What’s New for Oracle and .NET
Part 2
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Oracle
Program Agenda – Day 1

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2. NuGet
3. Entity Framework
4. Schema Compare
Program Agenda – Day 2

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ODP.NET, Managed Driver
ODP.NET, Unmanaged Driver Architecture
Managed and Unmanaged Code

Managed

ODP.NET
Oracle.Data
Access.dll

ODP.NET
Unmanaged
DLLs

OCI

NET

Unmanaged

Database

Oracle
ODP.NET, Managed Driver Architecture

Managed

ODP.NET
Oracle.Managed
DataAccess.dll

Database

Oracle
Managed ODP.NET vs. Unmanaged ODP.NET

Benefits of Managed

• One assembly for both 32-bit and x64
• Easier side by side deployment
• Deploy smaller and fewer binaries
  – Before: 150 MB
  – After: Less than 10 MB
• Easier patching process
• Fully integrated with Code Access Security
Managed ODP.NET vs. Unmanaged ODP.NET

Benefits of Unmanaged

• More functionality
  – Will remain so for foreseeable future
  – New features introduced here

• More mature
  – Advantage will decline over time
Managed ODP.NET

• 100% managed provider
• Assembly
  – Oracle.ManagedDataAccess.dll
• No other Oracle Client files required
  – Unless using distributed transactions with .NET 4.5.1 or lower (Oracle.ManagedDataAccessDTC.dll)
  – Unless using Kerberos (Oracle.ManagedDataAccessIOP.dll)
• Namespaces
  – Oracle.ManagedDataAccess.Client
  – Oracle.ManagedDataAccess.Types
ODP.NET, Managed Driver
ODP.NET, Managed Driver

More Info

• Recorded ODTUG webinar: “Oracle Data Provider for .NET, Managed Driver”
  – Available at: http://www.odtug.com/p/do/sd/topic=84&sid=2826
ODP.NET, Managed Driver

New Features since ODAC 12 R1

• XML DB
  – ODP.NET XML DB classes supported

• Kerberos
  – Single sign-on and centralized authentication
  – During setup, acquire Kerberos5 credentials with MIT Kerberos 4.0.1 or higher
    • Not needed at runtime
Distributed Transactions

• Oracle.ManagedDataAccessDTC.dll no longer necessary to deploy
  – When using .NET Framework 4.5.2 or higher
• Oracle and Microsoft jointly developed this solution together
And What Was Presented Yesterday

New Features

• NuGet

• Entity Framework
  – EF 6
  – Code First
  – Code First Migrations
Ease of ODP.NET Development and Migration
Install Changes in ODAC 12c Release 3

Non-Machine-Wide Configuration Install

• All ODAC installs provide machine-wide install option
  – Machine-wide (default)
    • Same as previous ODAC install behavior
    • Places ODP.NET in GAC
    • Updates machine.config with configuration section handler and DbProviderFactory information
  – Non-machine-wide
    • None of these machine-wide actions
    • Existing apps will NOT use the newly installed version automatically
    • Preferred by NuGet users and global configuration customizers

• Oracle Developer Tools for Visual Studio work with either setting
Unified .NET Configuration File Format

For Managed and Unmanaged ODP.NET

• New unmanaged ODP.NET .NET config file format: <oracle.unmanageddataaccess.client>
• Same elements and values as <oracle.manageddataaccess.client>
• Simplifies configuration with one scheme
• Legacy <oracle.dataaccess.client> format still available
Boolean Data Type

• ODP.NET OracleBoolean data type
  – Can be used with PL/SQL Booleans

• Benefit
  – Eases parameter binding
    • Stored procedures
    • Entity Framework Function Imports

• Note: No DB Boolean data type

• Unmanaged ODP.NET only
Identity Column

• DB automatically increments for next value as needed
  – Supports ANSI’s IDENTITY keyword

• Benefit
  – Easier to set up auto incrementing values (e.g. primary keys)

• Integrated with ODT and ODP.NET
  – E.g. ODT: Create table with auto-incrementing Identity column
  – E.g. ODP.NET: Add row without explicitly providing identity value

• New in Oracle Database 12c

• Unmanaged ODP.NET only
Large VARCHAR2, NVARCHAR2, and RAW

• ODP.NET VARCHAR2, NVARCHAR2, and RAW data types now can be up to 32 KB in size

• Benefit
  – Continue using fundamental data types even with larger data
    • No need to modify schema or use more advanced type

• New in Oracle Database 12c
Enhanced Implicit REF CURSOR (RC)

• ODP.NET retrieves result set without explicit RC declaration nor metadata in .NET config

• Can retrieve multiple implicit RCs
  – ExecuteNonQuery – Returns array of RCs
  – ExecuteReader – Returns DataReader, each accessible via calling NextResult

• Benefit
  – Simplifies retrieving result sets from PL/SQL
Enhanced Implicit REF CURSOR

• Calling DBMS_SQL.RETURN_RESULT(cursor)
  – Returns RC implicitly to ODP.NET
  – Intended to support DBs and apps migrated to Oracle

• Entity Framework
  – Still requires RC metadata, but new auto-generation feature
Enhanced Implicit REF CURSOR Sample Code

Create or Replace PROCEDURE GetEmpAndDept
AS
EMPS sys_refcursor;
DEPTS sys_refcursor;
BEGIN
  OPEN EMPS for SELECT empno, ename from emp;
dbms_sql.return_result(EMPS);
  OPEN DEPTS for SELECT deptno, dname from dept;
dbms_sql.return_result(DEPTS);
END;

OracleConnection conn = new OracleConnection("User Id=scott; Password=tiger");
  conn.Open();
  OracleCommand cmd = new OracleCommand("GetEmpAndDept", conn);
  cmd.CommandType = CommandType.StoredProcedure;
  OracleDataReader rdr = cmd.ExecuteReader();
  while(rdr.Read())
    Console.WriteLine("\{0\}\t\{1\}", rdr.GetInt32(0), rdr.GetString(1));
  rdr.NextResult();
  while(rdr.Read())
    Console.WriteLine("\{0\}\t\{1\}", rdr.GetInt32(0), rdr.GetString(1));
Return Row Count Per Array DML Iteration

• ODP.NET returns number of rows affected for each input value, not just the total number of rows affected

• New OracleCommand.ArrayBindRowCount property
  – Returns number of affected rows for each executed array bound DML iteration

• Benefit
  – Provides more info on DML correctness and efficiency
High Availability
ODP.NET FAN Uses ONS

• Oracle Notification Service (ONS) replaces AQ

• Benefits
  – Faster, more scalable, eliminates firewall issue, supports Active Data Guard, and consolidates publish/subscribe service

• No code changes required
  – But configuration changes required

• Managed and unmanaged ODP.NET 12c always uses ONS
  • Except unmanaged ODP.NET 12c with Oracle DB 11.2 or earlier
Faster and More Graceful Planned Outage

• Offline DB alerts ODP.NET of impending downtime
• ODP.NET stops allocating and closes idle connections
  – Connections returned to the pool are closed
• Benefit
  – DB brought offline as quickly as possible without end user disruptions
• Set ODP.NET attribute “HA Events = true”
• Recommend using Oracle Database 11.2.0.4+ and ODP.NET 11.2.0.4+
Transaction Guard

• ODP.NET can determine whether a transaction committed even upon a DB failure

• Benefit
  – Ensures accurate knowledge of transaction outcome

• App can query transaction outcome
  – OracleConnection properties return transaction ID and status
  – OracleLogicalTransaction class

• Requires Oracle Database 12c and ODP.NET 12c
Transaction Guard Scenario

1. ODP.NET receives FAN down event or error
2. IsRecoverable=false ➜ roll back
   IsRecoverable=true ➜ re-submit
3. **New for 12.1.0.2** – To re-submit, retrieve OracleConnection.OracleLogicalTransaction
4. **New for 12.1.0.2** – Retrieve transaction status with OracleLogicalTransaction.GetOutcome.
5. If committed and completed, done.
   If not committed nor completed, re-submit.
Global Data Services

• Extend RAC services to a global basis
  – Access to FCF, load balancing, and affinity capabilities
  – RAC, Active Data Guard, and GoldenGate can participate

• Benefit
  – Optimizes utilization, HA, and performance

• ODP.NET connection pool enhanced for GDS
  – No code changes required

• Requires Oracle Database 12c and ODP.NET 12c
Oracle Multitenant
Multitenant Architecture

Components of a Multitenant Container Database (CDB)

Pluggable Databases (PDBs)

CDB

Root

PDBs
Multitenant for Test and Development
Clone Test system, plug into Development. Clone/destroy test instances
Multitenant is great for developers

• Very rapid cloning and creating database
  – About as long as copying the database files (minutes)
  – Using DBCA to create a database takes a long time

• Rapid sharing with other devs for testing
  – Unplugged PDBs are an XML file and several DBF files
  – Zip these up and share with other developers who can plug them in and be using them in minutes
PDB Functionality in Server Explorer

• Pluggable Databases Node
  – *New pluggable database*: Fast provisioning from the seed
  – *Plug*: Plug in an XML file and some DBFs

• Pluggable Database Nodes
  – *Clone*: Fast copy
  – *Unplug*: Removes PDB from CDB and creates XML manifest
  – *Open, Close*: Equivalent to Startup and Shutdown
  – *Delete*: Removes PDB from CDB and deletes files
PDB Functionality in Server Explorer

• Server Explorer connections automatically made to new or cloned pluggable databases
  – TNSNAMES.ORA updated and connection to ADMIN made

• No Server Explorer connection made when plugging in
  – Need to create TNSNAMES.ORA aliases or use EZ Connect
  – Connect info for PDB is the same as container (host, port, etc) EXCEPT:
    • service_name = pdb name
Oracle Multitenant with ODP.NET

• ODP.NET works implicitly with PDBs
  – Connect to the Service_name of the PDB
  – Hostname and port are same as container

• Requires Oracle Database 12c and ODAC 12c
Oracle Multitenant and Visual Studio
Additional Oracle .NET Resources

OTN
otn.oracle.com/dotnet

Twitter
twitter.com/OracleDOTNET

YouTube
youtube.com/OracleDOTNETTeam

Email
alex.keh@oracle.com
Questions and Answers
Safe Harbor Statement

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