

Release Notes for Oracle TimesTen In-Memory Database 6.0.8

Part Number B25282-08

This document provides late-breaking information as well as information that is not yet part of the formal documentation.

To install the Oracle TimesTen In-Memory Database, run `setup` from the installation media pack.

For installation information, please see the *Installation Guide* (named `install.pdf`). This file is located in the `doc` directory of the root of the installation media pack.

1. Platforms

Oracle TimesTen In-Memory Database is supported in these environments:

- Solaris 8, 9 and 10 32-bit and 64-bit for UltraSparc architecture CPUs. Compiled with Workshop 5. Tested with Workshop 5 and 6 and gcc 3.2.3.
- Solaris 10 32-bit and 64-bit for AMD64 CPUs. Compiled and tested with the Sun Studio 10 compiler.
- Red Hat Enterprise Linux AS, ES and WS 3 and 4 for Intel IA-32 CPUs. Compiled with gcc 2.96. Tested with gcc 3.0 and 3.2.
- Red Hat Enterprise Linux AS, ES and WS 3 and 4 for Intel Itanium2 CPUs. Compiled and tested with gcc 3.0.4.
- Red Hat Enterprise Linux AS, ES and WS 3 and 4 32-bit and 64-bit for Intel IA-32 and EM64T and AMD64 CPUs. Compiled and tested with gcc 3.2.2.
- MontaVista Linux Carrier Grade 3.1 and 4.0 32-bit and 64-bit for Intel IA-32 and EM64T and AMD64 CPUs. Compiled with gcc 2.96. Tested with gcc 3.0 and 3.2.
- SUSE Linux Enterprise Server 9 32-bit and 64-bit for Intel IA-32 and EM64T and AMD64 CPUs. Compiled with gcc 2.96. Tested with gcc 3.0 and 3.2.
- HP-UX 11i and 11i v2 32-bit and 64-bit for PA-RISC CPUs. Compiled and tested with HP compiler.
- HP-UX 11i v2 (version 11.23) 32-bit and 64-bit for Itanium2. Compiled and tested with HP Compiler.

- Microsoft Windows 2000 (including Terminal Server), Windows XP and Windows Server 2003 32-bit for Intel CPUs. Compiled and tested with Microsoft Visual C++ Release 6.0.
- AIX 5L 5.2 and 5.3 32-bit and 64-bit for POWER systems. Compiled and tested with AIX compiler.
- Tru64 UNIX 5.1B-2 for AlphaChip EV68 CPUs. Compiled and tested with Compaq C/C++ 6.5 compiler.

The Oracle TimesTen In-Memory Database ttClasses library is compiled using the compilers listed below. To use another compiler, you must rebuild the ttClasses library.

- For Solaris platforms, separate libraries are shipped compiled with Sun Workshop 5, Sun Workshop 6 and gcc 3.2.3.
- For Linux x86 platforms, separate libraries are shipped compiled with gcc 2.96, gcc 3.2.3 and gcc 3.4.3.
- For Linux 8664 platforms, separate libraries are shipped compiled with gcc 3.2.3 and gcc 3.4.3.
- For all other platforms a single ttclasses library is shipped.

2. Requirements and installation

For software and disk space requirements please refer to the *Installation and Configuration Guide*.

3. Deliverables

You should receive the following with your copy of the Oracle TimesTen In-Memory Database Release 6.0.3:

- **Installation Guide.** This guide describes how to install the Oracle TimesTen Data Server, view the online documentation, perform upgrades and troubleshoot installation problems.
- **Release Notes.** This document (which you are now reading) covers late-breaking information not included in the formal documentation.

- **Oracle TimesTen Media Pack.** The media pack includes the Oracle TimesTen libraries and executables, demo programs, utilities, and online documentation. The documentation included on the media pack consists of:
 - **Oracle TimesTen In-Memory Database Installation Guide (Part Number B25264-03).** (See the description above.)
 - **Oracle TimesTen In-Memory Database Architectural Overview (Part Number B25267-03).** This guide describes all the features of Oracle TimesTen and provides information to help developers plan a Oracle TimesTen application.
 - **Oracle TimesTen In-Memory Database Operations Guide (Part Number B25269-03).** This guide describes how to manage the Oracle TimesTen daemon, run the demo programs and troubleshoot problems with the demo programs. This guide also has a step-by-step tutorial for working with Oracle TimesTen.
 - **Oracle TimesTen In-Memory Database C Developer's and Reference Guide (Part Number B25269-03).** This guide describes how to compile and link your C application with Oracle TimesTen and how to set up and work with Oracle TimesTen data stores. It covers topics that include error handling, event management, performance tuning, and troubleshooting. It also provides a reference for all C language-specific APIs.
 - **Oracle TimesTen In-Memory Database Java Developer's and Reference Guide (Part Number B25266-03).** This guide describes how to compile and link your Java application with Oracle TimesTen and how to set up and work with Oracle TimesTen data stores. It covers topics that include error handling, event management, performance tuning, and troubleshooting. It also provides a reference for Java language-specific APIs.

- **Oracle TimesTen In-Memory Database API and SQL Reference Guide (Part Number B25271-03).** This guide provides a reference of all Oracle TimesTen utilities, procedures, APIs, error messages and other reference information. This guide also describes the SQL that Oracle TimesTen supports, and lists the built-in system constants and limits.
- **TimesTen to TimesTen Replication Guide (Part Number B25272-03).** This guide provides background information to help you understand how Oracle TimesTen replication works and step-by-step instructions and examples that show how to perform the most commonly needed tasks.
- **Cache Connect to Oracle Guide (Part Number B25270-03).** This guide provides background information to help you understand how to create and manage a Oracle TimesTen cache for Oracle data.
- **Oracle TimesTen In-Memory Database Application Server Configuration Guide (Part Number B25268-03).** This guide contains information for configuring Java application servers to work with Oracle TimesTen IMDB.
- **Oracle TimesTen In-Memory Database Recommended Programming Practices for Release 6.0 (Part Number B25273-03).** This guide contains methods for designing a Oracle TimesTen application for maximum stability and performance.
- **Oracle TimesTen In-Memory Database TTClasses Guide (Part Number B25263-03).** This guide describes the Oracle TimesTen C++ Interface Classes library. The library provides wrappers around the most common ODBC functionality.
- **Oracle TimesTen In-Memory Database Troubleshooting Guide (Part Number B25274-03).** This guide describes the Oracle TimesTen C++ Interface Classes library. The library provides wrappers around the most common ODBC functionality.

- **Microsoft ODBC Reference.** This Microsoft book describes the ODBC interface that is used to access Oracle TimesTen data stores. Shipments for UNIX and Windows NT include a reference on ODBC version 2.0. This reference guide is shipped in an online format. Oracle TimesTen supports ODBC version 2.5 on UNIX; the differences between version 2.0 and 2.5 are covered in the *Oracle TimesTen In-Memory Database API and SQL Reference Guide*.
- **Oracle TimesTen In-Memory Database Release Notes.** (See the description above.)

If any of these items is missing, please contact Oracle for TimesTen support. See 7, [“Contacting Oracle for Oracle TimesTen Support.”](#)

4. Advance Notice

4.1 Deprecated items in Release 6.0

These items are supported for backward compatibility in this release and will be removed in a later release. Using deprecated items will result in a warning message.

- SQL_C_ADDR ODBC type has been deprecated.
- The **ttRepDuplicate** and **ttRepDuplicateAcc** utilities have been replaced by **ttRepDuplicateEx**.
- The following name changes for built-in procedures have occurred in this release. The old names have been deprecated.
 - **ttCGGenSQL** to **ttCacheSqlGet**
 - **ttCGMonitor** to **ttCacheMonitor**
 - **ttCacheSetMemoryThreshold** to **ttCacheAgingMemoryThresholdSet**
 - **ttCacheSetAgingInterval** to **ttCacheAgingIntervalSet**
 - **ttCachePropagateFlag** to **ttCachePropagateFlagSet**
 - **ttOracleAgentStart** to **ttCacheStart**
 - **ttOracleAgentStop** to **ttCacheStop**

- **ttOracleAgentPolicy** to **ttCachePolicy**
- **ttCacheSetAgingInterval** to **ttCacheAgingIntervalSet**
- **ttAdmin -oracleUidPwdSet** to **ttAdmin -cacheUidPwdSet**
- The following command line changes to the arguments for **ttAdmin**, **ttMigrate** and **ttRepAdmin** -duplicate have occurred in this release. The old argument names have been deprecated.
 - **-oracleUid** to **-cacheUid**
 - **-oraclePwd** to **-cachePwd**
 - **ttAdmin -oracleUidPwdSet** to **ttAdmin -cacheUidPwdSet**
 - **ttAdmin -oraAgentStart** to **ttAdmin -cacheStart**
 - **ttAdmin -oraAgentStop** to **ttAdmin -cacheStop**
 - **ttAdmin -oraAgentPolicy** to **ttAdmin -cachePolicy**
- The **ttIsql** command **cggensql** has changed to **cachesqlget**. The **cggensql** command has been deprecated.
- The following name changes for SNMP traps have occurred in this release:
 - Ora to Cache
 - Oracle Cache Agent to Cache Agent
 - TimesTen Oracle Connect to Timesten Cache
- The TimesTen script to set environment variables has been changed from **ttVars.bat** to **ttenv.bat**.
- The Timesten **ttSetEnv.csh** and **ttSetEnv.sh** scripts for setting environment variables have been deprecated. The new scripts are **ttenv.csh** and **ttenv.sh**.

5. Changes in This Release

5.1 Changes for Release 6.0.8 from Release 6.0.7

- In previous releases performing multiple parallel ttMigrate operations could result in deadlocks on TimesTen system tables. In this release, TimesTen transparently retries the deadlocked transactions when parallel ttMigrate operations are in progress. (BugDB# 5415417)
- In previous releases the information message “No new connection during shutdown” and “Connect failed” error message could be returned when the cache agent shutdown. These messages are no longer returned. (BugDB# 5516612)
- A problem has been fixed where a memory leak could occur after an ALTER REPLICATION ADD or DROP SUBSCRIBER operation. (BugDB# 5563287)
- In previous releases, an assertion would occur when the value of LogFileSize exceeded the maximum allowed. TimesTen now returns an error message. The maximum log file size is 1024. (BugDB# 5592515)
- In previous releases, an error was returned when an ownership conflict occurred on replication elements. In this release, a warning is returned. (BugDB 5596298)
- On Windows, a problem has been fixed where a Compact Installation would install the complete TimesTen installation, when it should only have installed the client. (BugDB# 5605822)
- In previous releases, the checkpoint write rate could spike significantly above the value set in the CkptRate data store attribute. This generally occurred after a drop in the checkpoint rate. This problem has been fixed. (BugDB# 5613064)
- A problem has been fixed where the checkpoint status was being marked as complete when in fact it was incomplete. (BugDB# 5630133)
- A problem has been fixed where a core dump could occur when a SELECT SUM statement was issued on 256 or more columns. (BugDB# 5665250)

- A problem has been fixed where after performing a `ttRepAdmin -duplication` operation, restarting the main TimesTen daemon would result in master-to-master replication being broken in one direction. (BugDB# 5668535)
- A problem has been fixed where TimesTen would not allow a password greater than 24 characters when connecting in Client/Server mode. In this release, the maximum allowed password is 30 characters for both direct connections and Client/Server connections. (BugDB# 5671694)

5.2 Changes for Release 6.0.7 from Release 6.0.6

- A problem that could cause a data store validity check in `sbBlkDirIsContiguous` to fail during checkpoint has been fixed. (BugDB# 5527532)

5.3 Changes for Release 6.0.6 from Release 6.0.5

- Diagnostic information has been added to the TimesTen daemon log to indicate when the TimesTen replication agent has timed out when using Asynchronous WriteThrough (AWT) cache groups. (BugDB# 5358222)
- A problem has been fixed where a `ttRepAdmin -duplicate` operation would fail on IPv6 systems. (BugDB# 5402401)
- A problem has been fixed where a `ttRepAdmin -duplicate` operation on a temporary data store would fail when Access Control was enabled in the TimesTen instance. (BugDB# 5445623)
- In a previous release, child table changes in a TimesTen cache group were not propagated properly to the Oracle database. In this release, the tables are properly propagated to the Oracle database. (BugDB# 5465925)
- In a previous release, TimesTen would not retry an AWT cache group transaction after receiving the Oracle error message: “ORA-12537: TNS: Connection Closed.” In this release the connection is retried after receiving this message. (BugDB# 5470264)

- A problem has been fixed where a Flush Cache Group Statement with a subquery would crash unless the join order specified the cache root table first. (BugDB# 5472902)
- A problem has been fixed where a memory leak in temp space would occur after repeated calls to the **ttRepDuplicate** built-in procedure.(BugDB# 5478527)
- In the 6.0.5 release, when performing a `ttRepAdmin - duplicate` operation between an earlier release of TimesTen and TimesTen 6.0.5, an assert occurred. With this release, duplication operations can occur:
 - From a pre-6.0.5 TimesTen release to TimesTen 6.0.6
 - From TimesTen 6.0.5 to TimesTen 6.0.6 and
 - From TimesTen 6.0.6 to a pre-6.0.5 TimesTen release.
 Duplication operations cannot occur from TimesTen 6.0.5 and pre-6.0.5 TimesTen releases. Duplication from 6.0.6 to 6.0.5 also is not possible. (BugDB # 5505483)

5.4 Changes for Release 6.0.5 from Release 6.0.4

- A problem has been fixed where large truncate operations could cause the system to appear to hang. (BugDB# 5355876)
- A problem has been fixed where replicating sequences could cause row replication to become out of sync between replication peers. However, when creating a replication scheme, a replicated sequence cannot be defined to have the same name with different ranges on peers. (BugDB# 5371337)
- A problem has been fixed where `ttRepAdmin - duplicate` operations would not truncate the log properly, leading to double applies on the subscriber. (BugDB# 5375809)

5.5 Changes for Release 6.0.4 from Release 6.0.3

- Oracle TimesTen In-Memory Database is now supported on MontaVista Linux Carrier Grade Edition 4.0 (both 32-bit and 64-bit).
- TimesTen Cache Connect to Oracle option is now supported on Sun Solaris 10 64-bit (x86 on AMD Opteron).

- In previous releases, the replication conflict file might not contain primary key information on a row that had been deleted. This problem has been fixed. (BugDB# 5101973)
- A problem has been fixed where an assertion could occur when terminating an application if there were more active connections on the data store than the value set by the Connections data store attribute. (BugDB # 5163468)
- A problem has been fixed, where, in rare cases, terminating the main TimesTen daemon (for example with a `kill -9` command) might not cause the data store to become invalidated as it should. (BugDB#5188360)
- A problem has been fixed where the `TO_CHAR` function would incorrectly truncate some values when it should round off. (BugDB # 5201006)
- In previous releases, materialized view maintenance may have had a problem with an `INSERT` or `UPDATE` that specified a `NULL` value to a join column of an outer table. This problem has been fixed. (BugDB # 5204584)
- The `TT_HASH` function has been added to this release (BugDB# 5183359 and 5210393).

The `TT_HASH` function returns the hash value of an expression or list of expressions. This value is the value that would be used by a hash index.

The syntax is:

```
TT_HASH(Expression [, ...])
```

Where *Expression* [, ...] is one or more expressions used to determine the hash value of the expression or list of expressions.

For example, the following query finds the set of rows whose primary key columns hash to a given hash value:

```
SELECT * FROM t1
      WHERE TT_HASH(pkey_col1, pkey_col2,
pkey_col3) = 12345678;
```

Each expression must have a known data type and must be non-nullable. The hash value of the expression depends on both the value of the expression and its type. For example, `TT_HASH` of an `INTEGER` with value 25 may be different

from TT_HASH of a DECIMAL or DOUBLE with value 25. If you specify a list of expressions, the TT_HASH result will depend on the order of the expressions in the list.

Since constants and expressions that are not simple column references are subject to internal typing rules, over which applications have no control, the best way to ensure that TT_HASH computes the desired value for expressions that are not simple column references is to **CAST** the expression to the desired type.

The result type of TT_HASH is INTEGER in 32-bit mode and BIGINT in 64-bit mode.

TT_HASH can be used in a SQL statement anywhere an expression can be used. For example, TT_HASH can be used in a SELECT list, a WHERE or HAVING clause, an ORDER BY clause, or a GROUP BY clause.

The output of error messages, trace messages, and the **ttXactAdmin** utility display the hash value as a signed decimal so that the value matches TT_HASH output.

- In previous releases, the ttBulkCp conversion of INTEGER type data would be incorrect if the value contained a leading zero. This problem has been fixed. (BugDB # 5197511 and 5210691)
- A problem that caused ttBulkCp -i -XP rollback to fail has been fixed. (BugDB # 5240844)
- A problem has been fixed where a deadlock could occur on an ALTER TABLE ADD COLUMN operation or an ALTER TABLE MODIFY DEFAULT operation. (BugDB# 5247346)
- In previous releases, the cache agent could crash when there were more than 20 autorefresh cache group tables. This problem has been fixed. (BugDB # 5358252)
- In previous releases, a LIKE comparison for strings greater than 128 characters could return invalid results. This problem has been fixed. A LIKE comparison can be performed on strings up to 255 characters. (BugDB # 5368795)

- In previous releases, if the **ttlsq** utility received a SIGTERM. (Signal 15) it would wait until the user had pressed ENTER. This problem has been fixed in this release. When ttlsq receives the signal, it rolls back the current transaction and terminates immediately. (BugDB # 5374922)

5.6 Changes for Release 6.0.3 from Release 6.0.2

New features in this release

- The following changes have been made to materialized views in this release:
 - Materialized views where one inner table is outer joined with more than one outer table is not allowed.
 - Aggregate materialized views where GROUP BY columns include one of a self-join table's column are not allowed.
 - Free compiled commands that do materialized view maintenance are now put into a free list separate from regular free compiled commands. The maximum length of both lists can be configured by the user. Free commands beyond the maximum in each list are destroyed based on a least recently deleted policy.
 - Compilation time and space usage for multiple table joins with multiple join conditions has been improved.
 - Compilation of queries with a large IN list have been improved to require less time and space. Execution of a large IN list that uses an index scan is also improved
 - Compilation and execution time has been improved for queries that update a join column of a materialized view. The optimizer now recognizes that there is a one to one mapping between the new and old join row. This is true when either the updated column is part of a non-nullable foreign key that is joined with a primary key of another table or the updated column is in the outer table of an outer join with a unique key on another table and the same condition is true when this other table is joined with another table.
- Performance of certain queries that contain an IN list has been improved in this release.

- The built-in procedure **ttRepDeactivate** has been added in this release. The procedure changes the state of the active data store in an active standby pair from ACTIVE to IDLE, allowing the roles of the active and standby data stores to be reversed when there has been no data store failure.
- The following SNMP traps have been added in this release: **ttRepAgentClockSkewTrap**, **ttCacheAgentFailOverTrap** and **ttCacheRecoveryAutoRefreshTrap**. In addition, the trap, **ttRepSubscriberFailedTrap** is now thrown if sign-on to remote peer fails.
- The demo application `install_dir/demo/appserver/TptbmsAS` is new in this release.

Bug fixes in this release

- A problem has been fixed where an XLA process would cause an assertion in the `sbLogBlkLRNNextLocate` function. (BugDB #4952194)
- Materialized view performance has been improved. (BugDB #4966933)
- In previous releases, first connection attempts by a user not having the ADMIN privilege to a data store created by **ttRestore** or **ttRepAdmin** -duplicate might fail with the error “ADMIN privilege required to alter ForceConnect attribute.” This has been fixed. (QA#20964, BugDB #4987168)
- A problem has been fixed where the TimesTen Server could core dump due to a port scanner problem. (BugDB #5001909)
- For TimesTen utility APIs, the diagnostics attribute is now checked before a warning is issued. (BugDB# 5034188)
- A problem has been fixed where an assertion failure could occur when a join UPDATE statement used table locks. (BugDB #5050279)
- A problem has been fixed where the TimesTen Server could core dump when using ShmIPC. (BugDB #5057932)

- A problem has been fixed where the ttpasswd files were not deleted when uninstalling TimesTen. The files are now deleted at uninstall time. (BugDB # 5060927)
- A problem has been fixed where a deadlock could occur with when updating materialized views if a table lock was acquired on the view, but row locks were used on the detail table(s). (BugDB #5075446)
- In previous releases, under rare circumstances, an attempt to delete a row using an equality search on a primary key defined on at least one non-integer (eg: VARCHAR) column may never terminate if another row with the same hash value is encountered first. This problem has been fixed. (BugDB #5109988)

5.7 Changes for Release 6.0.2 from Release 6.0.1

New features in this release

- Cache Connect to Oracle option to TimesTen is now supported on the AIX 32-bit platform.
- Replication of sequences is supported in this release.
- The ttMigrate utility now supports the `-rename` option, which can be used to restore tables and other objects under a different owner name.
- SQL queries used to define materialized views can now include self-joins and self-outer joins. The performance of materialized view maintenance has been improved. The XLA records generated by materialized view maintenance operations have been changed to match the actual operations performed on the view more closely.
- Cache Connect to Oracle option to TimesTen now supports Oracle Real Application Clusters (RAC) 10g R2.
- The **CkptRate** connection attribute has been added to this release. This allows the user to throttle the checkpoint resource usage by setting the rate at which checkpoint operations are written to disk.
- This release contains a new built-in procedure, **ttCommitLSN**, which returns the log sequence number of the last commit record written by the connection.

- Oracle TimesTen has been tested with the Oracle TopLink object relational persistence framework. Documentation on configuring Oracle TimesTen for Oracle TopLink is included in the *Oracle TimesTen In-Memory Database Java Developer's Guide*.
- Oracle TimesTen is supported with the Hibernate object relational persistence framework. Documentation on configuring Oracle TimesTen for Hibernate is included in the *Oracle TimesTen In-Memory Database Java Developer's Guide*.
- A sample application, **TptbmsAS**, is included in this release. This application shows how to configure Oracle TimesTen to work with application servers.
- Some performance enhancements were made to the JMS/XLA interface.

Bug fixes in this release

- A problem has been fixed where an XLA process could cause an assertion in the **sbLogBlkLRNNextLocate** function. (BugDB #4932719)
- The Oracle TimesTen error message 873 has been improved. It now reads: “Cumulative altered length of inline row (<length>) exceeds limit (8400) The command failed.” (QA incident #20325)
- The **ttMainDaemonDiedTrap** SNMP trap previously reported an empty field for `ttDaePID`. This has been fixed by removing the field from the MIB file (QA incident #20614)
- Performance of the JMS XLA API has been improved in this release over the performance in the 6.0.1 release. (QA incident #21349)
- In previous releases, a memory leak could occur when calling the ODBC function **SQLColumns**. When many tables existed, TEMP space could become exhausted. This problem has been fixed. (QA incident #21360)
- In previous releases, creation of a temporary index could allocate a cursor that would not be released until the transaction committed, causing temporary space usage to

grow. This problem has been fixed.(QA incident #21542 and #21545)

- When running earlier versions of Oracle client with an Oracle 10gR2 server, the cache agent may crash with a core file if the user tries to drop and recreate a cache group that is being autorefreshed. This is due to an Oracle client bug. See Metalink Note 342791.1. or Bug 4499298. The bug fix requires upgrading the Oracle server to version Oracle10g R2 10.2.0.1.0 or greater. It also requires upgrading the Oracle client to one of the following versions or greater. The workaround is to shutdown the cache agent before recreating the cache group, and restart the cache agent afterwards. (QA incident #21578)
- In previous releases, inefficient optimizer plans were used for queries containing NOT IN clause. This problem has been fixed. (QA incident #21636)

5.8 Changes for Release 6.0.1 from Release 6.0.0

- This release is now supported on Solaris/x86 version 5.10 (Solaris 10) platform, with support for JDK 5.0. The Cache Connect option is not available on this platform.
- Oracle TimesTen now supports up to 63 subscribers in a replication scheme. An active standby pair can have up to 62 read-only subscribers.
- **ttBlockInfo** is a new built-in procedure. It provides information about perm blocks and the amount of block-level fragmentation in a data store.
- Oracle TimesTen SQL has been changed to be compatible with Oracle TimesTen SQL as follows:
 - The EXTRACT, NUMTODSINTERVAL and NUMTOYMINTERVAL functions are supported.
 - SELECT * FROM DUAL is supported.
 - An UPDATE statement *cannot* contain a FROM clause that specifies tables that supply the update values.
 - The following string functions are *not* supported: SUBSTRING, CHARINDEX, CHAR_LEN.

- A SELECT statement without a FROM clause is *not* supported.
- When used as undelimited object names, the following keywords will result in an error:
 - CASE
 - CONNECTION
 - CROSS
 - DEFAULT
 - DESTROY
 - INNER
 - INTERVAL
 - JOIN
 - LEFT
 - RIGHT
 - WHEN
- **ttStatus** output has been changed to include the ConnectionName values of all connections to the data store. A new option, `-[no]pretty`, enables the old style of output when `-nopretty` is chosen.
- A document (`behaviorchanges.txt`) summarizing behavior changes in this release can be found in the root directory of the installation media pack.
- The scripts for setting environment variables are `ttenv.csh` and `ttenv.sh`.
- The **getObject()** method for fetching values from JMS/XLA MapMessages has been implemented.
- When using XLA, insert, update, and delete operations now report table owner and name when `__TBLOWNER` and `__TBLNAME` mapMessage fields are used.
- The default value of the **SMPOptLevel** first connection attribute has been changed. It is 0 for machines with 1 CPU and 1 on machines with more than one CPU. A value of 0 indicates minimal use of synchronization primitives.
- The default value of the **DurableCommit** general connection attribute has been changed to 0.

Bug fixes in this release

- In previous releases, a replication scheme could not be dropped if master catchup was required. Now a replication scheme or active standby pair can be dropped when master catchup is required if it is the only replication scheme in the store. (QA incident 20178)
- In previous releases, unexpected row locks were sometimes created during select operations. This has been fixed. (QA incident 19110)
- Unnecessary latency to some subscribers in a multi-subscriber replication scheme sometimes occurred because their semaphores were claimed prematurely by a thread to another subscriber. This has been fixed. (QA incident 19916)
- In previous releases, there was a 15-subscriber limit in replication schemes, but it was not enforced when the replication scheme was created. This has been fixed. (QA incident 19300) In addition, the limit has been increased to 63 subscribers. In an active standby pair, the limit is 62 subscribers.
- Starting the daemon through the **ttDaemonAdmin** utility with a read-only log file now produces a warning message. (QA incident 20434)
- In previous releases, using the **ttBulkCp** utility to copy a large table could cause replication to hang. In this release, the default value for the `-xp` option has been changed from 0 to 1000 to avoid this problem. A default value of 0 caused the copy to be handled as a single transaction. (QA incident 18830)
- *TTClasses Guide* has been added to the documentation. (QA incident 20710)
- When using XLA, insert, update, and delete operations now report table owner and name when `__TBLOWNER` and `__TBLNAME` mapMessage fields are used. (QA incident 20749)
- After a non-root installation of Oracle TimesTen IMDB, the files are owned by the user who installed Oracle TimesTen IMDB, and the group is the group of that user. After a root

installation, the files are owned by root, and the group ID is 0 (usually root, depending on the operating system). (QA incident 20711)

5.9 Changes for Release 6.0.0 (from Release 5.1.27)

New features and changes in this release

- Oracle TimesTen provides support for a pair of master data stores and up to 15 read-only subscribers in an active standby pair. This feature enables the user to create a multinode replication topology that guarantees data convergence. When used with return twosafe replication between the active and the standby, it also guarantees no transaction loss in the case of one failure of the active or the standby.
- You can now include or exclude specified tables and cache groups when you create or alter a DATASTORE element replication scheme or an active standby pair.
- Asynchronous writethrough (AWT) cache groups enable you to insert, update, and delete data so that the changes are automatically propagated from an Oracle TimesTen cache to the Oracle tables. Oracle TimesTen transactions can continue without waiting for a commit from Oracle.
- **ttRepAdmin** -duplicate has been enhanced so that you can choose to keep cache groups intact during duplication by using the -keepCG option.
- Two new features have been added to speed up recovery. The first is a background thread that checkpoints a data store to ensure that recovery will not have to process a large number of log files. Users have control over this thread through the **CkptFrequency** and **CkptLogVolume** data store attributes, and through the **ttCkptConfig()** built-in procedure. The second is the ability to rebuild indexes in parallel as part of the recovery process. Users have control over the degree of parallelism through the **RecoveryThreads** data store attribute.
- The performance of the **ttRepDuplicateEx** utility API and of the **ttRepAdmin** -duplicate utility have improved in this release. In addition, users can now compress data and

control the flow of data sent across the network during a data store duplicate operation.

- UTF-16 encoding is supported.
- Improvements have been made to the Oracle TimesTen installation directory structure:
 - The *install_dir/bin* directory now contain *ttEnv.sh* and *ttEnv.csh* scripts that set environment variables for working with Oracle TimesTen. Formerly, these scripts resided only in the *install_dir/demos* directory. Those scripts have been renamed *ttdemoenv.sh* and *ttdemoenv.csh*
 - The *install_dir/demo* directory has been restructured to include demos used as examples in the Oracle TimesTen documentation. These demos are found in the directory *install_dir/demo/tutorial*.

In addition, the demo directory now includes the following new items:

- The *ttclasses* directory
- *TTJdbcExamples.java*
- *ttShop.java* (if you install Cache Connect to Oracle)
- *build.xml* -An Ant makefile for Java demos
- WHERE clauses are allowed for read-only cache groups.
- When a cache group is created, the default autorefresh state is now ON instead of PAUSED.
- Cache groups must be manually loaded after creation. Autoloading is no longer available.
- A LOAD CACHE GROUP or REFRESH CACHE GROUP statement must contain a COMMIT EVERY *n* ROWS clause if the WITH ID clause is not present. It must not contain a COMMIT EVERY *n* ROWS clause if the WITH ID clause is present.
- A LOAD CACHE GROUP or REFRESH CACHE GROUP statement can be issued on an autorefresh cache group if the LOAD/REFRESH statement does not contain a WHERE clause and the autorefresh state of the cache group is

PAUSED. LOAD and REFRESH operations require the cache agent to be running unless logging is off.

- The LOAD CACHE GROUP and REFRESH CACHE GROUP statements require that the cache agent be running unless logging is turned off.
- Oracle TimesTen can now perform data store checkpoints in the background. Application-initiated checkpoints may collide with these background checkpoints, resulting in error 606.
- The following built-in procedures are new:
 - **ttCacheUidPwdSet** – Sets the cache administration user ID and password
 - **ttCacheUidGet** – Gets the current cache administration user ID
 - **ttCacheAWTThresholdSet** – Sets the threshold for the number of log files that can accumulate before an asynchronous writethrough (AWT) cache group is considered either dead or too far behind to catch up.
 - **ttCacheAWTThresholdGet** – Gets the threshold for the number of log files that can accumulate before an asynchronous writethrough (AWT) cache group is considered either dead or too far behind to catch up.
 - **ttRepStateSet** – Sets the replication state of the data store
 - **ttRepStateGet** – Gets the replication state of the data store
 - **ttRepStateSave** – Indicates that the specified data store with name has moved into the indicated state
 - **ttXlaSubscribe** – Sets persistent XLA tracking of a table
 - **ttXlaUnsubscribe** – Stops persistent XLA tracking of a table
 - **ttXlaDeleteBookmark** – Deletes an XLA bookmark
 - **ttCkptHistory** – Returns information about the last eight checkpoints of the data store

- **ttCkptConfig** – Changes the configuration of the background checkpointer dynamically and returns the currently active settings of the configuration parameters

See the *API and SQL Reference Guide* for details about built-in procedures.

- The following connection attributes are new:
 - **RecoveryThreads** – Specifies the number of threads used to rebuild indexes during recovery
 - **PrivateCommands** – Determines if commands are shared between connections
 - **CkptFrequency** – Controls the frequency in seconds that Oracle TimesTen performs a background checkpoint
 - **CkptLogVolume** – Controls the amount of data in megabytes that collects in the log between background checkpoints
 - **ConnectionName** – Allows the user to attach a symbolic name to a given data store connection.

See the *API and SQL Reference Guide* for details.

- Oracle TimesTen SQL has been enhanced as follows:
 - The TRUNCATE TABLE statement enables you to delete the rows from a table without dropping the table.
 - Datetime arithmetic is supported for the DATE, TIME, and TIMESTAMP data types.
 - The INTERVAL data type is partially supported.
 - An UPDATE statement can contain a FROM clause that specifies tables that supply the update values.
 - Default column values can be specified for columns in the CREATE TABLE and CREATE CACHE GROUP statements. Default column values can also be specified for columns added in an ALTER TABLE statement.
 - UNION and UNION ALL are supported.

- SELECT statements with subqueries that return aggregate expressions are supported.
- A SELECT can be specified in a FROM clause.
- NOT EXISTS, NOT IN and quantified comparison can be specified with the ALL quantifier in an OR expression.
- The aggregate of a SELECT query that specifies subqueries with IN, EXISTS, or a quantified predicate with ANY or SOME is supported.
- Nonmaterialized views are supported.
- The following bit operations on binary data types are supported: & (bitand), | (bitor), ^ (exclusive or) and ~ (bitneg).
- The UNIQUE column constraint is supported in the CREATE TABLE and CREATE CACHE GROUP statements.
- CASE expressions can be used to specify a conditional value.
- Empty IN lists are supported.
- Joined tables can be specified in the FROM clause of a SELECT statement.
- The CAST operation can be used for data type conversion.
- The following string functions are supported: SUBSTR or SUBSTRING, INSTR or CHARINDEX, and LENGTH or CHAR_LENGTH.
- Global temporary tables are supported.
- Queries can now return multiple distinct aggregate values.
- The || operator for concatenation of two character strings is supported.
- Oracle Database 10g is supported. The Cache Connect to Oracle option is tested using Oracle Database 10g server version 10.1.0.4.0.
- The following JDBC 2.0 methods are supported: ResultSet.getTimestamp (int columnIndex, Calendar cal)

and PreparedStatement.setTimestamp (int parameterIndex, Timestamp x, Calendar cal)

- JDBC 3.0 is supported.
- JDK 5.0 is supported. JDK 1.3 is no longer supported.
- Solaris 7 is no longer supported.
- XLA has a Java interface for change notification to applications. For more details, see the *Java Developer's and Reference Guide*.
- Information about using Oracle TimesTen IMDB with the JBoss and Weblogic application servers is provided in the *Application Server Configuration Guide*.

Bug fixes in this release

- In previous releases, query optimization of an OR list with a NULL argument and no other valid parameters could result in a failure. This has been fixed. (QA incident 20203)
- In previous releases, incomplete clean-up from a failed block merge resulted in an assertion when one of the blocks was subsequently allocated. This has been fixed so that no assertion occurs. (QA incident 20038)

6. Known Problems and Limitations

6.1 Access Control

- On Windows systems, where Oracle TimesTen has been installed with Access Control enabled, you cannot subsequently perform a “modified” or incremental installation. For example, if you originally installed only the Oracle TimesTen Client and later wanted to install the Oracle TimesTen Data Manager, you need to first uninstall Oracle TimesTen and reinstall all the components you wish to have on your system.

6.2 Installing and Uninstalling Oracle TimesTen

- The installation process for this release has changed. New batch files must be generated to be used with the `-batch` option to the installer on UNIX. Batch files used for previous releases cannot be used with the 6.0.0 installer.

- On Windows, Oracle TimesTen fails to install successfully if the installation path contains a space. Install in a directory that does not contain any spaces in its name.
- TTClasses is not supported with gcc 3.0 on 64-bit Linux. This is because optimized builds (-O) with gcc 3.0 on 64-bit Linux/IA-64 have been shown to have different (incorrect) runtime behavior (related to exception throw-and-catch), as compared with debug builds on the same platform with the same compiler. Use gcc 2.96 or gcc 3.2 on 64-bit Linux when compiling TTClasses.
- When re-installing Oracle TimesTen, existing `sys.odbcc.ini` and `sys.ttconnect.ini` files are saved as `sys.odbcc.ini.old` and `sys.ttconnect.ini.old` files and new demo files are installed. You must manually merge any additional DSNs that may have been defined after reinstalling.
- If you are installing Oracle TimesTen on a new RedHat Linux system, you may find that it is not enabled for 32-bit applications. According to the Redhat Enterprise Linux installation guide: 'Users of AMD64, Intel^(R) EM64T, and Itanium systems who want support for developing or running 32-bit applications are encouraged to select the Compatibility Arch Support and Compatibility Arch Development Support packages to install architecture specific support for their systems.'
- JDK 5.0 is not available for AIX or for Itanium 64-bit on Linux AS 3.0.

6.3 Cache Connect to Oracle

- When caching data from an Oracle 9.2.0.4 or above database, applications should not DROP a cache group and then immediately recreate the cache group.
- If an autorefresh cache group table has a key column whose name is an Oracle keyword such as `TIMESTAMP`, the user may receive the following error from the `CREATE CACHE GROUP SQL` statement:

```
ORA-06553: PLS-320: the declaration of the type of
this expression is incomplete or malformed rc = -1
```

- Replicating a regular table to a read-only cache group table is not allowed, but the constraint is not enforced in this release.
- When using the Cache Administrator, some actions result in the following error: “Cannot find server or DNS Error”.
- User applications with the passthrough level set to 1 or 2 may behave differently in Oracle TimesTen 6.0.0 because of Oracle TimesTen SQL enhancements. Certain statements may no longer cause a syntax error and will be executed on Oracle TimesTen instead of Oracle.
- On Windows, when using Oracle directory server, the cache agent may encounter an access violation in the Oracle library `orantcp9.dll`. This is a known Oracle problem (ref. Oracle MetaLink Doc ID Note:234794.1). The signature of the problem displays the following failures `0xc0000005 (access violation) in ORANTCP9.dll` or `0x80010105 (unknown exception) in KERNEL32.dll`. The workaround is to use Oracle `tnsnames.ora` instead of the directory server.

6.4 Replication - TimesTen to TimesTen

- The mechanism that replication uses to process IP addresses has changed on the Solaris operating system. If you have configured the file `/etc/inet/ipnodes` to contain any IP address, you must ensure that it contains the same information that is present in the `/etc/hosts` file. Replication cannot process the `/etc/hosts` file if it finds some IP addresses in the `ipnodes` file that are not in the `/etc/hosts` file. If no IP addresses are present in the `ipnodes` file, replication ignores the file and processes the `/etc/hosts` file.
- Due to a defect in TimesTen Cache Connect release 6.0.2, it is not possible to replicate cache groups between release 6.0.2 to any other TimesTen release. Consequently, online upgrades will not work for cache groups between 6.0.2 and any other release of TimesTen.
- Cache groups from Oracle TimesTen release 6.0.2 can only be replicated to another Oracle TimesTen release 6.0.2 store.

- ttMigrate does not support replication schemes that define replication elements on tables that are not present on the local data store.
- Under very rare circumstances, it is possible for a pair of replicated detail tables and their corresponding materialized view to diverge. This divergence can only happen if the materialized view satisfies both of the following conditions:
 - The view definition has 2 or more predicates
 - One of the predicates contains an expression that can generate an exception such as numeric overflow, division by zero or string truncation
 - Replicating an update to a detail table can cause divergence if differences in the order of predicate evaluation on the two data stores cause a predicate to be evaluated and generate an exception only on the receiving data store. The store will then reject the update, resulting in divergence of the detail table and the materialized view. To prevent such divergence, users should avoid replicating materialized views that have predicates that can generate exceptions during expression evaluation. The SQL CAST operator can be used in some cases to avoid arithmetic overflow.
- If you create a new replication scheme in 5.1 or later that uses a DATASTORE ELEMENT, you cannot migrate backwards, for example to 5.0 or 4.5. A scheme involving a DATASTORE ELEMENT created in a Oracle TimesTen release older than 5.1 can be migrated to 5.1 and then migrated back to an older release.
- All Oracle TimesTen data stores that replicate to each other must use the same daemon port number. This port number is set at install time and can be verified using the **ttVersion** utility.
- If you set up replica data stores by running a separate script of **ttRepAdmin** commands on each data store (instead of using **ttRepAdmin -duplicate** or backup and restore), then the scripts must define all the subscriptions and must give the subscriptions in exactly the same order on all replicas.

- Foreign key and uniqueness constraints cannot be checked at the “statement level” if **ttXLAApply** is used to implement replication.
- For replication to work efficiently, it must be able to quickly translate host names of peers into IP addresses. For this to happen efficiently on Windows, make sure that a Windows machine is set up to query either a valid WINS server or a valid DNS server that has correct information about the hosts on the network. In the absence of such servers, static HOST-to-IP entries can be entered in either a

```
%windir%\system32\drivers\etc\hosts or
%windir%\system32\drivers\etc\lmhosts
```

file.

Without any of these four options, a Windows machine resorts to broadcasting, which is extremely slow, to detect peer nodes. Also, if the Windows machine cannot communicate with a defined WINS servers or DNS servers, or if incorrect information is stored on those servers, the hostname resolution will be extremely slow. Use the `ping` command to test whether a host can be efficiently located. The `ping` command should immediately respond if host name resolution is set up properly.

- When changing the state of a replication receiver (that is, to “start” or “stop”) when replication has been configured to use a secondary IP address, a misconfiguration may cause **ttRepAdmin** to print the error: Alter replication with “ALTER REPLICATION ... port 0” failed: TT0907: Unique constraint (REPSTORESIX) violated. This error is caused by replication not recognizing the local data store. This situation can be confirmed by the following query:

```
SELECT * FROM ttrep.ttstores WHERE
is_local_store <> 0x0;
```

If this query returns either no rows, or a row with the data store's main host name set to the result of the “hostname” command rather than the host you specified, you have encountered a configuration problem with `/etc/hosts`.

To correct the problem, you must make sure that the special host name you are using is defined in `/etc/hosts` and that there is an IP address in common between your special host name and the result of the “hostname” command.

Example: your “hostname” command returns “softswitch” and your machine has two Ethernet cards with the addresses 10.10.15.136 and 192.168.15.136. Then the IP addresses defined for “softswitch” should include both IP addresses. You can then configure replication to:

- * Use only one Ethernet card by either the dotted decimal notation for the IP address or a host name that is defined for the desired IP address.
- * Use whichever Ethernet card will reach your other systems by configuring with the name “softswitch.”

6.5 Compilation

- Hangs may occur inside TTClasses code when using Workshop 5 on 64-bit Solaris optimized builds. This can occur when the program involves TTClasses logging (via `TTGlobal::setLogStream()` and/or `TTGlobal::setLogLevel()`). This problem is due to a bug in Workshop 5 related to the synchronization between the C++ and C I/O runtime libraries. It does not occur with Workshop 6 and later versions. A compiler flag “-DSOL64_OSTRSTREAM” can be used (see the Makefile for solaris 64-bit installations) to reduce the likelihood of these hangs; but the hangs cannot be completely eliminated when using Workshop 5.

6.6 Client/Server

- On Unix, when using `ttlocalhost`, a client of one TimesTen instance cannot connect with a server of another TimesTen instance. The workaround is to use `ttShmHost` (shared memory IPC) or `localhost` (127.0.0.1).
- When the client/server connections reach a system-limited maximum, the data store may be invalidated.

- While using shared memory as IPC, the application may see the error message 24 from the Client Driver if the application reaches the system-defined, per process file-descriptor-limit. This may happen during a connect operation to the Client DSN when the `shmat` system call fails because the application has more open file descriptors than the system-defined per-process file-descriptor-limit.

6.7 Connection attributes

- **Preallocate** should be a first connection attribute, but it is implemented as a data store creation attribute.

6.8 Utilities, procedures, and SQL statements

- Certain Oracle TimesTen query restrictions are not checked when a non-materialized view is created. Views that violate those restrictions may be allowed to be created, but an error is returned when the view is referenced later in an executed statement.
- If an application process on HPUX is connected to a Oracle TimesTen data store and if the application process calls the **ttXactIdRollback** utility API for a transaction associated with the same data store, the call may fail due to the inability to attach to the shared memory segment for the data store.
- The fourth argument (“stats”) to the **ttOptSetColIntvlStats** built-in procedure is a compound structure that cannot be parameterized using ODBC functions. This means that a statement such as the following will fail:

```
SQLPrepare(hstmt, "call
ttOptSetColIntvlStats('t1', 'c1', 1, ?)",
SQL_NTS);
```

Similarly, the **ttlsql describe** command fails because the “stats” argument does not have one of the known types.

6.9 ODBC/JDBC

- On HPUX 11 systems, 32-bit JDBC client and direct drivers cannot co-exist in one JVM due to some problems with loading shared libraries.
- If a JDBC application running in a time zone that has Daylight Savings Time selects a non-existent time using

ResultSet.getTimestamp, it gets a time that is an hour behind. For example, in Pacific Standard Time, on the day when the time changes from Standard to Daylight Savings Time, the time between 2:00 a.m. and 2:59 a.m. does not exist. So, if a JDBC application running in Standard Time selects a value of '2002-04-07 02:00:00' using getTimestamp it will get '2002-04-07 01:00:00'.

- Cache Connect to Oracle JDBC applications may deadlock in the Solaris thread library when establishing an Oracle connection. This is due to known bugs in Oracle and Solaris (Oracle bugs 2095266 and 2002293, SUN case id 62645007). This occurs when using Oracle TimesTen Cache Connect to Oracle with the Java JDK 1.4 or greater, on Solaris. The work around on Solaris 8 is to change LD_LIBRARY_PATH to use the alternate thread library in /usr/lib/lwp. For example:
setenv LD_LIBRARY_PATH=
/usr/lib/lwp:\$LD_LIBRARY_PATH

6.10 JNI

- There is a known problem in JNI support with BEA WebLogic JRockit(TM) 1.4.2. As a result, getObject(int columnIndex)/getObject(String columnName) or getBigDecimal(int columnIndex)/getBigDecimal(String columnName) returns a null reference if the underlying column contains all zeroes (.00000). To work around this, use BEA WebLogic JRockit(R) 1.5.0 or access the column using getString(int columnIndex)/getString(String columnName) and pass it to BigDecimal(String val).

7. Contacting Oracle for Oracle TimesTen Support

For information about obtaining technical support for Oracle TimesTen products, go to the following Web address:

<http://www.oracle.com/support/contact.html>

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