

Machine Learning Installation Manual

Oracle FLEXCUBE Universal Banking

Release 14.4.0.3.0

February 2021





Table of Contents

| | | |
|--------------|---|-----------|
| 1 | Glossary: | 4 |
| 2 | Introduction: | 4 |
| 3 | Application Compatibility: | 4 |
| 3.1 | Oracle FLEXCUBE Universal Banking | 4 |
| 3.2 | OML4R (Previously Oracle R Enterprise (ORE)) | 4 |
| 3.3 | Machine Learning Database | 4 |
| 4 | Oracle FLEXCUBE Machine Learning Architecture | 4 |
| 5 | Pre-Installation Checklist: | 5 |
| 5.1 | FLEXCUBE Database Instance | 5 |
| 5.2 | Machine Learning Database Instance | 5 |
| 5.3 | Data Replication | 6 |
| 6 | Installation Steps: | 6 |
| 6.1 | Machine Learning Instance | 7 |
| 6.1.1 | Object Summary | 7 |
| 6.1.2 | User Creation and granting privileges | 7 |
| 6.1.3 | Installation of Database Objects | 8 |
| 6.1.4 | Installation of OML4R (previously ORE) Packages | 10 |
| 6.1.5 | Installation of OML4R (previously ORE) wrapper scripts | 11 |
| 6.2 | FLEXCUBE Instance | 16 |
| 6.2.1 | Object Summary | 16 |
| 6.2.2 | Login to FLEXCUBE Instance | 16 |
| 6.2.3 | Database Link | 16 |
| 6.2.4 | Execute the INSERT scripts | 16 |
| 6.2.5 | FLEXCUBE User Interfaces | 16 |
| 6.3 | Machine Learning Validation Checkpoints: | 16 |
| 6.3.1 | Validate Database Tables | 16 |
| 6.3.2 | Validate Views | 18 |
| 6.3.3 | Validate PL/SQL Objects: | 18 |
| 6.3.4 | Validate OML4R (Previously ORE) scripts: | 19 |
| 6.4 | FLEXCUBE Validation Checkpoints: | 19 |
| 6.4.1 | Validate database link creation | 19 |

| | | |
|--------------|---|-----------|
| 6.4.2 | Validate database link credentials | 19 |
| 6.4.3 | Validate FLEXCUBE menu | 20 |

1 Glossary:

| Abbreviation | Detailed Description |
|--------------|---|
| FCUBS | Oracle FLEXCUBE Universal Banking |
| ML | Machine Learning |
| LTV | Life Time Value |
| OML4R | Previously Oracle R Enterprise (ORE) |
| IDE | Integrated Development Environment |

2 Introduction:

This document contains detailed guidelines to install Oracle FLEXCUBE Machine Learning framework.

Note: Please refer Oracle FLEXCUBE Machine Learning User Manual for Model execution and control

3 Application Compatibility:

3.1 Oracle FLEXCUBE Universal Banking

Version: 14.4.0.0.0

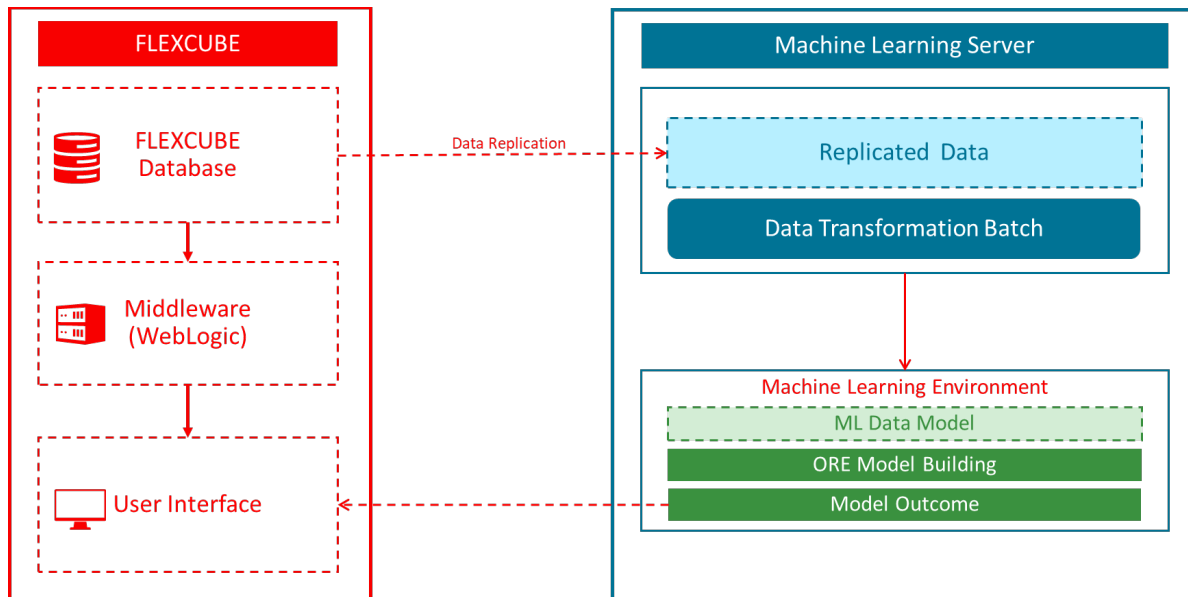
3.2 OML4R (Previously Oracle R Enterprise (ORE))

- All the Machine Learning models were built using OML4R (Previously Oracle R Enterprise) 1.5.1
- For installation and setup please refer to the guidelines received with the licensed version of OML4R (Previously Oracle R Enterprise Software).
- Oracle Enterprise Linux server 7.1 (x86 64 bit)

3.3 Machine Learning Database

- Oracle Database 19.6c

4 Oracle FLEXCUBE Machine Learning Architecture



Note:

- i. FLEXCUBE database and Machine learning database should be on two different servers
- ii. This is to ensure that the machine learning workload is not on the critical path of banking operations and hog critical server memory

5 Pre-Installation Checklist:

5.1 FLEXCUBE Database Instance

- FLEXCUBE database instance should be up and available.

5.2 Machine Learning Database Instance



Note: OML4R (Previously ORE) database **MUST** be a separate instance from Oracle FLEXCUBE Instance. This is to ensure that the machine learning workload is not on the critical path of banking operations and hog critical server memory

Please follow the sequential steps are detailed below.

- 1) Install Oracle Database on the Machine Learning server. Refer to [3.3](#) for compatible database versions.

- 2) OML4R (Previously Oracle R Enterprise) should be installed in Machine Learning database server. Please refer [3.2](#) for compatible OML4R (Previously ORE) version.
- 3) For OML4R (Previously ORE) installation and setup please refer to the guideline received with licensed version.
- 4) R Client needs to be installed to access OML4R (Previously Oracle R Enterprise) server from client machine. R client could be open source R or Oracle R Distribution. Below are the links to install the same.
 - a. Open source R: <https://cran.r-project.org/bin/windows/base/>
 - b. Oracle R Distribution (ORD): <https://oss.oracle.com/ORD/>
- 5) Rstudio IDE can be installed for developer friendly environment. Below is the link to download Rstudio. Download the version based on the operating system in client machine
<https://www.rstudio.com/products/rstudio/download/#download>
- 6) Set up OML4R (Previously Oracle R Enterprise) client in client machine. Please refer to the guideline received with licensed version.

5.3 Data Replication

Data replication from FLEXCUBE to the Machine learning server is outside the purview of this document.



Any data replication software could be deployed to replicate FLEXCUBE data to the Machine Learning database Instance

It is left to the bank/solution team to decide on the data Replication Software including the mode of replication and frequency of replication

Please ensure FLEXCUBE data is already replicated into the Machine Learning Schema, before proceeding ahead with the Installation

6 Installation Steps:

To proceed with the installation steps first check if all the checkpoints mentioned in section [Pre-Installation Checklist](#) are met. Follow below steps sequentially for the installation.

6.1 Machine Learning Instance

6.1.1 Object Summary

| No. | OBJECT TYPE | COUNT |
|-----|------------------------------------|-----------|
| 1 | TABLES | 27 |
| 2 | VIEWS | 08 |
| 3 | INSERT SCRIPTS (INC) | 02 |
| 4 | SEQUENCE (SEQ) | 01 |
| 5 | PROCEDURE (PRC) | 01 |
| 6 | PACKAGE SPECIFICATION(SPC) | 02 |
| 7 | PACKAGE BODY (SQL) | 02 |
| 8 | FUNCTION (FNC) | 01 |
| 9 | R BINARY PACKAGES (OML4R, old ORE) | 02 |
| 10 | R WRAPPER SCRIPT (OML4R, old ORE) | 01 |
| | Total Object Count | 47 |

6.1.2 User Creation and granting privileges

6.1.2.1 Create User

Log in to the Machine Learning database with SYSDBA credentials and execute below query to create a machine learning user.

```
CREATE USER <username> IDENTIFIED BY <password>;
```

If the user has been already created at the time of OML4R (previously ORE) installation, then proceed to next step

6.1.2.2 Give necessary privileges

Grant the below privileges to the machine learning user created in the previous step (6.1.2.1)

- i. **grant CONNECT, ODMUSER, RQADMIN TO <username>;**
- ii. **grant CREATE SESSION to <username>;**
- iii. **grant CREATE TABLE to <username>;**
- iv. **grant CREATE VIEW to <username>;**
- v. **grant CREATE DATABASE LINK to <username>;**
- vi. **grant CREATE MINING MODEL to <username>;**
- vii. **grant CREATE PROCEDURE to <username>;**
- viii. **grant CREATE JOB to <username>;**

6.1.3 Installation of Database Objects

6.1.3.1 Login to the Machine Learning schema

Connect using the user credentials defined in step (6.1.2.1)

6.1.3.2 Execute DDL scripts

Execute the DDL scripts mentioned in section [Machine Learning Data Model](#) . Below are the DDL scripts (27 Tables)

1. MLTB_BRN_RISK.ddl
2. MLTB_BRN_SEGMENT.ddl
3. MLTB_CUST_ACQ_COST.ddl
4. MLTB_CUST_CHRN_LTV_SEG.ddl
5. MLTB_CUST_ICCF_INCOME.ddl
6. MLTB_DEBUG.ddl
7. MLTB_ENT_RISK.ddl
8. MLTB_ENT_SEGMENT.ddl
9. MLTB_MODEL_PERF_LOG.ddl
10. MLTB_PARAM.ddl
11. MLTB_PROC_STAT_DETAIL.ddl
12. MLTB_PROC_STAT_DETAIL_HIST.ddl
13. MLTB_PROC_STAT_MASTER.ddl
14. MLTB_PROC_STAT_MASTER_HIST.ddl
15. MLTB_RETAIL_CUST_ENG.ddl
16. MLTB_RETAIL_CUST_ENG_HIST.ddl
17. MLTB_RETAIL_CUST_TXN_TREND.ddl
18. MLTB_STAT_DETAIL_PREV_RUN.ddl
19. MLTB_STAT_MASTER_PREV_RUN.ddl
20. MLTG_TREND_TXN_DATES.DDL
21. MLTM_STG_RETAIL_CUST_PROFILE.ddl
22. MLTB_DATA_TRANSFORM_JOB_PARAM.ddl
23. MLTB_PROD_CUST_SCORE.ddl
24. MLTB_PROD_CUST_SCORE_VAMI.ddl
25. MLTB_PROD_CUST_SCORE_ROLL.ddl
26. MLTB_PROD_CUST_SCORE_CLOS.ddl
27. MLTB_PROD_FEATURES.ddl

6.1.3.3 Execute the VIEW scripts

Execute the VW scripts mentioned in section [Machine Learning Data Model](#) . Below are the VW scripts (8 Views)

1. mlvw_brn_seg.vw
2. mlvw_brn_seg_det.vw
3. mlvw_cust_ltv_bank.vw
4. mlvw_cust_ltv_seg.vw
5. mlvw_ent_seg.vw
6. mlvw_ent_seg_det.vw
7. mlvw_retail_cust_eng.vw
8. mlvw_prod_desc.vw

6.1.3.4 *Execute the INSERT Scripts*

Execute the INC scripts mentioned in section [Machine Learning Data Model](#) . Below are the INC scripts (2 INCs)

1. MLTB_PARAM.INC
2. MLTB_CUST_ACQ_COST.INC

6.1.3.5 *Execute Sequence Scripts*

Execute the SQL scripts mentioned in section [Machine Learning Data Model](#) . Below are the SEQ scripts (One)

1. SEQ_ML_DEBUG.SQL

6.1.3.6 *Create PROCEDURE*

Compile the SQL script(s) mentioned in section [Machine Learning Data Model](#) . Below are the SQL script(s) for creating procedure(s) (one SQL)

1. PR_ML_DEBUG.SQL

6.1.3.7 *Create PACKAGES*

Compile the SQL script(s) mentioned in section [Machine Learning Data Model](#) . Below are the SQL script(s) for creating package specification(s) and body (One SPC and one SQL)

1. MLPKS_DATA_TRANSFORMATION.SPC
2. MLPKS_DATA_TRANSFORMATION.SQL
3. MLPKS_PROD_TRANSFORMATION.SPC
4. MLPKS_PROD_TRANSFORMATION.SQL

6.1.3.8 *Create FUNCTION*

Compile the SQL script(s) mentioned in section [Machine Learning Data Model](#) . Below are the SQL script(s) for creating function(s) (one SQL)

1. FN_MODELCONEX.SQL

6.1.4 Installation of OML4R (previously ORE) Packages

6.1.4.1 Download ML binary packages.

There will be two binary packages, one for the global function and another one for FCUBS.

Linux Binary Packages:

1. globalfunction_0.1.0_R_x86_64-pc-linux-gnu.tar.gz
2. FCUBSML_0.2.0_R_x86_64-pc-linux-gnu.tar.gz

6.1.4.2 Check the user access and environment variables.

Usually those things are already set up while installing OML4R (Previously ORE) in the server
The user should have the following access rights

- *Has sudo rights access or root access for installing Oracle R Distribution.*
- *Is a member of the dba group for installing and using OML4R (Previously Oracle R Enterprise)*
- *Has write access to \$ORACLE_HOME/lib.*

The following environment variable should be set up...

- *\$ORACLE_SID specifies the identifier (SID) of the database.*
- *\$ORACLE_HOME specifies the home directory of the database.*
- *\$LD_LIBRARY_PATH includes \$ORACLE_HOME/lib.*
- *\$PATH includes \$ORACLE_HOME/bin*

6.1.4.3 Now install the packages in the server by executing following command.

Use sudo command in case current user does not have write access to the OML4R (Previously ORE) library folder

ORE CMD INSTALL {package name}

E.g.

ORE CMD INSTALL globalfunction_0.1.0_R_x86_64-pc-linux-gnu.tar.gz

ORE CMD INSTALL FCUBSML_0.2.0_R_x86_64-pc-linux-gnu.tar.gz

```
-bash-4.2$ sudo ORE CMD INSTALL globalfunction_0.1.0_R_x86_64-pc-linux-gnu.tar.gz
* installing to library '/scratch/db/db1900/product/19.0.0/dbhome_1/R/library'
* installing *binary* package 'globalfunction' ...
* DONE (globalfunction)
```

```
-bash-4.2$ sudo ORE CMD INSTALL FCUBSML_0.2.0_R_x86_64-pc-linux-gnu.tar.gz
[sudo] password for kibose:
* installing to library '/scratch/db/db1900/product/19.0.0/dbhome_1/R/library'
* installing *binary* package 'FCUBSML' ...
* DONE (FCUBSML)
```

6.1.4.4 After successful installation the packages will be present in OML4R (Previously ORE) library path...

```
-bash-4.2$
-bash-4.2$ cd /scratch/db/db1900/product/19.0.0/dbhome_1/R/library
-bash-4.2$ pwd
/scratch/db/db1900/product/19.0.0/dbhome_1/R/library
-bash-4.2$ ll
total 100
drwxr-xr-x 9 db1900 oinstall 4096 Aug 19 17:13 arules
drwxr-xr-x 7 db1900 oinstall 4096 Aug 19 17:13 Cairo
drwxr-xr-x 7 db1900 oinstall 4096 Aug 19 17:13 DBI
drwxrwxr-x 6 root root 4096 Nov 26 15:33 FCISML
drwxrwxr-x 6 root root 4096 Nov 26 15:53 FCUBSML
drwxrwxr-x 6 root root 4096 Nov 26 15:55 globalfunction
```

6.1.5 Installation of OML4R (previously ORE) wrapper scripts

6.1.5.1 Launch R Studio

1. Launch RStudio IDE.
2. The default screen will be displayed as shown below.
3. If open source R is installed, then it will show the version of Open Source R

Open source R:

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Console ~/
R version 3.4.4 (2018-03-15) -- "Someone to Lean On"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[workspace loaded from ~/.RData]
>
```

4. Or, if Oracle R Distribution (ORD) is used, it will show the version of ORD.

Oracle R Distribution (ORD):

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Console ~/
Oracle Distribution of R version 3.3.0 (2016-05-03) -- "supposedly Educational"
Copyright (C) 2016 The R Foundation for Statistical computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
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R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

You are using Oracle's distribution of R. Please contact
Oracle Support for any problems you encounter with this
distribution.

[workspace loaded from ~/.RData]
> |
```

6.1.5.2 Loading ORE Library

1. From RStudio console execute below command

```
> library(ORE)
```

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Console ~/
R version 3.4.4 (2018-03-15) -- "Someone to Lean On"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

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'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[workspace loaded from ~/.RData]
> library(ORE)
```

2. Once executed, it will show the following output in console

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Console ~/
R version 3.4.4 (2018-03-15) -- "Someone to Lean On"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

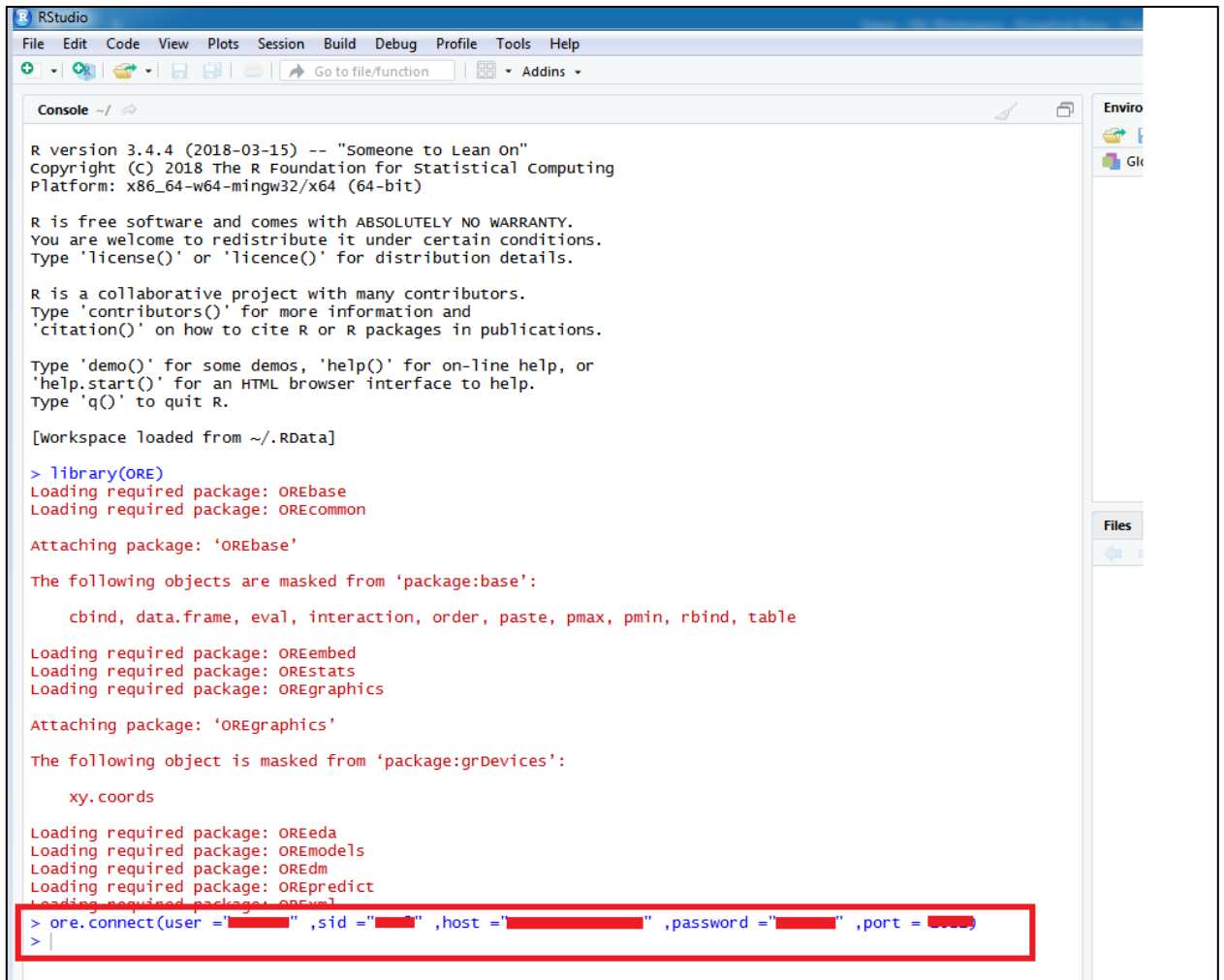
[workspace loaded from ~/.RData]
> library(ORE)
Loading required package: OREbase
Loading required package: OREcommon
Attaching package: 'OREbase'
The following objects are masked from 'package:base':
  cbind, data.frame, eval, interaction, order, paste, pmax, pmin, rbind, table
Loading required package: OREembed
Loading required package: OREstats
Loading required package: OREgraphics
Attaching package: 'OREgraphics'
The following object is masked from 'package:grDevices':
  xy.coords
Loading required package: OREeda
Loading required package: OREmodels
Loading required package: OREdm
Loading required package: OREpredict
Loading required package: ORExml
>
```

6.1.5.3 Connecting to the ORE Server

1. To connect ORE server from the client machine, execute below command

```
ore.connect (user = <username>, sid =<sid>, host =<hostname>, password=<password>, port = <port>)
```

Note: *The credential created in step 6.1.2.1*



```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Console ~/
R version 3.4.4 (2018-03-15) -- "Someone to Lean On"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[workspace loaded from ~/.RData]
> library(ORE)
Loading required package: OREbase
Loading required package: OREcommon
Attaching package: 'OREbase'

The following objects are masked from 'package:base':

  cbind, data.frame, eval, interaction, order, paste, pmax, pmin, rbind, table

Loading required package: OREembed
Loading required package: OREstats
Loading required package: OREgraphics
Attaching package: 'OREgraphics'

The following object is masked from 'package:grDevices':

  xy.coords

Loading required package: OREeda
Loading required package: OREmodels
Loading required package: OREdm
Loading required package: OREpredict
Loading required package: OREvis
> ore.connect(user = "██████████", sid = "██████████", host = "██████████", password = "██████████", port = 5555)
> |
```

6.1.5.4 Testing the ORE Connection:

1. To check if ORE client is connected to ORE server, execute below command from Rstudio console.
`ore.is.connected()`
2. It should return TRUE if ORE connection is successful, otherwise it will return FALSE.

6.2 FLEXCUBE Instance

6.2.1 Object Summary

| No. | OBJECT TYPE | COUNT |
|-----|---------------------------|-----------|
| 1 | Database Link | 01 |
| 2 | INC | 02 |
| 3 | Function IDs | 04 |
| | Total Object Count | 07 |

6.2.2 Login to FLEXCUBE Instance

Connect to the FLEXCUBE Database using the required credentials

6.2.3 Database Link

1. The database link FCUBSML must point to the machine learning user
2. Edit the database link script FCUBSML.SQL with the machine learning user credentials created as part of section 6.1.2.1
3. Execute the modified script FCUBSML.SQL



Note: Do not change the Database link name FCUBSML

6.2.4 Execute the INSERT scripts

Execute the INC scripts mentioned in section FLEXCUBE database objects, under section 5.1.2 below is the INC script(s) (one INC)

1. SMTB_FUNCTION_DESCRIPTION.INC
2. ERTB_MSGS.INC

6.2.5 FLEXCUBE User Interfaces

Please refer the standard Oracle FLEXCUBE Installation Manual for deploying these new user interface screens

1. STDASHBC
2. STDASHAB
3. STDASHCD
4. STDDRMBE

6.3 Machine Learning Validation Checkpoints:

6.3.1 Validate Database Tables

1. Log in to the Machine Learning schema and run below SQL query

Select owner, object_name, object_type, status, created from all_objects


```

where object_name in
('MLTB_BRN_RISK','MLTB_BRN_SEGMENT','MLTB_CUST_ACQ_COST',
'MLTB_CUST_CHRN_LTV_SEG','MLTB_CUST_ICCF_INCOME','MLTB_DEBUG',
'MLTB_ENT_RISK','MLTB_ENT_SEGMENT','MLTB_MODEL_PERF_LOG','MLTB_PARAM',
'MLTB_RETAIL_CUST_ENG','MLTB_RETAIL_CUST_ENG_HIST',
'MLTB_RETAIL_CUST_TXN_TREND','MLTG_TREND_TXN_DATES',
'MLTM_STG_RETAIL_CUST_PROFILE','MLTB_PROC_STAT_DETAIL',
'MLTB_PROC_STAT_DETAIL_HIST','MLTB_PROC_STAT_MASTER',
'MLTB_PROC_STAT_MASTER_HIST','MLTB_STAT_DETAIL_PREV_RUN',
'MLTB_STAT_MASTER_PREV_RUN',
MLTB_DATA_TRANSFORM_JOB_PARAM','MLTB_PROD_CUST_SCORE',
'MLTB_PROD_CUST_SCORE_VAMI','MLTB_PROD_CUST_SCORE_ROLL',
'MLTB_PROD_CUST_SCORE_CLOS','MLTB_PROD_FEATURES')

```

2. The SQL query should return 27 rows with the following details.

| OWNER | OBJECT NAME | OBJECT TYPE | STATUS | CREATED |
|----------------|-------------------------------|-------------|--------|---------------|
| < Schema name> | MLTB_BRN_RISK | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_BRN_SEGMENT | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_CUST_ACQ_COST | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_CUST_CHRN_LTV_SEG | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_CUST_ICCF_INCOME | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_DEBUG | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_ENT_RISK | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_ENT_SEGMENT | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_MODEL_PERF_LOG | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PARAM | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROC_STAT_DETAIL | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROC_STAT_DETAIL_HIST | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROC_STAT_MASTER | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROC_STAT_MASTER_HIST | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_RETAIL_CUST_ENG | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_RETAIL_CUST_ENG_HIST | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_RETAIL_CUST_TXN_TREND | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_STAT_DETAIL_PREV_RUN | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_STAT_MASTER_PREV_RUN | TABLE | VALID | Creation Date |
| < Schema name> | MLTG_TREND_TXN_DATES | TABLE | VALID | Creation Date |
| < Schema name> | MLTM_STG_RETAIL_CUST_PROFILE | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_DATA_TRANSFORM_JOB_PARAM | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROD_CUST_SCORE | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROD_CUST_SCORE_VAMI | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROD_CUST_SCORE_ROLL | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROD_CUST_SCORE_CLOS | TABLE | VALID | Creation Date |
| < Schema name> | MLTB_PROD_FEATURES | TABLE | VALID | Creation Date |

6.3.2 Validate Views

1. Log in to the Machine Learning schema and run below SQL query

```
Select owner, object_name, object_type, status, created from all_objects
where object_name in
('MLVW_BRN_SEG','MLVW_BRN_SEG_DET','MLVW_CUST_LTV_BANK',
'MLVW_CUST_LTV_SEG','MLVW_ENT_SEG','MLVW_ENT_SEG_DET',
'MLVW_RETAIL_CUST_ENG','MLVW_PROD_DESC')
;
```

2. The SQL query should return 8 rows with the following details.

| OWNER | OBJECT NAME | OBJECT TYPE | STATUS | CREATED |
|-----------------|----------------------|-------------|--------|---------------|
| < Schema name > | MLVW_BRN_SEG | VIEW | VALID | Creation Date |
| < Schema name > | MLVW_BRN_SEG_DET | VIEW | VALID | Creation Date |
| < Schema name > | MLVW_CUST_LTV_BANK | VIEW | VALID | Creation Date |
| < Schema name > | MLVW_CUST_LTV_SEG | VIEW | VALID | Creation Date |
| < Schema name > | MLVW_ENT_SEG | VIEW | VALID | Creation Date |
| < Schema name > | MLVW_ENT_SEG_DET | VIEW | VALID | Creation Date |
| < Schema name > | MLVW_RETAIL_CUST_ENG | VIEW | VALID | Creation Date |
| < Schema name > | MLVW_PROD_DESC | VIEW | VALID | Creation Date |

6.3.3 Validate PL/SQL Objects:

1. Log in to the Machine Learning schema and run below SQL query

```
select owner,object_name,object_type,status,created
from all_objects where object_name in
('MLPKS_DATA_TRANSFORMATION','PR_ML_DEBUG','FN_MODELCONEX')
```

2. The SQL query should produce following result

| OWNER | OBJECT NAME | OBJECT TYPE | STATUS | CREATED |
|---------------|---------------------------|--------------|--------|---------------|
| <Schema name> | MLPKS_DATA_TRANSFORMATION | PACKAGE | VALID | Creation Date |
| <Schema name> | MLPKS_DATA_TRANSFORMATION | PACKAGE BODY | VALID | Creation Date |
| <Schema name> | PR_ML_DEBUG | PROCEDURE | VALID | Creation Date |
| <Schema name> | FN_MODELCONEX | FUNCTION | VALID | Creation Date |
| <Schema name> | MLPKS_PROD_TRANSFORMATION | PACKAGE | VALID | Creation Date |
| <Schema name> | MLPKS_PROD_TRANSFORMATION | PACKAGE BODY | VALID | Creation Date |

6.3.4 Validate OML4R (Previously ORE) scripts:

1. Log in to the Machine Learning schema and run below SQL query

```
select * from user_rq_scripts ;
```

2. The SQL query should produce following result

| NAME | SCRIPT |
|-------------------------------------|----------------|
| ML_FCUBS_CUSCRN_ORE_BLD | <CLOB content> |
| ML_FCUBS_CUSCRN_ORE_EXEC | <CLOB content> |
| ML_FCUBS_CUSLTV_MARKOV_ORE | <CLOB content> |
| ML_FCUBS_CUSSEG_ORE_BLD | <CLOB content> |
| ML_FCUBS_PROD_REC_ORE_BLD | <CLOB content> |
| ML_FCUBS_PROD_REC_ORE_EXEC | <CLOB content> |
| ML_FCUBS_PROD_REC_CUST_COLD_ORE_EXE | <CLOB content> |

6.4 FLEXCUBE Validation Checkpoints:

6.4.1 Validate database link creation

1. Log in to the Machine Learning schema and run below SQL query

```
select DB_LINK,USERNAME, HOST, CREATED from user_db_links where  
DB_LINK='FCUBSML'
```

2. The SQL query should produce following result

| DB_LINK | USERNAME | HOST | CREATED |
|-----------------------|------------|---------------------|---------------|
| FCUBSML.IN.ORACLE.COM | <username> | <connection string> | Creation Date |

6.4.2 Validate database link credentials

1. Execute the following SQL query in FLEXCUBE database

```
select param_name, param_val from MLTB_PARAM@FCUBSML
```

2. It should produce following result

| PARAM_NAME | PARAM_VAL |
|------------|-----------|
| LOG_REQD | N |

6.4.3 Validate FLEXCUBE menu

1. Execute the following SQL query in FLEXCUBE database

```
select LANG_CODE,FUNCTION_ID,MAIN_MENU,SUB_MENU_1,SUB_MENU_2 ,  
RAD_FUNCTION_ID  
from smtb_function_description where function_id in  
( 'STDASHBC','STDASHAB','STDASHCD','STDDRMBE')
```

2. It should produce following result

| LANG_CODE | FUNCTION_ID | MAIN_MENU | SUB_MENU_1 | SUB_MENU_2 | RAD_FUNCTION_ID |
|-----------|-------------|-------------------------|------------|-----------------------------|-----------------|
| ENG | STDASHBC | Machine Learning Retail | Customer | Enterprise Dashboard | STDASHBC |
| ENG | STDASHAB | Machine Learning Retail | Customer | Branch Dashboard | STDASHAB |
| ENG | STDASHCD | Machine Learning Retail | Customer | Customer Query Board | STDASHCD |
| ENG | STDDRMBE | Machine Learning Retail | Customer | Model Execution and Control | STDDRMBE |



Installer FCUBS Machine Learning Setup
[February] [2021]
Version 14.4.0.3.0
Oracle Financial Services Software Limited
Oracle Park
Off Western Express Highway
Goregaon (East)
Mumbai, Maharashtra 400 063
India

Worldwide Inquiries:

Phone: +91 22 6718 3000

Fax: +91 22 6718 3001

<https://www.oracle.com/industries/financial-services/index.html>

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