GE Energy

Smallworld 4 Product Suite

Smallworld* on Oracle† Solutions

© 2004 General Electric Company.
All Rights Reserved

GER-4240 (10/04)

Consistent management of data using Smallworld on Oracle

Abstract

Organizations today hold vast amounts of data that is critical to the processes driving their business. The data held is both spatial and non-spatial and the expectation is that mainstream database management systems, such as Oracle†, can be used to store and access both types of data to provide a consistent way of managing information and making it available across the enterprise. With the progress made by Oracle for handling spatial data, combined with the optimization of GE Energy's Smallworld* software's advanced database architecture to support these changes, this ideal is now possible. Consequently, customers can share information more easily between Smallworld software applications and other systems across the enterprise. This enables them to streamline processes such as customer relationship management, accounting, budget planning, asset tracking, network planning and engineering whilst reusing many of the skills and resources used to manage their existing Oracle installation.

Introduction

Within many Organizations Oracle is a corporate database standard. Standardization on Oracle provides the organization with many benefits, such as:

- Confidence in security of data being held in a database from the world's largest database vendor
- Common database administration such as database backup and user management
- Ability to store all enterprise data in a single central repository
- Availability of skilled resources in Oracle
- Access to data in a standard way through SQL to meet management and reporting requirements
- Ease of integration into the enterprise through a wide range of Oracle and third party tools

Spatial data is no exception, Organizations desire that their critical spatial data is handled in exactly the same way as their non-spatial data. However spatial data is inherently different to more traditional data such as financial records for a number of reasons. The data stored is a different type, e.g. coordinate information, the volume of the data stored is greater and the rate of change of the data is more frequent.

Therefore spatial data requires special tools to solve this problem, traditionally these tools have been provided by GIS applications, such as Smallworld software.

As Organizations strive to build a single database of records across the organization, they seek to include their spatial data into this single source.

Smallworld software technology supports this critical business need by providing a range of technologies that enable spatial data held in the Smallworld software to be integrated into an Oracle database environment.

This need can be broken down into two areas:

- Storage and management of data
- Seamless access to this data

Smallworld software solutions meet both of these needs. *Smallworld On Oracle* allows for the storage of all Smallworld spatial and non-spatial data within an Oracle environment, and when used in conjunction with *Smallworld SQL Server* provides access to the data held within Smallworld to the wider enterprise using standard tools based upon ODBC and SQL.

The range of options available combine many alternative approaches and architectures to provide a range of flexible, scalable solutions to meet a wide variety of business requirements.

Smallworld and Oracle: A long standing partnership

Very early in the lifetime of Smallworld products it was recognized that Oracle played a key role in many Organizations and Smallworld technology was

provided to access non-spatial data held within Oracle and expose this within the Smallworld software environment.

Since that time Oracle has expanded the capabilities of its database solution with support for spatial data, in Oracle Spatial† and Oracle Locator† (a sub-set of Oracle Spatial).

GE Energy's Smallworld technology has kept pace with these extensions to Oracle. For example in the late 1990s GE Energy was one of the first GIS vendors to release a solution which enabled Oracle Spatial data to be accessed and manipulated in the Smallworld environment as if it were native Smallworld data. This solution is part of *Smallworld On Oracle*.

Oracle has continued to develop functionality applicable to spatial data and, recognizing Smallworld as an industry-leader in providing long transaction solutions, has collaborated with Smallworld on the Oracle Work Space Manager to provide long transaction support in an Oracle environment. Building on this knowledge, GE Energy has extended the capability of *Smallworld On Oracle* by providing support for Oracle-based long transactions within the Smallworld software environment.

Smallworld participates in all major Oracle beta programs. The beta program for Oracle 10g, which provides the significant development of Oracle Spatial to support topological networks, was no exception.

During this program Smallworld actively evaluated and prototyped solutions based on this emerging technology and provided valuable feedback to Oracle allowing them to further refine and improve their solution.

GE Energy continues to work and collaborate with Oracle to ensure we align our product plans to take advantage of the latest Oracle technology to meet our customers' needs.

Storage and management of data

Smallworld On Oracle protects a customer's investment in existing data and the technology deployed to support it. Data held in Oracle Spatial can be easily exploited by Smallworld applications without the need to develop bespoke code to handle this data (the same consistent API is provided to access both native Smallworld data and external Oracle Spatial data). This means the data that needs to remain in Oracle Spatial for good business reasons can continue to do so and to the end user the integration of the disparate data sources is seamless.

Smallworld On Oracle provides support for Oracle Spatial simple geometry types. There are three simple geometry types: point, polylines and polygons together with collections that can be composed of a mix of these base types. Standard Smallworld tools can be used to configure the availability and appearance of Oracle Spatial data and SQL queries can be built to interrogate, both spatial and non-spatial (alphanumeric), data in a single query.

Oracle Spatial is typically used in conjunction with Smallworld to manage large volumes of simple (non-topological) spatial data such as a geographic landbase. *Smallworld On Oracle* provides the integration capability to enable Smallworld users to interact with the data in a seamless manner. An advantage of storing landbase data in this way is that it is not only possible to use the data with Smallworld software but it also provides a centralized repository to make the data available to other applications.

Oracle Spatial is also used to manage address information which is accessible within Smallworld software through *Smallworld On Oracle*. Address information, and the geographic location of the address, is vital to many critical business processes. The non-spatial information generally already exists in an existing enterprise system, such as a Customer Relationship Management system. Therefore by extending this system to hold the geographic location of the address,

using Oracle Spatial, this vital resource can become available within the Smallworld environment providing a number of business benefits, such as:

- Ability to link customer location to the network for fault and outage management needs
- Ability to analyze customer and network relationships though spatial queries
- Ability to query and report based upon any geographic area, for example network serving area, etc.

Smallworld On Oracle allows the entire Smallworld solution to be embedded in an Oracle environment whilst preserving all the critical Smallworld software functionality required to manage complex spatial data. The solution is ideal for customers with a significant investment in an existing Oracle infrastructure. The end user is unaware that an Oracle database is being used to hold the data. Applications read, write and combine changes as if it were being stored in a native Smallworld environment.

This approach leverages both an existing investment in technology and the skill sets that have been developed to support it. Common administration tasks such as database backup and database optimization can be performed using standard Oracle tools. Additional Smallworld administration tools are provided to manage Smallworld-hosted spatial data (for example, to compress it, copy it or create new tables).

Seamless data access

As outlined earlier, a key aspect to building a centralized information repository is ensuring that the data held in this repository is accessible by all systems and users that depend upon this critical data and spatial data is no exception to this.

Smallworld technology provides two complimentary approaches to this solution using *Smallworld On Oracle*:

- Enable data held in Smallworld software to be published one-way into Oracle: this includes spatial data
- Provide two-way synchronization between data stored and managed in a Smallworld native database and data held in an Oracle database.

These synchronization approaches are used to support two primary business goals. The first is to enable spatial and non-spatial data held within the native Smallworld environment to be published into an Oracle database allowing specific reports and queries to be run against the data outside the Smallworld environment. To meet the requirements placed upon the Smallworld system by our customers, it is necessary to provide complex data models and supporting applications. However the complexity of these underlying data models often means that simply exposing this data outside of the Smallworld environment would not bring any benefit as application logic is required to interpret the data. *Smallworld On Oracle* provides tools to allow the complex native Smallworld data model to be simplified and published as a set of standard Oracle tables which are suitable for use as a basis for reports and queries that do not require the enhanced capabilities provided by the Smallworld application logic.

Another way of meeting this first business goal is to access the data through the use of *Smallworld SQL Server* (which provides ODBC access to data held in a *Smallworld On Oracle* database). Using this capability the data can be accessed directly within the Smallworld environment and made available to other third-party applications whilst still being utilized and managed within the Smallworld environment. Thus enabling end users and other systems to have access to the data in the right format in the right tool to complete the necessary business processes.

The second business goal is to support consistency of data between the Smallworld system and a third-party application based on Oracle. A typical example is where it may be necessary to coordinate data between an Oracle-based asset management system and Smallworld software. In this case, two-way synchronization is required between data held in both

systems. The data can be updated in either system and the synchronization process, provided by *Smallworld On Oracle*, will align the two databases at regular intervals to ensure that they are equivalent. Tools are provided that enable the mapping of the data from one data model definition to an alternative definition. This supports coordination between the short transaction environment required by live data in an Oracle database and the long transaction environment that is essential for planning and design work in a Smallworld database.

Smallworld on Oracle: Technical Implementation

The *Smallworld on Oracle* solution set consists of four modules, which can be used in isolation or combination to solve the various problems outlined throughout this paper.

The following points provide a brief outline of these four modules:

- **Repository:** Allows the whole Smallworld solution to be embedded in Oracle whilst preserving all native Smallworld software long transaction functionality.
- **InSync:** Publishes attribute and spatial data from Smallworld software for other Oracle applications to make use of. Allows changes in Oracle to be reflected in the Smallworld application. Allows publishing of complex network geometry (no topology) into Oracle Spatial
- **Spatial SOM:** Allows Oracle Spatial data to be used as if it was native Smallworld data, enabling rendering, editing, insert, update and deletion of Oracle Spatial data from the Smallworld environment.
- **OWM SOM:** Oracle Workspace Manager enables multiple concurrent views of an entire database for large numbers of users. Essentially it implements long transactions within Oracle.

The following table lists the main business requirements outlined in the paper and indicates which of the *Smallworld on Oracle* modules are used to solve that specific requirement. This table is not intended to be an exhaustive list but represents the most common requirements customers wish to solve.

Using a combination of the solution, a 100% on Oracle-based solution can be delivered, meeting the requirement for an enterprise-wide Oracle-based solution. Native Smallworld data is stored in Repository, leveraging Oracle's database administration power and existing skill sets. InSync

Requirement	Spatial SOM	OWM SOM	InSync	Repository
Access to a simplified, published, view of spatial and non-spatial application data for all enterprise users via SQL to standard Oracle tables	✓		✓	
Access to non-topological spatial data, such as a landbase, stored in Oracle Spatial, managed either by Smallworld or by other spatially-enabled applications	✓			
Application integration at the database level for Oracle-based applications, such as customer address management			✓	
Update data held in Oracle Spatial without locking out other users	✓	✓		
Enterprise requirement – all applications run on Oracle platform and store all data in Oracle, including complex application (i.e. topological) data	✓	✓	✓	✓

(with Spatial SOM) is used to publish this complex spatial and non-spatial data into a format that can be understood by other third party business applications, making it more widely available across the organization and leveraging the value of the data. Spatial SOM can be used to either access spatial data managed outside of the Smallworld environment (e.g. a landbase dataset) or to use Oracle Spatial and Oracle Workspace Manager SOMs to allow the Smallworld application to be used to manipulate and manage common spatial data stored in Oracle Spatial.

Continuing the Partnership

Oracle version 10g further extended the capabilities of Oracle Spatial to provide support for topologically structured spatial data and specialist spatial data types. Previously Oracle Spatial data was limited to that defined as simple geometry (as discussed elsewhere in this paper).

GE Energy and Oracle continue to work with a focus on compatibility of existing Smallworld, Oracle-based products with Oracle. On-going research and development will focus on how to best leverage the latest capabilities of Oracle to meet the long term goal of utilizing Oracle Spatial as the primary database management system for a broad range of Smallworld applications.

Summary

As Organizations increasingly opt for Oracle as their corporate database standard, there is a growing need for enterprise application providers to ensure their solutions are capable of being implemented on this industry leading platform. The Smallworld applications advanced architecture provides Organizations with this flexibility ensuring customers are able to protect their investment in existing data and the technology deployed to support it.

GE Energy's approach is to provide packaged application solutions built on flexible, innovative technologies that enable customers to store, manage and access their data in Oracle. The solutions are focussed on reducing overall cost of ownership. The open architecture offers integration capabilities that allow disparate systems to seamlessly share data enabling customers to reuse many of their existing Oracle skills and resources. Standard tools provide a consistent way of accessing this data across the enterprise to meet particular business objectives, thereby improving operational efficiency.

As Oracle's capabilities continue to develop, the Smallworld technology is kept in step with these developments, even influencing the latest release. This level of collaboration ensures customers are provided with the best possible combination of Smallworld application solutions based on standard Oracle database technology.

Further technical details of *Smallworld on Oracle* can be obtained upon request from GE Energy.

† are trademarks of Oracle Corporation.

** is a trademark of General Electric Company.*