Database Practices
Oracle Banking Trade Finance
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FINANCIAL SERVICES

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1. Database Initialization Parameters

Oracle Banking Trade Finance 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 **OBTF-Disk-Layouts-initparams-12cr2.xlsm** excel sheet base lined along with this document.
Following are the Parameters with the details and its relevance to Banking Trade Finance:

1.1.1 _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]

1.1.2 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 Banking Trade Finance relevance
Some of the Oracle Banking Trade Finance 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.

1.1.3 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 Banking Trade Finance relevance
Turning ON advisory will have an extra overhead. Please note it should be ON, only during performance monitoring.

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1.1.4 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 Banking Trade Finance 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.

1.1.5 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	4000
Range of values	0 to 1000
Recommended Values	Refer **OBTF-Disk-Layouts-initparams-12cr2.xlsm**

Oracle Banking Trade Finance relevance
This parameter has to be set with respect to the maximum number of scheduler jobs. To arrive at the right value, refer OBTF-Disk-Layouts-initparams-12cr2.xlsm excel.

1.1.6 LOG_BUFFER

Recommended Value: Refer **OBTF-Disk-Layouts-initparams-12cr2.xlsm**
Oracle Banking Trade Finance relevance
The default log buffer size is too small as Banking Trade Finance performs heavy DML during batch processing.

1.1.7 MEMORY TARGET/MEMORY_MAX_TARGET

Recommended Value: Refer **OBTF-Disk-Layouts-initparams-12cr2.xlsm.**
For linux systems, make sure that the value of operating system /dev/shm mount is set to appropriate value to accommodate memory_Target.

1.1.8 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

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Recommended Values	DD-MON-RRRR

Oracle Banking Trade Finance relevance

Oracle Banking Trade Finance standard date format.

1.1.9 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 Banking Trade Finance relevance

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

1.1.10 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 Banking Trade Finance 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.

1.1.11 OPTIMIZER_INDEX_CACHING

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

Property	Description
Parameter type	Integer
Default value	0
Recommended Values	90

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Range of values	0 to 100

Oracle Banking Trade Finance 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 Banking Trade Finance favors nested loop joins by setting optimizer_index_caching to 90.

1.1.12 OPTIMIZER_INDEX_COST_ADJ

This lets you tune optimizer behavior 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 Banking Trade Finance relevance

Oracle Banking Trade Finance 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.

1.1.13 PARALLEL_MAX_SERVERS

This specifies the maximum number of parallel execution processes and parallel recovery processes for an instance. As demand increases, Oracle Database increases the number of processes from the number created at instance startup up to this value.

Property	Description
Parameter type	Integer
Default value	Derived from the values of CPU_COUNT, PARALLEL_THREADS_PER_CPU, and PGA_AGGREGATE_TARGET
Recommended Values	Refer **OBTF-Disk-Layouts-initparams-12cr2.xlsm**
Range of values	0 to 3600
Real Application Clusters	Multiple instances can have different values

Oracle Banking Trade Finance relevance

To arrive right value, refer **OBTF-Disk-Layouts-initparams-12cr2.xlsm** excel.

1.1.14 PGA_AGGREGATE_LIMIT

Recommended Value: 0
Oracle Banking Trade Finance Relevance:
Setting this parameter limits the pga consumed by the instance, hence might cause failure to few of the running processes.

1.1.15 PLSQL_CODE_TYPE

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

Property	Description
Parameter type	String
Default value	INTERPRETED

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Recommended values	NATIVE
Range of values	INTERPRETED, NATIVE

Oracle Banking Trade Finance relevance
The PL SQL interpreter overhead will be minimal when set to NATIVE.

1.1.16 <u>PROCESSES</u>

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 **OBTF-Disk-Layouts-initparams-12cr2.xlsm**

Oracle Banking Trade Finance relevance
This parameter can set be set with respect to maximum no of sessions connected to DB.

1.1.17 <u>REMOTE_DEPENDENCIES_MODE</u>

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 Banking Trade Finance 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.

1.1.18 <u>SESSION_CACHED_CURSORS</u>

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

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1.1.19 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 Banking Trade Finance 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 Banking Trade Finance application should throw error if any of the indexes become UNUSABLE.

1.1.20 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 Banking Trade Finance relevance
Increased value along with automatic undo management helps to avoid "snapshot too old error".

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2. Database Patches Required

Patch 24423416 needs to be applied for the respective platform and below events need to be set in the parameter file

event='10946 trace name context level 8454144','10934 trace name context level 2048'

This relates to a known issue where PLSQL compilation takes time. Setting this event with   the patch applied will help to improve the performance of PLSQL compilation performance and storage optimization.

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3. Redo Log Files

The default number of redo log files groups and its size is inadequate to run Oracle Banking Trade Finance. 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. Tablespace Layout and Moving Tables to Respective Tablespaces

Oracle Banking Trade Finance 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 ACTB_HISTORY is heavily populated. So this table and its indexes will be placed in tablespace FCCDATAXL and FCCINDXXL respectively where extent size is high. The table STTM_BRANCH and its indexes are placed in tablespace FCCDATASML and FCCINDXSML respectively which is having smaller extent size.

Oracle Banking Trade Finance Standard Tablespaces are as follows,

Tablespace name	Tablespace type	Extent management	Segment space management
FCCDATASML	DATA	LOCAL	AUTO
FCCINDXSML	INDEX	LOCAL	AUTO
FCCDATAMED	DATA	LOCAL	AUTO
FCCINDXMED	INDEX	LOCAL	AUTO
FCCDATALAR	DATA	LOCAL	AUTO
FCCINDXLAR	INDEX	LOCAL	AUTO
FCCDATAXL	DATA	LOCAL	AUTO
FCCINDXXL	INDEX	LOCAL	AUTO
FCCDFLT	AD HOC	LOCAL	AUTO

Note: Tablespaces extent size depends on the Oracle Banking Trade Finance implementation (i.e. Small, Medium and Large). So these parameters are to be derived using base lined excel **OBTF-Disk-Layouts-initparams-12cr2.xlsm** based on implementation.

For the table to tablespace mapping, refer base lined excel sheet **OBTF-Tablespace-Distribution-12cr2.xlsx**.

Sample script to move table and index:

```
Alter table STTM_CUST_ACCOUNT_DORMANCY move tablespace FCCDATALAR;
Alter index IND_DRREF rebuild tablespace FCCINDXLAR;
```

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

Also, all CLOB columns needs to be stored as SECUREFILE with Compress parameter set to LOW

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5. Table & 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 Banking Trade Finance in RAC database.

Following are the list of tables to be partitioned:

Table Name	Partitioning Type	Column name
ACTB_ACCBAL_HISTORY	LIST	BRANCH_CODE
TRTB_ACCOUNTING_TXN	LIST	AC_BRANCH
ACTB_HISTORY	LIST	AC_BRANCH
ACTB_MONTHLY_TOV_HIST	LIST	BRANCH_CODE
ACTB_VD_BAL	LIST	BRN
CATM_CHECK_BOOK	LIST	BRANCH
CATM_CHECK_DETAILS	LIST	BRANCH
CFTB_TR_CONTRACT_CHARGES	HASH	CONTRACT_REFERENCE_NO
CLTB_ACCOUNT_APPS_MASTER	RANGE	BRANCH_CODE,PROCESS_NO
CLTB_ACCOUNT_COMPONENTS	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_BALANCES	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_BAL_BREAKUP	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_BAL_SUMMARY	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_CALC	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_SCH	LIST	BRANCH_CODE
CLTB_ACCOUNT_EVENTS_ADVICES	LIST	BRANCH_CODE
CLTB_ACCOUNT_EVENTS_DIARY	RANGE	BRANCH_CODE,PROCESS_NO
CLTB_ACCOUNT_PARTIES	LIST	BRANCH_CODE
CLTB_ACCOUNT_ROLL_COMP	LIST	BRANCH_CODE
CLTB_ACCOUNT_SCHEDULES	LIST	BRANCH_CODE
CLTB_ACCOUNT_UDE_EFF_DATES	LIST	BRANCH_CODE
CLTB_ACCOUNT_UDE_VALUES	LIST	BRANCH_CODE
CLTB_ACC_COMPOUNDING_DATES	LIST	BRANCH_CODE
CLTB_ACC_STCH_PROCESED	LIST	BRANCH_CODE
CLTB_AMOUNT_PAID	LIST	BRANCH_CODE
CLTB_AMOUNT_PAID_HISTORY	LIST	BRANCH_CODE
CLTB_AMOUNT_RECD	LIST	BRANCH_CODE
CLTB_CALC_DATES	LIST	BRANCH_CODE
CLTB_DISBR_SCHEDULES	LIST	BRANCH_CODE
CLTB_EVENT_ENTRIES	RANGE	BRANCH_CODE,PROCESS_NO
CLTB_EVENT_ENTRIES_PENDING	LIST	BRANCH_CODE
CLTB_EVENT_REMARKS	LIST	BRANCH_CODE
CLTB_LIQ	LIST	BRANCH_CODE
CLTB_PROCESSED_REVISIONS	LIST	BRANCH_CODE
CLTB_RECON	LIST	BRANCH_CODE
CLTB_REVISION_ACCOUNTS	LIST	BRANCH_CODE

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CLTB_REVN_SCHEDULES	LIST	BRANCH_CODE
CLTP_ACCOUNT_COMP_BALANCES	LIST	BRANCH_CODE
CLTP_ACCOUNT_COMP_CALC	LIST	BRANCH_CODE
CLTP_ACCOUNT_COMP_SCH	LIST	BRANCH_CODE
CLTP_ACCOUNT_SCHEDULES	LIST	BRANCH_CODE
CLTP_REVN_SCHEDULES	LIST	BRANCH_CODE
CSTB_TR_AMOUNT_DUE	HASH	CONTRACT_REF_NO
CSTB_TR_AUTO_SETTLE_BLOCK	LIST	ACCOUNT_BR
CSTB_TR_CONTRACT	LIST	BRANCH
CSTB_TR_CONTRACT_EVENT_LOG	HASH	CONTRACT_REF_NO
CSTB_TR_CONTRACT_OVD	HASH	CONTRACT_REF_NO,EVENT_SEQ_NO,OVD_SEQ_NO
CSTB_TR_EXT_CONTRACT_STAT	LIST	BRANCH_CODE
CSTB_MSG_LOG	HASH	MSG_ID
CSTB_TR_RELATIONSHIP_LINKAGE	HASH	REF_NO
DETB_BATCH_MASTER	LIST	BRANCH_CODE
DETB_JRNL_LOG	LIST	BRANCH_CODE
DETB_PCTRN	LIST	BRANCH
DETB_RTL_TELLER	LIST	BRANCH_CODE
ELTB_UTIL_TXN_LOG	HASH	MASTER_TXN_ID
FBTB_OVD	HASH	SEQ_NO,XREF
FBTB_TXNLOG_DETAILS	HASH	XREFID
FBTB_TXNLOG_MASTER	HASH	XREFID
FCT_FACILITY	RANGE	MIS_DATE
FCT_FAC_EXP_MAP	RANGE	MIS_DATE
FCT_LOAN	RANGE	MIS_DATE
FCT_TRACK_EXPOSURE	RANGE	MIS_DATE
FCT_UTILS_EXP	RANGE	MIS_DATE
FTTB_ACTIVITY_JOURNAL	HASH	CONTRACT_REF_NO
FTTB_CONTRACT_MASTER	HASH	CONTRACT_REF_NO
GETB_MAIN_UTILS	HASH	UTIL_ID
GETB_UTILS	HASH	USER_REFNO
GETB_UTILS_LOG	LIST	UTIL_BRN
GETB_VD_UTILS	HASH	FACILITY_ID
GETH_UTILS	LIST	UTIL_BRN
GETM_LIAB	HASH	ID
GETM_LIAB_CUST	LIST	BRANCH_CODE
GLTB_CUST_ACCBREAKUP	LIST	BRANCH_CODE
GLTB_GL_BAL	LIST	BRANCH_CODE
GWTB_DEDUPE	HASH	MSG_REF_NO
GWTB_MSG_IN_LOG	HASH	MSG_REF_NO
GWTB_MSG_OUT_LOG	HASH	MSG_REF_NO
ICTB_ACC_PR	RANGE	BRN,PROCESS

ICTB_ACC_PR_HISTORY	LIST	BRN
ICTB_ADJ_INTEREST	LIST	BRN
ICTB_ADJ_INTEREST_HISTORY	LIST	BRN
ICTB_BOOK_ERR	LIST	BRN
ICTB_CHG_VAL	LIST	BRN
ICTB_DLY_MSG_OUT	LIST	BRN
ICTB_DR_INT_DUE	LIST	BOOK_BRN
ICTB_ENTRIES	RANGE	BRN,PROCESS
ICTB_ENTRIES_HISTORY	RANGE	BRN,PROCESS
ICTB_IS_VALS	LIST	BRN
ICTB_ITM_TOV	LIST	BRN
ICTB_PROBLEM_LOG	LIST	BRN
ICTB_UDEVALS	HASH	COND_KEY
ICTB_UDEVAL_ROW	HASH	COND_KEY
ICTM_ACC	LIST	BRN
ICTM_CHILDTD_DETAILS	LIST	BRN
ICTW_ACC_PR	LIST	BRN
ICTW_BACK_IS_VALS	LIST	BRN
ICTW_MAKE_ROW	HASH	COND_KEY
ISTB_TR_CONTRACTIS	HASH	CONTRACT_REF_NO
ISTB_TR_CONTRACT_DETAILS	HASH	CONTRACT_REF_NO
ISTB_TR_MSGHO	HASH	CONTRACT_REF_NO
ISTM_TR_INSTR	LIST	BRANCH
MITB_TR_CLASS_MAPPING	HASH	UNIT_REF_NO
MSTB_CONTRACT_CHG_ADVICE	HASH	CONTRACT_REF_NO
MSTB_TR_DLY_MSG_OUT	LIST	BRANCH
MSTB_TR_EXT_MSG_OUT	HASH	DCN
MSTB_MSG_PDE_LOG	HASH	DCN
MSTB_TR_MSG_STAT	HASH	REFERENCE_NO
MSTM_TR_MSG_ADDRESS	HASH	CUSTOMER_NO
PCTB_CONTRACT_MASTER	LIST	BRANCH_CODE
SITB_CONTRACT_MASTER	HASH	CONTRACT_REF_NO
SITB_CYCLE_DETAIL	LIST	BRANCH_CODE
SITB_CYCLE_DUE_EXEC	LIST	BRANCH_CODE
SITB_DLY_MSG_OUT	HASH	INSTRUCTION_NO
SITB_TR_INSTRUCTION	LIST	BRANCH
SMTB_SMS_ACTION_LOG	HASH	ACTION_SEQUENCE_NO
SMTB_SMS_LOG	HASH	SEQUENCE_NO
SMTT_SMS_LOG	HASH	SEQUENCE_NO
STTB_ACCOUNT	LIST	BRANCH_CODE
STTB_FIELD_LOG	HASH	KEY_ID
STTB_TR_NOTIFICATION	HASH	PKEY_VALUES

STTB_TR_NOTIFICATION_HISTORY	HASH	PKEY_VALUES	
STTB_NOTIFICATION_LOG	HASH	REFERENCE_NO	
STTB_RECORD_LOG	LIST	BRANCH_CODE	
STTB_RECORD_MASTER	LIST	BRANCH_CODE	
STTM_ACCOUNT_REPORT_GEN_TIME	LIST	BRANCH_CODE	
STTM_TR_ACCSTAT_REPLINES_DTL	LIST	BRANCH_CODE	
STTM_CUSTAC_BAL_NOTIF	LIST	BRANCH_CODE	
TRVW_CUSTOMER	HASH	CUSTOMER_NO	
STTM_CUST_ACCOUNT	LIST	BRANCH_CODE	
STTM_CUST_ACCOUNT_DORMANCY	LIST	BRANCH_CODE	
STTM_CUST_PERSONAL	HASH	CUSTOMER_NO	
SWTB_ARCHIVE_STAGING	LIST	PROCESS_SEQ_NO	
SWTB_TXN_HIST	HASH	XREF	
SWTB_TXN_LOG	HASH	XREF	
SWTB_TXN_TIME	HASH	XREF	
TATB_TR_TXNRULE	HASH	CONTRACT_REF_NO	

Following are the list of indexes to be partitioned:

TABLE_NAME	INDEX_NAME	PARTITION ING_TYPE	PARTITION COLUMN
ACTB_ACCBAL_HISTORY	PK01_ACTB_ACCBAL_HISTORY	LIST	BRANCH_CODE
TRTB_ACCOUNTING_TXN	IX01_ TRTB_ACCOUNTING_TXN	LIST	AC_BRANCH
TRTB_ACCOUNTING_TXN	IX02_TRTB_ACCOUNTING_TXN	HASH	TRN_REF_NO
TRTB_ACCOUNTING_TXN	IX07_TRTB_ACCOUNTING_TXN	HASH	AC_NO
TRTB_ACCOUNTING_TXN	IX08_ TRTB_ACCOUNTING_TXN	LIST	AC_BRANCH
TRTB_ACCOUNTING_TXN	PK01_ TRTB_ACCOUNTING_TXN	REVERSE	AC_ENTRY_SR_NO
TRTB_ACCOUNTING_TXN	X5_ TRTB_ACCOUNTING_TXN	HASH	RELATED_ACCOUNT
TRTB_ACCOUNTING_TXN	X6_TRTB_ACCOUNTING_TXN	LIST	AC_BRANCH
ACTB_HISTORY	IX01_ACTB_HISTORY	LIST	AC_BRANCH
ACTB_HISTORY	IX05_ACTB_HISTORY	HASH	AC_NO
ACTB_HISTORY	PK01_ACTB_HISTORY	REVERSE	AC_ENTRY_SR_NO
ACTB_MONTHLY_TOV_HIST	PK01_ACTB_MONTHLY_TOV_HIST	LIST	BRANCH_CODE
ACTB_VD_BAL	PK01_ACTB_VD_BAL	LIST	BRN
CATM_CHECK_BOOK	PK01_CATM_CHECK_BOOK	LIST	BRANCH
CATM_CHECK_DETAILS	PK01_CATM_CHECK_DETAILS	LIST	BRANCH
CFTB_TR_CONTRACT_CHARGES	IX01_ CFTB_TR_CONTRACT_CHARGES	HASH	CONTRACT_REFEREN CE_NO
CFTB_TR_CONTRACT_CHARGES	PK01_ CFTB_TR_CONTRACT_CHARGES	HASH	CONTRACT_REFEREN CE_NO
CLTB_ACCOUNT_APPS_MASTER	IDX_ACC_BATCH	RANGE	BRANCH_CODE,PROC ESS_NO
CLTB_ACCOUNT_APPS_MAST	IDX_CLALTACC	HASH	ALT_ACC_NO

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ER			
CLTB_ACCOUNT_APPS_MAST ER	IND1_CLTB_ACCOUNT_APPS_MAST ER	HASH	CUSTOMER_ID
CLTB_ACCOUNT_APPS_MAST ER	PK_CL_ACNT_APP_MASTER	HASH	ACCOUNT_NUMBER
CLTB_ACCOUNT_COMPONENT S	PK_CL_ACNT_COMP	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_BALA NCES	PK_ACCT_COMP_BAL	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_BAL_ BREAKUP	IDX_UNQ_COMP_BAL_BREAKUP	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_BAL_ SUMMARY	PK_CLTB_ACCOUNT_COMP_BAL_SU MMA	LIST	BRANCH_CODE
CLTB_ACCOUNT_COMP_CALC	PK_CLTB_ACCOUNT_COMP_CALC	HASH	ACCOUNT_NUMBER
CLTB_ACCOUNT_COMP_SCH	PK_CL_ACNT_COMP_SCH	LIST	BRANCH_CODE
CLTB_ACCOUNT_EVENTS_ADV ICES	PK_CLTB_ACCOUNT_EVENTS_ADVIC ES	LIST	BRANCH_CODE
CLTB_ACCOUNT_EVENTS_DIA RY	IDX_CL_ACNT_EVNTS_LOG	RANGE	BRANCH_CODE,PROC ESS_NO
CLTB_ACCOUNT_EVENTS_DIA RY	IND_INCOMPLETE_EVENTS	RANGE	BRANCH_CODE,PROC ESS_NO
CLTB_ACCOUNT_EVENTS_DIA RY	IX01_CLTB_ACCNT_EVNTS_DIRY	RANGE	BRANCH_CODE,PROC ESS_NO
CLTB_ACCOUNT_PARTIES	PK_CL_ACNT_PARTIES	LIST	BRANCH_CODE
CLTB_ACCOUNT_ROLL_COMP	PK_ACCOUNT_ROLL_COMP	LIST	BRANCH_CODE
CLTB_ACCOUNT_SCHEDULES	IDX_CL_AMT_DUE	LIST	BRANCH_CODE
CLTB_ACCOUNT_SCHEDULES	IND_COMP_DUE_DATE	HASH	ACCOUNT_NUMBER
CLTB_ACCOUNT_UDE_EFF_DA TES	PK_ACC_UDE_EFF_DT	LIST	BRANCH_CODE
CLTB_ACCOUNT_UDE_VALUES	IDX_ARVN	LIST	BRANCH_CODE
CLTB_ACCOUNT_UDE_VALUES	PK_CL_ACNT_UDE_VALS	HASH	ACCOUNT_NUMBER
CLTB_ACC_STCH_PROCESED	PK_CLTB_ACC_STCH_PROCESED	LIST	BRANCH_CODE
CLTB_AMOUNT_RECD	IDX_CLTB_AMOUNT_RECD	LIST	BRANCH_CODE
CLTB_CALC_DATES	IDX_CALC_DT	LIST	BRANCH_CODE
CLTB_CALC_DATES	PK01_CLTB_CALC_DATES	LIST	BRANCH_CODE
CLTB_DISBR_SCHEDULES	PK_CL_DISBR_SCH	LIST	BRANCH_CODE
CLTB_EVENT_ENTRIES	IDX_ENT_AUTHACNT	RANGE	BRANCH_CODE,PROC ESS_NO
CLTB_EVENT_ENTRIES	IND_CRREF	HASH	CRTRNREFNO
CLTB_EVENT_ENTRIES	IND_DRREF	HASH	DRTRNREFNO
CLTB_EVENT_ENTRIES_PENDI NG	IDX_PEND_EVENT	LIST	BRANCH_CODE
CLTB_EVENT_ENTRIES_PENDI NG	IND1_CLTB_EVENT_ENTR_PNDING	HASH	DR_ACC
CLTB_EVENT_REMARKS	PK_CLTB_EVENT_REMARKS	LIST	BRANCH_CODE

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CLTB_LIQ	PK_CLTB_LIQ	HASH	ACCOUNT_NUMBER
CLTB_PROCESSED_REVISIONS	PK_CLTB_PROCESSED_REVISIONS	LIST	BRANCH_CODE
CLTB_RECON	PK1_CLTB_RECON	LIST	BRANCH_CODE
CLTB_REVISION_ACCOUNTS	IDX_REVN_BATCH	LIST	BRANCH_CODE
CLTB_REVISION_ACCOUNTS	PK_REVISION_ACCOUNTS	LIST	BRANCH_CODE
CLTB_REVN_SCHEDULES	PK_REVN_SCH	LIST	BRANCH_CODE
CLTB_SDE_VALUES	PK_SDE_VALUES	HASH	ACCOUNT_NUMBER
CLTP_ACCOUNT_COMP_BALANCES	PK_CLTP_COMP_BAL	LIST	BRANCH_CODE
CLTP_ACCOUNT_COMP_CALC	PK_CLTP_ACCOUNT_COMP_CALC	LIST	BRANCH_CODE
CLTP_ACCOUNT_COMP_SCH	PK_CLTP_COMP_SCH	HASH	ACCOUNT_NUMBER
CLTP_ACCOUNT_MASTER	IND1_CLTP_ACCOUNT_MASTER	HASH	ACCOUNT_NUMBER
CLTP_ACCOUNT_SCHEDULES	IDX_CLTP_AMT_DUE	LIST	BRANCH_CODE
CLTP_REVN_SCHEDULES	PK_P_REVN_SCH	HASH	ACCOUNT_NUMBER
CSTB_TR_AMOUNT_DUE	PK01_CSTB_AMOUNT_DUE	HASH	CONTRACT_REF_NO
CSTB_AMOUNT_PAID	PK01_CSTB_AMOUNT_PAID	HASH	CONTRACT_REF_NO
CSTB_TR_AUTO_SETTLE_BLOCK	IND_AUTO_STLBLK_ACC	LIST	ACCOUNT_BR
CSTB_TR_AUTO_SETTLE_BLOCK	PK01_CSTB_AUTO_SETTLE_BLOCK	HASH	CONTRACT_REF_NO
CSTB_TR_CONTRACT	IX03_CSTB_CONTRACT	HASH	COUNTERPARTY
CSTB_TR_CONTRACT	IX04_CSTB_CONTRACT	LIST	BRANCH
CSTB_TR_CONTRACT	PK01_CSTB_CONTRACT	HASH	CONTRACT_REF_NO
CSTB_TR_CONTRACT	UI01_CSTB_CONTRACT	HASH	USER_REF_NO
CSTB_CONTRACT_C	I02_CSTB_CONTRACT_C	HASH	CONTRACT_REF_NO
CSTB_TR_CONTRACT_EVENT_LOG	IX02_CSTB_CONTRACT_EVENT_LOG	HASH	CONTRACT_REF_NO
CSTB_TR_CONTRACT_EVENT_LOG	PK01_CSTB_CONTRACT_EVENT_LOG	HASH	CONTRACT_REF_NO
CSTB_TR_CONTRACT_OVD	PK01_CSTB_CONTRACT_OVD	HASH	CONTRACT_REF_NO
CSTB_TR_CONT_USERDEF_VALUES	PK01_CSTB_CONTRACT_USERDEF_VAL	HASH	CONTRACT_REF_NO
CSTB_DOC_UPLOAD_MASTER	PK01_CSTB_DOC_UPLD_MASTER	HASH	KEY_ID
CSTB_TR_EXT_CONTRACT_STAT	IX02_CSTB_EXT_CONTRACT_STAT	LIST	BRANCH_CODE
CSTB_MSG_LOG	PK01_CSTB_MSG_LOG	HASH	MSG_ID
CSTB_TR_RELATIONSHIP_LINKAGE	PK01_CSTB_RELATIONSHIP_LINKAGE	HASH	REF_NO
DETB_BATCH_MASTER	IX01_DETB_BATCH_MASTER	LIST	BRANCH_CODE
DETB_BATCH_MASTER	PK01_DETB_BATCH_MASTER	LIST	BRANCH_CODE
DETB_JRNL_LOG	IX01_DETB_JRNL_LOG	LIST	BRANCH_CODE
DETB_PCTRN	PK01_DETB_PCTRN	LIST	BRANCH
DETB_RTL_TELLER	IND01_DETBS_RTL_TELLER	HASH	XREF
DETB_RTL_TELLER	UI01_DETB_RTL_TELLER	HASH	TRN_REF_NO

ELTB_UTIL_TXN_LOG	IX01_ELTB_UTIL_TXN_LOG	HASH	MASTER_TXN_ID
ELTB_UTIL_TXN_LOG	IX02_ELTB_UTIL_TXN_LOG	HASH	MASTER_TXN_ID
FBTB_TXNLOG_DETAILS	IX01_FBTB_TXNLOG_DETAILS	HASH	XREFID
FBTB_TXNLOG_DETAILS	PK_FBTB_TXNLOG_DETAILS	HASH	SEQUENCE_NO
FBTB_TXNLOG_MASTER	IDX_FBTB_TXNLOG_MASTER	HASH	XREFID
FCT_FACILITY	BI_FCT_CUST_FACILITY_KY_IX	RANGE	MIS_DATE
FCT_FACILITY	BI_FCT_CY_FACILITY_KY_IX	RANGE	MIS_DATE
FCT_FACILITY	BI_FCT_DT_FACILITY_KY_IX	RANGE	MIS_DATE
FCT_FACILITY	BI_FCT_FAC_FACILITY_KY_IX	RANGE	MIS_DATE
FCT_FACILITY	BI_FCT_LB_FACILITY_KY_IX	RANGE	MIS_DATE
FCT_FACILITY	FCT_FACILITY_KEY_IDX	RANGE	MIS_DATE
FCT_FAC_EXP_MAP	BI_FCT_DT_FAC_EXP_MAP_KY_IX	RANGE	MIS_DATE
FCT_FAC_EXP_MAP	BI_FCT_EXP_FAC_EXP_MAP_KY_IX	RANGE	MIS_DATE
FCT_FAC_EXP_MAP	BI_FCT_FAC_EXP_FAC_EXP_KY_IX	RANGE	MIS_DATE
FCT_FAC_EXP_MAP	BI_FCT_FAC_FAC_EXP_MAP_KY_IX	RANGE	MIS_DATE
FCT_FAC_EXP_MAP	FCT_FAC_EXP_MAP_KEY_IDX	RANGE	MIS_DATE
FCT_TRACK_EXPOSURE	BI_FCT_TRACK_EXPOSURE_CY_KY_I X	RANGE	MIS_DATE
FCT_TRACK_EXPOSURE	BI_FCT_TRACK_EXPOSURE_DT_KY_I X	RANGE	MIS_DATE
FCT_TRACK_EXPOSURE	BI_FCT_TRACK_EXPOSURE_EX_KY_I X	RANGE	MIS_DATE
FCT_TRACK_EXPOSURE	FCT_TRACK_EXPOSURE_KEY_IDX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_BR_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_CUST_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_CY_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_DT_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_EXP_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_LB_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_MAIN_LB_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	BI_FCT_UTIL_UTILS_EXP_KY_IX	RANGE	MIS_DATE
FCT_UTILS_EXP	FCT_UTILS_EXP_KEY_IDX	RANGE	MIS_DATE
FTTB_ACTIVITY_JOURNAL	PK01_FTTB_ACTIVITY_JOURNAL	HASH	CONTRACT_REF_NO
FTTB_CONTRACT_MASTER	IDX01_FTTB_CONTRACT_MASTER	HASH	CONTRACT_REF_NO
FTTB_CONTRACT_MASTER	PK01_FTTB_CONTRACT_MASTER	HASH	CONTRACT_REF_NO
FTTB_CUSTTFR_CONTRACT_D TLS	IDX01_FTTB_CUSTTFR_CON_DTLS	HASH	CONTRACT_REF_NU MBER
FTTB_STOP_PMNT	PK01_FTTB_STOP_PMNT	HASH	CONTRACT_REF_NO
GETB_UTILS	UK01_GETB_UTILS	HASH	USER_REFNO
GETB_UTILS_LOG	PK01_GETB_UTILS_LOG	HASH	SERIAL_NO
GETB_VD_UTILS	PK01_GETB_VD_UTILS	HASH	FACILITY_ID
GETM_LIAB	PK01_GETM_LIAB	HASH	ID

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GETM_LIAB	UI01_GETM_LIAB	HASH	LIAB_NO
GETM_LIAB_CUST	PK01_GETM_LIAB_CUST	HASH	ID
GETM_LIAB_CUST	UI01_GETM_LIAB_CUST	HASH	CUSTOMER_NO
GLTB_CUST_ACCBREAKUP	PK01_GLTB_CUST_ACCBREAKUP	LIST	BRANCH_CODE
GLTB_GL_BAL	PK01_GLTB_GL_BAL	LIST	BRANCH_CODE
GWTB_DEDUPE	DUP_UNQ	HASH	EXT_SYSTEM,MSG_ID_COMPL,MSG_ID_SRC
GWTB_DEDUPE	MSG_REF_PK	HASH	MSG_REF_NO
GWTB_MSG_IN_LOG	PK01_GWTB_MSG_IN_LOG	HASH	MSG_REF_NO
GWTB_MSG_OUT_LOG	PK01_GWTB_MSG_OUT_LOG	HASH	MSG_REF_NO
ICTB_ACC_PR	IX01_ICTB_ACC_PR	RANGE	BRN,PROCESS
ICTB_ACC_PR	IX02_ICTB_ACC_PR	HASH	ACC
ICTB_ACC_PR	PK01_ICTB_ACC_PR	RANGE	BRN,PROCESS
ICTB_ACC_PR_HISTORY	PK01_ICTB_ACC_PR_HIST	LIST	BRN
ICTB_ADJ_INTEREST	PK01_ICTB_ADJ_INTEREST	LIST	BRN
ICTB_ADJ_INTEREST_HISTORY	PK01_ICTB_ADJ_INTEREST_HISTORY	HASH	ACC
ICTB_BOOK_ERR	IX01_ICTB_BOOK_ERR	LIST	BRN
ICTB_BOOK_ERR	PK_ICTB_BOOK_ERR	HASH	ID
ICTB_CHG_VAL	X1_ICTB_CHG_VAL	LIST	BRN
ICTB_DR_INT_DUE	PK01_ICTB_DR_INT_DUE	HASH	ACC
ICTB_ENTRIES	IX01_ICTB_ENTRIES	RANGE	BRN,PROCESS
ICTB_ENTRIES	PK01_ICTB_ENTRIES	RANGE	BRN,PROCESS
ICTB_ENTRIES_HISTORY	PK01_ICTB_ENTRIES_HISTORY	RANGE	BRN,PROCESS
ICTB_IS_VALS	PK01_ICTB_IS_VALS	LIST	BRN
ICTB_ITM_TOV	IDX_TOV	HASH	ACC
ICTB_PROBLEM_LOG	IX01_IC_PROB_LOG	LIST	BRN
ICTB_PROBLEM_LOG	PK_ICTB_PROBLEM_LOG	HASH	ID
ICTB_UDEVALS	PK01_ICTB_UDEVALS	HASH	COND_KEY
ICTB_UDEVAL_ROW	PK01_ICTB_UDEVAL_ROW	HASH	COND_KEY
ICTM_ACC	PK01_ICTM_ACC	LIST	BRN
ICTM_ACC_PR	PK01_ICTM_ACC_PR	HASH	ACC
ICTM_CHILDTD_DETAILS	PK01_ICTM_CHILDTD_DETAILS	LIST	BRN
ICTW_ACC_PR	IX01_ICTW_ACC_PR	HASH	ACC
ICTW_ACC_PR	IX02_ICTW_ACC_PR	LIST	BRN
ICTW_BACK_IS_VALS	IND_ICTW_BACK_IS_VALS	LIST	BRN
ICTW_MAKE_ROW	PK01_ICTW_MAKE_ROW	HASH	COND_KEY
ISTB_TR_CONTRACTIS	PK01_ISTB_TR_CONTRACTIS	HASH	CONTRACT_REF_NO
ISTB_CONTRACTIS_SWIFT	PK_ISTB_CONTRACTIS_SWIFT	HASH	CONTRACT_REF_NO
ISTB_TR_CONTRACT_DETAILS	PK01_ISTB_TR_CONTRACT_DETAILS	HASH	CONTRACT_REF_NO
ISTB_TR_MSGHO	IND_ISTB_TR_MSGHO	HASH	CONTRACT_REF_NO
ISTB_TR_MSGHO	PK01_ISTB_TR_MSGHO	HASH	CONTRACT_REF_NO
ISTM_TR_INSTR	PK01_ISTM_TR_INSTR	LIST	BRANCH

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MITB_TR_CLASS_MAPPING	PK01_MITB_TR_CLASS_MAPPING	HASH	UNIT_REF_NO
MITM_TR_CUSTOMER_DEFAULT	PK01_MITM_TR_CUSTOMER_DEFAULT	HASH	CUSTOMER
MITM_TR_DEFAULT_CODES	PK_MITM_TR_DEFAULT_CODES	HASH	KEY_ID
MSTB_TR_ARCHIVE_OUT	IND_MSTB_TR_ARCHIVE_OUT	HASH	REFERENCE_NO
MSTB_CONTRACT_CHG_ADVICE	IND_MSTB_CONTRACT_CHG_ADV	HASH	CONTRACT_REF_NO
MSTB_CONTRACT_CHG_ADVICE	PK01_MSTB_CONTRACT_CHG_ADVICE	HASH	CONTRACT_REF_NO
MSTB_TR_DLY_MSG_OUT	IX01_MSTB_TR_DLY_MSG_OUT	LIST	BRANCH
MSTB_TR_DLY_MSG_OUT	IX02_MSTB_TR_DLY_MSG_OUT	HASH	REFERENCE_NO
MSTB_TR_DLY_MSG_OUT	PK01_MSTB_TR_DLY_MSG_OUT	HASH	DCN
MSTB_TR_DLY_MSG_OUT	X9_MSTB_TR_DLY_MSG_OUT	LIST	BRANCH
MSTB_TR_EXT_MSG_OUT	PK01_MSTB_TR_EXT_MSG_OUT	HASH	DCN
MSTB_MSG_PDE_LOG	IND_MSTB_MSG_PDE_LOG	HASH	HASH_VALUE
MSTB_MSG_PDE_LOG	PK01_MSTB_MSG_PDE_LOG	HASH	DCN
MSTB_TR_MSG_STAT	IND_MSTB_TR_MSG_STAT	HASH	REFERENCE_NO
MSTB_TR_MSG_STAT	PK_MSTB_TR_MSG_STAT	HASH	REFERENCE_NO
MSTM_TR_CUST_ADDRESS	PK01_MSTM_TR_CUST_ADDRESS	HASH	CUSTOMER_NO
PCTB_CONTRACT_MASTER	IX03_PCTB_CONTRACT_MASTER	LIST	BRANCH_CODE
PCTB_CONTRACT_MASTER	PK01_PCTB_CONTRACT_MASTER	HASH	CONTRACT_REF_NO
SITB_CONTRACT_MASTER	IND_SITB_CONTRACT_MASTER	HASH	USER_REF_NUMBER
SITB_CYCLE_DETAIL	IX01_SITB_CYCLE_DETAIL	HASH	CONTRACT_REF_NO
SITB_CYCLE_DETAIL	PK01_SITB_CYCLE_DETAIL	HASH	CONTRACT_REF_NO
SITB_CYCLE_DUE_EXEC	PK01_SITB_CYCLE_DUE_EXEC	HASH	CONTRACT_REF_NO
SITB_DLY_MSG_OUT	PK01_SITB_DLY_MSG_OUT	HASH	INSTRUCTION_NO
SITB_TR_INSTRUCTION	IND_SITB_TR_INSTRUCTION	HASH	USER_INST_NO
SITB_TR_INSTRUCTION	IX01_SITB_TR_INSTRUCTION	LIST	BRANCH
SITB_TR_INSTRUCTION	PK01_SITB_TR_INSTRUCTION	HASH	INSTRUCTION_NO
SMTB_SMS_ACTION_LOG	PK_SMTB_SMS_ACTION_LOG	HASH	ACTION_SEQUENCE_NO
SMTB_SMS_LOG	PK01_SMTB_SMS_LOG	HASH	SEQUENCE_NO
SMTT_SMS_LOG	IND_SMTT_SMS_LOG	HASH	SEQUENCE_NO
STTB_ACCOUNT	IX01_STTB_ACCOUNT	LIST	BRANCH_CODE
STTB_ACCOUNT	IX02_STTB_ACCOUNT	HASH	ALT_AC_NO
STTB_ACCOUNT	IX03_STTB_ACCOUNT	LIST	BRANCH_CODE
STTB_FIELD_LOG	PK01_STTB_FIELD_LOG	HASH	KEY_ID
STTB_TR_NOTIFICATION	STTB_TR_NOTIFICATION_P01	HASH	PKEY_VALUES
STTB_TR_NOTIFICATION_HISTORY	STTB_TR_NOTIFICATION_HISTORY_P01	HASH	PKEY_VALUES
STTB_NOTIFICATION_LOG	STTB_NOTIFICATION_LOG_P01	HASH	REFERENCE_NO
STTB_RECORD_MASTER	IND1_STTB_RECORD_MASTER	LIST	BRANCH_CODE
STTB_RECORD_MASTER	IND_STTB_REC_MSTR	LIST	BRANCH_CODE

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STTB_RECORD_MASTER	PK_STTB_RECORD_MASTER	HASH	KEY_ID
STTM_ACCOUNT_REPORT_GEN_TIME	PK_STTM_ACCOUNT_REPORT_GEN_TI	HASH	CUST_AC_NO
STTM_TR_ACCSTAT_REPLINES_DTL	PK01_STTM_TR_ACCSTAT_REPLINES_DET	LIST	BRANCH_CODE
STTM_CUSTAC_BAL_NOTIF	PK01_STTM_CUSTAC_BAL_NOTIF	LIST	BRANCH_CODE
TRVW_CUSTOMER	PK01_TRVW_CUSTOMER	HASH	CUSTOMER_NO
STTM_CUST_ACCOUNT	IND1_STTM_CUST_ACCOUNT	LIST	BRANCH_CODE
STTM_CUST_ACCOUNT	IX03_STTM_CUST_ACCOUNT	LIST	BRANCH_CODE
STTM_CUST_ACCOUNT	IX04_STTM_CUST_ACCOUNT	LIST	BRANCH_CODE
STTM_CUST_ACCOUNT	PK01_STTM_CUST_ACCOUNT	HASH	CUST_AC_NO
STTM_CUST_ACCOUNT	UI01_STTM_CUST_ACCOUNT	LIST	BRANCH_CODE
STTM_CUST_ACCOUNT_DORMANCY	IX01_STTM_CUST_ACCOUNT_DORMANC	HASH	CUST_AC_NO
STTM_CUST_DOMESTIC	PK01_STTM_CUST_DOMESTIC	HASH	CUSTOMER_NO
STTM_CUST_PERSONAL	PK01_STTM_CUST_PERSONAL	HASH	CUSTOMER_NO
SVTB_TR_ACCOUNT_HANDOFF	PK01_SVTB_TR_ACCOUNT_HANDOFF	HASH	CONTRACT_REF_NO
SWTB_TXN_HIST	PK01_SWTB_TXN_HIST	HASH	XREF
SWTB_TXN_LOG	PK01_SWTB_TXN_LOG	HASH	XREF
SWTB_TXN_LOG	P_KEY_INDEX	HASH	P_KEY
SWTB_TXN_LOG_HASH	INDX1_SWTB_TXN_LOG_HASH	RANGE	PURGE_DATE
SWTB_TXN_LOG_HISTORY_PAR	PK01_SWTB_TXN_LOG_HPAR	LIST	SEQ_NO
SWTB_TXN_LOG_HIST_HASH	P_KEY_SWTB_TXN_LOG_HIST_HASH	HASH	XREF
SWTB_TXN_LOG_HIST_LIST	P_KEY_INDEX_HIST_LIST	LIST	PROCESS_SEQ_NO
SWTB_TXN_LOG_LIST	P_KEY_INDEX_LIST	LIST	PROCESS_SEQ_NO
SWTB_TXN_LOG_PAR	PK01_SWTB_TXN_LOG_PAR	LIST	SEQ_NO
SWTB_TXN_TIME	PK01_SWTB_TXN_TIME	HASH	XREF
TATB_TR_TXNRULE	PK01_TATB_TR_TXNRULE	HASH	CONTRACT_REF_NO

Following points are to be noted during partitioning:

- Keep the number of partitions same as number of branches for list partitions.

- Exact name of some indexes might be different.

- 'Actb_daily_log and actb_history tables' primary key index has to be recreated as reverse key index without partition as follows:

```
Alter table ACTB_DAILY_LOG drop primary key;
Drop index PK01_ACTB_DAILY_LOG;
Create unique index PK01_ACTB_DAILY_LOG on ACTB_DAILY_LOG
(AC_ENTRY_SR_NO) reverse;
Alter table ACTB_DAILY_LOG add constraint PK01_ ACTB_DAILY_LOG
primary key (AC_ENTRY_SR_NO) using index PK01_ACTB_DAILY_LOG;
```

  - Similarly recreate actb_history primary key as reverse index.

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Following grants are included during application installation:

Sr. No	Default Grants
1	grant create session to &user;
2	grant select on dba_jobs to &user;
3	grant select on dba_jobs_running to &user;
4	grant select on v_$database to &user;
5	grant select on v_$nls_parameters to &user;
6	grant select on v_$parameter to &user;
7	grant select on v_$process to &user;
8	grant select on v_$session to &user;
9	grant select on v_$timer to &user;
10	grant select on v_$instance to &user;
11	grant create database link to &user;
12	grant create library to &user;
13	grant create materialized view to &user;
14	grant create procedure to &user;
15	grant create sequence to &user;
16	grant create synonym to &user;
17	grant create table to &user;
18	grant create trigger to &user;
19	grant create type to &user;
20	grant create view to &user;
21	grant execute on dbms_alert to &user;
22	grant execute on dbms_application_info to &user;
23	grant execute on dbms_aq to &user;
24	grant execute on dbms_aqadm to &user;
25	grant execute on dbms_defer to &user;
26	grant execute on dbms_defer_query to &user;
27	grant execute on dbms_defer_sys to &user;
28	grant execute on dbms_job to &user;
29	grant execute on dbms_lock to &user;
30	grant execute on dbms_pipe to &user;
31	grant execute on dbms_refresh to &user;
32	grant execute on dbms_rls to &user;
33	create public synonym dbms_shared_pool for sys.dbms_shared_pool;
34	grant execute on dbms_shared_pool to &user;
35	grant execute on dbms_sql to &user;
36	grant execute on utl_file to &user;
37	grant select on SYS.TRANSPORT_SET_VIOLATIONS to &user;
38	grant create evaluation context to &user;

39	grant create rule to &user;
40	grant create job to &user;
41	grant create rule set to &user;
42	grant exp_full_database to &user;
43	grant alter tablespace to &user;
44	grant manage tablespace to &user;
45	grant execute on DBMS_FILE_TRANSFER to &user;
46	grant execute on SYS.DBMS_TTS to &user;
47	grant execute on SYS.DBMS_DATAPUMP to &user;
48	grant JAVAUSERPRIV to &user;
49	grant execute on dbms_scheduler to &user;
50	create public synonym UTL_RECOMP for sys.UTL_RECOMP;
51	grant execute on UTL_RECOMP to &user;
52	grant execute on DBMS_MONITOR to &user;
53	grant select on dba_directories to &user;
54	grant execute on DBMS_CRYPTO to &user;
55	grant select on gv_$session to &user;
56	grant create any directory to &user;
57	grant select on SYS.DBA_SCHEDULER_RUNNING_JOBS to &user;
58	grant execute on sys.dbms_redact to &user;
59	grant execute on sys.redaction_policies to &user;
60	grant execute on sys.redaction_columns to &user;
61	grant execute on sys.redaction_values_for_type_full to &user;

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7. Sequence Caching

Sequence Caching is applicable only if Oracle Banking Trade Finance 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 Banking Trade Finance indexes should be recreated cache 500 and noorder. Steps to alter existing sequences as follows:

1. Login to Banking Trade Finance 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 Oracle Banking Trade Finance some of the sequences are recreated as part of end of day batches. Those sequences have to be taken care in TRPKS package. Sequence creation is handled in procedure Pr_Create_Seq and function Fn_Create_Seq_For_Combination. These methods 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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8. 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 Banking Trade Finance 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('FCCBM2')

Here, 'FCCBM2' refers to the Oracle Banking Trade Finance schema.

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

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9. Statistics Collection for Oracle Banking Trade Finance Schema (Recommended Method)

Oracle 12c provides a default scheduled job to collect statistics for the entire database and is default scheduled to run every night. Given that the Oracle Banking Trade Finance 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 Banking Trade Finance Schema.

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

9.1 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(
    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');
```

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```
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

9.2 Customizing Statistics Gathering for Oracle Banking Trade Finance

The default statistics gathering is designed to be generic. It is recommended to customize the default statistics gathering to suit Oracle Banking Trade Finance online and batch.
Following are the areas that would need customization for Oracle Banking Trade Finance:

- Statistics Histograms
- Sample Size of Statistics

9.2.1 Statistics Histograms

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 Banking Trade Finance 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
```

9.2.2 Sample Size of Statistics

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 Oracle Banking Trade Finance tables is not recommended
Configure the default statistics gathered with 100% data coverage.
/* Start of Script – Script to be executed as SYS*/

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```
BEGIN
DBMS_STATS.SET_PARAM('ESTIMATE_PERCENT',100);
END;
/
/* End of Script */
```
Verify the setup using
```
SELECT DBMS_STATS.GET_PARAM('ESTIMATE_PERCENT')
FROM DUAL;
```
Should return
100

9.3 Script to Capture and Lock Stats for Volatile Tables in Oracle Banking Trade Finance Schema

As mentioned in section on Oracle Banking Trade Finance specific Statistic collection, statistics on the volatile tables are critical for performance and the statistics would have to be collected when these volatile tables have data.
The approach to be followed is as follows:

- Identify the time period where these specific tables have maximum data. E.g. ACTB_DAILY_LOG is an accounting table that is volatile. This table is bound to have maximum data (Peak Day of Business/ Month End Day).

- Unlock and Collect Statistics for this specific table on the day of Maximum Volume.

- Lock The statistics

Note: Different Oracle Banking Trade Finance tables might have different days of peak volume and hence the statistics should be collected at different days matching the peak volume for the respective table.
The statistics would have to be monthly refreshed so that the boundary values are refreshed. Lower bound and upper bound values are stored in the data dictionary and out dated boundary values might skew the cost of the SQL.
Use the attached script to capture statistics. The script would have to be run connecting as Oracle Banking Trade Finance schema. The following example uses ACTB_DAILY_LOG as the volatile table. The same script can be used for other tables as well.

```
Spool OBTF_Vol_Table_Stats.txt
SELECT NUM_ROWS, BLOCKS, SAMPLE_SIZE, TO_CHAR(LAST_ANALYZED,'DD-
MON-YYYY HH24:MI:SS')
from USER_TAB_STATISTICS
WHERE TABLE_NAME='ACTB_DAILY_LOG';
exec dbms_stats.unlock_table_stats(USER,'ACTB_DAILY_LOG');
exec
dbms_stats.gather_table_stats(OWNNAME=>USER,tabname=>'ACTB_DAILY_
LOG',METHOD_OPT=>'FOR ALL COLUMNS SIZE 1', CASCADE=>true,
DEGREE=>4);
exec dbms_stats.lock_table_stats(USER,'ACTB_DAILY_LOG');
SELECT NUM_ROWS, BLOCKS,SAMPLE_SIZE,TO_CHAR(LAST_ANALYZED,'DD-
MON-YYYY HH24:MI:SS')
from USER_TAB_STATISTICS
WHERE TABLE_NAME='ACTB_DAILY_LOG';
Spool off
```

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10. Oracle Banking Trade Finance Database Storage Recommendations

Oracle database 10g release 2 onwards, Automatic Storage Management (ASM) is the recommended storage option for Oracle Banking Trade Finance 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.

10.1 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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11. Oracle Banking Trade Finance 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 catalog 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.

11.1 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.

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

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11.2 <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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11.3 <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)
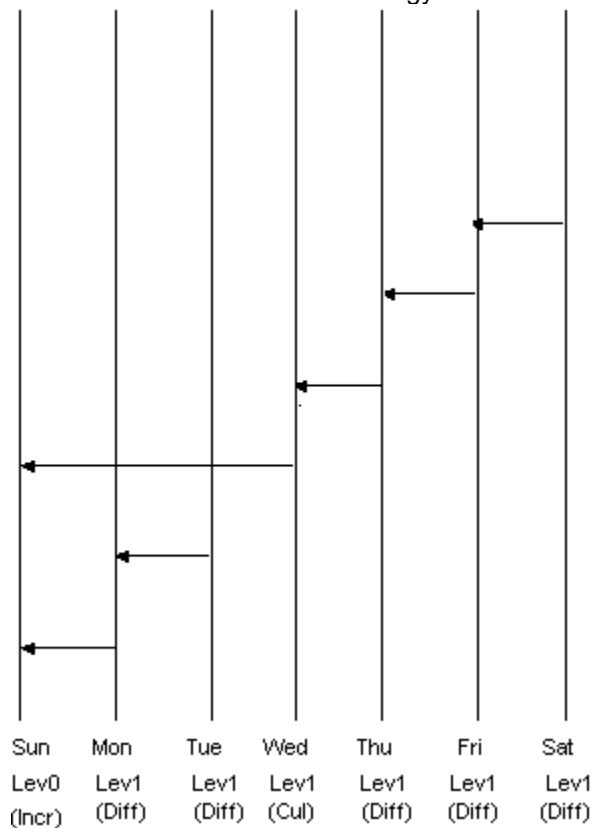
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12. Oracle Banking Trade Finance Periodic Table Maintenance

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
Compress Table: Data of this table is required hence compress table and index data
Recreate Table: These tables and it corresponding indexes needs to be rebuild.

Table Name	Action
ACTB_ACCBAL_HISTORY	Compress Table
ACTB_DAILY_LOG	Recreate table
ACTB_HISTORY	Compress Table
CSTB_MSG_LOG	Truncate Table
DETB_RTL_TELLER	Recreate table
FBTB_TXNLOG_DETAILS_HIST	Truncate Table
ICTB_ENTRIES_HISTORY	Compress Table
ICTB_ICALC_STMT	Recreate table
MITB_CLASS_MAPPING	Compress Table
SMTB_IMAGE_UPLOAD	Truncate Table
SMTB_SMS_ACTION_LOG_HIST	Truncate Table
STTB_FIELD_LOG	Recreate table
STTB_FIELD_LOG_HIST	Truncate Table
STTB_RECORD_LOG	Recreate table
STTM_CUST_IMAGE	Compress Table
SVTM_CIF_SIG_DET	Compress Table
SVTM_UPLOAD_CIF_SIG_DET	Truncate Table
SWTB_TXN_HIST	Recreate table

Note: 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 document FS_OBTF_12.0.2_CO_Purging.docx .

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13. Oracle Banking Trade Finance 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'
ONLINE GL Update	N	select ONLINE_GL_UPDATE from STTM_BANK
VD Balance update	OFFLINE	select param_val from cstb_param where param_name='VDBAL_UPDATE'
CL - Netting - Accrual	Y	select GL_NETTING_ACCR from CLTM_BRANCH_PARAMETERS
CL - Netting - Liquidation	Y	select GL_NETTING_LIQD from CLTM_BRANCH_PARAMETERS
CL - Netting - STCH	Y	select GL_NETTING_STCH from CLTM_BRANCH_PARAMETERS

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14. Appendix

14.1 Script to Check Histograms on Oracle Banking Trade Finance Schema

Following script would have to be executed in the Oracle Banking Trade Finance schema:

```
select distinct table_name
from
(
select table_name from user_tab_columns where histogram!='NONE'
)
```

Should return **No Records**

14.2 Script to Remove Histograms on Oracle Banking Trade Finance Schema

Following script would have to be executed in the Oracle Banking Trade Finance 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
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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