



NetApp ILM for Oracle Databases- v1.1 Installation and Configuration Guide

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1 INTRODUCTION

Information Lifecycle Management (ILM) is a set of policies and techniques for managing data during its lifetime. NetApp® ILM for Oracle Database is the first tool of its kind that uses capabilities in Oracle® Database 10g or 11g and NetApp SnapLock® technology to simplify the challenge of designing and implementing a strategy for managing the information lifecycle. Oracle ILM Assistant (ILMA), a tool from Oracle, provides the GUI interface to manage the ILM. The ILMA advises when to move, archive, or delete data, and illustrates the storage requirements and cost savings associated with moving data.

NetApp ILM for Oracle Database v1.1 has a built-in extension specifically developed for the Oracle ILM Assistant, which provides seamless integration between these tools. Using this, managing the information lifecycles is easy and efficient, and may help reduce their related storage costs.

1.1 INTENDED AUDIENCE AND ASSUMPTIONS

This document is for Oracle DBAs, storage, and system administrators.

This document assumes familiarity with Oracle database concepts, PL/SQL, and Data ONTAP® features such as SnapLock and SnapMirror®.

1.2 ARCHITECTURE

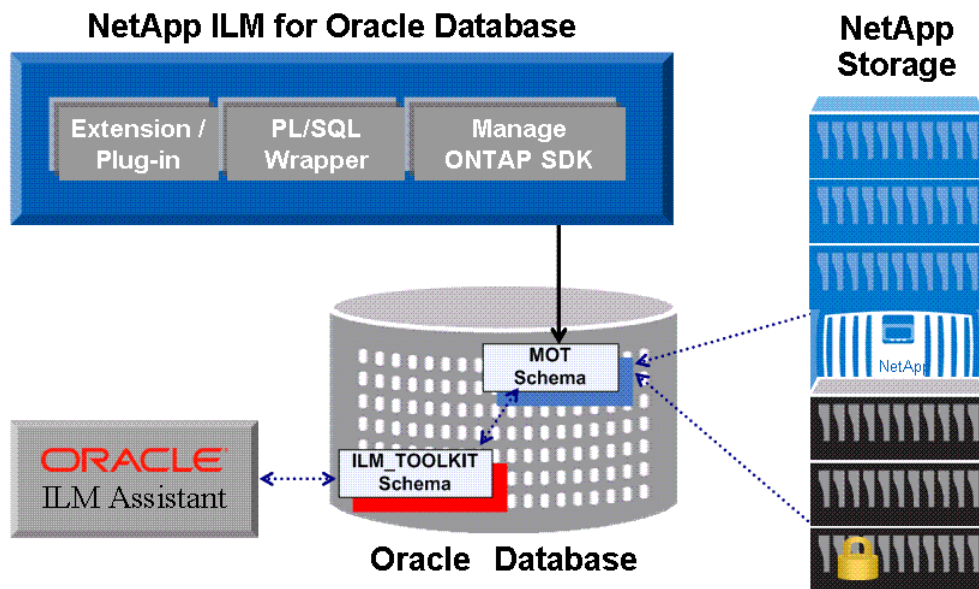


Figure 1) Architecture diagram.

1.3 HARDWARE SOFTWARE REQUIREMENTS

SOFTWARE REQUIREMENTS

Table 1) Software requirements.

Component	Version	Comments
Oracle JVM	9i R2 10g R2 11g R1	
ILM Assistant with ILM Toolkit installed in DB	1.3	
ILM Plug-in extension	1.3	
PLSQL	10.2.0.2 11.1.0.6	
Database	10.2.0.2 11.1.0.6	
ManageONTAP.jar	3.0	
Network transport type	HTTPS	
Operating system	Check the NFS supportability matrix	
SnapLock (Compliance and Enterprise)	7.0.7-7.2.5	
Data ONTAP	7.2.x	SnapLock Compliance (SLC) requires all NetApp storage systems that have SLC or are the target of a SnapMirror of a SLC volume be upgraded to the latest release of ONTAP; 7.0.7, 7.1.3 or 7.2.5.

2 INSTALLING NETAPP ILM

This section describes the procedure to install NetApp ILM v1.1 for Oracle Database 10g R2 (10.2.0.2) or higher.

Note: Read the instructions in this section carefully before downloading this tool.

2.1 PREREQUISITES

1. Check if Oracle Database 9.2 or higher and Oracle Application Express (HTMLDB) version 2.2 or higher is installed.

Make sure that Oracle Application Express is configured with Oracle HTTP Server or embedded PL/SQL gateway to run it from the web.

2. Download the Oracle ILM Assistant v1.3 from <http://www.oracle.com/technology/software/deploy/ilm/index.html>
3. Install and configure Oracle ILM Assistant. See the *ILMA Installation Guide*, listed in Appendix A: References.

3 INSTALLATION PROCEDURE

1. Download the NetApp ILM for Oracle Database v1.1 from [NOW](#)™.
2. Log in as 'oracle' user or as the user owning the database binary, to the database server where Oracle ILM Assistant v1.3 is installed.
3. Create a separate directory for NetApp ILM v1.1 (for example, NetApp_ILM).
4. Unzip the download (xx.zip) file to the directory created in step 3.
5. Check that you have the correct ORACLE_SID and ORACLE_HOME environment variable set for the Oracle Database where you want to connect and install this tool.
6. Log in to Oracle Database as SYSDBA and execute:

```
run_install.sql
```

7. Check the netapp_ilm_install.log log file created in the current directory.

4 NETAPP ILM FOR ORACLE DATABASE V 1.1 INSTALLATION

Table 2 lists the scripts that are invoked from run_install.sql.

Table 2) Scripts.

Script	Description
create_mot_user1.sql	Creates a MOT schema. It requires the MOT schema password, Default Tablespace, and Temporary Tablespace.
grants_to_mot.sql	Assigns necessary grants to MOT.
load_mot_java.sql	Loads the manageontap.jar and DBMSWrapper.class files to the Oracle database.
compile_java_class.sql	Compiles the Java Classes.
verify_java_class.sql	Verifies the status of the Java Classes. Check whether the status is "VALID", otherwise recompile.
create_dbms_ontap_pkg_head.sql	Creates the DBMS_ONTAP package specification in MOT schema.
create_dbms_ontap_pkg_body.plb	Creates the DBMS_ONTAP package body in MOT schema.
verify_dbms_ontap_pkg.sql	Verifies the status of the DBMS_ONTAP package.
netapp_irma_install_head.sql	This is a NetApp specific extension to the Oracle ILM Assistant, which creates the Object Type instantiating from ILM_TOOLKIT schema.
netapp_irma_install_body.plb	This is a NetApp specific extension to the Oracle ILM Assistant, which creates the Object Type Body instantiating from ILM_TOOLKIT schema.

For more information about the tool usage, see the *Oracle ILMA v1.3 Users Guide*.

5 CONFIGURING NETAPP ILM

This section describes the procedure to configure NetApp ILM for Oracle Databases.

5.1 PREREQUISITES

- Check that the Oracle ILM Assistant is installed correctly and you are able to invoke the URL similar to the following:

`http://:hostname:port number/apex/f?p=737677:1`

For example:

<http://ibmx345-svl03.iop.eng.netapp.com:9090/apex/f?p=737677:1>

- To run it from the web, Oracle Application Express should be configured with Oracle HTTP Server or embedded PL/SQL gateway. For the configuration procedure, see:

http://download.oracle.com/docs/cd/B32472_01/doc/install.300/b32468/toc.htm

5.2 CONFIGURING THE STORAGE SYSTEM

SnapLock is an advanced storage solution that provides an alternative to traditional optical WORM storage systems for non-rewritable data. SnapLock is a license-based, open-protocol feature that works with application software to administer non-rewritable storage of data.

SnapLock is available in two versions: SnapLock Compliance and SnapLock Enterprise. Make sure that your version of Data ONTAP supports both versions.

Use NetApp FilerView® GUI—a web based tool, or the command line to create a SnapLock volume in the NetApp storage system.

1. License the SnapLock feature.

Check that the SnapLock Enterprise or SnapLock Compliance license is added correctly.

2. Create a SnapLock specific aggregates by entering:

```
Aggregates > Add > aggregate name
```

3. Create a SnapLock volume by entering:

```
Volumes > Add > volume_name
```

For example:

```
Volumes > Add > sl_2to20
```

4. Export NFS for the volume created in the previous step by entering:

```
NFS > Manage Exports > volume_name
```

5. Initialize the compliance clock by entering:

```
date -c initialize
```

Use this option only if you have the SnapLock Compliance or SnapLock Enterprise license installed. This option initializes the compliance clock to the current value of the system clock.

Note: Make sure that the system clock is appropriately set before running the above command. The compliance clock can only be set once and there is no mechanism for resetting it.

For more information, see the NetApp storage system specific documentation available at <http://now.netapp.com/NOW/knowledge/docs/ontap/rel7251/html/ontap/onlinebk/7snaplo2.htm>

NetApp FilerView can be invoked by using the URL similar to the following:

`http://storage system name/na_admin`

For example:

http://10.61.162.12/na_admin/

5.3 CONFIGURING THE DATABASE HOST

The following example describes how to create a physical directory in the database host and NFS mount them in Linux.

Make sure you have the root privileges to create directories and the operating system user name like 'oracle' with group 'dba' with the same privileges used when creating the Oracle Database.

Make appropriate changes when installing on Solaris and other UNIX flavors.

1. Create a physical directory on the database hosts to mount the volume created in the storage system. Change the ownership of the directory to the OS user (in this case oracle).

For example:

```
# mkdir -p /u02/spectrevol/sl_2to20
# chown -R oracle:dba /u02/spectrevol/sl_2to20
# mount /u02/spectrevol/sl_2to20
# ls -ld /u02/spectrevol/sl_2to20
drwxr-xr-x 3 root root 4096 Jul 21 2008 /u02/spectrevol/sl_2to20
# chown -R oracle:dba sl_2to20/
chown: changing ownership of `sl_2to20/.snapshot': Read-only file system
# ls -ltr
total 4
drwxr-xr-x 3 oracle dba 4096 Jul 21 2008 sl_2to20
```

2. Use the **mount** command to mount the volume to the physical directory or add entries to the `/etc/fstab` file (in the Linux OS).

For example:

```
10.61.162.12:/vol/sl_2to20 /u02/spectrevol/sl_2to20 nfs
hard,nointr,proto=tcp,suid,rw,bg,vers=3,rsz=32768,wsz=32768,actimeo=0,ti
meo=600
```

3. Verify whether the NFS volumes is mounted from the hosts.

For example:

```
$mount
10.61.162.12:/vol/sl_2to20 on /u02/spectrevol/sl_2to20 type nfs
(rw,hard,nointr,proto=tcp,bg,nfsvers=3,rsz=32768,wsz=32768,actimeo=0,tim
eo=600,addr=10.61.162.12)
```

5.4 CONFIGURING THE NETAPP ILM EXTENSION

This section describes how to create a database user and assign credentials for this user to enable access to the Oracle ILM Assistant.

To configure the NetApp ILM Extension, every SnapLock volume created and NFS mounted should be added as a file system to the Oracle ILM Assistant.

1. Log in as `sysdba` and grant execute privilege on `DBMS_ONTAP` to the Oracle ILM Assistant.

For example:

```
SQL> grant execute on mot.dbms_ontap to ilm_toolkit ;
```

2. Create a database user name (for example `netapp_ilm_demo`) to log in into the Oracle ILM Assistant GUI.

For example:

```
SQL> CREATE USER "NETAPP_ILM_DEMO" PROFILE "DEFAULT" IDENTIFIED BY "*****"  
DEFAULT TABLESPACE "NETAPP_ILM_DEMO" TEMPORARY TABLESPACE "TEMP" ACCOUNT  
UNLOCK  
GRANT "CONNECT" TO "NETAPP_ILM_DEMO"
```

3. Assign privileges to the database user created.

Log in as `sysdba` and run the `grant2run_ilm.sql` script. Pass the database user name (step 2) as an argument.

For example:

```
SQL > @grant2run_ilm.sql <netapp_ilm_demo>
```

4. Add the file system to the Oracle ILM Assistant:

Every SnapLock volume created on the storage system, which is mounted on the database host, should be added as a file system to Oracle ILM Assistant with the required credentials.

For every file system added, the Oracle ILM Assistant expects the directory object created with the directory path to be same as the physical path that is mounted to the SnapLock volume. This step is automated so that the directory object appears in the output when running the `netapp_add_fs.sql` script.

Log in as `MOT` user or `sysdba` privilege and run the `ilm_netapp_add.sql` script.

For example:

```
SQL> @netapp_add_fs  
  
Enter Storage System Name           :10.61.162.12  
Enter Volume/Device Path            :/vol/sl_2to20  
Enter Storage System Username       :root  
Enter Storage System Password       :  
Enter File System Display Name      :SL_ENTERPRISE_2TO20  
Enter File System Unique ID         :4444  
Enter Physical path from the Host   :/u02/spectrevol/sl_2to20  
PL/SQL procedure successfully completed.  
Device ID Display Name  
  
-----  
4444 SL_ENTERPRISE_2TO20  
DIRECTORY_NAME      DIRECTORY_PATH  
-----  
NETAPP_SNAPE_4444    /u02/spectrevol/sl_2to20  
SQL>
```

Where:

File System Display Name: The name of the file system displayed in the Oracle ILM Assistant.

File System Unique ID: A unique ID that identifies the file system.

Physical path from the Host: The physical directory created and mounted to the SnapLock volume. Oracle ILM Assistant expects datafiles for this volume to be created in this directory.

The Device ID Display Name: Shows that volume is successfully added as a file system to Oracle ILM Assistant. It also internally creates a directory structure where the datafiles for this volume will be created.

5. Create a tablespace template for each file system added:

At least one tablespace must exist on the managed file system to be used by the ILM Assistant. The purpose of the tablespace is to be a template for new tablespaces targeted to receive migrated database partitions. The new tablespaces inherit every attribute of the template, except the file name, which is fabricated by the ILM Assistant.

Template tablespaces must not contain volume paths associated with multiple file systems. If this occurs, the ILM Assistant will ignore the tablespace and possibly the entire file system.

Note: Make sure that the datafile location is the physical directory created and mounted as shown in step 4.

For example:

```
SQL> CREATE SMALLFILE TABLESPACE "SL_2TO20_TPLATE" DATAFILE
'/u02/spectrevol/sl_2to20/sl_2to20_tplate01.dbf' SIZE 50M REUSE LOGGING
EXTENT MANAGEMENT LOCAL SEGMENT SPACE MANAGEMENT AUTO DEFAULT NOCOMPRESS
```

6. Verify that you can log in into Oracle ILM Assistant GUI using the URL and the database user name created in step 2.

URL: <http://ibmx345-svl03.iop.eng.netapp.com:9090/apex/f?p=737677:1>

Database username: *netapp_ilm_demo*

Database password: *XXXXXX*

7. Set the retention date.

Note: The retention date on a particular database is set when implementing the ILM for your environment (see Section 5.8).

A retention date is the date after which Data ONTAP allows deleting a WORM file on a SnapLock volume. The retention date for WORM records on a SnapLock volume is stored in the last access timestamp of the record file metadata.

To set a retention date for a WORM record, the application must first explicitly set the "file last access time" to the desired retention date before setting the file as read-only and engaging the WORM commit operation. Once committed to the WORM state, the access time of the file is immutable, with the exception of extending the record retention period.

Oracle ILM Assistant provides the script to set the retention date for a particular tablespace, based on the Event Detection. That script internally calls the NetApp ILM extension to set the retention date correctly on the SnapLock volumes on the NetApp storage system.

Sample script:

```
begin
ilm_toolkit.ilm_toolkit.set_retention ( 'SL_2TO20_TPLATE4',
to_date('10/11/2015', 'MM/DD/YYYY') );
end;
/
```

5.5 DELETING THE FILE SYSTEM (ONLY WHEN TROUBLESHOOTING)

To remove an incorrectly added file system, do the following steps. Perform this procedure only when troubleshooting.

1. Execute the `ilm_toolkit.ilm_toolkit.delete_file_system` package by logging in as `sysdba`. Use the file system unique ID as a parameter.

```
SQL> exec ilm_toolkit.ilm_toolkit.delete_file_system (file system id);
```

For example:

```
SQL> exec ilm_toolkit.ilm_toolkit.delete_file_system (4444);
```

PL/SQL procedure successfully completed.

2. Drop the directories manually by entering:

```
SQL> drop directory Directory Name
```

For example:

```
SQL> drop directory NETAPP_SNAPE_4444
```

5.6 USING NETAPP ILM FOR ORACLE DATABASE SQL SCRIPT FILES

Using the following SQL script files you can directly connect to the database and get the NetApp storage system specific information:

`DataFileToVol.sql`

`PhyToVol.sql`

`VolToPhyPath.sql`

`getretention.sql`

`setretention.sql`

`getsysteminfo.sql`

`getslvolinfo.sql`

`getslvoloptioninfo.sql`

`getontapver.sql`

5.7 USING ORACLE ILM ASSISTANT WITH NETAPP ILM FOR ORACLE DATABASE

To set up and use the ILM for your environment, refer to the Oracle ILM Assistant Guide:

http://www.oracle.com/technology/software/deploy/ilm/ilma_users_guide_0.html

5.8 IMPLEMENTING ILM FOR YOUR ENVIRONMENT

Implement ILM using Oracle database using the following procedures:

1. Defining Data Classes
2. Creating Storage Tiers for Data Classes
3. Creating Data Access and Migration Policies
4. Defining and Enforcing Compliance Policies

Data can be classified based on the frequency of usage. Storage tiers can then be created for the identified data classes. During its lifetime, the data migrates between the data classes and the access to it is controlled. Eventually the data may be archived, or remain in the database indefinitely.

When creating a logical storage tier, every SnapLock volume created as a file system will be available as a List of Values to be assigned to a particular storage tier.

A storage tier can only be associated with one type of file system. The file system determines which tablespace objects are assigned to the storage tier. There can be more than one file system available for the storage tier usage. The conventional system, which permits standard read/write operations, is the default file system used by the Oracle Database.

The other file systems that are created as part of NetApp specific extension configuration are initially set with read/write permissions. After migrating the data to be protected, the file system is set as read-only.

For the more details, see the section “Logical Storage Tier” in the *Oracle ILM Assistant User Guide*.

6 APPENDIX A: REFERENCES

- Oracle Information Lifecycle Management: <http://www.oracle.com/technology/deploy/ilm/index.html>
- Oracle ILM Assistant Installation Guide: http://www.oracle.com/technology/software/deploy/ilm/ilma_install_guide.pdf
- Oracle Information Lifecycle Management: http://www.oracle.com/technology/software/deploy/ilm/ilma_users_guide_0.html
- ILM Assistant FAQ: http://www.oracle.com/technology/deploy/ilm/ilma_faq.htm



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