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微软指定MCSD教材（影印第2版）

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微软全球唯一指定的教材　高薪职位通行证
深入专业的编程技术　高级程序员必备

Microsoft
Visual C++ 6.0
分布式应用程序开发

（影印第2版）

Distributed
Applications with
Microsoft
Visual C++ 6.0
MCSD
Training Kit

For Exam
70-015

Microsoft **Certified**
Professional
Solution Developer
Exam
Training

[美] Microsoft 公司　著

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分布式应用程序开发

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内 容 简 介

本书是《微软指定 MCSD 教材（影印第 2 版）》丛书中的一本，讲述 Visual C++ 6.0 分布式应用程序开发技巧，内容包括系统安装与配置、开发用户服务、COM 、ATL、MFC、平台式 SDK、OLE DB、ADO、异常情况处理以及开发基于 Web 和基于网络的解决方案等。本书还可指导您准备 MCP 70-015 考试（微软认证解决方案开发人员证书的一门核心考试）。

本书由微软公司专家编写，技术深入，权威性强，可作为 Visual C++ 6.0 分布式应用程序开发人员和 MCP 考试应试者的参考书。

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前　言

微软认证是一项综合性认证计划，是对个人的与软件有关的技能的重要评测标准，其证书授予那些能够使用微软公司的产品完成特定任务和实施解决方案的人。微软认证被全世界的技术管理者视为质量的标志，是雇主聘用和考核职员的重要参考依据，又是个人求职和升迁的金钥匙。MCSD 即微软认证解决方案开发人员，获得此证书表明能够使用微软的开发工具、技术和平台（包括 Microsoft Office 和 Microsoft BackOffice）开发自定义商务解决方案。所以，这套面向 MCSD 认证考试的培训教材一经推出，就受到了广大读者的欢迎。针对这种情况，我们及时地推出了它的影印第 2 版，并为每本书附上了 Microsoft SQL Server 2000 的 120 天试用版或者 Microsoft Windows 2000 Advanced Server 的 120 天试用版。

本套影印丛书共分 6 册，分别是《Microsoft Visual Basic 6.0 桌面应用程序开发》、《Microsoft Visual Basic 6.0 分布式应用程序开发》、《Microsoft Visual C++ 6.0 桌面应用程序开发》、《Microsoft Visual C++ 6.0 分布式应用程序开发》、《需求分析和解决方案结构定义》和《Microsoft Visual InterDev 6.0 Web 应用程序开发》。6 册书分别针对不同的用户群体以及 MCSD 认证计划的不同考试，讲述不同的内容，各有侧重，互为补充。

本套丛书具有以下共同特点：

每一章一开始，首先对本章内容作以概括性介绍，让读者有一个总体性认识。然后说明在学习本章内容之前需要具有哪些预备知识，安装哪些软件。

书中提供了大量操作训练实例，让读者能够即时地对所学技能进行有效的练习。

配套光盘中提供了丰富的辅助资料，包括多媒体演示、示例数据和操作训练文件等。多媒体演示所涉及的是本书中的一些关键概念。操作训练文件则给了读者一个亲自动手的机会。可以直接在光盘上练习，也可以安装到硬盘上之后再使用。

为了进一步提高本丛书及其配套光盘的质量，希望广大读者把有关的意见或建议反馈给微软出版社。联系方法是：

电子邮件地址：

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http://mspress.microsoft.com/support/

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About This Book

Welcome to *Distributed Applications with Microsoft® Visual C++® 6.0 MCSD Training Kit*. By completing the chapters, practice exercises, and labs in this course, you will acquire the knowledge and skills necessary to develop solutions using Microsoft Visual C++ 6.0.

This book also addresses the objectives of the Microsoft Certified Solution Developer (MCSD) Exam 70-015, providing content that supports the skills measured by the exam. Review questions at the end of each chapter test your knowledge of the chapter material and help you prepare for the 70-015 exam.

Note For more information on becoming a Microsoft Certified Solution Developer, see "Microsoft Certified Professional Program" later in this section.

Intended Audience

This course is designed for students interested in developing their skills in Visual C++ 6.0 while developing distributed applications. These skills include:

- Using the Microsoft Solutions Framework (MSF)
- Building applications with the Microsoft Foundation Classes (MFC)
- Creating user interfaces
- Implementing application behaviors
- Working with persistent data
- Adding database support to applications
- Creating Component Object Model (COM) components and ActiveX controls
- Using MFC and the Active Template Library (ATL)
- Internet programming
- Error handling, debugging, and testing
- Application deployment

Prerequisites

This book assumes that you have a solid working knowledge of C++ application development and are acquainted with but not fully knowledgeable about Microsoft Visual C++ 6.0 and the Microsoft Windows Application Programming Interface (API). Before beginning this self-paced course, you should have:

- A thorough working knowledge of the C++ language as described by the ANSI standard, and an acquaintance with language features such as templates and exception handling
- A good understanding of the principles of object-oriented software development
- A good basic understanding of the operation of a Windows application and the features of the Windows user interface

Course Overview

This course combines text, graphics, and review questions to teach you about designing and implementing distributed applications with Visual C++ 6.0. The course assumes that you will work through the book from beginning to end. However, you can choose a customized track and complete only the sections that interest you. If you choose to customize your course, see the "Before You Begin" section in each chapter for important information regarding prerequisites.

The book is divided into the following chapters:

- **Chapter 1, "Designing the Application"** In this chapter, you will learn about a distributed application design approach that you can use to identify and separate the layers of an application architecture. This approach, based on the Microsoft Solutions Framework (MSF) Application model, can provide your development team with a means to identify and design the application's classes and components.

- **Chapter 2, "Development Environment"** This chapter examines the development environment of the professional developer or development team, and also examines the production channel concept, in which your work moves from initial coding to the production environment in standard, measured steps. In addition, this chapter discusses various aspects of change control, showing you how to manage change to your code even before it enters the production channel, as well as the documentation that should surround your code. Finally, this chapter examines some tools you can use to make these tasks easier and more consistent.

- **Chapter 3, "C++ Development Essentials"** This chapter provides an overview of several essential technologies, including MFC, Active Template Library (ATL) and Standard Template Library (STL). In addition, this chapter covers some programming concepts, including threading and threading models, and memory allocation and management.

- **Chapter 4, "Developing the User Services"** You will begin this chapter by learning user interface techniques with menu systems, toolbars, and tool tips. Additional user interface techniques are implemented using dialogue boxes to present information as well as gather, validate, and process user input. This chapter completes with a discussion on creating and using ActiveX controls.

- **Chapter 5, "Building Basic Business Objects"** In this chapter, you will create several C++ classes using classic C++. After studying some of the problems with the classic C++ architecture, you will convert the classes to COM classes. At the end of that exercise, you will have a COM server written in raw C++. The chapter ends with a discussion of how ATL and MFC simplify the process of building COM servers.

- **Chapter 6, "Building Advanced Business Objects"** This chapter continues our lessons on COM. It begins with more advanced topics of implementing Distributed COM components. To increase the performance of a COM component, we discuss implementing a tread-safe multi-threaded COM component. Additionally, we discuss implementing and packaging COM components as Windows Services. This chapter completes by implementing an ISAPI DLL that dynamically alters web content.

- **Chapter 7, "Using Microsoft Transaction Services"** This chapter discusses transactions and explains how to install and deploy Microsoft Transaction Services (MTS). First, this chapter introduces you to the concept of transactions and describes how MTS serves as an infrastructure for building distributed applications. This chapter then provides an overview of how to install and configure MTS and how to design and create objects for use in MTS. In addition, this chapter introduces you to advanced topics such as security and load balancing, and then concludes with a discussion of design and scalability issues in transaction-based applications.

- **Chapter 8, "Microsoft Message Queuing Services"** This chapter discusses message queues and explains how to install and deploy Microsoft Message Queuing Services (MSMQ). First, this chapter introduces you to the concept of message queues and describes how MSMQ serves as an infrastructure for building distributed applications. This chapter then provides an overview of how to install and configure MSMQ and how to design and create objects for use in MSMQ. This chapter concludes with a discussion of design and scalability issues in message queue-based applications.

- **Chapter 9, "Using Data Access Services"** This chapter begins with an overview of Structured Query Language (SQL). A brief discussion on configuration issues with Microsoft SQL Server is included with discussions on creating, querying, and manipulating relational database tables using SQL, stored procedures, and triggers. Different data access methods are discussed within the context of MFC and ATL including OLEDB, ODBC, ADO, RDO, DAO.

- **Chapter 10, "Exception Handling"** This chapter describes how an application can intelligently respond to many types of errors that can occur during program execution. You will learn about specific types of error events called

exceptions, and how to write programs that are more stable because they monitor exceptions.

- **Chapter 11, "Debugging and Testing"** In this chapter, you will learn about debugging and testing, an essential part of development; they merit as much attention as that given to the designing/coding phase, or more. Generally viewed as less glamorous or interesting than actual coding, debugging and testing often receive inadequate attention due to budget and schedule constraints. However, this lack of attention is almost always false economy; a poorly tested application can cost you in lost revenue, wasted productivity, and strained relations with users.

- **Chapter 12, "Deploying Distributed Applications"** In this chapter, you will learn some of the ways that a Windows application created with Visual C++ can be efficiently deployed. This chapter first presents an overview of deployment methods, focusing on how to write an installation program that copies required files to the user's hard disk. It continues with a discussion on InstallShield, a tool that helps automate the creation of installation programs for Visual C++ projects.

- **Appendix A, "Application Design Concepts"** This appendix serves as additional information for the reader, outside of the exam preparation context. It first presents the concepts of architecture notations such as UML, design patterns, and design antipatterns. It then discusses the implementation of a structured development process and reviews the Unified Process (UP) and the Microsoft Solutions Framework (MSF). It concludes with a detailed process for creating the conceptual, logical, and physical designs of a distributed application including Use Case, Class, and Programming models.

- **Appendix B, "Review Questions and Answers"** This appendix contains the questions from each chapter's review section along with the appropriate answers. These questions serve to reinforce the information within each chapter and are not intended as test review questions.

Features of This Book

The following features are designed to enhance the usefulness of this course:

- Each chapter opens with a Before You Begin section, which prepares you for completing the chapter.

- Each chapter is divided into lessons. Most lessons include hands-on exercises that allow you to practice an associated skill or procedure. Each lesson ends with a short Lesson Summary of the material presented.

- Most lessons contain procedures that give you an opportunity to use the skills presented or explore the part of the application described in the lesson. All procedures are preceded by an arrow symbol.

- The Review section at the end of the chapter lets you test what you have learned in the lesson.

- Appendix A, "Application Design Concepts," contains a detailed distributed application design guide.

- Appendix B, "Review Questions and Answers," contains all of the book's review questions and their corresponding answers.

- The Glossary contains key terms and definitions used in the course.

Conventions Used in This Book

Before you start reading any of the chapters, it is important that you understand the terms and notational conventions used in this book.

Notational Conventions

- *Italic* is used for emphasis when defining new terms. *Italic* is also used for C++ keywords, variable names, function names, placeholders, user input, methods, operators, parameters, and constants.

- Names of files and folders appear in Title Caps. Unless otherwise indicated, you can use all uppercase or lowercase letters when you type a file or folder name in a dialog box or at a command prompt.

- File name extensions appear in all lowercase.

- Dialog box names and options appear in Title Caps, regardless of how they are capitalized on screen.

- Acronyms appear in all uppercase.

- Monospace type represents code samples, examples of screen text, or entries that you might type at a command prompt or in initialization files.

- Square brackets [ ] are used in syntax statements to enclose optional items. For example, [*filename*] in command syntax indicates that you can choose to type a filename with the command. Type only the information within the brackets, not the brackets themselves.

Keyboard Conventions

- A plus sign (+) between two key names means that you must press those keys at the same time. For example, "Press Alt+Tab" means that you hold down Alt while you press Tab.

- A comma (,) between two or more key names means that you must press each of the keys consecutively, not together. For example, "Press Alt, F, X" means that you press and release each key in sequence. "Press Alt+W, L" means that you first press Alt and W together, then release them and press L.

- You can choose menu commands from the keyboard. Press the Alt key to activate the menu bar, and then sequentially press the keys that correspond to the highlighted or underlined letter of the menu name or the command name. For some commands, you can also press a key combination, shown in the menu.

- You can select or clear check boxes or option buttons in dialog boxes from the keyboard. Press the Alt key, and then press the key that corresponds to the underlined letter of the option name. Or you can press Tab until the option is highlighted, and then press the spacebar to select or clear the check box or option button.

- You can cancel the display of a dialog box by pressing the Esc key.

About the Companion CD

The companion CD contains sample exam questions and the files used in the hands-on labs and exercises in the text.

Using the Lab and Lesson Files

The companion CD contains files required to perform the hands-on lab and practice exercises. To copy the files to your hard drive, run the setup.exe program in the \Setup folder on the CD and follow the instructions that appear on your screen.

By default, the lab files are copied to the \DISV\Labs folder. Each chapter in the book has its own subfolder. (For example, material relating to Chapter 1 can be found in \DISV\Labs\Ch01.) Each of these folders might contain subfolders, as required by the particular lab exercises. Files required to complete exercises within a lesson are copied to the \DISV\Lessons folder.

The recommended procedure is to follow the labs in numerical order. None of the labs in this book require that you complete a preceding lab as a prerequisite.

Self Test Software Visual C++ 6.0 Sample Exam

To practice taking a certification exam, you can install the sample exam from Self Test Software (STS) contained on the companion CD. Designed in accordance with the actual Microsoft certification exam, this sample includes questions to help you assess your understanding of the materials presented in this book. Each question includes feedback with an associated course reference so that you can review the material presented. Visit the STS Web site at *www.selftestsoftware.com* for a complete list of available practice exams.

The Self Test Software demonstration for Exam 70-015 is located in the \Exam folder on the companion CD. To install the sample exam on your hard drive, run the mp015.exe program in this folder and follow the instructions that appear on your screen.

Getting Started

This training course is intended to help you prepare for the Microsoft Certified Solution Developer (MCSD) Exam 70-015, "Designing and Implementing Distributed Applications with Microsoft Visual C++ 6.0." To complete the exercises, your computer must meet the following hardware and software requirements.

Hardware Requirements

All hardware should be on the Microsoft Windows 98 or Microsoft Windows NT Hardware Compatibility List.

Computer/Processor	Personal computer with a Pentium-class processor; 166-megahertz (MHz) or higher processor recommended
Memory	24 megabytes (MB) of RAM for Microsoft Windows 95 or later (32 MB recommended); 32 MB for Windows NT 4.0 (64 MB recommended)
Hard Disk Space	Visual C++: 300 MB typical; 360 MB maximum
	Microsoft Developer Network (MSDN): 57 MB typical; 493 MB maximum
	Microsoft Internet Explorer: 43 MB typical; 59 MB maximum
	Windows NT 4.0 Option Pack: 40 MB for Windows 95 or later; 200 MB for Windows NT 4.0
	SQL Server 7.0: 170 MB typical; 266 MB maximum
Drive	CD-ROM drive
Display	VGA or higher-resolution monitor; Super VGA recommended
Operating System	Windows 95, Windows 98, Windows NT Workstation 4.0, or Windows NT Server 4.0 with Service Pack 4 or later
Peripheral/Miscellaneous	Microsoft Mouse or compatible pointing device

Software Requirements

The following software is required to complete the exercises in this course:

- Visual C++ 6.0, Professional or Enterprise Edition
- Microsoft Visual SourceSafe (VSS) Client and Server
- Windows NT 4.0 Option Pack including Microsoft Internet Information Server (IIS) or Microsoft Personal Web Server (PWS)
- SQL Server 7.0
- Internet Explorer 4.01 with Service Pack 2 or later

The above software is not provided on the companion CD.

Installation Instructions

These instructions describe how to install the following software required to complete the exercises and labs in this book:

- Windows NT 4.0 Option Pack

- Internet Information Server 4.0 (if you are running Windows NT 4.0 Server)
  - or -
  Personal Web Server (if you are running Windows NT 4.0 Workstation, Windows 95, or Windows 98)

- SQL Server 7.0 Standard Edition (if you are running Windows NT Server)
  - or -
  SQL Server 7.0 Desktop Edition (if you are running Windows NT Workstation, Windows 95, or Windows 98)

Installing the Windows NT 4.0 Option Pack

The Windows NT 4.0 Option Pack contains Internet Information Server, which can be installed on Windows NT 4.0 Server; and Personal Web Server, which can be installed on Windows NT 4.0 Workstation, Windows 95 or Windows 98. You can download the Windows NT 4.0 Option Pack Setup.exe file from the Web at *http://www.microsoft.com/ntserver/nts/downloads/recommended/nt4optpk/ default.asp.*

Note To install all the components of the Windows NT 4.0 Option Pack, networking and the TCP/IP protocol must be installed.

▶ **To install and configure the Windows NT 4.0 Option Pack including IIS on Windows NT Server 4.0**

1. Download and run the Setup.exe file. If you have Service Pack 4 or later installed, the following message appears: "Setup detected that Windows NT 4.0 SP4 or greater is installed on your machine. We haven't tested this product on SP4. Do you wish to proceed?" Click Yes. If the message appears again, click Yes again.

2. When the Windows NT 4.0 Option Pack Setup window appears, click Next.

3. Click Accept to accept the terms of the license agreement.

4. Select a Typical install. Choose the directories in which to install the files or accept the defaults, and then click Next.

5. For SMTP and NNTP Service Setup, choose the directories you want or accept the defaults, and click Next.

6. Click Finish when the installation is complete.

7. Click Yes to restart the computer and accept the system settings change.

Installing Personal Web Server

Personal Web Server (PWS) comes as a version of the Windows NT 4.0 Option Pack that is configured to install on Windows NT 4.0 Workstation, Windows 95, or Windows 98. You can download the PWS Setup.exe file from the Web at *http://www.microsoft.com/windows/ie/pws/default.htm*.

Note To install all the components of the Personal Web Server, networking and the TCP/IP protocol must be installed.

► **To install and configure Personal Web Server on Windows NT Workstation 4.0**

1. Download and run the Setup.exe file. If you have Service Pack 4 or later installed, the following message appears: "Setup detected that Windows NT 4.0 SP4 or greater is installed on your machine. We haven't tested this product on SP4. Do you wish to proceed?" Click Yes. If the message appears again, click Yes again.

2. When the Windows NT 4.0 Option Pack Setup window appears, click Next.

3. Click Accept to agree to the terms of the license agreement.

4. Select a Typical install. Choose a directory in which to install the Default Web home directory or accept the default, and then click Next.

5. Click Finish when installation is complete.

6. Click Yes to restart the computer and accept the systems settings change.

► **To install and configure Personal Web Server on Windows 95 or Windows 98**

1. Download and run the Setup.exe file.

2. If you are installing on Windows 95, the following message might be displayed: "Setup has installed Winsock2 on your machine and needs to reboot to complete the installation." When prompted to restart your system, click Yes. After your computer restarts, the Personal Web Server Setup window appears.

3. In the Personal Web Server Setup window, click Next.

4. Click Accept to agree to the terms of the license agreement.

5. Select a Typical install. Choose a directory in which to install the Default Web home directory or accept the default, and then click Next.

6. Click Finish when installation is complete.

7. Click Yes to restart the computer and accept the systems settings change.

Installing SQL Server 7.0 Standard Edition

► **To install and configure SQL Server 7.0 Standard Edition on Windows NT Server 4.0**

1. Insert the SQL Server 7.0 CD-ROM. Autorun starts.

2. Select Install SQL Server Components.

3. Select Database Server – Standard Edition.

4. In the Select Install Method window, select the Local installation and click Next.

5. In the Welcome window, click Next.

6. Click Yes to agree to the terms of the license agreement.

7. Complete the User Information section with your name (required) and company information (optional).

8. Select Typical as the Setup Type, set the Destination Folder for Program Files and Data Files to C:\Mssql7, accept the defaults, and click Next.

9. In the Services Accounts window, select Use The Same Account For Each Service. Select Use The Local System Account For Service Settings. Click Next.

10. To start copying files, click Next.

11. Select Per Seat as the licensing mode and click Continue.

12. When the per-seat licensing agreement is displayed, select the I Agree That check box and click OK.

13. After the necessary files are copied to your hard drive, click Finish in the Setup Complete dialog box.

14. Exit the SQL Server setup program.

15. Restart your computer to configure the Data Access Component.

Installing SQL Server 7.0 Desktop Edition

▶ **To install and configure SQL Server 7.0 Desktop Edition on Windows NT Workstation 4.0**

1. Insert the SQL Server 7.0 CD-ROM. Autorun starts.

2. Select Install SQL Server Components.

3. Select Database Server – Desktop Edition.

4. In the Select Install Method window, select the Local installation and click Next.

5. In the Welcome window, click Next.

6. Click Yes to agree to the terms of the license agreement.

7. Complete the User Information section with your name (required) and company information (optional).

8. Select Typical as the Setup Type, set the Destination Folder for Program Files and Data Files to C:\Mssql7, accept the defaults, and click Next.

9. In the Services Accounts window, select Use The Same Account For Each Service. Select Use The Local System Account For Service Settings and click Next.

10. To start copying files, click Next.

11. After the necessary files are copied to your hard drive, click Finish in the Setup Complete dialog box.

12. Exit the SQL Server setup program.

13. Restart your computer to configure the Data Access Component.

▶ **To install and configure SQL Server 7.0 Desktop Edition on Windows 95 or Windows 98**

1. Insert the SQL Server 7.0 CD-ROM. Autorun starts.

2. Select Install SQL Server Components.

3. Select Database Server – Desktop Edition.

4. In the Welcome window, click Next.

5. Click Yes to agree to the terms of the license agreement.

6. Complete the User Information section with your name (required) and company information (optional).

7. Select Typical as the Setup Type.

8. Set the Destination Folder for Program Files and Data Files to C:\Mssql7, accept the defaults, and click Next.

9. To start copying files, click Next.

10. When setup is complete, click Yes to restart your computer and then click Finish.

Using This Book to Prepare for Certification

Where to Find Specific Skills in This Book

The following tables provide lists of the skills measured on the Microsoft Certified Solution Developer (MCSD) Exam 70-015 and indicate where in this book you will find the lesson relating to each skill.

Note Exam skills are subject to change without notice and at the sole discretion of Microsoft.

Deriving the Physical Design

Skills measured	Location in book
Explain the elements of an application that is based on the MFC framework.	Chapter 3, Lesson 1
Identify differences between developing an MFC application for Windows NT, Windows 95, and Windows 98.	Chapter 5, Lesson 1 Chapter 6, Lesson 1
Explain when to use the Platform Software Development Kit (SDK) for an MFC application and when to use the functionality provided by the MFC framework.	Chapter 3, Lessons 1, 5 Chapter 9, Lesson 3
Choose whether to use an MFC regular DLL or an MFC extension DLL.	Chapter 6, Lesson 6
Explain how command messages are routed between a user interface object and a handler function.	Chapter 4, Lesson 4
Describe the Document/View architecture.	Chapter 3, Lesson 1
Explain the MFC drawing, printing, and print preview architecture.	Chapter 3, Lesson 1
Explain how the MFC architecture supports multithreading.	Chapter 3, Lesson 2
Evaluate whether access to a database should be encapsulated in an object.	Chapter 1, Lesson 2
Evaluate whether a database should be incorporated in the application.	Chapter 1, Lesson 2 Chapter 9, Lesson 3
Identify which type of library to use. Valid libraries include MFC, ATL, and the SDK.	Chapter 9, Lessons 4-6
Identify which type of object to use. Valid object types include ADO, ODBC, and RDO.	Chapter 9, Lessons 3-6
Design the properties, methods, and events of components.	Chapter 4, Lesson 4 Chapter 5, Lessons 3-4 Chapter 6, Lesson 1 Chapter 7, Lesson 2

Establishing the Development Environment

Skills measured	Location in book
Establish the environment for source-code control by using Visual SourceSafe. Issues include multiple user/multiple location development and versioning of the source code.	Chapter 2, Lessons 1-2
Install the Visual C++ development tools that are necessary for developing a distributed application on various platforms. Platforms include Windows NT Workstation, Windows NT Server, Windows 95, and Windows 98.	Chapter 2, Lesson 3 Lab 2 Chapter 7, Lesson 2
Install server services. Services include MTS, SQL, and MSMQ.	About This Book Chapter 7, Lesson 2 Chapter 8, Lesson 1 Chapter 9, Lesson 2
Configure server services. Services include MTS, SQL, and MSMQ.	Chapter 7, Lesson 2 Chapter 8, Lesson 1 Chapter 9, Lesson 2
Configure a client computer to use an MTS component.	Chapter 7, Lesson 5 Chapter 12, Lesson 3