

# **Oracle Financial Services Liquidity Risk Solution**

## **Performance Tuning Guide**

**Release 8.1.0.0.0**

**June 2020**

**F32747-01**

**ORACLE**  
Financial Services

## OFS LRS Performance Tuning Guide

Copyright © 2021 Oracle and/or its affiliates. All rights reserved.

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

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

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

U.S. GOVERNMENT END USERS: Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are “commercial computer software” pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

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

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information about content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services unless otherwise set forth in an applicable agreement between you and Oracle. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services, except as set forth in an applicable agreement between you and Oracle.

For information on third party licenses, see the [OFSAA Licensing Information User Manual](#).

## Document Control

Version Number	Revision Date	Change Log
1.0	First release: June 2020	This version is created to document the performance tuning steps in OFS LRS.

# Table of Contents

<b>1</b>	<b>Preface</b> .....	<b>5</b>
1.1	Scope of the Guide.....	5
1.2	Intended Audience.....	5
1.3	Access to Oracle Support .....	5
1.4	Related Information Sources.....	5
1.5	Conventions .....	6
1.6	Abbreviations .....	7
<b>2</b>	<b>Introduction</b> .....	<b>8</b>
<b>3</b>	<b>OFSAAI Application Performance Tuning</b> .....	<b>9</b>
<b>4</b>	<b>Database Performance Tuning</b> .....	<b>11</b>

# 1 Preface

This chapter provides a brief description of the scope, the audience, and the references for this document.

## Topics:

- [Scope of the Guide](#)
- [Intended Audience](#)
- [Access to Oracle Support](#)
- [Related Information Sources](#)
- [Conventions](#)
- [Abbreviations](#)

## 1.1 Scope of the Guide

This document includes the performance tuning steps for OFS LRS.

## 1.2 Intended Audience

This manual is intended for database administrators.

## 1.3 Access to Oracle Support

Oracle customers have access to electronic support through [My Oracle Support](#). For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info>

Or, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

## 1.4 Related Information Sources

We strive to keep this and all other related documents updated regularly; visit the [OHC Documentation Library](#) to download the latest version available there. The list of related documents is provided here.

- [OHC Documentation Library for OFS Liquidity Risk Solution:](#)

For existing customers of OFS Liquidity Risk Management (LRM):

- *OFS Liquidity Risk Solution Application Pack 8.1.0.0.0 Release*
- *OFS Liquidity Risk Solution Application Pack 8.1.0.0.0 Installation Guide*
- *OFS Liquidity Risk Measurement and Management Release 8.1.0.0.0 Analytics User Guide*
- *OFS Liquidity Risk Measurement and Management Release 8.1.0.0.0 User Guide*
- *OFS Liquidity Risk Regulatory Calculations for Reserve Bank of India 8.1.0.0.0 User Guide*

- *OFS Liquidity Risk Regulatory Calculations for US Federal Reserve 8.1.0.0.0 User Guide*
- *OFS Liquidity Risk Regulatory Calculations for European Banking Authority 8.1.0.0.0 User Guide*
- For new customers of OFS Liquidity Risk Solution (LRS):
  - *OFS Liquidity Risk Solution Application Pack 8.1.0.0.0 Release Notes*
  - *OFS Liquidity Risk Solution Application Pack 8.1.0.0.0 Installation Guide*
  - *OFS Liquidity Risk Measurement and Management Release 8.1.0.0.0 Analytics User Guide*
  - *OFS Liquidity Risk Measurement and Management Release 8.1.0.0.0 User Guide*
  - *OFS Liquidity Risk Regulatory Calculations for Reserve Bank of India 8.1.0.0.0 User Guide*
  - *OFS Liquidity Risk Regulatory Calculations for US Federal Reserve 8.1.0.0.0 User Guide*
  - *OFS Liquidity Risk Regulatory Calculations for European Banking Authority 8.1.0.0.0 User Guide*
  - *OFS Liquidity Risk Regulatory Calculations for Bank of Thailand 8.1.0.0.0 User Guide*
  - *OFS Liquidity Risk Regulatory Calculations for Bank Negara Malaysia 8.1.0.0.0 User Guide*
  - *OFS Liquidity Risk Regulatory Calculations for Monetary Authority of Singapore 8.1.0.0.0 User Guide*
  - *OFS Liquidity Risk Regulatory Calculations for Hong Kong Monetary Authority 8.1.0.0.0 User Guide*
  - *OFS Deposit Insurance Calculations for Liquidity Risk Management 8.1.0.0.0 User Guide*
- [OHC Documentation Library](#) for **OFS AAAI Application Pack**:
  - *OFS Advanced Analytical Applications Infrastructure (OFS AAAI) Application Pack Installation and Configuration Guide*
  - *OFS Analytical Applications Infrastructure User Guide*
  - *OFS Analytical Applications Infrastructure Administration Guide*
  - *Oracle Financial Services Analytical Applications Infrastructure Environment Check Utility Guide*

## 1.5 Conventions

The following conventions are used in this document.

**Table 1: Conventions Used in the Document**

Conventions	Description
<b>Boldface</b>	The boldface font type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>Italic</i>	The italic font type indicates book titles, emphasis, or placeholder variables for which you supply particular values.

Conventions	Description
Monospace	The monospace font type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

## 1.6 Abbreviations

The following table lists the abbreviations used in this document.

**Table 2: Abbreviations Used in the Document**

Abbreviations	Description
OFS LRS	OFS Liquidity Risk Solution
BAU	Business As usual
LRRCHKMA	OFS Liquidity Risk Regulatory Calculations for Hong Kong Monetary Authority
LRMM	OFS Liquidity Risk Measurement and Management
DICLRM	OFS Deposit Insurance Calculation for Liquidity Risk Management

## 2 Introduction

This document includes the performance tuning steps for OFS Liquidity Risk Solution (LRS). Follow the steps in this document to achieve the batch performance statistics for LRM Contractual and Business As usual (BAU) Run definitions.

**NOTE**

The performance tuning steps mentioned in this document were implemented and tested during the development and Quality Assurance (QA) phase of the OFS LRS Release 8.1 development life cycle.



### 3 OFSAAI Application Performance Tuning

This section includes the performance tuning steps for OFSAAI.

Perform the following steps in the OFSAAI instance:

1. Navigate to the `$FIC_HOME/ficdb/conf` directory and modify the OracleDB configuration (`OracleDB.conf`) file as follows:

```
CNF_PARALLEL_QUERY=ENABLE
CNF_PARALLEL_DML=ENABLE
CNF_DEGREE_OF_PARALLELISM=
CNF_PARALLEL_DEGREE_POLICY=MANUAL
```

Decide the value for `CNF_DEGREE_OF_PARALLELISM` based on the number of CPU cores available in the database (DB) engine server. It is recommended to use 40 % of the available core.

For example, if the CPU cores are 10 in count, then assign `CNF_DEGREE_OF_PARALLELISM=4`.

**NOTE**      The setting of these parameters assumes that the database is enabled for Parallel DML execution

2. Modify the `.profile` file of the OFSAAI instance user.

Increase the memory setting for the variable `X_ARGS_RLEXE` as follows:

```
X_ARGS_RLEXE="-Xms512m -Xmx4g -XX:+UseAdaptiveSizePolicy -
XX:MaxPermSize=1024M -XX:+UseParallelOldGC -XX:+DisableExplicitGC
$X_ARGS_GEN"
```

The Rule engine uses these settings. If the OFSAAI application server has a memory of 32 GB, this value can be set up to 8 GB. For example: `-Xms4g -Xmx8g`

3. In the `ETLloader.sh` file, used by the T2T, increase the load of `Xms6400m -Xmx10256m` to 10G.
4. Modify the `SETUP_MASTER` table as follows:
  - a. Log in to the OFSAAI Atomic schema (this is the schema where the LRM objects are physicalized).
  - b. Verify the following Component Codes and Component Values in the `SETUP_MASTER` table.

**Table 3: Component Codes and Component Values in the SETUP\_MASTER Table**

V_COMPONENT_CODE	V_COMPONENT_DESC	V_COMPONENT_VALUE
DT_ALLOC_HINT_MATERIALIZE	Appends <code>/*+ materialize */</code> hint in the <code>SELECT</code> statement of the Allocation Engine Merge Query.	N

V_COMPONENT_CODE	V_COMPONENT_DESC	V_COMPONENT_VALUE
DT_ALLOC_HINT_USE_HASH	In Allocation Engine Merge Query, whether to use <code>/*+ USE_HASH */</code> to merge in the <code>FCT_AGG_CASH_FLOWS</code> table.	Y
DT_PARALLEL_DOP	Degree of parallelism to be used in DML and Queries statements in the data transformations.	4
DT_PARALLEL_ENABLE	Enables parallel sessions for DML and Queries statements in data transformations.	Y
GATHER_TABLE_STATS	If the value is set to Y, then the process will gather table statistics.	Y
GATHER_STAT_OWNER	Gather Stats Database User	Update the Atomic schema name.

- Decide the `DT_PARALLEL_DOP` value based on the number of CPU cores available in the database engine server. It is recommended to use 40 % of the available core. For example, if the CPU cores are 10 in count then assign `DT_PARALLEL_DOP=4`.

**NOTE**

The setting of these parameters assumes that the database is enabled for Parallel DML execution.

- You can turn-off the configuration by disabling the gather stats. To disable, set the component code `GATHER_TABLE_STATS` as N in the `SETUP_MASTER` table.
- Modify the `CONFIGURATION` table as follows:
    - Login to the Config schema.
    - Set the `PARAMVALUE` settings for the `PARAMNAME` as follows.

**Table 4: PARAMNAME and PARAMVALUE**

PARAMNAME	PARAMVALUE	DESCRIPTION
<code>QRY_OPT_USE_ROWID</code>	Y	To use ROWID in MERGE ON statement for RRF, specify Y otherwise N.

- Increase the Connection Pool in the WebLogic console, and set the Connection Pool to 100.

## 4 Database Performance Tuning

This section includes the database performance tuning steps.

Perform the following steps:

1. Partition the following tables:
  - FSI\_LRM\_INSTRUMENT: Partition by range on the N\_RUN\_SKEY column
  - FCT\_AGG\_CASH\_FLOWS: Partition by range on the N\_RUN\_SKEY column
  - FCT\_MITIGANTS: Partition by range on the N\_RUN\_SKEY column
2. Disable all the Foreign Key Constraints in the following tables:
  - FCT\_ACCOUNT\_CASH\_FLOWS
  - FCT\_AGG\_CASH\_FLOWS
  - FCT\_LRM\_TIME\_BUCKET\_DETAILS
  - FSI\_LRM\_INSTRUMENT
  - FCT\_MITIGANTS
  - FSI\_DEPOSIT\_INSURANCE
  - FSI\_DEPOSIT\_INSURANCE\_DTLS
  - FCT\_PARTY\_PARTY\_ACCT\_RELTNSHP

**NOTE** Do NOT delete the foreign key constraints from the database or from the LRS Data Model.

```
BEGIN
  FOR c IN
    (SELECT c.owner, c.table_name, c.constraint_name
     FROM user_constraints c, user_tables t
     WHERE c.table_name = t.table_name
     AND c.owner = '$Atomic_Schema '
     AND t.table_name in ('FSI_LRM_INSTRUMENT',
                          'FCT_ACCOUNT_CASH_FLOWS', 'FCT_LRM_TIME_BUCKET_DETAILS',
                          'FCT_AGG_CASH_FLOWS', 'FCT_MITIGANTS')
     AND c.status = 'ENABLED'
     AND c.constraint_name not like 'PK%'
     AND NOT (t.iot_type IS NOT NULL AND c.constraint_type = 'P')
     ORDER BY c.constraint_type DESC)
  LOOP
    dbms_utility.exec_ddl_statement('alter table "' || c.owner || '".' ||
    || c.table_name || '" disable constraint ' || c.constraint_name);
```

```

    END LOOP;
END;
/

```

### 3. Create the following indexes.

**NOTE** If the creation of the following indexes fails due to any reason – such as *object name already exists*, then provide new index names.

#### Scripts:

```

CREATE INDEX IDX_ACCT_SKEY_1 ON FSI_LRM_INSTRUMENT (N_ACCT_SKEY) LOCAL
PARALLEL 4 NOLOGGING
/
CREATE INDEX IDX_AS_OF_DT_1 ON FSI_LRM_INSTRUMENT (N_AS_OF_DATE_SKEY)
LOCAL PARALLEL 4 NOLOGGING
/
CREATE INDEX IDX_LRM_INST_ID_1 ON FSI_LRM_INSTRUMENT
(N_LRM_INSTRUMENT_ID) LOCAL PARALLEL 4 NOLOGGING
/
CREATE INDEX IDX_RUN_SKEY_1 ON FSI_LRM_INSTRUMENT (N_RUN_SKEY) LOCAL
PARALLEL 4 NOLOGGING
/
CREATE INDEX IDX_FLTBD_ENTSK_1 ON FCT_LRM_TIME_BUCKET_DETAILS
(N_ENTITY_SKEY) PARALLEL 4 NOLOGGING
/
CREATE INDEX IDX_FLTBD_MIDSK_1 ON FCT_LRM_TIME_BUCKET_DETAILS
(N_MIS_DATE_SKEY) PARALLEL 4 NOLOGGING
/
CREATE INDEX IDX_FLTBD_RNSK_1 ON FCT_LRM_TIME_BUCKET_DETAILS
(N_RUN_SKEY) PARALLEL 4 NOLOGGING
/
CREATE INDEX IDX_SC_GAAP_1 ON STG_CARDS (V_GAAP_CODE) PARALLEL 4
NOLOGGING
/
CREATE INDEX IDX_SC_LR_ID_1 ON STG_CARDS (N_LOAD_RUN_ID) PARALLEL 4
NOLOGGING
/
CREATE INDEX IDX_SC_MIS_DATE_1 ON STG_CARDS (FIC_MIS_DATE) PARALLEL 4
NOLOGGING
/
CREATE INDEX IDX_SLC_MIS_DATE_1 ON STG_LOAN_CONTRACTS (FIC_MIS_DATE)
PARALLEL 4 NOLOGGING
/

```

```
CREATE INDEX IDX_SLC_LR_ID_1 ON STG_LOAN_CONTRACTS (N_LOAD_RUN_ID)
PARALLEL 4 NOLOGGING
```

/

```
CREATE INDEX IDX_SLC_GAAP_1 ON STG_LOAN_CONTRACTS (V_GAAP_CODE)
PARALLEL 4 NOLOGGING
```

/

```
CREATE INDEX IDX_STD_MIS_DATE_1 ON STG_TD_CONTRACTS (FIC_MIS_DATE)
PARALLEL 4 NOLOGGING
```

/

```
CREATE INDEX IDX_STD_LR_ID_1 ON STG_TD_CONTRACTS (N_LOAD_RUN_ID)
PARALLEL 4 NOLOGGING
```

/

```
CREATE INDEX IDX_STD_GAAP_1 ON STG_TD_CONTRACTS (V_GAAP_CODE) PARALLEL
4 NOLOGGING
```

/

#### NOTE

Decide the Parallel 4 value based on the number of CPU cores available in the database engine server. It is recommended to use 40 % of the available core. For example, if the CPU cores are 10 in count, then assign parallel to 4.

The setting of these parameters assumes that the database is enabled for Parallel DML execution.

- a. For OFS Deposit Insurance Calculation for Liquidity Risk Management (DICLRM), follow these steps:
  - i. For the FCT\_PARTY\_PARTY\_ACCT\_RELTNSHP table, create indexes for the following columns:
    - N\_PARTY\_SKEY
    - N\_RELATED\_PARTY\_SKEY
  - ii. For the N\_POOL\_ID column in the FSI\_DEPOSIT\_INSURANCE\_DTLS table, index the following:
    - N\_ACCT\_SKEY
    - N\_RUN\_SKEY
- b. For OFS Liquidity Risk Measurement and Management (LRMM), follow these steps:
 

In the FSI\_LRM\_TIME\_BUCKET\_DAYS table, create indexes for the following columns:

  - N\_MIS\_DATE\_SKEY
  - N\_RUN\_SKEY
  - N\_HOLIDAY\_CODE
  - D\_BUSS\_DAY\_CONV\_TB\_DATE

- c. For OFS Liquidity Risk Regulatory Calculations for Hong Kong Monetary Authority (LRRCHKMA), if the tasks T2T\_STG\_BORROWINGS\_FLI\_COM, T2T\_STG\_CASA\_FLI\_COM, T2T\_STG\_INVESTMENTS\_FLI\_COM, and T2T\_STG\_MITIGANTS\_FM\_COM consume more time, create indexes on the:
- V\_ACCOUNT\_NUMBER column of the DIM\_ACCOUNT table.
  - V\_PARTY\_ID column of the DIM\_PARTY table.
  - FIC\_MIS\_DATE column of the STG\_CASA table.
4. Alter the following tables for NOLOGGING:

```
ALTER TABLE FSI_LRM_INSTRUMENT NOLOGGING
/
ALTER TABLE FCT_ACCOUNT_CASH_FLOWS NOLOGGING
/
ALTER TABLE FCT_AGG_CASH_FLOWS NOLOGGING
/
ALTER TABLE FCT_MITIGANTS NOLOGGING
/
ALTER TABLE FCT_FCAST_AGG_CASH_FLOWS NOLOGGING
/
ALTER TABLE FCT_FCAST_DATES NOLOGGING
/
ALTER TABLE FCT_FCAST_LRM_LE_SUMMARY NOLOGGING
/
ALTER TABLE FCT_FCAST_LRM_TB_DETAILS NOLOGGING
/
ALTER TABLE FCT_FCST_EXCHANGE_RATES NOLOGGING
/
ALTER TABLE FSI_ACCT_COMPOSITE_KEY_MAP NOLOGGING
/
ALTER TABLE FCT_ACCOUNT_CASH_FLOWS NOLOGGING
/
ALTER TABLE FCT_LRM_TIME_BUCKET_DETAILS NOLOGGING
/
ALTER TABLE FCT_FCAST_ASSUMPT_AUDIT_TRAIL NOLOGGING
/
```

## 5. Gather Stats for all the tables in the Atomic Schema periodically.

You must gather statistics periodically for objects where the statistics become stale over time, due to changing data volumes or changes in column values. New statistics should be gathered after a schema object's data or structure is modified in ways that make the previous statistics inaccurate. For example, after loading a significant number of rows into a table, collect new statistics on the number of rows. After updating data in a table, collecting new statistics on the number of rows is not required, but you might need new statistics on the average row length.

Use the **DBMS\_STATS** package to generate the statistics.

Following are examples of Gather Stats:

```
begin
DBMS_STATS.GATHER_TABLE_STATS(ownname          => '$Atomic_Schema ',
                              tabname          =>
                              'FCT_LRM_TIME_BUCKET_DETAILS',
                              estimate_percent => 20,
                              DEGREE          => 4,
                              granularity      => 'ALL',
                              CASCADE         => TRUE);

end;
```

```
/
Begin

DBMS_STATS.GATHER_TABLE_STATS(ownname          => '$Atomic_Schema ',
                              tabname          =>
                              'FCT_AGG_CASH_FLOWS',
                              estimate_percent => 20,
                              DEGREE          => 4,
                              granularity      => 'ALL',
                              CASCADE         => TRUE);

end;
```

```
/
Begin

DBMS_STATS.GATHER_TABLE_STATS(ownname          => '$Atomic_Schema ',
                              tabname          =>
                              'FSI_LRM_INSTRUMENT',
                              estimate_percent => 20,
                              DEGREE          => 4,
                              granularity      => 'ALL',
```

```

                                CASCADE           => TRUE);

end;
/

Begin

DBMS_STATS.GATHER_TABLE_STATS(ownname           => '$Atomic_Schema ',
                                tabname           =>
'FCT_FCAST_AGG_CASH_FLOWS',
                                estimate_percent => 20,
                                DEGREE           => 4,
                                granularity       => 'ALL',
                                CASCADE           => TRUE);

end;
/

```

**NOTE** Modify the ownname `$Atomic_Schema` to the actual schema name used by the Atomic schema.

**6.** Set the Temp Tablespace to 5 TB.

This step is optional. The database administrator can select the right Temp Tablespace depending on the volume of data coming in for LRS processing.

**7.** Periodically clean up the following Processing tables:

**a.** For OFS DICLRM:

- FSI\_DEPOSIT\_INSURANCE
- FSI\_DEPOSIT\_INSURANCE\_DTLS

**a.** For OFS LRMM:

- FSI\_LRM\_TIME\_BUCKET\_DAYS



## OFSAA Support

Raise a Service Request (SR) in [My Oracle Support](#) for queries related to the OFSAA applications.

## Send Us Your Comments

Oracle welcomes your comments and suggestions on the quality and usefulness of this publication. Your input is an important part of the information used for revision.

- Did you find any errors?
- Is the information clearly presented?
- Do you need more information? If so, where?
- Are the examples correct? Do you need more examples?
- What features did you like most about this manual?

If you find any errors or have any other suggestions for improvement, indicate the title and part number of the documentation along with the chapter/section/page number (if available) and contact the Oracle Support.

Before sending us your comments, you might like to ensure that you have the latest version of the document wherein any of your concerns have already been addressed. You can access My Oracle Support site that has all the revised/recently released documents.

