

Oracle® TimesTen In-Memory Database

Release Notes

Release 18.1

E61191-23

September 2019

This document provides late-breaking information for **TimesTen 18.1.2.2.0**, as well as information that is not yet part of the formal documentation. The latest version of this document is the `README.html` file in your installation directory.

If you're upgrading to this release from 18.1.1.1.0, please contact Oracle Support.

Release notes may also be updated from time to time in the documentation library at

<https://docs.oracle.com/database/timesten-18.1/>

To install the Oracle TimesTen In-Memory Database, `unzip` the distribution file. For installation information, see *Oracle TimesTen In-Memory Database Installation, Migration, and Upgrade Guide* and the *Oracle TimesTen In-Memory Database Scaleout User's Guide*.

Note:

TimesTen release numbers are reflected in items such as TimesTen utility output, file names, and directory names. These are subject to change with every minor or patch release, and the documentation cannot always be up to date. The documentation seeks primarily to show the basic form of output, file names, directory names, and so on. You can confirm the current release number by executing the `ttVersion` utility.

This document contains the following sections:

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1 Changes in this release

This section lists changes between releases:

- [Changes for Release 18.1.2.2.0 from Release 18.1.2.1.0](#)
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- [Changes for Release 18.1.1.3.0 from Release 18.1.1.2.1](#)
- [Changes for Release 18.1.1.2.1 from Release 18.1.1.2.0](#)
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1.1 Changes for Release 18.1.2.2.0 from Release 18.1.2.1.0

Changes in this release include:

- [New feature](#)
- [Behavior change](#)
- [Bug fixes](#)

1.1.1 New feature

- You can use the `SQLQueryTimeoutMsec` connection attribute to specify the time limit in milliseconds within which the database should execute SQL statements. The value of `SQLQueryTimeoutMsec` can be any integer equal to or greater than 0. The default value is 0. A value of 0 indicates that the query does not time out. This attribute does not stop TimesTen Cache operations that are being processed on an Oracle database. This includes passthrough statements, flushing, manual loading, manual refreshing, synchronous writethrough, and propagating. Both `SQLQueryTimeout` and `SQLQueryTimeoutMsec` attributes are internally mapped to one timeout value in milliseconds. If different values are specified for these attributes, TimesTen retains the value specified by the `SQLQueryTimeoutMsec` connection attribute.
- TimesTen active standby pair replication is supported with Oracle Clusterware 18.1, in addition to Oracle Clusterware 12.2.

1.1.2 Behavior change

- In previous releases, SQL query timeouts were disabled during dynamic load (selecting from an Oracle database and inserting into TimesTen). In this release, SQL query timeouts are honored during dynamic load unless the dynamic load requires a new connection to the Oracle database, in which case the connection is allowed to complete. If the connection completes successfully but the dynamic load times out, the connection will be retained. As in previous releases, this attribute does not stop TimesTen Cache operations that are being processed on an Oracle database. (BugDB)

1.1.3 Bug fixes

- A problem is fixed where a segmentation fault could occur when `TypeMode=1` and a query tries to convert an empty string to a number type. (BugDB #25501615)
- A problem that caused timeouts of materialized views that had self joins of inner tables is fixed in this release. (BugDB #29014221)
- In previous releases, the `ttRestore` utility did not respect the value of the `Preallocate` connection attribute when the value was 1. This problem impacted databases created by using the `ttRepAdmin -duplicate` command or the `ttRestore` utility. This problem is fixed. (BugDB #29214692)
- A problem is fixed where an `ALTER STANDBY PAIR ... DROP SUBSCRIBER` or an `ALTER REPLICATION ... DROP SUBSCRIBER` statement is given priority over user workloads to avoid deadlocks when dropping a subscriber. (BugDB # 29278422)
- A problem is fixed where the output of columns in a Replication Conflict Resolution report were truncated (which were not previously truncated) resulting in the generation of invalid XML in the report. (BugDB #29359698)
- A compilation heap corruption could invalidate the database if the compilation heap header was corrupted. This problem is fixed. (BugDB #29371488)
- A problem has been fixed where replication between hosts that have TimesTen 18.x releases and pre-18.x releases installed could break due to incorrect table aging comparison errors. (BugDB #29456369)
- In previous releases, it was possible for the `ttGridAdmin modelApply` command to delete the current version of the model if the current version of the model was older than the `Retain Days` value. This problem is fixed. (BugDB #29642503)

Before upgrading a grid to the 18.1.2.2.0 release, ensure that you perform these steps:

1. Take note of the current values for `Retain Days` and `Retain Versions` in your grid.

```
% ttGridAdmin gridDisplay
...
Retain Days: 30
Retain Versions: 10
...
```

2. Set the values for `Retain Days` and `Retain Versions` to 0.

```
% ttGridAdmin gridModify -retainDays 0 -retainVersions 0
```

3. After the upgrade, restore the values for `Retain Days` and `Retain Versions` in your grid.

```
% ttGridAdmin gridModify -retainDays 30 -retainVersions 10
```

- A performance issue related to B-tree latch contention has been fixed. (BugDB #29664356)
- A problem is fixed where a complex query returned TimesTen error 4053: Internal error:

Failed to get offset. The command failed. (BugDB #29178157)

- In previous releases, running an anonymous block could result in an internal error. In this release the `ttTraceMon` utility is enhanced to include new traces for PL/SQL compilation. Trace level 1 is for PL/SQL compilation and Trace level 2 is for PL/SQL execution. (BugDB #29863040 - Forward port of BugDB #20625183)
- In previous releases, when recovering from a fuzzy checkpoint after activating replication for the first time, an assertion could occur. This problem is fixed. (BugDB #30025064)
- An assertion failure in the function `sbTupRefCountDecMacro` is fixed in this release. (BugDB #3008138 - Forward port of BugDB #29916932)
- In a previous release, an assertion failure could happen without printing a message to indicate the SQL statement in which the error occurred. In this release, TimesTen prints out the failing SQL statement. (BugDB #30179366 - Backport of BugDB #30119077)

1.2 Changes for Release 18.1.2.1.0 from Release 18.1.1.3.0

Changes in this release include:

- New features
- Behavior change
- Bug fixes

1.2.1 New features

- This release supports Classic TimesTen In-Memory Database, in addition to TimesTen Scaleout.
- This release includes the *Oracle TimesTen In-Memory Database Installation, Migration, and Upgrade Guide*. The procedures for completing an installation have changed since the TimesTen 11.2.2 release.
- You can attempt a re-synchronization of your data if the data distribution process is interrupted or fails to complete. Re-synchronization involves executing the `ttGridAdmin dbDistribute -resync` operation. See "Recovering from a data distribution error" in the *Oracle TimesTen In-Memory Database Scaleout User's Guide* for further details.
- The TimesTen JDBC driver implements the JDBC 4.2 API (Java 8) and is certified to work with Java 8, 9, and 10 runtime environments (JRE). This includes support for standard REF CURSORs, large update counts, `SQLType`, and `DatabaseMetaData` enhancements.
- You can gracefully shut down the database by disconnecting applications in an orderly fashion. On Linux platforms, the new forced disconnect option asynchronously disconnects all connected applications from the database, including those that are idle or unresponsive. See "Disconnecting from a database" in the *Oracle TimesTen In-Memory Database Operations Guide*, "ForceDisconnectEnabled", "Force disconnect" for Classic, and "Force all connections to disconnect (dbDisconnect)" for TimesTen Scaleout in *Oracle TimesTen In-Memory Database Reference*.

- The `ttCkptHistory` built-in procedure was updated to add information about the number of actual transaction log files purged by a checkpoint and the reason for a transaction log hold. See "Displaying checkpoint history and status" in the *Oracle TimesTen In-Memory Database Operations Guide* for full details.
- Some applications choose incremental autorefresh instead of full autorefresh mode for performance reasons. However, a full autorefresh could still be requested in some situations. You can set the `DisableFullAutorefresh` cache configuration parameter to 1 to disallow any full autorefresh requests for all cache groups defined with incremental autorefresh. See "Disabling full autorefresh for cache groups" in the *Oracle TimesTen Application-Tier Database Cache User's Guide* for details.
- The `PLSQL_SESSION_CACHED_CURSORS` connection attribute specifies the number of session cursors to cache. The default value is 50 and the range is 1-65535. Also see "PLSQL_SESSION_CACHED_CURSORS" in *Oracle TimesTen In-Memory Database Reference*.
- `PLSQL_OPEN_CURSORS` is a `ttDBConfig` parameter that specifies the maximum number of PL/SQL cursors that can be open in a session at one time. The default value is 50 and the range is 1-65535. Also see "ttDBConfig" in *Oracle TimesTen In-Memory Database Reference*.
- For TimesTen Scaleout, you can find proxy connection information by specifying the command `ttGridAdmin dbStatus -proxies`.

1.2.2 Behavior change

- In previous releases, a call to the ODBC 2.5 `SQLColAttribute` function returned a blank field. In this release, a call to `SQLColAttribute` returns the owner name. This is a behavior change.

1.2.3 Bug fixes

- In previous releases, when dropping a table and creating a new table during a replication backlog, the replication agent could transmit work for a table that had been dropped. This problem is fixed. (BugDB #6053644)
- When using asynchronous writethrough under no workload, the AWT sorter thread could consume 100% of the CPU. This problem is fixed. (BugDB #21556263 - ForwardPort BugDB #21452176)
- A deadlock could occur when trying to add a subscriber to a replication scheme. This problem is fixed. (BugDB #26546964 and BugDB #27433418- ForwardPort BugDB #26383257)
- A problem has been fixed where TimesTen would return `Error 8110: Connection not permitted. This store may require master catchup`, when an active store had closed abruptly and the standby was marked failed. (BugDB #27433402 - ForwardPort BugDB #24007219)
- A problem has been fixed where slow performance occurred because the cache agent executed PL/SQL using literal SQL strings instead of bind variables. (BugDB #27444093 - ForwardPort BugDB #25906163)
- This release contains a new built-in procedure for changing the frequency at which "Waiting for latch . . ." messages are printed. The built-in procedure is `ttLatchWaitMsgTimeout`. (BugDB #27692915 - ForwardPort BugDB #27388330)

- A problem is fixed where multiple dynamic load executions from the same TimesTen connection could lead to a memory corruption. (BugDB #27840782 - ForwardPort BugDB #27753072)
- A problem is fixed where connection errors could occur when trying to create many simultaneous client/server connections. (BugDB #28084560)
- A problem is fixed where a full autorefresh could be triggered after manually loading a cache group. (BugDB #28130065 - ForwardPort BugDB #27953067)
- A problem related to reuse of constant expressions in `NVL` and `CAST` clauses of a `SELECT` operation is fixed in this release. (BugDB #28361914 - ForwardPort BugDB #28325161)
- An assertion could occur when a `CREATE VIEW` operation returned long view query results. This problem is fixed. (BugDB #28640816 - ForwardPort BugDB #28618970)
- A problem is fixed where memory from one shared cursor could consume most of the memory specified by the `PLSQL_MEMORY_SIZE` connection attribute and TimesTen would return error 4030. (BugDB #28715222 - ForwardPort BugDB #18829074)
- A problem is fixed where the `ttRepAdmin -showstatus -detail` command could show multiple entries for the same peer relationship and return confusing output. (BugDB #28716671)
- An assertion failure that could occur at SQL parsing and at heap compilation when querying system tables now returns an error instead of asserting. (BugDB #28717010 and #27976616- ForwardPort BugDB #27928747)
- In previous releases, a compilation heap assertion failure could invalidate the database. This problem is fixed. (BugDB #28717013 - ForwardPort BugDB #26535068)
- Performance for certain `SELECT` queries was slower than in an older release of TimesTen. This problem is fixed. (BugDB #28717014 - ForwardPort BugDB #)
- A problem is fixed where a segmentation fault could occur during a query that contained a `CASE` statement and a `GROUPBY` clause. (BugDB #28448399)
- A problem that caused a delay in a log-based catchup (LBCU) operation is fixed. (BugDB #28852175)
- For TimesTen Scaleout, when upgrading from an 18.1.1.x release to this release, there was a problem that would prevent the creation of a duplicate grid management store from the previous release or duplicating a grid management store to the previous release. This problem was fixed. (BugDB #28890812)
- An assertion failure during latch handling that caused database invalidation is fixed in this release. (BugDB #28902021)
- A problem that caused a loop of disconnect failure for log-based catchup (LBCU) operation is fixed in this release. (BugDB #28920075)
- In previous releases, a background checkpoint could fail if the system was waiting on an epoch. This would cause excess log records to accumulate. In this release, TimesTen retries the background checkpoint as soon as possible. (BugDB #28931970 - Forward Port of BugDB #29039498)

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An application using a mini-client produced by `ttmkLiteClient` could core dump when trying to connect. This problem is fixed. (BugDB #29286011)

1.3 Changes for Release 18.1.1.3.0 from Release 18.1.1.2.1

- This release contains new options to the `ttGridAdmin dbStatus` command that provide information about connections. For details, see the *Oracle TimesTen In-Memory Database Reference*.
- A problem is fixed where a query could return different results depending on the position of the optimizer hint. (BugDB #27424470 - Forward port of BugDB #27237541)
- A problem is fixed where TimesTen could return a wrong result for a query with an aggregate push down when concurrent update operations involved tables used in the query. (BugDB #27444108 - Forward port of BugDB #25647667)
- A problem is fixed where an assertion failure could happen during an update operation. (BugDB #28390068 - Forward port of BugDB #28289058)
- In previous releases, if the `ttGridAdmin modelApply` command executed numerous times with a database created, eventually subsequent executions of `ttGridAdmin modelApply` failed. This is fixed. (BugDB #28425254)
- A problem with batch insert with duplicate key is fixed. (BugDB #28522995)

1.4 Changes for Release 18.1.1.2.1 from Release 18.1.1.2.0

- This release contains changes to the client-server driver, that can be used to configure the Oracle connection pool for IMDB Cache, which was added in TimesTen 11.2.2.8.33.
- In previous releases, an import operation (`ttGridAdmin dbImport`) would fail on a grid with multiple instances that had the same instance name. This problem is fixed. (BugDB #28489389 - Backport of BugDB #28488704)

1.5 Changes for Release 18.1.1.2.0 from Release 18.1.1.1.0

Changes in this release include:

- New features
- Bug fixes

1.5.1 New features

- TimesTen Scaleout now contains the `TT_CommitDMLOnSuccess` optimizer option that forces simple DML transactions to commit automatically on both elements of the replica set.
- TimesTen Scaleout includes a new client routing API that enables C and Java client applications to route connections to an element based on the key value for a hash distribution key. This feature

enables the client application to connect to the element that stores the row with the specified key value, avoiding unnecessary communication between the element storing the row and the one connected to your application. For more information, see the *Oracle TimesTen In-Memory Database C Developer's Guide* and *Oracle TimesTen In-Memory Database Java Developer's Guide*.

- This release contains system table and system view changes that are not documented. These changes are reserved for a future release.

1.5.2 Bug fixes

- A problem is fixed where TimesTen returned errors 1699 and 907 on the standby, when there were unique hash indexes on a replicated table. (BugDB #27086859)
- A problem is fixed where the status of the standby database in an active standby pair replication scheme changed to `IDLE` after migration using the `ttMigrate` utility. (BugDB #27433379 - Forward port of BugDB #21124942)
- A problem has been fixed where a deadlock could occur during an `ALTER REPLICATION` operation. (BugDB #27433413 - Forward port BugDB #26050592)
- A problem is fixed where an assertion failure and database invalidation could happen during an update operation. (BugDB #27445399 - Forward port BugDB #27210882)
- A problem is fixed where calling to a particular PL/SQL procedure when the database is empty would throw error `TimesTen: ORA-06508: PL/SQL: Could not find program unit being called.` (BugDB #27509032 - Forward port BugDB #27503945)
- With very large group entries, the daemon startup could fail with a message like "`{groupname}`" is not a valid value for the `-group` option. This problem is fixed. (BugDB #28025300)
- A problem is fixed where a final checkpoint could fail with a negative reference count on a slot inside a tuple page. (BugDB #28094755)
- A problem is fixed where an `INSERT SELECT` operation with a `UNION` would fail to insert some rows. (BugDB #28188267)
- Space allocation latch contention related to point queries such as `SELECT 1 FROM A_TABLE WHERE PK=?` has been fixed. (BugDB #28336156)

1.6 Changes for Release 18.1.1.1.0 from Release 11.2.2.8.29

Changes in this release include:

- New features
- Behavior changes
- Bug fixes

1.6.1 New features

- This release includes a new mode referred to as "TimesTen Scaleout," or "grid." TimesTen Scaleout is a grid of interconnected hosts running TimesTen instances that work together to provide fast, fault tolerance, and high availability for in-memory data. A grid contains one or more databases and each database is distributed across all instances of the grid. The features are documented in the *Oracle TimesTen In-Memory Database Scaleout User's Guide*.

TimesTen Scaleout supports a maximum of 64 instances in this release.

NOTE: Oracle TimesTen In-Memory Database "in classic mode" or "TimesTen Classic" refers to single-instance environments and databases as in previous releases.

- Newly included with this release are these documents: the *Oracle TimesTen In-Memory Database Security Guide*, the *Oracle TimesTen In-Memory Database Scaleout User's Guide*, *Oracle TimesTen In-Memory Database Accessibility Guide* and *Oracle TimesTen In-Memory Database Licensing Information*.
- Installation information for this release is included in the *Oracle TimesTen In-Memory Database Scaleout User's Guide*.
- TimesTen adds ODBC 3.51 core interface conformance to the previous support for ODBC 2.5. If you use a driver manager for ODBC 3.5 applications, you must explicitly specify which ODBC version you are using. In this release, it is advisable to recompile and relink existing ODBC applications. Some applications may require code changes. See "ODBC API incompatibilities with previous versions of TimesTen" in the *Oracle TimesTen In-Memory Database C Developer's Guide* for more details.

1.6.2 Behavior changes

- Cache Advisor is removed from TimesTen in this release.
- Cache grid and all its components are removed in this release.
- Asynchronous WriteThrough cache groups are only supported with active standby pair replication schemes in this release.
- The default value for the `Preallocate` connection attribute is 1.
- The `RangeIndexType` connection attribute is removed in this release. By default, TimesTen uses B-tree indexes.
- The default value for the `ckptFrequency` connection attribute is 0.
- The default value for the `ckptLogVolume` connection attribute is now the value of the `LogFilesize` connection attribute.
- The default value for the `connections` attribute is the minimum of 2000 or the value of the kernel setting `SEMMNS-15`.
- The values returned by some attributes to the ODBC call `SQLGetInfo` are changed. This affects both ODBC and JDBC.

These are the changes to `SQLGetInfo` output:

```

SQL_IUBLE_PROCEDURES  "N"  ==> "Y"
SQL_PROCEDURES          "N"  ==> "Y"
SQL_FETCH_DIRECTION      [Not Supported]  ==> SQL_FD_FETCH_NEXT
SQL_TXN_CAPABLE          [SQL_TC_ALL]  ==> [SQL_TC_DDL_COMMIT]
SQL_MAX_BINARY_LITERAL_LEN [0] ==> [16384]
SQL_MAX_CURSOR_NAME_LEN  [0] ==> [18]
SQL_MAX_INDEX_SIZE        [0] ==> [4194304]
SQL_MAX_ROW_SIZE          [0] ==> [4194304]
SQL_TIMEDATE_FUNCTIONS    Added SQL_FN_TD_NOW to bitmask.
SQL_OWNER_USAGE,          Added SQL_OU_PROCEDURE_INVOCATION  +
SQL_OU_PRIVILEGE_DEFINITION to bitmask.

```

- If the number of columns provided in an `INSERT AS SELECT` statement is less than number of columns in a table, TimesTen now returns error message 843.
- The default value for the `LogBufMB` connection attribute is 1024 MB.
- The default value for the `LogFilesize` connection attribute is now the value of the `LogBufMB` connection attribute.
- The default value for the `CommitBufferSizeMax` is 10 MB per connection.
- The `-delayFkeys` option is removed from the `ttMigrate` utility. In this release, `ttMigrate` always delays the foreign keys check.
- PL/SQL is always enabled.
- Only Oracle mode is supported for duplicate bind mode.
- DDL is always auto-committed.
- `ttDataStoreStatus` builtin procedure did not separately classify client/server connections. This release includes a flag to indicate whether a connection is direct connect or a client server connection.
- In the past, the TimesTen `Connection.setAutoCommit` method would result in a commit whenever it was called, regardless of whether the setting of the `AUTOCOMMIT` flag actually changed. Beginning in this release, there is a commit only when the method call actually changes the setting of `AUTOCOMMIT`.
- Obsolete errors: `sb_ErrCkptBlocked` (606) and `sb_ErrBackupBlocked` (607) are not used anymore. They are replaced by `sb_ErrCkptReserveBlocked` (625). To prevent the new behavior from changing application logic, replace the obsolete errors (606 and 607) with `sb_ErrCkptReserveBlocked` (625).
- The database ID of the latch is now included in the output of `ttxactAdmin -latch` command. This database ID can be used to externally release the latch.
- Error message 907 (Unique constraint violation) is improved to include column names and values.
- The `sb_ErrOcDupKey` error msg is improved to contain the column name and value of the row causing a load or autorefresh failure.
- In this release, TTClasses source code is not shipped with the product. The TTClasses libraries are included in this release. Any discussion of compiling TTClasses in in the *Oracle TimesTen In-*

1.6.3 Bug fixes

- A problem is fixed where performance would slow because commands were accumulated in the command cache instead of being freed. (BugDB #13891496)
- The database ID of the latch was included into the latch name. This database ID can be used to externally release the latch. (BugDB #14578460)
- The WE8DEC character set is not supported in TimesTen. A problem is fixed where users could choose the character set WE8DEC although it is not supported. (BugDB #17557587)
- A problem is fixed where an integer overflow would occur when calling `SELECT COUNT (1)` from a large table. (BugDB #18692578)
- In previous releases, TimesTen returned an `EOF` failure when the database could not be loaded because it was not in the expected location. In this release the error message contains the expected path to the database to help with troubleshooting. (BugDB #18899144)
- An assertion would occur when using `cachesqlget` with `oracle_ddl_tracking`. This problem is fixed. (BugDB #19619587)
- If the wrong `UID/PWD` was provided to a connection attempt and client failover was configured, the connect request would hang for the number of seconds specified by the `TTC_TIMEOUT` connection attribute. In this release an appropriate error is returned. (BugDB #19828640)
- This release contains more diagnostics when an error occurs while checkpointing. (BugDB #19914524)
- A problem is fixed where SQL-92 queries ran slowly. (BugDB #20198488)
- This release contains more diagnostics when TimesTen returns Error 805. (BugDB #20477397)
- A memory leak in the JDBC driver has been fixed. The issue would occur when the daemon was down and the application continuously tried to connect. (BugDB #21225265)
- A problem has been fixed where an invalid out-of-line value would be found in the `sys.CACHE.GROUP` table when attempting to use the `ttRepAdmin -duplicate` command. (BugDB #21260424)
- A problem is fixed where replication would stop replicating to all nodes on a system that involved more than 8 nodes. (BugDB #21695235)
- The `ttCheck` utility failed with Error 15009, when a user logged into the operating system as a user other than the instance administrator, or with Error 7001, when the external user logged in as a user in the same group as the instance administrator. These problems are fixed. (BugDB #24285271)
- In this release, a commit for a replicated transaction that is using either `TWOSAFE` or `RETURN RECEIPT` will not observe any SQL query timeout setting. It will only return after the time indicated by the wait value configured in the replication scheme. (BugDB #25039883)

2 Platforms and configurations

This section includes:

- [Platforms and compilers](#)
- [Client/Server configurations](#)
- [TimesTen Cache](#)
- [Replication configurations](#)

2.1 Platforms and compilers

Platform or operating system	C/C++ compiler support	JDK support
Linux x86-64: • Oracle Linux 6 and 7 • Red Hat Enterprise Linux 6 and 7 • SUSE Enterprise Server 12	Intel icc 14.0.3.174, gcc 4.4.7 and 4.5	Oracle JDK 8, 9, 10, and 11 <small>Foot 1</small> OpenJDK 8, 9, 10, and 11
TimesTen supports Native POSIX threads but not LinuxThreads.		
Microsoft Windows x86-64 (Client only):	Visual Studio 2010 and 2008 Windows	Oracle JDK 8, 9, 10, and 11 JRockit JDK 5 and 6
IBM AIX 64-bit: • AIX 7.1	IBM xlC 13.1.0 Compiler for AIX	IBM JDK 8
MacOS 64-bit: • Darwin 13.1.0	Apple LLVM 5.1, gcc 4.2.1	Oracle JDK 8

Footnote 1 TimesTen `ttjdbcn.jar` files generally include the JDBC driver for use with the JRE version that corresponds to the number in the file name. In the current release, `ttjdbc9.jar`, `ttjdbc10.jar`, and `ttjdbc11.jar` are copies of `ttjdbc8.jar`, implementing JDBC 4.2 (Java 8) only.

TimesTen is supported in virtual machines provided by Oracle VM.

2.2 Client/Server configurations

A TimesTen client on any supported platform can connect to a TimesTen server on any platform where TimesTen is supported.

For configuration details see "Configuring TimesTen Client and Server" in the *Oracle TimesTen In-Memory Database Operations Guide*.

2.3 TimesTen Cache

Oracle TimesTen Application-Tier Database Cache (TimesTen Cache) enables you to cache Oracle Database data in TimesTen. The TimesTen installation includes Oracle Instant Client. TimesTen Cache is supported with TimesTen Classic only.

The following Oracle server releases are supported with the TimesTen Cache option:

- Oracle Database Release 12.1
- Oracle Database Release 12.2
- Oracle Database Release 18c
- Oracle Database Release 19c

2.4 Replication configurations

TimesTen replication is supported only between identical platforms and bit-levels. TimesTen replication is supported with Classic TimesTen only.

TimesTen active standby pair replication is supported with Oracle Clusterware 12.2. It is also supported with 18.1 on the Linux platform. Any reference in the documentation to other Oracle Clusterware releases being supported is incorrect.

For more details, see *Oracle TimesTen In-Memory Database Replication Guide*.

3 Software requirements

For software requirements, refer to *Oracle TimesTen In-Memory Database Scaleout User's Guide*.

4 Documentation

These documents are included in the TimesTen library found at

<https://docs.oracle.com/database/timesten-18.1/>

- **Oracle TimesTen In-Memory Database Release Notes (Part Number E61191).**
- **Oracle TimesTen In-Memory Database Accessibility Guide (Part Number E91401).** This document provides information for the TimesTen In-Memory database production and documentation.
- **Oracle TimesTen In-Memory Database Licensing Information (Part Number E92813).** This document provides information on licensing for all components contained in the TimesTen In-Memory Database.
- **Oracle TimesTen In-Memory Database Introduction (Part Number E61192).** This guide describes the features of Oracle TimesTen Application-Tier Database Cache and provides information to help developers plan an TimesTen Cache application.
- **Oracle TimesTen In-Memory Database Installation, Migration, and Upgrade Guide (Part Number E61193):** Provides information about installing and upgrading TimesTen Classic and migrating between releases.

- **Oracle TimesTen In-Memory Database Scaleout User's Guide (Part Number E61194).** This guide describes the features of TimesTen Scaleout.
- **Oracle TimesTen In-Memory Database Security Guide (Part Number E79756).** This guide describes security recommendations and warnings for using TimesTen In-Memory Database.
- **Oracle TimesTen In-Memory Database Operations Guide (Part Number E61195).** This guide provides information about configuring TimesTen and using the `ttIsql` utility to manage a database. It also provides a basic tutorial for TimesTen.
- **Oracle TimesTen Application-Tier Database Cache User's Guide (Part Number E61196).** This guide provides background information to help you understand how to create and manage Oracle TimesTen Application-Tier Database Cache and cache grid.
- **Oracle TimesTen In-Memory Database Replication Guide (Part Number E61197).** 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. It includes information about TimesTen integration with Oracle Clusterware.
- **Oracle TimesTen In-Memory Database Troubleshooting Guide (Part Number E61198).** This guide describes how to troubleshoot some of the problems users encounter when using TimesTen.
- **Oracle TimesTen In-Memory Database C Developer's Guide (Part Number E61199).** This guide describes how to compile and link your C application with Oracle TimesTen and how to set up and work with Oracle TimesTen databases. It covers topics that include error handling, event management and performance tuning. It also provides a reference for C language-specific APIs.
- **Oracle TimesTen In-Memory Database Java Developer's Guide (Part Number E61200).** This guide describes how to compile your Java application with Oracle TimesTen and how to set up and work with Oracle TimesTen databases. It covers topics that include error handling, event management and performance tuning. It also provides a reference for Java language-specific APIs.
- **Oracle TimesTen In-Memory Database PL/SQL Developer's Guide (Part Number E61201).** This guide describes and explains how to use PL/SQL in the TimesTen database. It is intended for anyone developing PL/SQL-based applications for the Oracle TimesTen In-Memory Database.
- **Oracle TimesTen In-Memory Database TTClasses Guide (Part Number E61202).** This guide describes the Oracle TimesTen C++ Interface Classes library. The library provides wrappers around the most common ODBC functionality.
- **Oracle Data Provider for .NET Oracle TimesTen In-Memory Database Support User's Guide for Windows (Part Number E38358):** Documents ADO.NET data access from .NET client applications to TimesTen databases. This document covers features specific to ODP.NET support of and use with TimesTen.
- **Oracle TimesTen In-Memory Database SQL Reference (Part Number E61203).** This guide contains a complete reference to all TimesTen SQL statements, expressions and functions, including TimesTen SQL extensions.
- **Oracle TimesTen In-Memory Database Reference (Part Number E61204).** This guide provides a reference to all Oracle TimesTen utilities, built-in procedures, attributes and system

limits. Also provides a reference to other features of TimesTen.

- **Oracle TimesTen In-Memory Database System Tables and Views Reference (Part Number E61205).** This document provides a reference for TimesTen system tables and views and replication tables.
- **Oracle TimesTen In-Memory Database PL/SQL Packages Reference (Part Number E61206).** This guide provides a reference to all PL/SQL packages available for use with the TimesTen database. It is intended for anyone developing PL/SQL-based applications for the Oracle TimesTen In-Memory Database.
- **Oracle TimesTen In-Memory Database Error Messages (Part Number E61207).** This guide contains a complete reference to the TimesTen error messages and information about using SNMP traps with TimesTen.
- **Oracle TimesTen In-Memory Database JDBC Extensions Java API Reference (Part Number E61208) and Oracle TimesTen In-Memory Database JMS/XLA Java API Reference (Part Number E61209).** These references describe TimesTen extensions to JDBC classes and interfaces and the TimesTen JMS/XLA package.
- **Oracle SQL Developer Oracle TimesTen In-Memory Database Support Release Notes (Part Number E71315) and Oracle SQL Developer Oracle TimesTen In-Memory Database Support User's Guide (Part Number E71314).** The guide and release notes describe using TimesTen with Oracle SQL Developer.

5 Advance notice

This section lists deprecated items. In this release, using a deprecated feature results in a warning. Deprecated items are permanently removed in a future release.

- Because PL/SQL is now always enabled, the `PLSQL` connection attribute is deprecated.
- Because now only Oracle mode is supported, the `DuplicateBindMode` connection attribute is deprecated.
- Because DDL is now always auto-committed, the `DDLCommitBehavior` connection attribute is deprecated.
- The `ttSyslogCheck` utility is deprecated in this release. (BugDB #29436501)
- The `TT_DECIMAL` data type and the `TIMESTEN8` character set are deprecated in this release.
- Setting the `ReplicationApplyOrdering` connection attribute to a value of `1` is deprecated.
- The `ttSQLCmdCacheInfo2` builtin procedure is removed in this release. The `ttSQLCmdCacheInfo` builtin procedure supports the features of this builtin procedure.
- The `RangeIndexType` connection attribute is deprecated.
- Asynchronous Materialized Views are deprecated in this release.
- The `-convertTypestoTT` and `-convertTypeToora` command line options to the `ttMigrate` utility are deprecated.

- The `TypeMode` connection attribute is deprecated. Oracle type mode is the default.
- The `OPTIMIZED FOR READ` clause of the `CREATE TABLE` statement is deprecated.
- The `ttCompactTS` builtin procedure is deprecated.
- The `CacheGridEnable` connection attribute is removed.
- For `TTClasses`, error checking must now be accomplished through `{try/catch}` blocks. Use of `TTStatus&` method parameters, previously deprecated, is now unsupported, as are the `TTStatus::DO_NOT_THROW` setting and the `-DTTEXCEPT` compiler flag. (Compiling with `-DTTEXCEPT` will not produce an error, but will have no effect.) Application code that previously used `TTStatus&` parameters must be updated, as these parameters are no longer in the method signatures.
- For `TTClasses`, The `TTCmd::RePrepare()` method is deprecated in this release. If the statement handle for a prepared statement becomes invalidated, call the `TTCmd::Prepare()` method again.

6 Known problems and limitations

This section contains known problems and limitations in these categories:

- [TimesTen Scaleout](#)
- [Client/Server](#)
- [JDBC](#)
- [PL/SQL](#)
- [SQL, utilities and procedures](#)
- [SQL*Plus](#)
- [TimesTen OCI support](#)
- [TimesTen Pro*C/C++ Support](#)
- [TTClasses](#)
- [Upgrade](#)
- [Backup/Restore](#)
- [Documentation issues](#)

6.1 TimesTen Scaleout

- TimesTen Scaleout supports a maximum of 64 instances in this release.
- Instances in a grid connect with each other over TCP/IP using ports within the dynamic port range. For this reason any active firewall needs to be configured to allow TCP/IP traffic over all possible ports in each host's dynamic port range. On Linux you can determine the port range as follows:

```
$ cat /proc/sys/net/ipv4/ip_local_port_range
9000      65500
```

In this case the host may allocate ports in the range 9000 through 65500.

- Each process connected to a TimesTen Scaleout database keeps at least one operating system file descriptor open. Additional file descriptors may be opened for a connection when the connection commits or rolls back a transaction. If you receive an error that all file descriptors are in use when attempting to connect to a database, increase the allowable number of file descriptors. (BugDB #25815090)

6.2 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)`.
- 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.

6.3 JDBC

- TimesTen does not support Positioned Updates and Deletes. Calls to `setCursorName` and `getCursorName` methods are ignored.
- If a JDBC application running in a time zone that has Daylight Savings Time selects a nonexistent 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 gets '2002-04-07 01:00:00'.
- SQL statements in JDBC applications should contain only characters from the database character set. Unicode characters not in the database character set are converted to replacement characters during parsing of the query. Potential workarounds include:
 - Using `AL32UTF8` as the database character set.
 - Parameterizing the statement to avoid characters that are not in the database character set in the query text.

6.4 PL/SQL

- `PLSQL_CODE_TYPE=NATIVE` can be specified, but it is implemented as `INTERPRETED`.
- Using `q'` (quoting syntax) is not supported.
- `UTL_FILE` is limited to a temporary directory located in `install_dir/plsql/utl_file_temp`. The instance administrator can grant to `UTL_FILE` to specific database users. Users can reference the

directory using `UTL_FILE` if and only if they provide the string '`UTL_FILE_TEMP`' for the location parameter string.

6.5 SQL, utilities and procedures

- When SQL query timeouts are used (`SQLQueryTimeout` or `SQLQueryTimeoutMsec`), TimesTen behavior is on a best-effort basis. It is not possible to guarantee that the timeout will actually occur within the specified time. (BugDB #29671762)
- TimesTen `BINARY_DOUBLE` and `BINARY_FLOAT` are approximate data types. When storing and retrieving data of these types, the least significant digits may be rounded or truncated. You should avoid using columns of these types in primary keys, unique keys and foreign keys.
- When the same column alias name is used in a view definition and a query that uses the view, TimesTen might incorrectly issue the `TT2210: Column reference of xxx is ambiguous` error. The workaround is to explicitly assign a different column alias name to the column.
- In TimesTen Scaleout, the `ALTER SESSION` statement should return an error when attempting to alter an unsupported feature. Instead, no error is returned.
- The maximum sum of the total number of tables specified in a query and all temporary aggregates needed to handle the query is 32. A temporary aggregate is needed to handle scalar or aggregate subqueries. A query fails with the message `statement that needs more than 31 nesting levels has not been implemented` when the sum of tables and temporary aggregates in a query is greater than 32.
- `COUNT DISTINCT` with `CHAR` type uses binary sorting order and binary comparison semantics even when the `NLS_SORT` attribute was set to a value different than `binary`.
- When the `NLS_SORT` session parameter is set to a multilingual sort (for example, `FRENCH_M`), the `LIKE` operator may produce incorrect results when the pattern match wild-card symbols are applied to the space character.
- If you execute an `ALTER SESSION` statement anytime after the initial connection, you must re-execute the statement after a failover. (BugDB #29444131)

6.6 SQL*Plus

- TimesTen does not support SQL*Plus connections to TimesTen databases. Use `ttIsql`.

6.7 TimesTen OCI support

- If `NLS_LANG` is set to a value that is not supported by TimesTen, spurious errors such as "Cannot connect" may result.

6.8 TimesTen Pro*C/C++ Support

- When compiling a Pro*C/C++ demo, this message may appear: "System default option values taken from: `install_dir/toracle_home/instantclient_11_2/precomp/admin/pcscfg.cfg`."

The path name may be incorrect.

6.9 TTClasses

- TTClasses source code is not shipped with the product. The TTClasses libraries are included in this release. Any discussion of compiling TTClasses in in the *Oracle TimesTen In-Memory Database TTClasses Guide* is not relevant for this release.

6.10 Upgrade

- Enhancements to the replication protocol mean that to perform an online upgrade between 11.2.2.8 and 18.1, the 11.2.2.8 release must be 11.2.2.8.27 or higher. If you are using a version prior to the 11.2.2.8.27, you must upgrade to a newer 11.2.2.8 release and then perform an online upgrade to this release using the documented online upgrade steps.

6.11 Backup/Restore

- Restoring a grid backup (using the `ttGridAdmin dbRestore` command) succeeds only when all instances in the grid are running.

6.12 Documentation issues

- The `ttDistributionProgress` built-in procedure is inaccurately referenced as the `ttDistributeProgress` built-in procedure in the *Oracle TimesTen In-Memory Database Scaleout User's Guide* and the *Oracle TimesTen In-Memory Database Reference*. The example correctly references the `ttDistributionProgress` built-in procedure.
- There are two sections in Chapter 2, "Working with TimesTen Databases in ODBC" in the *Oracle TimesTen In-Memory Database C Developer's Guide* where an incorrect file name is indicated. The `timesten.h` file should be referenced instead of the `ttodbc.h` file in the following sections:
 - The following sentence in the "Creating a grid map and distribution" section should state:
"TimesTen Scaleout includes two new objects for client routing in the `timesten.h` file."
...
◦ Example 2-17 in the "Getting the element location given a set of key values" section should include:
Example 2-17 Client routing API

```
#include <timesten.h>
...

```
- *Oracle TimesTen In-Memory Database Reference* does not yet document the `StandbyNetServiceName` connection attribute. (BugDB #29508533). Here is a description:
Set the `StandbyNetServiceName` attribute to the standby Oracle Service Name of the standby

Oracle database instance from which data is to be loaded into a TimesTen database. This attribute is only used by the cache agent in an Oracle Active Data Guard configuration.

- The `ttIsql monitor` command was inadvertently removed from documentation in the *Oracle TimesTen In-Memory Database Reference*. (BugDB #29508854). It is described as follows:

`monitor [optional_monitor_column]` -- Formats the contents of the `sys.MONITOR` table for easy viewing. If the `optional_monitor_column` is specified, only that column is displayed.

7 Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

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Oracle TimesTen In-Memory Database Release Notes, Release 18.1

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