Administering SQL Server 2000 – Level 1

This book is designed for those programmers or database administrators (DBA) who wish to learn to use SQL Server 2000.

Assumptions

To be able to use this book effectively it is assumed that you have some previous experience using database management systems (DBMS). You should be familiar with the basics of database terms and normalization. It is also assumed, that you own a copy of SQL Server 2000.

Get the latest Service Pack

Before you do too much in SQL Server, please make sure you have downloaded any latest service packs from the Web Site. A good place to start to see if any service packs are available is www..com/sql. This usually will point you to any latest service packs for SQL Server.

Installation Instructions

To install the samples for each of the chapters, simply create a new folder on your hard drive and copy all of the folders from the floppy disk to this new folder. Under this new folder on your hard drive you will find several folders, each one relating to those chapters in the book that have samples. Each folder is labeled with the chapter number and a short description of what the samples relate to.

Creating the Sample Database

You will first need to create a database named Employees in your SQL Server. Next, you can load the scripts in the following order:

Table.sql – Creates the tables for the employee system.
Insert.sql – Adds the data to the tables.
Foreign – Adds foreign keys to the tables.
Index.sql – Adds some Indexes to the tables.
StoredProc.sql – Adds some stored procedures.

Overview of SQL Server 2000

In this chapter you will be presented with an overview of the features of SQL Server 2000.

Chapter Objectives

1. Learn about the features of SQL Server

What is SQL Server

SQL Server for Windows NT is an RDMS (relational database management system) for the personal computer. SQL Server enforces database integrity, it handles all queries on the server itself, and just returns a result set. SQL Server also supports stored procedures, triggers, defaults, rules and other mechanisms for defining a database, modifying and retrieving data.
SQL Server contains not only a very powerful database server, but a group of products that will help you administer your server. SQL Server comes with a suite of graphical tools that allow database administrators and developers to install, configure, and administer the database with little effort.

1.1 Why use SQL Server

When deciding on a database platform you need to make some choices. Some of the reasons you may use SQL Server are:

- You need a powerful relational database.
- You want to move to client/server architecture.
- You need a fast database for on-line transaction processing.
- Your database is too slow for the amount of data you have.

- You need support for entity, domain, referential and business-policy integrity.
- You want security enforced at the database level.
- Ease of installation, deployment and use.
    - SQL Server is by far the easiest database system to install, deploy to users on a Windows 95/98 system. It is extremely easy to use with the wide variety of wizards available and the great graphical tools.
- Scalability
    - SQL Server can scale from a single user system on a Windows 95/98 platform all the way to an enterprise wide usage with thousands of users across a wide area network.
- Data Warehousing
    - With new features built in for on-line analytical processing (OLAP), SQL Server is ready to house your largest databases and be able to retrieve that data in a timely and easy format. An english query processor will help your users ask questions of the database and get the correct answers back.
- Integration with other OS Services
    - SQL Server easily integrates with other Windows NT services such as NT security, email, the internet and other services.
- XML Support
    - SQL Server has great XML support. It can retrieve data in an XML format, and, with a little help from some system procedures, it can use XML to modify data in a database.

SQL Server versus a desktop database

There are no hard and fast rules for choosing a client/server database system over a desktop database system like Access. However, if you are developing an application that contains gigabytes of data, will have 50 or more simultaneous users, or is an OLTP (on-line transaction processing) application, consider using SQL Server 7.0 as the database server. SQL Server 7.0 will perform better than Access, Xbase and other desktop systems when dealing with large amounts of data on a network.
The following are the major reasons you would choose to use SQL Server over a desktop database system:

- You will have large amounts of data.
- You will have a large amount of simultaneous users.
- You need better security than a desktop file system.
- You don’t want all records being filtered on the client.

1.2 SQL Server Graphical Tools

The following describes the graphical tools that come with SQL Server.

Tool	Description
SQL Server Books Online	These books provide all of the information you need to learn how to use SQL Server.
Client Network Utility	This tools will help you configure a client workstation to connect to SQL Server. You probably won't have to use this much as most client front-end applications will install the drivers necessary to connect to the server.
Enterprise Manager	This is the main tool used by database administrators that will be used most often. This plug in to the Management Console will help you create new databases, tables, logins, schedule jobs, perform backups and all other administrative tasks required to manage your server.
Import/Export data	This wizard will help you import and export data to and from your SQL Server into other formats.
MSDTC Administrative Console	This is the Distributed Transaction Coordinator tool that will help you view any distributed transaction between this SQL Server and another server.
Performance Monitor	This is the NT Performance Monitor with some special counters specifically for use with SQL Server.
Profiler	This tool will help you capture events as they occur in your server so you can help optimize and tune your server for optimimum performance.
Query Analyzer	This tool is used to submit ad-hoc queries to the server and have result sets generated. This tool will the 2nd most often used too. You can also use this tool to view statistical information about your queries and will help you optimize those queries.
Server Network Utility	This utility will let you configure your SQL Server to listen on different network protocols such as over a Novell network.
Service Manager	This utility will help you start, stop and pause the SQL Server service.

1.3 Transact-SQL

Transact-SQL is the SQL-Server dialect of the SQL language that drives the SQL Server engine. Transact-SQL is a superset of the ANSI 92 standard SQL language. Transact-SQL provides powerful extensions to the SQL language, giving users of SQL Server the ability to perform the following:

- Define stored procedures, remote stored procedures, triggers, rules, column defaults, user-defined data types, etc.
- Declare variables and use them within the different objects in the SQL Server environment.
- Control the flow of SQL statements with branching and looping constructs.
- Perform transaction processing.
- Enforce data integrity.

Transact-SQL goes beyond the ANSI standard by offering more than 35 new or enhanced statements, more than 60 system and utility functions, and over 70 built-in, system-level stored procedures that reside within SQL Server and can be called from front-end applications.

1.4 Objects you can create

SQL Server allows you to create many different objects that will help you create your relational database system.

Object	Description
Database	This is the main storage area for all your tables and other objects you will need to hold your data.
Table	This is where the data will be stored. Tables are made up of rows and columns.
Column	Each column in SQL Server stores a discreet piece of data. There is a wide variety of data types available to you to store data.
Stored Procedure	A stored procedure is a reusable sub routine that resides on the server in a pre-compiled form that is ready to be called by any front-end application. Stored procedures may return result sets, or simply perform some action.
Trigger	This is a special type of stored procedure that is fired whenever an INSERT, UPDATE or DELETE action is executed against a table.
View	This is a query that will return result sets from a base table. Views can also be used to express a JOIN that looks to the user like one base table. Most views are updatable as well.
Default	This is a value that is assigned to a column if you perform an INSERT against a table and you do not specify that column.

Rule	This is a piece of code that you can assign to one or many columns that will check the data being assigned to a column.
Check	This is like a rule, but is specifically attached to just one column.
User-Defined Data Type	SQL Server allows you to define your own user-defined data types that can be used to create columns in a table.
User-Defined Functions	You can create your own functions out of existing T-SQL statements and functions.

1.5 Security

SQL Server has the ability to enforce many levels of security.

Security Level	Description
NT Authentication	You can authenticate users via their NT login. This way users logging into NT will be automatically authenticated in the SQL Server service as well.
SQL Server Authentication	You can authenticate users via SQL Server authentication. You may need to do this is users might be coming in from the Internet and are not logged into your NT network.
Roles	SQL Server pre-defines a certain amount of server roles where the logins assigned to those roles have certain permissions to perform operations within the server. There are also pre-defined database roles for each database created. It is up to you as a system administrator to assign logins to those roles.
Users	Besides being authenticated to login to the server, you will also make a login a user of a database. This way only certain logins can get to certain databases.

Permissions

After the user has been validated into a database, they can be further granted rights to the objects within that database.

Permission	Description
Table	You can grant users of the database the rights to SELECT, INSERT, UPDATE and DELETE from one or many tables in your database.
Columns	You can grant users rights to just certain columns within a table.
Stored Procedures	You can grant users rights to execute one or many stored procedures.

Views	You can grant the same rights to views as you can for tables.

1.6 Services

There are at least two services installed with a SQL Server installation; MSSQLServer and SQLServerAgent. These are actual NT services when SQL Server is installed on an NT machine. These services are simulated when installed on Windows 95/98. For these services to run on NT, they must be assigned to a Windows NT user account. Both these services may be assigned to the same user account.

Service	Description
MSSQLServer	This is the relational database management system itself. It processes all of the SQL statements and manages all of the files. All of the other services extend the functionality of this service.
SQLServerAgent	This service helps SQL Server schedule tasks, and checks the alerts to see if any events have been recorded that need attention by an operator.
MSDTC	The distributed transaction coordinator can help you perform a two-phase commit between different SQL Server machines, or even between SQL Server and Oracle.
Search	This optional service will perform the full-text searching capabilities of SQL Server. This allows you to perform some advanced queries against textual data in your server.

You can assign one of three different types of accounts to these services; either a local system, local user, or a domain user account. It is recommended that you use a domain user account that is a member of the **Administrators** group. The reason for this is the local system and local user accounts do not have network access rights. This could be important if you need to interact with other SQL Servers or other NT servers for some remote services. These types of services that might require a domain user account would be:

- Replication from one machine to another. When setting up replication it is recommended that you use the same user account for all servers that will be in the replication process (Publishers and Subscribers).
- Backing up your databases to a network drive.
- Performing heterogeneous joins that involve remote data sources.
- If you wish to use the SQL Server Agent mail features and SQL Mail.
- Executing remote procedure calls (RPCs).

Help

There are several help files installed with SQL Server.

Help	Description
SQL Server Books Online	This is the main help that you will probably use most often. This help system will give you a complete overview of the SQL Server database system as well as specific help on how to perform the maintenance duties using the SQL Server Enterprise Manager, T-SQL or the SQL-DMO objects.
T-SQL Help	This help file gives you complete syntax information on the Transact-SQL language used by SQL Server.
Enterprise Manager Help	This help file gives you information on how to use the SQL Server Enterprise Manager menus and toolbars.
Query Analyzer Help	This help file gives you information on how to use the Query Analyzer menus and toolbars. If you press Shift-F1 after highlighting an SQL Statement in the query analyzer window you will bring up the T-SQL help.
Profiler Help	This help file gives you information on how to use the Profiler menus and toolbars.

1.7 Capacities

Like any database system, SQL Server has its limitations. The following table is a list of those limits:

Object	Limits
Databases per server	32,767 databases.
Size of database	Over 1 million terabytes.
Tables per database	2 billion tables per database.
Columns per table	1024
Rows per table	Limited only by available storage
Bytes per row	8060. This does not include text and image data types.
File size of data	32 TB
File size of log data	32 TB
Column names & variable name length	128 characters
Indexes per table	1 clustered index per table. 249 nonclustered indexes per table. A composite index may have up to 16 columns.
Triggers per table	Limited only by the number of objects in a database
Stored procedures	Can have up to 255 parameters, and can nest up to 16 levels

	deep.
User connections	Whatever your licensing allows

1.8 Connectivity options

You can connect to SQL Sever from a client application in several different ways. SQL Server has a few different native APIs that you can use to connect. A Native API is one that calls network APIs that are directly sent to the SQL Server and require no intermediate layer of software to translate those API calls. SQL Server supports 3 different methods of Native API calls.

- OLE DB
- ODBC
- DB-Library (You can also use Embedded SQL (C/C++, COBOL) that will call DB-Library)

SQL Server for Windows NT supports multiple protocols through a dynamic protocol architecture. It can read multiple packets sent over multiple transports including NetBEUI, TCP/IP, and IPX/SPX.

1.9 Other Features

The features listed above are just some of the capabilities of SQL Server. While there are way to many to list in just one chapter, below are a few more of the major features that make SQL Server such a powerful database engine.

Replication

SQL Server allows you to replicate data from one server to another when the data changes, or at regularly scheduled times. You are allowed to replicate not only to another SQL Server, but any OLE DB data source.

Data Warehousing Capabilities

SQL Server has added a whole host of tools that make creating and retrieving information from a data warehouse much easier. SQL Server includes a complete OLAP (on-line analytical processing) engine that will make querying data in the warehouse much easier.

Import/Export Capabilities

SQL Server has the most complete import/export facility of any database system on the market. In fact it even kills a lot of the third party products that perform data transformations from one system to another. You are given complete control over the source and destination of the process. You can even write VBScript code if you need to control the process at the row and/or the column level.

Job Scheduling

SQL Server has a complete scheduling system that will help you schedule tasks that need to run at specified intervals of time. These jobs you might schedule include backups, verifying the integrity of the database, replication, and maybe even publishing data to a web server.

Full-Text Indexing

Allows you to store important words from your character or text data types. You can then perform complex word pattern matching to retrieve rows of data.

Index Tuning Wizard

This new wizard will take the output from the Profiler and help you determine the best mix of indexes to improve the performance of your database.

English Query

This tool allows users to type in english sentences to query your database. For example you might express a query such as “How many employees had sales over $5000 last month?” This would return a list of employee names.

Summary

SQL Server 7.0 is an extremely easy database system to use while providing extreme power and flexibility for the most demanding database jobs.

Review Questions

1. Which operating systems will SQL Server run on?
   a). Linux, Windows and OS/2
   b). Any version of Windows 95/98/NT/2000
   c). All versions of Windows, plus OS/2.
   d). None of the above

2. Name the two graphical tools that you will use most often.
   a). SQL Enterprise Manager and SQL Query Analyzer
   b). SQL Query Analyzer and SQL Service Manager
   c). SQL Service Manager and SQL Enterprise Manager
   d). None of the above.

3. What is Transact-SQL?
   a). An SQL command that starts a transaction.
   b). A stored procedure.
   c). A dialect of the SQL language defined to run on the SQL Server engine.
   d). None of the above.

4. What is the main storage area for all your tables and other objects called?
   a). Database
   b). Table
   c). Column
   d). None of the above.

5. What does the SQLServerAgent service do?
   a). Schedules tasks and checks alerts
   b). Helps you perform a two phase commit between different SQL Server

machines
c). Performs full text searching
d). Process all SQL Server SQL statements

Answers to Review Questions

1. Which operating systems will SQL Server run on? **Any version of Windows 95/98/NT/2000**
2. Name the two graphical tools that you will use most often. **SQL Enterprise Manager and SQL Query Analyzer**
3. What is Transact-SQL? **A dialect of the SQL language defined to run on the SQL Server engine.**
4. What is the main storage area for all your tables and other objects called? **Database**
5. What does the SQLServerAgent service do? **Schedules tasks and checks alerts**