Section 1

An introduction to SQL

Before you begin to learn the fundamentals of programming in SQL, you need to understand the concepts and terms related to SQL and relational databases. That's what you'll learn in chapter 1. Then, in chapter 2, you'll learn about some of the tools you can use to work with a SQL Server database. That will prepare you for using the skills you'll learn in the rest of this book.

1

An introduction to relational databases and SQL

Before you can use SQL to work with a SQL Server database, you need to be familiar with the concepts and terms that apply to database systems. In particular, you need to understand what a relational database is. That's what you'll learn in the first part of this chapter. Then, you'll learn about some of the basic SQL statements and features provided by SQL Server.

An introduction to client/server systems 4
The hardware components of a client/server system 4
The software components of a client/server system 6
Other client/server system architectures 8

An introduction to the relational database model 10
How a database table is organized 10
How the tables in a relational database are related 12
How the columns in a table are defined 14
How relational databases compare to other data models 16

An introduction to SQL and SQL-based systems 18
A brief history of SQL 18
A comparison of Oracle, DB2, MySQL, and SQL Server 20

The Transact-SQL statements 22
An introduction to the SQL statements 22
Typical statements for working with database objects 24
How to query a single table 26
How to join data from two or more tables 28
How to add, update, and delete data in a table 30
SQL coding guidelines 32

How to work with other database objects 34
How to work with views 34
How to work with stored procedures, triggers, and user-defined functions 36

How to use SQL from an application program 38
Common data access models 38
How to use ADO.NET from a .NET application 40
Visual Basic code that retrieves data from a SQL Server database 42
C# code that retrieves data from a SQL Server database 44

Perspective 46

An introduction to client/server systems

In case you aren't familiar with client/server systems, the first two topics that follow introduce you to their essential hardware and software components. These are the types of systems that you're most likely to use SQL with. Then, the last topic gives you an idea of how complex client/server systems can be.

The hardware components of a client/server system

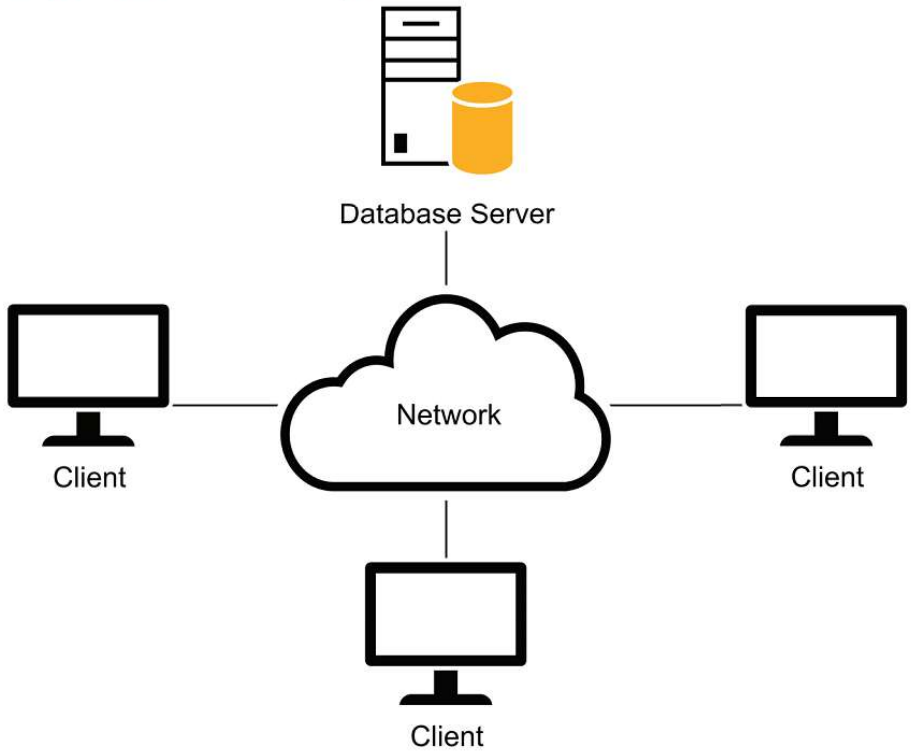
Figure 1-1 presents the three hardware components of a client/server system: the clients, the network, and the server. The *clients* are usually the PCs that are already available on the desktops throughout a company. And the *network* is the cabling, communication lines, network interface cards, hubs, routers, and other components that connect the clients and the server.

The *server*, commonly referred to as a *database server*, is a computer that has enough processor speed, internal memory (RAM), and disk storage to store the files and databases of the system and provide services to the clients of the system. This computer is usually a high-powered PC, but it can also be a midrange system like an IBM System x or Unix system, or even a mainframe system. When a system consists of networks, midrange systems, and mainframe systems, often spread throughout the country or world, it is commonly referred to as an *enterprise system*.

To back up the files of a client/server system, a server usually has a tape drive or some other form of offline storage. It often has one or more printers or specialized devices that can be shared by the users of the system. And it can provide programs or services like e-mail that can be accessed by all the users of the system.

In a simple client/server system, the clients and the server are part of a *local area network (LAN)*. However, two or more LANs that reside at separate geographical locations can be connected as part of a larger network such as a *wide area network (WAN)*. In addition, individual systems or networks can be connected over the Internet.

A simple client/server system



The three hardware components of a client/server system

- The *clients* are the PCs, Macs, or workstations of the system.
- The *server* is a computer that stores the files and databases of the system and provides services to the clients. When it stores databases, it's often referred to as a *database server*.
- The *network* consists of the cabling, communication lines, and other components that connect the clients and the servers of the system.

Client/server system implementations

- In a simple *client/server system* like the one shown above, the server is typically a high-powered PC that communicates with the clients over a *local area network* (*LAN*).
- The server can also be a midrange system, like an IBM System x or a Unix system, or it can be a mainframe system. Then, special hardware and software components are required to make it possible for the clients to communicate with the midrange and mainframe systems.
- A client/server system can also consist of one or more PC-based systems, one or more midrange systems, and a mainframe system in dispersed geographical locations. This type of system is commonly referred to as an *enterprise system*.
- Individual systems and LANs can be connected and share data over larger private networks, such as a *wide area network* (*WAN*), or a public network like the Internet.

Figure 1-1 The hardware components of a client/server system