

## **Getting Mobile with SQL Server CE version 2.0**

Windows CE (Compact Edition) has been around for a number of years following the advent of handheld devices powerful enough to operate in the field for a decent duration. If you had said to me 12 years ago that we would be seeing SQL Server ported onto handheld devices I would have laughed my head off, as then it could hardly run on an OS/2 server but amazingly that is where we are today.

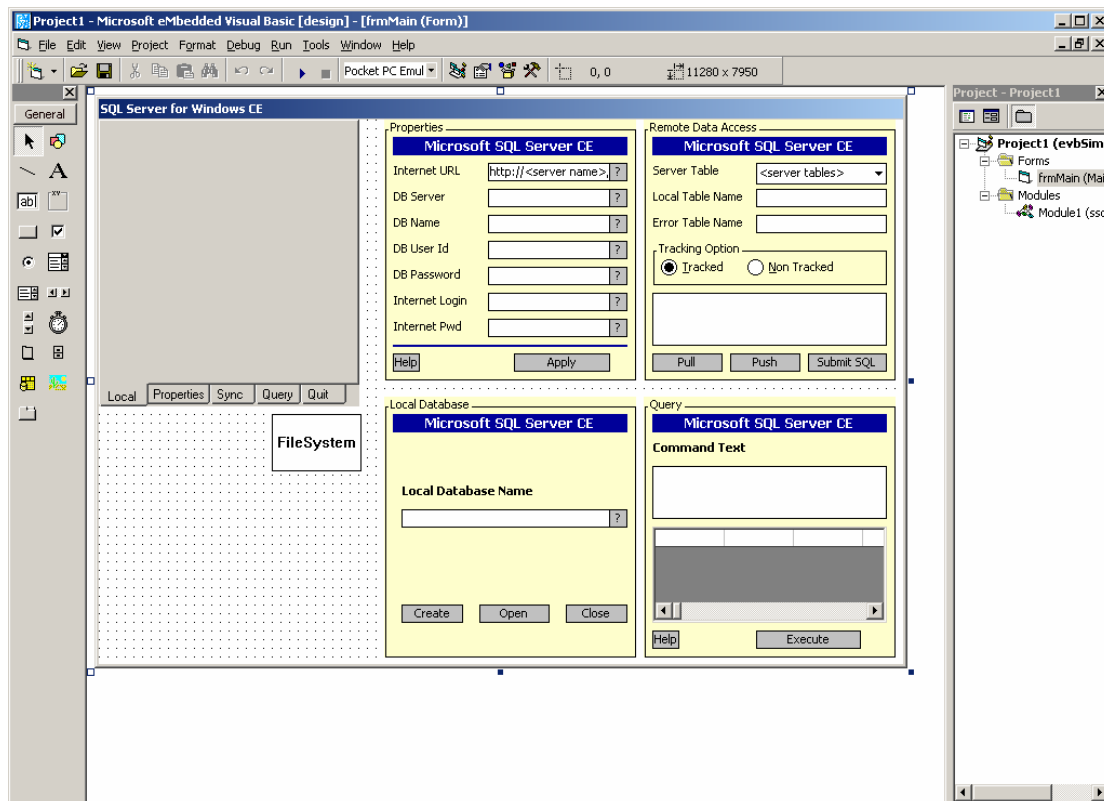
This month we will take a look at the new version of SQL Server for Windows CE, version 2.0, and how it can be used to best effect for building mobile solutions.

### **.NET Compact Framework**

The starting point for any current development work on the Microsoft platform is .NET.

The .NET Framework is the environment in which a developer designs, builds and deploys a .NET based solution. This can either be for the Web or a rich Windows client application as the .NET Framework encompasses access to all of the developer technologies from Microsoft including ATL (ActiveX Template Library), COM, MFC (Microsoft Foundation Classes) and Win 32. In addition the .NET Framework supports a number of third party languages that have been written to conform to the Common Language Specification, a set of rules that define how a language will perform and act within .NET. These include COBOL, Eiffel, Smalltalk and Perl.

The .NET Compact Framework is a lighter version of this architecture designed for devices with limited resources. It provides support for managed code and XML Web services and is designed to prevent developers completely rewriting applications or needing to learn a new development environment. Visual Studio .NET has a set of new features called the Smart Device Extensions which make this application design or porting a lot easier.



**Fig. 1. The eMbedded Visual Basic Development Environment**

### **SQL Server for Windows CE – Database Features**

SQL Server on Windows CE is a fully functioning database, and is as close to the “proper” SQL Server database as can be achieved on hand held devices. Transact-SQL (T-SQL – programming language for SQL Server) in SQL Server for Windows CE is upwardly compatible with other versions of SQL Server so your code should work across the server range.

Up to 249 indexes per table and multi column indexes are now supported in SQL Server CE 2.0. This indexing flexibility means that you can now maximise the performance of searches by creating specific indexes to speed specific queries if needed. SQL Server CE supports a wide range of data types including REAL, NUMERIC, FLOAT, UNICODE character types, MONEY, DATETIME and UNIQUEIDENTIFIER. The database files can be encrypted to 128-bit level and the usual data manipulation commands SELECT, INSERT, UPDATE and DELETE are supported. Version 2.0 has introduced the UNION operator and the facility to create parameterised queries. A UNION will combine the results of two or more queries into a results set consisting all the rows belonging to all queries in the UNION. The benefit of parameterised queries is that you can submit different values to the query for execution but the query does not need to go through an expensive recompilation process.

The database itself has a very small footprint considering its heritage. Dependent upon the device you are using it will occupy between 1.2MB and 1.6MB and in turn the database can support databases of 2GB and BLOBS

(binary large objects - often graphics) up to 1GB, assuming your handheld device has that type of capacity.

### **Is it fast?**

SQL Server is a very fast database. The latest benchmarks have SQL Server as one of the fastest databases in the world.

How does this translate to the Compact Edition?

SQL Server CE developers were able to make an immediate assumption not open to server developers. By its very nature running SQL Server on a handheld device is single user. Unless you fancy sharing your tap screen with a mate you will be the only user on a device so SQL Server for CE can ignore the irritations and time consuming problems that locks impose. So even if your mate did share the screen its too bad as they could not open the same objects as you anyway!. Managing locks is a difficult task and consumes a lot of resources in SQL Server, as it does in any relational database. This job is left up to the query optimiser which normally needs to figure out how best to make a query run in multi-user mode. With SQL Server CE the query optimiser simply works out the fastest way for a query to run using the SQL Server cost based optimiser. It will use B-tree based indexes for sorting and evaluating query conditions maximising speed where ever possible. B-trees are tree like structures that can be traversed to find an appropriate value or pointer to a value and are a standard relational database mechanism used to retrieve data quickly.

Some developers may decide to access the database directly. SQL Server CE has a number of features exposed through a COM interface, so that the query optimiser can be by-passed if need be.

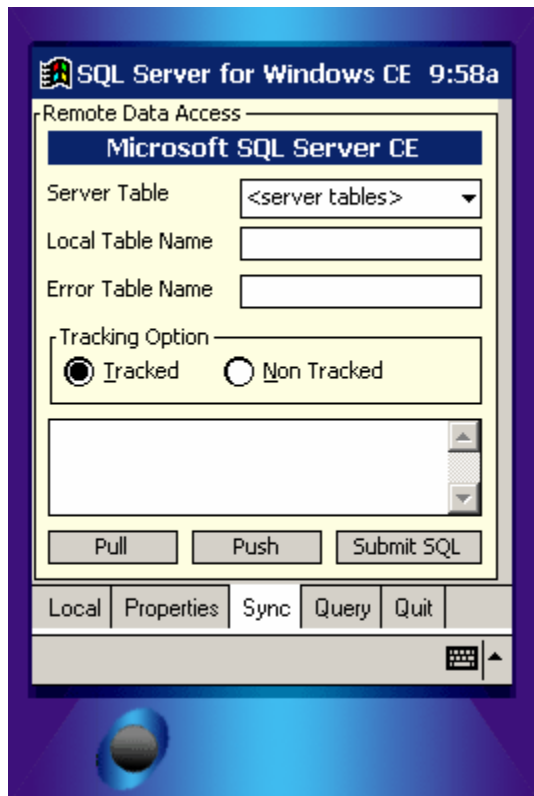
In addition to this SQL Server CE comprises a number of DLLs (Dynamic Link Libraries). Applications running at the same time on a device can share these, swapping them in and out of memory as required. This reduces the amount of storage space required by SQL Server CE on the device.

### **SQL Server Connectivity**

There are two ways of connecting to a central data source from within SQL Server CE.

- Merge replication allows data to be modified on the handheld device and central SQL Server independently of each other. The handheld device is then connected to the SQL Server and the content uploaded for synchronisation. Typically static data would be downloaded to the handheld, for example product lists, by using read-only replication as the data will not be changed locally. A process called data capture and upload would be used to send completed orders back from the handheld to the central SQL Server often using horizontal or vertical filters to prevent data conflicts.
- RDA or remote data access has the handheld device sending queries back to the central SQL Server and then handling row sets in a local

table as they are returned to the device. Any updates are then returned to the central SQL Server.



**Fig. 2. Pocket PC ready to synchronise. Note the use of an error table to track conflicts**

With replication SQL Server CE uses a row level tracking system to detect conflicts if the same data has been updated independently on the hand held device and central SQL Server. This will invoke a merge agent on the publishing SQL Server which in turn will start an appropriate conflict resolution model, which determines which update should eventually become the final update. RDA does not support such an advanced conflict model. Instead any conflicts are logged into a table on SQL Server CE which can be dealt with programmatically.

### **SQL Server Data Access**

ADO (ActiveX Data Objects) has been Microsoft's strategic data access API for a number of years. This has been updated with the advent of .NET and is now called ADO .NET.

SQL Server CE supports a number of database access technologies:

- ADOCE version 3.1 is widely used by eMbedded Visual Basic programmers and allows the creation, modification and access to most of the SQL Server resources. This is actually a subset of the ADO used by developers working against fully fledged SQL Servers.

- ADOXCE is an extension to ADOCE permitting access to some additional database schema objects and goes by its full name of ActiveX Data Objects Extensions for Data Definition Language and Security.
- OLEDBCE can be used by eMbedded C++ as a lower level database access API with deeper access to granular database features. This is an OLEDB 2.5 compliant driver and is used by the other two access technologies to get to SQL Server.

Undoubtedly SQL Server CE is an excellent piece of technology and a great example of getting a quart into a pint pot. If nothing else it proves that Microsoft have some neat software engineering skills up their sleeves.