Beginning Spatial with SQL Server 2008

Alastair Aitchison

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To Clare and Douglas.

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About the Author

ALASTAIR AITCHISON has over eight years' experience as a management information consultant and has provided reporting and analysis of data for the House of Lords, the Department of Health, the Police Force, and various UK media agencies. For the past three years, Alastair has been a technical manager at Aviva, the world's fifth-largest insurance group. In this role, he has developed and promoted the use of spatial data in a range of corporate applications, such as the geographic analysis of risk patterns, plotting the success of regional sales campaigns, and understanding the impact of major weather incidents.

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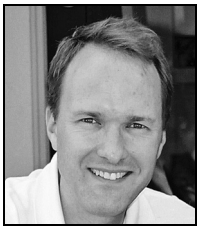
About the Technical Reviewer



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Introduction

The use of spatial data in information systems is hardly a new technology. Dedicated geographic information systems (GISs), such as ARC/INFO from ESRI, have been commercially available since the early 1980s. While the technological capabilities of these systems have evolved significantly over the past 25 years, their adoption has remained relatively confined within a small, specialized group of developers. One reason for this is that, because of the complex nature of spatial data, GIS systems themselves are typically complex, and require dedicated, specially trained operators. Furthermore, these systems are frequently stand-alone systems and do not integrate spatial data with central corporate data systems.

More recently, database management system providers, including Oracle, IBM (DB2), MySQL, and the PostgreSQL Global Development Group, have all released spatially enabled relational database management systems (RDBMSs). Although this has widened the adoption of spatial techniques, the spatial functionality is typically provided using an optional add-in component that requires specific product knowledge that general developers typically do not have yet. Knowledge of spatial data has therefore still largely remained limited to specialist technical fields.

With the introduction of spatial support in SQL Server 2008, Microsoft has taken a number of steps to reduce the number of barriers that, until now, have prevented mainstream developers from using spatial data:

- Spatial datatypes are included as a core component of the SQL Server 2008 database, and work "out of the box," requiring no additional components to be installed or configured.
- Spatial operations are integrated into the existing functionality of the SQL Server Database Engine, allowing developers to continue working within a familiar development environment using existing tools such as SQL Server Management Studio.
- Existing SQL Server databases can be easily enriched by adding spatial data fields to their existing structure—there is no need to migrate data onto a new platform.
- The new `geometry` spatial datatype conforms to accepted industry-wide standards set by the Open Geospatial Consortium (OGC).
- Spatial support is included in all versions of SQL Server 2008, including the freely available SQL Server Express Edition. As a result, even small-scale, hobbyist, and amateur programmers can start using spatial data.

In this book, I give you an introduction to working with spatial data in SQL Server 2008 that will enable you to start using these new features to add exciting and value-adding capabilities to your database applications.

Who This Book Is For

This book is aimed at developers who are being introduced to spatial data for the first time through SQL Server 2008. No previous knowledge of working with spatial data is assumed, and all topics are explained from the ground up. My intention is to explain how to use the new spatial datatypes to add additional reporting and analysis capability to your existing datasets, by demonstrating a range of practical usage examples.

How This Book Is Structured

The chapters in this book are divided into five parts. Each part introduces topics that are related to a particular aspect of spatial data, and the topics are listed in the order in which, as a newcomer to spatial data, you are likely to encounter them.

Part 1 (Chapters 1–3) introduces the fundamental concepts involved when working with any spatial data. It first covers the theoretical issues of models of the earth, coordinate references, and geodetic datums, and then describes the specific practical implementation of spatial data in SQL Server 2008. It presents a side-by-side comparison of the two new spatial datatypes, `geography` and `geometry`, and examples to demonstrate how they can be used with reference to the .NET CLR.

Part 2 spans four chapters, each of which introduces a different method to insert spatial data into a SQL Server 2008 database. Chapter 4 explains how to use the various formats that are natively supported by SQL Server (WKT, WKB, and GML), and Chapter 6 describes tools and methods that you can use to import other commonly used formats such as KML and ESRI shapefiles. Part 2 includes two chapters that each cover an example of extending SQL Server functionality by using an external service. Chapter 5 explains how Virtual Earth can be used as a drawing canvas to define new spatial data, and Chapter 7 describes how to create a custom .NET assembly to access the MapPoint Find service to provide geocoding functionality in SQL Server.

Part 3 (Chapters 8–10) describes various methods of visually presenting spatial data. SQL Server 2008 has only very limited built-in spatial visualization capability, so in this part I describe how to present and visualize syndicated spatial data using the GeoRSS format, and how to build interactive front-end spatial applications using the Virtual Earth and Google Maps controls. I also describe the Spatial Results tab, which allows you to quickly examine the results of a query from within SQL Server Management Studio.

Part 4 (Chapters 11–13) introduces the range of spatial methods that can be used to query properties and relationships between spatial objects. Every method is covered in outline form, including an explanation of its purpose, a description of the context in which it can be used, and a simple code example to demonstrate its use in a real-life situation. Additionally, there are many diagrams used to illustrate the results of the most commonly used methods.

Part 5, composed of Chapter 14, covers issues related to the performance of spatial databases, with a focus on the important topic of spatial indices.

Prerequisites

In order to follow the code examples listed in this book, you should have a fully installed and configured instance of SQL Server 2008. All of the examples presented in this book work with any edition of SQL Server 2008, from the Enterprise Edition right down to the freely available Express Edition.

Although spatial data is supported by the SQL Server core Database Engine, this alone does not provide all the capabilities generally required for an end-to-end spatial application. For example, SQL Server has only limited capability to import common formats of existing spatial data, and has only a basic method of displaying spatial data. In order to show you how to integrate SQL Server into an end-to-end spatial application, some chapters use additional software or services. These include Shape2SQL (used in Chapter 6); Microsoft MapPoint Web Service, Microsoft Visual Basic Express Edition, and Microsoft Visual C# Express Edition (used in Chapter 7); and Virtual Earth and Google Maps (both used in Chapters 8 and 9). All of the additional software used in this book is freely available, and details of how to obtain the software are included in the relevant chapters.

Downloading the Code

This book contains numerous code examples to demonstrate the methods used in each chapter. You can download the code in a zip archive from the Source Code/Download area of the Apress web site (`http://www.apress.com`).

Contacting the Author

If you have any questions or comments, you can e-mail the author directly at `alastair@beginningspatial.com`. Alternatively, check out `http://www.beginningspatial.com` for additional information and resources related to this book.