chapter 4

Database Installation 2: Microsoft SQL Server

After reading this chapter and completing the exercises, you will be able to:

- Identify the considerations that an administrator must take into account prior to installation
- Install the Microsoft SQL Server 2008 for Windows operating systems
- Configure Microsoft SQL Server 2008 Services for Windows platforms
- Secure the installation and configuration of Microsoft SQL Server 2008

Security In Your World

Both Luke Werner and Jason Lucarelli work for Questionable Meds Pharmaceuticals, a midsized pharmaceutical sales organization that has shown tremendous growth over the last few years. Luke has been overseeing the technical development as the company's IT manager for the past five years, and from this experience he has learned a great deal about the organization's data storage needs.

Jason was recently hired as the database administrator (DBA) for Questionable Meds. Although he has only been employed for five months, he has been administrating databases for over 15 years and has developed a strong understanding of the data needs for large organizations. Armed with a midsized budget, together Jason and Luke seem to be the perfect team to tackle the task of developing and implementing a Microsoft SQL Server database environment.

Not far into the project's implementation, their different agendas began to cause problems. Luke and Jason were not seeing eye-to-eye regarding the many decisions that needed to be made for the company's data storage needs. From as early as the planning stage, their differences began to take a toll on the overall project, causing delays in development.

One major subject of disagreement was the budget. After assessing the network and mapping the organizational data, Jason believed that three separate editions of Microsoft SQL Server (Standard, Developer, and Web) were necessary to custom manage the organization's current and future data storage needs effectively.

Luke, on the other hand, felt that purchasing three separate and different licenses was excessive. He felt that the Enterprise Edition could handle the majority of data manipulation and storage for the organization.

In view of the company's recent growth, Luke proposed that the budget would be best utilized by replacing all of the network servers and PCs, confident that this would ensure they exceed Microsoft hardware recommendation requirements and ensure quality performance far into the future.

Jason adamantly disagreed. He affirmed that only the network servers needed to be updated, and that anything else would be unwarranted and excessive.

Another source of conflict was security, with Luke and Jason disagreeing on the type and amount of security needed. Luke suggested that additional firewalls be added to surround the new servers in order to isolate the database from the rest of the network. Jason felt that this configuration would be too cumbersome and unmanageable for both administrators and users. He was certain that applying different administrative passwords for different components of the database would suffice in keeping the data isolated. He argued that his approach coupled with policy management, would be

(continued)

necessary for their new environment to remain secure. He further explained that limiting access to tables and objects using groups and accounts could be just as efficient as adding expensive firewalls.

Both Jason and Luke make valid points, and their arguments represent the difficult decisions that need to be made when implementing a Microsoft SQL Server environment in the real world. Awareness of the needs of your environment and the features available within your chosen database management system are prerequisites for creating the ideal solution. SQL Server is known for its many customizable features and installations. This chapter will introduce you to these features, explore the different concerns that should be addressed when considering an installation of SQL Server, and present a step-by-step installation.

Planning for a Microsoft SQL Server Installation

Over the last decade, Microsoft SQL Server has become a significant database enterprise solution for many organizations. Improvements in its scalability and performance, combined with its ease of use and low cost, has made it an attractive solution for processing, storing, and securing data within large enterprise networks.

Installation of Microsoft SQL is as simple as any other Microsoft application installation; however, administrators must make several important decisions to ensure that the system best meets the needs of an organization. Proper planning is the key to success for any new system installation. Understanding the requirements, available versions, and available features of the system is required in order to design the most effective solutions for an organization.

In this section, we will explore the hardware, software, and networking requirements for SQL Server. We will review the different editions currently available for SQL Server, as well as the major features that these editions offer. Supported platforms will also be explored along with licensing and help resources.

Meeting the Requirements

Before installing Server 2008, administrators need to verify that the hardware, software, and network compatibility of the system on which SQL Server will be running. Supported platforms must also be considered. This section will cover the hardware, software, and network requirements of Microsoft SQL Server.

Hardware Requirements

Hardware requirements for SQL Server 2008 include processor type, processor speed, hard drive storage, and main memory storage amounts. The minimum requirements for 64-bit versions of SQL Server are: 1.4 GHz processor, 350 MB of hard drive space, and 512 MB of RAM. The minimum requirements for 32-bit versions of SQL Server are 1.0 GHz processor, 350 MB of hard drive space, and 512 MB of RAM.

Table 4-1 provides the hardware requirements for the core editions of Microsoft SQL. It is suggested that SQL Server not be run on machines that only have the minimum hardware requirements. These requirements are the lowest possible resources necessary to run the application. Attempting to run SQL Server on a machine with the minimum hardware requirements available will result in poor performance and unpredictable functionality. Microsoft recommends that SQL Servers be run on machines with at least 2.0 GHz processors, and that 2 GB of RAM must be available to function properly.

Hard drive space recommendations are not as cut and dried. In order to determine the hard drive space necessary, the current data that the organization and database need to function, combined with estimated future growth of data storage needs, should be calculated and used to determine hard drive storage space requirements. The size of the database will also differ depending on which features of SQL Server 2008 are installed. Table 4-2 displays the amount of storage used by each feature within SQL Server 2008.

Edition	Minimum CPU type	Minimum CPU speed/ recommended	Operating systems	Minimum memory/ recommended memory/maximum memory
Enterprise IA64	Itanium	1.0 GHz/ 2.0 GHz	Windows Server 2008 64-bit Itanium Windows Server 2003 64-bit Itanium Data Center Windows 2003 64-bit Itanium Enterprise	512 MB/2 GB/ Operating system maximum
Enterprise X64	AMD Opteron, AMD Athlon 64, Intel Xeon EM64T, Intel Pentium IV EM64T	1.4 GHz/ 2.0 GHz	Windows Server 2008 64-bit x64 Standard Windows Server 2008 64-bit x64 Data Center Windows Server 2008 64-bit x64 Enterprise Windows 7 Ultimate Windows 7 Enterprise Windows 7 Professional Windows 7 64-bit x64 Ultimate Windows 7 64-bit x64 Enterprise Windows 7 64-bit x64 Professional Windows Server 2003 64-bit x64 Standard SP2 Windows Server 2003 64-bit x64 Data Center SP2 Windows Server 2003 64-bit x64 Enterprise SP2 Windows Server 2008 64-bit x64 Web	512 MB/2 GB/ Operating system maximum

Table 4-1 SQL Server software and hardware requirements (*continues*)

Edition	Minimum CPU type	Minimum CPU speed/ recommended	Operating systems	Minimum memory/ recommended memory/maximum memory
Standard x64	AMD Opteron, AMD Athlon 64, Intel Xeon EM64T, Intel Pentium IV EM64T	1.4 GHz/ 2.0 GHz	Windows Server 2008 64-bit x64 Web Windows Server 2008 64-bit x64 Standard Windows Server 2008 64-bit x64 Datacenter Windows Server 2008 64-bit x64 Enterprise Windows 7 Ultimate x64 Windows 7 Enterprise x64 Windows 7 Business x64 Windows Vista Ultimate x64 Windows Vista Enterprise x64 Windows Vista Business x64 Windows XP Professional X64 Windows Server 2003 64-bit x64 Standard SP2 Windows Server 2003 64-bit x64 Data Center SP2 Windows Server 2003 64-bit x64 Enterprise SP2	512 MB/2 GB/ Operating system maximum
Enterprise X86 (32-bit)	PIII	1.0 GHz/ 2.0 GHz	Windows Server 2008 Enterprise Windows Server 2008 Web Windows Server 2008 Data Center Windows Server 2008 64-bit x64 Standard Windows Server 2008 64-bit x64 Enterprise Windows Server 2008 64-bit x64 Data Center Windows Small Business Server 2003 Standard Windows Small Business Server 2003 Premium Windows Server 2003 Standard SP2 Windows Server 2003 Enterprise SP2 Windows Server 2003 Premium SP2 Windows Server 2003 64-bit x64 Standard SP2 Windows Server 2003 64-bit x64 Data Center SP2 Windows Server 2003 64-bit x64 Enterprise SP2	512 MB/2 GB/ Operating system maximum

Table 4-1 SQL Server software and hardware requirements (*continues*)

Edition	Minimum CPU type	Minimum CPU speed/ recommended	Operating systems	Minimum memory/ recommended memory/maximum memory
Standard X86 (32-bit)	PIII	1.0 GHz/ 2.0 GHz	Windows Server 2008 Enterprise Windows Server 2008 Web Windows Server 2008 Data Center Windows Small Business Server 2008 Windows Server 2008 64-bit x64 Standard Windows Server 2008 64-bit x64 Enterprise Windows Server 2008 64-bit x64 Data Center Windows 7 Ultimate Windows 7 Enterprise Windows 7 Professional Windows 7 64-bit x64 Ultimate Windows 7 64-bit x64 Enterprise Windows 7 64-bit x64 Professional Windows Vista Ultimate x64 Windows Vista Enterprise x64 Windows Vista Business x64 Windows XP Professional SP2 Windows XP Professional X64 SP2 Windows Server 2003 32-bit Standard Windows Small Business Server 2003 Standard Windows Small Business Server 2003 Premium Windows Server 2003 Standard SP2 Windows Server 2003 Enterprise SP2 Windows Server 2003 Premium SP2 Windows Server 2003 64-bit x64 Standard SP2 Windows Server 2003 64-bit x64 Data Center SP2 Windows Server 2003 64-bit x64 Enterprise SP2	512 MB/2 GB/ Operating system maximum

Table 4-1 SQL Server software and hardware requirements (*continued*)

Feature	Storage cost
Complete Data Engine Core	250 MB
Complete Analysis services and data files	90 MB
Complete Reporting and Reporting Manager services	120 MB
Complete Integration Services	120 MB
Complete Client Components	240 MB
Complete Server Books Online	240 MB

Table 4-2 Storage used by SQL Server 2008 features

For a complete list of the recommended hardware requirements for editions of Microsoft SQL Server, refer to the SQL Server Books Online.

Supported Platforms

Although SQL Server 2008 supports a number of different operating systems, not all editions support the same operating system. For this reason, the platform choice should not be taken lightly. Deciding on the most appropriate operating system should involve much more than mere preference or experience of the administrator. A mistake can be quite damaging to the performance and scalability of the system. The operating system on which SQL Server will be installed will determine the features that will be available, so finding the perfect match could make the difference between a robust data management machine and an inflexible storage component.

64-bit and 32-bit

When choosing an appropriate operating system, you first must decide on either a 32-bit or a 64-bit platform. To fully leverage the capability of a 64-bit operating system, only 64-bit versions of SQL should be used. When a 32-bit version of SQL is placed on a 64-bit operating system, the platform is forced to run the database server in 32-bit mode, thus disabling many of its valuable features.

Operating System Requirements

As just mentioned, different versions of SQL Server require different operating systems. In general, SQL 2008 can be placed on different versions of Windows Server 2008, Windows Server 2003, Windows 7, Windows Vista, and Windows XP. Table 4-1 provides a basic overview of the operating systems compatible for core SQL Server 2008 editions.

It is important to take note of the service packs and processor stipulations for each operating system. Compatibility is specific to the service packs and processors listed in Table 4-1.

Other Software Prerequisites

Before installing SQL Server onto a Windows Machine, a few important prerequisites must be met. The SQL Server installation wizard will verify that these prerequisites have been satisfied prior to installation. An administrator installing SQL Server will be prompted to either install missing items manually or to give permission for the wizard to install them automatically. The following software requirements must be in place to enable the installation of all 32-bit and 64-bit Microsoft SQL Server editions:

General software

- NET Framework 3.5 SP11
- Microsoft Windows Installer 4.5 or later
- Internet Explorer 6 SP1 or later
- Latest version of PowerShell
- Microsoft Data Access Components (MDAC) 2.8 SP1 or later

Network software

- Shared Memory
- TCP/IP
- Named Pipes
- Virtual Interface Adapter Via Protocols

Network Resource Requirements

The network is a vital component in a database success story. After all, what is a database without a network on which to share the information? SQL Server data is stored, retrieved, and manipulated within a client-server architecture. The effectiveness of the communication and connections established on this network will be determined by network hardware and software within a Microsoft SQL Server 2008 environment.

Network design and architecture play a large role in the reliability and efficiency of a client-server environment. Although these topics are beyond the scope of this book, it is important to identify concerns related to network design and efficiency.

Changes to the network's hardware and software may be necessary with the implementation of Microsoft SQL Server. An environment being prepared for an initial installation of Microsoft SQL should be tested to ensure that it can handle the amount of data that will be transferred across segments of the network. Check network cards, switches, cables, and other hardware devices to determine how well they operate under heavy traffic conditions.

Making the Difficult Decisions

Difficult decisions are a part of any database system installation planning stage. Customization is one of SQL Server's greatest selling points, so its software includes a few more choices than most. SQL Server currently offers several different editions of its database, each with its

own set of features from which to pick and choose. This section will cover the important decisions that a DBA must make when choosing to implement SQL Server into their environment, such as SQL Server editions, features, and licensing options.

Choosing an Edition

New editions have made improvements in the server's scalability and performance for developers and administrators, adding the flexibility needed to fit in virtually any organization. Microsoft has added features that offer a variety of different user interfaces and editions which are focused on a specific business database purpose. These provide a way to meet the needs of varying data storage scenarios at low cost and with little to no overhead caused by extra unnecessary features. For example, an organization may need a database that can handle a lot of online activity, such as an e-commerce environment, while another may need to implement a solution that enables the use of their mobile handheld devices.

Microsoft has created editions of SQL Server to meet both of these specific needs independently. Becoming familiar with what each edition has to offer is critical to choosing the right solution for your particular environmental needs.

- *SQL Server Express Edition*—A free, lightweight version of SQL Server 2008, this edition replaced the SQL Server desktop engine. It is recommended for personal and individual use. SQL Server Express is available for download at *http://msdn.microsoft.com/express*.
- *Compact 3.5*—A skinny version of SQL Server 2008, this free edition is created for mobile devices and for mobile application developers. SQL Server Express is available for download at *http://msdn.microsoft.com/express*.
- *Workgroup Edition*—Intended for a department or small business use, this edition is ideal for environments that require small user data storage or Web applications that have minimal usage, such as remote branch office access scenarios.
- *Web Edition*—Built for a large amount of traffic, this edition is ideal for full Web hosting.
- *Developer Edition*—Providing the same features as the full Enterprise version, this edition is to be used for development and testing only, and is not intended for production.
- *Standard Edition*—Ideal for most applications, this edition can be used in small to large organizations where server redundancy is not required, but usage is significant and integration services are needed.
- *Enterprise Edition*—The complete feature set of the product that provides the most scalability, and is intended to support the largest organizations. This version is ideal for large workloads and frequent usage, including features for high availability, enterprise security, data warehousing and business intelligence. The Enterprise Edition of SQL Server includes a great number of features that are tailored to an enterprise environment, and are not offered in the standard version. Features included are partitioned table parallelism, database mirroring, online indexing, online page restore, extensible key management, failover clustering, transparent database encryption, resource governor, text mining, and performance data collection.

Table 4-3 provides some SQL Server editions and hardware requirements, but for a complete list of the features available in each edition of Microsoft SQL Server, refer to the SQL Server Books Online.

Edition	CPUs supported	Maximum addressable memory	Maximum database size
SQL Server Express (x86, x64)	1	1 GB	4 GB
SQL Compact	OS maximum	OS maximum	4 GB
SQL Server Workgroup (x86 and x64)	2	4 GB on a 64-bit OS and the OS maximum on a 32-bit one	No maximum
Web (x86, x64)	4	OS maximum	No maximum
SQL Server Developer (x86, x64, and IA64)	OS maximum	OS maximum	No maximum
Standard (x86, x64)	4	OS maximum	No maximum
Enterprise (x86, x64, and IA64)	OS maximum	OS maximum	No maximum

Table 4-3 SQL Server editions and hardware requirements

SQL Server Features and Components

Server features have experienced quite a number of significant changes throughout history, yet each change has had a noteworthy impact on the application in its current form. Refer to Table 4-4 for a complete history of Microsoft SQL Server releases and added features.

Microsoft SQL Server is made up of a number of features administrators can choose to include or leave out of an installation. The goal of this modular packaging is to provide an organization with a customizable, lightweight server built with environment-specific capabilities.

Choosing the right fit for an organization first and foremost requires familiarity with what optional components are available in Microsoft SQL Server. In this section, the major server and management tools of SQL Server are explored. For a complete listing of features available in Microsoft Server 2008, refer to the SQL Server Books Online.

Server Tools Server management tools represent the fundamental tools available with an installation of Microsoft Server 2008, and include the Database Engine Services, Reporting Services, Analysis Services, and Integration Services.

- *Database Engine Services*—This is the heart of the SQL Server database. This service is responsible for data storage, retrieval, manipulation, and security. It provides access control and fast transaction processing. There are two subcomponents of the Database Engine Service: Replication and Full Text Search. **Replication** (the act of sending copies of one database to another database within a network) is the component responsible for managing database replication within a network. The replication of a database is the process of sharing recent changes made to a database with all other network databases in hopes of remaining consistent and in sync with one another. It is also used to support load balancing, fault tolerance, and data distribution. Full Text Search is the component that maintains the indexes and full text catalogs, making searches more simple by allowing full word and phrase searches.
- *Reporting Services (SSRS)*—Provides different ways for presenting and delivering data in Microsoft SQL Server 2008. The Database Engine sends the data to the

Year	Version	Comments
1987	Sybase SQL Server	Released for UNIX
1988	SQL Server	A joint effort between Sybase and Microsoft, included support for use on OS/2 Capable of storage and handling of personal and small department use
1989	SQL Server 1.0	Fine-tuned, focused support for OS/2 Capable of storage and handling of personal and small department use
1990	SQL Server 1.1	Added support for Windows 3.0 Capable of storage and handling of personal and small department use
1993	SQL Server 4.2	Integrated with Windows NT; capable of storage and handling of personal and small department use
1994		Microsoft and Sybase split; Sybase continues to focus on UNIX database systems while Microsoft focuses on Windows
1995	SQL Server 6.05	First version to be written solely by Microsoft; database engine rewritten to support small business and e-commerce applications
1996	SQL Server 6.5	Gaining prominence
1998	SQL Server 7.0	Database engine rewritten to support small-to-medium-sized businesses Additional features include analysis services and data transformation services
2000	SQL Server 2000 enterprise database	First version to support enterprise environments; database engine was enhanced for improved performance and scalability; provided full support of online operations of businesses, improved development, and analysis tools
2005	SQL Server 2005	Engine rewritten to include integration services, .NET Framework giving the user the ability to create NET SQL Server-specific objects
2008	SQL Server 2008	Additions to 2005 to include additional data types, use of Language Integrated Query (LINQ), and XML; enhanced support of large installations

Table 4-4 Timeline of Microsoft SQL Server releases

reporting services for formatting and creating a graphical representation of the data into reports.

- *Analysis Services (SSAS)*—Provides online analytical processing (OLAP) and data mining for a database. It is designed for the fast and frequent processing of data and queries to be used in OLAP-appropriate environments.
- *Integrated Services (SSiS)*—Joins together and normalizes data from different sources. **Integrated Services** is a valuable tool in data warehouses where different types of data need to be joined together for reporting and extrapolation.

Management Tools The management tools available in Microsoft SQL Server 2008 are those features available to aid in the administration and customization of the server:

- *SQL Server Configuration Manager*—This tool is used to configure the installation of SQL Server. It provides administrators the ability to configure network protocols used by the application to manage services associated with the SQL Server and to configure native client connectivity.

- *SQL Server Management Studio*—This component is the primary administrative interface to the SQL Server database. This tool enables administrators to configure and interact with the database from a single console.
- *Business Intelligence Development Studio*—An environment for application development, allowing developers to create custom applications and forms to meet business needs. These forms can include built-in analysis, as well as integrated and reporting services to improve their functionality.
- *Client Tools Connectivity*—A group of tools that enable communication between a client and a server.
- *Server Profiler*—The service that provides the graphical user interface (GUI) to the computer monitor for an instance of the database.

Licensing Options

During installation of Microsoft SQL Server 2008, administrators are prompted to choose a licensing option. Once this option is chosen, it cannot be changed, so it is important that these options are fully understood prior to the installation of the database application.

Express and Compact editions of Microsoft SQL Server 2008 are free for download, yet typically the cost of the server will depend on the server edition as well as the number of features included within that edition. The more features available within an edition of SQL Server, the higher the licensing costs.

Microsoft licensing can be negotiable for larger organizations, software vendors, and educational institutions. Contracts for these type of organizations may be flexible, yet for the most part, licensing for Microsoft SQL Server 2008 is available under three specific terms: Per Processor Licensing, Per Server Plus Device CAL, and Per User Plus Device CAL.

Per Processor, or Per Server licenses, provide access for an unlimited number of users and devices, so individual user and device Client Access Licenses, or CALs, are not necessary. A **Client Access License (CAL)** is a unique license that allows users or devices access to gain a licensed Microsoft SQL Server 2008 server. There are two types of CALs:

- *SQL CAL*—In this agreement, it is stated that any SQL CAL can be used with any licensed SQL Server regardless of the type of platform.
- *Workgroup CAL*—In this agreement, it is stated that Workgroup CALs can only be used with a licensed Workgroup Server.

The Developer edition of SQL Server 2008 can only be purchased and used by application developers. Therefore, this edition is sold only to individuals, and cannot be registered on production servers.

- *Per Processor Licensing*—In this contract, organizations and individuals pay for each available processor intended for a Microsoft SQL Server 2008 install.
- *Per Server Plus Device CAL license*—In this contract, a license is required for each server, plus a CAL is required for each device accessing the SQL Server within the organization.
- *Per Server Plus User CAL license*—In this contract, a license is required for each server. In addition, a CAL is required for each user accessing the SQL server.

In per-processor licensing, the term *processor* refers to the physical processor only. This essentially means that those processors deemed multi core (e.g., Dual Core, Quad Core), which enable the installation of several instances of SQL Server on one machine, are only considered to be one physical CPU by Microsoft licensing standards. This specification allows organizations ways to save costs if taken into consideration when designing the environment's Microsoft SQL Server installation strategy.

Locating Help

As with any major or minor hardware and software installation, being able to locate help is vital to the success of the installation as well as the future reliability of your environment. The Internet continues to provide an opportunity for an endless amount of peer and expert support, yet there is no better resource than that found within the product manufacturer's main site. This section will identify the major Web sites and resources available for Microsoft Server 2008.

Help Resources

As with all other Microsoft products, help resources are plentiful and rich. Several levels of technical support are offered with the licensing of SQL Server. Contracts can be formed to provide help in many different areas. Whether help is necessary over the phone, in person, or online, you can find resources for a variety of different concerns (e.g., technical support, database consultation, and object development). The resources are endless. Searching online is often the most common first step in obtaining support with any concern. Following are several major Web sites and resources available for Microsoft Server 2008:

- *SQL Server Books Online*—A detailed set of online documents that help you find information regarding all aspects of SQL Server 2008 functionality. The categories include, but are not limited to: Database Engine, Analysis Services, Integrated Services, Replication, and Reporting Services. You can find these documents within SQL Server as well as on the Web at *http://msdn.microsoft.com/en-us/library/ms130214.aspx*.
- *Web sites*—A number of Microsoft SQL Server Web sites are available online. Web sites offer a great amount of information through forums, knowledge bases, blogs, vlogs, and digital libraries. One of the most useful Web sites for Microsoft SQL 2008 is the Microsoft SQL Server Development Center. This site offers the greatest number of resources for SQL Server 2008. The site features links to the Microsoft SQL Library, software downloads, searches of the Microsoft SQL knowledge base, SQL Server communities (including blogs, newsgroups, and forums), self-paced and instructor-led courses, product demos, and training videos. You can view the Microsoft SQL Server Development Center at *http://msdn.microsoft.com/en-us/sqlserver/default.aspx*.
- *The Microsoft Online Books*—This resource provides a comprehensive online manual for all of the current versions and editions of MySQL. These manuals can be found at *http://dev.mysql.com/doc/*.

- *Microsoft SQL release notes*—The benefits of the release notes are that they contain the newest information not necessarily provided in the online book.
- *Microsoft SQL Forums*—Forums are a great way to ask questions and share ideas with other users and Mircrosoft SQL Professionals online. Several great forums are available on the Internet. One suggested group of forums can be found at the Microsoft SQL Server Development Center, which is located at *http://msdn.microsoft.com/en-us/sqlserver/bb671050.aspx*.
- *Bloggers*—Blogs have become a fantastic resource, especially for the technology fields. Many people who work with Microsoft Server 2008 or have experience with the application, blog about their experiences and share their knowledge at this blog site: *http://msdn.microsoft.com/en-us/sqlserver/bb671054.aspx*.
- *Twitter*—Twitter has become a popular way to keep people informed on a minute-by-minute basis. Sending quick updates and reminders, organizations can reach out to their customers directly via e-mail and cell phone. Microsoft uses Twitter as a way for users to ask questions and for Microsoft SQL professionals to send out alerts relevant to upgrades, bugs, and other software-related support at *http://twitter.com/sqlserver*.

Installation

Once a user has obtained the desired copy of MySQL, verified that the hardware and software requirements have been met, and decided on its purpose and design (by choosing the desired edition and features), installation can begin. If prerequisites have not been met, SQL Server will require updates before the installation process.

The Server Installation Center

The server installation center, illustrated in Figure 4-2, is the first window that appears once your prerequisites have been satisfied and before installation begins. It is important to become familiar with the different resources available here. This section will explore those tools and resources.

The Planning Page The planning page provides all of the resources and tools necessary for planning a Microsoft Server 2008 installation. This window provides links to the following resources:

- *Hardware and Software Requirements*—This document displays the hardware and software requirements for the current SQL Server 2008 installation.
- *Security Documentation*—Documentation displays security considerations for a SQL Server 2008 installation.
- *Online Release Notes*—These notes provide the most up-to-date information for the most current release of SQL Server 2008.
- *System Configuration Checker*—A tool that checks the system for anything that might interfere with or prevent the current installation.

- *Install Upgrade Advisor*—This tool is for update installations. The Install Upgrade Advisor will check older versions of SQL already installed on the current machine and fix any known issues with these versions prior to the upgrade.
- *Online Installation Help*—Documentation that provides step-by-step installation instructions as well as information for troubleshooting an installation.
- *How to Get Started with SQL Server 2008 Failover Clustering*—Documentation that provides instructions on setting up and preparing for failover and clustering strategies using Microsoft SQL Server.
- *Upgrade Documentation*—Documentation that provides step-by-step upgrade installation instructions as well as information for troubleshooting an upgrade.

The Installation Page

On this page, you will find the launch tools to begin stand-alone installation, to start a failover cluster installation, and to add a node for failover cluster installations. Links to product updates and upgrades are also available on this window.

- *New SQL Server stand-alone installation or add features to an existing installation*—This link launches a wizard to provide administrators a way to add features to an existing installation of SQL Server or to initiate a new installation.
- *New SQL Server failover cluster installation*—This link launches the single-node failover strategy wizard.
- *Add node to a SQL Server failover cluster*—Launches a wizard for adding nodes to existing failover installations.
- *Upgrade for SQL Server 2000 or SQL Server 2005*—Launches the upgrade wizard.
- *Search for product updates* —Takes user to the Microsoft server update site located at *http://www.update.microsoft.com*.

The Maintenance Page

On this page, you will find various maintenance options available to upgrade, repair, and remove features from SQL.

- *Edition Upgrade*—This link launches a wizard to change your edition of SQL Server 2008.
- *Repair*—This link launches a wizard to repair damaged versions of SQL Server 2008.
- *Remove node to a SQL Server failover cluster*—This link launches a wizard for removing nodes from existing failover installations.

The Tools Page

On this page, you will find various tools available for SQL Server.

- *System Configuration Checker*—A tool that checks the system for anything that might interfere with or prevent the current installation.
- *Installed SQL Server features discovery report*—Compiles a report of all previously installed versions and features of SQL Server.
- *Upgrade Integration Services Package*—Launches a wizard for upgrading SQL Server integration packages to 2008.

The Resources Page

On this page, you will find links to various resources for SQL Server. Here is a list of resources found in this area:

- Books Online
- TechCenter
- Developer Center
- Product Evaluation Web site
- License Agreement
- Register your copy of SQL Server 2008 Express
- Microsoft Privacy Statement
- Community
- CodePlex samples Web site

The Advanced Page

On this page, you will find various advanced tools available for SQL Server.

- *Install-based configuration file*—A tool that enables the administrator to use an existing configuration file to install SQL Server 2008.
- *Advanced Cluster Preparation*—A wizard to prepare SQL Server failover cluster installation.
- *Advanced Cluster Completion*—A wizard to create a failover cluster from existing cluster instances.

The Options Page

On this page, you can specify which edition architecture of SQL Server to install (e.g., x86, x64, ia64) and the installation media root directory. This option is available for installations that will be applied from someplace other than the CD.

Step-by-Step Installation

This section will include the steps for installing Microsoft SQL Server on a Windows 64-bit machine. In order to ensure a successful installation, the machine on which the installation will take place must meet the minimum hardware and software requirements described earlier in this chapter. The instructional steps provided in this section are intended for installing the Enterprise Edition of Microsoft SQL Server 2008.

1. Insert the CD into the CD or DVD drive. From the main folder, double-click the **setup executable file** (Figure 4-1).
2. If all of the necessary hardware and software prerequisites have been met, the Planning page of SQL Server Installation Center will appear (Figure 4-2). On the menu at the left, click **Installation** to gain access to the Installation Page (Figure 4-3).

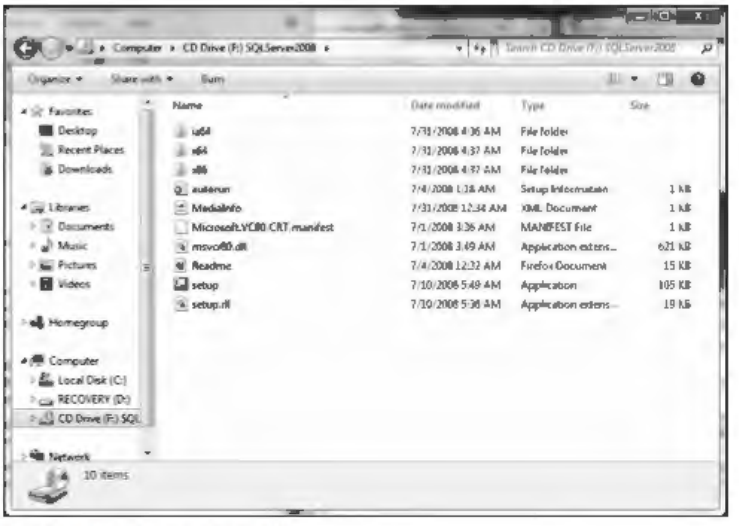

Figure 4-1 Locating the setup file

Figure 4-2 SQL Server Installation Center—Planning page

Figure 4-3 Installation page

3. On the Installation Page of the Server Installation Center, click **New SQL Server stand-alone installation or add features to an existing installation.** The Configuration Checker will run (Figure 4-4). Click **OK**.

The Show details button will display the Configuration Checker log.

4. The Installation Wizard will install the SQL Server prerequisites software (e.g., NET Framework 3.5 SP1, SQL Server Native Client, and SQL Server Setup Support Files) if this was not already completed. To install the prerequisites, click **Next.**
5. The System Configuration Checker (Figure 4-5) will provide details regarding the system state of the computer before setup continues. Click **Next.**
6. The administrator will be prompted to enter the product key. If a free edition of SQL Server 2008 is being installed, this edition must be specified using the drop-down list provided (Figure 4-6). Click **Next.**
7. The Licensing terms window displays the license and requires that the administrator accept the license terms (Figure 4-7). Accept the license and click **Next.**
8. On the Feature Selection window (Figure 4-8), select the features and components to customize your installation. A description for each component will appear in the right pane once a feature is selected.

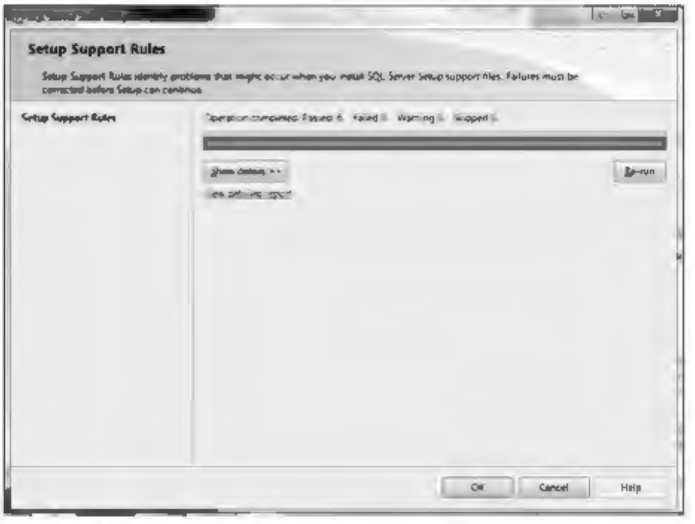

Figure 4-4 System Configuration Checker

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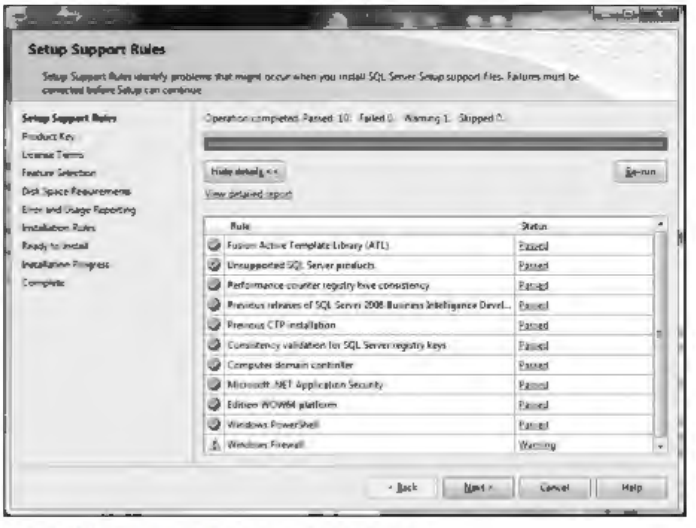

Figure 4-5 System Configuration Checker Details

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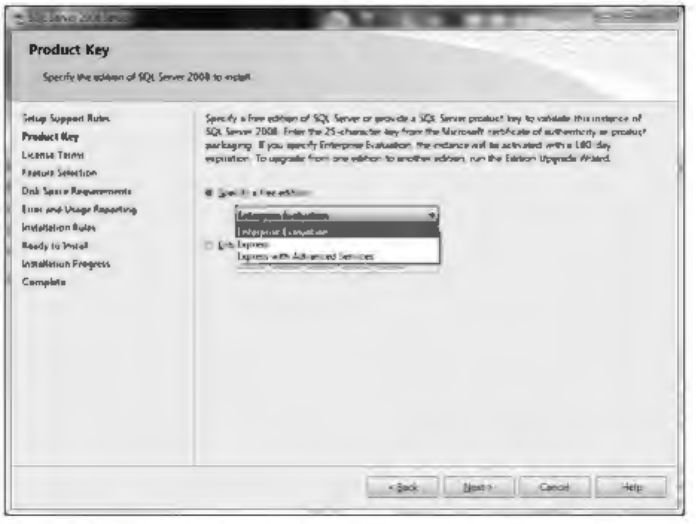

Figure 4-6 Product Key window
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Figure 4-7 Licensing Terms window
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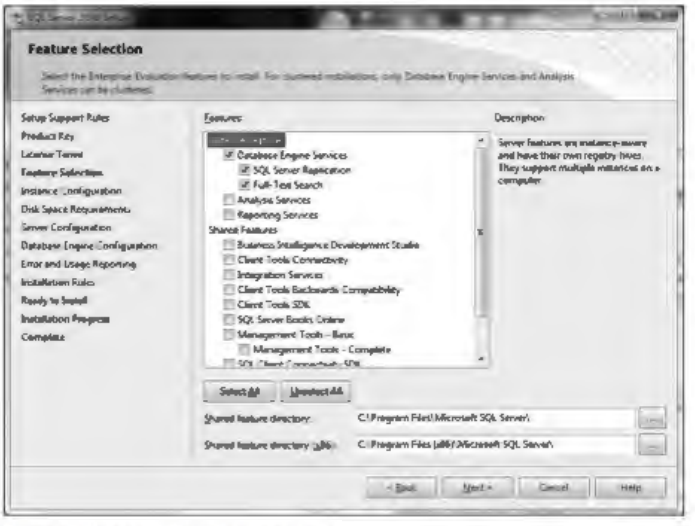

Figure 4-8 Feature Selection window
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Any number or combination of features can be included within the installation. The administrator can choose to select all or none of the features using the available buttons, Select All and Unselect All. Shared directories can also be customized for the specific network environments by clicking the browse button (depicted as '...') and selecting the location for the shared features directory. Once features are selected, click **Next.**

9. On the Instance Configuration window (Figure 4-9), the administrator can specify whether to use a default instance or a custom named instance and instance directory. The name that is specified will also be used as the Instance ID by default. The Installed instances field displays instances that are already installed on the computer within the root directory. Click **Next.**
10. The Disk Space Requirements Window (Figure 4-10) calculates the required disk space for the features that were specified earlier in the installation. Click **Next.**

The remaining instructions may differ since they are dependent on features that you specified earlier in the installation.

11. For security reasons, some services require a username and password. On the Service Accounts window, the administrator will specify login accounts for SQL Server services (Figure 4-11). Change the names by clicking the Account Name and Password fields for each corresponding server feature, and insert the required information into these fields. These services can be assigned the same username and password or each service can be assigned its own unique username and password. For security purposes, provide a separate logon for each service, ensure that the passwords for these accounts are strong,

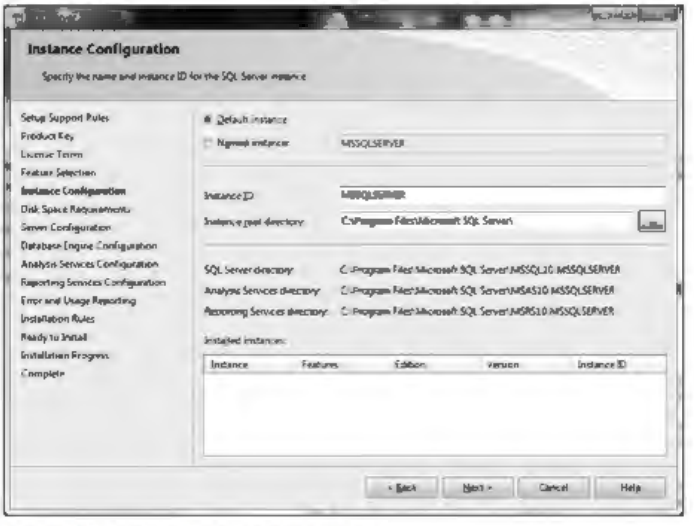

Figure 4-9 Instance Configuration window

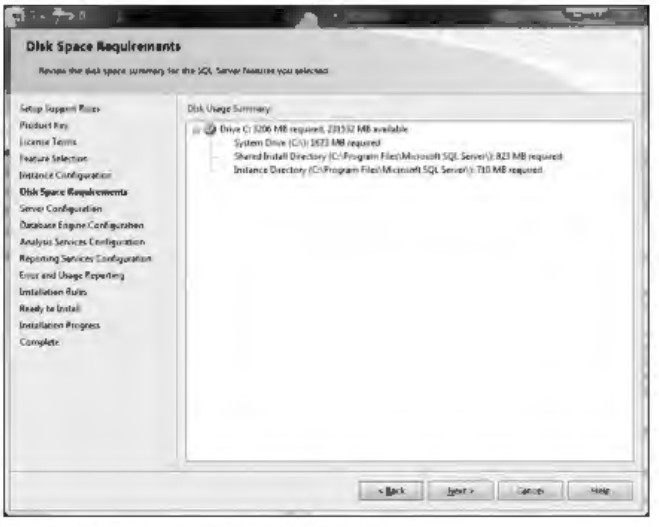

Figure 4-10 Disk Space Requirements window

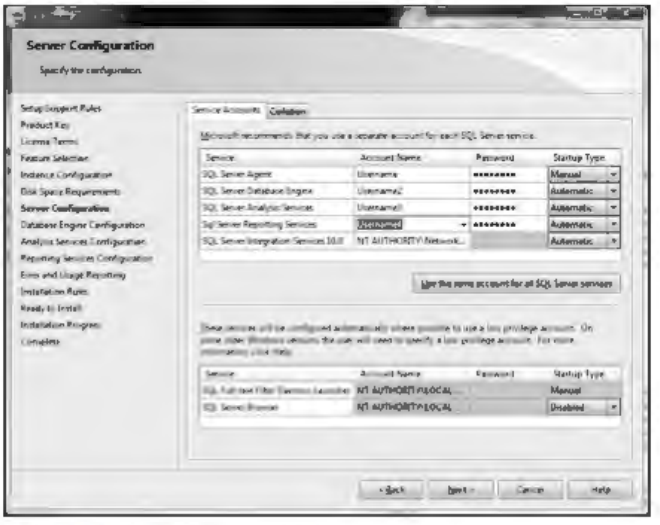

Figure 4-11 Service Accounts window

and that accounts are enabled for least privilege. Services can also be disabled, set to start up automatically, or set to start up manually. For security reasons, do not set services to start automatically unless completely necessary and secured. When finished specifying login information for the services, click **Next**.

12. The Database Engine Configuration window helps ensure that security measures are taken for the initial installation of a server (Figure 4-12). For server administrators, the Account Provisioning page specifies the security mode and the server administrator. The security mode can be set to either Windows Authentication or Mixed Mode Authentication for an instance. Mixed Mode Authentication requires either server or windows authentication, but requires the transmission of login names and passwords over the network. It is recommended that you choose Windows Authentication for installation. The server administration section requires at least one system administrator for the server instance. To add the account under which SQL Server Setup is running, click **Add Current User**. To add or remove accounts from the list of system administrators, click **Add** or **Remove**, and then edit the list of users, groups, or computers that will have administrator privileges for the instance of SQL Server. When the list is finished, click **OK**. Verify the list of administrators in the configuration dialog box and click **Next**.
13. The Analysis Services Configuration window allows administrators to specify users or accounts that will have administrator permissions for Analysis Services (Figure 4-13). At least one system administrator for Analysis Services must be specified. To add the account under which SQL Server Setup is running, click **Add Current User**. To add or remove accounts from the list of system administrators, click **Add** or **Remove**, and then edit the list of users, groups, or computers that will have administrator privileges for

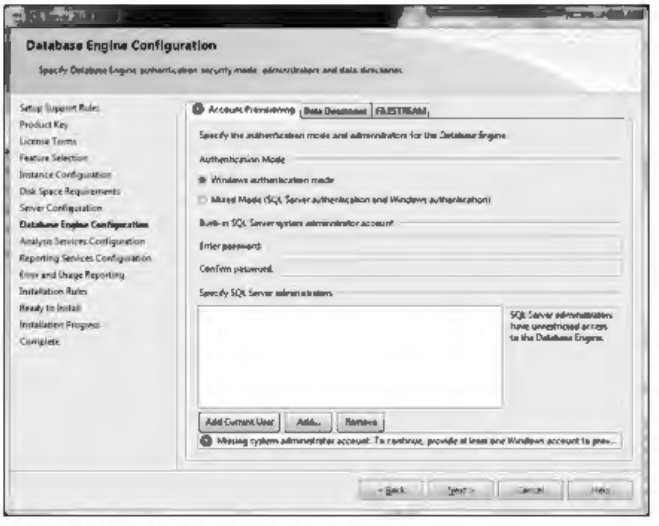

Figure 4-12 Database Engine Configuration window

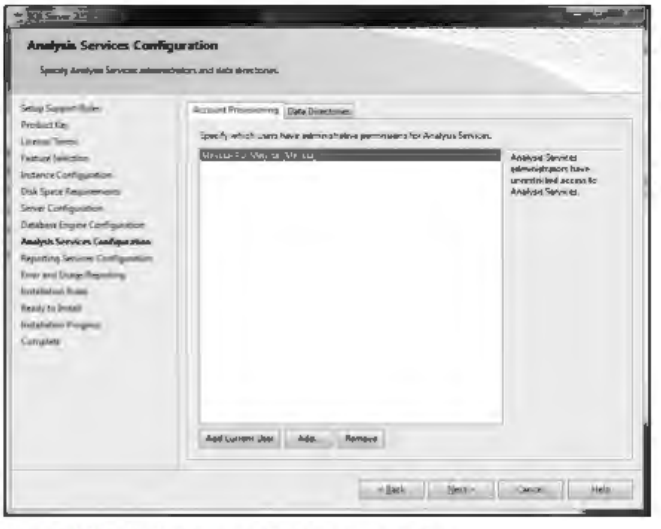

Figure 4-13 Analysis Services Configuration window

Analysis Services. Once complete, click **OK**. Verify the list of administrators in the configuration dialog box and then click **Next**.

14. The Reporting Services Configuration window enables administrators to specify the kind of Reporting Services installation to create (Figure 4-14). There are three different types of Reporting Services from which to choose:
    - *Native Mode*—Setup will install the Report Server and configure it using default values.
    - *SharePoint Integrated Mode*—Setup will install the Report Server database using SharePoint integration default modes.
    - *Not Configured*—Setup will install but not configure the Report Server Software.

    Select **Native Mode** and click **Next**.

Figure 4-14 Reporting Services Configuration window

15. The Error and Usage Reporting window specifies the information that you want to send to Microsoft that will help improve SQL Server (Figure 4-15). By default, options for error reporting and feature usage are enabled. Click **Send Windows and SQL Server Error Reports to Microsoft or your corporate report server**. This setting only applies to services that run without user interaction. Click **Next**.
16. The System Configuration Checker will run once again to validate your configuration (Figure 4-16). Once complete, click **Next**.
17. The Ready to Install window (Figure 4-17) shows a tree view of installation options that were specified during setup. Click **Install**.
18. After installation, the Complete window (Figure 4-18) provides a link to the summary log file for the installation and other important notes. To complete the SQL Server installation, click **Close**.

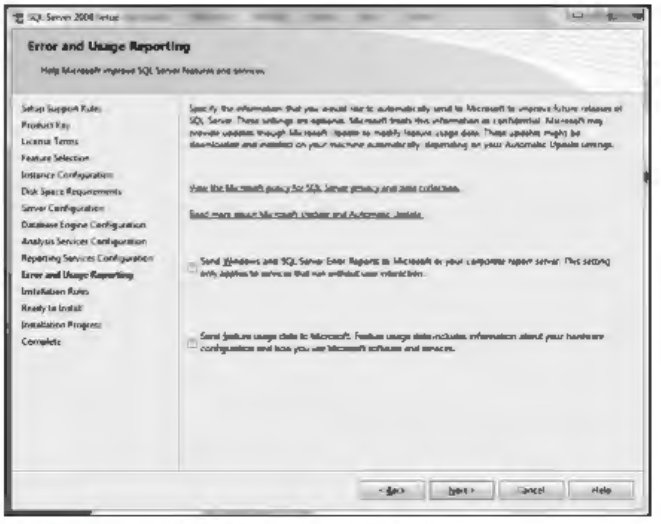

Figure 4-15 Error and Usage Reporting window
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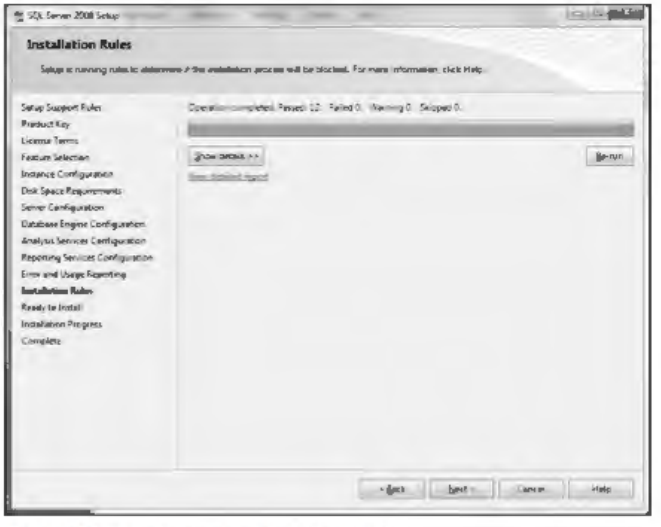

Figure 4-16 Final system configuration check
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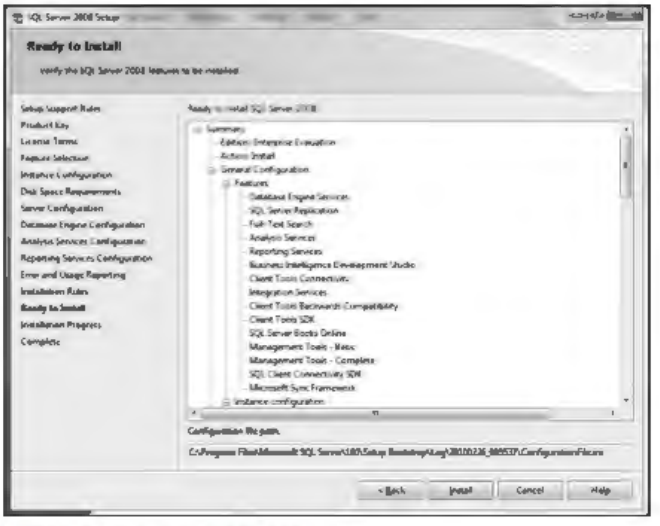

Figure 4-17 Ready to Install window

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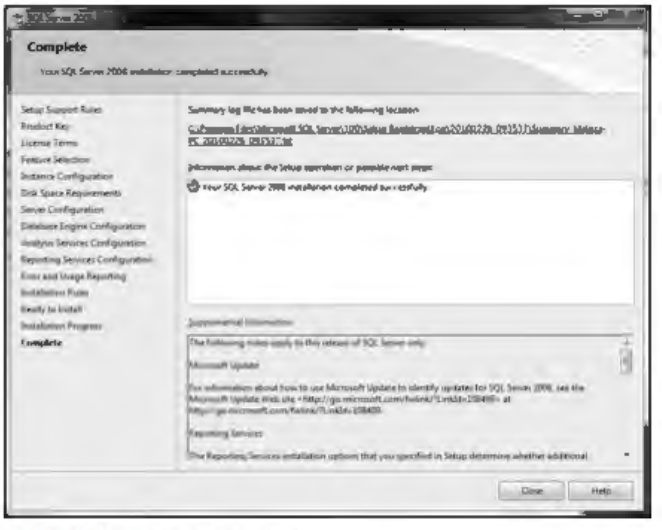

Figure 4-18 Completion window

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Additional Security Considerations for SQL Server 2008

Microsoft has been a household name for many years, and its software currently resides on close to 90% of all of the computers in the world. This type of popularity is the reason it currently creates the most sought-after applications and platforms among the hacking and cracking community. Microsoft SQL Server is no exception to this. As its popularity continues to increase, so do the security attacks. An attack against an organization's database can be quite damaging to its reputation and overall business success, so taking early security measures is vital. This section addresses the basic security concerns in relation to the installation and early administration of Microsoft SQL Server 2008.

Security Steps Prior to Installation

As mentioned earlier, security must be addressed promptly. Even prior to the installation of SQL Server, administrators and network architecture designers should be planning a best-practice strategy to keep their organization's database secure. Here are a few best practices when considering the security of SQL Servers prior to installation:

- Place servers behind firewalls and locked doors in order to keep intruders from gaining access both inside and outside of the organization.
- Use multiple firewalls (both internal and external); create subnets, and require strict authentication.
- Isolate database servers from public networks such as the Internet and eliminate all connections to unnecessary segments of the network.
- Use a very selective strategy when deciding which users to give permission to access the database.
- Configure ports on a computer, and on an individual basis. Avoid group range exceptions whenever possible. Never leave ports open and unmanaged.
- Choose servers for your SQL Server installation that use an NTFS file system. They provide extra security through encryption and access control list permission implementation.
- Encrypt your connection to the server using SSH or SSL. By default, Microsoft SQL Server is not encrypted, which can lead to communication being intercepted and compromised data.

During Installation

- Apply policy-based management and manage it centrally. Polices help to enforce naming conventions and configuration standards to keep a database safe.
- Utilize Encryption and Auditing services. Transparent data encryption (TDE) enables the encryption of the database and backups without affecting the user.
- Enhanced auditing features allow the tracking of data access in addition to data modification.
- As mentioned in the chapter, passwords should be applied to services individually and uniquely. Different passwords limit the access of those who may intrude.

- Choose Windows authentication over Mixed authentication to avoid login names and passwords being sent across the network.
- Passwords should always follow a strict and strong policy. The more complex the password, the better defense against it being cracked.
- Administrative usernames can be just as important as passwords. Change default usernames whenever possible, as they are easy to find online. Changing the usernames of root passwords can provide additional security against intruders attempting to discover access.

After Installation

- Never store passwords in plain text format (udf files). When a password is stored within your SQL Server database, apply strong encryption techniques. If a machine becomes compromised and the password is stored in plain text, the intruder can take full advantage and further compromise your site.
- Take a multitiered approach to access. Create specific roles at the server, application, and database layers.
- Just as one should assign separate passwords to separate SQL Services, these services should run under separate Windows accounts that are local or that have minimum rights.
- Always apply the principle of least privilege when creating accounts and providing access to database objects and services.
- Keep up to date with security updates and patches from Microsoft.
- Configure auditing services to enable login auditing at both the Operating System and SQL Server level. Frequently review the logs for any clues.
- Disable all guest accounts within Windows.
- If possible, group database users on a different global group, separate from all other user groups.
- Make use of your error logs and ensure their security as well.
- Never use the administrative account to run the database service engine; log on with a user account having the least privilege possible for these intended tasks.
- Make sure all the file and disk shares on the SQL Server computer are read-only whenever possible.

Chapter Summary

- Microsoft SQL Server offers flexible installations that require a number of decisions to be made during the planning phase.
- There are 32-bit and 64-bit versions of SQL Server 2008 available.
- Supported platforms for Microsoft SQL Server are dependent on their edition. Overall, Microsoft SQL Server 2008 is supported in Windows XP, 2003 Server, Vista, 2008 Server, and Windows 7.

- Microsoft SQL Server 2008 cannot be installed on computers without NET Framework 3.5 SP2, Microsoft Windows Installer 4.5, the newest version of PowerShell, and MDAC 2.1 SP1.
- The network software required for SQL Server to communicate are Shared Memory, TCP/IP, Named Pipes, and Virtual Interface Adapter via Protocols.
- Changes in the network design and architecture may be necessary with the installation of SQL Server. This change will depend on the amount of data and the amount of users adding traffic to the network.
- There are seven editions of Microsoft SQL Server 2008: Express, Compact, Workgroup, Web, Standard, and Enterprise. The main core editions are Express, Standard, and Enterprise.
- The number of CPUs permitted, maximum memory that can be utilized, and the maximum database size are determined by the edition of Microsoft SQL Server.
- Components or features in SQL Server are optional, allowing for customizable installations that are based on specific network scenarios.
- Database Engine Services, Reporting Services, Analysis Services, and Integrated Services are examples of optional server tools available within SQL Server 2008.
- Configuration Manager, Server Management Studio, Business Intelligence Development Studio, Client Tools Connectivity, and Server Profiler are examples of optional management tools in SQL Server 2008.
- Licensing options for SQL Server enable users to choose to pay per server, processor, or user.
- Microsoft offers a number of online and offline help sources that can provide consulting, development, or technical support.
- Microsoft Online Books are the most comprehensive and popular resources available both online and within the application.
- Forums, blogs, and tweets are great ways to share knowledge and get answers from SQL Server experts.
- The Server installation center is the main administrator interface within SQL Server. It provides access to resources for planning, management, installation, and tools within SQL Server.
- Strong security is vital to the success of SQL Server since its popularity makes it a major target for potential intruders.
- Prior to installation, security design decisions such as firewalls, subnets, encryption, and file systems should be considered.
- During installation, administrators should choose secure usernames and passwords, apply policy-based management, and utilize encryption and auditing practices.
- After installation, logs and auditing techniques should be put into place and authentication should be applied using several tiers.

Key Terms

Client Access License (CAL) A unique license that allows users or devices access to gain a licensed Microsoft SQL Server 2008 server.

integrated services A valuable tool in data warehouses where different types of data need to be joined together for reporting and extrapolation.

replication The act of sending copies of one database to another database within a network.

Review Questions

1. List the decisions a network administrator should make prior to database installation.
2. Explain the difference between a 32-bit and 64-bit operating system.
3. Explain why installing the mimum hardware requirements is not suggested.
4. Explain how server hard drive storage requirements and network hardware components are similar to the way an administrator determines requirements.
5. Explain what must be considered when choosing the appropriate supporting platform for an edition of SQL Server 2008 being installed on a machine.
6. Explain how editions of Microsoft SQL Server are able to provide customization for specific network and environment scenarios.
7. How do the Compact and Express editions differ from all other editions of Microsoft SQL Server 2008?
8. List the online resources that are also accessible within the pages of SQL Server.
9. Identify and define at least six different features of Microsoft SQL Server available for downloading and installation.
10. Identify and define at least three different ways Microsoft SQL Server is licensed.
11. Explain why it is better to install a unique username and password for each installed feature, compared to one general username and password for all features.
12. List three security practices to follow during installation of Microsoft SQL Server 2008.

Case Projects

Case Project 4-1: Microsoft SQL Server Identify the Edition

Write a paragraph providing a rationale for identifying the server component best used for the following business scenarios:

a. Questionable Meds Pharmaceuticals has been collecting sales data for five years. Sales have tremendously increased over the last two years. Jason is asked to look for trends to explain the increase.

b. Jason of Questionable Meds Pharmaceuticals must provide sales information to the senior managers on a weekly basis. Senior management has requested that they receive the information in the same format and using the same organization each week.

Case Project 4-2: Microsoft SQL Server Community

Using SQL Server Books Online, list all of the available resources currently provided within the Microsoft SQL Server community. Choose one resource, explore it, and explain one thing that you have learned.

Case Project 4-3: Implementing Security Measures

Suppose that you are Jason for Questionable Meds Pharmaceuticals. Outline the security measures that you would implement to protect a new installation of MySQL.

Hands-On Projects

Hands-On Project 4-1: Installing a Sample Database

Go to *http://www.codeplex.com/*. Describe the purpose of this Web site, find one sample, provide the name of that sample, and install it.

Hands-On Project 4-2: Researching and Applying Authentication Mode

Using the Internet, further research the Authentication Mode. Describe the steps that you would take to show an example of Authentication Mode when authenticating through Windows.