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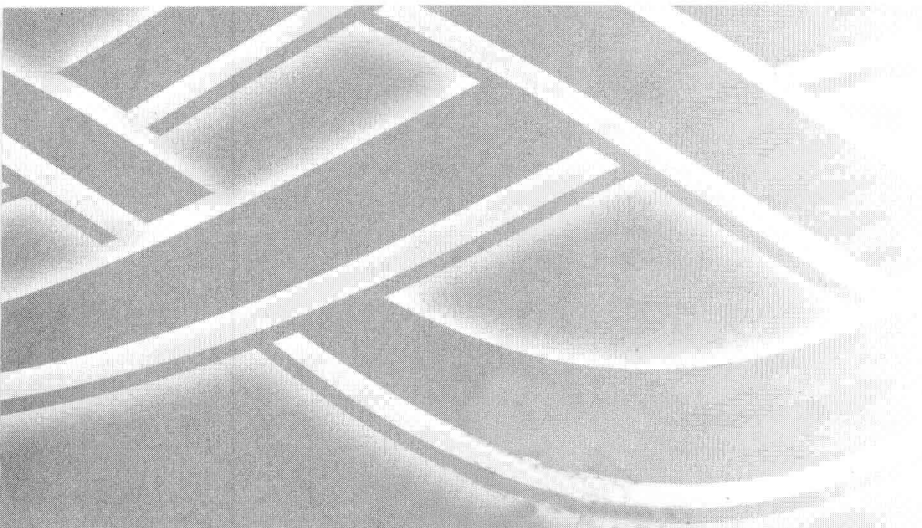
# TCP/IP for
Microsoft®
# Windows NT®

**Microsoft**®Press

# TCP/IP for
## Microsoft®
# Windows NT®

# About This Book

Welcome to *Internetworking with Microsoft® TCP/IP on Microsoft Windows NT® 4.0*. This book provides systems administrators the knowledge and skills to set up, configure, use, and support Transmission Control Protocol/Internet Protocol (TCP/IP) on the Microsoft Windows NT operating system version 4.0 in a networked environment. It will also prepare you to meet the certification requirements to become a Microsoft Internet Systems Certified Professional.

**Note**  For more information on becoming a Microsoft Certified Professional, please see the section titled "The Microsoft Certified Professional Program" later in this chapter.

Each chapter in this book is divided into lessons. Most lessons include hands-on procedures to practice or demonstrate the concept or skill presented in the lesson. At the end of each lesson is a short summary, and at the end of each chapter is a set of review questions to test your knowledge of the chapter material. If appropriate, at the end of each chapter there are references to additional information on the lesson material or related topics.

The "Getting Started" section provides important setup instructions that describe the hardware and software requirements to complete the procedures in this course. This section also provides the networking configuration for the two computers that are necessary to complete the hands-on procedures. Read through this section thoroughly before you start the lessons.

# Course Compact Disc

The compact disc provided in this course contains multimedia presentations that supplement the key concepts covered in the book. You should view these presentations when suggested, and then use them as a review tool while you work through the material.

The course compact disc also contains files required to perform the hands-on procedures, and information designed to supplement the lesson material.

The multimedia presentations, additional materials, and files can all be accessed from the *Course Materials* Web page on the course compact disc. In order to view the course Web site from the compact disc, you must first install Microsoft Internet Explorer™ 3.0. See the "Getting Started" section for information on installing Internet Explorer from the course compact disc.

# Reference Materials

You may find the following reference material useful:

- Documentation for Windows NT Server version 4.0
- *Microsoft Windows NT Server Resource Kit*

# Intended Audience

This book is designed for network integrators, system engineers, and support professionals who implement and support TCP/IP in local and wide area network environments. This book was developed for those who plan to take the related Microsoft Certified Professional exam 70-59, Internetworking with Microsoft TCP/IP on Microsoft Windows NT 4.0.

### Prerequisites

- A knowledge of the function and uses of local area network (LAN) hardware, including network cards, cabling, bridges, and routers.
- Successful completion of the following Microsoft Certified Professional exam:

  70-67, Implementing and Supporting Microsoft Windows NT Server 4.0

  –Or–
- Completion of the following course:

  #687, Supporting Microsoft Windows NT Server 4.0 Core Technologies

# Finding the Best Starting Point for You

This book is designed for you to complete at your own pace, so you can skip some lessons and revisit them later. Keep in mind that you need to complete the procedures in Chapter 2, "Installing and Configuring TCP/IP," in order to perform the procedures in the other chapters. Use the following table to find the best starting point for you.

| If you | Follow this learning path |
| --- | --- |
| Are preparing to take the Microsoft Certified Professional exam 70-59, Internetworking with Microsoft TCP/IP on Microsoft Windows NT 4.0 | Read the "Getting Started" section. Next, work through Chapters 1–3. Work through the remaining chapters in any order. Before beginning a chapter, always refer to the "Before You Begin" section to determine any prerequisites. |
| Need to install and configure TCP/IP | Read the "Getting Started" section. Next, work through Chapter 2. Complete Chapters 1 and 3, then work through the other chapters in any order. |
| Need to install TCP/IP and configure multiple departments, groups, or computers | Read the "Getting Started" section. Depending on your configuration, you should read the appropriate planning chapter. For example, if your configuration requires multiple subnets, read Chapter 5, "Subnetting," for information on how to create a range of valid IP addresses. Then complete Chapter 2 and work through the other chapters in any order. |
| Need information on a specific topic related to TCP/IP | Refer to the table of contents or index. |

# Conventions Used in This Book

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

## Features of This Book

- Each chapter opens with a "Before You Begin" section, which describes other chapters that must be completed before continuing.

- Whenever possible, lessons contain procedures that give you an opportunity to use the skills being presented or explore the part of TCP/IP being described. All procedures are identified with the following procedural convention: ▶

- The "Review" section at the end of most lessons allows you to test what you have learned in the lesson. They are designed to familiarize you with the Microsoft Certified Professional exam.

- The "For More Information" list at the end of many chapters provides additional resource locations for information on the concepts and skills covered in the chapter. The information referred to covers product documentation, online locations, or both.

- The "Questions and Answers" section contains all of the book's questions and corresponding answers. Each question is cross-referenced by page number.

## Procedural Conventions

- Hands-on procedures that you are to follow are presented in numbered lists of steps (1, 2, and so on). A triangular bullet (▶) indicates the beginning of a procedure.

- The word *select* is used for highlighting directories, file names, text boxes, menu bars, and option buttons, and for selecting options in a dialog box.

- The word *click* is used for carrying out a command from a menu or dialog box.

## Notational Conventions

- Characters or commands that you type appear in **bold lowercase** type.

- *Italic* in syntax statements indicates placeholders for variable information. *Italic* is also used for important new terms, for book titles, and for emphasis in the text.

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

- File name extensions appear in all lowercase.

- Names of directories appear in initial caps, except when you are to type them directly. Unless otherwise indicated, you can use all lowercase letters when you type a directory name in a dialog box or at a command prompt.

- Acronyms appear in all uppercase.

- Monospace type represents code samples, examples of screen text, or entries that you might type in a command line 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 file name with the command. Type only the information within the brackets, not the brackets themselves.

- Braces { } are used in syntax statements to enclose required items. Type only the information within the braces, not the braces themselves.

## Keyboard Conventions

- Names of keys that you press appear in SMALL CAPITALS; for example, TAB and SHIFT.

- 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, and then release them and press L.

- You can choose menu commands with 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 and the command name. For some commands, you can also press a key combination listed in the menu.

- You can select or clear check boxes or option buttons in dialog boxes with 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 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.

## Notes

Notes appear throughout the lessons.

- Notes marked **Tip** contain explanations of possible results or alternative methods.

- Notes marked **Important** contain information that is essential to completing a task.

- Notes marked **Note** contain supplemental information.

- Notes marked **Caution** contain warnings about possible loss of data.

# Getting Started

## Hardware and Software Requirements

This self-paced training course contains hands-on procedures to help you learn about Microsoft TCP/IP on Microsoft Windows NT 4.0. To complete many of these procedures, you must have two networked computers or be connected to a larger network.

Both computers must be capable of running Microsoft Windows NT Server 4.0 and must have the following minimum configuration:

- A 486/33 or higher Intel-based processor
- 16 MB of RAM (32 MB recommended)
- A minimum of 450 MB of available hard disk space on each computer
- SVGA display adapter and monitor capable of displaying 256 colors
- Microsoft Mouse or compatible pointing device
- Network adapter card and related cables
- One 3.5-inch high-density disk drive
- CD-ROM drive
- Sound card with headphones or speakers on one computer (optional)

All hardware should be on the Microsoft Windows NT 4.0 Hardware Compatibility List (HCL).

### Software

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

- Windows NT Server 4.0 retail product
- Microsoft MS-DOS® 5.0 or later
- Windows NT Server 4.0 Service Pack 2 or later (Service Pack 2 is located on the course compact disc)

## Setup Instructions

It is highly recommended that you have two networked computers or be part of a larger network to perform many of the procedures.

1. Set up both computers according to the manufacturer's instructions.

2. The computers need to be networked together, either cabled together using a hub so that the two computers can communicate or as part of a larger network.

3. Each computer requires 450 MB of free disk space on drive C.

4. Set up Windows NT Server on each computer. For the Evaulation Editions included with this trainingkit, the CD-ROM key is 040-0048126. Microsoft technical support does not provide assistance with Evaulation Editions.

The first computer will be configured as a primary domain controller (PDC), and will be assigned the computer account name Server1 and the domain name, Domain1. This computer will act as a domain controller, a file and print server, and an application server in Domain1.

The second computer will act as a server and workstation for most of the procedures in this course. It is a member of Domain1 and is assigned the computer account name Server2.

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**Caution**  If your computers are part of a larger network, you *must* verify with your network administrator that the computer names, domain name, and IP address information in the following table do not conflict with network operations. If they do conflict, ask your network administrator to provide alternative values and use those values throughout all of the practices in this book.

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| Variable | Values used in this course |
| --- | --- |
| Computer name for first computer (PDC) | Server1 |
| IP address for first computer | 131.107.2.200 |
| Computer name for second computer | Server2 |
| IP address for second computer | 131.107.2.211 |
| IP address range | 131.107.2.200 — 131.107.2.211 |
| Subnet mask | 255.255.255.0 |
| Domain name | Domain1 |
| Default gateway | 131.107.2.1 |

## Microsoft Internet Explorer

To use the course Web site from the course compact disc, you must first install Microsoft Internet Explorer 3.0.

▶ **To install Microsoft Internet Explorer 3.0**

1. On the course compact disc, open the Ie_setup folder, and then run Msie30.exe.

   A **Microsoft Internet Explorer 3.0** dialog box appears prompting if you want to install Microsoft Internet Explorer 3.0.

2. Click **Yes** to install Microsoft Internet Explorer 3.0.

   A **Microsoft Internet Explorer 3.0** dialog box appears indicating that files are being copied to a temporary folder on your hard disk.

3. Read the End-User License Agreement for Microsoft Internet Explorer, and then click **I Agree** to accept the terms of the agreement and continue the installation.

   A **Microsoft Internet Explorer Setup** dialog box appears indicating that files are being copied and Microsoft Internet Explorer is being set up on your computer.

4. When prompted to restart your computer, click **Yes**.

## Windows NT 4.0 Service Pack

If you have not already installed the Windows NT 4.0 Service Pack 2, you should do so. This procedure shows you how to install the Service Pack from the course compact disc.

▶ **To install Windows NT 4.0 Service Pack 2**

1. Log on as Administrator.

2. Insert the course compact disc into the CD-ROM drive.

   Internet Explorer starts and the Internetworking with Microsoft TCP/IP on Microsoft Windows NT 4.0 start page opens.

   –Or–

   Start Windows NT Explorer, navigate to the drive containing the course compact disc, and then double-click the Open.htm file.

3. Click the start page icon.

4. Click **Course Materials**.

5. Click **Windows NT 4.0 Service Pack 2**.

6. Click **Service Pack**.

7. Scroll and click the **Install Service Pack** hyperlink.

   An Internet Explorer dialog box appears asking if you want to open the file or save it to disk.

8. Select **Open it**, and then click **OK**.

   This launches Spsetup.bat, which begins the upgrade process.

9. At the Welcome screen, click **Next**.

10. In the **Service Pack Setup** dialog box, select **Install the Service Pack**, and then click **Next**.

11. Select whether you want to create an Uninstall directory, and then click **Next**.

12. Click **Finish** for the Service Pack setup to complete.

    Setup inspects your computer and then begins to copy the Service Pack files.

    At the end of copying files a dialog box pops up, notifying you that Windows NT 4.0 has been updated.

13. Click **OK** to restart your computer.

# Chapter and Appendix Overview

This self-paced training course combines notes, hands-on procedures, multimedia presentations, and review questions to teach you Microsoft TCP/IP on Microsoft Windows NT 4.0. It is designed to be completed from beginning to end, but you can choose a customized track and complete only the sections that interest you. If you choose the customized track option, see the "Before You Begin" section in each chapter. Any hands-on procedures that require preliminary work from preceding chapters refer to the appropriate chapters.

The self-paced training book is divided into the following chapters:

- The "About This Book" section contains a self-paced training overview and introduces the components of this training. Read this section thoroughly to get the greatest educational value from this self-paced training and to plan which lessons you will complete.

- Chapter 1, "Introduction to TCP/IP," provides an overview of TCP/IP and the Internet standards process.

- Chapter 2, "Installing and Configuring TCP/IP," covers installing and manually configuring an IP address, subnet mask, and default gateway. An overview is also provided on basic configuration testing procedures using Ipconfig, PING, and Microsoft Network Monitor.

- Chapter 3, "Architectural Overview of the TCP/IP Protocol Suite," describes the four layers of the TCP/IP protocol suite and explains how protocols at each layer work internally and in association with other protocols.

- Chapter 4, "IP Addressing," introduces IP addressing, including the differences between IP address classes, IP addressing guidelines, network components that require an IP address, and common addressing problems.

- Chapter 5, "Subnetting," teaches you fundamental subnetting and supernetting concepts and procedures, including: when subnetting is necessary, how to use a default subnet mask, how to define a custom subnet mask, and how to create a range of valid IP addresses for each subnet in an intranet from one IP address.

- Chapter 6, "Implementing IP Routing," provides an overview of IP routing concepts and terminology, and detailed information on implementing IP routing in Microsoft network environments.

- Chapter 7, "The Dynamic Host Configuration Protocol," addresses how the Dynamic Host Configuration Protocol (DHCP) centralizes and manages the allocation of TCP/IP configuration information by automatically assigning IP addresses to computers configured to use DHCP.

- Chapter 8, "NetBIOS over TCP/IP," provides an overview of NetBIOS name resolution concepts and methods.

- Chapter 9, "Windows Internet Name Service (WINS)," discusses how WINS reduces broadcast traffic with NetBIOS over TCP/IP, addresses database replication between WINS servers, and provides the knowledge and skills required to support WINS in an intranet.

- Chapter 10, "IP Internetwork Browsing and Domain Functions," discusses how browsing for NetBIOS resources occurs in a TCP/IP internetwork.

- Chapter 11, "Host Name Resolution," covers host name resolution concepts and issues.

- Chapter 12, "Domain Name System (DNS)," gives you an overview of the structure and components of the Domain Name System (DNS). You will learn about DNS database files, and how to resolve TCP/IP addresses.

- Chapter 13, "Implementing DNS," addresses installing and configuring DNS, and integrating DNS and WINS.

- Chapter 14, "Connectivity in Heterogeneous Environments," covers the options for using TCP/IP to operate in a heterogeneous environment.

- Chapter 15, "Implementing the Microsoft SNMP Services," provides an overview of the Simple Network Management Protocol (SNMP), including the functions performed by an SNMP management station and the Microsoft SNMP service (SNMP agent).

- Chapter 16, "Troubleshooting Microsoft TCP/IP," combines a review of important topics with troubleshooting guidelines. Topics include common TCP/IP-related problems, symptoms, possible causes, and the Windows NT and TCP/IP utilities useful in troubleshooting problems.

# The Microsoft Certified Professional Program

The Microsoft Certified Professional (MCP) program provides the best method to prove your command of current Microsoft products and technologies. Microsoft, an industry leader in certification, is on the forefront of testing methodology. Our exams and corresponding certifications are developed to validate your mastery of critical competencies as you design and develop, or implement and support, solutions with Microsoft products and technologies. Computer professionals who become Microsoft certified are recognized as experts and are sought after industry-wide.

The Microsoft Certified Professional program offers four certifications, based on specific areas of technical expertise:

- *Microsoft Certified Product Specialists.* Demonstrated in-depth knowledge of at least one Microsoft operating system. Candidates may pass additional Microsoft certification exams to further qualify their skills with Microsoft BackOffice™ products, development tools, or desktop programs.

- *Microsoft Certified Systems Engineers.* Qualified to effectively plan, implement, maintain, and support information systems with Microsoft Windows® 95, Microsoft Windows NT, and the Microsoft BackOffice integrated family of server software.

- *Microsoft Certified Solution Developers.* Qualified to design and develop custom business solutions with Microsoft development tools, technologies, and platforms, including Microsoft Office and Microsoft BackOffice.

- *Microsoft Certified Trainers.* Instructionally and technically qualified to deliver Microsoft Official Curriculum through a Microsoft Authorized Technical Education Center (ATEC).

## What Are the Requirements for Becoming a Microsoft Certified Professional?

The certification requirements differ for each certification and are specific to the products and job functions addressed by the certification.

To become a Microsoft Certified Professional, you must pass rigorous certification exams that provide a valid and reliable measure of technical proficiency and expertise. These exams are designed to test your expertise and ability to perform a role or task with a product, and are developed with the input of professionals in the industry. Questions in the exams reflect how Microsoft products are used in actual organizations, giving them "real-world" relevance.

- *Microsoft Certified Product Specialists* are required to pass one operating system exam. In addition, individuals seeking to validate their expertise in a program must pass the appropriate elective exam.

- *Microsoft Certified Systems Engineers* are required to pass a series of operating system exams and elective exams.

- *Microsoft Certified Solution Developers* are required to pass two core technology exams and two elective exams.

- *Microsoft Certified Trainers* are required to meet instructional and technical requirements specific to each Microsoft Official Curriculum course they are certified to deliver. In the United States and Canada, call Microsoft at (800) 636-7544 for more information on becoming a Microsoft Certified Trainer. Outside the United States and Canada, contact your local Microsoft subsidiary.

## How to Order the Microsoft Roadmap to Education and Certification

It is easy to find the road that leads to your successful future—just use the Microsoft Roadmap to Education and Certification. The Roadmap contains everything you need to take advantage of Microsoft Education and Certification, including detailed descriptions of all of the most current Microsoft Official Curriculum courses; complete information about the Microsoft Certified Professional Program; Microsoft Certified Professional Assessment exams; and the Planning wizard, an easy-to-use tool to help you quickly map out a plan designed to meet your training goals. The Roadmap can be obtained from the following sources:

- Internet: ftp://ftp.microsoft.com/services/msedcert/e&cmap.zip

- CompuServe: Go MECFORUM, Library #2, e&cmap.zip

- TechNet: Search for "Roadmap" and install from the built-in setup link.

- Microsoft: Call us at (800) 636-7544 and ask for the Roadmap.
  Outside the United States and Canada, contact your local Microsoft subsidiary.

# Microsoft Online Institute

The Microsoft Online Institute is an online interactive learning and information resource available on the World Wide Web (WWW) and the Microsoft Network (MSN™). The Microsoft Online Institute provides access to learning materials, instructor expertise, product information, developer articles, user forums, and other resources for Microsoft product and technology information.

Anyone with access to the Web or to an MSN account can access the Microsoft Online Institute to attend a class, join user forums, research library materials, purchase learning materials, or investigate other Microsoft Online Institute offerings.

To access the Microsoft Online Institute on the Web, connect to http://moli.microsoft.com. For more information about classes and other offerings, contact the Microsoft Online Institute by e-mail at moli_quest@msn.com.

# ATECs

Authorized Technical Education Centers (ATECs) are the best source for instructor-led training that can help you prepare to become a Microsoft Certified Professional. The Microsoft ATEC program is a worldwide network of qualified technical training organizations that provide authorized delivery of Microsoft Official Curriculum courses by Microsoft Certified Trainers to computer professionals.

For a listing of ATEC locations in the United States and Canada, call the Microsoft fax service at (800) 727-3351. Outside the United States and Canada, call the fax service at (206) 635-2233.

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