Oracle® Health Sciences Clinical Development Analytics

Security Guide

Release 3.2.1

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This document provides the security guidelines that must be followed to use the Oracle Health Sciences Clinical Development Analytics (OHSCDA) application. It includes the following sections:

1 General Security Principles

The following principles are fundamental to using any application securely.

1.1 Keeping Software Up To Date

One of the principles of good security practice is to keep all software versions and patches up to date.

1.2 Keeping Up To Date on Latest Security Information Critical Patch Updates

Oracle continually improves its software and documentation. Critical Patch Updates are the primary means of releasing security fixes for Oracle products to customers with valid support contracts. They are released on the Tuesday closest to the 17th day of January, April, July and October. Oracle highly recommends customers to apply these patches as soon as they are released. Critical patch updates are available at http://www.oracle.com/technetwork/topics/security/alerts-086861.html#CriticalPatchUpdates.

1.3 Configuring Strong Passwords on the Database

Although the importance of passwords is well known, the following basic rule of security management is worth repeating:

Ensure all passwords are strong passwords.

You can strengthen passwords by creating and using password policies for your organization. For guidelines on securing passwords and for additional ways to protect passwords, refer to the *Oracle® WebLogic Portal Security Guide* specific to the database release you are using.

You should modify the following passwords to use your policy-compliant strings:

- Passwords for the database default accounts, such as SYS and SYSTEM.
- Passwords for the database application-specific schema accounts, such as RXI.
- The password for the database listener. Oracle recommends that you do not configure a password for the database listener as that will enable remote administration. For more information, refer to *Oracle® Database Net Services Reference 12c (12.1)*.

1.4 Following the Principle of Least Privilege

The principle of least privilege states that users should be given the least amount of privilege to perform their jobs. Overly ambitious granting of responsibilities, roles, grants — especially early on in an organization's life cycle when people are few and work needs to be done quickly — often leaves a system wide open for abuse. User privileges should be reviewed periodically to determine relevance to current job responsibilities.

1.5 Managing Default User Accounts

Lock and expire default user accounts.

1.6 Closing All Open Ports Not in Use

Keep only the minimum number of ports open. You should close all ports not in use.

1.7 Disabling the Telnet Service

Oracle Health Sciences Clinical Development Analytics does not use the Telnet service.

Telnet listens on port 23 by default.

If the Telnet service is available on any computer, Oracle recommends that you disable Telnet in favor of Secure Shell (SSH). Telnet, which sends clear-text passwords and user names through a log-in, is a security risk to your servers. Disabling Telnet tightens and protects your system security.

1.8 Disabling Other Unused Services

In addition to not using Telnet, the Oracle Health Sciences Clinical Development Analytics does not use the following services or information for any functionality:

- Simple Mail Transfer Protocol (SMTP): This protocol is an Internet standard for E-mail transmission across Internet Protocol (IP) networks.
- Identification Protocol (identd): This protocol is generally used to identify the owner of a TCP connection on UNIX.
- Simple Network Management Protocol (SNMP): This protocol is a method for managing and reporting information about different systems.

Restricting these services or information does not affect the use of Oracle Health Sciences Clinical Development Analytics. If you are not using these services for other applications, Oracle recommends that you disable these services to minimize your security exposure. If you need SMTP, identd, or SNMP for other applications, be sure to upgrade to the latest version of the protocol to provide the most up-to-date security for your system.

1.9 Designing for Multiple Layers of Protection

When designing a secure deployment, design multiple layers of protection. If a hacker should gain access to one layer, such as the application server, that should not automatically give them easy access to other layers, such as the database server.

Providing multiple layers of protection may include:

- Enable only those ports required for communication between different tiers, for example, only allowing communication to the database tier on the port used for SQL*NET communications (1521 by default).
- Place firewalls between servers so that only expected traffic can move between servers.

1.10 Enabling TLS

Due to the complexity in setting up TLS 1.2, it is not enabled by default during installation. Communications between the browser and the application servers should be restricted to TLS 1.2.

Set the weblogic.security.SSL.protocolVersion system property to TLS V 1.2. For more information, see *Oracle Fusion Middleware Securing Oracle WebLogic Server 10.3.6*.

2 Protected Health Information

OHSCDA contains the following subject data that are used for both out of the box reports and/or available for use in ad hoc queries:

- Date of Birth
- Initials
- Subject ID (concatenation of initials and date of birth)
- Screening # (concatenation of initials and date of birth)

If you have concerns over these data, you have several options available. You can configure the source systems to not use initials and data of birth in Subject ID and Screening # measures. Additionally, you can remove the Data of Birth and Initials measures from the presentation in OHSCDA as these are not used in any out of the box reports.

2.1 Removing PHI Measures

You can configure the OHSCDA repository to remove measures that contain PHI data. Refer to OBIEE documentation for full instructions on configuring the RPD.

1. Open the RPD in the OBIEE Administration tool.
2. Delete the following measures from the Subject folder in the presentation layer:
    - Date of Birth

- Initials
- Subject ID (concatenation of initials and date of birth)
- Screening # (concatenation of initials and date of birth)

3. Deploy the updated RPD on the OBIEE server.

2.2 Exporting Data

OHSCDA out of the box utilizes native OBIEE export functionality. You can export any report into PDF, Excel, Powerpoint, web archive (.mht), csv, tab delimited, or xml.

If you have concerns over exporting data, you have several options available. You can modify the dashboard properties and remove the export link at the bottom of reports. You can also enable the OBIEE's Usage Tracking option. This option tracks which queries were run by which users and when.

3 Security Guidelines for Oracle Health Sciences Clinical Development Analytics

Oracle Health Sciences Clinical Development Analytics (OHSCDA) spans several applications: Oracle Clinical, Oracle's Siebel Clinical, and InForm are the data sources, and Informatica ETL Execution Plans and transform Oracle Clinical, Siebel Clinical, and InForm data structures into the star schemas in an Oracle database. Oracle Business Intelligence Enterprise Edition (OBIEE), which reads from the star schemas and provides the user interface where end users can view and analyze data through dashboards and reports. The execution of the ETL is controlled by the Oracle Data Warehouse Administration Console (DAC) or Oracle Data Integrator (ODI) for the respective OHSCDA technology stack release.

The Oracle WebLogic Server Administration Console is used to manage the embedded directory server used to authenticate users and groups. Oracle Fusion Middleware Control is used to create and manage the application roles and policies that control access to Oracle Business Intelligence resources.

Each of the following applications requires its own security implementation:

- **Transactional Applications**: Create and maintain access to Oracle Clinical, Siebel Clinical, and InForm using the application interfaces.
- **DAC**:
  - Access to modify DAC specifications should be limited to administrators. Other users who need to review execution plans and source specifications should be given read-only access to the DAC repository.
  - Create and maintain access to DAC using its user interface.
- **Informatica**:
  - Access to modify Informatica specifications should be limited to administrators. Other users who need to review mappings and workflows should be given read-only access to the Informatica repository.
  - Create and maintain access to Informatica using its user interface.
- **ODI**:

- Access to modify ODI specifications should be limited to administrators. Other users who need to review mappings should be given read-only access to the ODI repository.
- Create and maintain access to ODI using its user interface.

- **Oracle RDBMS**: End users of OHSCDA do not need to have accounts in the Oracle database schema that hosts the warehouse. Give access to the warehouse schema only to those who need to administer the warehouse tables.
- **OBIEE**:
  - **Authentication**: Use the Oracle WebLogic Server Administration Console to manage the embedded directory server that is used to authenticate users and groups.
  - **Authorization**: Use the Oracle Fusion Middleware Control to create and manage the Application roles and Application Policies that control access to Oracle Business Intelligence resources.

    Predefined OBIEE user groups determine the privileges allowed to users and allow access to the shipped OHSCDA dashboards and reports. You can create additional user groups as needed in OBIEE.

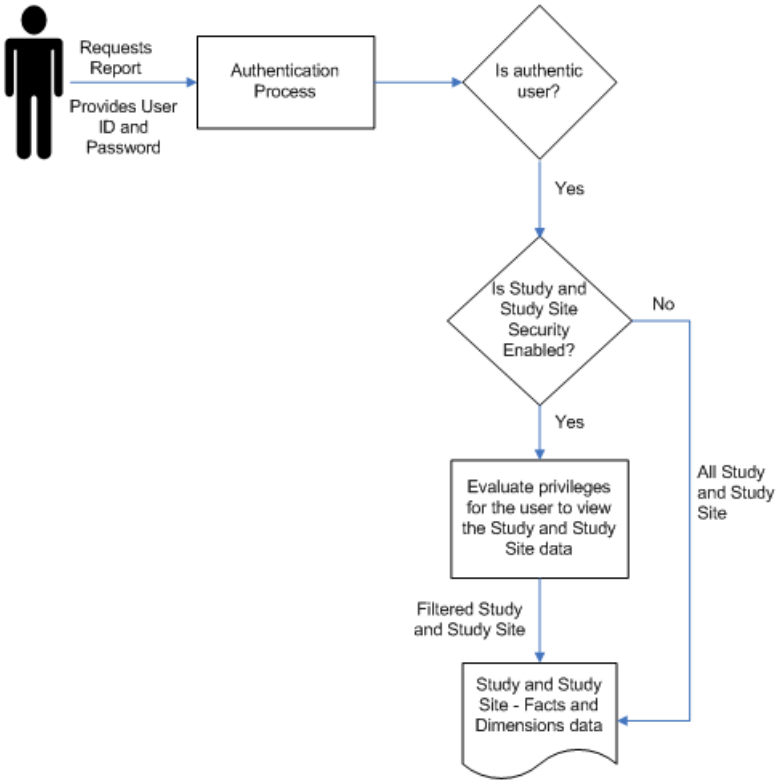
  Data access controls which OBIEE users see what study and Study-site level data.

  In OHSCDA,

  - *study-level data* means planned sites, documents, and enrollment
  - *study site-level data* means all other OHSCDA data

  You can allow all users to see study-level data from all studies and study site-level data from all study sites, or you can require explicit access to particular studies and study sites for each user. You may need to create Oracle Clinical, Siebel Clinical, or InForm user accounts in order to explicitly control access by OHSCDA users to Study and Study-site level data. For more information, see Section 3.2, "Setting Up Study and Study Site Data Access for Users".

Figure 1 Study and Study Site Security Implementation



You must set up security for the following basic types of users:

- **OCDA End Users**: Users who can view Oracle Clinical, Siebel Clinical, and InForm data in OHSCDA through dashboards and reports. The specific dashboards and reports they can view are determined by the user groups they belong to.
- **OCDA Programmers**: Users who are authorized to create their own reports in the Analysis component of OBIEE or OCDA, which does not require any programming skills. You can distinguish between people who can simply create ad hoc reports and those who can save the reports they create to a dashboard so that other people can use them.
- **Informatica or ODI Programmers**: Users who can modify the functionality of OHSCDA by modifying the predefined ETL Programs that OHSCDA uses to transform transactional source data in Informatica or ODI repository for use in OHSCDA. They may also create new ETL Programs to support custom dashboards and reports in OHSCDA.
- **OCDA Schedulers**: Users who schedule OHSCDA jobs, including the data loading job and the user data access jobs. They need privileges similar to Informatica Programmers.
- **DAC Administrators**: Users who set up DAC and grant privileges to other users.
- **Informatica or ODI Administrators**: Users who set up Informatica or ODI Setups and grant privileges to other users.

3.1 Setting Up User Authentication

DAC handles creation and maintenance of users for ETL administration of OHSCDA. Oracle WebLogic handles reports related user authentication for OHSCDA.

3.1.1 Creating User Accounts in DAC

You can create user accounts in the following ways:

- Create users in DAC. For more information, refer to the *Oracle Business Intelligence Data Warehouse Administration Console Guide*.
- If you have an Oracle LDAP Directory, migrate users to Oracle Applications. For more information, see Doc ID 1508321.1 on My Oracle Support (`https://support.oracle.com`).

3.1.2 Setting Up User Authorization in OBIEE

When a user logs in, OBIEE verifies that they have valid credentials and populates the OBIEE Group session variable with a list of the user groups the user belongs to.

Authorization at the OBIEE level determines which parts of OHSCDA's OBIEE user interface, the logged in users can access. For information on how to set up user authorization, see Section 3.1.2.1, "Using Predefined User Groups in OBIEE and Creating New Ones".

3.1.2.1 Using Predefined User Groups in OBIEE and Creating New Ones

All OHSCDA end users who view Oracle Clinical, Siebel Clinical, and InForm data in OBIEE must be associated with one or more OBIEE user groups. The OBIEE groups determine privileges allowed to users and allow access to the shipped OHSCDA dashboards and reports. To associate users with an OBIEE user group, assign their OBIEE account to an OBIEE user group.

OHSCDA provides a set of predefined OBIEE user groups. You can create additional groups, as needed.

Note: To perform administrative tasks in OBIEE, you must be a member of OBIEE's predefined Administrator group.

3.1.2.2 Predefined OBIEE User Groups

OHSCDA includes predefined OBIEE user groups (called *groups* in OBIEE) to allow OHSCDA end users access to predefined dashboards. Each dashboard allows access to a predefined set of reports. For more information about predefined reports, see *Oracle Health Sciences Clinical Development Analytics User's Guide*.

The predefined user groups allow dashboard access as follows:

- **CRA dashboard**: Executive, Study Manager, Region Manager, and CRA
- **Data Manager EDC dashboard**: Data Manager, Executive, Study Manager, and Region Manager
- **Data Manager Paper dashboard**: Data Manager, Executive, Study Manager, and Region Manager
- **Executive dashboard**: Executive
- **Region Manager dashboard**: Executive and Region Manager

- **Study Manager dashboard**: Executive, Study Manager, and Region Manager
- **Study Overview dashboard**: All users
- **Study Region Overview dashboard**: Executive, Study Manager, and Region Manager
- **Study Site Overview dashboard**: All users
- **Index dashboard**: All users

For more information, refer to Section 3.1.2.4, "Assigning OBIEE User Groups to Dashboards and Reports".

Note: OHSCDA ships with both the Presentation catalog and Repository groups for each predefined user group.

3.1.2.3 Creating User Groups in WebLogic

You can create additional user groups in WebLogic, as needed. For example:

- If you create new dashboards or reports, you may need new user groups to manage access to them.
- To create new dashboards and reports, you must allow some users access to the OBIEE Answers component, for which they need to be in a user group with access to Answers.

For more information refer to *Oracle Fusion Middleware Securing Resources Using Roles and Policies for Oracle WebLogic Server 11g Release 1*.

Note: The OBIEE Presentation catalog and Repository user groups must all have **exactly** the same name.

3.1.2.4 Assigning OBIEE User Groups to Dashboards and Reports

To use a group to allow users access to particular dashboards or reports, you must assign the new group to one or more dashboards or reports.

Log in to OBIEE, click **Settings** > **Administration** > **Privileges**. For more information, see *Oracle Business Intelligence Presentation Services Administration Guide*.

3.2 Setting Up Study and Study Site Data Access for Users

You can set two variables to either allow all users access to data from all studies and study sites or you can require each user to have explicit access to particular studies and study sites. For more information, refer to Section 3.2.1, "Setting the Systemwide Access Variables".

In OHSCDA:

- **Study data** means data pertaining to the study as a whole, including planned sites, planned enrollment, and the ratio of actual to planned subjects. It is not a roll-up of all patient data from all study sites. For security purposes, all documents are considered Study data as well, regardless of whether the document pertains to a Study, a Region, or a Study-Site.

- **Study site data** means all other OHSCDA data, including information about discrepancy management, CRF verification and approval, workloads, and more.

This means that if you set the variables to require explicit access:

- If users require access to study-wide data on planned sites, enrollment, or documents, they must have explicit access to study data for that study. Having access to all study sites does not automatically allow access to study data.
- If users require access to study site data from every site in a study, they must have explicit access to each study site. You can set up this access automatically by importing user privileges from Oracle Clinical, Siebel Clinical, or InForm. For more information, refer to Section 3.2.3, "Importing Study and Study Site Data Access Privileges".

> **Note:** If a user has access to multiple, but not all, sites in a study, the totals displayed in OHSCDA reports reflect the totals for the sites to which the user has access, not the totals for all sites in the study. For more information, refer to Section 3.2.4, "Study-Site Access Example".

3.2.1 Setting the Systemwide Access Variables

The following static repository variables determine whether explicit access to study or study site data is required for all users:

- **Enable_Study_Access_Sec**: If set to **Y**, all users must have explicit access granted to study-level data for a particular study in order to see that data. If set to **N**, all users can see study-level data for all studies.
- **Enable_Study_Site_Access_Sec**: If set to **Y**, all users must have explicit access to a particular study site in order to see site-level data for that study site. If set to **N**, all users can see site-level data for all study sites.

  The default value for both variables is **N**.

> **Note:** If you set these variables to **Y** you must populate a set of tables with user access data. For more information, refer to Section 3.2.3, "Importing Study and Study Site Data Access Privileges".
>
> Oracle recommends that you set both variables to the same value.

To change the value for either variable:

1. Stop the BI Server and the BI Presentation Server Services.
2. Using the OBIEE Administrator tool, edit the Repository:
   a. On the **Manage** Menu, choose **Variables**.
   b. In the **Variable Manager** dialog, choose **Repository**, then **Variables**, then **Static**.
   c. Open the properties of the variable, either by double-clicking it or through the context menu.
   d. Edit the value of Default Initializer for the variable: **Y** enables access control; **N** disables access control.
   e. Exit the Static Repository Variable dialog.

f. Exit the Variable Manager.

g. Save the modified Repository.

3. Start the BI Server and BI Presentation Server Services.

3.2.2 Data Access Tables

OHSCDA uses three database tables to control users' access to rows of data in the star schema fact tables that pertain to particular studies and study sites. The data access tables are:

- W_HS_APPLICATION_USER_D contains a list of the user accounts that can have data access granted to particular studies and study sites. It must be populated from an external source. OHSCDA includes a sample ETL Program for this purpose. For more information, refer to Section 3.2.3, "Importing Study and Study Site Data Access Privileges".
- W_HS_STUDY_ACCESS_SEC controls which users can see study-level data on which studies.
- W_HS_STUDY_SITE_ACCESS_SEC controls which users can see study site-level data on which study sites.

3.2.3 Importing Study and Study Site Data Access Privileges

The data access tables must be populated with data. OHSCDA includes a set of template ETL programs for this purpose. The programs are called *template* programs because you will need to adjust them according to your particular configuration, if you are enabling access control. If you are not enabling access control, the template programs can be used as they are. The following list enumerates the degrees to which you may want to modify the template programs:

- If you set the systemwide access variables to **N**, run the template ETL programs as is to populate the tables with a dummy user. All users have access to all study-level and study site-level data for all studies and sites.
- If you set the systemwide access variables to **Y**, modify the ETL programs as necessary to import user access information from Oracle Clinical, Siebel Clinical, and InForm. If you are able to use OHSCDA but do not currently have either Oracle Clinical, Siebel Clinical, or InForm user accounts with privileges for specific studies or sites set, you must create user accounts with the desired privileges in one of the source transactional systems.
- If you set the systemwide access variables to **Y**, modify the ETL programs as necessary to import user access information from some other source.

About Oracle Clinical Template Programs

The template ETL programs for Oracle Clinical are:

- SDE_OC_Application_User_D
- SDE_OC_Study_Access_Sec
- SDE_OC_Study_Site_Access_Sec

The Oracle Clinical table OPA.OPA_LEVEL_PRIVS stores study and study site data access information for Oracle Clinical and Oracle Clinical Remote Data Capture (RDC) Onsite users. The Oracle Clinical or RDC administrator sets these privileges in the Maintain Access to Studies and Maintain Access to Sites windows in either Oracle Clinical or the RDC Administration application.

The template OC ETL programs will read data from this table and populate the data access tables in the OHSCDA warehouse.

OHSCDA uses this data to allow users access to study and study site data in OBIEE. In Oracle Clinical and RDC the concept of study and study site data access is different from OHSCDA's, and you can specify a variety of privileges on studies and study sites, which is not required in OHSCDA where all data access is view-only. The template OHSCDA ETL programs interpret the Oracle Clinical/RDC data as follows:

- If a user has been granted any privileges on a study site in OPA_LEVEL_PRIVS, the programs give the user study site-level access to that study site in OHSCDA.
- If a user has been given any privileges on a study in OPA_LEVEL_PRIVS, the programs give the user:
  - Study-level access to that study in OHSCDA
  - Study site-level access to all the study sites in that study

The template ETL programs also remove the Oracle Clinical `OPS$` prefix from each user name. You will likely need to alter this translation of Oracle Clinical user name to OHSCDA user name. For more information, refer to Section 3.2.3.1, "Modifying the Data Access Programs".

About Siebel Clinical Security ETL Programs

The security ETL programs for Siebel Clinical are:

- SDE_SC_Application_User_D
- SDE_SC_Study_Access_Sec
- SDE_SC_Study_Site_Access_Sec
- SDE_SC_Party_Parent
- SDE_SC_Study_Hierarchy
- SDE_SC_Study_Site_Hierarchy

These programs read from the standard tables describing Siebel Clinical users and protocols, and the access that users have to studies. Review the programs, and adjust them to correspond to any changes you have made from the standard Siebel Clinical model.

About InForm Security ETL Programs

The security ETL programs for InForm Clinical are:

- SDE_IF_Study_Access_Secs
- SDE_IF_Study_Site_Access_Secs

Programs read from the standard tables describing InForm users and studies, and the access that users have to studies and study sites. Review the programs, and adjust them to correspond to any changes needed as per the custom requirement.

The other security ETL programs are:

- SIL_Application_User_D
- SIL_Study_Access_Sec
- SIL_Study_Site_Access_Sec

3.2.3.1 Modifying the Data Access Programs

You may need to modify the data access ETL programs for the following reasons:

- **User Name Conversion Modification**: You may need to edit the SDE programs to adapt the user name conversion to your input Oracle Clinical, Siebel Clinical, or InForm user names and your output OHSCDA user names. Be careful; if the following conditions are not met, names will not match up and access control will fail.
  - The conversion performed in the all the SDE programs must be identical
  - The resultant user name must be the same as the user name used for OHSCDA purposes. SDE ETL programs that execute the ETL to populate the data access tables have a parameter for entering the E-mail portion of the standard user name format.
- **Interpretation Logic Modification**: You may prefer to interpret the Oracle Clinical, Siebel Clinical, or InForm privileges differently in OHSCDA.
- **Source Modification**: You may want to import data access information from another source.

  For instructions on modifying ETL programs, see *Oracle Health Sciences Clinical Development Analytics Administrator's Guide*.

3.2.3.2 Running the Template Data Access Control ETL Programs You should run your versions of these programs:

- when you first set up OHSCDA
- when new users need access
- when new studies are added
- when new sites are added to studies
- when the systemwide access variable settings are modified

You must run the programs in the order in which they are listed in Section 3.2.3, "Importing Study and Study Site Data Access Privileges". For more information, see *Oracle Health Sciences Clinical Development Analytics Administrator's Guide*.

3.2.4 Study-Site Access Example

In Study 012345, users U2 and U3 have study-site access defined in the OHSCDA data access table W_STUDY_ACCESS_STUDY_SITE_SEC as follows (note that user U1 is not in the table at all):

Table 1 Study Site Access Example

APPLICATION_ USER_WID	STUDY_WID	STUDY_SITE_WID
U2	A	A1
U2	A	A2
U3	B	B1
U3	B	B2

The distribution of discrepancies by study site, as stored in the discrepancies aggregate table in the warehouse, is:

Table 2 Study Site Access Example

Study	Study Site	Number Of Discrepancies
A	A1	20
A	A2	15
B	B1	30
B	B2	10
B	B3	20

Table 3 Study Site Access Example

Study	Study Site	Number Of Discrepancies
A	A1	20
A	A2	15
B	B1	30
B	B2	10
B	B3	20

A query on this data has been created and saved as a report:

Users U1, U2, and U3 can run the report. When user U1 runs the report, nothing can be seen. U1 has no access to any study site data.

When user U2 runs the report, U2 sees the following:

Table 4 Study Site Access Example

Study	Number of Discrepancies
A	35

And U2 drills down within Study A, the following can be seen:

Table 5 Study Site Access Example

Study	Site	Number of Discrepancies
A	A1	20
A	A2	15
Total		35

When user U3 runs the report, U3 sees the following:

Table 6 Study Site Access Example

Study	Number of Discrepancies
B	40

That is, U3 sees the sum of the values for the sites U3 is entitled to see, not the sum for the study. For user U3, it is as if site B3 does not exist. Drilling down shows the same effect:

Table 7 Study Site Access Example

Study	Site	Number of Discrepancies
B	B1	30
B	B2	10
Total		40

Note: A given document can pertain to study-site, a region, or a study. Ideally, there would be separate security controls for each level. However, in OCDA Release 3.2.1, we are applying the same security to all documents. As every region and study-site belongs to a study, we control documents at the study level.

4 Security Guidelines for Oracle Business Intelligence Enterprise Edition

While installing and configuring the OBIEE Server, you should follow guidelines in the document *Oracle® Fusion Middleware Security Guide for Oracle Business Intelligence Enterprise Edition 11g Release 1 (11.1.1)*.

4.1 Checking External Links that May Expose Account Data

It is possible to add customized links to web applications that are deployed in a web server. Through this mechanism, any information that can be made available through a URL can be made accessible to OHSCDA users. In addition, your customized links may support passing session parameters, such as the log-in user ID, and currently selected Product, Program, Study and Site to a URL. By passing these session parameters, you can access Web pages specific to your current selections on these attributes. However, you should be aware that in links that access external Web sites, passing account data and session information may pose a security risk.

4.2 Managing Usage Tracking

For information, see *Oracle® Fusion Middleware System Administrator's Guide for Oracle Business Intelligence Enterprise Edition*.

5 Setting Up Transparent Data Encryption Tablespace

To set up the transparent data encryption tablespace, perform the following configuration steps:

1. Create a wallet by executing the following syntax at the command line.

```
mkstore -wrl <wallet_location> -create
```

Note: `<wallet_location>` is the directory where you want to create and store the wallet.

The command will prompt for the wallet password twice. Enter the same password and note down the password as it will used later.

2. Update the sqlnet.ora file.
   a. Navigate to $ORACLE_HOME\NETWORK\ADMIN.
   b. Update the sqlnet.ora file for ENCRYPTION_WALLET_LOCATION.

      For example,

```
ENCRYPTION_WALLET_LOCATION=
  (SOURCE=(METHOD=FILE)(METHOD_DATA=
    (DIRECTORY=<wallet location>)))
```

3. Create a wallet key and open the wallet in the database.

```
ALTER SYSTEM SET ENCRYPTION KEY IDENTIFIED BY "<password>";
```

> **Note:** You must enter the same password used in step 1.

4. Create an encrypted tablespace. Run the following command:

```
CREATE TABLESPACE <tablespace name>
DATAFILE '<data file location>' SIZE 500M
AUTOEXTEND ON NEXT 1m
ENCRYPTION USING 'AES256'
DEFAULT STORAGE (ENCRYPT);
```

5. Create a schema and grant access to the encrypted tablespace.

   To create user or schema, run the following command:

```
Create user <username> identified by <user_password>;
```

   To grant user access, execute the following command:

```
Grant connect, resource to <username>;
```

   To grant tablespace quota, execute the following command.

```
ALTER USER <username> QUOTA UNLIMITED ON <tablespace name>;
```

6 Configuring SSO for OHSCDA OBIEE Using Oracle Access Manager 11g

This section describes the steps to configure SSO in Oracle Access Manager (OAM) 11g.

6.1 Prerequisites

The following are the prerequisites:

- OAM 11g installation must be configured to work with the desired LDAP.

  (For example, OUD), as the identity data-store.
- User profiles must exist in the LDAP server as well as in OHSCDA with the same credentials.
- Oracle Web Tier 11.1.1.3 (or higher) must be installed on the same server where the OBIEE server is installed and configured with the WebLogic Server hosting OBIEE.
- Oracle Webgate 11g must be installed on the same server where the OBIEE server is installed.

6.2 Configuring SSO on OAM 11g

To configure SSO on OAM 11g, perform the following steps:

1. Navigate to the OAM 11g OAM Console URL (http://<oam_server:port>/oamconsole) and log in with the OAM Admin credentials.
2. Select the **System Configuration** tab.
3. Select the **Access Manager Settings** submenu in the left navigation window of the browser.
4. Double-click **SSO Agents** and select the **OAM Agents** option to open the **OAM Agents** sub window.
5. Click **Create 11g Webgate** and enter the following details:
   - Specify the name for the OHSCDA Policy.
   - In the **Security** field, select the **Open** option.
   - Enter the host identifier. For example, <obiee_server>.

     Note: The <obiee_server> refers to the server where the OBIEE 11g is installed along with Oracle Web Tier and Oracle Webgate.

   - Select the **Auto Create Policies** option.
6. Click **Apply** to save and register the 11g Webgate and policies with OAM.
7. On the subsequent page, update the details for the OHSCDA policy created in step 5.
   - **Cache Pragma Header**: Private
   - **Cache Control Header**: Private
8. Click **Apply**.
9. Navigate to the **Policy Configuration** tab.
10. Expand and double-click **Shared Components > Resource Type > Host Identifiers > <obiee_server>** (for example, server.domain.com) to open the **Host Identifiers** window and add the following details:
    - <obiee_server>
    - <obiee_server> <port>
    - <obiee_server_ip>
    - <obiee_server_ip> <port>

      Note: <obiee_server> refers to the server where the OBIEE 11g is installed along with Oracle Web Tier and Oracle Webgate. The port refers to the Oracle Web Tier Port.

11. Expand and double-click **Application Domains > <OHSCDA Policy> > Authentication Policies > Protected Resource Policy**.
12. Ensure that the Authentication Scheme is set as **LDAPScheme**.

13. Ensure that the following resources are present:
    - /
    - /…/*
14. Add the following response variables:
    - **Name**: OAM_REMOTE_USER
    - **Type**: Header
    - **Value**: $user.attr.uid [based on the LDAP schema setup]
15. Click **Apply** and save the changes.
16. Expand and double-click **Application Domains > <OHSCDA Policy> > Authorization Policies > Protected Resource Policy**
17. Ensure that the following resources are present:
    - /
    - /…/*
18. Add the following response variables:
    - **Name**: OAM_REMOTE_USER
    - **Type**: Header
    - **Value**: $user.attr.uid [based on the LDAP schema setup]
19. Click **Apply** to save the changes.
20. Navigate to the OHSCDA Web Tier Machine [<obiee_server>], where the OHSCDA OBIEE server is installed.
21. Run the installer for Webgate (OFM Webgate 11g for OAM 11g) to complete the installation.
22. Configure the 11g Webgate using the following steps to communicate with the OAM 11g server:

    Note: For more information, see *Oracle® Fusion Middleware Installation Guide for Oracle Identity Management*

    11g Release 1 (11.1.1).

    a. Move to the following directory under your Oracle Home for Webgate:

       On UNIX Operating Systems:

       ```
       <Webgate_Home>/webgate/ohs/tools/deployWebGate
       ```

       On Windows Operating Systems:

       ```
       <Webgate_Home>\webgate\ohs\tools\deployWebGate
       ```

    b. On the command line, run the following command to copy the required bits of agent from the **Webgate_Home** directory to the Webgate Instance location:

       On UNIX Operating Systems:

       ```
       ./deployWebgateInstance.sh -w <Webgate_Instance_Directory> -oh
       <Webgate_Oracle_Home>
       ```

On Windows Operating Systems:

```
deployWebgateInstance.bat -w <Webgate_Instance_Directory> -oh
<Webgate_Oracle_Home>
```

where, <Webgate_Oracle_Home> is the directory where you have installed Oracle HTTP Server Webgate and created as the Oracle Home for Webgate, as shown in the following example:

```
MW_HOME>/Oracle_OAMWebGate1
```

The <Webgate_Instance_Directory> is the location of Webgate instance home, which is the same as the instance home of Oracle HTTP Server, as shown in the following example:

```
<MW_HOME>/Oracle_WT1/instances/instance2/config/OHS/ohs1
```

c. Run the following command to ensure that the **LD_LIBRARY_PATH** variable contains <Oracle_Home_for_Oracle_HTTP_Server>/lib:

On UNIX (depending on the shell):

```
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:<Oracle_Home_for_Oracle_
HTTP_Server>/lib
```

On Windows:

Set the <Webgate_Installation_Directory>\webgate\ohs\lib location and the <Oracle_Home_for_Oracle_HTTP_Server>\bin location in the PATH environment variable.

Add a semicolon (;) followed by this path at the end of the entry for the PATH environment variable.

d. From your current working directory, move up one directory level:

On UNIX Operating Systems, move to:

```
<Webgate_Home>/webgate/ohs/tools/setup/InstallTools
```

On Windows Operating Systems, move to:

```
<Webgate_Home>\webgate\ohs\tools\EditHttpConf
```

e. On the command line, run the following command to copy the **apache_webgate.template** from the **Webgate_Home** directory to the Webgate instance location (renamed to webgate.conf) and update the **httpd.conf** file to add one line to include the name of **webgate.conf**:

On UNIX operating systems:

```
./EditHttpConf -w <Webgate_Instance_Directory> -oh <Webgate_Oracle_
Home> -o <output_file>
```

On Windows operating systems:

```
EditHttpConf.exe -w <Webgate_Instance_Directory> -oh <Webgate_
Oracle_Home> -o <output_file>
```

where, <Webgate_Oracle_Home> is the directory where Oracle HTTP Server Webgate is installed for Oracle Access Manager and created as the Oracle Home for Webgate, as shown in the following example:

```
<MW_HOME>/Oracle_OAMWebGate1
```

The <Webgate_Instance_Directory> is the location of Webgate instance home, which is the same as the instance home of Oracle HTTP Server, as shown in the following example:

```
<MW_HOME>/Oracle_WT1/instances/instance2/config/OHS/ohs1
```

The <output_file> is the name of the temporary output file used by the tool, as shown in the following example:

```
Edithttpconf.log
```

f. Copy Generated Files (Artifacts) to the Webgate Instance Location from the OAM 11g server.

The 11g Webgate Agent (<OHSCDA Policy>), which was created in the OAM 11g OAM Console, would have also created the following artifacts on the OAM 11g server:

- cwallet.sso

- ObAccessClient.xml

This is based on the Security Mode that you have configured, which in this case is **Open**.

On the OAM 11g server, these files are present at the following location:

```
<OAM_FMW_HOME>/user_projects/domains/<OAM_domain>/output/<OHSCDA
Policy>
```

23. Copy these files to the <obiee_server> in the following directory:

```
<Webgate_Instance_Directory>/webgate/config
```
directory

For example, <MW_HOME>/Oracle_
WT1/instances/instance2/config/OHS/ohs1/webgate/config.

24. Restart the Oracle HTTP Server instance.

To stop the Oracle HTTP Server instance, run the following commands on the command line:

```
<MW_HOME>/Oracle_WT1/instances/instance2/bin/opmnctl stopall
```

To restart the Oracle HTTP Server instance, run the following commands on the command line:

```
<MW_HOME>/Oracle_WT1/instances/instance2/bin/opmnctl startall
```

25. Configure the HTTP Server as a reverse proxy for the WebLogic Server. To execute this, modify the **mod_wl_ohs.conf** file present at the following location:

```
OracleWebTierHome\instances\instance2\config\OHS\ohs1
```

The following is a template to configure **mod_weblogic**:

LoadModule weblogic_module "${ORACLE_HOME}/ohs/modules/mod_wl_
ohs.so"

This empty block is needed to save mod_wl related configuration from EM to this file when changes are made at the base virtual host level:

```
<IfModule weblogic_module>
# WebLogicHost <WEBLOGIC_HOST>
# WebLogicPort <WEBLOGIC_PORT>
# Debug ON
# WLLogFile /tmp/weblogic.log
```

```
# MatchExpression *.jsp

<Location /console>
SetHandler weblogic-handler
WebLogicHost <WebLogic host name>
WeblogicPort <WebLogic port number
WLProxySSL ON
WLProxySSLPassThrough ON
</Location>

<Location /em>
SetHandler weblogic-handler
WebLogicHost <WebLogic host name>
WeblogicPort <WebLogic port number
WLProxySSL ON
WLProxySSLPassThrough ON
</Location>

<Location /analytics>
SetHandler weblogic-handler
WebLogicHost <WebLogic host name>
WeblogicPort <OBIEE Analytics Port>
WLProxySSL ON
WLProxySSLPassThrough ON
</Location>

<Location /analyticsRes>
SetHandler weblogic-handler
WebLogicHost <WebLogic host name>
WeblogicPort <OBIEE Analytics Port>
WLProxySSL ON
WLProxySSLPassThrough ON
</Location>

<Location /xmlpserver>
SetHandler weblogic-handler
WebLogicHost <WebLogic host name>
WeblogicPort <OBIEE Analytics Port>
WLProxySSL ON
WLProxySSLPassThrough ON
</Location>

</IfModule>
# <Location /weblogic>
# SetHandler weblogic-handler
# PathTrim /weblogic
# ErrorPage http:/WEBLOGIC_HOME:WEBLOGIC_PORT/
# </Location>
```

26. Restart the Web Tier Instance in WebLogic EM or as described in step 23.

27. Configure a new authenticator for Oracle WebLogic Server on the OBIEE server using the following steps:

- **a.** Login to the WebLogic Server Administrator Console and navigate to **Security Realms > myrealm**.
- **b.** Click the **Providers** tab.
- **c.** Click **Lock & Edit** on the right corner of the webpage, highlighted as Change Center.

d. Click **New** to create a new authentication provider and add the following details:

   Name: A name of your choice <Name>

   Type: OracleInternetDirectoryAuthenticator

e. After saving the details, click the new authenticator that you have created, and enter the following details:

   In the sub tab, change the Control Flag as **SUFFICIENT**

f. Click **Save**.

g. Click the **Provider Specific** tab and enter the following settings required using values for your environment:

   - **Host**: Your LDAP host.

   - **Port**: Your LDAP host listening port.

   - **Principal**: LDAP administrative user.

   For example, cn=Directory Manager

   - **Credential**: LDAP administrative user password.

   - **User Base DN**: Same search base as in Oracle Access Manager.

   For example, dc=us, dc=oracle, dc=com

   - **All Users Filter**:

   For example, (&(uid=*) (objectclass=person))

   - **User Name Attribute**: Set as the default attribute for username in the directory server.

   For example, uid

   - **Group Base DN**: The group search base.

   For example: dc=us, dc=oracle, dc=com

   - **All Groups Filter**:

   For example,
   (&(cn=*)(|(objectclass=groupofUniqueNames)(objectclass=groupOfURLs)))

   - **Group From Name Filter**:

   For example,
   (|(&(cn=%g)(objectclass=groupofUniqueNames))(&(cn=%g)(objectclass=groupOfURLs)))

   - **Static Group Name Attribute**:

   For example, cn

   - **Static Group Object Class**:

   For example, groupofuniquenames

   - **Static Member DN Attribute**:

   For example, uniquemember

   - **Static Group DNs from Member DN Filter**:

   For example, (&(uniquemember=%M)(objectclass=groupofuniquenames))

- **Dynamic Group Name Attribute**:

For example, cn

- **Dynamic Group Object Class**:

For example, groupOfURLs

- **User Dynamic Group DN Attribute**:

For example, uniquemember

- Leave the other defaults as is.

- **GUID Attribute**: The GUID attribute defined in the OUD LDAP Server

For example, uid

h. Click **Save**.

28. Configure a new Identity Asserter for WebLogic Server using the following steps:

a. In the Oracle WebLogic Server Administration Console, select **Security Realms** from the left pane and click the realm which you want to configure.

For example, myrealm.

b. Select **Providers**.

c. Click **New** and enter the following values in the fields:

Name: <Name>OAMIdentityAsserter or a name of your choice

Type: `OAMIdentityAsserter`

d. Click **OK**.

e. Click on the newly created asserter and set the Control Flag to **REQUIRED**.

f. Ensure that the Active Types that you have selected is **OAM_REMOTE_USER**.

g. Click **Save**.

h. Navigate to the **Provider Specific** tab and enter the following details:

- **Transport Security**: open

- **Application Domain**: <Name>, as set in the OAM 11g Console

- **Access Gate Name**: <Name>, as specified in the OAM 11g Console

- **Primary Access Server**: <Name>:<Port>, OAM 11g server with port

i. Click **Save**.

j. In the **Providers** tab, perform the following steps to reorder providers:

i. Click **Reorder**.

ii. On the **Reorder Authentication Providers** page, select a provider name and use the arrows to order the following providers:

- <Name>OAMIdentityAsserter

- OCDAAuthenticator

- DefaultAuthenticator

- DefaultIdentityAsserter

iii. Click **OK** to save your changes.

k. In the **Providers** tab, click **Default Authenticator** and change the Control Flag to **Sufficient**.

l. In the Change Center, click **Activate Changes**.

m. Restart Oracle WebLogic Server

29. Delete the **BISystemUser** present in the default embedded LDAP (using Security Realms in the **Administration Console** Link of the WebLogic Server) and add the same or another user in the newly added OID.

    You must add this user to the BI Application Roles using the following steps:

    a. Navigate to **Administration Console > Security Realms > myrealm > Users and Groups > Users** and select the **BISystemUser** check box (from Provider: Default Authenticator).

    b. Click **Delete**.

    c. Navigate to **Security Realms > myrealm > Roles and Policies > Realm Roles**.

    d. In the tree structure, expand **Global Roles** node and select the **Roles** link.

    e. In the subsequent screen, click the **Admin Role** link.

    f. Click **Add Conditions**.

    g. In the next screen, select the Predicate List as **User** and click **Next**.

    h. In the **User Argument Name**, enter **BISystemUser** and click **ADD**.

    i. Click **Finish**.

    j. In the **Role Conditions** screen, ensure that the set operator is set to **Or**.

    k. Save the configuration.

    l. Navigate to the Enterprise Manager of OBIEE or the Fusion Middleware Control page and navigate in the tree structure to the **Business Intelligence > coreapplication** node.

    m. In the Business Intelligence drop-down menu, select **Security > Application > Roles**.

    n. In the Roles displayed, select **BISystem**, and in the next screen remove the old **BISystemUser** (from the Default Provider), and add the newly created **BISystemUser** user in OUD.

    o. Add the trusted user's credentials to the oracle.bi.system credential map.

    p. Using Fusion Middleware Control target navigation pane, navigate to **farm > WebLogic Domain**, and select **bifoundation_domain**.

       i. Using the WebLogic Domain menu, select **Security** > **Credentials.**

       ii. Open the oracle.bi.system credential map, and select **system.user**.

       iii. Click **Edit**.

       iv. In the **Edit Key** dialog box, enter **BISystemUser** (or a name of your choice) in the **User Name** field.

       v. In the **Password** field, enter the trusted user's password that is contained in Oracle Internet Directory.

       vi. Click **OK**.

q. Restart the Managed Servers.

30. Enable the SSO authentication in the Weblogic Server for OBIEE using the following steps:

a. Login to Fusion Middleware Control (EM) of the WebLogic Server.

b. Navigate to the **Business Intelligence Overview** page.

c. Navigate to the **Security** page.

d. Click **Lock and Edit Configuration**.

e. Select **Enable SSO,** this makes the SSO provider list active.

f. Select the configured SSO provider from the list, as **Oracle Access Manager**.

g. In **The SSO Provider Logoff URL**, specify the following URL:

http://<oam_server:port>/oam/server/logout

h. Click **Apply**.

i. Click **Activate Changes**.

j. Restart the Oracle Business Intelligence components using Fusion Middleware Control.

7 Documentation Accessibility

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