

Oracle® Data Provider for .NET

Oracle TimesTen In-Memory Database Support User's Guide

12c Release 1 (12.1) for Windows

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Oracle TimesTen In-Memory Database (TimesTen) is a relational database that is memory-optimized for fast response and throughput. The database resides entirely in memory at runtime and is persisted to the file system.

- Oracle TimesTen In-Memory Database in classic mode, or TimesTen Classic, refers to single-instance and replicated databases (as in previous releases).
- Oracle TimesTen In-Memory Database in grid mode, or TimesTen Scaleout, refers to a multiple-instance distributed database. TimesTen Scaleout is a grid of interconnected hosts running instances that work together to provide fast access, fault tolerance, and high availability for in-memory data.
- TimesTen alone refers to both classic and grid modes (such as in references to TimesTen utilities, releases, distributions, installations, actions taken by the database, and functionality within the database).
- TimesTen Application-Tier Database Cache, or TimesTen Cache, is an Oracle Database Enterprise Edition option. TimesTen Cache is ideal for caching performance-critical subsets of an Oracle database into cache tables within a TimesTen database for improved response time in the application tier. Cache tables can be read-only or updatable. Applications read and update the cache tables using standard Structured Query Language (SQL) while data synchronization between the TimesTen database and the Oracle database is performed automatically. TimesTen Cache offers all of the functionality and performance of TimesTen Classic, plus the additional functionality for caching Oracle Database tables.
- TimesTen Replication features, available with TimesTen Classic or TimesTen Cache, enable high availability.

TimesTen supports standard application interfaces JDBC, ODBC, and ODP.NET; Oracle interfaces PL/SQL, OCI, and Pro*C/C++; and the TimesTen TTClasses library for C++.

This document covers only those aspects of ODP.NET that are specific to its use in a TimesTen environment and uses the term *ODP.NET for TimesTen* to refer to ODP.NET support for TimesTen.

For general ODP.NET and related API information, refer to *Oracle Data Provider for .NET Developer's Guide*.

This document covers the following topics:

- [Initial considerations for ODP.NET in a TimesTen environment](#)
- [Getting started with ODP.NET](#)
- [Configuring TimesTen connections for an ODP.NET application](#)

- [Testing your ODP.NET installation with TimesTen](#)
- [Development considerations for ODP.NET with TimesTen](#)
- [ODP.NET namespace and class support with TimesTen](#)

There is also a "[Documentation Accessibility](#)" section at the end of this document.

Initial considerations for ODP.NET in a TimesTen environment

This section discusses points you should be aware of before starting to use ODP.NET with TimesTen Classic, covering the following topics:

- [Environments and TimesTen releases supported by ODP.NET](#)
- [Support for .NET-related features](#)
- [Requirements and prerequisites for using ODP.NET with TimesTen](#)
- [Related documents](#)

Environments and TimesTen releases supported by ODP.NET

This revision of the document is for TimesTen support of the ODP.NET 12.1 release.

Note the following:

- See "[ODP.NET namespace and class support with TimesTen](#)" on page 14 for details of supported namespaces and APIs. ODP.NET 12.1 is available in corresponding Oracle Database or Oracle Data Access Components (ODAC) releases.
- As of this release, ODP.NET for TimesTen can be used in the following environments:
 - ODP.NET for .NET Framework 2.0 with Microsoft .NET Framework 3.5 SP 1 or higher
 - ODP.NET for .NET Framework 4 with Microsoft .NET Framework 4 or 4.5
- ODP.NET for TimesTen can be used on all Microsoft Windows platforms that support TimesTen. Use the 64-bit version of ODP.NET with a 64-bit instance of the TimesTen database or TimesTen client.

Support for .NET-related features

ODP.NET for TimesTen supports a subset of features currently available in ODP.NET for Oracle Database. In particular, as of this release, it supports the following features:

- ODP.NET connection pooling
- ODP.NET tracing

ODP.NET for TimesTen does not currently support these features:

- ADO.NET Entity Framework object relational mapper
- LINQ (Language-Integrated Query)

ODP.NET for TimesTen does not currently support interoperability with the following Oracle Database client components:

- Oracle Developer Tools for Visual Studio
- Oracle Database Extensions for .NET

- Oracle Providers for ASP.NET

Requirements and prerequisites for using ODP.NET with TimesTen

Note the following requirements to use ODP.NET for TimesTen:

- You must install TimesTen Data Manager or TimesTen Client or both on your system. TimesTen is not provided with ODP.NET or OCI.
- PL/SQL must be installed and enabled, which is always the case in TimesTen 18.1.
- ODP.NET 12.1 for TimesTen depends on Oracle Call Interface (OCI) support for TimesTen and requires the version of OCI that is provided with ODP.NET 12.1 releases, not the version provided with TimesTen.

Also see "[Post-installation path considerations](#)" on page 6.

Notes:

- For reference, the OCI version provided with TimesTen is under the `tt_installation_dir\tooracle_home` directory, where `tt_installation_dir` is the TimesTen installation root directory. Do *not* use this version for ODP.NET applications.
 - There is no issue in using the TimesTen version of OCI for OCI or Pro*C/C++ programs that do not use ODP.NET.
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- Requirements for the execution environment to use ODP.NET with Oracle Database apply to using ODP.NET with TimesTen as well. Refer to *Oracle Data Provider for .NET Developer's Guide* for information.

Related documents

Some of the preceding discussion refers to documents in the TimesTen and Oracle Database documentation libraries.

TimesTen documentation is available at
<https://docs.oracle.com/database/timesten-18.1>.

For information about ODP.NET in Oracle 12c Release 1 (12.1), see ".NET and Windows Application Development" under
https://docs.oracle.com/database/121/nav/portal_5.htm

Getting started with ODP.NET

This section discusses the following topics to help you start using ODP.NET. Note that installation steps are not TimesTen-specific.

- [Installing ODP.NET](#)
- [Post-installation path considerations](#)
- [Uninstalling ODP.NET](#)
- [Building an application for ODP.NET](#)

Installing ODP.NET

This section covers the following installations:

- [Install ODP.NET as part of Oracle Database 12.1](#)
- [Install ODP.NET as part of ODAC 12.1 for Windows, OUI version](#)
- [Install ODP.NET as part of ODAC 12.1 for Windows, XCopy version](#)

The installation process for ODP.NET is independent of the TimesTen environment. Nothing is installed into the TimesTen installation directories.

Refer to *Oracle Data Provider for .NET Developer's Guide* for additional information about ODP.NET installation, including associated Windows registry entries.

Important:

- To use ODP.NET for TimesTen, ODP.NET should be installed on the same system as TimesTen Data Manager or TimesTen Client. See "Installation and Management of TimesTen on Windows" in *Oracle TimesTen In-Memory Database Installation, Migration, and Upgrade Guide* for installation information. In addition, a TimesTen DSN must be configured. Refer to "Specifying Data Source Names to identify TimesTen databases" in *Oracle TimesTen In-Memory Database Operations Guide* for information about setting up a DSN.
 - It is recommended, but not required (unless otherwise noted), to remove any previous versions of ODP.NET before installing a new version.
 - After you have completed the installation steps, the location of ODP.NET binaries varies depending on your type of Oracle product installation and version of .NET. Consult *Oracle Data Provider for .NET Developer's Guide* and the ODP.NET README file for information.
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Install ODP.NET as part of Oracle Database 12.1

An Oracle Database installation on Windows includes ODP.NET. No special steps are necessary.

Install ODP.NET as part of ODAC 12.1 for Windows, OUI version

Use these instructions to install ODP.NET as part of the Oracle Universal Installer (OUI) version of Oracle Data Access Components (ODAC) 12.1 releases.

Run OUI by executing its `setup.exe` file, which you can access in the staging directory into which you unzip the ODAC ZIP file for OUI installation, then complete the following steps:

1. In the Select Product Languages dialog, choose your language.
2. In the Specify Oracle Home User dialog, select the appropriate user account.
3. In the Specify Installation Location dialog, specify the desired Oracle base and software location.
4. In the Available Product Components dialog, select Oracle Data Provider for .NET and any other desired components.

Note: Oracle Providers for ASP.NET is not relevant to TimesTen. You can deselect it unless you need it for other purposes.

5. In the ODP.NET (Oracle Data Provider for .NET) dialog, check the box to configure ODP.NET.
6. In the Perform Prerequisites Checks dialog, you can optionally select desired items under "Checks" and refer to the results at the bottom of the dialog.
7. The Summary dialog summarizes the installation settings.
8. In the Install Product dialog, perform the installation.
9. In the Finish dialog, follow any relevant additional instructions in the dialog.

Install ODP.NET as part of ODAC 12.1 for Windows, XCopy version

Use these instructions to install ODP.NET as part of the Oracle XCopy version of Oracle Data Access Components (ODAC) 12.1 releases.

XCopy provides system administrators with an ODP.NET client that is smaller than the standard ODP.NET client and can be configured more easily, with finer-grained control than OUI offers. This makes it more convenient for production deployments to large numbers of computers, and simplifies the embedding of ODP.NET in customized deployment packages.

This installation does *not* use the Oracle Universal Installer. Instead, run the installation by executing the `install.bat` batch file, which you can access in the installation directory into which you unzip the ODAC ZIP file for XCopy installation.

This is a summary of the installation instructions. For further details, refer to `readme.htm`, which is also located in the installation directory.

Important: The `readme.htm` file emphasizes the following points.

- Do not install XCopy over an existing OUI-based Oracle home installation.
 - If you do multiple ODAC product installations to the same directory, specify the same Oracle home name each time.
 - By default, ODAC products and dependencies are installed without a check to see if there are newer product versions already installed.
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Execute `install.bat` to specify the desired ODAC products to install. For example, assuming `C:\oracle\odac` is your installation directory and `odachome` is your Oracle home name for ODAC, use the following command to install the client with only ODP.NET for .NET 2.0 libraries:

```
install.bat odp.net2 C:\oracle\odac odachome
```

Or use this command to install the client with only ODP.NET for .NET 4 libraries:

```
install.bat odp.net4 C:\oracle\odac odachome
```

Alternatively, use the following command to install the client with all ODAC products:

```
install.bat all C:\oracle\odac odachome
```

Post-installation path considerations

In a TimesTen environment, ODP.NET finds and uses the appropriate version of OCI; namely, the Oracle Client version and not the TimesTen Instant Client version. In addition, check the following for your path:

1. Confirm that the `PATH` setting has the location of the TimesTen shared libraries at `timesten_home\bin`, where `timesten_home` is the TimesTen instance home directory. This should follow any other Oracle directories in the path.

Note that on Windows, there is only one TimesTen instance per installation, and `timesten_home` (the instance home) refers to `tt_installation_dir\instance`.

2. For an XCopy installation, add your ODAC installation directory and ODAC installation bin directory to the `PATH` setting, preceding any other Oracle directories, including TimesTen directories. For example, if `C:\oracle\odac` is the installation directory:

```
set PATH=C:\oracle\odac;C:\oracle\odac\bin;%PATH%
```

Note: Refer to the ODP.NET README file for any further information about setting up ODP.NET.

Uninstalling ODP.NET

For information about uninstalling Oracle Database products, including ODP.NET, refer to "Removing Oracle Database Software" in *Oracle Database Installation Guide for Microsoft Windows*.

To uninstall an OUI installation, run `setup.exe` again (refer to "[Install ODP.NET as part of ODAC 12.1 for Windows, OUI version](#)" on page 4). In the OUI welcome page, choose **Deinstall Products**. In the resulting Inventory dialog, select the product or products to uninstall, then choose **Remove**. Then choose **Yes** in the Confirmation and Warning dialogs. Close the Inventory dialog once the products have been uninstalled.

To uninstall an XCopy installation, execute the `uninstall.bat` batch file from your ODP.NET installation directory (refer to "[Install ODP.NET as part of ODAC 12.1 for Windows, XCopy version](#)" on page 5), specifying the product to uninstall (or all products) and the Oracle home name for ODAC products. For example, to uninstall a client with ODP.NET for .NET 2.0 libraries, assuming the Oracle home name is `odachome`:

```
uninstall.bat odp.net2 odachome
```

Or to uninstall all ODAC products:

```
uninstall.bat all odachome
```

Building an application for ODP.NET

You can use the Visual Studio IDE to build your application, or you can use the `csc.exe` command-line compiler executed from the Visual Studio command prompt. The following example uses `csc.exe` (where the input is all one command line):

```
C:\Temp> csc /out:myapp.exe /reference:C:\app\mydir\path\  
Oracle.DataAccess.dll myapp.cs
```

```
Microsoft (R) Visual C# 2005 Compiler version 8.00.50727.3053  
for Microsoft (R) Windows (R) 2005 Framework version 2.0.50727
```

The location of the `Oracle.DataAccess.dll` assembly and dependent libraries is according to your type of Oracle product installation and version of .NET. Refer to *Oracle Data Provider for .NET Developer's Guide* and the ODP.NET README file for information.

Note: Visual Studio is not a runtime requirement of ODP.NET for TimesTen, but you would need a .NET compiler, such as the C# compiler that comes with Visual Studio, to develop applications.

Configuring TimesTen connections for an ODP.NET application

ODP.NET for TimesTen supports multiple simultaneous connections to TimesTen and Oracle databases. Existing applications written for the ODP.NET interface can access TimesTen with a minimal set of changes to their application code.

In a TimesTen environment, ODP.NET uses OCI to interact with the TimesTen database. Therefore, an ODP.NET application can connect to TimesTen using either the `tnsnames` or the *easy connect* naming method, as with Oracle Database. See "Configuring Naming Methods" in *Oracle Database Net Services Administrator's Guide* for information about the `tnsnames` and *easy connect* naming methods beyond what is provided below.

This section covers the following topics:

- [Using the `tnsnames` naming method to connect](#)
- [Using the *easy connect* naming method to connect](#)
- [Configuring whether to use `tnsnames` or *easy connect* naming method](#)
- [Setting TimesTen connection attributes in ODP.NET connection strings](#)

Notes:

- TimesTen does not support distributed transactions through OCI. Therefore, an ODP.NET application cannot use distributed transactions in a TimesTen connection.
 - ODP.NET for TimesTen does not support global runtime load balancing (a feature for Oracle RAC databases) and therefore does not support the connection string attribute setting "`Load Balancing=true`".
 - Error messages associated with connections to TimesTen from an ODP.NET application are based on TimesTen OCI error message mapping. TimesTen OCI errors are propagated to the ODP.NET application as `OracleException` objects. (Also see "OCI error reporting" in *Oracle TimesTen In-Memory Database C Developer's Guide*.)
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Using the `tnsnames` naming method to connect

TimesTen supports `tnsnames` syntax. You can use a TimesTen `tnsnames.ora` entry in the same way you would use an Oracle `tnsnames.ora` entry.

The syntax of a TimesTen entry in the `tnsnames.ora` file is as follows:

```
tns_entry = (DESCRIPTION =
            (CONNECT_DATA =
              (SERVICE_NAME = dsn)
              (SERVER = timesten_direct | timesten_client)))
```

Where `tns_entry` is an arbitrary TNS name you assign to the entry. Note the following:

- `DESCRIPTION` and `CONNECT_DATA` are required as shown.
- For `SERVICE_NAME`, `dsn` must be a TimesTen data source name (DSN) that is defined in the ODBC Data Source Administrator and is visible to the user running the ODP.NET application.
- For `SERVER`, `timesten_direct` specifies a direct connection to a TimesTen database, while `timesten_client` specifies a client/server connection. If you specify `timesten_direct`, then `dsn` must be a TimesTen Data Manager DSN. If you specify `timesten_client`, then `dsn` must be a TimesTen Client DSN.

The following is a sample `tnsnames.ora` entry for a direct connection to the TimesTen database referenced by the DSN `my_dsn`:

```
my_tnsname = (DESCRIPTION =
             (CONNECT_DATA =
              (SERVICE_NAME = my_dsn)
              (SERVER = timesten_direct)))
```

To connect as user `scott` with password `tiger` to the `my_dsn` TimesTen database that is referenced by the `my_tnsname` entry in the `tnsnames.ora` file, specify the following connection string in your ODP.NET application:

```
"User Id=scott;Password=tiger;Data Source=my_tnsname"
```

To connect as the current operating system user to `my_dsn` that is referenced by the `my_tnsname` entry in the `tnsnames.ora` file, specify the following connection string in your ODP.NET application. The current operating system user must be either the TimesTen instance administrator or a defined TimesTen external user.

```
"User Id=/;Data Source=my_tnsname"
```

Note: For TimesTen Classic, you can use the `ttInstanceCreate -tnsadmin` option or the `ttInstanceModify -tns_admin` option (in addition to the `TNS_ADMIN` environment variable) to set the `tnsnames` location.

Using the easy connect naming method to connect

TimesTen supports easy connect syntax, which allows connections to be made without configuring a `tnsnames.ora` entry. The syntax of a TimesTen easy connect string is as follows:

```
host/service_name:server
```

Note the following:

- A host name must be specified to satisfy easy connect syntax, but is otherwise ignored by TimesTen. The name `localhost` is typically used by convention.

- For *service_name*, specify a TimesTen DSN that is defined in the ODBC Data Source Administrator and is visible to the user running the ODP.NET application.
- For *server*, *timesten_direct* specifies a direct connection to a TimesTen database, while *timesten_client* specifies a client/server connection. If you specify *timesten_direct*, then *service_name* must be a TimesTen Data Manager DSN. If you specify *timesten_client*, then *service_name* must be a TimesTen Client DSN.

To establish a direct connection as user *scott* with password *tiger* to the TimesTen database referenced by the *my_dsn* DSN, specify the following connection string in your ODP.NET application:

```
"User Id=scott;Password=tiger;Data Source=localhost/my_dsn:timesten_direct"
```

To establish a direct connection as the current operating system user to the TimesTen database referenced by *my_dsn*, specify the following connection string in your ODP.NET application. The current operating system user must be either the TimesTen instance administrator or a defined TimesTen external user.

```
"User Id=/;Data Source=localhost/my_dsn:timesten_direct"
```

Configuring whether to use tnsnames or easy connect naming method

If a *sqlnet.ora* file is present, it specifies the naming methods to be tried and the order in which to try them. ODP.NET looks for a *sqlnet.ora* file with the following precedence:

1. If the *TNS_ADMIN* environment variable has been set, ODP.NET looks in that specified location.
2. If *TNS_ADMIN* has not been set, ODP.NET looks in the Oracle Database default location, as noted in "Parameters for the *sqlnet.ora* File" in *Oracle Database Net Services Reference*.

If *sqlnet.ora* is found, you can use only naming methods that are indicated there. If *sqlnet.ora* is not found, you can use either the *tnsnames* or easy connect naming method.

In TimesTen, sample copies of the *tnsnames.ora* and *sqlnet.ora* files are in the *tt_installation_dir\network\admin\samples* directory, where *tt_installation_dir* is the TimesTen installation root directory. The following is the *sqlnet.ora* file that TimesTen provides, which supports both the *tnsnames* naming method and the easy connect naming method.

```
# To use ezconnect syntax or tnsnames, the following entries must be
# included in the sqlnet.ora configuration.
NAMES.DIRECTORY_PATH= (TNSNAMES, EZCONNECT)
```

With this setting, ODP.NET first looks for *tnsnames* syntax in your connection strings. If it cannot find *tnsnames* syntax, it looks for easy connect strings.

Important: Oracle Database network libraries are provided with ODP.NET. In a TimesTen environment, ODP.NET does *not* use the copy of the Oracle Database network libraries provided with the Instant Client shipped with TimesTen. (That location, for reference, is *tt_installation_dir\tooracle_home\instantclient_12_1* for the Oracle Database 12.1 Instant Client shipped with TimesTen releases.)

Setting TimesTen connection attributes in ODP.NET connection strings

You can set TimesTen connection attributes within the `Password` setting of your ODP.NET connection string, with syntax as follows:

- Components of the `Password` setting, including the password setting itself and any TimesTen connection attribute settings, are delimited by semi-colons.
- Whenever the `Password` setting has semi-colons, the entire setting must be quoted.
- Because the ODP.NET connection string as a whole is quoted, the begin quotation mark and end quotation mark of the `Password` setting must each be preceded by the `"\"` escape character.

The following example specifies `lion` as the password for user `scott` in TimesTen. It also sets the `TimesTen OraclePWD` connection attribute, which specifies the password `tiger` for user `scott` in Oracle Database, for use of TimesTen Application-Tier Database Cache (TimesTen Cache).

```
"Data Source=mysource;User Id=scott;Password=\"lion;OraclePwd=tiger\"";
```

The next example again specifies `lion` as the password for `scott` in TimesTen. This time, it sets the `TimesTen OracleNetServiceName` connection attribute as well as the `OraclePWD` connection attribute. `OracleNetServiceName` specifies the Oracle ID in Oracle Database, with the `OraclePWD` setting specifying the corresponding password `tiger`. Finally, this example sets the TimesTen passthrough level to 1.

```
"Data Source=mysource;User ID=scott;Password=\"lion;OraclePwd=tiger;OracleNetServiceName=mytest-pc.example.com;passthrough=1\"";
```

(For general information about TimesTen connection attributes, refer to "Connection Attributes" in *Oracle TimesTen In-Memory Database Reference*.)

Note: As always, you can also set TimesTen connection attributes in your TimesTen DSN definition in ODBC Data Source Administrator, as shown in "Managing TimesTen Databases" in *Oracle TimesTen In-Memory Database Operations Guide*. This is not secure, however, so is not advisable for password settings such as the `OraclePWD` attribute.

Testing your ODP.NET installation with TimesTen

Perform the following steps to test ODP.NET with TimesTen in a .NET environment.

You must have a TimesTen installation and access to TimesTen Quick Start sample applications to perform these tests. These instructions also assume you have Visual Studio.

Note: The TimesTen Classic Quick Start is available from the TimesTen GitHub location. There is a complete set of tutorials, how-to instructions, and sample applications.

1. Run the Quick Start `ttquickstartenv.bat` script, a superset of the `ttenv.bat` script typically used for TimesTen setup, to set up your environment.
2. Run the Quick Start `build_sampledb.bat` script. This creates a TimesTen database, `sampledb`, with users and objects.

3. Copy the ODP.NET sample program `DemoODP.cs` to your system.

4. Create a `tnsnames.ora` file that contains the following:

```
sampledb =(DESCRIPTION=(CONNECT_DATA =  
  (SERVICE_NAME = sampledb)(SERVER = timesten_direct)))
```

5. Open Visual Studio Command Prompt and set the environment variable `TNS_ADMIN` to specify the location of the `tnsnames.ora` file you created. For example:

```
>set TNS_ADMIN=c:\mytnsdir\sqlnet
```

6. Navigate to the directory where `DemoODP.cs` was placed and compile the `DemoODP` program. For example:

```
csc /out:DemoODP.exe /reference:C:\path\Oracle.DataAccess.dll DemoODP.cs
```

Notes:

- The location of the `Oracle.DataAccess.dll` assembly and dependent libraries is according to your type of Oracle product installation and version of .NET. Refer to *Oracle Data Provider for .NET Developer's Guide* and the ODP.NET README file for information.
 - The name of the TimesTen sample database in TimesTen 18.1 releases is `sampledb`.
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7. Execute `DemoODP` as follows. (The database name, user name, and password are determined automatically during execution of `build_sampledb.bat`.)

```
DemoODP -db sampledb -user appuser -passwd welcome1
```

This should produce the following output:

```
Start Test  
The employee who got the 10% pay raise was CLARK  
  
Employees in department #50:  
7944, ITMGR, MANAGER, 7839, 10/08/2010 10:34:20 AM, 2500, <NULL>, 50  
7945, DVLPR1, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7946, DVLPR2, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7947, DVLPR3, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7948, DVLPR4, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7949, DVLPR5, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7950, DVLPR6, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7951, DVLPR7, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7952, DVLPR8, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7953, DVLPR9, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
7954, DVLPR10, DEVELOPER, 7944, 10/08/2010 12:00:00 AM, 2000, <NULL>, 50  
Test finished
```

Development considerations for ODP.NET with TimesTen

This section discusses points to be aware of when developing applications to use ODP.NET in a TimesTen environment, covering the following topics:

- [Effects of transaction commits on result sets and REF CURSORS](#)

- [Support for TimesTen built-in procedures](#)
- [Support for VARCHAR2, NVARCHAR2 and VARBINARY data types](#)
- [Support for LOBs](#)
- [Troubleshooting](#)
- [The ttSrcScan utility](#)

Effects of transaction commits on result sets and REF CURSORS

When processing result sets generated from executing statements and creating REF CURSORS, the behavior when transactions in TimesTen connections are committed differs from that when transactions in Oracle Database connections are committed. When a transaction is committed in TimesTen while a result set of an `OracleDataReader` object is open, the result set is closed automatically, unlike in an Oracle database. This applies to explicit commits, autocommit, and implicit commits.

In TimesTen, an implicit commit occurs after a DDL statement. In ODP.NET, an implicit commit also occurs when an `OracleCommand` object is executed without there first being an `OracleTransaction` object instantiated from the command connection. An explicit commit occurs when the `Commit` method is called on an `OracleTransaction` object. In either case, if a commit occurs in a TimesTen connection before a result set that is open in the transaction is completely processed, the "Function sequence error" exception may be thrown.

This difference in behavior is likely to occur when the execution of an `OracleCommand` object is interleaved with the processing of a result set associated with another `OracleCommand` object. To avoid the "Function sequence error" exception, the execution and processing of a result set should be contained exclusively within the context of an `OracleTransaction` object. This prevents a commit from occurring before all rows of the result set are retrieved.

The occurrence of a "Function sequence error" exception may depend on the value of the `FetchSize` property of an `OracleCommand`, `OracleRefCursor` or `OracleDataReader` object. If the `FetchSize` property is not explicitly set or if it is set to a large value, then many rows may be fetched by the application before the "Function sequence error" exception is thrown.

Support for TimesTen built-in procedures

You can call TimesTen built-in procedures directly from TimesTen OCI only for built-ins that do not return a result set. Therefore, this restriction also applies to ODP.NET for TimesTen.

Use an `OracleCommand` instance to call a built-in, as in the following example. This assumes an `OracleConnection` instance `conn` with a connection to TimesTen has been established. Call the `Dispose` method to free resources when you have finished using the `OracleCommand` instance.

```
// switching to passthrough 1 mode using ttOptSetFlag built-in function
string switchModeStmt = "call ttOptSetFlag('passthrough', 1)";
OracleCommand switchCmd = new OracleCommand(switchModeStmt, conn);
switchCmd.CommandType = CommandType.Text;
switchCmd.ExecuteNonQuery();
switchCmd.Dispose();
```

For built-in procedures that do return a result set, the result set would not be accessible directly through ODP.NET. However, you could access it as an OUT parameter if you call the built-in from PL/SQL. Here is an example:

```
int passThruValue = -1;
OracleCommand cmd = conn.CreateCommand();
cmd.CommandText = "declare v_name varchar2(255); begin execute immediate
                  'call ttOptGetFlag(''passthrough'')' into v_name, :rc1; end;";
cmd.Parameters.Add("rc1", OracleDbType.Int32, -1, ParameterDirection.Output);
cmd.ExecuteNonQuery();
passThruValue = Convert.ToInt32(cmd.Parameters[0].Value.ToString());
cmd.Parameters.Clear();
cmd.Dispose();
```

Support for VARCHAR2, NVARCHAR2 and VARBINARY data types

TimesTen VARCHAR2, NVARCHAR2 and VARBINARY types support a maximum of 4 MB of data. ODP.NET for TimesTen supports the transfer of the maximum amount of data for these types (and all other TimesTen SQL types).

Note: ODP.NET 12.1, when used outside of a TimesTen environment, has a 32 KB size limit for character data, increased from a 4 KB limit in previous releases.

Support for LOBs

TimesTen LOB support is limited to the LOB access methods associated with the default 0 (zero) setting of the `InitialLobFetchSize` property of the `OracleDataReader` object. If this property is changed to another value then TimesTen ignores such changes, assuming it retains the 0 setting.

Also refer to "[OracleDataReader class support](#)" on page 18.

Troubleshooting

This section discusses solutions for various exceptions you may encounter when using ODP.NET for TimesTen.

- **Exception "ORA-12154: TNS: Could not resolve the connect identifier specified" or "ORA-12541: TNS: No listener"**

To connect to a TimesTen database from an ODP.NET application, the `Data Source` attribute in the ODP.NET connection string must be set either to the TNS name of a TimesTen entry in the `tnsnames.ora` file or to a TimesTen easy connect string.

If the `tnsnames` naming method is used to connect, verify that an entry in the `tnsnames.ora` file is associated with a TimesTen DSN. Also verify that the `TNS_ADMIN` environment variable is set to the directory where the `tnsnames.ora` file is located.

If the easy connect naming method is used to connect, verify that `service_name` is set to a TimesTen DSN and that `server` is set to either `timesten_direct` or `timesten_client`, depending on whether the DSN configures a direct connection or a client/server connection.

- **Exception "ORA-29158: Unable to open library"**

If you are connecting to a TimesTen database, verify either that the entry in the `tnsnames.ora` file is associated with a TimesTen DSN or that `service_name` in the easy connect string is set to a TimesTen DSN.

This error may also occur due to a path issue, if ODP.NET cannot find the TimesTen ODBC driver, which is located in the TimesTen `timesten_home\install\lib` directory. (Also see the next troubleshooting item.)

- **Exception "ORA-29159: Unable to read library"**

In addition to the steps for ORA-29158 above, verify that the server setting in the `tnsnames.ora` file entry or easy connect string is `timesten_direct` or `timesten_client`, as appropriate for the type of TimesTen DSN.

See "Connecting to a TimesTen database from OCI" in *Oracle TimesTen In-Memory Database C Developer's Guide* for information about `tnsnames.ora` and easy connect.

- **Exception "The application has failed to start because ttcommonxxx.dll was not found. Re-installing the application may fix the problem"**

This indicates that the location of the TimesTen shared libraries at `timesten_home\install\lib` is not in the `PATH` environment variable setting.

Note: Instead of "xxx", the TimesTen release number is indicated. In TimesTen 18.1 releases the file name is `ttcommon181.dll`.

The ttSrcScan utility

If you have an existing ODP.NET application and want to see whether it uses ODP.NET features that TimesTen does not support, you can use the `ttSrcScan` command line utility to scan your program for unsupported functions, types, type codes, attributes, modes, and constants. This is a standalone utility that can be run without TimesTen or Oracle Database being installed and runs on any platform supported by TimesTen. It reads source code files as input and creates HTML and text files as output. If the utility finds unsupported items, then they are logged and alternatives are suggested. Specify an input file or directory for the program to be scanned and an output directory for the `ttSrcScan` reports. Other options are available as well.

The `ttSrcScan` utility is available on the Oracle Technology Network site. See the README file there for additional information.

ODP.NET namespace and class support with TimesTen

This reference section documents support for ODP.NET namespaces and classes in a TimesTen environment.

ODP.NET implements the classes, enumerations, interfaces, delegates, and structures of the `Oracle.DataAccess.Client` and `Oracle.DataAccess.Types` namespaces. The `Oracle.DataAccess.Client` namespace contains implementations of core ADO.NET classes, enumerations for ODP.NET, and ODP.NET-specific classes. The `Oracle.DataAccess.Types` namespace provides classes, structures, and exceptions for Oracle Database native types that can be used with ODP.NET. See *Oracle Data Provider for .NET Developer's Guide* for information about these namespaces beyond what is provided below. You must have access to them in your program as follows:

```
using Oracle.DataAccess.Client;
using Oracle.DataAccess.Types;
```

The following sections list TimesTen support for the ODP.NET classes, enumerations and types of the `Oracle.DataAccess.Client` and `Oracle.DataAccess.Types` namespaces that are documented for ODP.NET 12.1 releases:

- [Oracle.DataAccess.Client namespace support](#)
- [Oracle.DataAccess.Types namespace support](#)

Note: When connecting to a TimesTen database from an ODP.NET application, your application can use only ODP.NET features that correspond to features that TimesTen supports. This is reflected in what is supported for the namespaces discussed here.

For example, you cannot use Oracle Streams Advanced Queuing because TimesTen does not support this feature. `OracleException` objects are thrown when you attempt to use ODP.NET features that are not supported by TimesTen. These exceptions are based on corresponding TimesTen OCI error messages.

Oracle.DataAccess.Client namespace support

The following tables list supported delegates, classes, and enumerations of the `Oracle.DataAccess.Client` namespace.

Table 1 *Oracle.DataAccess.Client namespace delegate support*

Delegate Name	Notes
<code>OracleInfoMessageEventHandler</code>	No notes
<code>OracleRowUpdatedEventHandler</code>	No notes
<code>OracleRowUpdatingEventHandler</code>	No notes

Table 2 *Oracle.DataAccess.Client namespace class support*

Class Name	Notes
<code>OracleClientFactory</code>	No notes
<code>OracleCommand</code>	See " OracleCommand class support " on page 16 for information about TimesTen support for properties and public methods of this class.
<code>OracleCommandBuilder</code>	No notes
<code>OracleConnection</code>	See " OracleConnection class support " on page 17 for information about TimesTen support for properties and public methods of this class.
<code>OracleConnectionStringBuilder</code>	No notes
<code>OracleDataAdapter</code>	The <code>IdentityInsert</code> and <code>IdentityUpdate</code> properties are not supported.
<code>OracleDataReader</code>	See " OracleDataReader class support " on page 18 for information about TimesTen support for properties and public methods of this class.
<code>OracleDataSourceEnumerator</code>	No notes

Table 2 (Cont.) Oracle.DataAccess.Client namespace class support

Class Name	Notes
OracleError	No notes
OracleErrorCollection	No notes
OracleException	No notes
OracleInfoMessageEventArgs	No notes
OracleParameter	No notes
OracleParameterCollection	No notes
OraclePermission	No notes
OraclePermissionAttribute	No notes
OracleRowUpdatedEventArgs	No notes
OracleRowUpdatingEventArgs	No notes
OracleTransaction	See " OracleTransaction class support " on page 20 for information about TimesTen support for properties and public methods of this class.

Table 3 Oracle.DataAccess.Client namespace enumeration support

Enumeration Name	Notes
OracleDbType	No notes
OracleParameterStatus	No notes

The rest of this section presents the following:

- [OracleCommand class support](#)
- [OracleConnection class support](#)
- [OracleDataReader class support](#)
- [OracleTransaction class support](#)

OracleCommand class support

The following tables list supported properties and methods of the OracleCommand class.

Table 4 OracleCommand class property support

Property Name	Notes
AddToStatementCache	No notes
ArrayBindCount	No notes
CommandText	No notes
CommandType	No notes
Connection	No notes
FetchSize	No notes

Table 4 (Cont.) OracleCommand class property support

Property Name	Notes
ImpliedRefCursors	While TimesTen supports the ImpliedRefCursors property, its use is complementary to the ADO.NET Entity Framework, which TimesTen does not support.
Parameters	No notes
RowSize	No notes
Transaction	No notes
UpdatedRowSource	No notes

Note: ODP.NET for TimesTen does not support the InitialLOBFetchSize property. Changing its value has no effect. It is always effectively set to the default value of 0 (zero).

Table 5 OracleCommand class method support

Method Name	Notes
Clone	No notes
CreateParameter	No notes
ExecuteNonQuery	No notes
ExecuteReader	No notes
ExecuteScalar	No notes

OracleConnection class support

The following tables list supported properties and methods of the OracleConnection class.

Table 6 OracleConnection class property support

Property Name	Notes
ConnectionString	No notes
ConnectionTimeout	No notes
DataSource	No notes
ServerVersion	No notes
State	No notes
StatementCacheSize	No notes

Table 7 OracleConnection class event support

Method Name	Notes
StateChange	No notes

Table 8 OracleConnection class method support

Method Name	Notes
BeginTransaction	No notes
ClearAllPools (static method)	No notes
ClearPool (static method)	No notes
Clone	No notes
Close	No notes
CreateCommand	No notes
GetSchema	Returns metadata collections of tables, columns, users, and other objects that allow application developers to discover and enumerate database information. This information is specific to TimesTen and may differ from corresponding metadata collections returned from Oracle Database. For example, TimesTen does not support the <code>JavaClasses</code> and <code>XMLSchemas</code> metadata collections because these object types are not supported by TimesTen.
GetSessionInfo	No notes
Open	No notes
PurgeStatementCache	No notes

Note: TimesTen does not support distributed transactions through OCI. An ODP.NET application cannot use `EnlistDistributedTransaction` or `EnlistTransaction` in a TimesTen connection.

`OracleConnectionType`, an enumeration and public `OracleConnection` class property, allows an ODP.NET application to determine whether a particular connection object is associated with a TimesTen connection, an Oracle Database connection, or no physical connection at all. The property has the following signature:

```
public OracleConnectionType ConnectionType
```

It returns one of the following values from the `OracleConnectionType` enumeration:

`OracleConnectionType.Undefined`: No connection is associated with the `OracleConnection` object

`OracleConnectionType.Oracle`: The `OracleConnection` object is associated with an Oracle database

`OracleConnectionType.TimesTen`: The `OracleConnection` object is associated with a TimesTen database

OracleDataReader class support

The following tables list supported properties and methods of the `OracleDataReader` class.

Table 9 OracleDataReader class property support

Property Name	Notes
Depth	No notes
FetchSize	No notes
FieldCount	No notes
HasRows	No notes
HiddenFieldCount	No notes
IsClosed	No notes
Item	No notes
RowSize	No notes
VisibleFieldCount	No notes

Note: ODP.NET for TimesTen does not support use of the `InitialLOBFetchSize` property. Changing its value has no effect. It is always effectively set to the default value of 0 (zero).

Table 10 OracleDataReader class method support

Method Name	Notes
Close	No notes
Dispose	No notes
GetByte	No notes
GetBytes	No notes
GetChar	No notes
GetChars	No notes
GetDataTypeName	No notes
GetDateTime	No notes
GetDecimal	No notes
GetDouble	No notes
GetFieldType	No notes
GetFloat	No notes
GetInt16	No notes
GetInt32	No notes
GetInt64	No notes
GetName	No notes
GetOracleBinary	No notes
GetOracleBlob	No notes
GetOracleBlobForUpdate	No notes
GetOracleClob	No notes

Table 10 (Cont.) OracleDataReader class method support

Method Name	Notes
GetOracleClobForUpdate	No notes
GetOracleDate	No notes
GetOracleDecimal	No notes
GetOracleString	No notes
GetOracleTimeStamp	No notes
GetOracleValue	No notes
GetOracleValues	No notes
GetOrdinal	No notes
GetProviderSpecificFieldType	No notes
GetProviderSpecificValue	No notes
GetProviderSpecificValues	No notes
GetSchemaTable	No notes
GetString	No notes
GetValue	No notes
GetValues	No notes
IsDBNull	No notes
Read	No notes

OracleTransaction class support

The following tables list supported properties and methods of the `OracleTransaction` class.

Table 11 OracleTransaction class property support

Property Name	Notes
IsolationLevel	No notes
Connection	No notes

Table 12 OracleTransaction class method support

Class Name	Notes
Commit	No notes
Dispose	No notes
Rollback	No notes

Note: TimesTen does not support transaction savepoints.

Oracle.DataAccess.Types namespace support

The following tables list supported structures, exceptions, classes, interfaces, and enumerations of the `Oracle.DataAccess.Types` namespace.

Table 13 Oracle.DataAccess.Types namespace structure support

Structure Name	Notes
OracleBinary	No notes
OracleDate	No notes
OracleDecimal	No notes
OracleString	No notes
OracleTimeStamp	No notes

Table 14 Oracle.DataAccess.Types namespace exception support

Class Name	Notes
OracleTypeException	No notes
OracleNullValueException	No notes
OracleTruncateException	No notes

Table 15 Oracle.DataAccess.Types namespace class support

Class Name	Notes
OracleBlob	No notes
OracleClob	No notes
OracleRefCursor	No notes

Table 16 Oracle.DataAccess.Types namespace interface support

Interface Name	Notes
INullable	No notes

Table 17 Oracle.DataAccess.Types namespace enumeration support

Enumeration Name	Notes
(No enumerations are supported.)	No notes

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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