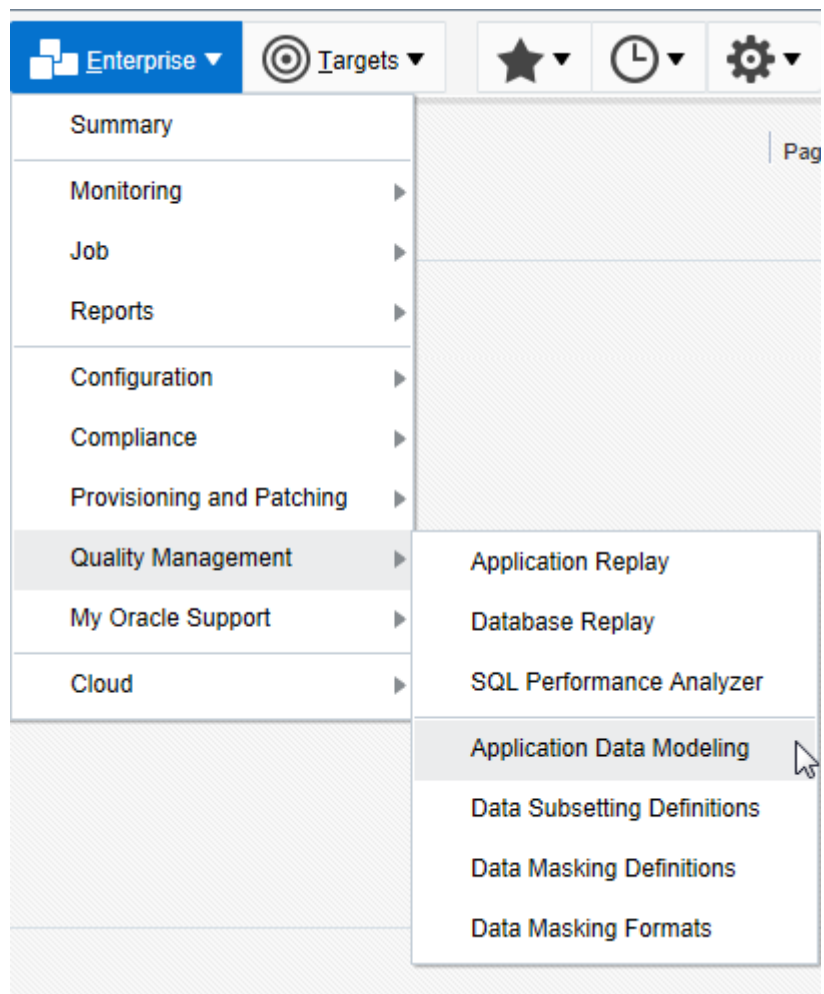


Figure 4.1: Open Data Discovery and Modeling

Make sure the ADM XML file is on your local desktop. Then select Actions → Import → File from Desktop. See Figure 4.2.

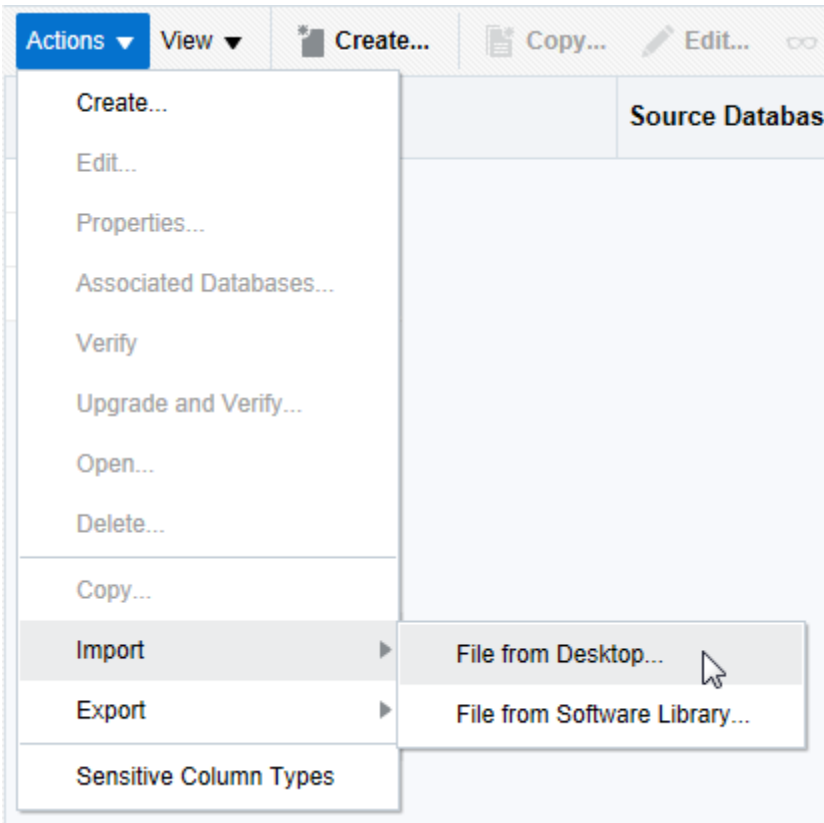


Figure 4.2: Starting the File from Desktop import.

Next enter a name for this ADM. Specifying the release number as part of the name of the ADM will help identify the correct ADM later on. Enter a description and select the masking source database. Then press Choose File and navigate to the ADM XML file on your local desktop. Finally press the OK button to start the import. See Figure 4.3.

A screenshot of an 'Import' dialog box. It contains several input fields and buttons. The 'Name' field is labeled with an asterisk and contains the text 'ADM OHI-BO 10.16.2.0.0 Masking'. The 'Description' field contains 'Application Data Model Masking for 10.16.2.0.0'. The 'Source Database' field is labeled with an asterisk and contains 'CDB02_slc00rxk.us.oracle.com_BDSUBMASK02'. Below this, there is a 'File' field containing 'SDM_OHI_1016200_MASK_ADM.xml' and an 'Update...' button. At the bottom right, there are 'OK' and 'Cancel' buttons. A magnifying glass icon is next to the 'Source Database' field.

Figure 4.3: Specifying masking ADM XML file to be imported.

The ADM import process may take a while.

After the import process has completed, the ADM must be verified against the source database. Select the imported ADM in the list of available ADMs. Then select Actions → Verify, and click Create Verification Job. See Figure 4.6.

Summary of Results by Associated Database				
View ▼	Create Verification Job	Associated Databases...		
Name	Type	Source Database	Status	Most Recent Job Status
CDB02_slc00rxk.us.oracle.com...	Pluggable Database	✓		

Figure 4.6: Create Verification Job.

Make sure to **uncheck** Synchronize Application Data Model before submitting. See Figure 4.7.

Create Verification Job

General

* Job Name

VERIFY_APP_DATA_MODEL_41

Job Description

Options

☐ Synchronize Application Data Model

✓ TIP

Verify will synchronize the application data model with the database by refreshing referential relationships from the data dictionary. Additional schemas and objects will be included as referential relationships require. If unchecked, only model object validation will occur.

Schedule

Start

☒ Immediately ☐ Later

(UTC+01:00) Amsterdam - Central European Time (CET)

Grace Period

☐ Do not run if it cannot start within

1

hours

of the scheduled start time

Figure 4.7: Uncheck Synchronize Application Data Model.

When the verification job has completed, you need to check the verification results. For this select the ADM from the list of available ADMs, and select Action → Verify. Now select the row with the database that you associated with the verification job. Look at the Verification Results. It should say: No verification results. See Figure 4.8.

Summary of Results by Associated Database				
View ▾	* Create Verification Job...	Associated Databases...		
Name	Type	Source Database	Status	Most Recent Job Status
CDB02_slc00rxk.us.oracle.com...	Pluggable Database	✓	✓ Valid	Succeeded
Verification Results				
View ▾				
Problem	Application	Short Name	Schema	Object
No verification results				

Figure 4.8: Checking verification results.

4.4 Import Data Masking Definitions into OEM

The masking definitions XML file (...MASK_DEF.xml for OHI BO and ...MASK_DM_DMD.xml for OHI DM) is imported from the Data Masking Definitions page. Press the Import button at the top right (Figure 4.9). Make sure you have the XML file loaded on your desktop.

Data Masking Definitions							
Data masking is the process of making sensitive information in test or non-production databases safe. It disguises sensitive information by overwriting it with realistic looking but false data of a similar type. A masking definition defines the columns to be masked and the format of masked data. You can create a new masking definition or use an existing definition for a masking operation. The Format Library contains a collection of ready-to-use masking formats.							
Search	Masking Definition ▾	Go	Import Import from Software Library Export from Software Library Create				
Select	Masking Definition	Owner	Application Data Model	Description	Columns	Status	Most Recent Job Ended
	No definitions						SQL Performance Analyzer Task
Format Library							
A masking format defines the format of masked data. You can create a new masking format and reuse it later when creating a masking definition.							
Format Library							

Figure 4.9: Starting masking definitions import.

Adapting the OHI BO definition for a specific application schema name

When the name of the application schema is other than 'OZG_OWNER', the masking definition needs to be modified before being imported (this applies to OHI BO only, because the OHI DM masking definition xml is generated with the correct application owner).

All references to OZG_OWNER in the SDM_..._MASK_DEF.xml (found in the xml folder of the \$OZG_BASE containing a specific release nr in it) must be replaced with the actual name of the application schema.

This renaming can be performed using the Linux command 'sed' (stream editor), for example for alternative schema 'OZADMIN':

```
$> sed -i.bak -e 's/OZG_OWNER/OZADMIN/g' <masking_definition.xml>
```

It will create a backup of the original.

Import the (modified) definition

In the Import Masking Definitions page enter a name (preferably include release name here too) and optionally a description. Select the **corresponding masking ADM** and select the source database (which is also the target database). Finally select the masking definition XML file from your local desktop and press the Continue button. See Figure 4.10.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface. The main title is 'Data Masking Definitions' and the sub-title is 'Import Masking Definition'. Below the title, there is a brief instruction: 'Use this page to import a masking definition that was previously exported from the Data Masking page. Select the exported file and continue to import masking definition into repository.' The form contains four input fields: 'Name' with the value 'SDM_OHI_1016200_MASK_ADM', 'Application Data Model' with the value 'ADM OHI-BO 10.16.2.0.0 Masking', 'Reference Database' with a dropdown menu showing 'CDB02_slc00nck.us.oracle.com_BDSUBMASK02', and 'File' with the value 'E:\SDM_OHI_1016200_MASK_DEF.xml'. There is a 'Browse...' button next to the file field. At the top right and bottom right of the form area, there are 'Cancel' and 'Continue' buttons.

Figure 4.10: Import Masking Definition.

The masking definitions xml file will now be imported and should be available on the Data Masking Definitions page.

4.5 Generate Masking Script

Once the masking definitions have been imported, the next step is to generate a masking script from these definitions. On the Data Masking Definitions page, select the masking definition and press the Generate Script button. See Figure 4.11.

Important: it is necessary to generate this script against the to-be-masked database. Running the script against a different target might result in errors.

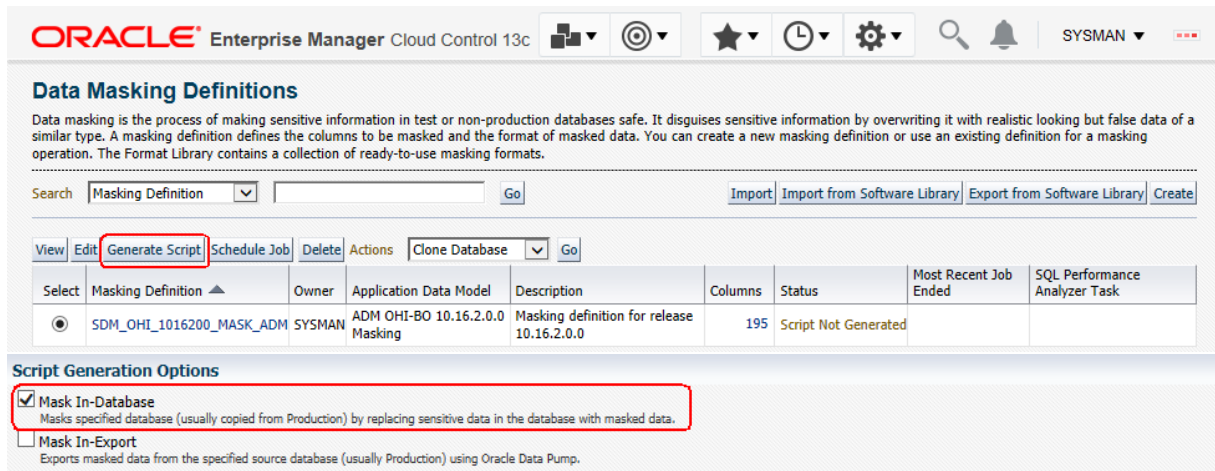


Figure 4.11: Generate Script (Masking).

Tip: During the generation of the masking script also a validation is performed against the database for the rules in the definition. This verification benefits the most when the queries are not performed using parallel query. For e.g. an OHI Data Marts the default is typically to make use of parallel query as much as possible. So when possible set before starting the generation process temporarily the (pluggable) database parameter `parallel_max_servers` to 0 and afterwards back to the original value. Using parallel query unneeded during validation can take quite some time per to be validated rule, especially on a full production copy due to a different optimization approach not suitable for validation purposes.

The Schedule Script Generation Job page displays. Specify the SYS credentials and submit the job. This job runs for a considerable amount of time during which all tables with sensitive columns are inspected. The end result of this job is a SQL script file which holds the actual commands to perform the data masking later in Section 4.6.

As mentioned earlier in Section 4.1, tables with sensitive columns are temporarily duplicated during the actual masking. The way the masking script performs is as follows:

- Tables with sensitive columns are renamed. Indexes and triggers are removed from the renamed tables.
- For each renamed table a "create table ... as select ..." (CTAS) is performed to recreate the table under the original name. During this CTAS the actual data masking is performed.
- Indexes and triggers are restored on the newly created tables. Also object-privileges for these tables are restored.
- The renamed original tables are dropped.
- Invalid objects are recompiled.

The CTAS statements are performed with the space definition clauses that were in place on the original table during the generation of the masking script. This means that there are two segments for these tables in the tablespaces allocated to these tables during masking. When data masking is performed on a full-size OHI BO data store this could substantially increase the tablespaces holding tables with sensitive columns. This is the reason that why in Section 4.1 it was mentioned that during

masking these tablespaces should either have enough free space available or be able to extend as required.

Take a close look at the output of the 'Generate Masking Script' Job. The Job will check whether enough free space is available in all tablespaces, it will report issues in the output log.

For example, it may report:

```
RESOURCE WARNING
TABLESPACE OZG_FACT_FIN_TAB
Insufficient free space in Tablespace OZG_FACT_FIN_TAB even
with automatic extension.

Some operations involving Tablespace OZG_FACT_FIN_TAB may fail.

Starting Freespace: 25610MB.

Ending Freespace (assuming increase in size): 9536MB.

Lowest Freespace: -18960MB.

Increase size of Tablespace OZG_FACT_FIN_TAB to at least
163418MB.
```

Make sure to add additional data files or extend options when reported, before running the masking script.

When the job reports errors like the following example...

```
ERROR TABLE OZADMIN.COM_COMMISSIEFACTUREN Unable to reorganize Table
OZADMIN.COM_COMMISSIEFACTUREN. Either the object does not exist in
the target database, or its reorganization is not supported. Remove
the object from the reorganization and regenerate the script.
```

... run the following statement to materialize tables without data

```
BEGIN
  DBMS_SPACE_ADMIN.MATERIALIZE_DEFERRED_SEGMENTS(schema_name =>
    'OZG_OWNER');
END;
/
```

When OZG_OWNER is not the owner of the OHI Back Office scheme, please replace OZG_OWNER with the correct owner.

Note: As of database release 12.2.0.1 the following error may be reported:

```
ORA-06598: insufficient INHERIT PRIVILEGES privilege
```

This is because the invoker (e.g. SYS) has higher privileges than its owner (e.g. OZG_OWNER), in that case the invoker rights unit might perform operations unintended by, or forbidden to, its owner.

To solve this issue provide an extra grant to the user used to generate/validate the script:

```
GRANT INHERIT PRIVILEGES ON USER <user> TO <owner>;
```

e.g `GRANT INHERIT PRIVILEGES ON USER SYS TO OZG_OWNER;`

4.6 Run Masking Script on Target Database

Recommended database configuration during masking

Before running the masking script on the target, it should be configured to maximize performance. The following parameters are recommended (and might deviate from parameters required for OHI Back Office or OHI Data Marts at runtime):

- `parallel_degree_limit = IO` (See chapter 3.5 for more details about this parameter and the importance of IO calibration)
- `parallel_max_servers` - default value (>1), to enable parallel query during subset export

As noted in the subsetting chapter, the sizing of both PGA and SGA is now also important to achieve a good performance.

The data masking script that was generated in Section 4.4, can be downloaded from OEM by selecting the masking definition in the Data Masking Definitions page, and by selecting Save Script. See Figure 4.12.

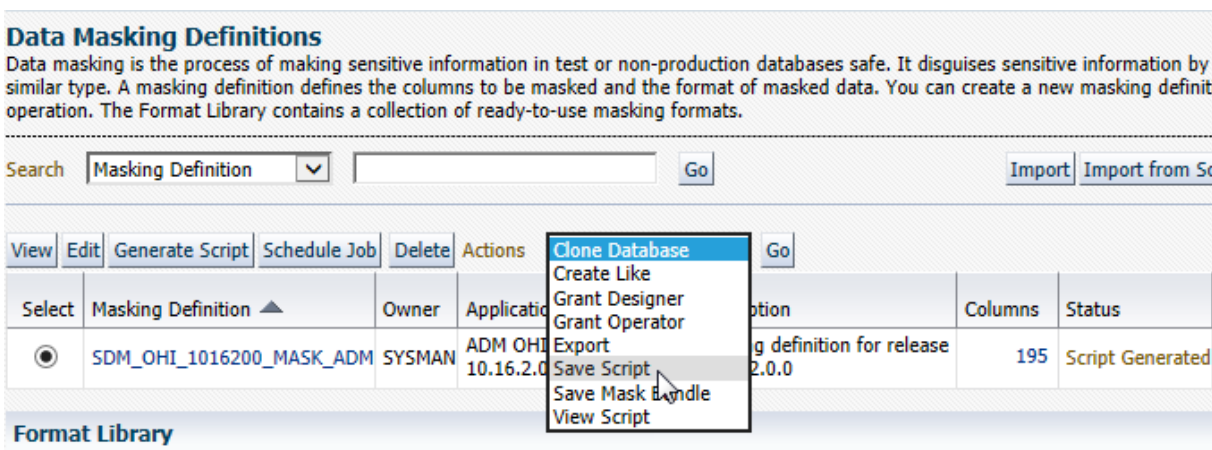


Figure 4.12: Save masking script.

Next, press the Go button. The masking script downloads to your desktop. Transfer the masking script to the target database server.

Prior to running the masking script, it is necessary to run the perl pre-processing script **SDM0001S.pl**. This script has 2 functions:

1. If you are using a application schema name other than 'OZG_OWNER' (applies to OHI BO only, the OHI DM application owner is always OBD_OWN), you may need to replace this in the masking script. The perl script SDM0001S.pl has been provided to alter the script and replace the application schema name.
2. As a solution to bug 25252355, the script will remove procedures which cause problems during the execution of the script. These procedures re-create instead-of-triggers, but fail because of invalid public synonyms. The procedures may be safely disabled because they are not necessary for masking data.

This script SDM0001S.pl may be found in the \$OZG_BASE/sh directory. Run the script with option -h for help on how to use it.

Finally, start the masking script from SQL*Plus as SYS.

Note: as from db plugin version 13.2.2.0.0 when running the script you can specify a tablespace to create temporary objects created by the masking script.

- Providing the value '0' or blank to the question "Enter your choice, leave blank if you want to use default tablespace" will use the default tablespace of the user running the script.
- Providing the value '1' creates a compressed tablespace. All the intermittent objects (mapping tables as well as the copy of original tables being masked) will be created in this tablespace. This means that all tables that will be masked are first moved to this new tablespace, the masked table will be (re)created again in the original tablespace. If the DB_CREATE_FILE_DEST is set, the datafile required for the new tablespace will be managed by Oracle. Otherwise, the datafile for the new tablespace will be created in the directory from where the masking script is being run. This tablespace will be dropped when the masking job is completed.
- Providing the value '2' will create the tempory objects in the provided tablespace. For this an existing tablespace in the next question needs to be provided or the script will fail, even when the script prompts that a default value (null) is available!
- Providing the value '3' will do the same as option 2 but also moves all tables to be masked to this tablespace. For this option it is also mandatory to provide an existing tablespace

Options 1 and 3 might increase the masking time as it moves the tables to be masked to the chosen tablespace but have the benefit after dropping this tablespace that the size of the database files is not significant increased after masking.

Note: when masking OHI DM, the procedure sdm_dm_drv_pck.write_files that is executed as described in section 4.3, also stores table and columns comments to be restored in the post-masking phase. If the masking script is generated on a different environment than where the generated

masking script is executed, the following command needs to be executed on the environment to be masked separately before the masking script is executed:

```
exec sdm_dm_drv_pck.store_comments;
```

After that the masking proceeds. Depending on the size of the data store that is to be masked, this can take a considerable amount of time.

The masking script spools a log file in the current directory. This script runs in the "whenever sqlerror exit" mode. Upon completion of the masking script execution, inspect the log file and check for unexpected "ORA-" errors. Depending on the situation and the stage at which the error occurred, you might be able to fix the issue and rerun the script. Alternatively you have to restore the target database first, solve the cause of the issue, and then rerun the masking script.

If you had moved the tables with sensitive columns to a temporarily created tablespace (as described earlier) then you can drop that tablespace now.

Note: revert the changes made to the database parameters when using the database as an OHI Back Office or OHI Data Marts runtime environment.

5 OHI Data Marts subset

From release 10.16.1.0.0 onwards OHI Data Marts (OHI DM) is certified to extract data from sub-setted and/or data-masked OHI Back Office (OHI BO) data stores.

The following types of OHI BO data stores are supported:

- subsetting
- subsetting and data-masked
- data-masked

From release 10.18.1.0.0 onwards, OHI DM can be data-masked itself as well. The process how to mask OHI DM is described in chapter 4.

When a subset OHI DM environment is needed you should use the approach described in this chapter. The fact if the source OHI BO environment is already masked determines typically whether the resulting OHI DM environment is masked. For creating a subset OHI DM environment an initial load is needed from the OHI BO subset environment.

When you need a full size masked OHI DM environment the masking process from the previous chapter can be applied.

Theoretically you can create a subset OHI BO environment and corresponding OHI DM environment and mask them both independently but this is more time consuming and as such more error-prone than using a subset masked OHI BO environment to create the corresponding OHI DM environment.

5.1 Prepare OHI Data Marts data-store

An empty OHI DM data store is required to be able to load data from a subsetting and/or data-masked OHI BO data store into OHI DM. The SQL script *OBDRESET.sql* (available within *OZG_TEMPLATES.zip* as of release 10.16.1.0.0) is provided to create an empty OHI DM data store by truncating all the necessary OHI DM tables. This script can be run using SQL*Plus connected to the OBD_OWN account.

It is strongly advised to create a clone from an existing OHI DM environment which is at the same OHI patch-level as the OHI BO data store, and use this cloned environment to run the SQL script *OBDRESET.sql* against. Make sure the database link SRC_OPENZORG is referring to the correct OHI BO data store.

NOTE: This SQL script should never be used directly within a production environment!

5.2 Loading OHI Data Marts

Performing loads from an subsetting and/or data-masked OHI BO environment is identical to loading from a normal OHI BO environment. See the OHI Back Office online help for information on loading (topic 'Loading OHI Data Marts').

You can proceed with a full initial load from the OHI BO subset environment by not specifying up to which moment to load. Or you choose to first load older data up to a specific date and divide the work in this way, by using additional incremental loads for later periods to load.