

ORACLE 11g RDBMS Features: Oracle Total Recall
Oracle FLEXCUBE Universal Banking
Release 14.1.0.0.0
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Table of Contents

- 1. INTRODUCTION2**
 - 1.1 SCOPE.....2
 - 1.2 INTRODUCTION TO ORACLE TOTAL RECALL.....2
 - 1.3 ADVANTAGES2
- 2. REQUIREMENT /PROBLEM STATEMENT.....3**
- 3. PREREQUISITES4**
- 4. ORACLE TOTAL RECALL.....5**
 - 4.1 FLASHBACK DATA ARCHIVE5
 - 4.2 FBDA PROCESS.....5
 - 4.3 FLASHBACK HISTORY TABLES.....5
 - 4.4 TOTAL RECALL BENEFITS6
 - 4.5 TOTAL RECALL RESTRICTIONS6
- 5. IMPLEMENTING FLASHBACK ARCHIVE ON FCUBS DE TELLER UPLOAD6**
 - 5.1 ENVIRONMENT USED9
 - 5.2 RESULTS OBSERVED.....10

1. Introduction

1.1 Scope

This document describes the features of Oracle Total recall and feasibility of enabling it for FLEXCUBE modules. It also describes the POC conducted by enabling the same for DE upload module of FLEXCUBE and also lists its results in terms of performance and storage overheads.

1.2 Introduction to Oracle Total Recall

Oracle Total recall feature is to capture and store the past historical data of a table or all the tables in a database with a simple 'enable archive' command. It provides an extremely secure, efficient, easy to use and application transparent solution for Managing historical data as well as a centralized, secure query-able historical data of the tables.

It is based on Oracle's Flashback feature and will allow users to query data "AS OF" an earlier time in the past. The main difference between flashback and Total Recall is that with Total Recall data will be permanently stored in an archive tablespace and ages out after a user defined retention time.

1.3 Advantages

- Easy to implement
- Centralized, integrated, and query-enabled
- Highly storage- and performance-efficient
- Provides automatic, policy-based management
- Reduces compliance costs
- Useful for compliance, internal auditing, and human error correction

2. Requirement /Problem Statement

The requirement is to setup Total recall for the most used tables of DE Upload module and assess its viability in terms of performance and storage overheads in enabling it.

3. Prerequisites

Oracle Total recall feature is available from Oracle 11g Release 1 onwards. And this option is available only over Enterprise Editions.

In addition, it is required to apply Oracle one-off patch 6502789 in above to Oracle 11g version 11.1.0.7.0.

Oracle 11g Release 2 (11.2.0.1) was used to validate Total Recall feature for FCUBS 11.4.3

4. Oracle Total Recall

Flashback features prior to Oracle 11g work at the logical level where in which the past is constructed by using the undo segments which are retained only for the time period mentioned by UNDO_RETENTION parameter. Once the UNDO data has gone, the past cannot be constructed.

Oracle Total Recall or Flashback Archive is a new feature which is available from Oracle 11g which is essentially an extended store of UNDO information by which the historical data gets stored in the tables.

4.1 Flashback Data Archive

Flashback data archive consists of one or more tablespaces, or parts of tablespace to store the historical data. Each flashback archive has a name, retention period (to store the data for the pre determined period) and a quota on each associated tablespaces.

A database can have multiple flashback data archives but a single default archive.

4.2 FBDA Process

FBDA is the Oracle database background process that gets initiated along with the database startup and it is responsible for populating the historical data from undo segment into historical segment. When a DML transaction commits an operation on a flashback archive enabled table, the Flashback Data Archiver (FBDA) process stores the pre-image of the rows into a flashback archive, along with metadata of the current rows. The FBDA process is also responsible for managing the data within the flashback archives, such as purging data beyond the retention period.

4.3 Flashback History Tables

The History tables that get created in the FBA tablespace for each Flashback enabled application tables are given below. These history tables get populated by the FBDA background process once a transaction on the tables is committed. Each history tables stores a part of the UNDO information /Preimage of the application which helps Oracle to construct the past data though the preimage is not in the undo segments. These history tables cannot be modified or deleted even by Sys administrators.

SI.No	Table_Name	Remarks
1	SYS_FBA_HIST	The Preimage of the rows of application table when the operation type is U/D.
2	SYS_FBA_DDL_COLMAP	Application table Column names and the corresponding historical column names
3	SYS_FBA_TCRV	All DML Operation types (U, I, D) along with the corresponding SCN's and the rowid.

The history table (SYS_FBA_HIST) that gets created is range partitioned based on End scn. Index SYS_FBA_TCRV_IDX gets created automatically for the SYS_FBA_HIST table based on Row id which would increase the performance when it retrieves the past. Additional indexes can also be created on the table which would be an overhead to the Recall to maintain the same.

The history table that gets created is not compressed by default but it can be compressed like other tables. There is always a considerable time lag in populating the history tables once the transaction is completed which cannot be pre-configured or controlled.

4.4 Total recall Benefits

Below lists the advantages of Flashback archive.

- Easy to implement by the application users
- The historical data cannot be modified even by the DBA user
- Centralized, integrated and query-enabled
- Highly storage and performance efficient

4.5 Total Recall Restrictions

DDL restrictions for the flashback enabled tables are

- ALTER TABLE statements that drop rename or modify columns
- ALTER TABLE statements that perform partition or sub partition operations
- ALTER TABLE statements that convert a LONG column to a LOB column
- ALTER TABLE statements that include an UPGRADE TABLE clause, with or without an INCLUDING DATA clause
- DROP TABLE statements
- RENAME TABLE statements
- TRUNCATE TABLE statements
- Table with Long data types are not supported with Flashback _archive

5. Implementing Flashback Archive on FCUBS DE Teller Upload

This section gives the steps to enable the flashback archive for the Primary tables which are involved in FLEXCUBE DE Teller upload and the POC statistics in terms of performance and storage for the same

Creating Flashback Data Archive and its Tablespaces

```
CREATE TABLESPACE fda_ts datafile
'/oracle/oradata/fcj10/fda_ts_01.dbf' SIZE 50m AUTOEXTEND ON MAXSIZE
1024m EXTENT MANAGEMENT LOCAL UNIFORM SIZE 64k;

CREATE FLASHBACK ARCHIVE fba_poc TABLESPACE fda_ts RETENTION 1 year;

GRANT FLASHBACK ARCHIVE ON fba_poc TO fcjdemo;

ALTER USER fcjdemo QUOTA UNLIMITED ON fda_ts;
```

A user should be granted **FLASHBACK ARCHIVE** privilege on the FBA to enable the tables with Total recall and also a user must have quota on the tablespaces corresponding to Flashback Archive which is been granted.

To enable Flashback Archive for the FLEXCUBE tables

```
ALTER TABLE actb_daily_log FLASHBACK ARCHIVE fba_poc;

ALTER TABLE sttm_cust_account FLASHBACK ARCHIVE fba_poc;

ALTER TABLE detb_upload_detail FLASHBACK ARCHIVE fba_poc;

ALTER TABLE detb_upload_master FLASHBACK ARCHIVE fba_poc;

ALTER TABLE detb_batch_master FLASHBACK ARCHIVE fba_poc;
```

Enabling Flashback Archive can be verified by querying the views created by Oracle.

SELECT * FROM USER_FLASHBACK_ARCHIVE_TABLES would list the table name (Which is Flashback Archived) and the corresponding History table name for the same.

We can also verify the History table creation by querying dba_segments

```
SELECT * FROM DBA_SEGMENTS WHERE TABLESPACE_NAME='FDA_TS'
```

The functionality can be verified by querying the table using **as of timestamp** and **as of SCN** clause to get to know the previous records.

5.1 Environment Used

Server Model	Linux x86_64 GNU/Linux
CPU	8 Intel(R) Xeon(R) CPU E5420 @ 2.50GHz
Memory	16GB
Storage	100GB
Oracle Version	11.1.0.7.0
OS Version	Red Hat Enterprise Linux 4.0

For FCUBS 11.4.3

Desktop Model	Optiplex 745
CPU	IBM XSERIES_3650 Intel® Xeon™ CPU 3.00 GHz
Memory	2GB
Storage	80 GB
Oracle Version	11.2.0.1
OS Version	Oracle Enterprise Linux 5.5

5.2 Results Observed

- The Oracle Total Recall enabled for FLEXCUBE UBS without any major issues. And it also verified that the historical data population for the Archive enabled tables was successful.
- An additional storage of 58MB consumed by the historical data of said FCUBS tables in the archive tablespace for the tested volume of 80,000 Data Entries.
- It also observed that the undo tablespace usage was doubled for the enablement of Oracle Total call for tested FCUBS Data Entry volume.
- There was about 10% of performance overhead observed during multiple iterations Data Entry upload test cases.



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