Database Practices - Oracle FCIS 12.1.0 Database 12c

Oracle FLEXCUBE Investor Servicing

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This document contains FCIS Database best practices.

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2. Database Initialization Parameters

Oracle FLEXCUBE standard database initialization parameters have been derived after performing the required benchmark tests (Performance Load tests).

Note: Since some of the initialization parameters values are specific to customer volume, parameters should be derived using **FLEXCUBE-Disk-Layouts-initparams-12c.xlsm** excel sheet base lined along with this document.

Following are the Parameters with the details and its relevance to FLEXCUBE:

2.1 DB_WRITER_PROCESSES

This is useful for systems that modify data heavily. It specifies the initial number of database writer processes for an instance.

Property	Description
Parameter type	Integer
Default value	1 or CPU_COUNT / 8, whichever is greater
Range of Values	1 to 20
Recommended	Refer **FLEXCUBE-Disk-Layouts-initparams-12c.xlsm**

Oracle FLEXCUBE relevance

Multiple DB writer processes helps faster flushing of data to disk. To arrive right value, refer **FLEXCUBE-Disk-Layouts-initparams-12c.xlsm** excel.

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2.2 **CURSOR_SHARING**

Determines what kind of SQL statements can share the same cursors.

Property	Description
Parameter type	String
Default value	EXACT
Recommended Value	Force

Oracle FLEXCUBE relevance

Some of the Oracle FLEXCUBE sql statements are generated dynamically. So they contain literal values in the WHERE clause conditions. This results in large numbers of nearly identical statements with separate parse trees in Oracle's library cache, which can slow performance and cause latch problems.

By setting cursor_sharing to FORCE database convert literals to bind variables before parsing the statement.

2.3 **DB_CACHE_ADVICE**

This enables or disables statistics gathering used for predicting behavior with different cache sizes through the V$DB_CACHE_ADVICE performance view.

Property	Description
Parameter type	String
Syntax	DB_CACHE_ADVICE = { ON	READY	OFF }
Default value	If STATISTICS_LEVEL is set to TYPICAL / ALL, then ON If STATISTICS_LEVEL is set to BASIC, then OFF
Recommended Value	OFF (Should be ON while Performance Monitoring)

Oracle FLEXCUBE relevance

Turning ON advisory will have an extra overhead. Please note it should be ON, only during performance monitoring.

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2.4 FAST_START_MTTR_TARGET

This enables you to specify the number of seconds the database takes to perform crash recovery of a single instance. When specified, FAST_START_MTTR_TARGET is overridden by LOG_CHECKPOINT_INTERVAL.

Property	Description
Parameter type	Integer
Default value	0
Range of values	0 to 3600 seconds
Recommended Values	300

Oracle FLEXCUBE relevance

If FAST_START_MTTR_TARGET is not set to 300 then run time performance for write/redo generation intensive workloads will not be optimized. This will reduce checkpoint writes from DBWR processes, making more room for LGWR IO. To optimize run time performance for write/redo generation intensive workloads, increase the FAST_START_MTTR_TARGET initialization parameter to 300.

2.5 FILESYSTEM_IO_OPTIONS

This specifies the IO operation for file system files.

Property	Description
Parameter type	String
Default value	There is no default value
Range of values	NONE,SETALL,DIRECTIO,ASYNC
Recommended Values	SETALL

Oracle FLEXCUBE relevance

By setting parameter value to SETALL, Oracle can take advantage of direct I/O and asynchronous I/O on supported platforms. However, this parameter will not have any effect if ASM is being used.

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2.6 JOB_QUEUE_PROCESSES

This specifies the maximum number of processes that can be created for the execution of jobs. It specifies the number of job queue processes per instance (J000, J999).

Property	Description
Parameter type	Integer
Default value	0
Range of values	0 to 1000
Recommended Values	Refer **FLEXCUBE-Disk-Layouts-initparams-12c.xlsm**

Oracle FLEXCUBE relevance

This parameter has to be set with respect to the maximum number of jobs (dbms_jobs). To arrive at the right value, refer **FLEXCUBE-Disk-Layouts-initparams-12c.xlsm** excel.

2.7 NLS_DATE_FORMAT

This specifies the default date format to use with the TO_CHAR and TO_DATE functions.

Property	Description
Parameter type	String
Syntax	NLS_DATE_FORMAT = "format"
Default value	Derived from NLS_TERRITORY
Recommended Values	DD-MON-RRRR

Oracle FLEXCUBE relevance

Oracle FLEXCUBE standard date format

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2.8 OPEN_CURSORS

This specifies the maximum number of open cursors (handles to private SQL areas) a session can have at once. You can use this parameter to prevent a session from opening an excessive number of cursors.

Property	Description
Parameter type	Integer
Default value	50
Modifiable	ALTER SYSTEM
Range of values	1 to 4294967295 (4 GB -1)
Recommended Values	5000

Oracle FLEXCUBE relevance

It is important to set the value of OPEN_CURSORS high enough to prevent FCIS application from running out of open cursors (ORA-01000: maximum open cursors exceeded).

2.9 OPTIMIZER_DYNAMIC_SAMPLING

This controls the level of dynamic sampling performed by the optimizer.

Property	Description
Parameter type	Integer
Default value	If OPTIMIZER_FEATURES_ENABLE is set to 10.0.0 or higher, then 2 If OPTIMIZER_FEATURES_ENABLE is set to 9.2.0, then 1 If OPTIMIZER_FEATURES_ENABLE is set to 9.0.1 or lower, then 0
Recommended Values	1
Range of values	0 to 10

Oracle FLEXCUBE relevance

Dynamic Sampling is a method of gathering additional statistics during optimization by recursively sampling statements. When dynamic sampling is enabled, queries are recursively generated by Oracle to test various selectivity based upon real values in order to improve their accuracy. This can result in the production of better explain plans.

Value 1 Sample all tables that have not been analyzed that meet certain criteria.

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2.10 OPTIMIZER_INDEX_CACHING

This lets you adjust the behaviour of cost-based optimization to favor nested loops joins and IN-list iterators.

Property	Description
Parameter type	Integer
Default value	0
Recommended Values	90
Range of values	0 to 100

Oracle FLEXCUBE relevance

The cost of executing an index using IN-list iterators or of executing nested loops join when an index is used to access the inner table depends on the caching of that index in the buffer cache. Oracle FLEXCUBE favors nested loop joins by setting optimizer_index_caching to 90.

2.11 OPTIMIZER_INDEX_COST_ADJ

This lets you tune optimizer behaviour for access path selection to be more or less index friendly - that is, to make the optimizer more or less prone to selecting an index access path over a full table scan.

Property	Description
Parameter type	Integer
Default value	100
Recommended Values	50
Range of values	1 to 10000

Oracle FLEXCUBE relevance

Oracle FLEXCUBE favors index read over full table scan as it is very useful when optimizer favors to give a lower cost to index scans over full-table scans.

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2.12 PLSQL_CODE_TYPE

This specifies the compilation mode of the PL/SQL units.

Property	Description
Parameter type	String
Default value	INTERPRETED
Recommended values	NATIVE
Range of values	INTERPRETED, NATIVE

Oracle FLEXCUBE relevance

The PL SQL interpreter overhead will be minimal when set to NATIVE.

2.13 PLSQL_OPTIMIZE_LEVEL

This specifies the optimization level that will be used to compile PL/SQL library units. The higher the setting of this parameter, the more effort the compiler makes to optimize PL/SQL library units.

Property	Description
Parameter type	Integer
Default value	2
Recommended values	2
Range of values	0 to 3

Oracle FLEXCUBE relevance

This applies a wide range of modern optimization techniques beyond those of level 1 including changes which may move source code relatively far from its original location.

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2.14 **PROCESSES**

This specifies the maximum number of operating system user processes that can simultaneously connect to Oracle. Its value should allow for all background processes such as locks, job queue processes, and parallel execution processes.

Property	Description
Parameter type	Integer
Default value	100
Range of values	6 to operating system dependent
Recommended values	Refer **FLEXCUBE-Disk-Layouts-initparams-12c.xlsm**

Oracle FLEXCUBE relevance

This parameter can set be set with respect to maximum no of sessions connected to DB.

2.15 **QUERY_REWRITE_ENABLED**

Allows you to enable or disable query rewriting globally for the database.

Property	Description
Parameter type	String
Syntax	QUERY_REWRITE_ENABLED = { false	true	force }
Default value	If OPTIMIZER_FEATURES_ENABLE is set to 10.0.0 or higher, then true If OPTIMIZER_FEATURES_ENABLE is set to 9.2.0 or lower, then false
Recommended values	FALSE

Oracle FLEXCUBE relevance

Oracle FLEXCUBE does not uses function-based indexes.

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2.16 REMOTE_DEPENDENCIES_MODE

Specifies how Oracle should handle dependencies upon remote PL/SQL stored procedures.

Property	Description
Parameter type	String
Syntax	REMOTE_DEPENDENCIES_MODE = { TIMESTAMP | SIGNATURE }
Default value	TIMESTAMP
Recommended values	SIGNATURE

Oracle FLEXCUBE relevance

Oracle allows the procedure to execute as long as the signatures are considered safe. This setting allows client PL/SQL applications to be run without recompilation.

2.17 RESULT_CACHE_MAX_SIZE

RESULT_CACHE_MAX_SIZE specifies the maximum amount of SGA memory (in bytes) that can be used by the Result Cache.

Property	Description
Parameter type	Big integer
Syntax	RESULT_CACHE_MAX_SIZE = integer [K | M | G]
Default value	Derived from the values of SHARED_POOL_SIZE, SGA_TARGET, and MEMORY_TARGET
Recommended values	0.5% of SGA

Oracle FLEXCUBE relevance

Automatic memory management: If you are using the MEMORY_TARGET initialization parameter to specify memory allocation, Oracle Database allocates 0.25% of the value of the MEMORY_TARGET parameter to the result cache.

Automatic shared memory management: If you are managing the size of the shared pool using the SGA_TARGET initialization parameter, Oracle Database allocates 0.50% of the value of the SGA_TARGET parameter to the result cache.

Manual shared memory management: If you are managing the size of the shared pool using the SHARED_POOL_SIZE initialization parameter, then Oracle Database allocates 1% of the shared pool size to the result cache.

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2.18 **CLIENT_RESULT_CACHE LAG**

CLIENT_RESULT_CACHE_LAG specifies the maximum time (in milliseconds) since the last round trip to the server, before which the OCI client query execute makes a round trip to get any database changes related to the queries cached on the client.

Property	Description
Parameter type	Big integer
Syntax	`CLIENT_RESULT_CACHE_LAG = integer`
Default value	3000
Recommended values	10,800,000(3 hours)

2.19 **CLIENT_RESULT_CACHE_SIZE**

CLIENT_RESULT_CACHE_SIZE specifies the maximum size of the client per-process result set cache (in bytes). All OCI client processes inherit this maximum size. Setting a nonzero value enables the client query cache feature. This can be overridden by the client configuration parameter OCI_RESULT_CACHE_MAX_SIZE.

Property	Description
Parameter type	Big integer
Syntax	`CLIENT_RESULT_CACHE_SIZE=integer [K|M|G]`
Default value	0
Recommended values	32K

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2.20 SESSION_CACHED_CURSORS

Specifies the number of session cursors to cache. Repeated parse calls of the same SQL statement cause the session cursor for that statement to be moved into the session cursor cache. Subsequent parse calls will find the cursor in the cache and do not need to reopen the cursor. Oracle uses a least recently used algorithm to remove entries in the session cursor cache to make room for new entries when needed.

Property	Description
Parameter type	Integer
Default value	50
Recommended values	400
Range of values	0 to operating system-dependent

Oracle FLEXCUBE relevance

This helps to cache the cursor thus avoid parsing of the cursor which heavy CPU intensive particularly in batch.

2.21 SKIP_UNUSABLE_INDEXES

Enables or disables the use and reporting of tables with unusable indexes or index partitions.

Property	Description
Parameter type	Boolean
Default value	true
Recommended values	FALSE
Range of values	true / false

Oracle FLEXCUBE relevance

TRUE enables error reporting of indexes marked UNUSABLE. This setting does not allow inserts, deletes, and updates on tables with unusable indexes or index partitions. IT is set to false, because Oracle FLEXCUBE application should throw error if any of the indexes become UNUSABLE.

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2.22 UNDO_RETENTION

This specifies (in seconds) the low threshold value of undo retention. For AUTOEXTEND undo tablespaces, the system retains undo for at least the time specified in this parameter, and automatically tunes the undo retention period to satisfy the undo requirements of the queries. For fixed- size undo tablespaces, the system automatically tunes for the maximum possible undo retention period, based on undo tablespace size and usage history, and ignores UNDO_RETENTION unless retention guarantee is enabled.

The UNDO_RETENTION parameter can only be honored if the current undo tablespace has enough space. If an active transaction requires undo space and the undo tablespace does not have available space, then the system starts reusing unexpired undo space. This action can potentially cause some queries to fail with a "snapshot too old" message.

Property	Description
Parameter type	Integer
Default value	900
Range of values	0 to 231 – 1
Recommended values	1800

Oracle FLEXCUBE relevance

Increased value along with automatic undo management helps to avoid "snapshot too old error".

2.23 UTL_FILE_DIR

Lets you specify one or more directories that Oracle should use for PL/SQL file I/O. If you are specifying multiple directories, you must repeat the UTL_FILE_DIR parameter for each directory on separate lines of the initialization parameter file.

Property	Description
Parameter type	String
Syntax	UTL_FILE_DIR = pathname
Default value	There is no default value
Recommended values	/tmp/Flexcube

Oracle FLEXCUBE relevance

Security recommends to create one single directory for writing all the DEBUG related files. This should be in sync with the DEBUG related parameter values mentioned in CSTB_PARAM table. If any other components require to write to a different location, the same needs to be updated in UTL_FILE_DIR as well.

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2.24 DEFERRED_SEGMENT_CREATION

Specifies the semantics of deferred segment creation. If set to true, then segments for non-partitioned tables and their dependent objects (LOBs, indexes) will not be created until the first row is inserted into the table.

Property	Description
Parameter type	Boolean
Default value	True
Modifiable	ALTER SESSION, ALTER SYSTEM
Recommended value	False

Oracle FLEXCUBE relevance

All Oracle FLEXCUBE tables should be imported / created even though there is no record in the table.

2.25 LOG_BUFFER

Recommended Value: 100M

Oracle FLEXCUBE relevance

The default log buffer size is too small as Oracle FLEXCUBE performs heavy DML during batch processing.

2.26 ALLOW_LEVEL_WITHOUT_CONNECT_BY

Recommended Value: TRUE

This parameter is set to avoid following error,

After Upgrading To Oracle 10g, Getting ORA-01788 When Running A Query That Includes

The LEVEL Pseudo Column [ID 455953.1]

2.27 PGA_AGGREGATE_LIMIT

Recommended Value: 0

Oracle FLEXCUBE Relevance

Setting this parameter limits the PGA consumed by the instance, hence might cause failure to few of the running processes.

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2.28 Optimizer_Adaptive_Features

Property	Description
Parameter type	Boolean
Default value	True
Modifiable	ALTER SESSION, ALTER SYSTEM
Recommended value	False

Oracle FLEXCUBE relevance

Some of the Oracle FLEXCUBE sql statements are generated dynamically. So they contain literal values in the WHERE clause conditions. This results in large numbers of nearly identical statements with separate parse trees in Oracle's library cache, which can slow performance and cause latch problems. Also this can lead to a wrong explain plan.

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3. Redo Log Files

The default redo log files groups and size is inadequate to run FLEXCUBE. Hence, the recommended are:

- 6 redo log groups
- Redo log file size
  - 1 GB each for the DB size up to 1 TB
  - 2 GB each for DB size more than 1 TB

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4. PLSQL Optimizer Level

The plsql_optimize_level value for all the pl/sql units should be same which would be the value set in plsql_optimize_level init parameter.

Following sql gives the PLSQL optimizer level for Oracle FLEXCUBE schema plsql units:

```
Select PLSQL_OPTIMIZE_LEVEL,type,count(*) "Count" from
user_plsql_object_settings group by PLSQL_OPTIMIZE_LEVEL,type;
```

PLSQL_OPTIMIZE_LEVEL for all the objects should be same which should be value set in plsql_optimize_level init parameter. If there is a difference then the objects should be recompiled. This can be done using dbms_utility.compile_schema procedure.

Eg: - exec dbms_utility.compile_schema('FCISBM2') Here, 'FCISBM2' refers to Oracle FLEXCUBE schema.

Note: The 'dbms_utility.compile_schema' procedure invalidates and recompiles all the plsql units.

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5. Oracle FLEXCUBE Database Storage Recommendations

Oracle database 10g release 2 onwards, Automatic Storage Management (ASM) is the recommended storage option for Oracle FLEXCUBE database. ASM is an integrated cluster aware volume manager and a file system designed and optimized for managing Oracle database files. ASM is the realization of the Oracle Stripe and Mirror Everything (SAME) storage management methodology researched and established as best practices for Oracle database environment over many years.

Note: For configuring ASM refer Automatic storage management best practice document provided by Oracle for your database version.

5.1 Key Benefits of ASM

- I/O is spread evenly across all available disk drives to prevent hot spots and maximize performance.
- ASM eliminates the need for over provisioning and maximizes storage resource utilization facilitating database consolidation.
- Inherent large file support.
- Performs automatic online redistribution after the incremental addition or removal of storage capacity.
- Maintains redundant copies of data to provide high availability, or leverage 3rd party RAID functionality.
- Supports Oracle Database 12c as well as Oracle Real Application Clusters (RAC). Capable of leveraging 3rd party multipathing technologies.
- For simplicity and easier migration to ASM, an Oracle Database 12c database can contain ASM and non-ASM files. Any new files can be created as ASM files whilst existing files can also be migrated to ASM.
- RMAN commands enable non-ASM managed files to be relocated to an ASM disk group. Oracle Database 12c Enterprise Manager can be used to manage ASM disk and file management activities.

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6. Oracle FLEXCUBE Database Backup Recommendations

Backup Policy is a very important ingredient of any High Availability system. Oracle recommends

RMAN utility for database backup.

RMAN is acronym for Recovery Manager, is Oracle utility which will backup, restore, and recover oracle data files. RMAN is an Oracle provided utility for efficiently performing Backup and Recovery. RMAN is available as a part of the standard Installation and no separate installation is required.

Recovery Manager is a client/server application that uses database server sessions to perform backup and recovery. It stores metadata about its operations in the control file of the target database and, optionally, in a recovery catalogue schema in an Oracle database.

You can invoke RMAN as a command-line executable from the operating system prompt or use some RMAN features through the Enterprise Manager GUI.

6.1 RMAN Vs Conventional Backup

During a conventional hot backup, the amount of Redo generated during the backup would be more due to the fact that the redo logs during the hot backup store the entire block images rather than the change vectors.

RMAN doesn't place the tablespace in a backup mode and hence the amount of Redo generated during the RMAN backup is considerably low.

RMAN can identify block corruption during backup operations and RMAN supports Block recovery.

RMAN automatically detects new data files and will backup them. Also, RMAN supports incremental backup method.

RMAN backs up only the blocks that have been used at least once. Unused blocks are never backed up. Unused block here refers to the blocks where in the block header is zeroed

RMAN enables us to test the backup without actually restoring the backup.

RMAN can verify physical and logical structures of the database without actually performing backup.

Usage of Shared Pool and Large Pool for RMAN

RMAN uses DBMS_RCVMAN and DBMS_BACKUP_RESTORE packages for backup and recovery. These packages would be loaded in the shared pool for backup and restore operation. RMAN uses the PGA for backup and restore operation.

RMAN Requires LARGE_POOL only if TAPE_IO_SLAVES and DBWR_IO_SLAVES are defined.

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Sizing Large Pool - LARGE_POOL = (Number of Channels) * (16 MB + Tape Buffer)

6.2 <u>Benefits of Using RMAN</u>

RMAN is an intelligent tool that comes at no extra cost. It is available free with the Oracle Database.

RMAN introduced in Oracle 8 it has become simpler with newer versions and easier than user managed backups.

Provides proper security for Backups

You can be 100% sure your database has been backed up.

Controlfile and Spfile of the database can be configured to be automatically backed up by RMAN. It contains detail of the backups taken etc in its central repository Facility for testing validity of backups also commands like crosscheck to check the status of backup. Faster backups and restores compared to backups without RMAN.

RMAN is the only native backup tool which supports incremental backups.

Oracle 12c has got further optimized incremental backup which has resulted in improvement of performance during backup and recovery time.

Parallel operations (Multiple Channels for Backup and Restore) are supported. Better querying facility for knowing different details of backup.

No extra redo is generated when backup is performed, compared to conventional online backup. Maintains repository of backup metadata.

Remembers backup set location. Knows what need to backed up. Knows what is required for recovery. Knows what backup are redundant.
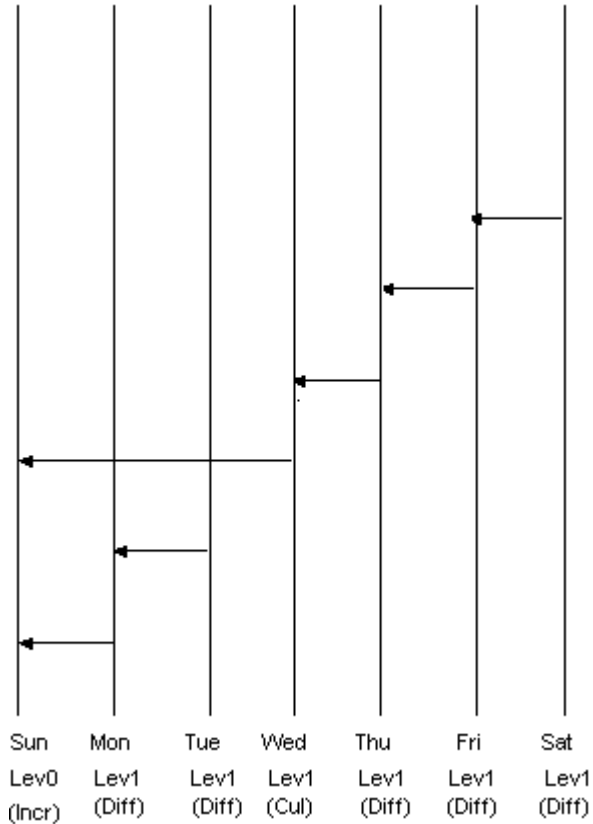
RMAN can back up the Database to Disk or directly to Tape. It is recommended that RMAN backup is performed to disk and then copied to tape.

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6.3 <u>Backup Strategy Recommendation</u>

RMAN will not backup the below files so it is advised to take the copy of the below files on regular basis (weekly/any change/addition to the file).

Tnsnames.ora Listener.ora Password file Init.ora

The Best practice is to take create the pfile once the spfile is updated. Below is the recommended strategy.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
Lev0	Lev1	Lev1	Lev1	Lev1	Lev1	Lev1
(Incr)	(Diff)	(Diff)	(Cul)	(Diff)	(Diff)	(Diff)

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7. Tablespace Layout and Moving Tables to Respective Tablespaces

Oracle FCIS tables and indexes are placed in corresponding tablespaces according to their usage, i.e. heavily populated tables and corresponding indexes are placed in tablespaces with higher extent size. Whereas the maintenance tables where the data population is less will be placed in a tablespace with smaller extent size. This avoids frequent space allocation in turn improve the performance.

For example table PERIODICLOADACCRUALHISTORY is heavily populated. So this table and its indexes will be placed in tablespace FCISDATAXL and FCISINDXXL respectively where extent size is high. The table funddemographicstbl and its indexes are placed in tablespace FCISDATASML and FCISINDXSML respectively which is having smaller extent size.

Oracle FLEXCUBE Standard Tablespaces are as follows:

Tablespace name	Tablespace type	Extent management	Segment space management
FCISDATASML	DATA	LOCAL	AUTO
FCISINDXSML	INDEX	LOCAL	AUTO
FCISDATAMED	DATA	LOCAL	AUTO
FCISINDXMED	INDEX	LOCAL	AUTO
FCISDATALAR	DATA	LOCAL	AUTO
FCISINDXLAR	INDEX	LOCAL	AUTO
FCISDATAXL	DATA	LOCAL	AUTO
FCISINDXXL	INDEX	LOCAL	AUTO
FCISDFLT	AD HOC	LOCAL	AUTO

Note: Tablespaces extent size depends on Oracle FLEXCUBE implementation (i.e. Small, Medium and Large). So these parameters are to be derived using base lined excel FLEXCUBE-Disk-Layouts-initparams-12c-version12.xlsm based on implementation.

Sample script to move table and index:

Alter table PERIODICLOADACCRUALTBL move tablespace FCISDATALAR;

Alter index PERIODICLOADACCHISTXN_IDX2 rebuild tablespace FCISINDXLAR;

Similarly all tables and indexes should be moved to respective tablespaces.

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8. Table and Index Partitioning

Table and index partitioning helps to reduce the contention and GC related delays in RAC environment. Table and index partitioning is mandatory if you have deployed Oracle FCIS in RAC database.

Following are the list of tables to be partitioned:

Table_name	Column_name	Partitioning_type
CONSOLIDATEDTXNTBL	FUNDID	list
TXNSETTLEMENTTBL	txn number	hash
UHBALLEDGERTBL	fundid	List
AGEINGTBL	TRANSACTIONNUMBER	HASH
ALLOCATIONTBL	TRANSACTIONNUMBER	HASH
POLICYTXNTBL	policytxnnumber	hash
TXNINTERMEDIARYTBL	TRANSACTIONNUMBER	hash
TXNDETAILSTBL	TRANSACTIONNUMBER	hash
LOADHISTORYTBL	fundid	List
PERIODICLOADLOGTBL	fundid	List
POLICYTXNFUNDRATIOTBL	policytxnnumber	hash
POLICYFUNDTXNLINKTBL	policytxnnumber	hash
CLEARINGTBL	transactionnumber	hash
DERIVEDLOADHISTORYTBL	fundid	list
TXNVATVALUESTBL	transactionnumber	Hash
UNITHOLDERTBL	Unitholderid	hash
UHINTERMEDIARYTBL	Unitholderid	hash

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Following points are to be noted during partitioning:

- • Keep the number of partitions same as number of entities.
- • All the corresponding indexes should be local partitioned except the primary key index which doesn't contain the partition key.
- • If the primary key index doesn't contain the table partition column then those indexes are to be created without partition.

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9. Sequence Caching

Sequence Caching is applicable only if Oracle FCIS is deployed in RAC database.

Heavy use of sequences in RAC database causes high DFS lock handle & row cache lock waits which affect the application scalability. In order to overcome this issue, the sequences are to be cached with noorder option.

All the FCIS sequences should be recreated cache 500 and noorder. Steps to alter existing sequences as follows:

1. Login to Oracle FLEXCUBE schema

2. SQL > Spool sequence.sql

3. SQL > select ' alter sequence ' || sequence_name || ' cache 500 noorder;' from user_sequences;

4. SQL > spool off;

5. SQL > @ sequence.sql

Verify that cache and order changed to all sequences.

6. Select order_flag, cache_size from user_sequences;

In FCIS some of the sequences are recreated as part of end of day batches. Those sequences have to be taken care in spRecreateSequences procedure. This procedure should be modified to include caching and noorder as follows:

l_Create := 'CREATE SEQUENCE ' || p_Seq_Name || ' INCREMENT BY 1 START WITH 1 MINVALUE 1 NOCYCLE CACHE 500 NOORDER';

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10.   Statistics Collection for FCIS Schema (Recommended Method)

Oracle provides a default scheduled job to collect statistics for the entire database and is default scheduled to run every night. Given that Oracle FLEXCUBE batch as well runs in the night it is critical that the statistics gathering is not run during the batch.

It is recommended to use the default database scheduled job that is shipped with Oracle

Database to collect statistics for Oracle FLEXCUBE Schema.

Note: This document assumes that there is no other tool or a program is scheduled to collect statistics for the Database.

10.1 Customizing Default Statistics Collection Schedule

The Default Scheduler is to be customized for the following:

- • Ensure that the default statistics gathering program is configured and Running.

SELECT STATUS

FROM DBA_AUTOTASK_CLIENT

WHERE CLIENT_NAME='auto optimizer stats collection';

Should return - ENABLED

- • Ensure that the default statistics gathering program is configured to run only on weekends.

/* Start of Script – Script to be executed as SYS*/

BEGIN DBMS_AUTO_TASK_ADMIN.ENABLE(

CLIENT_NAME => 'auto optimizer stats collection',

OPERATION   => NULL,

WINDOW_NAME => 'SATURDAY_WINDOW'); DBMS_AUTO_TASK_ADMIN.ENABLE(

CLIENT_NAME => 'auto optimizer stats collection', OPERATION => NULL,

WINDOW_NAME => 'SUNDAY_WINDOW'); END;

/* End of Script */

- Default schedule is daily. So disable the daily schedules for optimizer statistics.

/* Start of Script – Script to be executed as SYS*/

BEGIN DBMS_AUTO_TASK_ADMIN.DISABLE(

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CLIENT_NAME => 'auto optimizer stats collection', OPERATION => NULL,

WINDOW_NAME => 'MONDAY_WINDOW'); DBMS_AUTO_TASK_ADMIN.DISABLE(

CLIENT_NAME =>'auto optimizer stats collection', OPERATION => NULL,

WINDOW_NAME => 'TUESDAY_WINDOW');

DBMS_AUTO_TASK_ADMIN.DISABLE(

CLIENT_NAME =>'auto optimizer stats collection', OPERATION => NULL,

WINDOW_NAME => 'WEDNESDAY_WINDOW');

DBMS_AUTO_TASK_ADMIN.DISABLE(

CLIENT_NAME => 'auto optimizer stats collection', OPERATION => NULL,

WINDOW_NAME => 'THURSDAY_WINDOW'); DBMS_AUTO_TASK_ADMIN.DISABLE(

CLIENT_NAME => 'auto optimizer stats collection', OPERATION => NULL,

WINDOW_NAME => 'FRIDAY_WINDOW');

END;

/

/* End of Script */

Verify the setup using the following SQL

SELECT WINDOW_NAME,OPTIMIZER_STATS FROM DBA_AUTOTASK_WINDOW_CLIENTS;
Should return

MONDAY_WINDOW DISABLED

TUESDAY_WINDOW DISABLED

WEDNESDAY_WINDOW DISABLED

THURSDAY_WINDOW DISABLED

FRIDAY_WINDOW DISABLED

SATURDAY_WINDOW ENABLED

SUNDAY_WINDOW ENABLED

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10.2 <u>Customizing Statistics Gathering for FCIS</u>

The default statistics gathering is designed to be generic. It is recommended to customize the default statistics gathering to suit FLECUBE online and batch.

Following are the areas that would need customization for FLEXCUBE:

- Statistics Histograms
- Sample Size of Statistics

10.2.1 <u>Statistics Histograms</u>

Note the following:

- The default statistics gathering routine decides to collect histograms on specific tables based on certain criteria that are not documented.
- Statistics Histograms are not recommended for Oracle FLEXCUBE tables. Configure the default statistics gathered without Histograms.

/* Start of Script – Script to be executed as SYS*/

BEGIN

DBMS_STATS.SET_PARAM ('METHOD_OPT','FOR ALL COLUMNS SIZE 1'); END;

/

/*End of Script */ Verify the setup using

SELECT DBMS_STATS.GET_PARAM ('METHOD_OPT') FROM DUAL;

Should return

FOR ALL COLUMNS SIZE 1

10.2.2 <u>Sample Size of Statistics</u>

The default statistics gathering routine decides on the percentage of data sampling

(AUTO_SAMPLE_SIZE).

The idea of sampling is to reduce the time taken for collecting statistics. Sampling could be effective for very large historical tables but not for medium and small tables and hence Sampling of data for all FCIStables is not recommended

Configure the default statistics gathered with 100% data coverage.

/* Start of Script – Script to be executed as SYS*/ BEGIN
DBMS_STATS.SET_PARAM('ESTIMATE_PERCENT',100); END;

/

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/* End of Script */

Verify the setup using

SELECT DBMS_STATS.GET_PARAM('ESTIMATE_PERCENT') FROM DUAL;

Should return 100

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11. FCIS Periodic Table Maintenance

Find below the list of tables and the corresponding action that needs to be planned in a periodical basis so that no performance degradation is observed over a period of time. These activities need to be planned ahead since this would require downtime. Also ensure proper backups are taken prior to any table maintenance activity.

Details of the various Actions are as below:

Truncate Table: Take the backup of the current table data and truncate the table

Recreate Table: These tables and it corresponding indexes needs to be rebuild.

Table Name	Action
CSTB_MSG_LOG	Truncate Table
SMTB_IMAGE_UPLOAD	Truncate Table
STTB_RECORD_LOG	Recreate table
STTB_FIELD_LOG	Recreate table
PERIODICLOADACCRUALHISTORYTBL	Recreate table
CONSOLIDATEDTXNTBL	Recreate table
PERIODICLOADACCRUALTBL	Recreate table
PERIODICLOADHISTORYTBL	Recreate table
AGEINGTBL	Recreate table
POLICYTXNTBL	Recreate table
UHDIVIDENDBALANCETBL	Recreate table

For Maintenance Activity related to Truncate and Recreate table, the impact to be analyzed at site level before implementing the action. Also for any purging related solutions required, please refer the Purge Frequency Maintenance section in Admin user manual.

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12.   FCIS Functionality-related Performance Changes

The following parameters are discussed on functionality related performance changes:

Parameter	Recommended Value	How to find
Real debug parameter	N	select param_val from cstb_param where param_name='REAL_DEBUG'
PROCESSORCOUNT	Based on the processor count	select * from paramstbl where PARAMCODE = 'PROCESSORCOUNT'; Value decides the parallel degree for EOD jobs
JOBCOUNT	Based on the processor count	select * from paramstbl where PARAMCODE = 'JOBCOUNT'; Value decides the parallel degree for EOD jobs
PARALLELLEVEL	2	select * from paramstbl where PARAMCODE = 'PARALLELLEVEL'. Value decides the parallel degree for Allocation batch

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13. Appendix

13.1 Script to Check Histograms on FCIS Schema

Following script would have to be executed in Oracle FLEXCUBE schema:

```
select distinct

table_name from

(

select table_name from user_tab_columns where histogram!='NONE'

)
```

Should return No Records

13.2 Script to Remove Histograms on FCIS Schema

Following script would have to be executed in Oracle FLEXCUBE schema if there are any rows:

```
declare

cursor cur_tables is

select distinct

table_name from

(

select table_name from user_tab_columns where histogram!='NONE'

);

begin
```

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```
for rec_tables in cur_tables loop

dbms_stats.gather_table_stats(ownname=>USER,tabname=>rec_tables

.t
able_name,METHOD_OPT=>'FOR ALL COLUMNS SIZE

1',CASCADE=>TRUE,DEGREE=>2,ESTIMATE_PERCENT=>NULL);


end loop;


end;
```

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