

Microsoft®

William R. Stanek

*Award-winning author and Windows administration expert*

# Windows Server® 2008

# INSIDE OUT

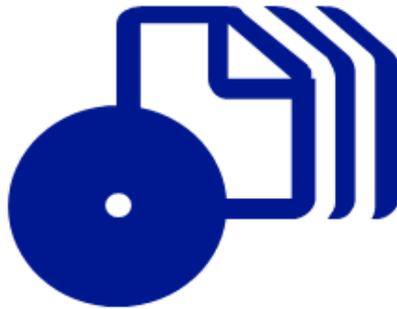
CD INCLUDES:

- 700+ sample scripts
- Links to white papers, guides, and tools
- Complete eBook and more!

- The ultimate, in-depth reference
- Hundreds of timesaving solutions
- Supremely organized book and CD



# How to access your CD files



The print edition of this book includes a CD. To access the CD files, go to <http://aka.ms/624382/files>, and look for the Downloads tab.

Note: Use a desktop web browser, as files may not be accessible from all ereader devices.

Questions? Please contact: [mspinput@microsoft.com](mailto:mspinput@microsoft.com)

Microsoft Press



PUBLISHED BY  
Microsoft Press  
A Division of Microsoft Corporation  
One Microsoft Way  
Redmond, Washington 98052-6399

Copyright © 2008 by William Stanek

All rights reserved. No part of the contents of this book may be reproduced or transmitted in any form or by any means without the written permission of the publisher.

Library of Congress Control Number: 2007942102

ISBN: 978-0-7356-2438-2

Printed and bound in the United States of America.

5 6 7 8 9 10 11 12 13 QGT 7 6 5 4 3 2

Distributed in Canada by H.B. Fenn and Company Ltd.

A CIP catalogue record for this book is available from the British Library.

Microsoft Press books are available through booksellers and distributors worldwide. For further information about international editions, contact your local Microsoft Corporation office or contact Microsoft Press International directly at fax (425) 936-7329. Visit our Web site at [www.microsoft.com/mspress](http://www.microsoft.com/mspress). Send comments to [mspinput@microsoft.com](mailto:mspinput@microsoft.com).

Microsoft, Microsoft Press, Active Directory, Authenticode, BitLocker, ClearType, Excel, IntelliMirror, Internet Explorer, Jscript, MS-DOS, Outlook, RemoteApp, SharePoint, SideShow, SQL Server, Visio, Win32, Windows, Windows Media, Windows NT, Windows PowerShell, Windows Server, and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. Other product and company names mentioned herein may be the trademarks of their respective owners.

The example companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted herein are fictitious. No association with any real company, organization, product, domain name, e-mail address, logo, person, place, or event is intended or should be inferred.

This book expresses the author's views and opinions. The information contained in this book is provided without any express, statutory, or implied warranties. Neither the authors, Microsoft Corporation, nor its resellers, or distributors will be held liable for any damages caused or alleged to be caused either directly or indirectly by this book.

**Acquisitions Editor:** Martin DelRe

**Developmental Editor:** Karen Szall

**Project Editor:** Victoria Thulman

**Editorial Production:** Publishing.Com

**Technical Reviewer:** Randall Galloway; Technical Review services provided by Content Master, a member of CM Group, Ltd.

**Cover:** Tom Draper Design

# Contents at a Glance

## **Part 1: Windows Server 2008 Overview and Planning**

|   |    |
|---|----|
| Chapter 1                                     |    |
| <b>Introducing Windows Server 2008</b> .....  | 3  |
| Chapter 2                                     |    |
| <b>Planning for Windows Server 2008</b> ..... | 27 |
| Chapter 3                                     |    |
| <b>Installing Windows Server 2008</b> .....   | 69 |

## **Part 2: Managing Windows Server 2008 Systems**

|   |     |
|---|-----|
| Chapter 4   |     |
| <b>Managing Windows Server 2008</b> .....                     | 105 |
| Chapter 5   |     |
| <b>Configuring Windows Server 2008</b> .....                  | 129 |
| Chapter 6   |     |
| <b>Windows Server 2008 MMC Administration</b> .....           | 153 |
| Chapter 7   |     |
| <b>Configuring Roles, Role Services, and Features</b> .....   | 185 |
| Chapter 8   |     |
| <b>Managing and Troubleshooting Hardware</b> ..               | 211 |
| Chapter 9   |     |
| <b>Managing the Registry</b> .....                            | 245 |
| Chapter 10  |     |
| <b>Software and User Account Control Administration</b> ..... | 285 |
| Chapter 11  |     |
| <b>Performance Monitoring and Tuning</b> .....                | 303 |
| Chapter 12  |     |
| <b>Comprehensive Performance Analysis and Logging</b> .....   | 343 |

## **Part 3: Managing Windows Server 2008 Storage and File Systems**

|  |     |
|--|-----|
| Chapter 13   |     |
| <b>Boot Configuration</b> .....                        | 377 |
| Chapter 14   |     |
| <b>Storage Management</b> .....                        | 405 |
| Chapter 15   |     |
| <b>TPM and BitLocker Drive Encryption</b> .....        | 467 |
| Chapter 16   |     |
| <b>Managing Windows Server 2008 File Systems</b> ..... | 497 |
| Chapter 17   |     |
| <b>File Sharing and Security</b> .....                 | 547 |
| Chapter 18   |     |
| <b>Using Volume Shadow Copy</b> .....                  | 587 |
| Chapter 19   |     |
| <b>Using Remote Desktop for Administration</b> .....   | 607 |

## **Part 4: Managing Windows Server 2008 Networking and Print Services**

|  |     |
|--|-----|
| Chapter 20                                   |     |
| <b>Networking with TCP/IP</b> .....          | 627 |
| Chapter 21                                   |     |
| <b>Managing TCP/IP Networking</b> .....      | 657 |
| Chapter 22                                   |     |
| <b>Managing DHCP</b> .....                   | 685 |
| Chapter 23                                   |     |
| <b>Architecting DNS Infrastructure</b> ..... | 743 |
| Chapter 24                                   |     |
| <b>Implementing and Managing DNS</b> .....   | 767 |

Chapter 25  
**Implementing and Maintaining WINS** . . . . . 823

Chapter 26  
**Deploying Print Services** . . . . . 841

Chapter 27  
**Managing and Maintaining Print Services** . . 879

Chapter 28  
**Deploying Terminal Services** . . . . . 919

**Part 5: Managing Active Directory and Security**

Chapter 29  
**Active Directory Architecture** . . . . . 987

Chapter 30  
**Designing and Managing the Domain Environment** . . . . . 1007

Chapter 31  
**Organizing Active Directory** . . . . . 1053

Chapter 32  
**Configuring Active Directory Sites and Replication** . . . . . 1071

Chapter 33  
**Implementing Active Directory Domain Services** . . . . . 1107

Chapter 34  
**Deploying Read-Only Domain Controllers** . . . . . 1141

Chapter 35  
**Managing Users, Groups, and Computers** . . . . . 1167

Chapter 36  
**Managing Group Policy** . . . . . 1233

Chapter 37  
**Active Directory Site Administration** . . . . . 1283

**Part 6: Windows Server 2008 Disaster Planning and Recovery**

Chapter 38  
**Planning for High Availability** . . . . . 1309

Chapter 39  
**Preparing and Deploying Server Clusters** . . 1323

Chapter 40  
**Disaster Planning** . . . . . 1369

Chapter 41  
**Backup and Recovery** . . . . . 1381

# Table of Contents

|  |        |
|--|--------|
| Acknowledgments . . . . .                            | xxvii  |
| About the CD . . . . .                               | xxix   |
| What's on the CD . . . . .                           | xxix   |
| System Requirements . . . . .                        | xxix   |
| Support Information . . . . .                        | xxx    |
| Conventions and Features Used in This Book . . . . . | xxxiii |
| Text Conventions . . . . .                           | xxxiii |
| Design Conventions . . . . .                         | xxxiii |

## Part 1: Windows Server 2008 Overview and Planning

|   |          |
|---|----------|
| Chapter 1: <b>Introducing Windows Server 2008 . . . . .</b> | <b>3</b> |
| What's New in Windows Server 2008 . . . . .                 | 4        |
| Windows Server 2008 Standard . . . . .                      | 5        |
| Windows Server 2008 Enterprise . . . . .                    | 6        |
| Windows Server 2008 Datacenter . . . . .                    | 6        |
| Windows Web Server 2008 . . . . .                           | 6        |
| 64-Bit Computing . . . . .                                  | 7        |
| Virtualized Computing . . . . .                             | 9        |
| Windows Vista and Windows Server 2008 . . . . .             | 10       |
| Windows Vista Editions . . . . .                            | 10       |
| Windows Vista and Active Directory . . . . .                | 10       |
| Architecture Improvements . . . . .                         | 11       |
| Kernel Architecture . . . . .                               | 11       |
| Boot Environment . . . . .                                  | 13       |
| Support Architecture . . . . .                              | 14       |

 **What do you think of this book? We want to hear from you!**

Microsoft is interested in hearing your feedback so we can continually improve our books and learning resources for you. To participate in a brief online survey, please visit:

[www.microsoft.com/learning/booksurvey/](http://www.microsoft.com/learning/booksurvey/)

|            |  |           |
|------------|--|-----------|
| Chapter 2: | <b>Planning for Windows Server 2008</b> .....          | <b>27</b> |
|            | Overview of Planning .....                             | 27        |
|            | The Microsoft Solutions Framework Process Model .....  | 28        |
|            | Your Plan: The Big Picture .....                       | 29        |
|            | Identifying Your Organizational Teams .....            | 31        |
|            | Microsoft Solutions Framework Team Model .....         | 31        |
|            | Your Project Team .....                                | 32        |
|            | Assessing Project Goals .....                          | 33        |
|            | The Business Perspective .....                         | 34        |
|            | Identifying IT Goals .....                             | 35        |
|            | Examining IT–Business Interaction .....                | 36        |
|            | Predicting Network Change .....                        | 36        |
|            | Analyzing the Existing Network .....                   | 37        |
|            | Evaluating the Network Infrastructure .....            | 38        |
|            | Assessing Systems .....                                | 39        |
|            | Identify Network Services and Applications .....       | 40        |
|            | Identifying Security Infrastructure .....              | 41        |
|            | Reviewing Network Administration .....                 | 42        |
|            | Defining Objectives and Scope .....                    | 45        |
|            | Specifying Organizational Objectives .....             | 45        |
|            | Setting the Schedule .....                             | 46        |
|            | Shaping the Budget .....                               | 47        |
|            | Allowing for Contingencies .....                       | 48        |
|            | Finalizing Project Scope .....                         | 49        |
|            | Defining the New Network Environment .....             | 50        |
|            | Defining Domain and Security Architecture .....        | 50        |
|            | Changing the Administrative Approach .....             | 51        |
|            | Thinking About Active Directory .....                  | 54        |
|            | Planning for Server Usage .....                        | 58        |
|            | Determining Which Windows Edition to Use .....         | 61        |
|            | Selecting a Software Licensing Program .....           | 63        |
|            | Retail Product Licenses .....                          | 64        |
|            | Volume-Licensing Programs .....                        | 64        |
|            | Final Considerations for Planning and Deployment ..... | 67        |
| Chapter 3: | <b>Installing Windows Server 2008</b> .....            | <b>69</b> |
|            | Getting a Quick Start .....                            | 69        |
|            | Product Licensing .....                                | 71        |
|            | Preparing for Windows Server 2008 Installation .....   | 72        |
|            | System Hardware Requirements .....                     | 72        |
|            | How a Clean Installation and an Upgrade Differ .....   | 73        |
|            | Supported Upgrade Paths .....                          | 74        |
|            | Using Windows Update .....                             | 74        |
|            | Preinstallation Tasks .....                            | 76        |
|            | Installing Windows Server 2008 .....                   | 77        |
|            | Installation on x86-Based Systems .....                | 77        |
|            | Installation on 64-Bit Systems .....                   | 78        |

|   |     |
|---|-----|
| Planning Partitions .....   | 79  |
| Installation Type.....  | 80  |
| Naming Computers.....   | 81  |
| Network and Domain Membership Options .....                                 | 82  |
| Performing a Clean Installation.....  | 84  |
| Performing an Upgrade Installation.....                                     | 88  |
| Activation Sequence.....  | 88  |
| Performing Additional Administration Tasks During Installation.....         | 90  |
| Accessing a Command Prompt During Installation.....                         | 90  |
| Forcing Disk Partition Removal During Installation.....                     | 94  |
| Creating, Deleting, and Extending Disk Partitions During Installation ..... | 95  |
| Troubleshooting Installation.....   | 96  |
| Start with the Potential Points of Failure.....                             | 96  |
| Continue Past Lockups and Freezes.....                                      | 98  |
| Postinstallation .....  | 100 |

## Part 2: Managing Windows Server 2008 Systems

|            |  |            |
|------------|--|------------|
| Chapter 4: | <b>Managing Windows Server 2008 .....</b>                | <b>105</b> |
|            | Working with the Administration Tools .....              | 105        |
|            | Using Control Panel Utilities .....                      | 106        |
|            | Using Graphical Administrative Tools .....               | 106        |
|            | Using Command-Line Utilities.....                        | 110        |
|            | Using the Initial Configuration Tasks Console.....       | 113        |
|            | Working with Computer Management .....                   | 115        |
|            | Computer Management System Tools.....                    | 115        |
|            | Computer Management Storage Tools.....                   | 116        |
|            | Computer Management Services And Applications Tools..... | 116        |
|            | Working with Server Manager.....                         | 116        |
|            | Using Control Panel.....                                 | 119        |
|            | Using the Appearance And Personalization Console .....   | 120        |
|            | Using the Date And Time Utility .....                    | 122        |
|            | Using the Folder Options Utility .....                   | 123        |
|            | Using the Regional and Language Options Utility .....    | 125        |
|            | Using the System Console .....                           | 126        |
| Chapter 5: | <b>Configuring Windows Server 2008.....</b>              | <b>129</b> |
|            | Optimizing the Menu System .....                         | 129        |
|            | Navigating the Start Menu Options.....                   | 130        |
|            | Modifying the Start Menu Content .....                   | 133        |
|            | Customizing the Desktop and the Taskbar .....            | 141        |
|            | Configuring Desktop Items .....                          | 142        |
|            | Configuring the Taskbar.....                             | 143        |
|            | Optimizing Toolbars .....                                | 148        |
|            | Customizing the Quick Launch Toolbar.....                | 148        |
|            | Displaying Other Custom Toolbars.....                    | 149        |
|            | Creating Personal Toolbars .....                         | 150        |

|            |   |            |
|------------|---|------------|
| Chapter 6: | <b>Windows Server 2008 MMC Administration . . . . .</b>               | <b>153</b> |
|            | Introducing the MMC . . . . .   | 153        |
|            | Using the MMC. . . . .  | 154        |
|            | MMC Snap-Ins. . . . .   | 155        |
|            | MMC Modes. . . . .  | 156        |
|            | MMC Windows and Startup . . . . .                                     | 158        |
|            | MMC Tool Availability. . . . .  | 160        |
|            | MMC and Remote Computers . . . . .                                    | 162        |
|            | Building Custom MMCs. . . . .   | 163        |
|            | Step 1: Creating the Console. . . . .                                 | 164        |
|            | Step 2: Adding Snap-Ins to the Console . . . . .                      | 165        |
|            | Step 3: Saving the Finished Console. . . . .                          | 169        |
|            | Designing Custom Taskpads for the MMC. . . . .                        | 173        |
|            | Getting Started with Taskpads . . . . .                               | 173        |
|            | Understanding Taskpad View Styles . . . . .                           | 174        |
|            | Creating and Managing Taskpads . . . . .                              | 176        |
|            | Creating and Managing Tasks. . . . .                                  | 179        |
|            | Publishing and Distributing Your Custom Tools . . . . .               | 184        |
| Chapter 7: | <b>Configuring Roles, Role Services, and Features . . . . .</b>       | <b>185</b> |
|            | Using Roles, Role Services, and Features . . . . .                    | 185        |
|            | Making Supplemental Components Available . . . . .                    | 190        |
|            | Installing Components with Server Manager . . . . .                   | 191        |
|            | Viewing Configured Roles and Role Services . . . . .                  | 191        |
|            | Managing Server Roles. . . . .  | 192        |
|            | Managing Role Services. . . . .                                       | 197        |
|            | Managing Windows Features . . . . .                                   | 198        |
|            | Installing Components at the Command Line. . . . .                    | 200        |
|            | Getting Started with ServerManagerCmd . . . . .                       | 201        |
|            | Understanding Component Names . . . . .                               | 202        |
|            | Determining the Installed Roles, Role Services, and Features. . . . . | 207        |
|            | Installing Components Using ServerManagerCmd . . . . .                | 208        |
|            | Removing Components Using ServerManagerCmd . . . . .                  | 209        |
| Chapter 8: | <b>Managing and Troubleshooting Hardware . . . . .</b>                | <b>211</b> |
|            | Understanding Hardware Installation Changes . . . . .                 | 211        |
|            | Choosing Internal Devices . . . . .                                   | 211        |
|            | Choosing External Devices. . . . .                                    | 212        |
|            | Installing Devices . . . . .  | 215        |
|            | Understanding Device Installation . . . . .                           | 215        |
|            | Installing New Devices . . . . .                                      | 216        |
|            | Viewing Device and Driver Details . . . . .                           | 219        |
|            | Working with Device Drivers . . . . .                                 | 222        |
|            | Device Driver Essentials . . . . .                                    | 222        |
|            | Using Signed and Unsigned Device Drivers . . . . .                    | 223        |
|            | Viewing Driver Information. . . . .                                   | 224        |
|            | Viewing Advanced, Resources, and Other Settings. . . . .              | 227        |

|             |  |            |
|-------------|--|------------|
|             | Installing and Updating Device Drivers . . . . .                   | 228        |
|             | Restricting Device Installation Using Group Policy . . . . .       | 232        |
|             | Rolling Back Drivers . . . . .                                     | 233        |
|             | Removing Device Drivers for Removed Devices . . . . .              | 234        |
|             | Uninstalling, Reinstalling, and Disabling Device Drivers . . . . . | 234        |
|             | Managing Hardware . . . . .  | 235        |
|             | Adding Non-Plug and Play Hardware . . . . .                        | 235        |
|             | Enabling and Disabling Hardware . . . . .                          | 236        |
|             | Troubleshooting Hardware . . . . .                                 | 237        |
|             | Resolving Resource Conflicts . . . . .                             | 240        |
| Chapter 9:  | <b>Managing the Registry . . . . .</b>                             | <b>245</b> |
|             | Introducing the Registry . . . . .                                 | 246        |
|             | Understanding the Registry Structure . . . . .                     | 248        |
|             | Registry Root Keys . . . . .                                       | 251        |
|             | HKEY_LOCAL_MACHINE . . . . .                                       | 253        |
|             | HKEY_USERS . . . . .   | 258        |
|             | HKEY_CLASSES_ROOT . . . . .  | 258        |
|             | HKEY_CURRENT_CONFIG . . . . .                                      | 259        |
|             | HKEY_CURRENT_USER . . . . .  | 259        |
|             | Registry Data: How It Is Stored and Used . . . . .                 | 260        |
|             | Where Registry Data Comes From . . . . .                           | 260        |
|             | Types of Registry Data Available . . . . .                         | 261        |
|             | Working with the Registry . . . . .                                | 262        |
|             | Searching the Registry . . . . .                                   | 263        |
|             | Modifying the Registry . . . . .                                   | 264        |
|             | Modifying the Registry of a Remote Machine . . . . .               | 267        |
|             | Importing and Exporting Registry Data . . . . .                    | 267        |
|             | Loading and Unloading Hive Files . . . . .                         | 270        |
|             | Working with the Registry from the Command Line . . . . .          | 271        |
|             | Backing Up and Restoring the Registry . . . . .                    | 272        |
|             | Maintaining the Registry . . . . .                                 | 273        |
|             | Using the Windows Installer Clean Up Utility . . . . .             | 274        |
|             | Using the Windows Installer Zapper . . . . .                       | 275        |
|             | Securing the Registry . . . . .                                    | 276        |
|             | Preventing Access to the Registry Utilities . . . . .              | 277        |
|             | Applying Permissions to Registry Keys . . . . .                    | 278        |
|             | Controlling Remote Registry Access . . . . .                       | 281        |
|             | Auditing Registry Access . . . . .                                 | 283        |
| Chapter 10: | <b>Software and User Account Control Administration . . . . .</b>  | <b>285</b> |
|             | Understanding Software Installation Changes . . . . .              | 285        |
|             | Mastering User Account Control . . . . .                           | 288        |
|             | Elevation, Prompts, and the Secure Desktop . . . . .               | 289        |
|             | Configuring UAC and Admin Approval Mode . . . . .                  | 290        |
|             | Maintaining Application Integrity . . . . .                        | 294        |
|             | Application Access Tokens . . . . .                                | 294        |

Application Run Levels ..... 296  
 Configuring Run Levels..... 298  
 Controlling Application Installation and Run Behavior..... 299

Chapter 11: **Performance Monitoring and Tuning** ..... 303

Tuning Performance, Memory Usage, and Data Throughput ..... 303  
     Tuning Windows Operating System Performance..... 303  
     Tuning Processor Scheduling ..... 304  
     Tuning Virtual Memory ..... 305  
 Tracking a System’s General Health..... 308  
     Monitoring Essentials ..... 308  
     Getting Processor and Memory Usage for Troubleshooting..... 311  
     Getting Information on Running Applications..... 314  
     Monitoring and Troubleshooting Processes..... 314  
     Monitoring and Troubleshooting Services ..... 321  
     Getting Network Usage Information..... 323  
     Getting Information on User and Remote User Sessions..... 324  
 Tracking Events and Troubleshooting by Using Event Viewer ..... 326  
     Understanding the Event Logs ..... 327  
     Accessing the Event Logs and Viewing Events..... 329  
     Viewing Event Logs on Remote Systems..... 333  
     Sorting, Finding, and Filtering Events ..... 333  
     Archiving Event Logs..... 337  
     Tracking Events Using PowerShell ..... 338  
     Using Subscriptions and Forwarded Events ..... 341

Chapter 12: **Comprehensive Performance Analysis and Logging** ..... 343

Establishing Performance Baselines ..... 344  
 Monitoring Reliability and Performance ..... 344  
 Comprehensive Performance Monitoring ..... 347  
     Using Performance Monitor ..... 347  
     Selecting Performance Objects and Counters to Monitor..... 349  
     Choosing Views and Controlling the Display ..... 351  
     Monitoring Performance Remotely ..... 354  
 Resolving Performance Bottlenecks ..... 356  
     Resolving Memory Bottlenecks ..... 356  
     Resolving Processor Bottlenecks ..... 359  
     Resolving Disk I/O Bottlenecks..... 360  
     Resolving Network Bottlenecks ..... 362  
 Performance Logging ..... 363  
     Viewing Data Collector Reports ..... 368  
     Configuring Performance Counter Alerts..... 369  
     Monitoring Performance from the Command Line..... 370  
     Analyzing Trace Logs at the Command Line..... 372

## Part 3: Managing Windows Server 2008 Storage and File Systems

|             |   |            |
|-------------|---|------------|
| Chapter 13: | <b>Boot Configuration</b> .....   | <b>377</b> |
|             | Boot from Hardware and Firmware .....   | 377        |
|             | Hardware and Firmware Power States .....                                      | 378        |
|             | Diagnosing Hardware and Firmware Startup Problems .....                       | 379        |
|             | Resolving Hardware and Firmware Startup Problems .....                        | 380        |
|             | Boot Environment Essentials .....   | 382        |
|             | Managing Startup and Boot Configuration .....                                 | 383        |
|             | Managing Startup and Recovery Options .....                                   | 384        |
|             | Managing System Boot Configuration .....                                      | 385        |
|             | Working with the BCD Editor .....   | 388        |
|             | Managing the Boot Configuration Data Store and Its Entries .....              | 390        |
|             | Viewing BCD Entries .....   | 390        |
|             | Creating and Identifying the BCD Store .....                                  | 393        |
|             | Importing and Exporting the BCD Store .....                                   | 394        |
|             | Creating, Copying, and Deleting BCD Entries .....                             | 394        |
|             | Setting BCD Entry Values .....  | 395        |
|             | Changing Data Execution Prevention and Physical Address Extension Options ... | 402        |
|             | Changing the Operating System Display Order .....                             | 402        |
|             | Changing the Default Operating System Entry .....                             | 403        |
|             | Changing the Default Timeout .....  | 404        |
|             | Changing the Boot Sequence Temporarily .....                                  | 404        |
| Chapter 14: | <b>Storage Management</b> .....   | <b>405</b> |
|             | Essential Storage Technologies .....  | 405        |
|             | Using Internal and External Storage Devices .....                             | 405        |
|             | Improving Storage Management .....  | 407        |
|             | Booting from SANs and Using SANs with Clusters .....                          | 409        |
|             | Configuring Multipath I/O .....   | 411        |
|             | Meeting Performance, Capacity, and Availability Requirements .....            | 413        |
|             | Installing and Configuring File Services .....                                | 414        |
|             | Optimizing the File Services Role .....                                       | 415        |
|             | Configuring the File Services Role .....                                      | 416        |
|             | Configuring Storage .....   | 419        |
|             | Using the Disk Management Tools .....   | 419        |
|             | Adding New Disks .....  | 423        |
|             | Using the MBR and GPT Partition Styles .....                                  | 425        |
|             | Using the Disk Storage Types .....  | 428        |
|             | Converting FAT or FAT32 to NTFS .....   | 432        |
|             | Managing MBR Disk Partitions on Basic Disks .....                             | 434        |
|             | Creating Partitions and Simple Volumes .....                                  | 435        |
|             | Formatting a Partition, Logical Drive, or Volume .....                        | 439        |

- Configuring Drive Letters . . . . . 440
- Configuring Mount Points . . . . . 442
- Extending Partitions . . . . . 443
- Shrinking Partitions . . . . . 446
- Deleting a Partition, Logical Drive, or Volume . . . . . 448
- Managing GPT Disk Partitions on Basic Disks . . . . . 449
  - ESP . . . . . 449
  - MSR Partitions . . . . . 450
  - Primary Partitions . . . . . 451
  - LDM Metadata and LDM Data Partitions . . . . . 451
  - OEM or Unknown Partitions . . . . . 452
- Managing Volumes on Dynamic Disks . . . . . 452
  - Creating a Simple or Spanned Volume . . . . . 453
  - Configuring RAID 0: Striping . . . . . 454
  - Recovering a Failed Simple, Spanned, or Striped Disk . . . . . 455
  - Moving Dynamic Disks . . . . . 456
  - Configuring RAID 1: Disk Mirroring . . . . . 457
  - Mirroring Boot and System Volumes . . . . . 459
  - Configuring RAID 5: Disk Striping with Parity . . . . . 462
  - Breaking or Removing a Mirrored Set . . . . . 463
  - Resolving Problems with Mirrored Sets . . . . . 464
  - Repairing a Mirrored System Volume . . . . . 465
  - Resolving Problems with RAID-5 Sets . . . . . 466

Chapter 15: **TPM and BitLocker Drive Encryption . . . . . 467**

- Working with Trusted Platforms . . . . . 467
- Managing TPM . . . . . 469
  - Understanding TPM States and Tools . . . . . 469
  - Initializing a TPM for First Use . . . . . 471
  - Turning an Initialized TPM On or Off . . . . . 473
  - Clearing the TPM . . . . . 475
  - Changing the TPM Owner Password . . . . . 476
- Introducing BitLocker Drive Encryption . . . . . 477
- Deploying BitLocker Drive Encryption . . . . . 478
- Setting Up and Managing BitLocker Drive Encryption . . . . . 481
  - Creating the BitLocker Drive Encryption Partition for a Computer with No Operating System . . . . . 482
  - Creating the BitLocker Drive Encryption Partition for a Computer with an Operating System . . . . . 483
  - Configuring and Enabling BitLocker Drive Encryption . . . . . 485
  - Determining Whether a Computer Has BitLocker Encrypted Volumes . . . . . 492
  - Managing BitLocker Passwords and PINs . . . . . 492
  - Encrypting Server Data Volumes . . . . . 493
  - Recovering Data Protected by BitLocker Drive Encryption . . . . . 494
  - Disabling or Turning Off BitLocker Drive Encryption . . . . . 495

|             |   |            |
|-------------|---|------------|
| Chapter 16: | <b>Managing Windows Server 2008 File Systems</b> . . . . .          | <b>497</b> |
|             | Understanding Disk and File System Structure . . . . .              | 497        |
|             | Using FAT . . . . .   | 499        |
|             | File Allocation Table Structure . . . . .                           | 499        |
|             | FAT Features . . . . .  | 500        |
|             | Using NTFS . . . . .  | 503        |
|             | NTFS Structures . . . . .   | 503        |
|             | NTFS Features . . . . .   | 507        |
|             | Analyzing NTFS Structure . . . . .                                  | 508        |
|             | Advanced NTFS Features . . . . .                                    | 511        |
|             | Hard Links . . . . .  | 511        |
|             | Data Streams . . . . .  | 512        |
|             | Change Journals . . . . .   | 514        |
|             | Object Identifiers . . . . .  | 516        |
|             | Reparse Points . . . . .  | 517        |
|             | Sparse Files . . . . .  | 518        |
|             | Transactional NTFS . . . . .  | 520        |
|             | Using File-Based Compression . . . . .                              | 521        |
|             | NTFS Compression . . . . .  | 521        |
|             | Compressed (Zipped) Folders . . . . .                               | 524        |
|             | Managing Disk Quotas . . . . .                                      | 525        |
|             | How Quota Management Works . . . . .                                | 525        |
|             | Configuring Disk Quotas . . . . .                                   | 527        |
|             | Customizing Quota Entries for Individual Users . . . . .            | 529        |
|             | Managing Disk Quotas After Configuration . . . . .                  | 532        |
|             | Exporting and Importing Quota Entries . . . . .                     | 534        |
|             | Maintaining File System Integrity . . . . .                         | 535        |
|             | How File System Errors Occur . . . . .                              | 535        |
|             | Fixing File System Errors by Using Check Disk . . . . .             | 535        |
|             | Analyzing FAT Volumes by Using ChkDsk . . . . .                     | 538        |
|             | Analyzing NTFS Volumes by Using ChkDsk . . . . .                    | 539        |
|             | Repairing Volumes and Marking Bad Sectors by Using ChkDsk . . . . . | 540        |
|             | Defragmenting Disks . . . . .                                       | 541        |
|             | Configuring Automated Defragmentation . . . . .                     | 541        |
|             | Fixing Fragmentation by Using Disk Defragmenter . . . . .           | 543        |
|             | Understanding the Fragmentation Analysis . . . . .                  | 545        |
| Chapter 17: | <b>File Sharing and Security</b> . . . . .                          | <b>547</b> |
|             | File Sharing Essentials . . . . .                                   | 547        |
|             | Understanding File-Sharing Models . . . . .                         | 547        |
|             | Using and Finding Shares . . . . .                                  | 550        |
|             | Hiding and Controlling Share Access . . . . .                       | 553        |
|             | Special and Administrative Shares . . . . .                         | 553        |
|             | Accessing Shares for Administration . . . . .                       | 555        |
|             | Creating and Publishing Shared Folders . . . . .                    | 556        |
|             | Creating Shares by Using Windows Explorer . . . . .                 | 556        |
|             | Creating Shares by Using Computer Management . . . . .              | 559        |
|             | Publishing Shares in Active Directory . . . . .                     | 563        |

- Managing Share Permissions . . . . . 563
  - Understanding Share Permissions . . . . . 564
  - Configuring Share Permissions . . . . . 565
- Managing File and Folder Permissions . . . . . 567
  - File and Folder Ownership . . . . . 567
  - Permission Inheritance for Files and Folders . . . . . 569
  - Configuring File and Folder Permissions . . . . . 571
  - Determining Effective Permissions . . . . . 578
- Managing File Shares After Configuration . . . . . 579
- Auditing File and Folder Access . . . . . 581
  - Enabling Auditing for Files and Folders . . . . . 581
  - Specifying Files and Folders to Audit . . . . . 582
  - Monitoring the Security Logs . . . . . 585

Chapter 18: **Using Volume Shadow Copy . . . . . 587**

- Shadow Copy Essentials . . . . . 587
  - Using Shadow Copies of Shared Folders . . . . . 588
  - How Shadow Copies Works . . . . . 589
  - Implementing Shadow Copies for Shared Folders . . . . . 590
- Managing Shadow Copies in Computer Management . . . . . 592
  - Configuring Shadow Copies in Computer Management . . . . . 593
  - Maintaining Shadow Copies After Configuration . . . . . 596
  - Reverting an Entire Volume . . . . . 597
- Configuring Shadow Copies at the Command Line . . . . . 598
  - Enabling Shadow Copying from the Command Line . . . . . 598
  - Create Manual Snapshots from the Command Line . . . . . 599
  - Viewing Shadow Copy Information . . . . . 600
  - Deleting Snapshot Images from the Command Line . . . . . 601
  - Disabling Shadow Copies from the Command Line . . . . . 602
  - Reverting Volumes from the Command Line . . . . . 602
- Using Shadow Copies on Clients . . . . . 603

Chapter 19: **Using Remote Desktop for Administration . . . . . 607**

- Remote Desktop for Administration Essentials . . . . . 607
- Configuring Remote Desktop for Administration . . . . . 609
  - Enabling Remote Desktop for Administration on Servers . . . . . 609
  - Permitting and Restricting Remote Logon . . . . . 610
  - Configuring Remote Desktop for Administration Through Group Policy . . . . . 612
- Supporting Remote Desktop Connection Clients . . . . . 613
  - Remote Desktop Connection Client . . . . . 613
  - Running the Remote Desktop Connection Client . . . . . 615
  - Running Remote Desktops . . . . . 620
- Tracking Who's Logged On . . . . . 623

## Part 4: Managing Windows Server 2008 Networking and Print Services

|             |   |            |
|-------------|---|------------|
| Chapter 20: | <b>Networking with TCP/IP</b> .....                                       | <b>627</b> |
|             | Navigating Networking in Windows Server 2008 .....                        | 627        |
|             | Using TCP/IP .....  | 631        |
|             | Understanding IPv4 Addressing .....                                       | 633        |
|             | Unicast IPv4 Addresses .....  | 633        |
|             | Multicast IPv4 Addresses .....  | 636        |
|             | Broadcast IPv4 Addresses .....  | 636        |
|             | Special IPv4 Addressing Rules .....                                       | 638        |
|             | Using Subnets and Subnet Masks .....                                      | 639        |
|             | Subnet Masks .....  | 639        |
|             | Network Prefix Notation .....   | 640        |
|             | Subnetting .....  | 641        |
|             | Understanding IP Data Packets .....                                       | 647        |
|             | Getting and Using IPv4 Addresses .....                                    | 647        |
|             | Understanding IPv6 .....  | 649        |
|             | Understanding Name Resolution .....                                       | 652        |
|             | Domain Name System .....  | 652        |
|             | Windows Internet Naming Service (WINS) .....                              | 654        |
|             | Link-Local Multicast Name Resolution (LLMNR) .....                        | 655        |
| Chapter 21: | <b>Managing TCP/IP Networking</b> .....                                   | <b>657</b> |
|             | Installing TCP/IP Networking .....  | 657        |
|             | Preparing for Installation of TCP/IP Networking .....                     | 657        |
|             | Installing Network Adapters .....   | 658        |
|             | Installing Networking Services (TCP/IP) .....                             | 659        |
|             | Configuring TCP/IP Networking .....                                       | 660        |
|             | Configuring Static IP Addresses .....                                     | 661        |
|             | Configuring Dynamic IP Addresses and Alternate IP Addressing .....        | 663        |
|             | Configuring Multiple IP Addresses and Gateways .....                      | 665        |
|             | Configuring DNS Resolution .....  | 667        |
|             | Configuring WINS Resolution .....   | 669        |
|             | Managing Network Connections .....  | 671        |
|             | Checking the Status, Speed, and Activity for Local Area Connections ..... | 671        |
|             | Viewing Network Configuration Information .....                           | 672        |
|             | Enabling and Disabling Local Area Connections .....                       | 673        |
|             | Renaming Local Area Connections .....                                     | 674        |
|             | Troubleshooting and Testing Network Settings .....                        | 674        |
|             | Diagnosing and Resolving Local Area Connection Problems .....             | 674        |
|             | Diagnosing and Resolving Internet Connection Problems .....               | 675        |
|             | Performing Basic Network Tests .....                                      | 675        |
|             | Diagnosing and Resolving IP Addressing Problems .....                     | 676        |
|             | Diagnosing and Resolving Routing Problems .....                           | 678        |
|             | Releasing and Renewing DHCP Settings .....                                | 679        |
|             | Diagnosing and Resolving Name Resolution Issues .....                     | 680        |

|             |   |            |
|-------------|---|------------|
| Chapter 22: | <b>Managing DHCP</b>                                    | <b>685</b> |
|             | DHCP Essentials   | 685        |
|             | DHCPv4 and Autoconfiguration                            | 687        |
|             | DHCPv6 and Autoconfiguration                            | 687        |
|             | DHCP Security Considerations                            | 688        |
|             | Planning DHCPv4 and DHCPv6 Implementations              | 689        |
|             | DHCPv4 Messages and Relay Agents                        | 689        |
|             | DHCPv6 Messages and Relay Agents                        | 691        |
|             | DHCP Availability and Fault Tolerance for IPv4 and IPv6 | 693        |
|             | Setting Up DHCP Servers                                 | 696        |
|             | Installing the DHCP Server Service                      | 697        |
|             | Authorizing DHCP Servers in Active Directory            | 701        |
|             | Creating and Configuring Scopes                         | 701        |
|             | Using Exclusions  | 712        |
|             | Using Reservations                                      | 713        |
|             | Activating Scopes                                       | 716        |
|             | Configuring TCP/IP Options                              | 717        |
|             | Levels of Options and Their Uses                        | 717        |
|             | Options Used by Windows Clients                         | 718        |
|             | Using User-Specific and Vendor-Specific TCP/IP Options  | 719        |
|             | Settings Options for All Clients                        | 721        |
|             | Settings Options for RRAS and NAP Clients               | 722        |
|             | Setting Add-On Options for Directly Connected Clients   | 723        |
|             | Defining Classes to Get Different Option Sets           | 724        |
|             | Advanced DHCP Configuration and Maintenance             | 727        |
|             | Configuring DHCP Audit Logging                          | 727        |
|             | Binding the DHCP Server Service to a Network Interface  | 729        |
|             | Integrating DHCP and DNS                                | 730        |
|             | Integrating DHCP and NAP                                | 731        |
|             | Enabling Conflict Detection on DHCP Servers             | 734        |
|             | Saving and Restoring the DHCP Configuration             | 734        |
|             | Managing and Maintaining the DHCP Database              | 735        |
|             | Setting Up DHCP Relay Agents                            | 737        |
|             | Configuring and Enabling Routing and Remote Access      | 738        |
|             | Adding and Configuring the DHCP Relay Agent             | 739        |
| Chapter 23: | <b>Architecting DNS Infrastructure</b>                  | <b>743</b> |
|             | DNS Essentials  | 743        |
|             | Planning DNS Implementations                            | 744        |
|             | Public and Private Namespaces                           | 744        |
|             | Name Resolution Using DNS                               | 746        |
|             | DNS Resource Records                                    | 748        |
|             | DNS Zones and Zone Transfers                            | 749        |
|             | Secondary Zones, Stub Zones, and Conditional Forwarding | 755        |
|             | Integration with Other Technologies                     | 756        |

|  |            |
|--|------------|
| Security Considerations . . . . .  | 757        |
| DNS Queries and Security . . . . .   | 757        |
| DNS Dynamic Updates and Security . . . . .   | 759        |
| External DNS Name Resolution and Security . . . . .                                  | 760        |
| Architecting a DNS Design . . . . .  | 762        |
| Split-Brain Design: Same Internal and External Names . . . . .                       | 762        |
| Separate-Name Design: Different Internal and External Names . . . . .                | 763        |
| <b>Chapter 24: Implementing and Managing DNS . . . . .</b>                           | <b>767</b> |
| Installing the DNS Server Service . . . . .  | 767        |
| Using DNS with Active Directory . . . . .  | 767        |
| Using DNS Without Active Directory . . . . .   | 771        |
| DNS Setup . . . . .  | 771        |
| Configuring DNS Using the Wizard . . . . .   | 773        |
| Configuring a Small Network Using the Configure A DNS Server Wizard . . . . .        | 774        |
| Configuring a Large Network Using the Configure A DNS Server Wizard . . . . .        | 778        |
| Configuring DNS Zones, Subdomains, Forwarders, and Zone Transfers . . . . .          | 783        |
| Creating Forward Lookup Zones . . . . .  | 783        |
| Creating Reverse Lookup Zones . . . . .  | 785        |
| Configuring Forwarders and Conditional Forwarding . . . . .                          | 786        |
| Configuring Subdomains and Delegating Authority . . . . .                            | 788        |
| Configuring Zone Transfers . . . . .   | 791        |
| Configuring Secondary Notification . . . . .   | 793        |
| Adding Resource Records . . . . .  | 794        |
| Host Address (A and AAAA) and Pointer (PTR) Records . . . . .                        | 795        |
| Canonical Name (CNAME) Records . . . . .   | 797        |
| Mail Exchanger (MX) Records . . . . .  | 798        |
| Name Server (NS) Records . . . . .   | 799        |
| Start of Authority (SOA) Records . . . . .   | 800        |
| Service Location (SRV) Records . . . . .   | 801        |
| Deploying Global Names . . . . .   | 803        |
| Maintaining and Monitoring DNS . . . . .   | 804        |
| Configuring Default Application Directory Partitions and Replication Scope . . . . . | 804        |
| Setting Aging and Scavenging . . . . .   | 807        |
| Configuring Logging and Checking DNS Server Logs . . . . .                           | 808        |
| Troubleshooting the DNS Client Service . . . . .                                     | 809        |
| Try Reregistering the Client . . . . .   | 809        |
| Check the Client's TCP/IP Configuration . . . . .                                    | 810        |
| Check the Client's Resolver Cache . . . . .  | 811        |
| Perform Lookups for Troubleshooting . . . . .  | 812        |
| Troubleshooting the DNS Server Service . . . . .                                     | 812        |
| Check the Server's TCP/IP Configuration . . . . .                                    | 812        |
| Check the Server's Cache . . . . .   | 813        |
| Check Replication to Other Name Servers . . . . .                                    | 813        |
| Examine the Configuration of the DNS Server . . . . .                                | 813        |
| Examine Zones and Zone Records . . . . .   | 819        |

|             |   |            |
|-------------|---|------------|
| Chapter 25: | <b>Implementing and Maintaining WINS</b> . . . . .                    | <b>823</b> |
|             | WINS Essentials. . . . .  | 823        |
|             | NetBIOS Namespace and Scope. . . . .                                  | 823        |
|             | NetBIOS Node Types . . . . .  | 824        |
|             | WINS Name Registration and Cache . . . . .                            | 824        |
|             | WINS Implementation Details. . . . .                                  | 825        |
|             | Setting Up WINS Servers . . . . .                                     | 826        |
|             | Configuring Replication Partners . . . . .                            | 828        |
|             | Replication Essentials . . . . .                                      | 828        |
|             | Configuring Automatic Replication Partners . . . . .                  | 829        |
|             | Using Designated Replication Partners . . . . .                       | 830        |
|             | Configuring and Maintaining WINS . . . . .                            | 832        |
|             | Configuring Burst Handling. . . . .                                   | 832        |
|             | Checking Server Status and Configuration. . . . .                     | 833        |
|             | Checking Active Registrations and Scavenging Records . . . . .        | 835        |
|             | Maintaining the WINS Database. . . . .                                | 836        |
|             | Enabling WINS Lookups Through DNS . . . . .                           | 839        |
| Chapter 26: | <b>Deploying Print Services</b> . . . . .                             | <b>841</b> |
|             | Understanding Windows Server 2008 Print Services. . . . .             | 841        |
|             | Planning for Printer Deployments and Consolidation. . . . .           | 847        |
|             | Sizing Print Server Hardware and Optimizing Configuration . . . . .   | 847        |
|             | Sizing Printer Hardware and Optimizing Configuration. . . . .         | 849        |
|             | Setting Up Print Servers . . . . .                                    | 852        |
|             | Installing a Print Server. . . . .                                    | 853        |
|             | Installing Network Printers Automatically. . . . .                    | 855        |
|             | Adding Local Printers . . . . .                                       | 855        |
|             | Adding Network-Attached Printers . . . . .                            | 860        |
|             | Changing Standard TCP/IP Port Monitor Settings. . . . .               | 863        |
|             | Connecting Users to Shared Printers. . . . .                          | 865        |
|             | Deploying Printer Connections. . . . .                                | 868        |
|             | Configuring Point and Print Restrictions. . . . .                     | 870        |
|             | Managing Printers Throughout the Organization . . . . .               | 872        |
|             | Managing Your Printers . . . . .                                      | 872        |
|             | Migrating Printers and Print Queues . . . . .                         | 873        |
|             | Monitoring Printers and Printer Queues Automatically. . . . .         | 876        |
| Chapter 27: | <b>Managing and Maintaining Print Services</b> . . . . .              | <b>879</b> |
|             | Managing Printer Permissions . . . . .                                | 879        |
|             | Understanding Printer Permissions . . . . .                           | 879        |
|             | Configuring Printer Permissions . . . . .                             | 881        |
|             | Assigning Printer Ownership. . . . .                                  | 883        |
|             | Auditing Printer Access. . . . .                                      | 884        |
|             | Managing Print Server Properties. . . . .                             | 885        |
|             | Viewing and Creating Printer Forms . . . . .                          | 885        |
|             | Viewing and Configuring Printer Ports . . . . .                       | 886        |
|             | Viewing and Configuring Print Drivers . . . . .                       | 887        |
|             | Configuring Print Spool, Logging, and Notification Settings . . . . . | 889        |

|   |            |
|---|------------|
| Managing Printer Properties . . . . .   | 890        |
| Setting General Properties, Printing Preferences, and Document Defaults . . . . . | 891        |
| Setting Overlays and Watermarks for Documents . . . . .                           | 893        |
| Installing and Updating Print Drivers on Clients . . . . .                        | 894        |
| Configuring Printer Sharing and Publishing . . . . .                              | 895        |
| Optimizing Printing Through Queues and Pooling . . . . .                          | 896        |
| Configuring Print Spooling . . . . .  | 900        |
| Viewing the Print Processor and Default Data Type . . . . .                       | 901        |
| Configuring Separator Pages . . . . .   | 902        |
| Configuring Color Profiles . . . . .  | 906        |
| Managing Print Jobs . . . . .   | 907        |
| Pausing, Starting, and Canceling All Printing . . . . .                           | 907        |
| Viewing Print Jobs . . . . .  | 907        |
| Managing a Print Job and Its Properties . . . . .                                 | 908        |
| Printer Maintenance and Troubleshooting . . . . .                                 | 909        |
| Monitoring Print Server Performance . . . . .                                     | 909        |
| Preparing for Print Server Failure . . . . .                                      | 912        |
| Solving Printing Problems . . . . .   | 913        |
| <b>Chapter 28: Deploying Terminal Services . . . . .</b>                          | <b>919</b> |
| Using Terminal Services . . . . .   | 919        |
| Terminal Services Clients . . . . .   | 919        |
| Terminal Services Servers . . . . .   | 921        |
| Terminal Services Licensing . . . . .   | 925        |
| Designing the Terminal Services Infrastructure . . . . .                          | 927        |
| Capacity Planning for Terminal Services . . . . .                                 | 927        |
| Planning Organizational Structure for Terminal Services . . . . .                 | 931        |
| Deploying Single-Server Environments . . . . .                                    | 932        |
| Deploying Multi-Server Environments . . . . .                                     | 933        |
| Setting Up Terminal Services . . . . .  | 936        |
| Installing a Terminal Server . . . . .  | 936        |
| Installing Applications for Clients to Use . . . . .                              | 939        |
| Enabling and Joining the Terminal Services Session Broker Service . . . . .       | 944        |
| Setting Up a Terminal Services License Server . . . . .                           | 951        |
| Using the Terminal Services Configuration Tool . . . . .                          | 957        |
| Configuring Global Connection Settings . . . . .                                  | 958        |
| Configuring Server Settings . . . . .   | 960        |
| Configuring Terminal Services Security . . . . .                                  | 961        |
| Auditing Terminal Services Access . . . . .                                       | 964        |
| Configuring RemoteApps . . . . .  | 966        |
| Making Programs Available as RemoteApps . . . . .                                 | 966        |
| Deploying RemoteApps . . . . .  | 968        |
| Configuring Deployment Settings for All RemoteApps . . . . .                      | 973        |
| Modifying or Removing a RemoteApp Program . . . . .                               | 975        |
| Using Terminal Services Manager . . . . .   | 975        |
| Connecting to Terminal Servers . . . . .  | 976        |
| Getting Terminal Services Information . . . . .                                   | 976        |
| Managing User Sessions in Terminal Services Manager . . . . .                     | 977        |

|  |     |
|--|-----|
| Managing Terminal Services from the Command Line . . . . .   | 978 |
| Gathering Terminal Services Information . . . . .            | 978 |
| Managing User Sessions from the Command Line . . . . .       | 979 |
| Other Useful Terminal Services Commands. . . . .             | 980 |
| Configuring Terminal Services Per-User Settings. . . . .     | 981 |
| Getting Remote Control of a User's Session . . . . .         | 981 |
| Setting Up the Terminal Services Profile for Users . . . . . | 982 |

## Part 5: Managing Active Directory and Security

|   |             |
|---|-------------|
| Chapter 29: <b>Active Directory Architecture . . . . .</b>                      | <b>987</b>  |
| Active Directory Physical Architecture . . . . .                                | 987         |
| Active Directory Physical Architecture: A Top-Level View . . . . .              | 987         |
| Active Directory Within the Local Security Authority . . . . .                  | 988         |
| Directory Service Architecture . . . . .  | 991         |
| Data Store Architecture . . . . .   | 995         |
| Active Directory Logical Architecture. . . . .                                  | 997         |
| Active Directory Objects . . . . .  | 998         |
| Active Directory Domains, Trees, and Forests . . . . .                          | 999         |
| Active Directory Trusts . . . . .   | 1001        |
| Active Directory Namespaces and Partitions . . . . .                            | 1003        |
| Active Directory Data Distribution. . . . .                                     | 1005        |
| Chapter 30: <b>Designing and Managing the Domain Environment . . . . .</b>      | <b>1007</b> |
| Design Considerations for Active Directory Replication . . . . .                | 1008        |
| Design Considerations for Active Directory Search and Global Catalogs . . . . . | 1010        |
| Searching the Tree. . . . .   | 1010        |
| Accessing the Global Catalog . . . . .  | 1011        |
| Designating Global Catalog Servers. . . . .                                     | 1012        |
| Designating Replication Attributes. . . . .                                     | 1014        |
| Design Considerations for Compatibility . . . . .                               | 1016        |
| Understanding Domain Functional Level . . . . .                                 | 1017        |
| Understanding Forest Functional Level. . . . .                                  | 1018        |
| Raising the Domain or Forest Functional Level . . . . .                         | 1019        |
| Design Considerations for Active Directory Authentication and Trusts . . . . .  | 1020        |
| Universal Groups and Authentication . . . . .                                   | 1020        |
| NTLM and Kerberos Authentication. . . . .                                       | 1023        |
| Authentication and Trusts Across Domain Boundaries. . . . .                     | 1026        |
| Authentication and Trusts Across Forest Boundaries . . . . .                    | 1030        |
| Examining Domain and Forest Trusts. . . . .                                     | 1033        |
| Establishing External, Shortcut, Realm, and Cross-Forest Trusts. . . . .        | 1035        |
| Verifying and Troubleshooting Trusts . . . . .                                  | 1039        |
| Delegating Authentication . . . . .   | 1040        |
| Delegated Authentication Essentials . . . . .                                   | 1040        |
| Configuring Delegated Authentication . . . . .                                  | 1041        |
| Design Considerations for Active Directory Operations Masters . . . . .         | 1044        |
| Operations Master Roles . . . . .   | 1044        |
| Using, Locating, and Transferring the Schema Master Role. . . . .               | 1047        |

|                    |   |             |
|--------------------|---|-------------|
|                    | Using, Locating, and Transferring the Domain Naming Master Role . . . . .           | 1048        |
|                    | Using, Locating, and Transferring the Relative ID Master Role . . . . .             | 1048        |
|                    | Using, Locating, and Transferring the PDC Emulator Role . . . . .                   | 1050        |
|                    | Using, Locating, and Transferring the Infrastructure Master Role . . . . .          | 1050        |
|                    | Seizing Operations Master Roles . . . . .   | 1051        |
| <b>Chapter 31:</b> | <b>Organizing Active Directory . . . . .</b>  | <b>1053</b> |
|                    | Creating an Active Directory Implementation or Update Plan . . . . .                | 1053        |
|                    | Developing a Forest Plan . . . . .  | 1054        |
|                    | Forest Namespace . . . . .  | 1054        |
|                    | Single vs. Multiple Forests . . . . .   | 1056        |
|                    | Forest Administration . . . . .   | 1057        |
|                    | Developing a Domain Plan . . . . .  | 1058        |
|                    | Domain Design Considerations . . . . .  | 1059        |
|                    | Single vs. Multiple Domains . . . . .   | 1060        |
|                    | Forest Root Domain Design Configurations . . . . .                                  | 1061        |
|                    | Changing Domain Design . . . . .  | 1061        |
|                    | Developing an Organizational Unit Plan . . . . .                                    | 1063        |
|                    | Using Organizational Units (OUs) . . . . .  | 1063        |
|                    | Using OUs for Delegation . . . . .  | 1064        |
|                    | Using OUs for Group Policy . . . . .  | 1065        |
|                    | Creating an OU Design . . . . .   | 1065        |
| <b>Chapter 32:</b> | <b>Configuring Active Directory Sites and Replication . . . . .</b>                 | <b>1071</b> |
|                    | Working with Active Directory Sites . . . . .                                       | 1071        |
|                    | Single Site vs. Multiple Sites . . . . .  | 1072        |
|                    | Replication Within and Between Sites . . . . .                                      | 1074        |
|                    | Determining Site Boundaries . . . . .   | 1075        |
|                    | Understanding Active Directory Replication . . . . .                                | 1075        |
|                    | Replication Enhancements for Active Directory . . . . .                             | 1076        |
|                    | Replication Enhancements for the Active Directory System Volume . . . . .           | 1077        |
|                    | Replication Architecture: An Overview . . . . .                                     | 1082        |
|                    | Intersite Replication Essentials . . . . .  | 1089        |
|                    | Replication Rings and Directory Partitions . . . . .                                | 1091        |
|                    | Developing or Revising a Site Design . . . . .                                      | 1096        |
|                    | Mapping Network Infrastructure . . . . .  | 1096        |
|                    | Creating a Site Design . . . . .  | 1098        |
| <b>Chapter 33:</b> | <b>Implementing Active Directory Domain Services . . . . .</b>                      | <b>1107</b> |
|                    | Preinstallation Considerations for Active Directory . . . . .                       | 1107        |
|                    | Hardware and Configuration Considerations for Domain Controllers . . . . .          | 1108        |
|                    | Configuring Active Directory for Fast Recovery with Storage Area Networks . . . . . | 1110        |
|                    | Connecting Clients to Active Directory . . . . .                                    | 1111        |
|                    | Installing Active Directory Domain Services . . . . .                               | 1112        |
|                    | Active Directory Installation Options and Issues . . . . .                          | 1112        |
|                    | Using the Active Directory Domain Services Installation Wizard . . . . .            | 1114        |
|                    | Performing an Active Directory Installation from Media . . . . .                    | 1126        |

|             |  |             |
|-------------|--|-------------|
|             | Uninstalling Active Directory . . . . .                                      | 1129        |
|             | Creating and Managing Organizational Units (OUs) . . . . .                   | 1133        |
|             | Creating an OU . . . . .   | 1133        |
|             | Setting OU Properties. . . . .   | 1135        |
|             | Creating or Moving Accounts and Resources for Use with an OU . . . . .       | 1136        |
|             | Delegating Administration of Domains and OUs . . . . .                       | 1136        |
|             | Understanding Delegation of Administration . . . . .                         | 1136        |
|             | Delegating Administration. . . . .   | 1137        |
| Chapter 34: | <b>Deploying Read-Only Domain Controllers . . . . .</b>                      | <b>1141</b> |
|             | Introducing Read-Only Domain Controllers . . . . .                           | 1141        |
|             | Design Considerations for Read-Only Replication . . . . .                    | 1145        |
|             | Installing RODCs. . . . .  | 1148        |
|             | Preparing for an RODC Installation . . . . .                                 | 1148        |
|             | Installing an RODC . . . . .   | 1150        |
|             | Installing an RODC from Media . . . . .                                      | 1156        |
|             | Managing Password Replication Policy . . . . .                               | 1158        |
|             | Working with Password Replication Policy. . . . .                            | 1158        |
|             | Allowing or Denying Accounts in Password Replication Policy. . . . .         | 1160        |
|             | Viewing and Managing Credentials on an RODC . . . . .                        | 1162        |
|             | Determining Whether an Account Is Allowed or Denied Access . . . . .         | 1163        |
|             | Resetting Credentials . . . . .  | 1164        |
|             | Delegating Administrative Permissions . . . . .                              | 1165        |
| Chapter 35: | <b>Managing Users, Groups, and Computers . . . . .</b>                       | <b>1167</b> |
|             | Managing Domain User Accounts. . . . .                                       | 1167        |
|             | Types of Users . . . . .   | 1167        |
|             | Configuring User Account Policies . . . . .                                  | 1169        |
|             | Creating Password Settings Objects and Applying Secondary Settings . . . . . | 1173        |
|             | Understanding User Account Capabilities, Privileges, and Rights . . . . .    | 1177        |
|             | Assigning User Rights. . . . .   | 1182        |
|             | Creating and Configuring Domain User Accounts. . . . .                       | 1184        |
|             | Configuring Account Options . . . . .  | 1189        |
|             | Configuring Profile Options. . . . .   | 1193        |
|             | Troubleshooting User Accounts . . . . .                                      | 1195        |
|             | Managing User Profiles. . . . .  | 1195        |
|             | Profile Essentials . . . . .   | 1196        |
|             | Implementing and Creating Preconfigured Profiles . . . . .                   | 1198        |
|             | Configuring Local User Profiles. . . . .                                     | 1199        |
|             | Configuring Roaming User Profiles . . . . .                                  | 1200        |
|             | Implementing Mandatory User Profiles . . . . .                               | 1201        |
|             | Switching Between a Local and a Roaming User Profile. . . . .                | 1202        |
|             | Managing User Data . . . . .   | 1203        |
|             | Using Folder Redirection . . . . .   | 1203        |
|             | Using Offline Files . . . . .  | 1207        |
|             | Managing File Synchronization. . . . .                                       | 1209        |

|  |             |
|--|-------------|
| Maintaining User Accounts . . . . .                        | 1210        |
| Deleting User Accounts . . . . .                           | 1210        |
| Disabling and Enabling User Accounts . . . . .             | 1211        |
| Moving User Accounts . . . . .                             | 1211        |
| Renaming User Accounts . . . . .                           | 1211        |
| Resetting a User's Domain Password . . . . .               | 1212        |
| Unlocking User Accounts . . . . .                          | 1213        |
| Creating a User Account Password Backup . . . . .          | 1214        |
| Managing Groups . . . . .                                  | 1215        |
| Understanding Groups . . . . .                             | 1215        |
| Creating a Group . . . . .                                 | 1220        |
| Adding Members to Groups . . . . .                         | 1222        |
| Deleting a Group . . . . .                                 | 1222        |
| Modifying Groups . . . . .                                 | 1223        |
| Managing Computer Accounts . . . . .                       | 1225        |
| Creating a Computer Account in Active Directory . . . . .  | 1225        |
| Joining Computers to a Domain . . . . .                    | 1226        |
| Moving a Computer Account . . . . .                        | 1227        |
| Disabling a Computer Account . . . . .                     | 1228        |
| Deleting a Computer Account . . . . .                      | 1228        |
| Managing a Computer Account . . . . .                      | 1228        |
| Resetting a Computer Account . . . . .                     | 1228        |
| Configuring Properties of Computer Accounts . . . . .      | 1229        |
| Troubleshooting Computer Accounts . . . . .                | 1230        |
| <b>Chapter 36: Managing Group Policy . . . . .</b>         | <b>1233</b> |
| Understanding Group Policy . . . . .                       | 1234        |
| Local and Active Directory Group Policy . . . . .          | 1234        |
| Group Policy Settings . . . . .                            | 1235        |
| Group Policy Architecture . . . . .                        | 1236        |
| Administrative Templates . . . . .                         | 1237        |
| Implementing Group Policy . . . . .                        | 1238        |
| Working with Local Group Policy . . . . .                  | 1239        |
| Working with the Group Policy Management Console . . . . . | 1242        |
| Working with the Default Group Policy Objects . . . . .    | 1247        |
| Managing Group Policy Through Delegation . . . . .         | 1249        |
| Managing GPO Creation Rights . . . . .                     | 1249        |
| Reviewing Group Policy Management Privileges . . . . .     | 1250        |
| Delegating Group Policy Management Privileges . . . . .    | 1252        |
| Delegating Privileges for Links and RSoP . . . . .         | 1253        |
| Managing Group Policy Inheritance and Processing . . . . . | 1254        |
| Group Policy Inheritance . . . . .                         | 1254        |
| Changing Link Order and Precedence . . . . .               | 1255        |
| Overriding Inheritance . . . . .                           | 1256        |
| Blocking Inheritance . . . . .                             | 1257        |
| Enforcing Inheritance . . . . .                            | 1258        |
| Filtering Group Policy Application . . . . .               | 1259        |

|   |  |             |
|---|--|-------------|
|   | Group Policy Processing . . . . .                                    | 1261        |
|   | Modifying Group Policy Processing . . . . .                          | 1262        |
|   | Modifying User Policy Preference Using Loopback Processing . . . . . | 1263        |
|   | Using Scripts in Group Policy . . . . .                              | 1264        |
|   | Configuring Computer Startup and Shutdown Scripts . . . . .          | 1264        |
|   | Configuring User Logon and Logoff Scripts . . . . .                  | 1265        |
|   | Applying Group Policy Through Security Templates . . . . .           | 1266        |
|   | Working with Security Templates . . . . .                            | 1266        |
|   | Applying Security Templates . . . . .                                | 1267        |
|   | Maintaining and Troubleshooting Group Policy . . . . .               | 1268        |
|   | Group Policy Refresh . . . . .                                       | 1268        |
|   | Modifying Group Policy Refresh . . . . .                             | 1269        |
|   | Viewing Applicable GPOs and Last Refresh . . . . .                   | 1271        |
|   | Modeling GPOs for Planning . . . . .                                 | 1274        |
|   | Refreshing Group Policy Manually . . . . .                           | 1278        |
|   | Backing Up GPOs . . . . .  | 1278        |
|   | Restoring GPOs . . . . .   | 1280        |
|   | Fixing Default Group Policy . . . . .                                | 1282        |
| Chapter 37:   | <b>Active Directory Site Administration . . . . .</b>                | <b>1283</b> |
|   | Managing Sites and Subnets . . . . .                                 | 1283        |
|   | Creating an Active Directory Site . . . . .                          | 1283        |
|   | Creating a Subnet and Associating It with a Site . . . . .           | 1285        |
|   | Associating Domain Controllers with a Site . . . . .                 | 1286        |
|   | Managing Site Links and Intersite Replication . . . . .              | 1287        |
|   | Understanding IP and SMTP Replication Transports . . . . .           | 1288        |
|   | Creating a Site Link . . . . .                                       | 1289        |
|   | Configuring Replication Schedules for Site Links . . . . .           | 1293        |
|   | Configuring Site Link Bridges . . . . .                              | 1295        |
|   | Determining the ISTG . . . . .                                       | 1297        |
|   | Configuring Site Bridgehead Servers . . . . .                        | 1298        |
|   | Configuring Advanced Site Link Options . . . . .                     | 1301        |
|   | Monitoring and Troubleshooting Replication . . . . .                 | 1302        |
|   | Using the Replication Administrator . . . . .                        | 1302        |
|   | Monitoring Replication . . . . .                                     | 1303        |
|   | Modifying Intersite Replication for Testing . . . . .                | 1305        |
| <br>  |  |             |
| <b>Part 6: Windows Server 2008 Disaster Planning and Recovery</b> |  |             |
| Chapter 38:   | <b>Planning for High Availability . . . . .</b>                      | <b>1309</b> |
|   | Planning for Software Needs . . . . .                                | 1309        |
|   | Planning for Hardware Needs . . . . .                                | 1311        |
|   | Planning for Support Structures and Facilities . . . . .             | 1313        |
|   | Planning for Day-to-Day Operations . . . . .                         | 1316        |
|   | Planning for Deploying Highly Available Servers . . . . .            | 1321        |

|             |  |             |
|-------------|--|-------------|
| Chapter 39: | <b>Preparing and Deploying Server Clusters</b> . . . . .                 | <b>1323</b> |
|             | Introducing Server Clustering . . . . .                                  | 1324        |
|             | Benefits and Limitations of Clustering . . . . .                         | 1324        |
|             | Cluster Organization . . . . .   | 1325        |
|             | Cluster Operating Modes . . . . .  | 1327        |
|             | Multisite Options for Clusters . . . . .                                 | 1329        |
|             | Using Network Load Balancing . . . . .                                   | 1331        |
|             | Using Network Load Balancing Clusters . . . . .                          | 1331        |
|             | Network Load Balancing Configuration . . . . .                           | 1332        |
|             | Network Load Balancing Port and Client Affinity Configurations . . . . . | 1335        |
|             | Planning Network Load Balancing Clusters . . . . .                       | 1336        |
|             | Managing Network Load Balancing Clusters . . . . .                       | 1337        |
|             | Creating a New Network Load Balancing Cluster . . . . .                  | 1337        |
|             | Adding Nodes to a Network Load Balancing Cluster . . . . .               | 1342        |
|             | Removing Nodes from a Network Load Balancing Cluster . . . . .           | 1343        |
|             | Configuring Event Logging for Network Load Balancing Clusters . . . . .  | 1344        |
|             | Controlling Cluster and Host Traffic . . . . .                           | 1344        |
|             | Using Failover Clustering . . . . .                                      | 1345        |
|             | Failover Cluster Configurations . . . . .                                | 1345        |
|             | Understanding Failover Cluster Resources . . . . .                       | 1347        |
|             | Optimizing Hardware for Failover Clusters . . . . .                      | 1349        |
|             | Optimizing Networking for Failover Clusters . . . . .                    | 1351        |
|             | Running Failover Clusters . . . . .                                      | 1352        |
|             | The Cluster Service and Cluster Objects . . . . .                        | 1352        |
|             | The Cluster Heartbeat . . . . .  | 1353        |
|             | The Cluster Database . . . . .   | 1354        |
|             | The Cluster Quorum Resource . . . . .                                    | 1354        |
|             | The Cluster Interface and Network States . . . . .                       | 1355        |
|             | Creating Failover Clusters . . . . .                                     | 1356        |
|             | Validating a Configuration . . . . .                                     | 1357        |
|             | Creating a Failover Cluster . . . . .                                    | 1358        |
|             | Add Nodes to a Cluster . . . . .   | 1360        |
|             | Managing Failover Clusters and Their Resources . . . . .                 | 1361        |
|             | Adding Storage to a Cluster . . . . .                                    | 1361        |
|             | Modifying Cluster Network Settings . . . . .                             | 1361        |
|             | Configuring Cluster Quorum Settings . . . . .                            | 1362        |
|             | Creating Clustered Resources . . . . .                                   | 1363        |
|             | Controlling the Cluster Service . . . . .                                | 1365        |
|             | Configuring Resource Failover and Failback . . . . .                     | 1365        |
|             | Creating a Shared Folder on a Clustered File Server . . . . .            | 1366        |
|             | Configuring Print Settings for a Clustered Print Server . . . . .        | 1367        |
| Chapter 40: | <b>Disaster Planning</b> . . . . .                                       | <b>1369</b> |
|             | Preparing for a Disaster . . . . .                                       | 1369        |
|             | Developing Contingency Procedures . . . . .                              | 1369        |
|             | Implementing Problem Escalation and Response Procedures . . . . .        | 1370        |
|             | Creating a Problem Resolution Policy Document . . . . .                  | 1371        |

- Disaster Preparedness Procedures ..... 1373
  - Performing Backups ..... 1373
  - Using Startup Repair ..... 1374
  - Getting Outside Help ..... 1375
  - Other Windows Recovery Environment Features ..... 1377
  - Setting Startup and Recovery Options ..... 1378
- Chapter 41: **Backup and Recovery** ..... **1381**
  - Developing Backup Strategies ..... 1381
    - Creating Your Backup Strategy ..... 1381
    - Backup Strategy Considerations ..... 1382
    - Selecting the Optimal Backup Techniques ..... 1383
    - Understanding Backup Types ..... 1385
    - Using Media Rotation and Maintaining Additional Media Sets ..... 1386
  - Backing Up and Recovering Your Data ..... 1387
    - Using the Backup Utility ..... 1388
    - Backing Up Your Data ..... 1390
    - Scheduling Backups ..... 1391
    - Performing a One-Time Backup ..... 1396
    - Tracking Scheduled and Manual Backups ..... 1400
    - Recovering Your Data ..... 1402
    - Recovering the System State ..... 1407
    - Restoring the Operating System and the Full System ..... 1408
  - Backing Up and Restoring Active Directory ..... 1409
    - Backup and Recovery Strategies for Active Directory ..... 1409
    - Performing a Nonauthoritative Restore of Active Directory ..... 1411
    - Performing an Authoritative Restore of Active Directory ..... 1412
    - Restoring Sysvol Data ..... 1414
    - Restoring a Failed Domain Controller by Installing a New Domain Controller ... 1415
  - Troubleshooting Startup and Shutdown ..... 1416
    - Resolving Startup Issues ..... 1416
    - Repairing Missing or Corrupted System Files ..... 1418
    - Resolving Restart or Shutdown Issues ..... 1419
- Index to Troubleshooting Topics** ..... **1420**
- Index** ..... **1421**



**What do you think of this book? We want to hear from you!**

Microsoft is interested in hearing your feedback so we can continually improve our books and learning resources for you. To participate in a brief online survey, please visit:

[www.microsoft.com/learning/booksurvey/](http://www.microsoft.com/learning/booksurvey/)

# Acknowledgments

Few projects have ever been as challenging or as fun as writing *Windows Server 2008 Inside Out*. Why? When I set out to write *Windows Server 2008 Inside Out*, I decided I would try to detail every quirk, every insider secret, and every sticky detail that I've learned about Windows Server 2008 since I started working with it in 2002—back when Windows Server 2008 was known as Windows Longhorn. As nearly six years have passed since I began working with Windows Server 2008, it is my sincere hope that the book you hold in your hands is the best of its class when it comes to managing a Windows Server 2008 implementation and handling everyday administration. I also hope the result of all the hard work is that *Windows Server 2008 Inside Out* is something unique. It takes into account all the experiences I've had while consulting, conducting training courses, and writing books about Windows Vista and Windows Server 2008. As this is my 35th Windows-related book and I've helped millions of people learn Windows over my 20+-year career, I hope that counts for an awful lot. But no man is an island and this book couldn't have been written without help from some very special people.

Without the support of my wife and children, this book would not have been possible. As I literally was writing every day since I signed on to this project—holidays included—my wife had to manage everything else and the little ones had a lot more responsibilities around the house. Thank you for your support and your extraordinary ability to put up with the clackety-clackety of my keyboard.

As I've stated in *Windows Server 2008 Administrator's Pocket Consultant* and in *Windows Vista Administrator's Pocket Consultant*, the team at Microsoft Press is top-notch. Karen Szall was instrumental throughout the writing process. Martin DelRe was the acquisitions editor for the project. He believed in the book and my unique approach and was really great to work with. Completing and publishing the book wouldn't have been possible without their help! Thanks also to Lucinda Rowley!

Curt Philips headed up the editorial process for Publishing.com. As the project manager for this and other Pocket Consultants I've written, he wore many hats and helped out in many ways. Thank you! I'd also like to add that everyone was very understanding—writing a book of this length is very fun but also very exhausting.

Unfortunately for the writer (but fortunately for readers), writing is only one part of the publishing process. Next came editing and author review. I must say, Microsoft Press has the most thorough editorial and technical review process I've seen anywhere—and I've written a lot of books for many different publishers. Randall Galloway was the technical editor for the book. Rozanne Whalen served as the copyeditor and was particularly thorough in her edits, which was much appreciated. I also want to thank Andrea Fox for her careful proofreading of the pages.

I want to thank a number of other people at Microsoft who provided technical reviews and insights, including Jose Luis Auricchio, Craig Threadgill, Jackson Robinson, Sasa Vidanovic, Anders Brabæk, Chris Gregory, Pat Telford, Monica Ene-Pietrosanu, Jose Renato Roda, Robert Hoover, Deepak Shenoy, Akshat Kesarwani, Shawn Travers, Heath Aubin, David Kennedy, Greg Cottingham, Sanjay Pandit, Lesley Kipling, Bernardo Castaneda Leon, Mark Kradel, and Robert Mitchell. Robert Mitchell in particular went above and beyond. Thank you!

I'd also like to thank Valerie DeGiulo and the Microsoft Press Creative Team for their contributions.

Hopefully, I haven't forgotten anyone but if I have, it was an oversight. *Honest.* ;-)

# About the CD

The companion CD that ships with this book contains many tools and resources to help you get the most out of your *Inside Out* book.

## What's on the CD

The companion CD is loaded with useful tools and links to help you with your Windows Server 2008 installation. The CD includes:

- **Complete e-book** An electronic version of *Windows Server 2008 Inside Out* in PDF format.
- **Product information** Links to information about the features and capabilities of Windows Server 2008 as well as product guides to help you optimize Windows Server 2008 in your enterprise.
- **Resources** Links to white papers, guides, webcasts, test labs and more to help you use and troubleshoot the features of Windows Server 2008.
- **Scripts** More than 700 sample scripts to help you automate management and maintenance tasks.
- **Tools** Many links to tools for IIS, PowerShell, System Center Data Operations, and more that you can put to use right away.
- **Sample chapters** Chapters from 15 other Windows Server 2008 books contain a wealth of information and provide a preview look at books that were recently published or will be published in the near future.

## System Requirements

The following are the minimum system requirements necessary to run the CD:

- Microsoft Windows Vista, Windows XP with Service Pack (SP) 2, Windows Server 2003 with SP1, or newer operating system
- 500 megahertz (MHz) processor or higher
- 2 gigabyte (GB) storage space (a portion of this disk space will be freed after installation if the original download package is removed from the hard drive)
- 256 megabytes (MB) RAM
- CD-ROM or DVD-ROM drive
- 1024×768 or higher resolution monitor

- Microsoft Windows or Windows Vista-compatible sound card and speakers
- Microsoft Internet Explorer 6 or newer
- Microsoft Mouse or compatible pointing device

**Digital Content for Digital Book Readers:** If you bought a digital-only edition of this book, you can enjoy select content from the print edition's companion CD. Visit <http://www.microsoftpressstore.com/title/9780735624382> to get your downloadable content. This content is always up-to-date and available to all readers.

## Viewing the E-Book

The electronic version of the book and some of the other documentation included on this CD is provided in Portable Document Format (PDF). To view these files, you will need Adobe Acrobat or Acrobat Reader. For more information about these products or to download the Acrobat Reader, visit the Adobe Web site at <http://www.adobe.com>.

## Support Information

Every effort has been made to ensure the accuracy of the contents of the book and of this CD. As corrections or changes are collected, they will be added to a Microsoft Knowledge Base article. Microsoft Press provides support for books and companion CDs at the following Web site:

<http://www.microsoft.com/learning/support/books/>

If you have comments, questions, or ideas regarding the book or this CD, or questions that are not answered by visiting the site above, please send them via e-mail to:

[mspinput@microsoft.com](mailto:mspinput@microsoft.com)

You can also click the Feedback or CD Support links on the Welcome page. Please note that Microsoft software product support is not offered through the above addresses. If your question is about the software, and not about the content of this book, please visit the Microsoft Help and Support page or the Microsoft Knowledge Base at:

<http://support.microsoft.com>

In the United States, Microsoft software product support issues not covered by the Microsoft Knowledge Base are addressed by Microsoft Product Support Services. Location-specific software support options are available from:

<http://support.microsoft.com/gp/selfoverview/>

Microsoft Press provides corrections for books through the World Wide Web at <http://www.microsoft.com/mspress/support/>. To connect directly to the Microsoft Press Knowledge Base and enter a query regarding a question or issue that you may have, go to <http://www.microsoft.com/mspress/support/search.htm>.

## Find Additional Content Online

As new or updated material becomes available that complements your book, it will be posted online on the Microsoft Press Online Windows Server and Client Web site. Based on the final build of Windows Server 2008, the type of material you might find includes updates to book content, articles, links to companion content, errata, sample chapters, and more. This Web site will be available soon at [www.microsoft.com/learning/books/online/serverclient](http://www.microsoft.com/learning/books/online/serverclient), and will be updated periodically.

## How to Reach the Author

E-mail: [williamstanek@aol.com](mailto:williamstanek@aol.com)

Web: <http://www.williamstanek.com/>



# Conventions and Features Used in This Book

This book uses special text and design conventions to make it easier for you to find the information you need.

## Text Conventions

| Convention                | Meaning   |
|---------------------------|---|
| Abbreviated menu commands | For your convenience, this book uses abbreviated menu commands. For example, “Click Tools, Track Changes, Highlight Changes” means that you should click the Tools menu, point to Track Changes, and click the Highlight Changes command. |
| <b>Boldface type</b>      | <b>Boldface</b> type is used to indicate text that you enter or type.   |
| Initial Capital Letters   | The first letters of the names of menus, dialog boxes, dialog box elements, and commands are capitalized. Example: the Save As dialog box.  |
| <i>Italicized type</i>    | <i>Italicized</i> type is used to indicate new terms.   |
| Plus sign (+) in text     | Keyboard shortcuts are indicated by a plus sign (+) separating two key names. For example, Ctrl+Alt+Delete means that you press the Ctrl, Alt, and Delete keys at the same time.  |

## Design Conventions

### INSIDE OUT

This statement illustrates an example of an “Inside Out” heading

These are the book’s signature tips. In these tips, you’ll get the straight scoop on what’s going on with the software—inside information about why a feature works the way it does. You’ll also find helpful hints, timesaving tricks, and handy workarounds to deal with software problems or alternative procedures related to the task being discussed.

## **TROUBLESHOOTING**

**This statement illustrates an example of a “Troubleshooting” problem statement**

Look for these sidebars to find solutions to common problems you might encounter. Troubleshooting sidebars appear next to related information in the chapters. You can also use the Troubleshooting Topics index at the back of the book to look up problems by topic.

## **CAUTION**!

Cautions identify potential problems that you should look out for when you’re completing a task or problems that you must address before you can complete a task.

## **Note**

Notes offer additional information related to the task being discussed.

## **Sidebars**

The sidebars sprinkled throughout these chapters provide ancillary information on the topic being discussed. Go to the sidebars to learn more about the technology or a feature.

Cross-references point you to other locations in the book that offer additional information about the topic being discussed.

# Configuring Roles, Role Services, and Features

|  |     |   |     |
|--|-----|---|-----|
| Using Roles, Role Services, and Features . . . . . | 185 | Installing Components with Server Manager . . . . . | 191 |
| Making Supplemental Components Available . . . . . | 190 | Installing Components at the Command Line . . . . . | 200 |

**W**indows Server 2008 has different configuration architecture than its predecessors. You prepare servers for use by installing and configuring the following components:

- **Server roles** Server roles are related sets of software components that allow servers to perform a specific function for users and other computers on networks. A computer can be dedicated to a single role, such as Active Directory Domain Services, or a computer can provide multiple roles.
- **Role services** Role services are software components that provide the functionality of server roles. Each server role has one or more related role services. Some server roles, such as Domain Name Service (DNS) and Dynamic Host Configuration Protocol (DHCP), have a single function and installing the role installs this function. Other roles, such as Network Policy And Access Services and Active Directory Certificate Services, have multiple role services that you can install. With these server roles, you can choose which role services to install.
- **Features** Features are software components that provide additional functionality. Features, such as WINS and Windows Server Backup, are installed and removed separately from roles and role services. A computer can have multiple features installed or none, depending on its configuration.

You configure roles, role services, and features using the Server Manager console. Server Manager has a command-line counterpart, called `ServerManagerCmd.exe`, which you can install as a feature.

## Using Roles, Role Services, and Features

Before modifying a server's configuration, you should carefully plan how adding or removing a role, role service, or feature will affect a server's overall performance. Although you typically want to combine complementary roles, doing so increases the workload on the server, so you'll need to optimize the server hardware accordingly. Also, keep in mind that roles, role services, and features can be dependent on other roles, role services, and features. When you install roles, role services, and features, Server Manager prompts you to install any additional roles, role services, or features that are required. If you try to remove a required component of an installed role, role service, or feature, Server Manager warns that you cannot remove the component unless you also remove the other role, role service, or feature.

Table 7-1 provides an overview of the primary roles and the related role services that you can deploy on a server running Windows Server 2008. In addition to roles and features that are included with Windows Server 2008 by default, Server Manager enables integration of additional roles and features that are available on the Microsoft Download Center as optional updates to Windows Server 2008.

**Table 7-1 Primary Roles and Related Role Services for Windows Server 2008**

| Role   | Description   |
|--|---|
| Active Directory Certificate Services (AD CS)            | AD CS provides functions necessary for issuing and revoking digital certificates for users, client computers, and servers. Includes these role services: Certification Authority, Certification Authority Web Enrollment, Online Certificate Status Protocol, and Microsoft Simple Certificate Enrollment Protocol (MSCEP). |
| Active Directory Domain Services (AD DS)                 | AD DS provides functions necessary for storing information about users, groups, computers, and other objects on the network and makes this information available to users and computers. Domain controllers give network users and computers access to permitted resources on the network.                                  |
| Active Directory Federation Services (AD FS)             | AD FS complements the authentication and access management features of AD DS by extending them to the World Wide Web. Includes these role services and subservices: Federation Service, Federation Service Proxy, AD FS Web Agents, Claims-Aware Agent, and Windows Token-Based Agent.                                      |
| Active Directory Lightweight Directory Services (AD LDS) | AD LDS provides a data store for directory-enabled applications that do not require AD DS and do not need to be deployed on domain controllers. Does not include additional role services.  |
| Active Directory Rights Management Services (AD RMS)     | AD RMS provides controlled access to protected e-mail messages, documents, intranet Web pages, and other types of files. Includes these role services: Active Directory Rights Management Server and Identity Federation Support.   |
| Application Server                                       | Application Server allows a server to host distributed applications built using ASP.NET, Enterprise Services, and .NET Framework 3.0. Includes more than a dozen role services, which are discussed in detail in <i>Internet Information Services (IIS) 7.0 Administrator's Pocket Consultant</i> (Microsoft Press, 2007).  |
| DHCP Server  | DHCP provides centralized control over Internet Protocol (IP) addressing. DHCP servers can assign dynamic IP addresses and essential TCP/IP settings to other computers on a network. Does not include additional role services.  |
| DNS Server   | DNS is a name resolution system that resolves computer names to IP addresses. DNS servers are essential for name resolution in Active Directory domains. Does not include additional role services.   |
| Fax Server   | Fax Server provides centralized control over sending and receiving faxes in the enterprise. A fax server can act as a gateway for faxing and allows you to manage fax resources, such as jobs and reports, and fax devices on the server or on the network. Does not include additional role services.                      |

| Role  | Description   |
|---|---|
| File Services   | File Services provide essential services for managing files and the way they are made available and replicated on the network. A number of server roles require some type of file service. Includes these role services and subservices: File Server, Distributed File System, DFS Namespace, DFS Replication, File Server Resource Manager, Services for Network File System (NFS), Windows Search Service, Windows Server 2003 File Services, File Replication Service (FRS), and Indexing Service.                                 |
| Network Policy And Access Services (NPAS)                   | NPAS provides essential services for managing routing and remote access to networks. Includes these role services: Network Policy Server (NPS), Routing And Remote Access Services (RRAS), Remote Access Service, Routing, Health Registration Authority, and Host Credential Authorization Protocol (HCAP).  |
| Print Services  | Print Services provide essential services for managing network printers and print drivers. Includes these role services: Print Server, LPD Service, and Internet Printing.  |
| Terminal Services   | Terminal Services provide services that allow users to run Windows-based applications that are installed on a remote server. When users run an application on a terminal server, the execution and processing occur on the server, and only the data from the application is transmitted over the network. Includes these role services: Terminal Server, TS Licensing, TS Session Broker, TS Gateway, and TS Web Access.   |
| Universal Description Discovery Integration (UDDI) Services | UDDI provides capabilities for sharing information about Web services both within an organization and between organizations. Includes these role services: UDDI Services Database and UDDI Services Web Application.  |
| Web Server (IIS)  | Web Server (IIS) is used to host Web sites and Web-based applications. Web sites hosted on a Web server can have both static content and dynamic content. You can build Web applications hosted on a Web server using ASP.NET and .NET Framework 3.0. When you deploy a Web server, you can manage the server configuration using IIS 7.0 modules and administration tools. Includes several dozen role services, which are discussed in detail in <i>Internet Information Services (IIS) 7.0 Administrator's Pocket Consultant</i> . |
| Windows Deployment Services (WDS)                           | WDS provides services for deploying Windows computers in the enterprise. Includes these role services: Deployment Server and Transport Server.  |
| Windows SharePoint Services                                 | Windows SharePoint Services enable team collaboration by connecting people and information. A SharePoint server is essentially a Web server running a full installation of IIS and using managed applications that provide the necessary collaboration functionality.   |
| Windows Server Update Services                              | Microsoft Windows Server Update Services (WSUS) allows you to distribute updates that are released through Microsoft Update to computers in your organization using centralized servers rather than individual updates.   |

Table 7-2 provides an overview of the primary features that you can deploy on a server running Windows Server 2008. Unlike earlier releases of Windows, some important server features are not installed automatically. For example, you must add Windows Server Backup to use the built-in backup and restore features of the operating system.

**Table 7-2 Primary Features for Windows Server 2008**

| Feature  | Description  |
|--|--|
| .NET Framework 3.0   | Provides .NET Framework 3.0 APIs for application development. Additional subfeatures include .NET Framework 3.0 Features, XPS Viewer, and Windows Communication Foundation (WCF) Activation Components.  |
| BitLocker Drive Encryption                                       | Provides hardware-based security to protect data through full-volume encryption that prevents disk tampering while the operating system is offline. Computers that have Trusted Platform Module (TPM) can use BitLocker Drive Encryption in Startup Key or TPM-only mode. Both modes provide early integrity validation. |
| Background Intelligent Transfer Service (BITS) Server Extensions | Provides intelligent background transfers. When this feature is installed, the server can act as a BITS server that can receive file uploads by clients. This feature isn't necessary for downloads to clients using BITS.   |
| Connection Manager Administration Kit (CMAK)                     | Provides functionality for generating Connection Manager profiles.   |
| Desktop Experience   | Provides additional Windows Vista desktop functionality on the server. Windows Vista features added include Windows Media Player, desktop themes, and Windows Photo Gallery. Although these features allow a server to be used like a desktop computer, they can reduce the server's overall performance.                |
| Failover Clustering  | Provides clustering functionality that allows multiple servers to work together to provide high availability for services and applications. Many types of services can be clustered, including file and print services. Messaging and database servers are ideal candidates for clustering.                              |
| Group Policy Management  | Installs the Group Policy Management Console (GPMC), which provides centralized administration of Group Policy.  |
| Internet Printing Client   | Provides functionality that allows clients to use HTTP to connect to printers on Web print servers.  |
| Internet Storage Name Server (iSNS)                              | Provides management and server functions for Internet SCSI (iSCSI) devices, allowing the server to process registration requests, de-registration requests, and queries from iSCSI devices.  |
| Line Printer Remote (LPR) Port Monitor                           | Installs the LPR Port Monitor, which allows printing to devices attached to UNIX-based computers.  |

| Feature  | Description  |
|--|--|
| Message Queuing                                    | Provides management and server functions for distributed message queuing. A group of related subfeatures is available as well.   |
| Multipath I/O (MPIO)                               | Provides functionality necessary for using multiple data paths to a storage device.  |
| Network Load Balancing (NLB)                       | NLB provides failover support and load balancing for IP-based applications and services by distributing incoming application requests among a group of participating servers. Web servers are ideal candidates for load balancing.   |
| Peer Name Resolution Protocol (PNRP)               | Provides Link-Local Multicast Name Resolution (LLMNR) functionality that allows peer-to-peer name-resolution services. When you install this feature, applications running on the server can register and resolve names using LLMNR.   |
| Remote Assistance                                  | Allows a remote user to connect to the server to provide or receive Remote Assistance.   |
| Remote Server Administration Tools (RSAT)          | Installs role- and feature-management tools that can be used for remote administration of other Windows Server 2008 systems. Options for individual tools are provided or you can install tools by top-level category or subcategory.  |
| Removable Storage Manager (RSM)                    | Installs the Removable Storage Manager tool, which you can use to manage removable media and removable media devices.  |
| Remote Procedure Call (RPC) over HTTP Proxy        | Installs a proxy for relaying RPC messages from client applications over HTTP to the server. RPC over HTTP is an alternative to having clients access the server over a VPN connection.  |
| Simple TCP/IP Services                             | Installs additional TCP/IP services, including Character Generator, Daytime, Discard, Echo, and Quote of the Day.  |
| Simple Mail Transfer Protocol (SMTP) Server        | SMTP is a network protocol for controlling the transfer and routing of e-mail messages. When this feature is installed, the server can act as a basic SMTP server. For a full-featured solution, you'll need to install a messaging server such as Microsoft Exchange Server 2007.                                   |
| Simple Network Management Protocol (SNMP) Services | SNMP is a protocol used to simplify management of TCP/IP networks. You can use SNMP for centralized network management if your network has SNMP-compliant devices. You can also use SNMP for network monitoring via network management software.   |
| Storage Manager For SANs                           | Installs the Storage Manager For SANs console. This console provides a central management interface for storage area network (SAN) devices. You can view storage subsystems, create and manage logical unit numbers (LUNs), and manage iSCSI target devices. The SAN device must support Visual Disk Services (VDS). |

| Feature                                     | Description  |
|---|--|
| Subsystem for UNIX-based Applications (SUA) | Provides functionality for running UNIX-based programs. You can download additional management utilities from the Microsoft Web site.  |
| Windows Internal Database                   | Installs SQL Server 2005 Embedded Edition. This allows the server to use relational databases with Windows roles and features that require an internal database, such as AD RMS, UDDI Services, Windows Server Update Services (WSUS), Windows SharePoint Services, and Windows System Resource Manager. |
| Windows PowerShell                          | Installs Windows PowerShell, which provides an enhanced command-line environment for managing Windows systems.   |
| Windows Process Activation Service          | Provides support for distributed Web-based applications that use HTTP and non-HTTP protocols.  |
| Windows Recovery Environment                | You can use the recovery environment to restore a server using recovery options if you cannot access recovery options provided by the server manufacturer.   |
| Windows Server Backup                       | Allows you to back up and restore the operating system, system state, and any data stored on a server.   |
| Windows System Resource Manager (WSRM)      | Allows you to manage resource usage on a per-processor basis.  |
| WINS Server                                 | WINS is a name-resolution service that resolves computer names to IP addresses. Installing this feature allows the computer to act as a WINS server.   |
| Wireless Networking                         | Allows the server to use wireless networking connections and profiles.   |

## Making Supplemental Components Available

Microsoft designed Server Manager and the underlying framework for managing components to be extensible. This makes it easier to provide supplemental roles, role services, and features for the operating system. Some additional components are available as downloads from the Microsoft Web site, including Windows Media Server 2008 and Windows SharePoint Server 2008.

You can make these components available for installation and configuration by completing the following steps:

1. Download the installer package or packages from the Microsoft Web site. Typically, these are provided as a set of Microsoft Update Standalone Packages (.msu) files.
2. Double-click each installer package to register it for use.

3. If Server Manager is running on the server, restart or refresh Server Manager to make the new components available.
4. In Server Manager, use the appropriate wizard to install and configure the supplemental role, role service, or feature.

## Installing Components with Server Manager

Server Manager is the primary tool you'll use to manage roles, role services, and features. Not only can you use Server Manager to add or remove roles, role services, and features, but you can also use Server Manager to view the configuration details and status for these software components.

### Viewing Configured Roles and Role Services

When you select Roles in the left pane, Server Manager lists roles you've installed. The main view of the Roles node displays a Roles Summary entry that lists the number and names of roles installed. In the case of error-related events for a particular server role, Server Manager displays a warning icon to the left of the role name.

In the Roles window, the name of a role is a clickable link that accesses the related role details, as shown in Figure 7-1. The role details provide the following information:

- Summary information about the status of related system services. If applicable, Server Manager lists the number of related services that are running or stopped, such as "System Services: 9 Running, 1 Stopped." You can manage a service by selecting it and then clicking Stop, Start, or Restart. In many cases, if a service isn't running as you think it should, you can click Restart to resolve the issue by stopping and then starting the service.
- Summary information about events the related services and components have generated in the last 24 hours, including details on whether any errors have occurred, such as "Events: 31 warning(s), 191 informational in the last 24 hours." If you select an event and then click View Properties, you can get detailed information about the event.
- Summary information about the role services installed, including the number of role services installed and the status (Installed or Not Installed) of each individual role service that you can use with the role.

You can refresh the details manually by selecting Refresh on the Action menu. If you want to set a different default refresh interval, click Configure Refresh at the bottom of the main pane, use the options provided to set a new refresh interval, and then click OK. Otherwise, Server Manager refreshes the details periodically for you.

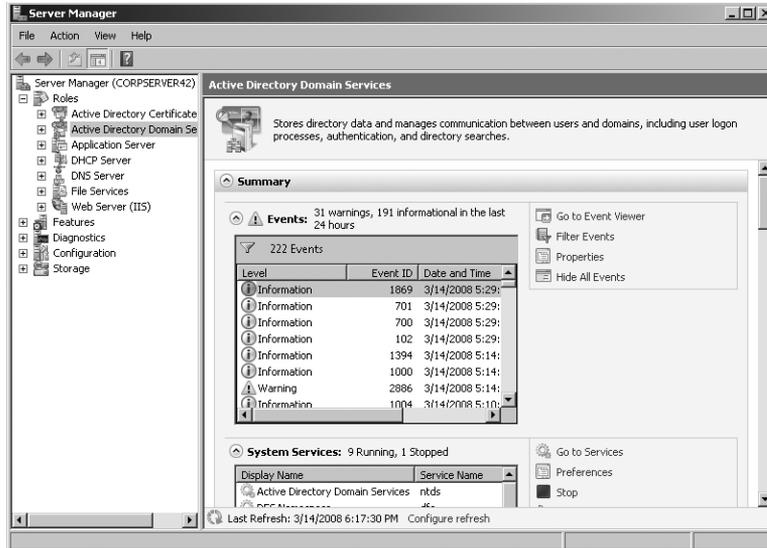


Figure 7-1 View the status details for installed roles.

## Managing Server Roles

When you select Roles in Server Manager, the Roles Summary pane provides details on the current roles that you've installed. In the Roles Summary section, you'll find options for adding and removing roles. Keep in mind that some roles cannot be added at the same time as other roles, and you'll have to install each role separately. Other roles cannot be combined with existing roles, and you'll see warning prompts about this.

### Adding a Server Role

You can add a server role by following these steps:

1. In Server Manager, select Roles in the left pane and then click Add Roles. This starts the Add Roles Wizard. If the wizard displays the Before You Begin page, read the introductory text and then click Next. You can avoid seeing the Before You Begin page the next time you start this wizard by selecting the Skip This Page By Default check box before clicking Next.
2. On the Select Server Roles page, select the check box for the role or roles to install (see Figure 7-2).

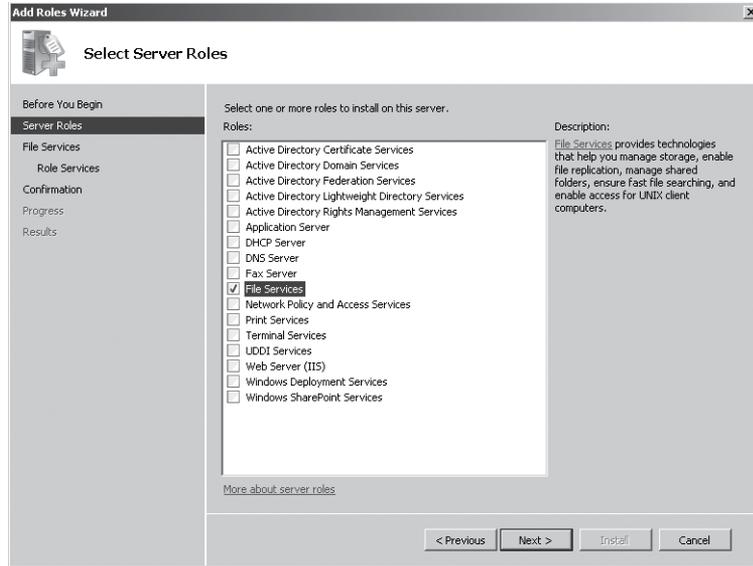


Figure 7-2 Select the roles to install.

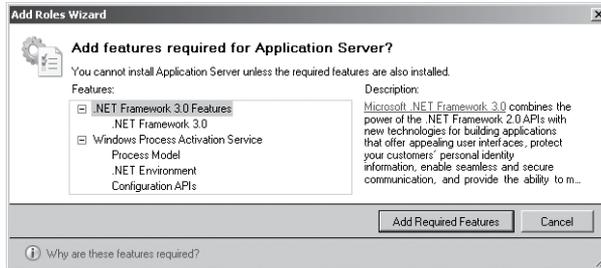
### Note

Adding the Active Directory Domain Services role does not configure the server as a domain controller. To configure the server as a domain controller, you must run Dcpromo.exe as discussed in Chapter 33, “Implementing Active Directory.” Additionally, if you plan to have a domain controller also act as a DNS server, Microsoft recommends that you install the Active Directory Domain Services role and then use Dcpromo to configure the server as a DNS server and domain controller. A server running a core server installation can act as a domain controller and can also hold any of the Flexible Single Master Operations (FSMO) roles for Active Directory.

3. If additional features are required to install a role, as shown in Figure 7-3, you'll then see the Add Features Required For dialog box. Click Add Required Features to close the dialog box and add the required components to the server installation. Click Next twice to continue.

**Note**

Occasionally, you'll need to install additional role services to install a role or role service. The procedure is similar to installing additional features. If so, you'll see an Add Role Services Required For dialog box. Click Add Required Role Services to close the dialog box and add the required components to the server installation.



**Figure 7-3** Confirm that required features can also be installed.

4. For each of the roles you are adding, you'll see a series of related pages that let you configure the associated role services as well as any other required configuration details. When selecting or clearing role services, keep the following in mind before you click Next to continue:
  - If you select a role service with additional required features or role services, you'll see a dialog box listing the additional required features or roles. After you review the required feature or roles, accept the additions and close the dialog box. If you click Cancel instead, the Add Roles Wizard will clear the role service you previously selected.
  - If you try to remove a role service that is required based on a previous role service, you'll see a warning prompt about dependent services that the Add Roles Wizard must also remove. In most cases, you'll want to click Cancel to preserve the previous selection. If you click the Remove Dependent Role Services button, the Add Roles Wizard will also remove the previously selected dependent services, which could cause the server to not function as expected.
5. On the Confirm Installation Selections page, click the Print, E-Mail, Or Save This Information link to generate an installation report and display it in Internet Explorer. You can then use standard Internet Explorer features to print or save the report. After you've reviewed the installation options and saved them as necessary, click Install to begin the installation process.

6. When the Add Roles Wizard finishes installing the server with the features you've selected, you'll see the Installation Results page. Review the installation details to ensure that all phases of the installation completed successfully. If any portion of the installation failed, note the reason for the failure and then use these troubleshooting techniques:
  - a. Click the Print, E-Mail, Or Save The Installation Report link to create or update the installation report and display it in Internet Explorer.
  - b. Scroll down to the bottom of the installation report in Internet Explorer and then click Full Log (Troubleshooting Only) to display the Server Manager log in Notepad.
  - c. In Notepad, press Ctrl+F, enter the current date in the appropriate format for your language settings (such as 2009-08-30), and then click Find Next. Notepad will then move through the log to the first entry for the current date.
  - d. Review the Server Manager entries for installation problems and take corrective actions as appropriate.

#### Note

In some cases, you might need to restart the server before installation or removal of a role, role service, or feature can be completed. In this case, you'll be prompted to restart the server when the Add Roles Wizard finishes. When you restart the server and log on, Server Manager will complete the installation or removal process.

## Removing a Server Role

You can remove a server role by following these steps:

1. In Server Manager, select Roles in the left pane and then click Remove Roles. This starts the Remove Roles Wizard. If the wizard displays the Before You Begin page, read the introductory text and then click Next. You can avoid seeing the Before You Begin page the next time you start this wizard by selecting the Skip This Page By Default check box before clicking Next.
2. On the Remove Server Roles page, the wizard selects the currently installed roles as shown in Figure 7-4. Clear the check box for the role you want to remove and then click Next.

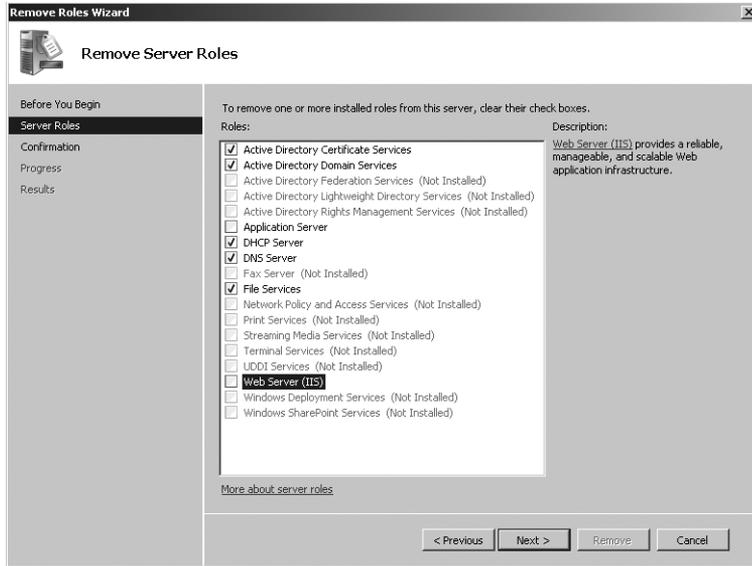


Figure 7-4 Clear selected roles to remove them.

3. If you try to remove a role that another role depends on, as shown in Figure 7-5, you'll see a warning prompt stating that you cannot remove the role unless you also remove the other role as well. If you click the Remove Dependent Role Services button, the Remove Roles Wizard will remove both roles.

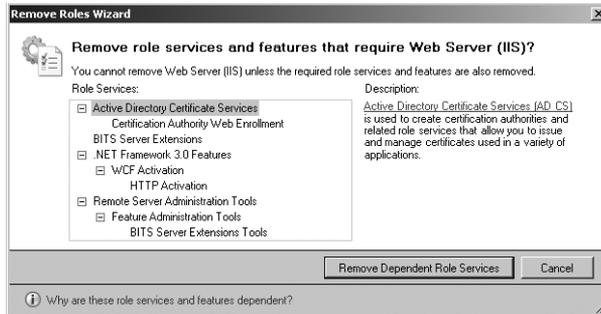


Figure 7-5 Confirm that dependent roles can also be removed.

4. On the Confirm Removal Selections page, review the related role services that the Remove Roles Wizard will remove based on your previous selections and then click Remove.
5. When the Remove Roles Wizard finishes modifying the server configuration, you'll see the Removal Results page. Review the modification details to ensure that all phases of the removal process completed successfully. If any portion of the removal process failed, note the reason for the failure and then use the previously discussed troubleshooting techniques to help resolve the problem.

# Managing Role Services

In Server Manager, you can view the role services configured for a role by selecting Roles in the left pane and then scrolling down to the details section for the role that you want to work with. In the details section, you'll find a list of role services that you can install as well as their current Installed or Not Installed status. You can manage role services for servers by clicking Add Role Services or Remove Role Services for the related role details entry. Some roles, however, do not have individual role services that you can manage in this way. With these roles, you can modify the server role or remove the role only.

## Adding a Role Service

You can add role services by following these steps:

1. In Server Manager, select Roles in the left pane and then scroll down until you see the details section for the role you want to manage. In the details section for the role, click Add Role Services. This starts the Add Role Services wizard.
2. On the Select Role Services page, the wizard dims the currently installed role services so that you cannot select the associated check box (see Figure 7-6). To add a role service, select its check box in the Role Services list. When you are finished selecting role services to add, click Next and then click Install.

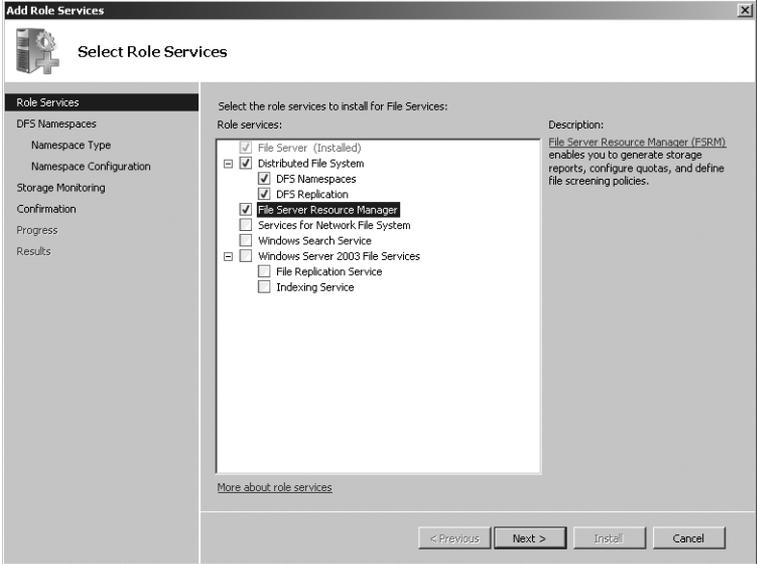


Figure 7-6 Select the role services to add.

## Removing a Role Service

You can remove role services by following these steps:

1. In Server Manager, select Roles in the left pane and then scroll down until you see the details section for the role you want to manage. In the details section for the role, click Remove Role Services. This starts the Remove Role Services wizard.
2. On the Select Role Services page, the wizard selects the currently installed role services as shown in Figure 7-7. To remove a role service, clear the related check box. If you try to remove a role service that another role service depends on, you'll see a warning prompt stating that you cannot remove the role service unless you also remove the other role service as well. If you click the Remove Dependent Role Service button, the Remove Role Services wizard will remove both role services.
3. When you are finished selecting role services to remove, click Next and then click Remove.

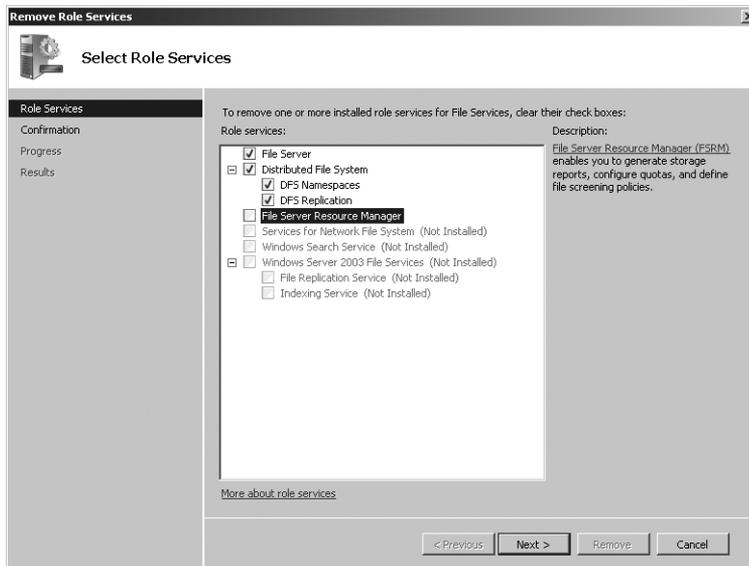


Figure 7-7 Clear selected role services to remove them.

## Managing Windows Features

In earlier versions of Windows, you used the Add/Remove Windows Components option of the Add Or Remove Programs utility to add or remove operating system components. In Windows Server 2008, you configure operating system components as Windows features that you can turn on or off rather than add or remove.

## Adding a Feature

You can add server features by following these steps:

1. In Server Manager, select Features in the left pane and then click Add Features. This starts the Add Features Wizard. If the wizard displays the Before You Begin page, read the introductory text and then click Next. You can avoid seeing the Before You Begin page the next time you start this wizard by selecting the Skip This Page By Default check box before clicking Next.
2. On the Select Features page, select the check boxes for the feature or features to install as shown in Figure 7-8. If additional features are required to install a feature, you'll then see the Add Features Required For dialog box. Click Add Required Features to close the dialog box and add the required components to the server installation.

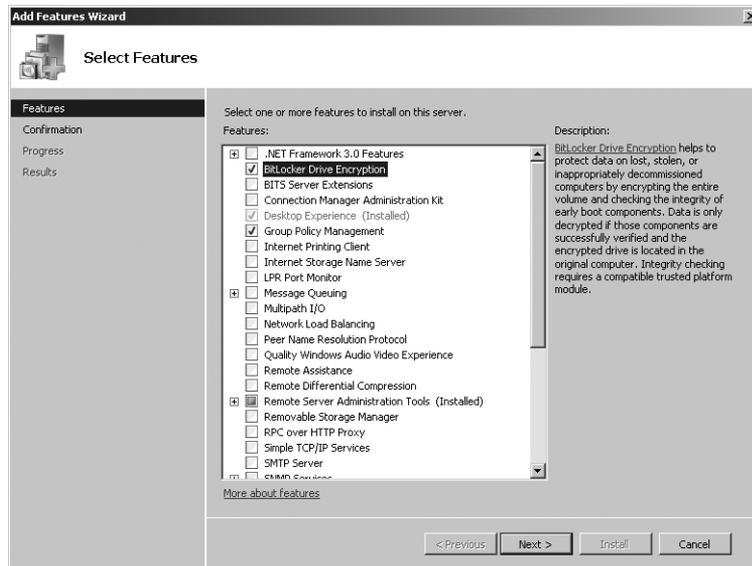


Figure 7-8 Select the features to add.

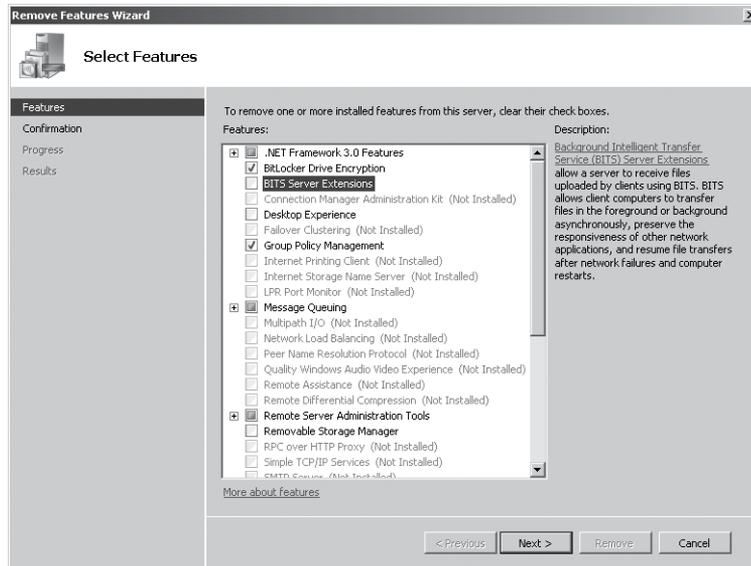
3. When you are finished selecting features to add, click Next and then click Install.

## Removing a Feature

You can remove server features by following these steps:

1. In Server Manager, select Features in the left pane and then click Remove Features. This starts the Remove Features Wizard. If the wizard displays the Before You Begin page, read the introductory text and then click Next. You can avoid seeing the Before You Begin page the next time you start this wizard by selecting the Skip This Page By Default check box before clicking Next.

- On the Select Features page, the Remove Features Wizard selects the currently installed features as shown in Figure 7-9. To remove a feature, clear the related check box. If you try to remove a feature that another feature depends on, you'll see a warning prompt stating that you cannot remove the feature unless you also remove the other feature as well. If you click the Remove Dependent Feature button, the Remove Features Wizard will remove both features.



**Figure 7-9** Clear the check boxes for selected features to remove them.

- When you are finished selecting features to remove, click Next and then click Remove.

## Installing Components at the Command Line

Server Manager's command-line counterpart is `ServerManagerCmd.exe`. When you work with `ServerManagerCmd`, you can:

- View the current configuration
- Add roles, role services, and features
- Remove roles, role services, and features

### Note

You can't use `ServerManagerCmd` at the same time you are using one of Server Manager's add or remove wizards. Only one instance of either `ServerManagerCmd` or Server Manager can add or remove components at the same time.

## Getting Started with ServerManagerCmd

You can manage roles, role services, and features using the following commands and command-line syntaxes:

- **-query** Obtains a detailed list of the server's current state with regard to roles, role services, and features. If *SaveFile.xml* is specified, the query results are displayed and saved to the named file, in XML format. Optionally, you can use `-q` instead of `-query`.

```
ServerManagerCmd -query [SaveFile.xml] [-logPath LogFile.txt]
```

- **-install** Installs the named role, role service, or feature. The `-allSubFeatures` or `-a` parameter allows you to install all subordinate role services and features of the named component. The `-setting` or `-s` parameter allows you to configure required settings to specific values. Optionally, you can use `-i` instead of `-install`.

```
ServerManagerCmd -install ComponentName [-setting SettingName=SettingValue]
[-allSubFeatures] [-resultPath Results.xml] [-restart] | -whatIf]
[-logPath LogFile.txt]
```

- **-inputPath** Adds or removes roles, role services, and features as specified in an XML answer file. Optionally, you can use `-ip` instead of `-inputPath`.

```
ServerManagerCmd -inputPath AnswerFile.xml [-resultPath Results.xml] [-restart]
| -whatIf] [-logPath LogFile.txt]
```

- **-remove** Removes the named role, role service, or feature. Optionally, you can use `-r` instead of `-remove`.

```
ServerManagerCmd -remove ComponentName [-resultPath Results.xml]
[-restart] | -whatIf] [-logPath LogFile.txt]
```

- **-version** Lists the version of the Server Manager command-line utility being used. Optionally, you can use `-v` instead of `-version`.

```
ServerManagerCmd -version
```

Each of the commands accepts additional parameters and parameter values. Most commands and parameters have short forms that can be used instead of the full name. You can use the `-logPath` or `-l` parameter to log error details to a named log file. With the `-install` and `-remove` commands, you can use the `-whatif` or `-w` command to display the operations that would be performed if the command were executed. With the `-install` and `-remove` commands, you can use the `-resultPath` or `-rp` command to write standard output results to a named file in XML format. With the `-install` and `-remove` commands, you also can use the `-restart` command to restart the computer automatically (if restarting is necessary to complete the operation).

The parameter values that can be used with commands include:

- **AnswerFile.xml** Uses the XML-formatted answer file to determine what components to add or remove.

- **SaveFile.xml** Saves the standard output results to a named file in XML format. The results are still displayed and it is important to note that results do not include errors, which are written separately to standard error output.
- **ComponentName** Identifies the role, role service, or feature to work with.
- **SettingName** Identifies a required setting by its name.
- **SettingValue** Sets the configuration value for a setting.
- **LogFile** Sets the name of the text file to which log error details should be written.
- **Results.xml** Saves the results of the install or remove operation to a named file in XML format. Results are still displayed.

Table 7-3 provides a quick reference for the long and short form parameters for ServerManagerCmd.

**Table 7-3 Long and Short Form Parameters for ServerManagerCmd**

| Operation                | Parameter   | Short Form |
|--------------------------|-------------|------------|
| Change log path          | -logPath    | -l         |
| Determine what if        | -whatif     | -w         |
| Display version          | -version    | -v         |
| Install component        | -install    | -i         |
| Install from answer file | -inputPath  | -ip        |
| Query current state      | -query      | -q         |
| Remove component         | -remove     | -r         |
| Restart if necessary     | -restart    |            |
| Saves the results        | -resultPath | -rp        |
| Specify required setting | -setting    | -s         |

## Understanding Component Names

Just about every installable role, role service, and feature has a component name. This name identifies the component so it can be manipulated from the command-line. Remember, supplemental components are made available by downloading and installing their installer packages from the Microsoft Web site.

Table 7-4 provides a hierarchical listing of the component names associated with roles, related role services, and related subcomponents. When you are installing a role, you can use the -allSubFeatures parameter to install all the subordinate role services and features listed under the role. When you are installing a role service, you can use the -allSubFeatures parameter to install all the subordinate features listed under the role service.

**Table 7-4 Component Names for Key Roles and Role Services**

| Component Name                       | Role  | Service | Feature |
|--------------------------------------|---|---------|---------|
| AD-Certificate                       | Active Directory Certificate Services           |         |         |
| ADCS-Cert-Authority                  | Certification Authority                         |         |         |
| ADCS-Web-Enrollment                  | Certification Authority Web Enrollment          |         |         |
| ADCS-Online-Cert                     | Online Responder                                |         |         |
| ADCS-Device-Enrollment               | Network Device Enrollment Service               |         |         |
| Active Directory Domain Services     |   |         |         |
| ADDS-Domain-Controller               | Active Directory Domain Controller              |         |         |
| ADDS-Identity-Mgmt                   | Identity Management For UNIX                    |         |         |
| ADDS-NIS                             | Server For Network Information Services         |         |         |
| ADDS-NIS                             | Password Synchronization                        |         |         |
| ADDS-IDMU-Tools                      | Administration Tools                            |         |         |
| Active Directory Federation Services |   |         |         |
| ADFS-Federation                      | Federation Service                              |         |         |
| ADFS-Proxy                           | Federation Service Proxy                        |         |         |
| ADFS-Web-Agents                      | AD FS Web Agents                                |         |         |
| ADFS-Claims                          | Claims-Aware Agent                              |         |         |
| ADFS-Windows-Token                   | Windows Token-Based Agent                       |         |         |
| ADLDS                                | Active Directory Lightweight Directory Services |         |         |
| DHCP                                 | DHCP Server                                     |         |         |
| DNS                                  | DNS Server                                      |         |         |
| Fax                                  | Fax Server                                      |         |         |
| File Services                        |   |         |         |
| FS-FileServer                        | File Server                                     |         |         |
| FS-DFS                               | Distributed File System                         |         |         |
| FS-DFS-Namespace                     | DFS Namespaces                                  |         |         |
| FS-DFS-Replication                   | DFS Replication                                 |         |         |
| FS-Resource-Manager                  | File Server Resource Manager                    |         |         |
| FS-NFS-Services                      | Services For Network File System                |         |         |
| FS-Search-Service                    | Windows Search Service                          |         |         |
| FS-Win2003-Services                  | Windows Server 2003 File Services               |         |         |
| FS-Replication                       | File Replication Service                        |         |         |

| Component Name      | Role                               | Service                                | Feature               |
|---------------------|------------------------------------|--|-----------------------|
| FS-Indexing-Service |                                    |  | Indexing Service      |
| NPAS                | Network Policy And Access Services |  |                       |
| NPAS-Policy-Server  |                                    | Network Policy Server                  |                       |
| NPAS-RRAS-Services  |                                    | Routing And Remote Access Services     |                       |
| NPAS-RRAS           |                                    |  | Remote Access Service |
| NPAS-Routing        |                                    |  | Routing               |
| NPAS-Health         |                                    | Health Registration Authority          |                       |
| NPAS-Host-Cred      |                                    | Host Credential Authorization Protocol |                       |
| Print-Services      | Print Services                     |  |                       |
| Print-Server        |                                    | Print Server                           |                       |
| Print-LPD-Service   |                                    | LPD Service                            |                       |
| Print-Internet      |                                    | Internet Printing                      |                       |
| Terminal-Services   | Terminal Services                  |  |                       |
| TS-Terminal-Server  |                                    | Terminal Server                        |                       |
| TS-Licensing        |                                    | TS Licensing                           |                       |
| TS-Session-Broker   |                                    | TS Session Broker                      |                       |
| TS-Gateway          |                                    | TS Gateway                             |                       |
| TS-Web-Access       |                                    | TS Web Access                          |                       |
| WDS                 | Windows Deployment Services        |  |                       |
| WDS-Deployment      |                                    | Deployment Server                      |                       |
| WDS-Transport       |                                    | Transport Server                       |                       |

Table 7-5 provides a hierarchical listing of the component names associated with features and related subfeatures. When you are installing a feature, you can use the `-allSubFeatures` parameter to install all the subordinate second-level and third-level features listed under the feature. When you are installing a second-level feature, you can use the `-allSubFeatures` parameter to install all the subordinate third-level features listed under the second-level feature.

#### Note

An asterisk following the feature command indicates the feature has unlisted subordinate features that generally are installed together by adding the `-allSubFeatures` parameter.

**Table 7-5 Component Names for Features and Subfeatures**

| Component Name        | Feature                                | Second-Level Feature      | Third-Level Feature                                   |
|-----------------------|--|---------------------------|---|
| NET-Framework*        | .NET Framework 3.0 Features            |                           |   |
| BitLocker             | BitLocker Drive Encryption             |                           |   |
| BITS                  | BITS Server Extensions                 |                           |   |
| CMAK                  | Connection Manager Administration Kit  |                           |   |
| Desktop-Experience    | Desktop Experience                     |                           |   |
| Failover-Clustering   | Failover Clustering                    |                           |   |
| GPMC                  | Group Policy Management                |                           |   |
| Internet-Print-Client | Internet Printing Client               |                           |   |
| ISNS                  | Internet Storage Name Server           |                           |   |
| LPR-Port-Monitor      | LPR Port Monitor                       |                           |   |
| MSMQ*                 | Message Queuing                        |                           |   |
| Multipath-IO          | Multipath I/O                          |                           |   |
| NLB                   | Network Load Balancing                 |                           |   |
| PNRP                  | Peer Name Resolution Protocol          |                           |   |
| qWave                 | Quality Windows Audio Video Experience |                           |   |
| Remote-Assistance     | Remote Assistance                      |                           |   |
| RDC                   | Remote Differential Compression        |                           |   |
| RSAT                  | Remote Server Administration Tools     |                           |   |
| RSAT-Role-Tools       |  | Role Administration Tools |   |
| RSAT-ADCS*            |  |                           | Active Directory Certificate Services Tools           |
| RSAT-ADDS*            |  |                           | Active Directory Domain Services Tools                |
| RSAT-ADLDS            |  |                           | Active Directory Lightweight Directory Services Tools |
| RSAT-RMS              |  |                           | Active Directory Rights Management Services Tools     |
| RSAT-DHCP             |  |                           | DHCP Server Tools                                     |
| RSAT-DNS-Server       |  |                           | DNS Server Tools                                      |
| RSAT-Fax              |  |                           | Fax Server Tools                                      |
| RSAT-File-Services*   |  |                           | File Services Tools                                   |
| RSAT-NPAS*            |  |                           | Network Policy And Access Services Tools              |

| Component Name      | Feature                               | Second-Level Feature         | Third-Level Feature               |
|---------------------|---------------------------------------|------------------------------|-----------------------------------|
| RSAT-Print-Services |                                       |                              | Print Services Tools              |
| RSAT-TS*            |                                       |                              | Terminal Services Tools           |
| RSAT-UDDI           |                                       |                              | UDDI Services Tools               |
| RSAT-Web-Server     |                                       |                              | Web Server (IIS) Tools            |
| RSAT-WDS            |                                       |                              | Windows Deployment Services Tools |
| RSAT-Feature-Tools  |                                       | Feature Administration Tools |                                   |
| RSAT-BitLocker      |                                       |                              | BitLocker Drive Encryption Tools  |
| RSAT-Bits-Server    |                                       |                              | BITS Server Extensions Tools      |
| RSAT-Clustering     |                                       |                              | Failover Clustering Tools         |
| RSAT-NLB            |                                       |                              | Network Load Balancing Tools      |
| RSAT-SMTP           |                                       |                              | SMTP Server Tools                 |
| RSAT-WINS           |                                       |                              | WINS Server Tools                 |
| Removable-Storage   | Removable Storage Manager             |                              |                                   |
| RPC-over-HTTP-Proxy | RPC over HTTP Proxy                   |                              |                                   |
| Simple-TCPIP        | Simple TCP/IP Services                |                              |                                   |
| SMTP-Server         | SMTP Server                           |                              |                                   |
| SNMP-Services       | SNMP Services                         |                              |                                   |
| SNMP-Service        |                                       | SNMP Service                 |                                   |
| SNMP-WMI-Provider   |                                       | SNMP WMI Provider            |                                   |
| Storage-Mgr-SANS    | Storage Manager For SANs              |                              |                                   |
| Subsystem-UNIX-Apps | Subsystem For UNIX-Based Applications |                              |                                   |
| Telnet-Client       | Telnet Client                         |                              |                                   |
| Telnet-Server       | Telnet Server                         |                              |                                   |
| TFTP-Client         | TFTP Client                           |                              |                                   |
| Windows-Internal-DB | Windows Internal Database             |                              |                                   |
| PowerShell          | Windows PowerShell                    |                              |                                   |
| Backup-Features     | Windows Server Backup Features        |                              |                                   |
| Backup              |                                       | Windows Server Backup        |                                   |
| Backup-Tools        |                                       | Command-Line Tools           |                                   |

| Component Name      | Feature                         | Second-Level Feature | Third-Level Feature |
|---------------------|---------------------------------|----------------------|---------------------|
| WSRM                | Windows System Resource Manager |                      |                     |
| WINS-Server         | WINS Server                     |                      |                     |
| Wireless-Networking | Wireless LAN Service            |                      |                     |

## Determining the Installed Roles, Role Services, and Features

You can determine the roles, roles services, and features that are installed on a server by typing **servermanagercmd -query** at an elevated command prompt. Each installed role, role service, and feature is highlighted and marked as such, and following the display name of each role, role service, and feature is the management naming component in brackets. In the output, roles and role services are listed before features as shown in the following example:

```

----- Roles -----
[X] Active Directory Certificate Services [AD-Certificate]
    [X] Certification Authority [ADCS-Cert-Authority]
    [X] Certification Authority Web Enrollment [ADCS-Web-Enrollment]
    [ ] Online Responder [ADCS-Online-Cert]
    [ ] Network Device Enrollment Service [ADCS-Device-Enrollment]
[X] Active Directory Domain Services
    [X] Active Directory Domain Controller [ADDS-Domain-Controller]
    [ ] Identity Management for UNIX [ADDS-Identity-Mgmt]
    [ ] Server for Network Information Services [ADDS-NIS]
    [ ] Password Synchronization [ADDS-Password-Sync]
    [ ] Administration Tools [ADDS-IDMU-Tools]

...

----- Features -----
[X] .NET Framework 3.0 Features [NET-Framework]
    [X] .NET Framework 3.0 [NET-Framework-Core]
    [ ] XPS Viewer [NET-XPS-Viewer]
    [X] WCF Activation [NET-Win-CFAC]
        [X] HTTP Activation [NET-HTTP-Activation]
        [X] Non-HTTP Activation [NET-Non-HTTP-Activ]
[X] BitLocker Drive Encryption [BitLocker]
[X] BITS Server Extensions [BITS]

```

For the purposes of documenting a server's configuration, you can save the output in a file as standard text using the redirection symbol (>) as shown in this example:

```
servermanagercmd -query > MySavedResults.txt
```

Here, you save the output to a file named MySavedResults.txt. If you want to save the results as an XML-formatted file, simply follow the `-query` command with the name of the XML file, such as:

```
servermanagercmd -query MySaveFile.xml
```

Saving the output to an XML file makes the file easier to manipulate using automation techniques.

## Installing Components Using ServerManagerCmd

You can install roles, role services, and features by typing **servermanagercmd -install *ComponentName*** at an elevated command prompt, where *ComponentName* is the name of the component to install as listed in Table 7-4 or Table 7-5. You can install subordinate components by including the **-allSubFeatures** parameter as shown in the following example:

```
servermanagercmd -install fs-dfs -allsubfeatures
```

Here, you install the Distributed File System role service as well as the subordinate DFS Namespaces and DFS Replication role services. The output for a successful installation should look similar to the following:

```
Start Installation...
[Installation] Succeeded: [File Services] Distributed File System.
[Installation] Succeeded: [File Services] DFS Namespaces.
[Installation] Succeeded: [File Services] DFS Replication.
<100/100>
```

Success: Installation succeeded.

Should a restart be required to complete an installation, you can have ServerManagerCmd restart the computer by including the **-restart** parameter. To test the installation prior to performing that actual operation, you can use the **-whatif** parameter. If you are trying to install components that are already installed you'll see a note stating that no changes were made, such as:

```
NoChange: No changes were made because the roles, role services and features specified are already installed, or have already been removed from the local computer.
```

If an error occurs and ServerManagerCmd is not able to perform the operation specified, you'll see an error. Generally, error text is shown in red and includes an error flag and error text, such as:

```
WriteError: Failed to write the log file: . Access to the path 'C:\Windows\logs\ServerManager.log' is denied.
```

This error indicates that ServerManagerCmd couldn't perform the operation because it couldn't gain write access to the log file. Other common errors you'll see are related to invalid arguments passed on the command line, such as:

```
ArgumentNotValid: Invalid parameters. Only specify either -install or -remove.
ArgumentNotValid: Invalid role, role service, or feature: 'fs-dfs'. The name was not found.
```

### Note

If you forget to run the command prompt as an administrator, you'll see an error stating that Server Manager can be run only by a member of the built-in Administrators group on the local computer. You'll need to run the command prompt with elevated permissions to resolve this error.

When you install components, `ServerManagerCmd` writes extended logging information to `%SystemRoot%\Logs\Servermanager.log`. This logging information details every operation performed by `ServerManagerCmd`. You can write the detailed information to an alternate location by including the `-logPath` or `-l` parameter. In this example, you write the logging information to `C:\Logs\Install.log`:

```
servermanagercmd -install fs-dfs -allsubfeatures -logPath c:\logs\install.log
```

## Removing Components Using `ServerManagerCmd`

You can uninstall roles, role services, and features by typing `servermanagercmd -remove ComponentName` at an elevated command prompt, where *ComponentName* is the name of the component to uninstall as listed in Table 7-4 or Table 7-5. You can uninstall subordinate components by including the `-allSubFeatures` parameter as shown in the following example:

```
servermanagercmd -remove fs-dfs -allsubfeatures
```

Here, you uninstall the Distributed File System role service as well as the subordinate DFS Namespaces and DFS Replication role services, and the output for a successful removal should look similar to the following:

```
Start Removal...
[Removal] Succeeded: [File Services] Distributed File System.
[Removal] Succeeded: [File Services] DFS Namespaces.
[Removal] Succeeded: [File Services] DFS Replication.
<100/100>
```

```
Success: Removal succeeded.
```

Should a restart be required to complete a removal, you can have `ServerManagerCmd` restart the computer by including the `-restart` parameter. As with installation, you can test the removal prior to performing that actual operation using the `-whatif` parameter. If you are trying to remove components that aren't installed, you'll see a note stating that no changes were made, such as:

```
NoChange: No changes were made because the roles, role services and features specified are already installed, or have already been removed from the local computer.
```

If an error occurs and `ServerManagerCmd` is not able to perform the operation specified, you'll see an error. During the removal process, `ServerManagerCmd` writes extended logging information to `%SystemRoot%\Logs\Servermanager.log`. As with the installation process, you can write the detailed information to an alternate location by including the `-logPath` or `-l` parameter.

# Managing TCP/IP Networking

|                                    |     |   |     |
|------------------------------------|-----|---|-----|
| Installing TCP/IP Networking ..... | 657 | Managing Network Connections.....                 | 671 |
| Configuring TCP/IP Networking..... | 660 | Troubleshooting and Testing Network Settings..... | 674 |

**A**s an administrator, you enable networked computers to communicate by using the basic networking protocols built into Windows Server 2008. The key protocol you'll use is Transmission Control Protocol/Internet Protocol (TCP/IP). TCP/IP is actually a collection of protocols and services used for communicating over a network. It's the primary protocol used for internetwork communications. Compared to configuring other networking protocols, configuring TCP/IP communications is fairly complicated, but TCP/IP is the most versatile protocol available.

## Note

Group Policy settings can affect your ability to install and manage TCP/IP networking. The key policies you'll want to examine are in User Configuration\Administrative Templates\Network\Network Connections and Computer Configuration\Administrative Templates\System\Group Policy. Group Policy is discussed in Chapter 36, "Managing Group Policy."

## Installing TCP/IP Networking

If you want to install networking on a computer, you must install TCP/IP networking and a network adapter. Windows Server 2008 uses TCP/IP as the default wide area network (WAN) protocol. Normally, networking is installed during Windows Server 2008 setup. You can also install TCP/IP networking through local area connection properties. Although name resolution can be performed using DNS, WINS, or LLMNR, the preferred technique on Windows Server 2008 domains is DNS.

## Preparing for Installation of TCP/IP Networking

Before you can configure TCP/IP networking on individual computers, you need the following information:

- **Domain name** The name of the domain in which the computer will be located. This can be a parent or a child domain.

- **IP address type, value, or both** The IP address information to assign to the computer, which can include both IPv4 and IPv6 addressing details.
- **Subnet mask** The subnet mask for the IPv4 network to which the computer is attached.
- **Subnet prefix length** The subnet prefix length for the IPv6 network to which the computer is attached.
- **Default gateway address** The address of the router or routers that will function as the computer's gateway.
- **DNS server address** The address of the DNS server or servers that provide DNS name resolution services on the network.
- **WINS server address** The address of the WINS server or servers that provide WINS name resolution services on the network.

If you are unsure of any of this information, you should ask the IT staff. In many cases, even if you are an administrator, there is a specific person you must ask for the IP address setup that should be used. Typically, this is your organization's network administrator and it is that person's job to maintain the spreadsheet or database that shows how IP addresses are assigned within the organization.

If no one in your organization has this role yet, this role should be assigned to someone or jointly managed to ensure that IP addresses are assigned following a specific plan. The plan should detail the following information:

- The address ranges that are reserved for network equipment and hardware and which individual IP addresses in this range are currently in use
- The address ranges that are reserved for DHCP and as such cannot be assigned using a static IP address
- The address ranges that are for static IP addresses and which individual IP addresses in this range are currently in use

## Installing Network Adapters

Network adapters are hardware devices that are used to communicate on networks. You can install and configure network adapters by following these steps:

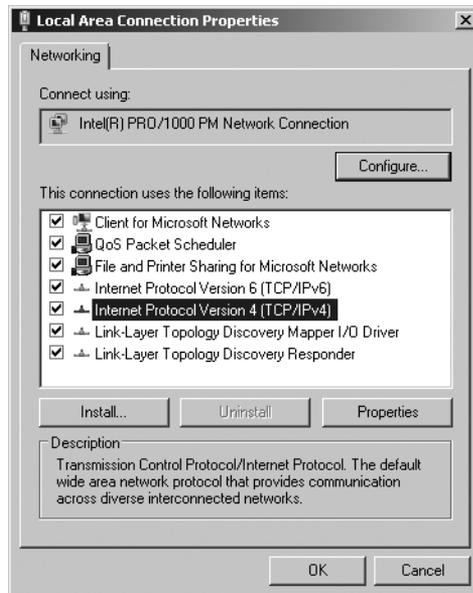
1. Configure the network adapter following the manufacturer's instructions. For example, you might need to use the software provided by the manufacturer to modify the Interrupt setting or the Port setting of the adapter.
2. If installing an internal network interface card, shut down the computer, unplug it, and install the adapter card in the appropriate slot on the computer. When you're finished, plug the computer in and start it.

3. Windows Server 2008 should detect the new adapter during startup. If you have a separate driver disc for the adapter, insert it now. Otherwise, you might be prompted to insert a driver disc.
4. If Windows Server 2008 doesn't detect the adapter automatically, follow the installation instructions in Chapter 8, "Managing and Troubleshooting Hardware."
5. If networking services aren't installed on the system, install them as described in the next section.

## Installing Networking Services (TCP/IP)

If you're installing TCP/IP after installing Windows Server 2008, log on to the computer using an account with Administrator privileges and then follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections.
3. In Network Connections, right-click the connection you want to work with and then select Properties.
4. This displays the Local Area Connection Properties dialog box, shown in Figure 21-1.



**Figure 21-1** Install and configure TCP/IP in the Local Area Connection Properties dialog box.

5. If Internet Protocol Version 6 (TCP/IPv6), Internet Protocol Version 4 (TCP/IPv4), or both aren't shown in the list of installed components, you'll need to install them. Click Install. Select Protocol, and then click Add. In the Select Network Protocol dialog box, select the protocol to install and then click OK. If you are installing both TCP/IPv6 and TCP/IPv4, repeat this procedure for each protocol.
6. In the Local Area Connection Properties dialog box, make sure that the following are selected as appropriate: Internet Protocol Version 6 (TCP/IPv6), Internet Protocol Version 4 (TCP/IPv4), or both. Then click OK.
7. As necessary, follow the instructions in the next section for configuring local area connections for the computer.

## Configuring TCP/IP Networking

A local area connection is created automatically if a computer has a network adapter and is connected to a network. If a computer has multiple network adapters and is connected to a network, you'll have one local area connection for each adapter. If no network connection is available, you should connect the computer to the network or create a different type of connection, as explained in "Managing Network Connections" on page 671.

Computers use IP addresses to communicate over TCP/IP. Windows Server 2008 provides the following ways to configure IP addressing:

**Manually** IP addresses that are assigned manually are called static IP addresses. Static IP addresses are fixed and don't change unless you change them. You'll usually assign static IP addresses to Windows servers, and when you do this, you'll need to configure additional information to help the server navigate the network.

**Dynamically** A DHCP server (if one is installed on the network) assigns dynamic IP addresses at startup, and the addresses might change over time. Dynamic IP addressing is the default configuration.

**Alternatively (IPv4 only)** When a computer is configured to use DHCPv4 and no DHCPv4 server is available, Windows Server 2008 assigns an alternate private IP address automatically. By default, the alternate IPv4 address is in the range from 169.254.0.1 to 169.254.255.254 with a subnet mask of 255.255.0.0. You can also specify a user-configured alternate IPv4 address, which is particularly useful for laptop users.

### Note

Unless an IP address is specifically reserved, DHCP servers assign IP addresses for a specific period of time, known as an *IP address lease*. If this lease expires and cannot be renewed, then the client assigns itself an automatic private IP address.

**Note**

To perform most TCP/IP configuration tasks, you must be a member of the Administrators group.

## Configuring Static IP Addresses

When you assign a static IP address, you need to tell the computer the IP address you want to use, the subnet mask for this IP address, and, if necessary, the default gateway to use for internetwork communications. An IP address is a numeric identifier for a computer. IP addressing schemes vary according to how your network is configured, but they're normally assigned based on a particular network segment.

IPv6 addresses and IPv4 addresses are very different. With IPv6, the first 64 bits represent the network ID and the remaining 64 bits represent the network interface. With IPv4, a variable number of the initial bits represent the network ID and the rest of the bits represent the host ID. For example, if you're working with IPv4 and a computer on the network segment 192.168.10.0 with a subnet mask of 255.255.255.0, the first 24 bits represent the network ID and the address range you have available for computer hosts is from 192.168.10.1 to 192.168.10.254. In this range, the address 192.168.10.255 is reserved for network broadcasts.

If you're on a private network that is indirectly connected to the Internet, you should use private IPv6 addresses. Link-local unicast addresses are private IPv6 addresses. All link-local unicast addresses begin with FE80.

If you're on a private network that is indirectly connected to the Internet, you should use private IPv4 addresses. Table 21-1 summarizes private network IPv4 addresses.

**Table 21-1 Private IPv4 Network Addressing**

| Private Network ID | Subnet Mask | Network Address Range       |
|--------------------|-------------|-----------------------------|
| 10.0.0.0           | 255.0.0.0   | 10.0.0.0–10.255.255.255     |
| 172.16.0.0         | 255.240.0.0 | 172.16.0.0–172.31.255.255   |
| 192.168.0.0        | 255.255.0.0 | 192.168.0.0–192.168.255.255 |

All other IPv4 network addresses are public and must be leased or purchased. If the network is connected directly to the Internet and you've obtained a range of IPv4 addresses from your Internet service provider, you can use the IPv4 addresses you've been assigned.

### Using the PING Command to Check an Address

Before you assign a static IP address, you should make sure that the address isn't already in use or reserved for use with DHCP. With the PING command, you can check to see whether an address is in use. Open a command prompt and type **ping**, followed by the IP address you want to check.

To test the IPv4 address 10.0.10.12, you would use the following command:

```
ping 10.0.10.12
```

To test the IPv6 address FEC0::02BC:FF:BECB:FE4F:961D, you would use the following command:

```
ping FEC0::02BC:FF:BECB:FE4F:961D
```

If you receive a successful reply from the PING test, the IP address is in use and you should try another one. If no current host on the network uses this IP address, the PING command output should be similar to the following:

```
Pinging 192.168.1.100 with 32 bytes of data:
```

```
Request timed out.  
Request timed out.  
Request timed out.  
Request timed out.
```

```
Ping statistics for 192.168.1.100:
```

```
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss)
```

You can then use the IP address.

#### Note

Pinging an IP address will work as long as all the hosts are active and reachable on the network at the time you ping the address. However, a firewall could be blocking your PING request. More important is to plan the assignment of static addresses to machines on your network carefully.

## Configuring a Static IPv4 or IPv6 Address

One local area network (LAN) connection is available for each network adapter installed. These connections are created automatically. To configure static IP addresses for a particular connection, follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection you want to work with and then select Properties.
3. Double-click Internet Protocol Version 6 (TCP/IPv6) or Internet Protocol Version 4 (TCP/IPv4) as appropriate for the type of IP address you are configuring.

4. For an IPv6 address, do the following:
  - Select Use The Following IPv6 Address and then type the IPv6 address in the IPv6 Address text box. The IPv6 address you assign to the computer must not be used anywhere else on the network.
  - Press the Tab key. The Subnet Prefix Length field ensures that the computer communicates over the network properly. Windows Server 2008 should insert a default value for the subnet prefix into the Subnet Prefix Length text box. If the network doesn't use variable-length subnetting, the default value should suffice. If your network does use variable-length subnets, you'll need to change this value as appropriate for your network.
5. For an IPv4 address, do the following:
  - Select Use The Following IP Address and then type the IPv4 address in the IP Address text box. The IPv4 address you assign to the computer must not be used anywhere else on the network.
  - Press the Tab key. The Subnet Mask field ensures that the computer communicates over the network properly. Windows Server 2008 should insert a default value for the subnet prefix into the Subnet Mask text box. If the network doesn't use variable-length subnetting, the default value should suffice. If your network does use variable-length subnets, you'll need to change this value as appropriate for your network.
6. If the computer needs to access other TCP/IP networks, the Internet, or other subnets, you must specify a default gateway. Type the IP address of the network's default router in the Default Gateway text box.
7. DNS is needed for domain name resolution. Select Use The Following DNS Server Addresses and then type a preferred address and an alternate DNS server address in the text boxes provided.
8. When you're finished, click OK three times to save your changes. Repeat this process for other network adapters and IP protocols you want to configure.
9. With IPv4 addressing, configure WINS as necessary, following the technique outlined in "Configuring WINS Resolution" on page 669.

## Configuring Dynamic IP Addresses and Alternate IP Addressing

Many organizations use DHCP servers to dynamically assign IPv4 and IPv6 addresses. To receive an IPv4 or IPv6 address, client computers use a limited broadcast to advertise that they need to obtain an IP address. DHCP servers on the network acknowledge the request by offering the client an IP address. The client acknowledges the first offer it receives, and the DHCP server in turn tells the client that it has succeeded in leasing the IP address for a specified amount of time.

The message from the DHCP server can, and typically does, include the IP addresses of the default gateway, the preferred and alternate DNS servers, and the preferred and

alternate WINS servers. This means these settings wouldn't need to be manually configured on the client computer.

### DHCP Is Primarily for Clients

Dynamic IP addresses aren't for all hosts on the network, however. Typically, you'll want to assign dynamic IP addresses to workstations and, in some instances, member servers that perform noncritical roles on the network. But if you use dynamic IP addressing for member servers, these servers should have reservations for their IP addresses. For any server that has a critical network role or provides a key service, you'll definitely want to use static IP addresses. Finally, with domain controllers and DHCP servers, you must use static IP addresses, so don't try to assign dynamic IP addresses to these servers.

Although you can use static IP addresses with workstations, most workstations use dynamic addressing, alternative IP addressing, or both. You configure dynamic and alternative addressing by following these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, one LAN connection is shown for each network adapter installed. These connections are created automatically. If you don't see a LAN connection for an installed adapter, check the driver for the adapter. It might be installed incorrectly. Right-click the connection you want to work with and then select Properties.
3. Double-click Internet Protocol Version 6 (TCP/IPv6) or Internet Protocol Version 4 (TCP/IPv4) as appropriate for the type of IP address you are configuring.
4. Select Obtain An IPv6 Address Automatically or Obtain An IP Address Automatically as appropriate for the type of IP address you are configuring. If desired, select Obtain DNS Server Address Automatically. Or select Use The Following DNS Server Addresses and then type a preferred and alternate DNS server address in the text boxes provided.
5. When you use dynamic IPv4 addressing with desktop computers, you should configure an automatic alternative address. To use this configuration, on the Alternate Configuration tab, select Automatic Private IP Address. Click OK, click Close, and then skip the remaining steps.
6. When you use dynamic IPv4 addressing with mobile computers, you'll usually want to configure the alternative address manually. To use this configuration, on the Alternate Configuration tab, select User Configured and then type the IP address you want to use in the IP Address text box. The IP address that you assign to the computer should be a private IP address, as shown in Table 20-1 on page 631, and it must not be in use anywhere else when the settings are applied.

7. With dynamic IPv4 addressing, complete the alternate configuration by entering a subnet mask, default gateway, DNS, and WINS settings. When you're finished, click OK twice.

## INSIDE OUT

### Disabling APIPA

Whenever DHCP is used, APIPA is enabled by default. If you don't want a computer to use APIPA, you can either assign a static TCP/IP address or disable APIPA. For example, if your network uses routers or your network is connected to the Internet without a NAT or proxy server, you might not want to use APIPA. You can disable APIPA in the Registry.

On Windows 2000 or later, you can disable APIPA by creating the `IPAutoconfigurationEnabled` as a `DWORD` value-entry under `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\Interfaces\AdapterGUID`, where *AdapterGUID* is the globally unique identifier (GUID) for the computer's network adapter. Set the value to `0x0`.

If you create the `IPAutoconfigurationEnabled` as a `DWORD` value-entry, you can enable APIPA at any time by changing the value to `0x1`.

For more information about disabling APIPA, see Microsoft Knowledge Base article 220874.

## Configuring Multiple IP Addresses and Gateways

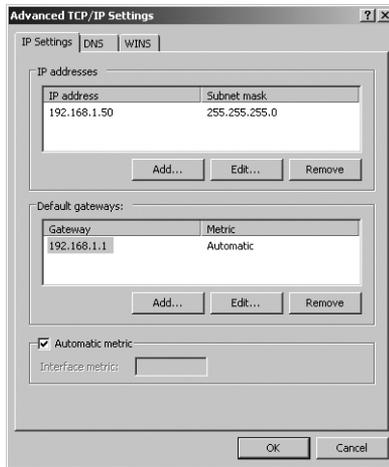
Using advanced TCP/IP settings, you can configure a single network interface on a computer to use multiple IP addresses and multiple gateways. This allows a computer to appear to be several computers and to access multiple logical subnets to route information or to provide internetworking services.

To provide fault tolerance in case of a router outage, you can choose to configure Windows Server 2008 computers so that they use multiple default gateways. When you assign multiple gateways, Windows Server 2008 uses the gateway metric to determine which gateway is used and at what time. The gateway metric indicates the routing cost of using a gateway. The gateway with the lowest routing cost, or metric, is used first. If the computer can't communicate with this gateway, Windows Server 2008 tries to use the gateway with the next lowest metric.

The best way to configure multiple gateways depends on the configuration of your network. If your organization's computers use DHCP, you'll probably want to configure the additional gateways through settings on the DHCP server. If computers use static IP addresses or you want to set gateways specifically, assign them by following these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.

2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection you want to work with and then select Properties.
3. Double-click Internet Protocol Version 6 (TCP/IPv6) or Internet Protocol Version 4 (TCP/IPv4) as appropriate for the type of IP address you are configuring.
4. Click Advanced to open the Advanced TCP/IP Settings dialog box. Figure 21-2 shows advanced settings for IPv4. The dialog box for IPv6 is similar.



**Figure 21-2** Configure multiple IP addresses and gateways in the Advanced TCP/IP Settings dialog box.

5. To add an IP address, click Add below IP Addresses to display the TCP/IP Address dialog box. After you type the IP address in the IP Address field, enter the subnet mask in the Subnet Mask field for IPv4 addresses or the subnet prefix length in the Subnet Prefix Length field for IPv6 addresses. Click Add to return to the Advanced TCP/IP Settings dialog box. Repeat this step for each IP address you want to add.
6. The Default Gateways panel shows the current gateways that have been manually configured (if any). To add a default gateway, click Add below Default Gateways to display the TCP/IP Gateway Address dialog box. Type the gateway address in the Gateway field. By default, Windows Server 2008 automatically assigns a metric to the gateway, which determines in which order the gateway is used. To assign the metric manually, clear the Automatic Metric check box, and then enter a metric in the field provided. Click Add, and then repeat this step for each gateway you want to add.
7. Click OK three times to close the open dialog boxes.

## Configuring DNS Resolution

DNS is a host name resolution service that you can use to determine the IP address of a computer from its host name. This lets users work with host names, such as *http://www.msn.com* or *http://www.microsoft.com*, rather than an IP address, such as 192.168.5.102 or 192.168.12.68. DNS is the primary name service for Windows Server 2008 and the Internet.

As with gateways, the best way to configure DNS depends on the configuration of your network. If computers use DHCP, you'll probably want to configure DNS through settings on the DHCP server. If computers use static IP addresses or you want to configure DNS specifically for an individual user or system, you'll want to configure DNS manually.

### Basic DNS Settings

You can configure basic DNS settings by following these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection you want to work with and then select Properties.
3. Double-click Internet Protocol Version 6 (TCP/IPv6) or Internet Protocol Version 4 (TCP/IPv4) as appropriate for the type of IP address you are configuring.
4. If the computer is using DHCP and you want DHCP to specify the DNS server address, select Obtain DNS Server Address Automatically. Otherwise, select Use The Following DNS Server Addresses and then type primary and alternate DNS server addresses in the text boxes provided.
5. Click OK three times to save your changes.

### Advanced DNS Settings

You configure advanced DNS settings on the DNS tab of the Advanced TCP/IP Settings dialog box, shown in Figure 21-3. You use the fields of the DNS tab as follows:

**DNS Server Addresses, In Order Of Use** Use this area to specify the IP address of each DNS server that is used for domain name resolution. Click Add if you want to add a server IP address to the list. Click Remove to remove a selected server address from the list. Click Edit to edit the selected entry. You can specify multiple servers for DNS resolution. Their priority is determined by the order. If the first server isn't available to respond to a host name resolution request, the next DNS server in the list is accessed, and so on. To change the position of a server in the list box, select it and then click the up or down arrow button.

**Append Primary And Connection Specific DNS Suffixes** Normally, this option is selected by default. Select this option to resolve unqualified computer names

in the primary domain. For example, if the computer name Gandolf is used and the parent domain is microsoft.com, the computer name would resolve to gandolf.microsoft.com. If the fully qualified computer name doesn't exist in the parent domain, the query fails. The parent domain used is the one set in the System Properties dialog box, on the Computer Name tab. (Click System And Maintenance\System in Control Panel, then click Change Settings and view the Computer Name tab to check the settings.)

**Append Parent Suffixes Of The Primary DNS Suffix** This option is selected by default. Select this check box to resolve unqualified computer names using the parent/child domain hierarchy. If a query fails in the immediate parent domain, the suffix for the parent of the parent domain is used to try to resolve the query. This process continues until the top of the DNS domain hierarchy is reached. For example, if the computer name Gandolf is used in the dev.microsoft.com domain, DNS would attempt to resolve the computer name to gandolf.dev.microsoft.com. If this didn't work, DNS would attempt to resolve the computer name to gandolf.microsoft.com.

**Append These DNS Suffixes (In Order)** Select this option to set specific DNS suffixes to use rather than resolving through the parent domain. Click Add if you want to add a domain suffix to the list. Click Remove to remove a selected domain suffix from the list. Click Edit to edit the selected entry. You can specify multiple domain suffixes, which are used in order. If the first suffix doesn't resolve properly, DNS attempts to use the next suffix in the list. If this fails, the next suffix is used, and so on. To change the order of the domain suffixes, select the suffix and then click the up or down arrow button to change its position.

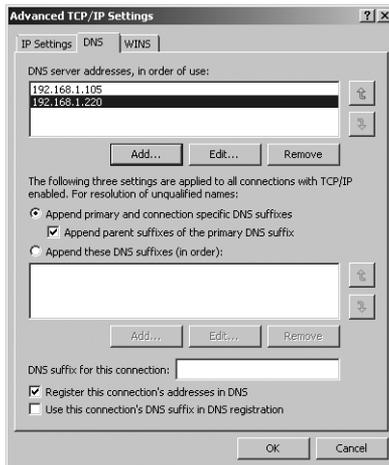
**DNS Suffix For This Connection** This option sets a specific DNS suffix for the connection that overrides DNS names already configured for use on this connection. You'll usually set the DNS domain name through the System Properties dialog box, on the Computer Name tab.

**Register This Connection's Addresses In DNS** Select this check box if you want all IP addresses for this connection to be registered in DNS under the computer's fully qualified domain name. This option is selected by default.

### Note

Dynamic DNS updates are used in conjunction with DHCP to enable a client to update its A (Host Address) record if its IP address changes, and to enable the DHCP server to update the PTR (Pointer) record for the client on the DNS server. You can also configure DHCP servers to update both the A and PTR records on the client's behalf. Dynamic DNS updates are supported only by BIND 5.1 or higher DNS servers as well as server editions of Microsoft Windows.

**Use This Connection's DNS Suffix In DNS Registration** Select this check box if you want all IP addresses for this connection to be registered in DNS under the parent domain.



**Figure 21-3** Configure advanced DNS settings on the DNS tab of the Advanced TCP/IP Settings dialog box.

## Configuring WINS Resolution

You use WINS to resolve network basic input/output system (NetBIOS) computer names to IPv4 addresses. You can use WINS to help computers on a network determine the address of other computers on the network. If a WINS server is installed on the network, you can use the server to resolve computer names. Although WINS is supported on all versions of Windows, Windows Server 2008 primarily uses WINS for backward compatibility.

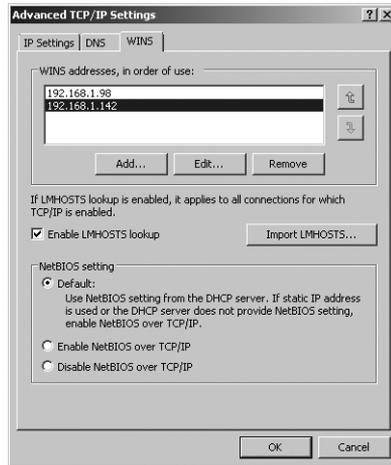
You can also configure Windows Server 2008 computers to use the local file LMHOSTS to resolve NetBIOS computer names. However, LMHOSTS is consulted only if normal name resolution methods fail. In a properly configured network, these files are rarely used. Thus, the preferred method of NetBIOS computer name resolution is WINS in conjunction with a WINS server.

As with gateways and DNS, the best way to configure WINS depends on the configuration of your network. If computers use DHCP, you'll probably want to configure WINS through settings on the DHCP server. If computers use static IPv4 addresses or you want to configure WINS specifically for an individual user or system, you'll want to configure WINS manually.

You can manually configure WINS by following these steps:

1. Access the Advanced TCP/IP Settings dialog box for IPv4 and click the WINS tab as shown in Figure 21-4. In the WINS Addresses, In Order Of Use panel, you can specify the IPv4 addresses of each WINS server that is used for NetBIOS name

resolution. Click Add if you want to add a server IPv4 address to the list. Click Remove to remove a selected server from the list. Click Edit to edit the selected entry.



**Figure 21-4** Configure WINS resolution for NetBIOS computer names on the WINS tab of the Advanced TCP/IP Settings dialog box.

2. You can specify multiple servers, which are used in order, for WINS resolution. If the first server isn't available to respond to a NetBIOS name resolution request, the next WINS server on the list is accessed, and so on. To change the position of a server in the list box, select it and then click the up or down arrow button.
3. To enable LMHOSTS lookups, select the Enable LMHOSTS Lookup check box. If you want the computer to use an existing LMHOSTS file defined somewhere on the network, retrieve this file by clicking Import LMHOSTS. You generally will use LMHOSTS only when other name resolution methods fail.
4. WINS name resolution requires NetBIOS over TCP/IP services. Select one of the following options to configure WINS name resolution using NetBIOS:
  - If you use DHCP and dynamic addressing, you can get the NetBIOS setting from the DHCP server. Select Default: Use NetBIOS Setting From The DHCP Server.
  - If you use a static IP address or the DHCP server does not provide NetBIOS settings, select Enable NetBIOS Over TCP/IP.
  - If WINS and NetBIOS are not used on the network, select Disable NetBIOS Over TCP/IP. This eliminates the NetBIOS broadcasts that would otherwise be sent by the computer.
5. Click OK three times. As necessary, repeat this process for other network adapters.

### Note

LMHOSTS files are maintained locally on a computer-by-computer basis, which can eventually make them unreliable. Rather than relying on LMHOSTS, ensure that your DNS and WINS servers are configured properly and are accessible to the network for centralized administration of name resolution services.

## Managing Network Connections

Local area connections make it possible for computers to access resources on the network and the Internet. One local area connection is created automatically for each network adapter installed on a computer. This section examines techniques you can use to manage these connections.

### Checking the Status, Speed, and Activity for Local Area Connections

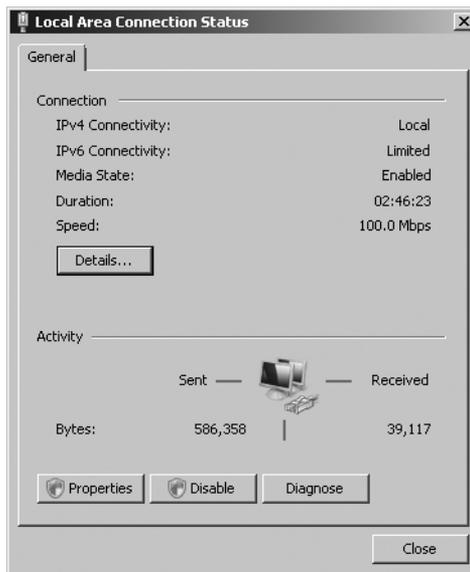
To check the status of a local area connection, follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection you want to work with and then click Status.
3. This displays the Local Area Connection Status dialog box. If the connection is disabled or the media is unplugged, you won't be able to access this dialog box. Enable the connection or connect the network cable to resolve the problem and then try to display the status dialog box again.

The General tab of this dialog box, shown in Figure 21-5, provides useful information regarding the following:

- **IPv4 Connectivity** The current IPv4 connection state and type. You'll typically see the status as Local when connected to an internal network or Not Connected when not connected to a network.
- **IPv6 Connectivity** The current IPv6 connection state and type. You'll typically see the status as Local when connected to an internal network or Not Connected when not connected to a network.
- **Media State** The state of the media. Because the status dialog box is available only when the connection is enabled, you'll typically see this as Enabled.

- **Duration** The amount of time the connection has been established. If the duration is fairly short, the user either recently connected to the network or the connection was recently reset.
- **Speed** The speed of the connection. This should read 10.0 megabits per second (Mbps) for 10-Mbps connections, 100.0 Mbps for 100-Mbps connections, and 1 gigabit per second (Gbps) for 1-gigabit connections. An incorrect setting can affect the computer's performance.
- **Bytes** The number of bytes sent and the number received by the connection. As the computer sends or receives packets, you'll see the computer icons light up to indicate the flow of traffic.



**Figure 21-5** The General tab of the Local Area Connection Status dialog box provides access to summary information regarding connections, properties, and support.

## Viewing Network Configuration Information

In Windows Server 2008, you can view the current configuration for network adapters in several ways. To view configuration settings using the Local Area Connection Status dialog box, follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection you want to work with and then click Status. This displays the Local Area Connection Status dialog box. If the connection is disabled or the media is unplugged, you won't be able to access this

dialog box. Enable the connection or connect the network cable to resolve the problem and then try to display the status dialog box again.

3. Click Details to view detailed information about the IP address configuration, including:
  - **Physical Address** The machine or Media Access Control (MAC) address of the network adapter. This address is unique for each network adapter.
  - **IPv4 IP Address** The IPv4 address assigned for IPv4 networking.
  - **IPv4 Subnet Mask** The subnet mask used for IPv4 networking.
  - **IPv4 Default Gateways** The IPv4 address of the default gateways used for IPv4 networking.
  - **IPv4 DNS Servers** IP addresses for DNS servers used with IPv4 networking.
  - **IPv4 WINS Servers** IP addresses for WINS servers used with IPv4 networking.
  - **IPv4 DHCP Server** The IP address of the DHCPv4 server from which the current lease was obtained (DHCPv4 only).
  - **Lease Obtained** A date and time stamp for when the DHCPv4 lease was obtained (DHCPv4 only).
  - **Lease Expires** A date and time stamp for when the DHCPv4 lease expires (DHCPv4 only).

You can also use the IPCONFIG command to view advanced configuration settings. To do so, follow these steps:

1. Click Start and type **cmd** in the Search field.
2. Press Enter.
3. At the command line, type **ipconfig /all** to see detailed configuration information for all network adapters configured on the computer.

#### Note

The command prompt is started in standard user mode. This is not an elevated command prompt.

## Enabling and Disabling Local Area Connections

Local area connections are created and connected automatically. If you want to disable a connection so that it cannot be used, follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.

2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection and select Disable to deactivate the connection and disable it.
3. If you want to enable the connection later, right-click the connection in Network Connections and select Enable.

If you want to disconnect from a network or start another connection, follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection and select Disconnect. Typically, only remote access connections have a Disconnect option.
3. If you want to activate the connection later, right-click the connection in Network Connections and select Connect.

## Renaming Local Area Connections

Windows Server 2008 initially assigns default names for local area connections. In Network Connections, you can rename the connections at any time by right-clicking the connection, selecting Rename, and then typing a new connection name. If a computer has multiple local area connections, proper naming can help you and others better understand the uses of a particular connection.

# Troubleshooting and Testing Network Settings

Windows Server 2008 includes many tools for troubleshooting and testing TCP/IP connectivity. This section looks at automated diagnostics, basic tests that you should perform whenever you install or modify a computer's network settings, and techniques for resolving difficult networking problems involving DHCP and DNS. The final section shows you how to perform detailed network diagnostics testing.

## Diagnosing and Resolving Local Area Connection Problems

Occasionally network cables can get unplugged or the network adapter might experience a problem that temporarily prevents it from working. After you plug the cable back in or solve the adapter problem, the connection should automatically reconnect. To diagnose local area connection problems, follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.

2. In Network And Sharing Center, click Manage Network Connections.
3. Right-click the connection you want to work with and select Diagnose.

Windows Network Diagnostics will then try to identify the problem. A list of possible solutions is provided for identifiable configuration problems. Some solutions provide automated fixes that you can execute by clicking the solution. Other solutions require manual fixes, such as might be required if you need to reset a network router or broadband modem. If your actions don't fix the problem, refer to other appropriate parts of this troubleshooting section.

## Diagnosing and Resolving Internet Connection Problems

Because of the many interdependencies between services, protocols, and configuration settings, troubleshooting network problems can be difficult. Fortunately, Windows Server 2008 includes a powerful network diagnostics tool for pinpointing problems that relate to the following:

- General network connectivity problems
- Internet service settings for e-mail, newsgroups, and proxies
- Settings for modems, network clients, and network adapters
- DNS, DHCP, and WINS configuration
- Default gateways and IP addresses

To diagnose Internet connection problems, follow these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. Click Diagnose And Repair.

Windows Network Diagnostics will then try to identify the problem. If identifiable configuration problems exist, a list of possible solutions is provided. Some solutions provide automated fixes that you can execute by clicking the solution. Other solutions require manual fixes, such as might be required if you need to reset a network router or broadband modem. If your actions don't fix the problem, refer to other appropriate parts of this troubleshooting section.

## Performing Basic Network Tests

Whenever you install a new computer or make configuration changes to the computer's network settings, you should test the configuration. The most basic TCP/IP test is to use the PING command to test the computer's connection to the network. PING is a command-line command. To use it, type **ping <host>** at the command prompt, where <host> is either the computer name or the IP address of the host computer you're trying to reach.

With Windows Server 2008, you can use the following methods to test the configuration using PING:

- **Try to ping IP addresses** If the computer is configured correctly and the host you're trying to reach is accessible to the network, PING should receive a reply, as long as pinging is allowed by the computer's firewall. If PING can't reach the host or is blocked by a firewall, PING times out.
- **On domains that use WINS, try to ping NetBIOS computer names** If NetBIOS computer names are resolved correctly by PING, the NetBIOS facilities, such as WINS, are correctly configured for the computer.
- **On domains that use DNS, try to ping DNS host names** If fully qualified DNS host names are resolved correctly by PING, DNS name resolution is configured properly.

You might also want to test network browsing for the computer. If the computer is a member of a Windows Server 2008 domain and computer browsing is enabled throughout the domain, log on to the computer and then use Windows Explorer or Network Explorer to browse other computers in the domain. Afterward, log on to a different computer in the domain and try to browse the computer you just configured. These tests tell you if the DNS resolution is being handled properly in the local environment. If you can't browse, check the configuration of the DNS services and protocols.

In some cases, discovering and sharing might be set to block discovery. You'll need to allow discovery to resolve this by following these steps:

1. Click Start and then click Network.
2. In Network Explorer, click Network And Sharing Center on the toolbar.
3. If Network Discovery is set to Off, expand the Sharing And Discovery panel using the Expand button, click Turn On Network Discovery, and then click Apply to turn on this feature.

## Diagnosing and Resolving IP Addressing Problems

The current IP address settings of a computer can be obtained as discussed in "Viewing Network Configuration Information" on page 672. If a computer is having problems accessing network resources or communicating with other computers, an IP addressing problem might exist. Take a close look at the IP address currently assigned, as well as other IP address settings, and use the following tips to help in your troubleshooting:

- If the IPv4 address currently assigned to the computer is in the range 169.254.0.1 to 169.254.255.254, the computer is using Automatic Private IP Addressing (APIPA). An automatic private IP address is assigned to a computer when it is configured to use DHCP and its DHCP client cannot reach a DHCP server. When using APIPA, Windows Server 2008 will automatically periodically check for

a DHCP server to become available. If a computer doesn't eventually obtain a dynamic IP address, the network connection usually has a problem. Check the network cable, and if necessary trace the cable back to the switch or hub into which it connects.

- If the IPv4 address and the subnet mask of the computer are currently set as 0.0.0.0, the network is either disconnected or someone attempted to use a static IP address that duplicated another IP address already in use on the network. In this case, you should access Network Connections and determine the state of the connection. If the connection is disabled or disconnected, this should be shown. Right-click the connection and select Enable or Diagnose as appropriate. If the connection is already enabled, you will need to modify the IP address settings for the connection.
- If the IP address is dynamically assigned, make sure that another computer on the network isn't using the same IP address. You can do this by disconnecting the network cable for the computer that you are working with and pinging the IP address in question. If you receive a response from the PING test, you know that another computer is using the IP address. This computer probably has an improper static IP address or a reservation that isn't set up properly.
- If the IP address appears to be set correctly, check the subnet mask, gateway, DNS, and WINS settings by comparing the network settings of the computer you are troubleshooting with those of a computer that is known to have a good network configuration. One of the biggest problem areas is the subnet mask. When subnetting is used, the subnet mask used in one area of the network might look very similar to that of another area of the network. For example, the subnet mask in one IPv4 area might be 255.255.255.240, and it might be 255.255.255.248 in another IPv4 area.

When you are using static IP addressing, you can check the current IPv4 or IPv6 settings by entering **ipconfig /all** at a command prompt. The display of the **ipconfig /all** command includes IPv4/IPv6 addresses, default routers, and DNS servers for all interfaces. You can also check IPv4 and IPv6 addressing separately. To check the IPv4 addressing configuration, enter **netsh interface ipv4 show address**. To check IPv6 addressing, enter **netsh interface ipv6 show address**. To use Netsh to show the configuration of a remote computer use the **-r RemoteComputerName** command line option. For example, to display the configuration of the remote computer named CORPSEVER26, you would enter **netsh -r corpserver26 interface ipv4 show address**.

To make changes to the configuration of IP interfaces, use the **netsh interface ipv4 set interface** and **netsh interface ipv6 set interface** commands. To add the IP addresses of DNS servers, use the **netsh interface ipv4 add dns** and **netsh interface ipv6 add dns** commands.

## Diagnosing and Resolving Routing Problems

As part of troubleshooting, you can verify the reachability of local and remote destinations. You can ping your default router by its IPv4 or IPv6 address. You can obtain the local IPv4 address of your default router by entering **netsh interface ipv4 show routes**. You can obtain the link-local IPv6 address of your default router by entering **netsh interface ipv6 show routes**. Pinging the default router tests whether you can reach local nodes and whether you can reach the default router, which forwards IP packets to remote nodes.

When you ping the default IPv6 router, you must specify the zone identifier (ID) for the interface on which you want the ICMPv6 Echo Request messages to be sent. The zone ID for the default router is listed when you enter the `ipconfig /all` command.

If you are able to ping your default router, ping a remote destination by its IPv4 or IPv6 address. If you are unable to ping a remote destination by its IP address, there might be a routing problem between your node and the destination node. Enter **tracert -d IPAddress** to trace the routing path to the remote destination. You use the `-d` command-line option to speed up the response by preventing Tracert from performing a reverse DNS query on every near-side router interface in the routing path.

The inability to reach a local or remote destination might be due to incorrect or missing routes in the local IP routing table. To view the local IP routing table, enter the **netsh interface ipv4 show routes** or **netsh interface ipv6 show routes** command. Use the command output to verify that you have a route corresponding to your local subnet. The route with the lowest metric is used first. If you have multiple default routes with the same lowest metric, you might need to modify your IP router configuration so that the default route with the lowest metric uses the interface that connects to the correct network.

You can add a route to the IP routing table by using the **netsh interface ipv4 add route** or **netsh interface ipv6 add route** command. To modify an existing route, use the **netsh interface ipv4 set route** or the **netsh interface ipv6 set route** command. To remove an existing route, use the **netsh interface ipv4 delete route** or **netsh interface ipv6 delete route** command.

If you suspect a problem with router performance, use the **pathping -d IPAddress** command to trace the path to a destination and display information on packet losses for each router in the path. You use the `-d` command-line option to speed up the response by preventing Pathping from performing a reverse DNS query on every near-side router interface in the routing path.

## INSIDE OUT

### Checking IPSec policies and Windows Firewall

The problem with reaching a destination node might be due to the configuration of Internet Protocol Security (IPSec) or packet filtering. Check for IPSec policies that have been configured on the computer having the problem, on intermediate IPv6 routers, and on the destination computer. On computers running Windows XP or later, IPSec is configured using Windows Firewall With Advanced Security.

In many cases, packet filtering is configured to allow specific types of traffic and discard all others, or to discard specific types of traffic and accept all others. Because of this, you might be able to view Web pages on a Web server, but not ping the Web server by its host name or IP address.

Each network connection configured on a computer can be enabled or disabled in the Windows Firewall. When enabled, IPv4 and IPv6 drop incoming requests. During troubleshooting, you can disable the Windows Firewall for a specific IPv4 or IPv6 interface with the **netsh interface ipv4 set interface interface=NameOrIndex firewall=disabled** and **netsh interface ipv6 set interface interface=NameOrIndex firewall=disabled** commands. You can also completely turn off the Windows Firewall with the **netsh firewall set opmode disable** command. Don't forget to reenab the firewall when you are done troubleshooting.

## Releasing and Renewing DHCP Settings

DHCP servers can assign many network configuration settings automatically, including IP addresses, default gateways, primary and secondary DNS servers, primary and secondary WINS servers, and more. When computers use dynamic addressing, they are assigned a lease on a specific IP address. This lease is good for a specific time period and must be renewed periodically. When the lease needs to be renewed, the computer contacts the DHCP server that provided the lease. If the server is available, the lease is renewed and a new lease period is granted. You can also renew leases manually as necessary on individual computers or by using the DHCP server itself.

Problems that prevent network communications can occur during the lease assignment and renewal process. If the server isn't available and cannot be reached before a lease expires, the IP address can become invalid. If this happens, the computer might use the alternate IP address configuration to set an alternate address, which in most cases has settings that are inappropriate and prevent proper communications. To resolve this problem, you'll need to release and then renew the DHCP lease.

Another type of problem occurs when users move around to various offices and subnets within the organization. While moving from location to location, their computers might obtain DHCP settings from the wrong server. When the users return to their offices, the computer might seem sluggish or perform incorrectly because of the settings assigned by the DHCP server at another location. If this happens, you'll need to release and then renew the DHCP lease.

You can use the graphical interface to release and renew DHCP leases by following these steps:

1. Click Start and then click Network. In Network Explorer, click Network And Sharing Center on the toolbar.
2. In Network And Sharing Center, click Manage Network Connections. In Network Connections, right-click the connection you want to work with and then select Diagnose.
3. After Windows Network Diagnostics tries to identify the problem, a list of possible solutions is provided. If the computer has one or more dynamically assigned IP addresses, one of the solutions should be Automatically Get New IP Settings.... Click this option.

You can also follow these steps to use the IPCONFIG command to renew and release settings:

1. Start an elevated command prompt.
2. To release the current settings for all network adapters, type **ipconfig /release** at the command line. Then renew the lease by typing **ipconfig /renew**.
3. To renew a DHCP lease for all network adapters, type **ipconfig /renew** at the command line.
4. You can check the updated settings by typing **ipconfig /all** at the command line.

#### Note

If a computer has multiple network adapters and you only want to work with one or a subset of the adapters, specify all or part of the connection name after the **ipconfig /renew** or **ipconfig /release** command. Use the asterisk as a wildcard to match any characters in a connection's name. For example, if you want to renew the lease for all connections with names starting with *Loc*, type the command **ipconfig /renew Loc\***. If you want to release the settings for all connections containing the word *Network*, type the command **ipconfig /release \*Network\***.

## Diagnosing and Resolving Name Resolution Issues

When you can reach a destination using an IP address but not reach a host using a host name, you might have a problem with host name resolution. Typically, name resolution issues have to do with improper configuration of the DNS client or problems with DNS registration. You can use the following tasks to troubleshoot problems with DNS name resolution:

- Verify DNS configuration

- Test DNS name resolution with the Ping tool
- Use the Nslookup tool to view DNS server responses
- Display and flush the DNS client resolver cache

On the computer having DNS name resolution problems, verify the following information:

- Host name
- The primary DNS suffix
- DNS suffix search list
- Connection-specific DNS suffixes
- DNS servers

You can obtain this information by entering **ipconfig /all** at a command prompt. To obtain information about which DNS names should be registered in DNS, enter **netsh interface ip show dns**.

Computers running Windows Vista and Windows Server 2008 support DNS traffic over IPv6. By default, IPv6 configures the well-known site-local addresses of DNS servers at FEC0:0:0:FFFF::1, FEC0:0:0:FFFF::2, and FEC0:0:0:FFFF::3. To add the IPv6 addresses of your DNS servers, use the properties of the Internet Protocol Version 6 (TCP/IPv6) component in Network Connections or **the netsh interface ipv6 add dns** command. To register the appropriate DNS names as IP address resource records with DNS dynamic update, use the **ipconfig /registerdns** command. Computers running Windows XP or Windows Server 2003 do not support DNS traffic over IPv6.

TCP/IP checks the DNS client resolver cache before sending DNS name queries. The DNS resolver cache maintains a history of DNS lookups that have been performed when a user accesses network resources using TCP/IP. This cache contains forward lookups, which provide host name to IP address resolution, and reverse lookups, which provide IP address to host name resolution. After a DNS entry is stored in the resolver cache for a particular DNS host, the local computer no longer has to query external servers for DNS information on that host. This enables the computer to resolve DNS requests locally, providing a quicker response.

How long entries are stored in the resolver cache depends on the Time to Live (TTL) value assigned to the record by the originating server. To view current records and see the remaining TTL value for each record, type **ipconfig /displaydns** in an elevated command prompt. These values are given as the number of seconds that a particular record can remain in the cache before it expires. These values are continually being counted down by the local computer. When the TTL value reaches zero, the record expires and is removed from the resolver cache.

Occasionally, you'll find that you need to clear out the resolver cache to remove old entries and enable computers to check for updated DNS entries before the normal expiration and purging process takes place. Typically, this happens because server IP

addresses have changed and the current entries in the resolver cache point to the old addresses rather than the new ones. Sometimes the resolver cache itself can get out of sync, particularly when DHCP has been misconfigured.

### Note

Skilled administrators know that several weeks in advance of the actual change, they should start to decrease the TTL values for DNS records that are going to be changed. Typically, this means reducing the TTL from a number of days (or weeks) to a number of hours, which allows for quicker propagation of the changes to computers that have cached the related DNS records. After the change is completed, administrators should restore the original TTL value to reduce renewal requests.

In most cases, you can resolve problems with the DNS resolver cache by either flushing the cache or reregistering DNS. When you flush the resolver cache, all DNS entries are cleared out of the cache and new entries are not created until the next time the computer performs a DNS lookup on a particular host or IP address. When you reregister DNS, Windows Server 2008 attempts to refresh all current DHCP leases and then performs a lookup on each DNS entry in the resolver cache. By looking up each host or IP address again, the entries are renewed and reregistered in the resolver cache. You'll generally want to flush the cache completely and allow the computer to perform lookups as needed. Reregister DNS only when you suspect problems with DHCP and the DNS resolver cache.

You can test DNS name resolution by pinging a destination using its host name or fully qualified domain name (FQDN). If an incorrect IP address is shown, you can flush the DNS resolver cache and use the Nslookup tool to determine the set of addresses returned in the DNS Name Query Response message.

You can use the IPCONFIG command to flush and reregister entries in the DNS resolver cache by following these steps:

1. Start an elevated command prompt.
2. To clear out the resolver cache, type **ipconfig /flushdns** at the command line.
3. To renew DHCP leases and reregister DNS entries, type **ipconfig /registerdns** at the command line.
4. When the tasks are complete, you can check your work by typing **ipconfig /displaydns** at the command line.

To start Nslookup, enter **Nslookup** at a command prompt. At the Nslookup > prompt, use the **set d2** command to get detail information about DNS response messages. Then, use Nslookup to look up the desired FQDN. Look for A and AAAA records in the detailed display of the DNS response messages.

With IPv6, the DNS client maintains a neighbor's cache of recently resolved link-layer addresses as well as a standard resolver cache. To display the current contents of the neighbor cache, enter **netsh interface ipv6 show neighbors**. To flush the neighbor's cache, enter **netsh interface ipv6 delete neighbors**.

For IPv6, the DNS client also maintains a destination cache. The destination cache stores next-hop IPv6 addresses for destinations. To display the current contents of the destination cache, enter **netsh interface ipv6 show destinationcache** command. To flush the destination cache, enter **netsh interface ipv6 delete destinationcache**.

# Index

## Symbols and Numbers

.NET Framework 3.0, 188  
64-bit computing, 7–8. *See also* Itanium-based servers

## A

### access control

access permissions for files and folders, 571–578  
Active Directory related features, list of, 989–990  
entries. *See* ACEs (access control entries)  
lists. *See* ACLs (access control lists)  
systems, physical, 1315  
user account control. *See* UAC (User Account Control)

### account policies. *See also* Group Policy

Account Policies, editing with default GPOs, 1247–1249  
configuring user policies, 1169–1170  
Group Policy objects. *See* GPOs (Group Policy objects)  
Kerberos policy settings, 1169, 1173  
local user accounts, 1169  
location of, 1169  
lockout policy, 1172, 1247  
password policy enforcement, 1170–1171  
password settings object creation, 1173–1176

### accounts

Accounts: Rename Administrator Account policy, 1248  
Accounts: Rename Guest Account policy, 1248  
Administrator. *See* Administrator account  
authentication of. *See* authentication  
built-in capabilities of, 1178  
contact accounts, 1168  
creating user accounts, 1184–1187  
default user accounts, 1168  
domain. *See* domain user accounts  
expiration options for, 1192  
Guest account, 1168  
InetOrgPerson. *See* InetOrgPerson accounts  
local. *See* local user accounts  
membership in groups, 1178  
naming accounts, 1168  
OUs, placing in, 1136  
permissions of. *See* permissions  
policies for. *See* account policies  
RODC password replication policies, 1148, 1158–1159

user. *See* user accounts  
user account control. *See* UAC (User Account Control)

ACEs (access control entries), 1188

ACLs (access control lists)

Active Directory, role in, 988

RODCs, for, 1158

ACPI (Advanced Configuration and Power Interface), 379–382

ACPI BIOS, 240–241

Act As Part Of The Operating System privilege, 1178

activation of Windows Server 2008

process for, 88–90

viewing status of, 126–127

### Active Directory

administering. *See* Active Directory Users And Computers snap-in

architecture of. *See* Active Directory architecture

attribute management, 1014–1016, 1076

authoritative restores of, 1412–1414

backup strategies for, 1409–1410

backups for installation media creation, 1127–1128  
bridgehead servers role, 58. *See also* bridgehead servers

building blocks, logical, 1053

business requirements for, 1053–1054

changing structure of, 1061–1062

classes of objects, 1014

client connection requirements, 1111

compatibility issues, 1016–1020

Computer objects, 1014

configuration containers in a forest, 1055

Contact objects, 1014

counters for, 1303–1304

CPUs, requirements for, 1108

creating domain controllers for existing domains, 1114–1122

data store architecture, 995–997

delegation of administrative rights, 1064–1065, 1136–1139

designing systems of. *See* Active Directory system design

DHCP authorization, 689

DHCP set up with, 696, 698, 701

**Active Directory, *continued***

Directory Services log, 328  
 DNs (distinguished names), 1003–1004  
 DNS zones, Active Directory–integrated type, 752–755  
 domain architecture design for, 50  
 Domain objects, 1014  
 Domain Rename utility, 1061–1062  
 domain trees. *See* trees, Active Directory  
 domain trust design, 55  
 domains. *See* domains, Active Directory  
 failed domain controllers, removing references to, 1415–1416  
 failover clustering, configuration for, 1351  
 forests. *See* forests, Active Directory  
 functional levels, 1016–1020  
 global catalog server role, 58. *See also* global catalog servers  
 Group objects, 1014  
 group policy. *See* Group Policy  
 InetOrgPerson objects, 1014, 1063  
 infrastructure masters, 57  
 inheritance of permissions, 1137  
 installing. *See* installing Active Directory  
 installing DNS Server service with, 767–771  
 KCCs. *See* KCC (knowledge consistency checker)  
 links. *See* site links  
 LSA (Local Security Authority), 988–989  
 managing. *See* Active Directory Users And Computers snap-in  
 media, installing from, 1126–1129  
 memory requirements, 1108  
 namespace design, 54–55  
 nonauthoritative restores of, 1411–1412  
 operations master role, 57. *See also* operations masters  
 OS support issues, 1016–1018  
 OUs. *See* OUs (organizational units)  
 PDC emulators, 57  
 Performance Monitor counters for, 1303–1304  
 planning deployments, 54–58  
 PrintQueue objects, 1014  
 read-only domain controllers. *See* RODCs (read-only domain controllers)  
 recovery on SANs, 1110–1111  
 RID masters, 57  
 RODCs. *See* RODCs (read-only domain controllers)  
 Schema snap-in, 1047  
 Server objects, 1014  
 server roles, planning for, 57–58  
 share information, publishing, 552  
 site concept, 58. *See also* sites, Active Directory  
 Site objects, 1014

snap-ins, 163  
 Subnet objects, 1014  
 System State files, 1110–1111, 1129  
 system volume. *See* Sysvol  
 Sysvol replication, 1077–1082. *See also* Sysvol SYSVOL\$ shares, 555  
 task delegation, 1138–1139  
 tools for administering, table of, 107  
 transactional processing, 993–995, 1076  
 trees. *See* trees, Active Directory  
 troubleshooting trust relationships, 1039–1040  
 trust relationships. *See* trusts  
 uninstalling, 1129–1133  
 User objects, 1014  
 Windows Vista with, 10–11

**Active Directory architecture**

ACLs, 988  
 administrator types, 1002  
 attributes of objects, 998  
 authentication mechanisms, list of, 989  
 authentication procedure, 990  
 Checkpoint file, 995  
 common names of objects, 1003  
 Configuration containers, 1004  
 containers, 998  
 data file types, 995–996  
 data store architecture, 995–997  
 Database Layer, 992–993  
 directory service component, 990–993  
 directory trees, 999–1000  
 DNs (distinguished names), 1003–1004  
 domains, 999, 1004. *See also* domains, Active Directory  
 ESE (Extensible Storage Engine), 993–995, 997  
 external trusts, 1003  
 Forest Root Domain containers, 1004  
 forests, 1000–1001. *See also* forests, Active Directory  
 global catalog servers, 1006  
 group policy, role of, 988  
 GUIDs, 992  
 indexed tables, 996  
 LDAP, 991, 998–999  
 log files, 995–997  
 logical architecture overview, 997–998  
 logon/access features used with, 989–990  
 MAPI, 992  
 multimaster approach to replication, 991–992, 1085  
 names of objects in data store, 992  
 NET LOGON, 989  
 object class types, 998  
 objects, 988, 998–999  
 operations masters. *See* operations masters

- OUs. *See* OUs (organizational units)
- partitions, 1005–1006
- physical layer overview, 987–988
- primary data files, 995–997
- purpose of Active Directory, 987
- RDNs, 1003
- replication support, 991–993
- RODC design considerations, 1145–1148
- root domains, 1000, 1003–1004
- rootDSE objects, 1003–1004
- SAM with, 990, 992
- Schema containers, 1004
- schemas, 993, 998–999, 1055
- security descriptor tables, 996
- security subsystem key areas, 989–990
- security subsystem, relation to, 987
- shortcut trusts, 1003
- SIDs (security identifiers), 993
- sites. *See* sites, Active Directory
- Temporary data files, 995
- tombstoned objects, 994–995
- top-level view of, 987–988
- transaction logs, 994
- trust paths, 1002–1003
- trust relationships, 988, 1001–1003
- user mode, 987
- Windows NT 4 with, 992
- Active Directory Domain Services Installation Wizard.**
  - See* installing Active Directory
- Active Directory Domains And Trusts tool**
  - creating trusts with, 1035–1038
  - raising functional levels, 1019–1020
  - Trust Type property, 1034
  - UPN suffixes, adding, 1021
  - validating trust relationships, 1039–1040
  - viewing existing trusts, 1033–1035
- Active Directory Migration Tool.** *See* ADMT (Active Directory Migration Tool)
- Active Directory Schema snap-in, 1047**
- Active Directory Sites And Services**
  - bridgehead servers, configuring as preferred, 1300–1301
  - changing forest connected to, 1284
  - creating sites, 1283–1285
  - domain controllers, associating with sites, 1286–1287
  - global catalog server designation, 1012–1013
  - site link bridges, configuring, 1295–1297
  - site link creation, 1289–1292
  - starting, 1012
  - subnet creation, 1285
  - subnets, associating with, 1285–1286
  - universal group membership caching, 1021–1022
- Active Directory system design**
  - attribute management, 1014–1016
  - authentication design overview, 1020
  - building blocks for, 1053
  - business requirements for, 1053–1054
  - compatibility issues, 1016–1020
  - cross-forest transitive trusts, 1030–1032
  - delegating authentication, 1040–1043
  - domain functional level, 1016–1018
  - domain planning overview, 1058–1059
  - elements of, 1007
  - Exchange Server 2007 with, 1014
  - federated forest design, 1030–1032
  - forest function level, 1018–1020
  - forests. *See* forests, Active Directory
  - global catalog access, 1011–1013
  - Kerberos for authentication, 1023–1026
  - LDAP, 1010
  - multimaster replication model, 1008
  - NTLM (NT LAN Manager), 1023–1024
  - operations masters. *See* operations masters
  - OS support issues, 1016–1018
  - OUs. *See* OUs (organizational units)
  - planning overview, 1007–1008, 1053–1054
  - read-only domain controllers, 1008
  - relative names of objects, 1010–1011
  - replication attribute designation, 1014–1016
  - replication design, 1008–1009. *See also* replication
  - resource access process, 1025–1026
  - RODC design considerations, 1145–1148
  - security tokens, 1020–1022
  - session tickets, 1025–1026
  - shortcut trusts, 1028–1029
  - single vs. multiple domains, 1060–1061
  - single vs. multiple forests, 1056–1057
  - sites. *See* sites, Active Directory
  - trees, searching, 1010–1011. *See also* trees, Active Directory
  - trusts. *See* trusts
  - two-way transitive trusts, 1027–1028
  - universal groups, 1020–1022
  - UPNs (user principal names), 1021
  - Windows Server 2008 domain functional level features, 1018
  - writable domain controllers, 1008
- Active Directory Users And Computers snap-in**
  - account options, managing, 1189–1192
  - adding members to groups, 1222
  - administration, delegation of, 1137–1139
  - computer account management, 1225–1231
  - computer account property configuration, 1229–1230
  - creating computer accounts, 1225–1226

- Active Directory Users And Computers snap-in, *continued*
  - creating domain user accounts, 1184–1187
  - creating groups, 1220
  - default accounts, listing, 1168
  - delegated authentication, 1041–1043
  - deleting computer accounts, 1228
  - disabling computer accounts, 1228
  - finding shared folders, 552
  - group properties, editing, 1223–1224
  - infrastructure master role, managing, 1050–1051
  - joining computers to domains, 1226–1227
  - managing computer accounts remotely, 1228
  - Member Of tab, 1188
  - moving computer accounts, 1227
  - moving groups, 1224
  - OU creation with, 1133–1134
  - Password Settings group creation, 1173–1176
  - PDC emulator role, managing, 1050
  - purpose of, 153
  - queries, saving, 1223
  - renaming groups, 1224
  - renaming user accounts, 1211–1212
  - resetting passwords for computer accounts, 1228–1229
  - resetting user account passwords, 1212–1213
  - RID (relative ID) role, managing, 1048–1050
  - RODC Password Application Policy, editing, 1160–1162
  - sending mail to groups, 1224
  - taskpad example, 174
  - unlocking user accounts, 1213–1214
  - user account properties, viewing and setting, 1187–1188
- active partitions, 77, 429
- Active/Active controller model, 411
- AD CS (Active Directory Certificate Services), 186
- AD DS (Active Directory Domain Services)
  - described, 186
  - installing, 1114. *See also* installing Active Directory
- AD FS (Active Directory Federation Services), 186
- AD LDS (Active Directory Lightweight Directory Services), 186
- AD RMS (Active Directory Rights Management Services), 186
- Add Features Wizard
  - starting, 114
  - Windows Server Backup, installing, 1388
- Add Hardware Wizard, 235–236
- Add Roles Wizard
  - RODC installations with, 1150
  - starting, 114
  - Terminal Services installation, 936–938
- Add Workstations To Domain privilege, 1178
- Add/Remote Programs utility, 285–286
- address classes. *See* classes of networks
- Address toolbar, 149–150
- addresses, IP. *See* IP addresses
- Adjust Memory Quotas For A Process privilege, 1178
- Admin Approval Mode, 290–293
- ADMIN\$ shares, 554
- administration
  - Active Directory, of. *See* Active Directory Users And Computers snap-in
  - delegation of administrative rights using OUs, 1064–1065
  - delegation of, for Active Directory objects, 1136–1139
  - planning deployments, 51–54
  - planning, reviewing for, 42–43
  - remote. *See* Remote Desktop for Administration tools for. *See* administration tools
  - tools, legacy compatibility issues, 52
- administration tools
  - Active Directory tools, 107
  - Administrative Tools menu, 106–110
  - availability of, 109
  - Certification Authority tool, 107
  - command-line utilities, 110–111
  - Computer Management console, 115–116
  - computer specification for, 109
  - Control Panel utilities. *See* Control Panel
  - Data Sources (ODBC) tool, 107
  - DFS Management tool, 107
  - Event Viewer tool, 107
  - Failover Cluster Management tool, 107
  - File Server Resource Manager tool, 107
  - Initial Configuration Tasks console, 113–114
  - installing, 109–110
  - installing full tool set, 160–161
  - Net tools, 111–112
  - Network Policy Server tool, 108
  - overview of, 105–106
  - PowerShell, 112–113
  - Registry, effect of tools on, 248
  - Reliability And Performance Monitor, 108
  - Server Manager. *See* Server Manager console
  - Services tool, 108
  - Storage Explorer, 108
  - System console, 126–128
- administrative shares, 553–555
- Administrative Templates, Group Policy, 1235
- Administrative Tools menu, 385–388
- Administrator account
  - Accounts: Rename Administrator Account policy, 1248
  - defined, 1168
  - renaming, 1168
  - strong passwords recommended, 88
- administrator applications, 295

- administrator tokens
  - application integrity, assuring
  - defined, 247
- administrators
  - domain, 1002
  - enterprise, 1002
  - forests, roles in, 1055
- Administrators group
  - default logon rights assigned to, table of, 1181-1182
  - default privileges assigned to, table of, 1178-1181
  - roaming user profiles, adding to, 1197
- ADMT (Active Directory Migration Tool), 1061
- ADMX files, 1237-1238
- Advanced Boot Options menu, 383
- advantages of Windows Server 2008, 3-4
- aliases, DNS, 797-798
- Allowed RODC Password Replication group, 1159-1160
- alternate IP addressing, 660, 663-665
- AMD-V, 10
- analysis of preexisting system for deployment planning
  - assessing servers and services, 39
  - disaster recovery, 43-44
  - hardware inventories, 39-40
  - licenses, 39
  - localization issues, 39
  - network administration review, 42-43
  - network infrastructure evaluation, 38
  - network management tools, assessing, 44
  - network map creation, 38
  - network services and applications identification, 40-41
  - project worksheets, 37
  - purpose of, 37
  - remote locations, 38
  - security infrastructure, 41-42
  - storage, 39
  - task in planning sequence, 29
- answer files
  - purpose of, 70
  - specifying in Setup, 70
- APIPA (Automatic Private IP Addressing)
  - troubleshooting, 676-677
  - use with DHCP, 665
- Appearance And Personalization console, 120-122
- application integrity
  - administrator applications, 295
  - administrator user tokens
  - Application Information service, 294
  - compliant applications, 294
  - integrity levels, 297
  - legacy applications, 294
  - overview, 294
  - run levels, 296-299
  - security settings related to, 299-301
  - standard user tokens, 294
  - UAC role in, 294
  - user applications, 295
- Application log, 327
- application servers
  - Application Server, 186
  - defined, 60
- applications
  - high-availability guidelines for, 1309-1311
  - installing. *See* software installation
  - monitoring with Task Manager, 314
  - RemoteApps, making programs available as. *See* RemoteApps
  - run levels, security tokens for, 247
  - running on remote servers. *See* Terminal Services
  - settings, storage of, 247
  - startup problems from, 388
  - Terminal Services compatibility scripts, 942
  - Terminal Services, installing, 939-943
  - virtualization, security tokens for, 247
- Applications and Services logs, 327-328
- Apply Group Policy permission, 1259-1261
- architecture of Windows Server 2008
  - boot environment, 13-14
  - DNS design, 762-765
  - kernel architecture, 11-13
  - Network Diagnostics Framework, 15-18
  - support architecture, 14-25
- architecture, Active Directory. *See* Active Directory architecture
- architecture, network
  - domain architecture, 50
  - team for planning, 31
- archives
  - archive attribute, 1385
  - media rotation, 1386-1387
  - media types supported, 1387
- atomic permissions, 575
- attributes
  - Active Directory architecture object attributes, 998
  - file and folder, 567
  - multi-valued directory attributes, 1159
  - nonresident NTFS attributes, 504
  - OUs attributes, editing, 1135
  - Read Attributes special permission, 573
  - Read Extended Attributes special permission, 574
  - resident NTFS attributes, 503
  - Write Attributes special permission, file sharing, 574

**auditing**

- file and folder access, 581–585
- logging, DHCP, 727–729
- printer access, 884
- Registry access, 283–284
- Security log, 327
- systemic procedures for, 1319–1320
- Terminal Services access, 964–966

**Authenticated Users group**

- default logon rights assigned to, table of, 1181
- default privileges assigned to, table of, 1178

**authentication**

- Active Directory related mechanisms, list of, 989
- computer accounts, troubleshooting, 1230–1231
- cross-forest transitive trusts, 1030–1032
- delegation overview, 1040–1041. *See also* delegating authentication
- design overview, 1020
- forwarded tickets, 1040
- Kerberos for, 1023–1026
- NTLM (NT LAN Manager), 1023–1024
- outgoing trust authentication levels, 1038
- proxy tickets, 1040
- RODC process for, 1144–1145
- security token generation, 1020–1022
- session tickets, KDC server, 1025–1026
- session tickets, Kerberos policy settings, 1173
- Terminal Services, for, 937
- trust paths, 1002–1003
- trusts. *See* trusts
- universal group membership caching, 1020–1022

**authoritative restores of Active Directory, 1412–1414****Automatic Black Hole Router Detection, 631****Automatic Dead Gateway Retry, 631****Automatic Updates, 11****availability**

- 99.9 percent uptime goal, 1309
- application requirements for, 1310
- checklist for application deployments, 1311
- clustering servers to improve. *See* clusters, server facilities design. *See* structures and facilities
- failover capabilities. *See* failover clustering
- fault tolerance for, 1312. *See also* fault tolerance
- hardware deployment process, 1312
- hardware planning checklists, 1313
- hardware standardization for high availability, 1311–1312
- hardware strategy for, 1311–1313
- high, defined, 1309
- highly available server deployment, 1321–1322
- integrated testing of applications for, 1310
- noncritical system goals, 1309
- operational plan for. *See* operations management

- power supply redundancy, 1314
- predeployment planning checklist, 1322
- redundancy, components for improving, 1312
- server types, standardization by, 1312
- spare parts, 1312
- standardized components for system services, 1310
- standardized deployment process, 1310
- standby systems, 1312

**B****backups**

- Active Directory backup procedure, 1409–1410
- Active Directory requirements, 1110–1111
- archive attribute, 1385
- Back Up Files And Directories privilege, 1178
- command-line tools for, 1387
- configuring backup type, 1389
- copy backups, 1385
- daily backups, 1385
- data considerations, 1382–1383
- destination selection, 1398
- DHCP backups, 1384
- differential backups, 1385–1386
- disaster preparedness procedures, 1373–1374
- disaster preparedness, relation to, 1384. *See also* disaster planning
- DNS backups, 1384
- DVDs for, 1390
- event logs for, 1400–1401
- file server backups, 1384
- group membership required for, 1388
- Group Policy backups, 1278–1280, 1384
- importance of, 1381
- incremental backups, 1385–1386
- installing Windows Server Backup, 1388
- manual backups, 1396–1400
- media rotation, 1386–1387
- normal backups, 1385–1386
- one-time backups, 1396–1400
- optimal technique selection, 1383–1385
- plans for, 1318–1319
- print server, 912–913, 1384
- programs for, 1384, 1388
- recommended strategy for, 1383
- recovering data. *See* recovery
- Registries, 272
- scheduling, 1391–1395
- services, backup functions of, 1383–1384
- Shadow Copy API advantages for, 1383
- starting Windows Server Backup, 1388
- storage location selection, 1390
- strategy considerations, 1382–1383
- strategy creation questions, 1381–1382

- system file considerations, 1382–1383
- volume specification for, 1390–1391
- VSS for file servers, 1384. *See also* VSS (Volume Shadow Copy Service)
- Wbadm command, 1387, 1390
- Windows Firewall settings for, 1390
- Windows Server Backup feature, 190
- Windows Server Backup overview, 1387
- WINS backups, 1384
- baselines for performance, establishing, 344
- basic disks
  - compared with dynamic type, 428–430
  - conversions to and from dynamic type, 430–432
  - ESP partition type, 449–450
  - LDM partitions, 451–452
  - managing GPT partitions on, 449–452
  - managing MBR partitions, 434–448
  - MSR partitions, 450–451
  - OEM partitions, 452
  - primary partitions, 451
- basic folder permissions, table of, 572
- BCD (Boot Configuration Data) stores
  - boot sequence, temporarily changing, 404
  - commands, table of, 389–390
  - creating entries, 394–395
  - creating new, 393–394
  - Debugger Settings entries, 397
  - default operating system entry selection, 403
  - deleting entries, 395
  - deleting options, 395–396
  - DEP (Data Execution Prevention) options, 402
  - Editor, 388–390
  - EMS Settings entries, 396–397
  - entries in, 388
  - exporting, 394
  - guidelines for modifying, 390
  - GUIDs with, 392
  - Hypervisor Settings entries, 397
  - importing, 394
  - multiple operating systems with, 393
  - operating system display order, 402–403
  - options for boot application entries, 399
  - options for Windows OS Loader applications, 400–401
  - PAE mode options, 402
  - properties, table of, 391
  - purpose of, 382–383
  - registry for, 382
  - Resume from Hibernate entries, 396
  - sample listing, 390–391
  - setting entry values, 395
  - system BCD stores, 390
  - timeout default, setting, 404
  - viewing entries, 390–393, 396–397
  - well-known identifiers, 392
  - Windows Legacy OS Loader entries, 396
  - Windows Memory Tester entries, 396
- BIOS (basic input/output system)
  - ACPI requirement, 379
  - entering during boots, 380
  - legacy boots, 382
- BirthObjectIDs, 516
- BirthVolumeIDs, 516
- BitLocker Drive Encryption
  - boot file validation, 477
  - boot issues, 382
  - data volume encryption, 493–494
  - decrypting data volumes, 495
  - defined, 188
  - deploying, 478–480
  - disabling, 495
  - Drive Preparation Tool, 484–485
  - enabling encryption with PINs, 491
  - enabling encryption with startup keys, 488–491
  - FIPS, 481
  - installing, 485
  - keys for volumes, 481
  - listing encrypted volumes, 492
  - non-TPM operation of, 477–478
  - partitions for, 479–480, 482–485
  - password management, 492–493
  - performance issues, 477
  - PIN management, 492–493
  - PINs, role of, 491–492
  - planning for, 479
  - policy settings for, 480–481, 486–487
  - purpose of, 11, 477
  - readiness test, 485–486
  - recovering data, 494–495
  - Recovery mode, 477–478
  - recovery passwords, 487–488
  - remote administration issues, 478
  - setup steps, overview, 481–482
  - Startup Key Only mode, 478
  - startup keys, 488–491
  - system vs. data volume encryption, 481
  - TPM and PIN mode, 478
  - TPM and Startup Key mode, 478
  - TPM with, 468, 477–478
  - TPM-Only mode, 478
  - USB flash startup keys, 478
  - Windows Vista vs. Windows Server 2008 versions, 479
- BITS (Background Intelligent Transfer Service) Server Extensions, 188

**boot configuration**

- ACPI requirement, 379
  - Advanced Boot Options menu, 383
  - applications problems, 388
  - BCD stores. *See* BCD (Boot Configuration Data) stores
  - BIOS legacy boots, 382
  - BitLocker boots, 382
  - boot environment layer, 382–383
  - boot loader applications, list of, 388
  - boot sequence, temporarily changing, 404
  - CPUs, specifying number to use, 386
  - DEP (Data Execution Prevention) options, 402
  - desktop class system issues, 377
  - EFI legacy boots, 382
  - firmware boot settings, 381–382
  - firmware types, 379
  - firmware, entering during boots, 380
  - hardware capabilities, 379–382
  - memory, specifying amount to use, 386
  - msconfig.exe command, 385–388
  - No GUI boots, 386
  - overview, 13–14, 377
  - partition styles, 382
  - power settings in firmware, 380–381
  - power state management capabilities, 379–382
  - power state options, 379–380
  - Safe Boot modes, 386
  - SANs, booting from, 409–411
  - services problems, 387
  - Startup And Recovery dialog box, 384–385
  - startup control within boot environment, 382–383
  - startup issues compounded in 2008, 377
  - Startup Repair Tool, 1408–1409
  - System Configuration, 385–388
  - timeout default, setting, 404
  - TPM for boot file validation, 468
  - Windows Boot Loader, 383
  - Windows Boot Manager, 383
  - Windows Vista power state management, 378
- boot partitions**
- defined, 77
  - mirrored boot volumes, 459–462
  - system partition allowed with, 429
- BOOTP (Bootstrap Protocol), 685**
- bottlenecks**
- disk I/O, 360–362
  - memory, 356–358
  - network-based, 362–363
  - overview of, 356
- bridgehead servers**
- configuring, 1298–1301
  - defined, 58
  - intersite replication with, 1089–1091

- listing for sites, 1298
- multiple, 1094–1095
- preferred servers, 1299–1301
- replication attribute options, 1305–1306
- RODCs not allowed as, 1145
- site links, relationship to, 1287
- sites, role in, 1072
- testing replication, 1305–1306

**bridges, 639**

**broadcast IP addresses, 636–637**

**budget issues, 47–48**

**building phase of MSF (Microsoft Solutions Framework), 28**

**business requirements**

- Active Directory planning for, 1053–1054
- goal assessment task for planning deployments, 34–35
- organizational objectives, specifying, 45–46
- system availability. *See* availability

**business units as OUs (organizational units), 1066**

**Bypass Traverse Checking privilege, 1178**

**C**

**C\$ type drive shares, 554**

**cabling, 1314**

**CALs (client access licenses)**

- CAL Installation Wizard, Terminal Services, 954–957
- defined, 63
- per-server vs. per-user options, 71
- Terminal Services with, 925–927

**CAP12 (CryptoAPI version 2), 18**

**certificates**

- Certification Authority tool, 107
- OCSP (Online Certificate Status Protocol), 18

**change control procedures, 1317–1318**

**change journals, 514–515**

**change logs, 1317**

**change management planning process, 54**

**Change Permissions**

- file sharing, 564
- file special permission, 575
- printer permission, 880

**Change The System Time privilege, 1179**

**Change The Time Zone privilege, 1179**

**Check Disk tool**

- bad sectors, marking, 540
- command-line parameters, table of, 537–538
- dirty, marking disks as, 537
- FAT volumes, analyzing, 538–539
- fixing errors with, 535–537
- NTFS volumes, analyzing, 539–540
- repairing volumes, 540
- Self Healing NTFS alternative to, 520–521
- syntax for, command line, 537

- child domains, 653
- child folders, 569
- CIDR (classless interdomain routing)
  - nonclassful network nature of, 637
  - notation, 640–641
- classes of networks
  - class A network subnets, 642–644
  - class B network subnets, 644–645
  - class C network subnets, 645–646
  - IDs for, 638–639
  - purpose of, 633–635
- clean installations
  - Initial Configuration Tasks console, 87
  - installation step, 87
  - language selection, 86
  - product keys, 85–86
  - rolling back installations, 84
  - starting, 84
  - steps for, 84–88
  - updates during, 85
  - where to install to, choosing, 86–87
- client access licenses. *See* CALs (client access licenses)
- cluster-aware applications
  - failover clustering of, 1348
  - high-availability goals for, 1309–1310
  - redundancy role of clustered systems, 1312
  - service compatibility requirements, 1325
- clusters, file system
  - FAT, 500
  - file system overview, 498–499
  - NTFS, 508
- clusters, server
  - active nodes, 1327–1328
  - application software compatibility with. *See* cluster-aware applications
  - availability goal of, 1324
  - benefits of, 1324–1325
  - Cluster Administrator renamed, 1352
  - Cluster service, 1352–1353
  - failover function. *See* failover clustering
  - failures, causes of, 1324
  - farms, 1325
  - fault tolerance not provided by, 1324
  - high availability, 1323–1324
  - load balancing. *See* NLB (Network Load Balancing)
  - maximum number of nodes supported, 1326
  - multisite options, 1329–1330
  - nodes defined, 1323
  - operating modes, 1327–1328
  - operating system version differences for, 1326
  - organization of servers in, 1325–1326
  - packs, 1325–1326
  - passive nodes, 1327–1328
  - print drivers with, 846
  - purpose of, 1324
  - quorums, 1330
  - redundancy role of, 1312
  - reliability goals, 1324–1325
  - SANs using, 409–411
  - scalability goals, 1325
  - scalability limits, 1326
  - server clusters defined, 1323–1324
  - shadow copy issues, 595
  - three-tier structure for, 1326
- CMAK (Connection Manager Administration Kit), 188
- color printers
  - basics of, 851
  - profiles, configuring, 906–907
- color scheme selection, 120–121
- command-line utilities, list of, 110–111
- Compact command, 523
- compliant applications, 294
- Compound TCP, 631
- compressed (zipped) folders, 524–525
- computer accounts
  - authentication issues, 1230–1231
  - Computer container, 1225
  - computer name, viewing, 1229
  - creating, 1225–1226
  - delegated authentication, 1042–1043, 1229
  - deleting, 1228
  - dial-in settings, 1230
  - disabling, 1228
  - Effective Permissions tool, 1188–1189
  - group membership configuration, 1229
  - group policies for. *See* Group Policy
  - joining computers to domains, 1226–1227
  - Managed By property, 1229
  - managing remotely, 1228
  - moving, 1227
  - properties, configuring, 1229–1230
  - remote install option, 1230
  - resetting passwords, 1228–1229
  - security options, advanced, 1230
  - troubleshooting, 1230–1231
  - user object canonical name, 1229
- Computer Management console
  - components of, 115
  - Computer Management Services And Applications
    - tools, 116
  - Computer Management Storage tools, 116
  - Computer Management System Tools, 115–116
  - creating shares with, 559–562
  - file sharing, 556
  - MMC nature of, 155
  - offline files configuration, 1207–1208

**Computer Management console, *continued***

- publishing shares, 563
- remote device management, 221
- shadow copy configuration, 593–596
- share permission configuration, 565–566
- TS Session Broker authorization, 946–947

**computer names**

- Append Suffixes settings, 667–668
- changing, 127
- viewing, 117, 126
- WINS for resolving, 654–655

**conditional forwarding, DNS**

- benefits of, 754
- configuring, 786–788
- drawbacks of, 756
- purpose of, 748

**configuration tools. *See* administration tools****Configure A DNS Server Wizard, 773–783****configuring TCP/IP networking**

- alternate IP addressing, 660, 663–665
- DNS configuration, 667–669
- dynamic IP addressing, 660, 663–665
- IP address configuration methods, 660–661
- IP address information needed, 657–658
- multiple gateway configuration, 665–666
- overview of, 660
- static IP address assignment, 660–663
- WINS configuration, 669–671

**configuring Windows Server 2008. *See also* specific****configuration topics**

- desktop configuration, 142–143
- menu customization. *See* menu system
- overview of, 129
- Quick Launch, 148–149
- taskbar configuration, 143–148
- toolbar optimization, 148–151

**conflict detection of IP addresses, 734****consoles. *See* MMCs (Microsoft Management Consoles)****contact accounts, 1168****contingency allowances in planning projects, 48–49****Control Panel**

- Appearance And Personalization console, 120–122
- color scheme selection, 120–121
- Date and Time utility, 122–123
- desktop background selection, 121
- display settings for monitors, 122
- Folder Options utility, 123–124
- mouse pointer selection, 121
- overview of utilities in, 106
- Programs And Features page, 287–288
- Regional and Language Options utility, 125
- Registry, effect of tools on, 248

## screen savers, 121

## sound schemes, 121

## themes, 121–122

## Uninstall Or Change A Program utility, 273

## views available, 119–120

**copy backups, 1385****copying items, 135–136****core-server installation type, 80****counters**

## Active Directory counters, 1303–1304

## adding to Performance Monitor, 349–350

## alert configuration, 369–370

## counter list, 352

data collector sets of. *See* data collector sets

## default, 349

## defined, 346–347

## deleting, 350

## disk I/O, 360–362

## display of, 350

## graphing of statistics for, 351

## Histogram Bar view, 353

## memory, 357–358

## Memory\Available Bytes, 357

## Memory\Commit Limit, 357

## Memory\Committed Bytes, 357

## Memory\Page Faults/Sec, 357

## Memory\Pages Input/Sec, 357

## Memory\Pages Output/Sec, 357

## Memory\Pages/Sec, 357

## Memory\Pool Nonpaged Bytes, 358

## Memory\Pool Paged Bytes, 358

## network, 362–363

## Paging File\% Usage, 358

## Paging File\% Usage Peak, 358

## Paste Counter List button, Performance Monitor, 352

## performance objects, table of common, 348–349

## Physical Disk\% Disk Time, 358

## Physical Disk\Avg Disk Queue Length, 358

## Physical Disk\Avg Disk Sec/Transfer, 358

## PhysicalDisk\ counters, 361–362

## print server, 909–912

## Processor\% Privileged Time, 360

## Processor\% Processor Time, 360

## Processor\% User Time, 360

## Processor\Interrupts/Sec, 360

## remote monitoring of, 354–355

## Report view, 353

## sample rates, 351

## System\Processor Queue Length, 360

**CPUs (central processing units)**

## Active Directory requirements for, 1108

## bottlenecks, resolving, 359–360

- counters for, 360
- installation errors caused by, 98–99
- Itanium. *See* Itanium-based servers
- listing types of, 126
- multiprocessor affinity issues, 359
- performance statistics in Reliability And Performance Monitor, 345
- performance statistics in Task Manager, 311–313
- process usage of, 315
- processor scheduling options, 304–305
- requirements by edition, 72–73
- specifying number to use, 386
- WSRM (Windows System Resource Manager), 190
- crash dump partitions, 77, 429
- Create A Pagefile privilege, 1179
- Create A Shared Folder Wizard, 560–562
- Create Files/Write Data special permission, 574
- Create Folders/Append Data special permission, 574
- Create privileges, 1179
- credentials, logon, 1195
- cross-forest transitive trusts, 1030–1032, 1035

## D

- daily backups, 1385
- DAS (direct-attached storage), 405–406
- data collector sets
  - alert configuration, 369–370
  - capabilities of, 363
  - configuration sets, 364, 368
  - creating, 365–367
  - deleting, 365
  - performance counter sets, 364–367
  - purpose of, 343, 363
  - Reliability And Performance Monitor console for, 363–364
  - reports, viewing, 368–369
  - saving as templates, 364
  - startup event traces, 364
  - trace data sets, 364, 367–368
  - types of, 364
- Data Execution Prevention (DEP) options, 402
- data packets. *See* packets
- Data Sources (ODBC) tool, 107
- data streams, 512–513
- database server failover clustering, 1349–1351
- Datacenter edition, Windows Server 2008
  - features of, 6
  - hardware requirements for installations, 72–73
  - selection criteria, 62–63
- Date And Time utility, 122–123
- day-to-day operations. *See* operations management
- Dcgpofix utility, 1282
- Dcpromo command, 1112, 1114, 1129
- Debug Programs privilege, 1179
- Default Domain Controllers Policy GPO
  - purpose of, 1235
  - restoring defaults, 1282
- Default Domain Policy GPO
  - purpose of, 1235
  - restoring defaults, 1282
- defragmenting drives
  - configuring automated, 541–542
  - Disk Defragmenter for, 543–544
  - fragmentation analysis, 545–546
  - fragmentation process, 541
  - shadow copy issues
- delegating authentication
  - account option for, 1192
  - configuring, 1041–1043
  - purpose of, 1040
  - ticket models for, 1040
- delegating management tasks
  - defined, 1249
  - delegating Group Policy management privileges, 1252–1253
  - delegating privileges for links and RSOP, 1253
  - GPO creation rights, 1249–1250
  - reviewing Group Policy management privileges, 1250–1252
- Delete special permission, 574
- Delete Subfolders And Files special permission, 574
- deleting user accounts, 1210–1211
- Denied RODC Password Replication group, 1159–1160
- DEP (Data Execution Prevention) options, 402
- department based groups, 1217
- deployments of applications
  - checklist for, 1311
  - standardized deployment process for high availability, 1310
- deployments of hardware
  - highly available server deployment, 1321–1322
  - standard process checklist, 1312
- deployments of Windows Server 2008
  - MSF deployment phase, 28
  - planning. *See* planning deployments
- designing new networks
  - domain architecture, 50
  - network operations issues, 50–51
  - overall objectives for, 50
  - place in overall design plan, 30
  - security requirements, 51
- Desktop Experience
  - defined, 12–13
  - purpose of, 188
  - recommended, 129
  - Software Explorer, 288

- Desktop toolbar, 150
- desktops, configuring, 142–143
- development teams, 32
- Device Manager
  - conflicting devices, 240–243
  - driver installation steps, 230–232
  - drivers, viewing information about, 224
  - Enable Device command, 225
  - removing drivers, 234
  - Resources tabs for drivers, 227–228
  - rolling back drivers, 233
  - shortcut menu options, 220
  - troubleshooting with, 237–243
  - types of devices displayed, options for, 221
  - viewing devices with, 219–220
  - warning symbols, 220
- devices. *See also* hardware
  - drivers for. *See* drivers
  - installing, 215–221
- DFS (Distributed File System)
  - architecture of, 1081–1082
  - clustering with, 1363
  - DFS command-line tools, 409
  - DFS management tool, 107
  - Dfscmd tool, 409
  - Dfsdiag tool, 409
  - metatdata of, 1080
  - Namespaces, 415, 417–418
  - optimizing File Services with, 415
  - purpose of, 408
  - Replication, 415
  - Replication log, 328
  - sites, Active Directory, effects on, 1073–1074
  - Sysvol replication, 1077–1082
- DHCP (Dynamic Host Configuration Protocol). *See also* DHCP console
  - Active Directory authorization for, 689, 701
  - Active Directory, setting up with, 696, 698
  - APIPA, 665, 676–677
  - audit logging, 727–729
  - autoconfiguration routine, 687–688
  - availability, 693–695
  - backups of, 1384
  - client broadcasts, 689–690
  - clients per server guideline, 686
  - clustering with, 1363
  - configuring network addresses, 663–665
  - conflict detection with, 734
  - conflicting addresses, troubleshooting, 677
  - console. *See* DHCP console
  - database management, 735–737
  - defined, 685
  - DHCP Server, 186
  - DHCPv6 capable clients, 632, 687–688
  - DHCPv6 stateless mode, 698
  - Discover messages, 689–690
  - DNS configuration with, 667, 686, 697, 730, 757
  - domain controller collocation issue, 689
  - dynamic addressing, 660
  - dynamic clients, 685
  - dynamic DNS with, 759–760
  - exclusions, 686, 709, 712–713
  - failover, 693–695
  - fault tolerance, 693–695
  - installing DHCP Server service, 697–700
  - IPCONFIG command for lease control, 680
  - IPv4 autoconfiguration, 687
  - IPv4 messages and relay agents, 689–691
  - IPv6 autoconfiguration, 687–688
  - IPv6 messages and relay agents, 691–693
  - lease audits, 728
  - lease broadcast process, 689–693
  - lease databases, 685
  - lease date stamps, viewing, 673
  - lease duration specification, 705–706
  - lease renewal process, 679–680
  - leases defined, 660
  - limited broadcasts, 637
  - M and O flags, 691–693
  - management console. *See* DHCP console
  - message mechanics, 689–693
  - multiple gateway configuration, 665
  - NAP integration, 731–733
  - Netsh DHCP command, 700
  - NICs, binding to server's, 729
  - normal scope creation, 702–710
  - number of clients per server, 696
  - Offer messages, 689–690
  - planning issues, 60, 689–695
  - relay agents, 691–693, 737–742
  - renewing leases, 690–691
  - Request messages, 689–690
  - reservations, 686, 713–716, 718
  - restoring data, 737
  - Routing and Remote Access Services setup, 737–739
  - RRAS integration, 686–687
  - saving configurations of, 734–735
  - saving data, 737
  - scopes. *See* scopes for IP addresses
  - security issues, 688–689
  - server selection guidelines, 689, 696
  - servers, reservations recommended for, 686
  - setting up servers, overview of, 696–697
  - sites, requirements for, 1073

- standby servers, 696
- startup sequence for clients, 687
- TCP/IP option configuration. *See* TCP/IP options under DHCP
- troubleshooting, 679–680
- user-defined classes, 724–726
- WINS settings, 697
- wireless network security issues, 689
- workgroup setup with, 697
- DHCP console**
  - activation of scopes, 716
  - domain name specification, 706
  - exclusions, 712–713
  - lease duration specification, 705–706
  - normal IPv6 scope configuration, 708–710
  - reservation management, 713–716
  - router address specification, 706
  - scope creation, 702–705
  - starting, 699
  - WINS server specification, 707
- DHCPv6.** *See also* DHCP (Dynamic Host Configuration Protocol)
  - clients, 632, 687–688
  - stateless mode, 698
- diagnostics**
  - key areas, table of, 20–21
  - Network Diagnostics Framework, 15–18
  - overview of, 14–15
  - startups, diagnostic, 385–388
  - WDI (Windows Diagnostics Infrastructure), 19–25
- dial-in settings for computer accounts, 1230
- differential backups, 1385–1386
- direct-attached storage. *See* DAS (direct-attached storage)
- directory. *See* Active Directory
- directory partitions. *See* partitions, directory
- Directory Replicator remote access to Registry requirement, 282
- directory service (Ntdsa.dll)
  - Active Directory with, 992–993
  - defined, 990
  - names of objects, 992
  - replication, role in, 993
  - schemas, 993
  - SIDs, reading, 993
- Directory Services log, 328
- Directory Systems Agent. *See* DSA (Directory Systems Agent)
- directory trees. *See* trees, Active Directory
- disabling user accounts, 1193, 1195, 1211
- disaster planning
  - availability issues. *See* availability
  - backup plans for data, 1370
  - backup procedures, 1373–1374
  - backups, coordinating with, 1384
  - emergency response teams, 1371
  - escalation procedures, 1372–1373
  - fault tolerance, 1370
  - identification of essential systems, 1369–1370
  - incident response teams, 1371
  - Microsoft Product Support, 1375–1376
  - notification procedures, 1372
  - On Screen Keyboard, 1377
  - overview of, 1369
  - physical security, 1370
  - post-action reporting, 1373
  - power protection plan, 1370–1371
  - preparedness procedures list, 1373
  - priorities systems, 1373
  - problem resolution policy documents, 1371–1373
  - recovery issues, 43–44, 1370
  - Rollback wizard, 1378
  - servers, types of essential, 1369
  - staff key data, 1372
  - Startup Repair, 1374–1375
  - UPS (uninterruptible power supplies), 1370–1371
  - vendor key data, 1372
- Disk Defragmenter, 541–546. *See also* defragmenting drives
- disk drives. *See* hard disk drives; storage
- disk I/O subsystem, 497
- Disk Management snap-in**
  - adding new disks, 423–424
  - bad sectors, marking, 438
  - Check Disk, starting, 536
  - command-line counterpart. *See* DiskPart tool
  - converting basic to dynamic disks, 431–432
  - converting dynamic to basic disks, 432
  - encrypted BitLocker volumes, 492
  - extending volumes, 443–446
  - moving dynamic disks, 456–457
  - purpose of, 419–420
  - quotas, setting, 529–532
  - rescanning disks, 455–456
  - shrinking partitions with, 446–447
  - spanned volume creation, 453–454
  - views available, 421
  - volume creation, 435–439
- disk mirroring. *See* mirrored volumes
- disk quotas. *See* quota management
- disk striping. *See* striped volumes
- DiskPart tool**
  - converting disk types, 432
  - defined, 409, 421
  - extending volumes, 445–446

**DiskPart tool, *continued***

- invoking, 421
- listing devices with, 422
- sample session, 422
- selecting devices, 422
- shrinking partitions with, 447

**Distributed File System. *See* DFS (Distributed File System)****distribution groups, 1216****DLT (Distributed Link Tracking) Client, 516–517****DNs (distinguished names)**

- defined, 1003–1004
- searching, 1010–1011

**DNS (Domain Name System)**

- A records, 794–797
- AAAA records, 794–797
- Active Directory requirements, 1109–1110
- Add Roles Wizard for installing services, 771
- aging configuration, 807–808, 818
- aliases, 797–798
- appending computer names settings, 667–668
- application directory partitions, configuring, 804–806
- architecture for, 762–765
- automatic record creation, 794
- backups of, 1384
- cache management, 813
- canonical names, 748
- client TCP/IP configuration checks, 810–811
- client/server nature of, 743
- CNAME records, 797–798
- conditional forwarding, 748, 754, 756, 786–788
- configuration flags, table of, 816–818
- Configure A DNS Server Wizard, 773–783
- configuring settings, 667–669
- database for, 746
- defined, 743
- destination caches, 683
- DHCP-based configuration, 667, 686, 697, 730, 757
- DNS console, 771–772
- DNS names for domains, setting, 768
- Dnscmd /Info command, 813–814
- Dnscmd /Statistics command, 818–819
- Dnscmd command, 772
- DNSSEC (DNS Security), 757–758
- domain names, 653–654
- dynamic updates, 668, 759–760, 776, 781–782, 819
- event logging, 808–809
- external name resolution security, 760–761
- external resource requests, 747–748
- forward lookup queries, 743
- forward lookup zone creation, 774–781, 783–785
- forwarders, 777–778, 782–783, 786–788, 818

global name deployment, 803–804

host addresses, 748

host names, 653

inappropriate associations, 757

installing DNS Server service with Active Directory, 767–771

installing DNS Server service without Active Directory, 771–773

IPv6 addresses for servers, 681, 756–757

ISP zone maintenance, 776

LLMNR with, 655–656

log configuration, 808–809

lookups, troubleshooting with, 812

mail exchange addresses, 749

main components of, 746

MX (Mail Exchanger) records, 798–799

name resolution in, 654, 746–748

name server resource records, 749

namespace, Active Directory planning, 54–55

namespaces, 744–746

NS records, 794, 799–800

parameters, server configuration, table of, 815–818

planning deployments of, 40, 59

planning overview, 744

pointer resource records, 749

preferred DNS server IP addresses, 773

primary DNS servers, 750–751, 771

primary zone creation, 775

private namespace, 746

PTR records, 794–797

purpose of, 652

query and reply, basic, 746–747

query security issues, 757–758

query statistics, 818–819

query types, 743

record change propagation, 795

recursion, 778, 786–788

registering clients, 809

replication scope, 780, 782

replication, troubleshooting, 813

resolver caches, 681–683, 811

resource records, 748–749, 794–802

restart issues, 754–755

reverse lookup queries, 743–744

reverse lookup zone creation, 781–782, 785–786

reverse lookup zones, 774

RODCs with, 1143, 1149

root hints files, 760–761, 778

roots name servers, 760–761

roots, namespace, 745

round-robin load balancing, 797, 1331

scavenging, 807–808

- secondary DNS servers, 750
  - secondary notification configuration, 793–794
  - secondary zone creation, 775
  - secondary zone setup, 770–771
  - secure dynamic updates, 759–760
  - separate-name design, 763–765
  - server order, setting, 667
  - server TCP/IP configuration checks, 812–813
  - service location resource records, 749
  - sites, requirements for, 1073
  - small network configuration, 774–778
  - SOA records, 794, 800
  - split-brain design, 762–763
  - SRV records, 794, 801–802
  - start-of-authority resource records, 749
  - static, single label name configuration, 803–804
  - subdomain configuration, 788–791
  - testing, 682
  - top-level domains, 745–746
  - troubleshooting, 680–683
  - troubleshooting client services, 809–812
  - troubleshooting server services, 800–821
  - TTL values, 682
  - viewing server configuration, 813–819
  - WINS lookups using, 839
  - zone transfers, 791–793
  - zones, 749–757
- DNS Server.** *See also* DNS (Domain Name System)
- defined, 186
  - log, 328
- documentation, importance of, 1317**
- domain administrators, 1002**
- domain controllers**
- authoritative restores of Active Directory, 1412–1414
  - backup media, creating from, 1127–1128
  - backup requirements, 1110–1111
  - change journals, 514
  - configuration containers in a forest, 1055
  - creating domain controllers for existing domains, 1114–1122
  - Default Domain Controllers Policy GPO, 1235, 1247–1249
  - delegation of administrative rights, 1136–1139
  - deleting, 1129–1133
  - designing systems of. *See* Active Directory system design
  - DHCP server collocation issue, 689
  - domain architecture design, 50
  - failed, removing references to, 1415–1416
  - global catalog access, 1011–1013
  - global catalog servers, 1006
  - hardware guidelines, 1108–1109
  - IP addresses, 1109
  - local account issues, 1113–1114
  - moving out of Domain Controllers OU, danger of, 1249
  - NETLOGON share, 555
  - nonauthoritative restores of Active Directory, 1411–1412
  - operations master. *See* operations masters
  - OS support issues, 1016–1018
  - OUs created within, 1133
  - partitions, 1005
  - planning issues, 58–59
  - privileges required for creating, 1112–1113
  - read-only. *See* RODCs (read-only domain controllers)
  - recovery strategies for, 1409–1410
  - replication issues. *See* replication
  - replication scope, 1008
  - replication topology based on number of, 1092
  - restoring failed with new, 1415–1416
  - restoring Sysvol data, 1414–1415
  - sites, associating with, 1286–1287
  - sites, locating in separate, advantages of, 1075
  - subdomain, DNS configuration for, 788–791
  - SYSVOL\$ shares, 555
  - trust paths, 1002–1003
- domain functional levels**
- operations masters, 57
  - planning for, 55–57
  - purpose of, 1016
  - RODC level requirements, 1148
  - Sysvol replication, 1077–1082
  - table of, 1017
  - Windows 2000 native mode, 1017
  - Windows 2008 mode, 1018
  - Windows Server 2003 mode, 1017–1018
- domain local groups**
- defined, 1217
  - local domain processing requirement, 1218
  - member inclusion rules, 1218
  - nesting limitations, 1218
  - permissions rules, 1218
  - reasons for using, 1218–1219
- domain names**
- child domains, 653
  - defined, 653
  - fully qualified, 654
  - obtaining, 653
  - parent domains, 653
  - resolving. *See* name resolution services
  - top-level domains, 653
- domain naming master role, 1044–1046, 1048**
- Domain Rename utility, 1061–1062**
- domain trees, 1053.** *See also* trees, Active Directory
- domain trusts**
- configuring, 1035
  - planning for, 55

**domain user accounts**

Administrator. *See* Administrator account

backing up passwords, 1214–1215

built-in capabilities of, 1178

cached credentials, 1195

consistency requirement, 1169

creating, 1184–1187

default user accounts, 1168

defined, 1167

deleting, 1210–1211

disabling, 1191, 1193, 1195, 1211

Effective Permissions tool, 1188–1189

enabling, 1211

enabling disabled, 1195

expiration options for, 1192

folder redirection, 1203–1207

group memberships of, 1177–1178

Home Folder, 1194

inheritance effects, 1188

Kerberos options, 1192

Kerberos policy settings, 1173

lockout policy, 1172, 1195

logon rights of, 1178

maintenance overview, 1210

moving, 1211

multiple users, selecting, 1211

naming accounts, 1168

options, managing, 1189–1192

password policy enforcement, 1170–1171

Password Settings containers, 1169

permissions of, 1178

policy configuration, 1169–1170

privileges of, 1178

profile settings, 1193–1194

properties, viewing and setting, 1187–1188

renaming, 1211–1212

resetting passwords, 1212–1213

security descriptors of, 1188

SIDs (security identifiers) of, 1210

smart cards, requiring, 1192

top-level account policies, 1169

troubleshooting, 1195

unlocking, 1213–1214

user profiles. *See* user profiles

**DomainIDs, 516****domains, Active Directory**

assigning user rights for, 1182–1183

changing designs for, 1061–1062

creating new domains in new forests, 1122–1125

creating new domains or trees in existing forests,  
1125–1126

creation in Active Directory, 1005

defined for Active Directory, 999, 1053

delegation of administrative rights, 1136–1139

deleting, 1129–1133

design considerations, 1059

domain functional level, 1016–1018

domain security policies, 1059

enforcing inheritance, 1258–1259

forests, relationship to, 1054–1055

group policies created with, 1235

group policies of. *See* Group Policy

group policy inheritance order, 1254

joining computer accounts to, 1226–1227

language standardization within, 1059

membership options, 83

OUs in. *See* OUs (organizational units)

planning overview, 1058–1059

policies on, 1059

privileges required for installing, 1112–1113

raising functional levels, 1019–1020

renaming, 1061–1062

replication considerations, 1059

resource access issues, 1059

root domains, 1000

servers for. *See* domain controllers

single vs. multiple, design considerations, 1060–1061

sites, relationship to, 1071

task delegation, 1138–1139

top-level domains, 653

trees. *See* trees, Active Directory

trusted and trusting, 1001–1002

DoS attacks, DHCP vulnerability to, 688

**drive letters**

assigning, 436

configuring, 440–442

enumeration of, 435

**drivers**

adding print drivers, 888

base installation library of, 222

bugginess of, 211

Code Signing For Device Drivers policy, 224

detection of missing, automatic, 215

disabling, 236–237

improvements in, 19

installation steps, 230–232

installation wizards, 229–230

installing available updates, 215–216

kernel mode, 845

loading disk drivers during installation, 94–95

maintaining lists of, 228

manifest files, 222

Microsoft Universal Printer Driver, 846

network adapters, Advanced settings for, 227

- new device installation, 216–219
- non-Plug and Play, adding, 235–236
- Plug and Play installation process, 216–219
- policies for updates, 230
- PostScript, 846
- printer, 844–846, 887–889
- printer, client-side, 894–895
- purpose of, 215, 222
- Registry, interactions with, 222
- remote management of, 221
- removing, 234
- removing print drivers, 889
- resource settings for, 227–228
- restricting installation using group policy, 232–233
- rolling back, 233
- Setup Information files, 222
- signed, 223
- troubleshooting, 237–243
- Unidrv, 846
- uninstalling, 236–237
- unsigned, 223–224
- Update Driver settings, 128
- update settings for, 215
- updating, 219
- user mode, 845
- version issues, 229
- viewing information about, 224
- DSA (Directory Systems Agent), 992–993
- dsadd group command, 1221
- dsadd user command, 1186
- dsget group command, 1221
- DSM (Device Specific Module), 411
- Dsmgmt command, 1165
- dsmod group command, 1221
- dsquery user -disabled command, 1195
- dump files, 1380
- dust and air quality, 1314
- dynamic disks
  - converting to and from basic disks, 430–432
  - drive section types, 429
  - extending partitions, 445–446
  - limitations of, 430
  - moving, 456–457
  - purpose of, 428
  - shrinking partitions, 446–447
  - spanned volumes, 452–454
  - types of volumes allowed, 452
- dynamic DNS, 759–760
- dynamic IP addressing. *See also* DHCP (Dynamic Host Configuration Protocol)
  - configuring, 663–665
  - conflicting addresses, troubleshooting, 677

- dynamic clients, 685
  - temporary vs. nontemporary IPv6, 709
- dynamic updates, DNS, 668, 759–760, 776, 781–782, 819

## E

- earthquakes, 1315
- editions of Windows Server 2008
  - Datacenter, 6
  - determining which to use, 61–63
  - Enterprise, 6
  - hardware requirements, table of, 72–73
  - for Itanium-Based Systems, 8
  - list of, 5
  - selection criteria, 61–63
  - Standard, 5
  - Web Server, 6–7
- effective permissions
  - determining, 578–579
  - Effective Permissions tool, 578–579, 1188–1189
- EFI (Extensible Firmware Interface)
  - ACPI requirement, 379
  - boot maintenance manager of, 78
  - creating new BCD store, 393–394
  - entering during boots, 380
  - installing Windows Server 2008 on Itanium systems, 78–79
- EFS (Encrypting File System)
  - EFSInfo utility, 1114
  - evading, 477
  - purpose of, 467
  - vulnerability of, 467
- EIST (Enhanced Intel SpeedStep Technology), 381
- elevation
  - administrator applications requirement for, 295
  - color coding of prompts for, 297–298
  - defined, 290
  - security settings related to, 299–301
  - software installation, required for, 285
- e-mail
  - distribution groups, 1216
  - SMTP (Simple Mail Transfer Protocol) Server, 189
- emergencies. *See also* disaster planning
  - data recovery plans, 1318–1319
  - emergency response teams, 1371
  - problem-escalation procedures, 1319
- EMF (enhanced metafile format)
  - printing process with, 842–843
  - purpose of, 842–843
  - server hardware requirements, 847
  - Unidrv support for, 846
- EMS (Emergency Management Services), 70–71
- Enable User And Computer Accounts To Be Trusted For Delegation privilege, 1179

## encryption

- drive. *See* BitLocker Drive Encryption
- Encrypting File System. *See* EFS (Encrypting File System)
- remote desktop use of, 613
- Terminal Services, 924, 959

Enforce Password History setting, 1170–1171

Enhanced Intel SpeedStep Technology (EIST), 381

enhanced metafile format. *See* EMF (enhanced metafile format)

enterprise administrators, 1002

Enterprise edition, Windows Server 2008

- hardware requirements for installations, 72–73
- purpose of, 6
- selection criteria, 61–62
- TS Session Broker, required for, 944

Enterprise Read-Only Domain Controller group, 1159

environment variables, 1194

envisioning phase of MSF (Microsoft Solutions Framework), 28

error messages, hardware, table of, 238–240

eSATA, 213

ESE (Extensible Storage Engine)

- operations of, 993–995
- Utility, 997

ESP partition type, 449–450

Event Viewer

- archiving logs, 337–338
- Computer field, 332
- defined, 107
- entries in, 330–332
- event levels, 330
- filtered views, 334–337
- Help features, 332
- Properties dialog boxes for events, 332
- remote systems, viewing, 333
- searching logs, 334
- sorting logs, 334
- starting, 329
- subscription creation, 341–342
- User field, 331
- views available, 329–330

## events

- Application log, 327
- Applications and Services logs, 327–328
- archiving logs, 337–338
- backups, tracking, 1400–1401
- configuring logs, 329
- defined, 326
- DFS Replication log, 328
- Directory Services log, 328
- DNS Server log, 328, 808–809

Event Log service, 327

File Replication Service log, 328

filtered views of, 334–337

Forwarded Events log, 327

forwarding to logging servers, 341–342

Hardware Events log, 328

logging servers, enabling, 341–342

Microsoft\Windows logs, 328

network load balancing events, 1344

of remote systems, viewing, 333

PowerShell for tracking, 338–341

searching logs for, 334

Security log, 327

Setup log, 327

sizing of logs, 328–329

sorting within logs, 334

subscriptions, 341–342

System log, 327

viewing. *See* Event Viewer

Windows logs, 327

Exchange Server 2007, 1014

exclusions for IP addresses, 686, 709, 712–713

Execute File special permission, 573

exFAT, 434

expiration options for accounts, 1192

explicit trusts, 1028–1029

Explorer, Network. *See* Network Explorer

Explorer, Windows. *See* Windows Explorer

Extensible Storage Engine. *See* ESE (Extensible Storage Engine)

extension components of MMCs, 155–156

external trusts, 1003

**F**

facilities for servers. *See* structures and facilities

failover clustering

- Active Directory configuration for, 1351
- active node mode, 1327–1328, 1345
- adding nodes to clusters, 1360
- availability planning, 1364
- cluadmin command, 1356
- Cluster Administrator renamed, 1352
- cluster databases, 1354
- Cluster Disk Driver, 1353
- Cluster Network Driver, 1352–1353
- cluster objects, 1352–1353
- Cluster service, 1352–1353, 1365
- cluster-unaware applications with, 1348–1349
- cluster-aware applications, 1348
- configuration options, 1345–1347
- controlling nodes, 1365
- creating clusters, 1356–1360

- database server requirements, 1349–1351
- DFS namespace server with, 1363
- DHCP Server with, 1363
- failback policy settings, 1366
- Failed state, 1355–1356
- Failover Cluster Management tool, 107, 1352
- failover policy settings, 1365–1366
- File Server with, 1363
- Generic Application resource type, 1363
- Generic Script resource type, 1363
- hardware optimization for, 1349–1351
- heartbeats, 1353
- high-availability configuration for services and applications, 1364–1365
- host name, setting for, 1359
- installing, 1345
- iSCSI with, 1350–1351
- majority node clusters, 1346
- Microsoft Cluster service, 1345
- multinode clusters, 1346
- network adapter interface states, 1355
- network adapters for, 1350
- network optimization for, 1351–1352
- network settings, modifying, 1361
- network states, 1355–1356
- nodes, maximum number of, 1345
- paging files, 1349
- passive node mode, 1327–1328
- print servers with, 1363, 1367
- purpose of, 188, 1323
- quorum resources, 1354
- quorum settings, 1362
- RAID configurations, 1349–1350
- resources of, 1347–1349
- resources specification, 1363–1365
- SAN optimization for, 1351–1352
- shared folder creation, 1366
- single node clusters, 1345
- sites, multiple physical, 1329–1330
- SQL Server requirements, 1349
- storage devices for, 1345, 1351
- storage tests, 1357
- storage, adding to clusters, 1361
- support applications of clustered services, 1364
- types of clusters, basic, 1345
- Unavailable state, 1355–1356
- Up state, 1356
- validation tests, 1356–1358
- Web server requirements, 1349–1351
- Windows Server 2008 compatibility, 1350
- Windows services with, 1363
- WINS with, 1363
- failover, DHCP service, 693–695
- farms
  - farm names in Terminal Services, 949
  - organization of servers in, 1325–1326
- FAT (file allocation table) file system
  - capabilities of, 500–501
  - Check Disk, analyzing volumes with, 538–539
  - clusters, 498–500
  - converting to NTFS, 432–433
  - data storage calculations, 501–502
  - data streams not supported, 513
  - disadvantages of, 500–501
  - file allocation table structure, 499–500
  - formatting drives as, 437–439
  - integrity of files, 535
  - mounting volumes, 502
  - overview of, 499
  - structure of, 499–500
  - versions of, 498
  - volume size issues, 501–502
- fault tolerance
  - DHCP, 693–695
  - disaster planning, for, 1370
  - high availability, contribution to, 1312
  - RAID 5, 462–463
- faxing
  - Fax Server, 186
  - FAX\$ shares, 554
- features
  - Add Features Wizard, starting, 114
  - adding, 199
  - component names for, 204–207
  - defined, 185
  - removing, 199–200
  - table of, 188–190
- federated forest design, 1030–1032
- Fibre Channel. *See also* SANs (storage area networks)
  - arbitrated loop not supported, 410
  - defined, 406
- file associations, Registry, 258–259
- File Replication Service. *See* FRS (File Replication Service)
- File Server Resource Manager. *See* FSRM (File Server Resource Manager)
- file servers
  - backups, 1384
  - File Server, failover clustering of, 1363
  - services. *See* File Services
- File Services
  - adding role to servers, 416–419
  - defined, 187
  - DFS with, 415, 417–418
  - disk quota management, 415
  - FRS, 416

**File Services, *continued***

- FSRM with, 415, 418
  - Multipath I/O with, 416
  - NFS with, 416
  - planning for, 60
  - report generation, 415
  - screening policies, 415
  - search services with, 416, 419
  - Share And Storage Management, 415
  - UNIX interoperability, 417
- file sharing**
- access permissions for, 571–578
  - adding user or group permissions, 566
  - ADMIN\$ shares, 554
  - administrative access to, 555–556
  - administrative shares, 553–555
  - Administrators Have Full Access, Other Users Have No Access permissions, 562
  - Administrators Have Full Access, Other Users Have Read-Only Access permissions, 561
  - All Users Have Read-Only Access permissions, 561
  - Apply Onto options, 577–578
  - attributes of files and folders, 567
  - auditing access, 581–585
  - basic folder permissions, table of, 572
  - basic permissions, setting, 572–573
  - C\$ type drive shares, 554
  - Change permissions, 564
  - Change Permissions special permission, 575
  - changing share permissions, 558–559
  - clearing inherited permissions, 569–570
  - combining special permissions for basic permissions, 575–576
  - Computer Management for, 556
  - Computer Management for share permission configuration, 565–566
  - configuration for, accessing, 549
  - configuration login script for, 581
  - Create A Shared Folder Wizard, 560–562
  - Create Files/Write Data special permission, 574
  - Create Folders/Append Data special permission, 574
  - creating shares with Computer Management, 559–562
  - creating shares with Windows Explorer, 556–559
  - Custom Permissions option, 562
  - default shares, 553–555
  - defined, 547
  - Delete special permission, 574
  - Delete Subfolders And Files special permission, 574
  - denying permissions, 565–566
  - descriptions of shares, entering, 561
  - effective permissions, determining, 578–579
  - Execute File special permission, 573
  - FAX\$ shares, 554
  - file permission management overview, 567
  - finding shared folders, 552
  - folder path, selecting for folder to share, 560
  - folder permission management overview, 567
  - Full Control permissions, 564, 572
  - group permissions, 564–565
  - hidden shares, 553
  - inheritance of permissions, 569–570
  - IPC\$ share, 554
  - List Folder Contents permission, 572
  - List Folder special permission, 573
  - listing shares, 579–580
  - management overview, 563–564
  - mapping share folders as network drives, 550–551
  - membership required for creating shares, 556
  - model options for, 547
  - Modify permission, 572
  - multiple shares on one folder, 558
  - Net Share command-line tool, 556, 579–581
  - NETLOGON share, 555
  - Network Discover required, 551
  - Network Explorer for viewing, 551
  - ownership of files and folders, 567–568
  - permissions options, 561–562
  - permissions types, 564
  - PRINT\$ shares, 555
  - public file sharing, 548
  - Public folder, configuring, 549–550
  - PUBLIC shares, 555
  - publishing share information, 552
  - publishing shares, 563
  - Read & Execute permission, 572
  - Read Attributes special permission, 573
  - Read Data special permission, 573
  - Read Extended Attributes special permission, 574
  - Read permissions, 564, 572
  - Read Permissions special permission, 575
  - remote computers, administration, 556
  - removing users or groups for permissions, 577
  - resetting permissions, 570–571
  - security logs for, viewing, 585
  - security, importance to choosing sharing model, 548
  - Server service required for, 547
  - setting special permissions for files and folders, 576–577
  - shadow copies of shared folders. *See* shadow copies
  - share details, viewing, 580
  - share names, 558, 560
  - share permissions, 563–566
  - shrpwb command, 560
  - special permissions, 573–578
  - special shares, 553–555

- specifying files and folders for auditing, 582–584
- standard file sharing, 547
- standard file sharing, configuring, 549
- stop sharing, 558
- SYSVOL\$ shares, 555
- Take Ownership special permission, 575
- transferring ownership, 568
- Traverse Folder special permission, 573
- troubleshooting, 579–581
- UNC paths to shares, 551
- users and groups, selecting for, 556–558
- viewing permissions for files and folders, 571
- viewing share permissions, 565
- Windows Explorer for, 556
- Write Attributes special permission, 574
- Write permission, 572
- file synchronization, 1209–1210
- file systems. *See also* storage
  - bad sectors, marking, 540
  - Check Disk tool for fixing errors, 535–538
  - clusters, 498–499
  - compression. *See* file-based compression
  - defragmenting, 541–546
  - dirty, marking disks as, 537
  - error creation, 535
  - FAT. *See* FAT (file allocation table) file system
  - Folder Options utility, 123–124
  - FSutil tool, 409
  - NTFS. *See* NTFS
  - quotas. *See* quota management
  - sectors, 497–498
  - structure overview, 497–499
  - type and features, viewing, 502
- file type associations, Registry, 258–259
- file-based compression
  - NTFS, 521–523
  - zipped folders, 524–525
- FIPS (Federal Information Processing Standard)
  - BitLocker with, 481
  - purpose of, 924
- fire suppression systems, 1315
- firewalls
  - backup exceptions, 1390
  - network troubleshooting issues, 679
  - Remote Desktop for Administration with, 610
  - Windows Firewall, 13
- FireWire (IEEE 1394), 213–214
- firmware
  - ACPI requirement, 379
  - entering during boots, 380
  - installation problems caused by, 100
  - interfaces, 13–14
  - TPM compliance, 469
- folders
  - access permissions for, 571–578
  - attributes of, 567
  - auditing file and folder access, 581–585
  - basic folder permissions, setting, 572–573
  - basic folder permissions, table of, 572
  - child, 569
  - compressed (zipped), 524–525
  - Delete special permission, 574
  - Folder Options utility, 123–124
  - folder redirection, 1203–1210
  - Home Folder, user accounts, 1194
  - junction points, 1080
  - ownership of, 567–568
  - parent, 569
  - permission management overview, 567
  - Public folder, 548
  - shadow copies of shared folders. *See* shadow copies
  - shared folders on clustered file servers, 1366
  - sharing. *See* file sharing
- Force A Shutdown Of A Remote System privilege, 1179
- forest functional levels
  - design considerations, 1018–1020
  - operations masters, 57
  - planning for, 55–57
  - raising, 1019–1020
  - RODC level requirements, 1148
  - setting, 1123–1124
  - table of, 1018
- forest trusts
  - architecture of, 1030–1032
  - configuring, 1035
  - trust configurations, 1055
- forests, Active Directory
  - administration of, 1057–1058
  - administrator roles in, 1055
  - configuration containers, 1055
  - creating new domains in new forests, 1122–1125
  - creating new domains or trees in existing forests, 1125–1126
  - cross-forest transitive trusts, 1030–1032
  - dedicated roots, 1061
  - defined, 1053
  - domains, relationship to, 1054–1055
  - empty roots, 1061
  - enforcing inheritance, 1258–1259
  - forest root domains, 1054–1055, 1062
  - functional levels. *See* forest functional levels
  - global catalogs in, 1055
  - Group Policy Management Console (GPMC) with, 1243
  - merging, 1057

- forests, Active Directory, *continued*
  - namespaces of, 1054–1055
  - non-dedicated roots, 1061
  - planning overview, 1054
  - privileges required for installing first domain controller, 1112
  - renaming domains in, 1061–1062
  - replication, 1008
  - replication issues, 1057
  - shortcut trusts, 1028–1029
  - single vs. multiple, 1056
  - structure of, 1000–1001
  - trusts. *See* forest trusts
- Forgotten Password Wizard, 1214
- formatting partitions, 437–440
- forms, printer, 885–886
- forward lookups, DNS
  - conditional. *See* conditional forwarding, DNS
  - forwarders, 777–778, 782–783, 786–788, 818
  - queries, 743
  - zone creation, 774–781, 783–785
- Forwarded Events log, 327
- forwarded tickets, 1040
- FQDNs (fully qualified domain names), 654
- fragmented drives. *See* defragmenting drives
- frequently used programs list, 133, 137–140
- FRS (File Replication Service)
  - backward compatibility provided by, 416
  - defined, 408
  - File Replication Service log, 328
  - object identifiers, 516–517
  - Sysvol replication, 1077–1082
- FSMO (flexible single-master operations) role, 1044
- FSRM (File Server Resource Manager)
  - capabilities of, 415
  - configuring, 418
  - defined, 107
- FSutil FSinfo command, 508–510
- FSutil tool, 409
- Full Control permissions, file sharing, 564, 572
- full-server installation type, 81
- functional levels, Active Directory. *See* domain functional levels; forest functional levels

## G

### gateways

- Automatic Dead Gateway Retry, 631
- Default Gateways panel, 666
- IPv4 addresses for, 639
- metric, 665–666
- multiple, configuration of, 665–666
- GDI (Graphics Device Interface), 844

- Generate Security Audits privilege, 1179
- geographic model for OUs, 1067
- global catalog servers
  - attribute management, 1014–1016
  - defined, 58
  - design considerations, 1011–1012
  - designating, 1012–1013
  - forests, in, 1055
  - partition replication, 1095
  - place of, 1006
  - removing, warning about, 1130
  - RODC requirements for, 1148
  - sites, requirements for, 1073, 1105
  - universal group storage, 1218
- global groups
  - defined, 1217
  - member inclusion rules, 1218
  - nesting limitations, 1218
  - permissions, 1218
  - reasons for using, 1219
  - security data structures, inclusion in, 1218
- globally unique identifiers. *See* GUIDs (globally unique identifiers)
- goal assessment task for planning deployments
  - business perspectives, 34–35
  - defined, 29
  - documentation, 34
  - IT goal identification, 35
  - IT-business interaction issues, 36
  - predicting changes, 36–37
  - scope of, 33
- governing phase of MSF (Microsoft Solutions Framework), 28
- GPMC (Group Policy Management Console). *See* Group Policy Management Console (GPMC)
- GPOs (Group Policy objects)
  - Account Policies, editing with default GPOs, 1247–1249
  - Administrative Templates, 1237–1238
  - ADMX files, 1237–1238
  - Apply Group Policy permission, 1259–1261
  - applying to all members of a group, 1260
  - applying to no members of a group, 1260
  - backing up, 1278–1280
  - blocking inheritance from, 1257–1258
  - configuring user policies, 1169–1170
  - creation rights management, 1249–1250
  - Default Domain Controllers Policy GPO, 1235, 1247–1249
  - Default Domain Policy GPO, 1235, 1247–1249
  - default policy restoration, 1282
  - default, working with, 1247–1249
  - deleting, 1247

- deleting links to, 1247
  - Edit Settings permissions, 1251–1252
  - Edit Settings, Delete, Modify Security permissions, 1252
  - editing GPOs, 1245
  - enforcing inheritance, 1258–1259
  - filtering policy application, 1259–1261
  - folder redirection, 1203–1207
  - Group Policy Starter GPO Editor, 1239
  - indeterminate as to applying to group membership, 1260
  - LGPOs (local GPOs), 1239–1242
  - Link GPOs permission, 1251, 1253
  - link order, editing, 1255–1256
  - linking to existing GPOs, 1246
  - Local Group Policy Object Editor, 1239
  - Local Security Policy console, 1241–1242
  - logoff scripts, 1265–1266
  - logon scripts, 1265–1266
  - loopback processing, 1263–1264
  - Management Editor tool for, 1239
  - modeling changes in, 1274–1277
  - new GPO creation, 1244–1245
  - Object Editor, 1241–1242
  - Perform Group Policy Modeling Analysis permission, 1251, 1253
  - preference order, changing, 1245
  - processing of policies overview, 1254
  - Read Group Policy Results Data permission, 1253
  - Read permissions, 1251–1252
  - refreshing, 1268–1278
  - restoring, 1280–1281
  - selectively applying, 1260
  - shutdown scripts, 1264–1265
  - starter GPO creation, 1246–1247
  - starter GPOs, 1245
  - startup scripts, 1264–1265
  - startup sequence, 1261–1262
  - viewing applicable GPOs, 1271–1274
- GPT partition style**
- background on, 425
  - basic-dynamic conversions, 430
  - changing to MBR, 428
  - drive letter assignment, 435
  - ESP partition type, 449–450
  - format support, 427–428
  - LDM partitions, 451–452
  - managing on basic disks, 449–452
  - mirrored boot and system volumes, 459–462
  - MSR partitions, 450–451
  - OEM partitions, 452
  - primary partitions, 451
  - selecting, 424
  - structure of, 426–427
  - types of partitions, 449
  - x86 vs. Itanium, 427
- GPTs (Group Policy Templates)**
- partition styles. *See* GPT partition style
  - role of, 1235
- Graphics Device Interface (GDI), 844**
- Group Policy**
- accessing the top-level LGPO, 1240–1241
  - Account Lockout Policy, 1247
  - Account Policies, editing with default GPOs, 1247–1249
  - Accounts: Rename Administrator Account policy, 1248
  - Accounts: Rename Guest Account policy, 1248
  - Active Directory group policy, 1234–1235
  - Administrative Templates, 1235, 1237–1238
  - ADMX files, 1237–1238
  - applicability of, 1235
  - Apply Group Policy permission, 1259–1261
  - applying to all members of a group, 1260
  - applying to no members of a group, 1260
  - architecture of, 1236–1237
  - backing up GPOs, 1278–1280
  - backups, 1384
  - capabilities of, 1233
  - client-side extensions, 1236
  - Computer Configuration category, 1235
  - Computer Configuration startup sequence, 1261–1262
  - Computer Configuration, disabling settings, 1263
  - conflict resolution with local GPOs, 1240
  - creation rights management, 1249–1250
  - Dcgpofix utility, 1282
  - Default Domain Controllers Policy GPO, 1235, 1247–1249
  - Default Domain Policy GPO, 1235, 1247–1249
  - default policy restoration, 1282
  - delegating Group Policy management privileges, 1252–1253
  - delegating privileges for links and RSOP, 1253
  - deleting GPOs, 1247
  - disabling an enabled policy, 1257
  - domain creation, policies created with, 1235
  - editing GPOs, 1245
  - enabling a disabled policy, 1257
  - events triggering policy processing, 1236
  - features of, 1233
  - filtering policy application, 1259–1261
  - GPOs, role of, 1235. *See also* GPOs (Group Policy objects)
  - implementation overview, 1238–1239
  - indeterminate as to applying to group membership, 1260
  - inheritance. *See* Group Policy inheritance

**Group Policy, *continued***

- Kerberos Policy, 1247
- legacy OSs not supported, 1234
- Link GPOs permission, 1251, 1253
- link order, editing, 1255–1256
- linking to existing GPOs, 1246
- local group policies. *See* local group policy
- Local Group Policy Editor, 1242
- Local Group Policy Object Editor, 1239
- Local Security Policy console, 1241–1242
- logoff scripts, 1265–1266
- logon scripts, 1265–1266
- loopback processing, 1263–1264
- maintenance tasks, 1268–1282
- Management Console. *See* Group Policy Management Console (GPMC)
- Management Editor, 1236, 1239
- Modeling Wizard, 1274–1277
- Network Access: Allow Anonymous SID/NAME Translation policy, 1248
- Network Security: Force Logoff When Logon Hours Expire policy, 1248
- new GPO creation, 1244–1245
- Object Editor, 1241–1242, 1270–1271
- OUs (organizational units), applying to, 1065
- overriding higher level policies, 1255–1257
- Password Policy, 1247
- PDC emulators, 1239
- Perform Group Policy Modeling Analysis permission, 1251, 1253
- planning using modeling feature, 1274–1277
- Policies nodes, 1234
- processing modification, 1262–1263
- processing of policies overview, 1254
- processing order, 1255. *See also* Group Policy inheritance
- purpose of, 1233
- Read Group Policy Results Data permission, 1251, 1253
- refreshing, 1268–1278
- restoring GPOs, 1280–1281
- restricting device installation with, 232–233
- reviewing Group Policy management privileges, 1250–1252
- RSoP (Resultant Set of Policy), 1251
- scripts for, 1264–1266
- security templates, 1266–1268
- selectively applying GPOs, 1260
- shutdown scripts, 1264–1265
- Software Settings class, 1235
- starter GPO creation, 1246–1247
- Starter GPO Editor, 1239
- starter GPOs, 1245

- startup scripts, 1264–1265
- startup sequence, 1261–1262
- Sysvol folder for components, 1237
- troubleshooting, 1268–1282
- universal group membership caching, 1020–1022
- User Configuration category, 1235
- User Configuration startup sequence, 1261–1262
- User Configuration, disabling settings, 1263
- Userevnl.dll, 1236
- versions of, compatibility issues, 1234
- viewing applicable GPOs, 1271–1274
- Windows Settings class, 1235

**Group Policy inheritance**

- Apply Group Policy permission, 1259–1261
- blocking, 1257–1258
- child OU group policy inheritance order, 1254
- configuration option effects, 1254
- disabling an enabled policy, 1257
- domain group policy inheritance order, 1254
- enabling a disabled policy, 1257
- enforcing inheritance, 1258–1259
- filtering policy application, 1259–1261
- link order effects, 1255–1256
- loopback processing, 1263–1264
- order of, 1254
- OU group policy inheritance order, 1254
- overriding higher level policies, 1255–1257
- processing modification, 1262–1263
- processing of policies overview, 1254
- purpose of inheritance, 1254
- site group policy inheritance order, 1254

**Group Policy Management Console (GPMC)**

- assigning user rights for domains and OUs, 1182–1183
- availability of, 1238–1239
- backing up GPOs, 1278–1280
- blocking inheritance, 1257–1258
- creation rights management with, 1249–1250
- delegating permission to create GPOs, 1249–1250
- deleting GPOs, 1247
- deleting links to GPOs, 1247
- domain access, 1244
- editing GPOs, 1245
- enforcing inheritance, 1258–1259
- folder redirection, 1203–1207
- forest access, 1243
- Group Policy Slow Link Detection policy configuration, 1269–1270
- Group Policy Starter GPO Editor, 1239
- installing, 1242
- link order, editing, 1255–1256
- linking to existing GPOs, 1246
- listing of GPOs and OUs by, 1243

- Local Group Policy Object Editor, 1239
  - logoff script configuration, 1265–1266
  - logon script configuration, 1265–1266
  - loopback processing, configuring, 1263–1264
  - Management Editor, 1236, 1239
  - modeling GPOs with, 1274–1277
  - new GPO creation, 1244–1245
  - offline file configuration, 1209
  - PDC emulators, 1239
  - point and print restrictions, 870–871
  - printer connection deployment policies, 869
  - processing modification, 1262–1263
  - refresh policy management, 1268–1278
  - restoring GPOs, 1280–1281
  - reviewing Group Policy management privileges, 1250–1252
  - selectively applying GPOs, 1260
  - shutdown script, assigning, 1264–1265
  - site access, 1244
  - starter GPO creation, 1246–1247
  - starting, 1242–1243
  - startup scripts, assigning, 1264–1265
  - user profiles, 1197
  - viewing applicable GPOs, 1271–1274
  - Group Policy Management feature, 188. *See also* Group Policy Management Console (GPMC)
  - Group Policy objects. *See* GPOs (Group Policy objects)
  - Group Policy Slow Link Detection policy, 1269–1270
  - Group Policy Templates. *See* GPTs (Group Policy Templates)
  - groups
    - accounts membership in, 1177–1178
    - adding members to, 1222
    - assigning rights to, for domains and OUs, 1182–1183
    - assigning rights to, for specific computers, 1184
    - caching, 1215–1216
    - creating, 1220–1221
    - default logon rights assigned to, table of, 1181–1182
    - default privileges assigned to, table of, 1178–1181
    - defined, 1215
    - deleting, 1222
    - department based, 1217
    - distribution groups, 1216
    - domain local. *See* domain local groups
    - dsadd group command, 1221
    - dsget group command, 1221
    - dsmod group command, 1221
    - Effective Permissions tool, 1188–1189
    - file sharing permissions, 564–565
    - finding, 1223
    - fundamentals, 1215–1216
    - global. *See* global groups
    - member inclusion and permissions by types, 1218
    - moving, 1224
    - nesting limitations, 1218
    - options for new, selecting, 1220–1221
    - Password Settings group, 1173–1176
    - precedence order, 1175
    - properties, editing, 1223–1224
    - Remote Desktop Users group, 938
    - renaming, 1224
    - replication of, 1216
    - RODC-specific, 1159
    - scope conversions and domain functional levels, table of, 1224
    - scopes of, 1216–1218
    - security groups, 1216
    - sending mail to, 1224
    - type selection criteria, 1217–1218
    - types of, 1216
    - universal. *See* universal groups
    - viewing permissions for files and folders, 571
  - Guest account
    - Accounts: Rename Guest Account policy, 1248
    - purpose of, 1168
  - GUIDs (globally unique identifiers)
    - Active Directory use of, 992
    - BCD (Boot Configuration Data) stores, 392
- ## H
- HAL (hardware abstraction layer), 222
  - hard disk drives. *See also* storage
    - adding new disks, 423–424
    - allocation unit size, 438
    - bad sectors, marking, 438, 540
    - basic disk type, 428–432
    - Check Disk for analyzing, 538–540
    - clusters, 498
    - compression, setting, 438
    - Computer Management Storage Tools, 116
    - defragmenting, 541–546
    - disk I/O subsystem, 497
    - disk quota management, 415
    - disk write caching, 424
    - drive letter assignment, 435
    - drive letter configuration, 440–442
    - driver installation, 94–95
    - dynamic disks, 428–432
    - formatting, 439–440
    - fragmented. *See* defragmenting drives
    - hot-swapping disks, 423
    - I/O bottlenecks, 360–362
    - Initialize Disk Wizard, 423–424
    - managing. *See* Disk Management snap-in

**hard disk drives, *continued***

- managing MBR partitions on basic disks, 434–448
- mirrored volumes, 452, 457–462, 464–466
- Missing status, 455–456
- mount points on. *See* mount points
- NTFS recommended file format, 437
- paging file options, 305–308
- performance issues, 413–414
- performance statistics, 345
- Physical Disk counters for, 358
- physical structure of, 497–498
- platters, 497
- print server requirements, 848
- RAID. *See* RAID (redundant array of independent disks)
- recovering, 455–456
- sectors, 497–498
- space requirements by edition, 72–73
- spanned volumes, 452–454
- storage area network. *See* SANs (storage area networks)
- striped volumes, 452, 454–455, 462–463
- tracks, 497–498
- troubleshooting, 100
- types of, 211–212

**hard links, 511–512****hardware**

- Active Directory guidelines, 1108–1109
- compatibility checks, 96
- deployment process, standardized, 1312
- disabling, 236–237
- drivers for. *See* drivers
- drives. *See* hard disk drives
- error message with actions for, table of, 238–240
- eSATA, 213
- events log, 328
- external devices, choosing, 212–214
- failover clustering, optimization for, 1349–1351
- fault tolerance for. *See* fault tolerance
- FireWire (IEEE 1394), 213–214
- HAL, 222
- Hardware Compatibility List, 1311
- high-availability planning checklists, 1313
- high-availability, strategy for, 1311–1313
- independence, boot environment role in, 13–14
- installing devices, 215–221
- internal devices, choosing, 211–212
- IRQ settings, 240–243
- memory. *See* memory
- Multipath I/O devices, 412–413
- new devices, installing, 216–219
- non-Plug and Play, adding, 235–236
- Plug and Play installation process, 216–219
- power state management capabilities, 379–382

- print server requirements, 847–848
- Problem Reports And Solutions console, 237
- RAM. *See* memory
- redundancy, components for improving, 1312
- Registry keys for, 251–252, 254–255
- remote management of, 221
- removal during installations, 97
- requirements for installations, 72–73
- resource conflicts, 240–243
- restricting installation using group policy, 232–233
- routers. *See* routers
- server types, standardization by, 1312
- spare parts, 1312
- standardization for high availability, 1311–1312
- standards selection, 53
- standby systems, 1312
- troubleshooting, 237–243
- uninstalling, 236–237
- updating drivers, 219
- USB 2.0, 213–214
- viewing devices with Device Manager, 219–220
- Windows Server Catalog, 1311

**Hardware Compatibility List (HCL), 1311****HCL (Hardware Compatibility List), 1311****headers**

- IPv4 packets, 647
- IPv6 packets, 652

**heartbeats**

- Cluster service, 1353
- NLB, 1331–1332

**help desks, 1319****hibernate state, 380****hidden shares, 553****high availability. *See* availability****highly available server deployment, 1321–1322****HKEY\_CLASSES\_ROOT (HKCR), 252, 258–259****HKEY\_CURRENT\_CONFIG (HKCC), 252, 259****HKEY\_CURRENT\_USER (HKCU), 252, 259****HKEY\_LOCAL\_MACHINE (HKLM), 252–258****HKEY\_USERS (HKU), 252, 258****Home Folder, user accounts, 1194****host IDs**

- classes, by, 638–639
- defined, 633
- network prefix notation, 640–641

**host names**

- aliases for, 797–798
- defined, 653
- LLMNR for resolving, 656
- WINS for resolving, 654–655

**host records, 653****hot-swapping disks, 423**

humidity, 1314

Hyper V, 9–10

Hypervisor Settings entries, 397

## I

IAID (identity association ID), 686

ICM (Integrated Color Management), 906

identification status of networks, 16

IIS (Internet Information Services)

TS Web Access requirements, 932

TS Web Access, automatically installed with, 920

IKE (Internet Key Exchange) IPv6 Security feature, 632

image names, 308

incident response teams

day-to-day operations plan for, 1320

disasters, planning for, 1371

Increase A Process Working Set privilege, 1179

Increase Scheduling Priority privilege, 1180

incremental adoption of Windows Server 2008, 3–4

incremental backups, 1385–1386

InetOrgPerson accounts

defined, 1167

InetOrgPerson objects, 1014, 1063

infrastructure masters

configuration, 1044–1046

defined, 57

inheritance

Group Policy. *See* Group Policy inheritance

permissions for file sharing, 569–570

permissions, effect on, 1188

Initial Configuration Tasks console

purpose of, 87, 113

table of tasks available, 113–114

ink-jet printers, 849

in-place file sharing, 547

installing Active Directory

AD DS binaries, 1112

Add Role feature for, 1112

Advanced Installation mode, choosing, 1114

answer file creation, 1120

backup requirements, 1110–1111

Basic Installation mode, 1114

client preparations, 1111

Configure TCP/IP warning, 1115

CPUs, requirements for, 1108

creating domain controllers for existing domains, 1114–1122

creating new domains in new forests, 1122–1125

creating new domains or trees in existing forests, 1125–1126

data protection requirements, 1109

Dcpromo command, 1112, 1114, 1129

disabling secure communications requirement, 1111

DNS configuration for, 1122

DNS server requirements, 1109–1110

DNS server selection, 1117–1118

domain selection step, 1115–1116

file volumes, 1109

forest functional levels, 1123–1124

global catalogs, last, warning for, 1130

hardware guidelines, 1108–1109

installation media creation, 1127

installation step, 1120

Installation Wizard, starting, 1114

IP addresses, 1109, 1113, 1117–1118

local account issues, 1113–1114

locations for files, selecting, 1119

media, installing from, 1118, 1126–1129

memory requirements, 1108

NetBIOS name generation, 1123

Network Credentials information, 1115

OU creation, 1133–1134. *See also* OUs (organizational units)

overview of process, 1107

password for Restore mode, 1120

privileges required for, 1112–1113

replication partner selection, 1118

RODC installations, 1148–1158

SAN configuration issues, 1110–1111

servermanagercmd install command, 1112

site selection step, 1117

starting Installation Wizard, 1114

storage requirements, 1108

System State files, 1110–1111, 1129

Sysvol, 1109

uninstalling, 1129–1133

verification of installs, 1121–1122

installing application software. *See* software installation

installing DHCP Server service

product keys and activations, 71–72

steps for, 697–700

installing TCP/IP networking

local area connections, 659–660

network adapter installation, 658–659

permissions for, 657

preparing for, 657–658

requirements for, 657

services installation, 659–660

installing Windows Server 2008

activation, 88–90

administration tools, installing, 109–110

answer files, 70

automated setup overview, 69

boot from media method, 77

installing Windows Server 2008, *continued*

- clean installation steps, 84–88
- clean installs, 74
- commands during install process, table of, 90–93
- core-server installation type, 80
- CPU issues, 98–99
- debugging, 96–97
- desktop class system issues, 377
- disk device drivers, 94–95
- disk drive issues, 100
- domain membership options, 83
- DVD-ROM problems, 97
- firmware issues, 100
- full-server installation type, 81
- general installation parameters, 70–71
- hardware requirements, 72–73, 96
- Initial Configuration Tasks console, 87, 113–114
- installation step, 87
- interactive setup overview, 69
- introduction to, 69
- Itanium-based systems issues, 78–79
- language selection, 86
- licensing issues, 71–72
- memory issues, 98–99
- naming computers, 81–82
- network component options, 83–84
- partition issues, 76–80, 95
- passwords, 88
- Plug and Play configuration issues, 97
- points of failure, potential, 96
- postinstallation checks, 100–101
- preinstallation tasks, 76–77
- preparing for, overview, 72
- product keys, 85–86
- protocol options, 82–83
- quick start guide, 69–71
- RAID, 80
- rolling back installations, 84
- Setup, running. *See* Setup.exe
- simplest method, 77
- Startup Repair Tool, 1408–1409
- Stop errors, 98–99
- troubleshooting, 96–100
- types of installs, 69
- types, full and core, 80–81
- unattended installing, 69–70
- updates during, 85
- upgrades, 73–74
- where to install to, choosing, 86–87
- Windows Update, 74–75
- x86 drive sections, 77–78

integrity levels, 297

Intel Quick Resume Technology Driver (QRTD), 381

Intel VT, 10

Internet connections, troubleshooting, 675

Internet Printing Client, 188

Internet Printing service, installing, 853

interrupts, bottlenecks from, 359

intrusion detection, 1319–1320

IP (Internet Protocol). *See also* TCP/IP (Transmission Control Protocol/Internet Protocol)

- addressing. *See* IP addresses; IPv4 addressing
- defined, 627

- IPCONFIG command, invoking, 673

- Next Generation TCP/IP stack, 631–632
- security protocol. *See* IPSec (IP Security)

## IP addresses

- domain controller configuration, 1109, 1113

- IPv4. *See* IPv4 addressing

- IPv6. *See* IPv6 (Internet Protocol version 6)

- NLB (Network Load Balancing), 1331, 1333

IP replication transport, 1288

IPC\$ share, 554

## IPCONFIG command

- DHCP troubleshooting with, 680

- DNS information and troubleshooting with, 680–683

- flushdns command, 811

- invoking, 673

- registerdns command, 809

- renew command, 810–811

- troubleshooting with, 677

## IPSec (IP Security)

- IPv6 implementation of, 652

- troubleshooting, 679

## IPv4 (Internet Protocol version 4)

- addresses. *See* IPv4 addressing

- classes, 633–635

- installing, 659–660

- IPv6 compared to, 631

- Next Generation TCP/IP stack, 631–632

- packet structure, 647

## IPv4 addressing

- addresses defined, 633

- autoconfiguration by DHCP, 687

- broadcast IP addresses, 636–637

- casting modes, 633

- classes, 633–635

- classful host IDs, table of, 638–639

- classful network IDs, table of, 638

- classful vs. nonclassful networks, 636–637

- conflict detection with DHCP, 734

- dynamic, 660

- host IDs, 633

- installation requirements, 657–658

- loopback addresses, 635
- multicast IP addresses, 636
- multiple addresses per computer, 665–666
- name resolution. *See* name resolution services
- NAT (Network Address Translation), 635–636
- network IDs, 633, 638
- packet structure, 647
- pinging IP addresses, 661–662
- planning for, 647–649
- private addresses. *See* private IP addresses
- public addresses. *See* public IP addresses
- router addresses, 639
- special addressing rules, 638
- static IP address assignment, 660–663
- subnetting. *See* subnets
- syntax of, 633
- troubleshooting, 676–677
- unicast addresses, 633–636
- IPv6 (Internet Protocol Version 6)**
  - advantages of, 649–650
  - autoconfiguration by DHCP, 687–688
  - DHCPv6 capable client, 632
  - DNS configuration, 667–669
  - DNS server issues, 681
  - dynamic address configuration, 664–665
  - headers, 652
  - hexadecimal notation for, 650–651
  - installing, 659–660
  - IP Security feature, 632
  - IPSec (IP Security) implementation, 652
  - IPv4 compared to, 631
  - jumbograms, 652
  - Link-Local Multicast Name Resolution, 632
  - loopback addresses, 651
  - MLDv2, 632
  - multicast IP addresses, 651
  - name resolution with LLMNR, 655–656
  - network IDs, 651
  - Next Generation TCP/IP stack, 631–632
  - normal IPv6 scopes, 708–710
  - packet structure, 652
  - payloads, 652
  - PPPv6, 632
  - Random Interface IDs, 632
  - static IP address assignment, 661–663
  - Symmetric Network Address Translators, 632
  - types of addresses, 651
- IRQ settings, 240–243**
- ISA Server, 1333**
- iSCSI**
  - clustering requirements with, 1350–1351
  - defined, 406

- Multipath I/O, adding support for, 412–413
- ISNS (Internet Storage Name Server), 188**
- ISTG (Inter-Site Topology Generator)**
  - bridgehead servers with, 1089–1091
  - listing for a site, 1303
  - monitoring, 1297–1298
  - site links, effect of additional, 1287
- Itanium-based servers**
  - 64-bit computing overview, 7–8
  - boot maintenance manager, 78
  - COM parameters not supported for EMS, 71
  - hardware requirements for installations, 73
  - installation issues, 78–79
  - Setup.exe, booting, 70

## J

- jobs, print**
  - canceling all jobs, 907
  - managing, 908
  - viewing, 907–908
- jumbograms, 652**

## K

- KCC (knowledge consistency checker)**
  - CPU requirements for, 1108
  - forcing topology recalculation, 1303
  - ISTG designation, 1091–1092
  - replication topology generation, 1085
  - site maximum from, 1077
  - testing replication, 1305–1306
- KDCs (Key Distribution Centers)**
  - operation of, 1024–1026
  - RODCs as, 1144–1145
- Kerberos**
  - account options for, 1192
  - advantages of, 1023
  - authentication process, 1024–1025
  - components of, 1024
  - cross-forest transitive trusts, 1030–1032
  - delegating authentication, 1040–1043
  - forwarded tickets, 1040
  - KDCs (Key Distribution Centers), 1024–1026
  - Kerberos Policy, 1169, 1247
  - mutual domain controller authentication by, 1083
  - policy settings, 1173
  - proxy tickets, 1040
  - resource access process, 1025–1026
- kernels**
  - kernel architecture, 11–13
  - kernel memory, 312
  - kernel memory dump files, 1380

**L**

## language selection

- domains, standardization within, 1059
- selection step, 86

## LANs (local area networks)

- NTLM. *See* NTLM (NT LAN Manager)
- setting up. *See* networking
- sites, relation to, 1071

## laser printers, 849, 852

## LDAP (Lightweight Directory Access Protocol)

- Active Directory architecture, 991, 998–999
- step in replication procedure, 1082

## LDM partitions, 451–452

## leases, DHCP

- audits, 728
- broadcast process, 689–693
- databases of, 685
- date stamps, 673
- defined, 660
- duration specification, 705–706
- renewal process, 679–680

## legacy applications, 294, 296

## LGPOs (local GPOs), 1239–1242

## licensing

- CAL Installation Wizard, Terminal Services, 954–957
- client access licenses. *See* CALs (client access licenses)
- Enterprise Agreement License program, 65–66
- installation issues, 71–72
- License Server, Terminal Services, 951–957
- Microsoft Clearinghouse, automatic method with, 955
- Open License program, 64–65
- overview, 63–64
- product keys and activations, table of, 71–72
- retail licenses, 64
- Select License program, 65
- Server Licenses, 63
- Software Assurance, 66
- Terminal Services, 925–927, 937
- volume licensing programs, 64–66

Lightweight Directory Access Protocol. *See* LDAP (Lightweight Directory Access Protocol)

## limited broadcasts, 637

## link bridge costs, 1101–1104, 1289

## link costs for replication, 1100–1101

## Link GPOs permission, 1251, 1253

## link order of GPOs, editing, 1255–1256

## Link-Layer Topology Responder components, 83

## Links toolbar, 150

## List Folder Contents permission, 572

## List Folder special permission, 573

## LLMNR (Link-Local Multicast Name Resolution), 632, 655–656, 757

## LMHOSTS, 669–671

## Load And Unload Device Drivers privilege, 1180

## load balancing

- NLB. *See* NLB (Network Load Balancing)
- round-robin using DNS, 797
- Terminal Services with, 933–935. *See also* TS Session Broker servers

## local area connections

- adding TCP/IP services, 659–660
- configuration, viewing current, 672–673
- creating, 660
- disabling, 673–674
- enabling, 673–674
- IPCONFIG command with, 673
- purpose of, 671
- renaming connections, 674
- speed, checking, 672
- status of, checking, 671–672
- troubleshooting, 674–675

## local group policy

- advantages of multiple, 1240
- conflict resolution, 1240
- inheritance order, 1254
- LGPO assignment, 1239
- Local Group Object Editor, 1241–1242
- Local Group Policy Editor, 1242
- managing settings, 1241–1242
- processing order, 1240
- top-level object access, 1240–1241

Local Security Authority. *See* LSA (Local Security Authority)

## Local Security Policy console

- auditing file and folder access, 581–582
- local group policy settings, 1241–1242
- Registry policy settings, 282–283
- user rights, assigning for specific computers, 1184

## local user accounts

- defined, 1167
- lockout policy, 1172
- password policy enforcement, 1170–1171
- policies for, 1169

## local user profiles

- configuring, 1199–1200
- data storage, 1196
- defined, 1196
- location for storage of, 1196
- switching to roaming, 1202

## localization issues

- planning for, 39
- Regional and Language Options utility, 125

## Lock Pages In Memory privilege, 1180

**lockout policy**

- Account Lockout Policy, 1247
- enabling accounts disabled by, 1195
- number of allowed attempts, specifying, 1176

**logoff scripts, Group Policy, 1265–1266****logon rights**

- accounts, relationship to, 1178
- default, groups assigned to, table of, 1181–1182

**logons**

- Active Directory related features, list of, 989–990
- cached credentials for, 1195
- Group Policy logon scripts, 1265–1266
- Log On To option, 1190
- Logon Hours option, 1190
- Logon Script option, 1194
- Network Security: Force Logoff When Logon Hours
  - Expire policy, 1248
- security token generation, 1020–1022
- sites, isolating by, 1072
- Terminal Services settings for, 959
- Unlock Account check box, 1191
- UPNs (user principal names), 1021

**logs of events. *See* events****loopback addresses**

- IPv4, 635
- IPv6 (Internet Protocol version 6), 651

**LPD (Line Printer Daemon) Service, installing, 853****LPR (Line Printer Remote) Port Monitor**

- installing, 860
- port monitor settings, 863–865
- purpose of, 188
- UNIX print servers with, 860

**LSA (Local Security Authority)**

- defined, 988–989
- Server, Active Directory use of, 990

**LUNs (logical unit numbers), 411****M****MAC addresses**

- checking, 673
- DHCP use of, 686
- NLB (Network Load Balancing) use of, 1334

**mail servers, DNS records for, 798–799****Manage Auditing And Security Log privilege, 1180****Manage Documents permission, 880****Manage Printers permission, 880****managing Windows Server 2008 systems**

- console for computer management. *See* Computer Management console
- console for server management. *See* Server Manager console
- Control Panel utilities. *See* Control Panel

MMCs for. *See* MMCs (Microsoft Management Consoles)

tools for. *See* administration tools

tools, legacy compatibility issues, 52

**mandatory user profiles**

- configuring, 1201–1202
- defined, 1196
- preconfigured, creating, 1198–1199

**man-in-the-middle attacks, 1111****Map Network Drive command, 551****MAPI (Messaging Application Programming Interface), 992****mapping network infrastructure, 1096–1098****Maximum Password Age setting, 1171****MBR partition style**

- background on, 425
- changing to GPT, 428
- creating partitions, 435–439
- drive letter assignment, 435
- format support, 427–428
- formatting, 437–439
- managing partitions on basic disks, 434–448
- mirrored boot and system volumes, 459
- selecting, 424
- structure of, 425–426
- x86 vs. Itanium, 427

**media rotation, 1386–1387****memory**

- Active Directory requirements, 1108
- bottlenecks, 356–358
- counters, 357–358
- diagnostics, 25
- faults, paging file, 357
- improved diagnostics for, 19
- insufficient during installation, 98
- nonpaged pools, 356
- paged pools, 356
- print server requirements, 847
- process usage of, 315
- Reliability And Performance Monitor statistics on, 345
- requirements by edition, table of, 72–73
- specifying boot amount to use, 386
- Terminal Services requirements, 930
- usage, viewing in Task Manager, 312–313
- Windows Memory Diagnostics Tools, 1377

**menu system**

- adding items, 134–135
- changes from 2003, 130–131
- copying items, 135–136
- folder options, Start menu, 131–132
- frequently used programs list, 137–140
- hiding items, 136–137
- highlighted items, 136–137

- menu system, *continued*
  - optional folders, 132
  - overview of, 129–130
  - pinned items, 133
  - removing items, 141
  - renaming items, 141
  - Search box, 132–133
  - sorting items, 140
  - standard Start menu new features, 133–134
- Message Queuing, 189
- Messaging Application Programming Interface. *See* MAPI (Messaging Application Programming Interface)
- MFTs (master file tables), 503–506
- Microsoft Cluster service, 1345
- Microsoft DSM, 411
- Microsoft Internet Security and Acceleration Server, 1333
- Microsoft Management Consoles. *See* MMCs (Microsoft Management Consoles)
- Microsoft Operations Framework (MOF), 28
- Microsoft Product Support, 1375–1376
- Microsoft Solutions Framework Process Model, 28–29
- Microsoft Solutions Framework Team Model, 31–32
- Microsoft Universal Printer Driver, 846
- Microsoft Vista. *See* Windows Vista
- Microsoft\Windows logs, 328
- migration to Windows Server 2008, 88. *See also*
  - upgrading to Windows Server 2008
- Minimum Password Age setting, 1171
- Minimum Password Length setting, 1171
- mirror sites, 1329–1330
- mirrored volumes
  - breaking, 463–464
  - configuring, 457–458
  - defined, 452
  - GPT boot and system volumes, 459–462
  - MBR boot and system volumes, 459
  - troubleshooting, 464–466
- mission-critical systems. *See* availability
- MLDv2 (Multicast Listener Discovery version 2), 632
- MMCs (Microsoft Management Consoles)
  - 3.0 version changes, 154
  - 32-bit vs. 64-bit snap-ins, 160
  - Active Directory Users And Computers. *See* Active Directory Users and Computers snap-in
  - Active Directory–related snap-ins, 163
  - adding snap-ins to custom consoles, 165–169
  - administrative tool set, installing full, 160–161
  - advantages of, 153
  - Appearance And Personalization console, 120–122
  - author mode, 156–157
  - capabilities of, 153
  - changes from 2003, 154
  - Computer Management. *See* Computer Management console
  - console tools with file names, table of, 161–162
  - console trees, 158
  - creating custom consoles, 164–165
  - customization overview, 163
  - details pane, 158
  - directories for tools, 159
  - Disk Management. *See* Disk Management snap-in
  - extension components, 155–156
  - GPMC. *See* Group Policy Management Console (GPMC)
  - icons for custom consoles, 171–172
  - limitations of, 154
  - Local Security Policy. *See* Local Security Policy console main pane, 158
  - mode settings for custom consoles, 170
  - modes of, 156–158
  - nodes in, 155, 158
  - opening console specification, 159
  - Print Management. *See* Print Management console publishing, 184
  - Reliability. *See* Reliability And Performance Monitor console
  - remote systems with, 162–163
  - saving custom console tools, 172–173
  - saving custom consoles, 169–172
  - snaps-ins, generally, 154–156
  - starting, 158–159
  - taskpads, custom, 173–183
  - tool availability, 160–161
  - user mode, 156–157, 170
- Modified Fast Recovery Algorithm, 631
- Modify An Object Label privilege, 1180
- Modify Firmware Environment Values privilege, 1180
- Modify permission, 572
- modular component design architecture, 14
- monitoring operations, 1316–1317
- monitoring performance. *See* performance monitoring monitors
  - display settings for, 122
  - spanning for remote sessions, 613
- motherboard power state management capabilities, 379
- mount points
  - adding and removing, 442–443
  - purpose of, 442
  - reparse points, 517–518
  - shadow copy issues with, 594
- mouse pointer selection, 121
- MPIO (Multipath I/O), 189
- msconfig.exe command boot configuration, 385–388
- MSF (Microsoft Solutions Framework), 28–29
- MSR partitions, 450–451

- multicast IP addresses
  - address class for, 636
  - host groups, 636
  - IPv6, 651
  - scopes for, 702
  - sending nodes, 636
- Multipath I/O
  - Active/Active controller model, 411
  - adding hardware devices, 412–413
  - DSM with, 411
  - File Services with, 416
  - MPIO Properties dialog box, opening, 411
  - purpose of, 408
  - removing devices, 413
- multiple operating systems
  - disk formats for, 437
  - settings for, 384–385
- multiprocessor system CPU affinity issues, 359
- multisite options for clusters, 1329–1330

## N

- name resolution services
  - DNS. *See* DNS (Domain Name System)
  - list of supported systems, 652
  - LLMNR, 655–656
  - LMHOSTS, 669–671
  - NetBIOS. *See* NetBIOS
  - processes for, 654
  - purpose of, 652
  - sites, requirements for, 1073
  - troubleshooting, 680–683
  - WINS. *See* WINS (Windows Internet Naming Service)
- named data streams, 512–513
- named pipes, IPC\$ share, 554
- namespaces
  - Active Directory design overview, 54–55
  - DNS, 744–746
  - forest, 1054–1055
  - private, 746
- naming computers, 81–82
- NAP (Network Access Policy) Network Policy Server tool, 108
- NAP (Network Access Protection)
  - class clients, setting options with DHCP, 722–723
  - DHCP integration with, 731–733
- NAS (network-attached storage)
  - command-line tools for managing, list of, 409
  - defined, 406
- NAT (Network Address Translation), 635–636
- Neighbor-Unreachability Detection, 631
- NET LOGON, 989
- net share command, 556
- Net Share command-line tool, 579–581
- Net tools, commands available, 111–112
- NetBIOS
  - Active Directory domains, name generation for, 1123
  - name resolution services for, 669–670
  - node types, 824
  - scope, 824
  - WINS support for, 654–655, 823–824
- NETLOGON share, 555
- netsh command
  - activation of scopes, 716–717
  - DHCP database management, 736
  - DHCP with, 700
  - scope management with, 710–711
  - troubleshooting with, 677–679
  - WINS commands with, 827
- Network Access: Allow Anonymous SID/NAME
  - Translation policy, 1170, 1248
- network adapters
  - binding DHCP to, 729
  - configuration, viewing current, 672–673
  - driver settings, 227
  - failover clustering interface states, 1355
  - failover clustering requirements, 1350
  - installation, 658–659
  - IP addresses of, configuring, 662–663
  - IPCONFIG command with, 673
  - MAC addresses of, 673, 686
  - monitoring statistics with Task Manager, 323–324
  - Network Load Balancing choices, 1332–1334
  - reservations, DHCP, 686
- Network Address Translation (NAT), 635–636
- Network And Sharing Center
  - Access field, 629–630
  - accessing, 549, 629
  - Connection field, 629–630
  - diagnostics from, 630
  - discovery, turning on, 676
  - dynamic address configuration, 664–665
  - identification status of networks, 16
  - multiple gateway configuration, 665–666
  - sharing and discovery area, 630
  - static IP address configuration, 662–663
  - summary network map area, 629
  - TCP/IP services, installing, 659–660
- network awareness
  - defined, 628
  - Network Diagnostics Framework, 15–18
- network browsing, troubleshooting, 676
- network connections
  - binding DHCP to, 729
  - local. *See* local area connections

**Network Connections tool**

- configuration, viewing current, 672–673
- DNS configuration, 667–669
- dynamic address configuration, 664–665
- enabling connections, 673–674
- multiple gateway configuration, 665–666
- renaming connections, 674
- static IP address configuration, 662–663
- Status dialog box, 671–672
- TCP/IP services, installing, 659–660

**Network Diagnostics Framework**

- CAPI2, 18
- identification status of networks, 16
- management policies, 18
- network awareness, 15–17
- Next Generation stack enhancement, as, 631
- OCSP, 18
- SMB 2, 17
- SRA (Secure Remote Access), 18
- SSO, 18
- SSTP (Secure Socket Tunneling Protocol), 18

**Network Discovery**

- automatic configuration of, 628–629
- categories of networks defined in, 628
- controlling in Network And Sharing Center, 630
- Off (Disabled) state, 629
- On (Enabled) state, 628
- purpose of, 628
- troubleshooting with, 676

**Network Explorer**

- accessing, 629
- enabling discovery, 629
- finding shared folders, 552
- viewing shared files, 551

**network IDs**

- classful network, list of, 638
- defined, 633
- IPv6, 651
- network prefix notation, 640–641

**Network Load Balancing (NLB). See NLB (Network Load Balancing)****network management tools for deployment planning, 44****Network Policy Servers**

- DHCP servers set up as, 731–733
- planning for, 60

**network prefix notation, 640–641****Network Security**

- Force Logoff When Logon Hours Expire policy, 1170, 1248

**network troubleshooting**

- DHCP issues, 679–680
- discovery issues, 676
- DNS issues, 680–683

**Internet connections, 675**

- IPSec issues, 679
- IPv4 addressing, 676–677
- local area connection issues, 674–675
- netsh command, 677–679
- network browsing, 676
- packet filtering issues, 679
- Pathping command, 678
- PING command for, 675–676
- subnets, 677
- Tracert for, 678
- Windows Firewall issues, 679

**network-attached printers**

- adding to print servers, 860–863
- defined, 850
- Network Printer Installation Wizard, 855, 857–863

**network-attached storage. See NAS (network-attached storage)****networking**

- addresses. *See* IP addresses
- automatic address assignment. *See* DHCP (Dynamic Host Configuration Protocol)
- bottlenecks, 362–363
- cabling, 1314
- classes of networks, 633–635
- classful vs. nonclassful networks, 636–637
- configuring TCP/IP. *See* configuring TCP/IP networking connections. *See* local area connections; Network Connections tool
- diagnostics. *See* Network Diagnostics Framework
- discovery feature. *See* Network Discovery Explorer. *See* Network Explorer
- fault tolerance, 1312
- IDs. *See* network IDs
- installing. *See* installing TCP/IP networking
- installing, component options, 83–84
- latency issues, 362
- mapping network infrastructure, 1096–1098
- monitoring availability, 1317
- monitoring statistics with Task Manager, 323–324
- name resolution. *See* name resolution services
- navigation of, overview, 627–630
- NLB. *See* NLB (Network Load Balancing)
- packets, data. *See* packets
- performance monitoring, 362–363
- policy servers. *See* Network Policy Servers
- prefix notation, 640–641
- printers. *See* network-attached printers; print servers
- Reliability And Performance Monitor statistics on, 345
- statistics, table of, 324
- storage. *See* NAS (network-attached storage); SANs (storage area networks)
- subnetting. *See* subnets

- TCP/IP. *See* TCP/IP (Transmission Control Protocol/Internet Protocol)
- Terminal Services bandwidth requirements, 920, 931
- tools for, list of, 627
- troubleshooting. *See* network troubleshooting
- New ObjectUser Wizard, 1184–1185
- New Task Wizard, 179–183
- New Trust Wizard, 1035–1038
- Next Generation TCP/IP stack, 631–632
- NFS (Network File System)
  - purpose of, 416
  - tool for, 108
- NICs (network interface cards). *See* network adapters
- NLB (Network Load Balancing)
  - active node mode, 1327–1328
  - adding nodes to a cluster, 1342–1343
  - basic models for, 1332
  - broadcast plus filtering traffic direction, 1332
  - cluster adapters, 1333
  - cluster management options, 1344
  - cluster parameter settings, 1341
  - cluster size requirements, 1336
  - creating new clusters, 1337–1342
  - data storage for, 1331
  - dedicated adapters, 1333
  - Drainstop option, 1344
  - event logging, 1344
  - failover in, 1331
  - filtering modes, 1335, 1342
  - heartbeats, 1331–1332
  - host management options, 1344–1345
  - host parameter settings, 1339
  - installing, 1337
  - IP addresses for, 1331, 1333, 1339–1340
  - ISA Server with, 1333
  - MAC addresses, 1334
  - maximum number of computers in clusters, 1331
  - multicast mode, 1332
  - NDIS lightweight filter model, 1332
  - network adapters, single vs. multiple, 1332–1334
  - network driver nature of, 1332
  - Network Load Balancing Manager, 1337
  - network types supported, 1332
  - nlbmgr command, 1337
  - operations mode, setting, 1341
  - optimization of servers, 1336
  - planning, 1336–1337
  - port rules, 1335, 1342
  - protocols controlled by, 1333
  - purpose of, 189, 1323, 1331
  - RAID with, 1336
  - recommended applications for, 1331
  - removing nodes from a cluster, 1343
  - Resume option, 1344
  - round-robin DNS compared to, 1331
  - router issues, 1334
  - services that work with, 1336
  - session state maintenance, 1335
  - Shared Configuration feature with, 1337
  - sites, multiple physical, 1329–1330
  - specific traffic to specific servers allowed, 1332
  - Start option, 1344–1345
  - stopping, 1344
  - stress testing of, 1336
  - Suspend option, 1344
  - switch flooding, limiting, 1341
  - synchronization of data, 1336
  - unicast mode, 1332
  - VPN with, 1336
  - workload distribution paradigms, 1335
- nodes, cluster
  - active vs. passive, 1327–1328
  - active, for failover clusters, 1345
  - adding to a cluster, 1342–1343, 1360
  - defined, 1323
  - maximum number supported, 1326
  - multiple physical sites for, 1329–1330
  - removing from a cluster, 1343
- nonauthoritative restores of Active Directory, 1411–1412
- nonclassful networks
  - defined, 636–637
  - network number identification, 638
- nonpaged pools, 356
- normal backups, 1385–1386
- NPAS (Network Policy And Access Services), 187
- nslookup command, 812
- NTDS, Settings dialog box, 1013
- Ntdsa.dll. *See* directory service (Ntdsa.dll)
- ntdsutil
  - activate instance ntds command, 1127–1128
  - failed domain controllers, removing references to, 1415–1416
  - restoring Active Directory, 1413–1414
- NTFS
  - advanced features, list of, 511
  - boot sectors, 503
  - change journals, 514–515
  - Check Disk, analyzing volumes with, 539–540
  - clusters, 498–499, 508
  - converting FAT disks to, 432–433
  - data streams, 512–513
  - feature set of, 507–508
  - file-based compression, 521–523
  - formatting drives as, 437–439

NTFS, *continued*

- FSutil FSinfo command, 508–510
- hard links, 511–512
- integrity of files, 535
- metadata, 503–504, 510
- MFTs (master file tables), 503–506
- nonresident attributes, 504
- object identifiers, 516–517
- quota management. *See* quota management
- recommended file format, 437
- reparse points, 517–518
- resident attributes, 503
- Self-Healing NTFS, 520–521
- sparse files, 518–519
- structure of volumes, 503–506
- transactional NTFS, 520
- VCNs (virtual cluster numbers), 505
- versions of, 507–508
- viewing drive information, 508–510

## NTLM (NT LAN Manager)

- authentication with, 1023–1024
- Security Accounts Manager, 990

## NX (non-execute) page protection, 402

## O

## object identifiers, 516–517

## objectives, defining

- budget issues, 47–48
- contingency allowances, 48–49
- organizational objectives, 45–46
- overview of, 45
- schedules for projects, setting, 46–47
- specificity of goals, 46
- tips for growing projects, 45

## OCSP (Online Certificate Status Protocol), 18

## OEM partitions, 452

## offline files

- configuring, 1207–1209
- file synchronization for, 1209–1210

## On Screen Keyboard, 1377

## operations management

- auditing procedures, 1319–1320
- backup plans, 1318
- change control procedures, 1317–1318
- checklist, 1320–1321
- critical procedures list, 1316
- data recovery plans, 1318–1319
- incident response teams, 1320
- monitoring plan, 1316–1317
- problem-escalation procedures, 1319
- resources, training and documentation, 1317
- staffing requirements, 1317

## operations masters

- changing roles, 1046
- defined, 57
- domain design considerations, 1044
- domain naming master role, 1044–1046, 1048
- guidelines for configuring, 1046
- infrastructure master role, 1044–1046, 1050–1051
- listing current, 1045
- PDC emulator role, 1044–1046, 1050
- purpose of, 1044
- RID (relative ID) role, 1044–1046, 1048–1050
- RODCs not allowed as, 1145
- roles, 1044
- schema master role, 1044–1047
- seizing and transferring roles, 1051–1052
- transferring roles, 1047

## organizational objectives, specifying, 45–46

## OUs (organizational units)

- accounts, placing in, 1136
- administration model for, 1069
- administrative rights delegation to, 1064
- advantages over multiple domains, 1060
- assigning user rights for, 1182–1183
- attributes, editing, 1135
- canonical name option, 1135
- child OU group policy inheritance order, 1254
- COM+ partitions, 1135
- cost center model for, 1068
- creating, 1133–1134
- defined, 1063
- delegation of administrative rights, 1064–1065, 1136–1139
- deleting, 1134
- descriptive information option, 1135
- design overview, 1065
- division or business unit model, 1066
- enforcing inheritance, 1258–1259
- geographic model for, 1067
- group policy inheritance order, 1254
- group policy with, 1065
- InetOrgPerson objects, 1063
- Managed By option, 1135
- managing groups of objects with, 1064
- naming, 1134
- permissions required to create, 1133
- properties, setting, 1135
- recursive capabilities of, 1064
- resources, placing in, 1136
- task delegation, 1138–1139
- Terminal Services, for, 613, 931–932
- types of objects in, 1063
- utility of, 1064

## ownership of files and folders, 567–568, 575

**P****packets**

- IPv4, structure of, 647
- IPv6, structure of, 652
- packet filtering, troubleshooting, 679

**packs**

- organization of servers in, 1325–1326
- SQL Server use of, 1326

**PAE (Physical Address Extension) options, 402****page file partitions, 429****paged pools, 356****paging files**

- counters for, 357–358
- failover clustering requirements, 1349
- faults, 357
- page faults per process, 315
- partitions, 77
- tuning performance of, 305–308

**paper trays, printer, 850****parent domains, 653****parent folders, 569****partitions, directory**

- purpose of, 1005–1006
- replication of, 1093–1095
- RODC replication of, 1146–1147

**partitions, drive**

- active, 429
- allocation unit size, 438
- basic disk, 428–432
- BitLocker, 482–485
- boot partitions, 429
- changing during installations, 95
- crash dump partitions, 429
- creating, 435–439
- creating additional, 79
- deleting, 448
- DiskPart tool, 409
- ESP partition type, 449–450
- extended, 430, 436
- extending, 443–446
- formatting, 437–440
- GPT types, 449
- Itanium-based, 78
- LDM partitions, 451–452
- MSR partitions, 450–451
- OEM partitions, 452
- page file, 429
- planning issues, 79–80
- postinstallation checks, 101
- primary partitions, 451
- RAID, 80
- shrinking, 446–447

size, setting, 435–436

styles, 424–428

system partitions, 429

types of, 76–78

where to install to, choosing, 86–87

**passwords**

account options, setting, 1185

Active Directory Restore mode, 1120

backing up, 1214–1215

complexity status setting, 1175

Enforce Password History setting, 1170–1171

history length setting, 1175

Kerberos policy settings, 1173

lockout policy, 1172, 1176

Maximum Password Age setting, 1171, 1176

Minimum Password Age setting, 1171, 1176

Minimum Password Length setting, 1171, 1175

options for, setting, 1191–1192

Password Must Meet Complexity Requirements setting, 1171

Password Policy, 1247

Password Settings containers, 1169

Password Settings group, 1173–1176

policy enforcement, 1170–1171

PSOs (Password Settings objects), 1169, 1173–1177

reset disks, 1214–1215

resetting by administrators, 1212–1213

RODC replication policies, 1148, 1158–1165

security policy effects on, 998

setting for new accounts, 1185–1187

settings object creation, 1173–1176

Store Passwords Using Reversible Encryption setting, 1171, 1175

strong, 88

trusts, creating for, 1037–1038

**Pathping command, 678****payloads, IPv6, 652****PCL (Printer Control Language), 842, 846. *See also* EMF (enhanced metafile format)****PDC emulators**

purpose of, 57

RODCs with, 1145, 1148

role, operations master, 1044–1046

**Perform Group Policy Modeling Analysis permission, 1251, 1253****Perform Volume Maintenance Tasks privilege, 1180****performance**

baselines, establishing, 303, 344

bottleneck overview, 356

counters for. *See* counters

CPU bottlenecks, 359–360

data collector sets for monitoring. *See* data collector sets

**performance, *continued***

- disk I/O bottlenecks, 360–362
- memory bottlenecks, 356–358
- monitoring. *See* Performance Monitor; performance monitoring
- network bottlenecks, 362–363
- Performance Diagnostics, 24
- reliability monitor. *See* Reliability Monitor
- tuning. *See* tuning performance
- visual effects hits on, 303–304

**Performance Monitor**

- Active Directory, monitoring, 1303–1304
  - Add button, 352
  - adding counters, 349–350
  - alert configuration, 369–370
  - alerts, 346
  - Change Graph Type button, 352
  - Copy Properties button, 352
  - counter list, 352
  - counters defined, 346–347. *See also* counters
  - CPU counters, 360
  - data collectors. *See* data collector sets
  - Delete button, 352
  - deleting counters, 350
  - Directory Services performance object, 1303–1304
  - Freeze Display button, 352
  - graphing counter statistics, 351
  - help, 353
  - Highlight button, 352
  - Histogram Bar view, 353
  - log files of, 346
  - memory counters, 357–358
  - network counters, 362–363
  - Paste Counter List button, 352
  - performance object instances, 347
  - performance objects, 347
  - performance objects, table of common, 348–349
  - print server performance, 909–912
  - Properties button, 352
  - purpose of, 343, 346
  - Reliability And Performance Monitor, location in, 346
  - remote monitoring, 354–355
  - replication statistics, 1303–1304
  - Report view, 353
  - resources consumed by issue, 354
  - toolbar, 351–352
  - Update Data button, 353
  - View Current Activity button, 352
  - View Log Data button, 352
- performance monitoring**
- applications status, 314
  - baselines, establishing, 344

- command-line commands for, 370–373
  - configuration data sets, 368
  - counters for. *See* counters
  - CPU counters, 360
  - CPU statistics, 311–313
  - data collectors. *See* data collector sets
  - defined, 303
  - get-process command, 315–320
  - get-service command, 321–322
  - kernel memory, 312
  - memory counters, 357–358
  - memory usage in Task Manager, 312–313
  - network counters, 362–363
  - networking statistics, 323–324
  - Performance tab, Task Manager, 311–313
  - print servers, 909–912
  - processes, 309–310, 314–320
  - remote monitoring, 354–355
  - replication monitoring, 1303–1304
  - Task Manager overview, 308–309. *See also* Task Manager
  - Tracert, 372–373
  - Typeperf command, 370–372
- Performance Options dialog box, 305**
- permissions**
- access permissions for files and folders, 571–578
  - accounts, relationship to, 1178
  - Apply Group Policy permission, 1259–1261
  - Apply Onto options, 577–578
  - atomic permissions, 575
  - Change Permissions special permission, 575
  - Change permissions, file sharing, 564
  - Create Files/Write Data special permission, 574
  - Create Folders/Append Data special permission, 574
  - delegation to manage Active Directory objects, 1136–1139
  - Delete special permission, 574
  - Delete Subfolders And Files special permission, 574
  - Effective Permissions tool, 1188–1189
  - effective permissions, determining, 578–579
  - Execute File special permission, 573
  - Full Control permissions, file sharing, 564, 572
  - Group Policy management permissions, 1250–1253
  - Group Policy, effects on, 1259. *See also* Group Policy
  - groups, table of types, 1218
  - inheritance of, for file sharing, 569–570
  - List Folder Contents permission, 572
  - List Folder special permission, 573
  - Modify permission, 572
  - Permissions icons, 289
  - printers, for. *See* printer permissions
  - Read & Execute permission, 572
  - Read Attributes special permission, 573

- Read Data special permission, 573
- Read Extended Attributes special permission, 574
- Read permissions, 572
- Read Permissions special permission, 575
- Read permissions, file sharing, 564
- Remote Desktop for Administration, for, 610–612
- removing users or groups for permissions, 577
- resetting for files and folders, 570–571
- setting special permissions for files and folders, 576–577
- share permissions, 563–566
- special permissions, 573–578
- Take Ownership special permission, 575
- Terminal Services, 961–964
- Traverse Folder special permission, 573
- viewing for files and folders, 571
- Write Attributes special permission, 574
- Write permission, 572
- Physical Address Extension (PAE) options, 402
- physical security, 1370
- PING command
  - checking for IP addresses, 661–662
  - testing networks with, 675–676
- planning deployments
  - Active Directory issues, 54–58. *See also* Active Directory system design
  - administrative approach issues, 51–54
  - analysis of existing system, 29, 37–44
  - budget issues, 47–48
  - building phase of MSF, 28
  - business perspectives, 34–35
  - change management process, 54
  - contingency allowances, 48–49
  - deploying phase of MSF, 28
  - designing the new network. *See* designing new networks
  - DHCP servers, 60
  - disaster recovery, 43–44
  - DNS server issues, 59
  - documentation, 34
  - domain architecture, 50
  - domain controllers, 58–59
  - domain functional levels, 55–57
  - domain trusts, 55
  - editions of Windows Server 2008, selecting, 61–63
  - envisioning phase of MSF, 28
  - file services, 60
  - global catalog servers, 58
  - goal assessment, 29, 33–37
  - governing phase of MSF, 28
  - hardware inventories, 39–40
  - installation phases, 30. *See also* installing Windows Server 2008
  - IT–business interaction issues, 36
  - IT goal identification, 35
  - licensing programs, 63–66
  - localization issues, 39
  - management tools, reviewing, 51–52
  - Microsoft Operations Framework (MOF), 28
  - Microsoft Solutions Framework Process Model, 28–29
  - namespace design, 54–55
  - network administration review, 42–43
  - network infrastructure evaluation, 38
  - network management tools, assessing, 44
  - Network Policy Servers, 60
  - network services and applications identification, 40–41
  - new installation issues, 67
  - objectives, defining, 45–49
  - operations masters, 57
  - organizational objectives, 45–46
  - overview, 27
  - partition issues, 79–80
  - planning phase of MSF, 28
  - predicting changes, 36–37
  - print services, 60
  - project scope definition, 29–30
  - remote locations, 38
  - schedules for projects, setting, 46–47
  - scope of projects, finalizing, 49
  - security infrastructure, 41–42, 51
  - servers and services, assessing, 39
  - server roles, 57–61
  - stabilizing phase of MSF, 28
  - standards selection, 52–53
  - tasks in deployment process, 29–30
  - team identification, 29, 31–33
  - testing the design, 30
  - WINS servers, 60
- platters, 497
- Plug and Play devices
  - installation process, 216–219
  - remote administration, 615
- PNRP (Peer Name Resolution Protocol), 189
- point and print restrictions, 870–871
- policies
  - account. *See* account policies
  - assigning user rights with, 1182–1183
  - domain user accounts, configuring for, 1169–1170
  - Group Policy objects. *See* GPOs (Group Policy objects)
  - Local Security Policy console, 1184
  - user profiles, for, 1197
- pooling printers, 898–900
- ports
  - replication use of, 1084
  - Terminal Services, 941

## ports, printer

- managing, 886–887
- pooling printers, 899–900
- port names, 862

## postinstallation checks, 100–101

## PostScript, 842, 846–847

## power protection, 1370

## power state management

- ACPI requirement, 379
- ACPI Suspend State or Suspend Mode setting, 380
- After Power Failure or AC Recovery setting, 380
- Enhanced Intel SpeedStep Technology (EIST), 381
- hardware dependence of, 379–382
- Intel Quick Resume Technology Driver (QRTD), 381
- motherboard specificity, 379
- states of, 379–380
- Wake On LAN From S5 or Auto Power On setting, 380
- Windows Vista, 378

## power supplies, 1314

## Power Users group legacy only in 2008, 296

## PowerShell

- commands, 112–113
- feature for installing, 190
- get-eventlog command, 338–341
- get-process command, 309–310, 315–320
- get-service command, 310, 321–322
- installing, 112
- stopping processes, 320

## PPP (Point-to-Point Protocol), 632

## preinstallation tasks, 76–77

## Previous Versions feature, 603–605

## primary DNS servers, 750–751

## primary partitions, 451

## Print Management console

- adding local printers, 855–859
- adding print devices manually, 857–859
- adding print servers to, 872–873
- Additional Drivers command, 857
- auditing access, 884
- automatic installation of network printers, 855
- Cancel All Jobs command, 907
- client printer drivers, 894–895
- color profiles, 906–907
- denying printer permissions, 881–883
- deploying connections, 868–869
- driver property management, 887–889
- drivers for network printers, 862–863
- Enable Advanced Printing Features option, 901
- Extended view, 907
- filtered displays of printers, 876–878
- forms, 885–886
- general properties, setting, 891

## granting printer permissions, 881–883

## Hold Mismatched Documents option, 901

## job properties, changing, 908

## jobs, managing, 908

## jobs, viewing, 907–908

## Keep Printed Documents option, 901

## listing available printers, 856

## menu command to open, 854

## migrating printers and queues, 873–876

## network-attached printers, adding, 860–863

## notifications property settings, 889–890

## notifications, setting, 877

## pausing all printing, 907

## pausing individual jobs, 908

## pooling printers, 898–900

## port management, 886–887

## Print Directly To The Printer option, 901

## Print Spooled Documents First option, 901

## properties of individual printers, 890

## property management overview, 885

## queue priority, setting, 896–898

## recommended tool, 872

## remote print server management, enabling, 872

## removing print servers from, 873

## resuming all printing, 907

## scheduling queues, 896–898

## share names, 856

## sharing printers, 895–896

## spooler property settings, 889–890

spooling configuration, 900–901. *See also* Print Spooler service

## Start Printing options, 900

## TCP/IP port monitor settings, 863–865

## viewing printer permissions, 881

## watermarks, 893–894

## print processors, 901–902, 916–917

## print servers

- 64-bit driver support, 845
- adding local printers, 855–859
- adding print devices manually, 857–859
- adding print drivers, 888
- adding to Print Management console, 872–873
- application-based printing issues, 917
- auditing access, 884
- automatic installation of network printers, 855
- backing up, 912–913
- backups, 1384
- canceling all jobs, 907
- client print drivers, 894–895
- client relationship to, 842–843
- client-computer-based errors, 917–918
- clustering, 846, 1363, 1367

- command-line scripts, 854–855
- command-line tool for, 854
- connecting from client computers, 865–867
- console for, 854. *See also* Print Management console
- counters, performance, 909–912
- data types for drivers, 841–842
- defined, 841, 852
- deploying connections, 868–869
- disk I/O requirements, 848
- disk space requirements, 848
- driver installation on clients, 845–846, 857
- driver property management, 887–889
- driver storage location, 844
- drivers for network printers, 862–863
- EMF (enhanced metafile format), 842–843, 846–847
- error handling, 845–846, 914
- failure, preparing for, 912–913
- filtered displays of printers, 876–878
- form management, 885–886
- frozen queues, 909
- GDI preprocessing, 844
- handles, 847–848
- hardware configuration, 847–848
- high-resolution graphics resource requirements, 847
- installing, 853–854
- Internet Printing service, 853
- IP address issues, 916
- jobs, managing, 908
- jobs, viewing, 907–908
- kernel mode drivers, 845
- legacy Windows clients, 848
- listing available printers, 856
- local print providers, 845
- local print spoolers, 844–845
- location descriptions, 863
- logging spooler events, 889–890
- logical devices, multiple per printer, 853
- LPD (Line Printer Daemon) Service, 853
- LPR (Line Printer Remote) Port Monitor, 860
- maintenance overview, 909
- memory requirements, 847
- Microsoft Universal Printer Driver, 846
- migrating printers and queues, 873–876
- multiple logical devices per printer, 896
- Net Use command, 867
- network issues, 916–917
- network-attached printers, adding to, 860–863
- non-Windows clients, 848
- notifications, setting, 877, 889–890
- optimization overview, 896
- overview of printing process, 842–845
- pausing printers, 907
- PCL (Printer Control Language), 842, 846
- performance monitoring, 909–912
- permissions. *See* printer permissions
- point and print restrictions, 870–871
- pooling printers, 898–900
- port management, 886–887
- port names, 862
- PostScript, 842, 846–847
- print monitors, 845
- Print Services role, adding to servers, 853–854
- Print Spooler service, 844–845, 889–890, 909, 913, 916
- PRINT\$ shares, 555
- printer installed bases, 841
- Printer Migration Wizard, 873–876
- property management overview, 885
- queue errors, 916
- queue priority, 896–898
- queues, location of, 845
- queues, tracking performance of, 911
- RAW data type, 842–843
- remote users, printer availability to, 863
- removing print drivers, 889
- RPC connections, 847–848
- scheduling queues, 896–898
- scripts, command line, 854–855
- secondary servers recommended, 912
- separator pages, 902–906
- service. *See* Print Services
- share names, 856
- SMB connections, 848, 918
- spool folder free space, 916
- spooler property settings, 889–890
- spooling, 844–845. *See also* Print Spooler service
- spooling configuration, 900–901
- SpoolSv instance, 909
- TCP/IP port monitor settings, 863–865
- test pages, printing, 914
- troubleshooting, 913–918
- Unidrv, 846
- UNIX, 860
- user access to printers, 865–867
- user mode drivers, 845
- user relations issues, 915
- user, single, unable to print, 917–918
- VBScript for connections, 867
- Print Services**
  - defined, 187
  - planning deployments of, 40, 60
  - role, adding to servers, 853–854
- Print Spooler service**
  - automatic spooling restarts, 913
  - configuring, 889–890
  - manually restarting, 909
  - place in connection sequence, 844–845

**Print Spooler service, *continued***

- remote access to Registry requirement, 282
- spooling configuration, 900–901
- SpoolSv instance, 909
- uncleared error documents in queue, 916

**printer permissions**

- auditing access, 884
- Change Permissions permission, 880
- default condition, 879
- defined, 879
- denying, 881–883
- granting, 881–883
- Manage Documents permission, 880
- Manage Printers permission, 880
- ownership assignments, 883
- Print permission, 880
- Read Permissions permission, 880
- restricting printer use, reasons for, 879
- special permissions, 880
- spool folder permissions, 881
- standard permissions, 880
- Take Ownership permission, 880
- troubleshooting, 917
- users and groups, 880
- viewing, 881

**printers**

- application-based printing issues, 917
- automatic installation of network printers, 855
- cabling options, 857
- color, 851, 906–907
- Comment property, 891
- direct-attached, 850
- domain local groups for accessing, 1218–1219
- duplexers, 850
- duty cycles of, 851–852
- failure, preparing for, 912–913
- Form To Tray Assignment property, 892
- general properties, setting, 891
- ink-jet printers, 849
- IP address issues, 916
- Job Timeout property, 892
- large-format printing, 850
- laser printers, 849, 852
- Layout tab, 892
- local printer name property, 891
- local printers, adding to print servers, 855–859
- location descriptions, 863
- Location property, 891
- memory expansion, 849, 892
- migrating printers and queues, 873–876
- monitoring, 847
- Net Use command, 867
- network issues, 916–917

- network-attached, 850
- ownership assignments, 883
- paper trays, 850
- Paper/Quality tab, 892
- permissions. *See* printer permissions
- photoprinting, 850–851
- print processors, 901–902
- PRINT\$ shares, 555
- printing preferences, setting, 891–892
- properties of individual printers, 890
- publishing by Active Directory, 895
- scheduling, 896–898
- security settings, client, 870–871
- separator pages, 902–906
- servers for. *See* print servers
- share configuration, 550
- share names, 856
- sharing, 854, 895–896
- status checks, 914–915
- Terminal Services support for, 924–925
- test pages, printing, 914
- troubleshooting, 913–918
- user access to shared, 865–867
- VBScript for connections, 867
- Wait Timeout property, 892
- watermarks, 893–894

**private IP addresses**

- classes of, 635–636
- guideline for using, 647–648
- static IP address assignment, 661

**privileges**

- accounts, relationship to, 1178
- default, groups assigned to, table of, 1178–1181

**Problem Reports And Solutions console, 22, 237****problem resolution policy documents, 1371–1373****problem-escalation procedures, 1319****processes**

- get-process command, PowerShell, 309–310, 315–320
- Processes tab, Task Manager, 308
- statistics, table of names and descriptions, 316–319
- stopping, 320
- Task Manager display of, 314–320
- terminating with Software Explorer, 288

**processors. *See* CPUs (central processing units)****product keys**

- changing, 127
- entering, 85–86

**product management teams, 31****Profile A Single Process privilege, 1180****Profile System Performance privilege, 1180****profiles**

- setting for accounts, 1193–1194
- user. *See* user profiles

- Program Compatibility Assistant, 286–287
- program management teams, 32
- Programs And Features page, 287–288
- project worksheets, 37
- protocol installation options, 82–83
- proxy tickets, 1040
- PSCs (Password Settings containers), 1169
- PSOs (Password Settings objects), 1169, 1173–1177
- public file sharing
  - configuring, 549–550
  - overview of, 548
  - PUBLIC shares, 555
- Public folder
  - configuring, 549–550
  - purpose of, 548
- public IP addresses
  - defined, 635
  - determining number needed, 649
  - subnets with, 640
- PUBLIC shares, 555

## Q

- QRTD (Intel Quick Resume Technology Driver), 381
- queues, printer
  - queue errors, 916
  - queue priority, 896–898
  - queues, location of, 845
  - queues, tracking performance of, 911
- Quick Launch toolbar, 143, 148–149
- quorums
  - resources, failover clustering, 1354, 1362
  - server clusters, 1330
- quota management
  - adding users outside local domain, 530
  - Administrators group, special treatment of, 526
  - capabilities of, 525
  - configuring quotas, 527–528
  - defined, 525
  - exporting entries, 534
  - importing entries, 534
  - logging events, 533–534
  - organizational culture issues, 525–526
  - ownership changes, 526
  - quota entries, viewing, 532–534
  - Recycle Bin, effect of, 527
  - setting quotas for individual users, 529–532
  - user notifications, 532
  - viewing quotas, 529
  - violations, checking for, 532–534
  - volume basis of, 526

## R

- RAID (redundant array of independent disks)
  - availability gains from, 414
  - disk I/O bottlenecks, 361
  - failover clustering requirements, 1349–1350
  - NLB (Network Load Balancing) with, 1336
  - paging file effects, 306
  - planning for installations, 80
  - RAID 0 configuration, 454–455
  - RAID 1 configuration, 457–462
  - RAID 5 configuration, 462–463
  - RAID 5 troubleshooting, 466
  - RAID-5 volumes, 452
  - software RAID, 430
- RAM. *See* memory
- RAW data type
  - defined, 842
  - port monitor settings, 863–865
  - printing process with, 843
  - PScript5.dll engine for, 846
- RDC (Remote Desktop Connection)
  - admin mode starts, 615
  - Advanced tab, 619
  - client features, 613–614
  - Clipboard with, 618
  - connection bar, 619–620
  - connection speed settings, 618
  - desktop settings, 618–619
  - device control, 618
  - Display tab, 617–618
  - encryption issues, 613
  - ending sessions, 620
  - Experience tab, 618–619
  - General tab, 617
  - keyboard combinations, 618
  - loading saved connection settings, 617
  - Local Resources tab, 617–618
  - logons, 616–617, 619
  - lost connections, 619
  - printers with, 618
  - Programs tab, 618
  - purpose of, 607
  - specifying computer to connect to, 616
  - starting clients, 615–616
  - Terminal Services, as client for, 919
  - virtual mode starts, 616
- RDC (Remote Differential Compression), 1078
- RDNs (relative distinguished names)
  - defined, 1003
  - searching, 1010–1011
- RDP (Remote Desktop Protocol)
  - RemoteApps .rdp file creation, 970–971

- RDP (Remote Desktop Protocol), *continued*
  - Terminal Services, configuring for, 958–960
  - TS Gateway, used by, 920
- Read & Execute permission, 572
- Read Attributes special permission, 573
- Read Data special permission, 573
- Read Extended Attributes special permission, 574
- Read Group Policy Results Data permission, 1251, 1253
- Read Permissions special permission, 575, 880
- Read permissions, file sharing, 564, 572
- read/writable domain controllers. *See* domain controllers
- Read-Only Domain Controller group, 1159
- read-only domain controllers. *See* RODCs (read-only domain controllers)
- realm trusts, 1034–1038
- Receive Window Auto Tuning, 632
- recovery. *See also* restores
  - applications, of specific, 1403
  - authoritative restores of Active Directory, 1412–1414
  - current server data, 1402–1405
  - disaster planning aspect of, 1370
  - domain controller strategies, 1409–1410
  - domain controllers, restoring failed with new, 1415–1416
  - event logs of, 1405
  - folders, of, 1403
  - full system recoveries, 1408–1409
  - location to recover to, selecting, 1404
  - nonauthoritative restores of Active Directory, 1411–1412
  - OS recovery, 1408–1409
  - overwriting options, 1404
  - plans (data), 1318–1319
  - Recovery Wizard, 1402–1407
  - remote server data recovery, 1406–1407
  - Repair Your Computer option, 1377–1378
  - Startup Recovery Options wizard, 1378
  - Startup Repair Tool, 1408–1409
  - stop errors, recovering from, 1378–1380
  - system state recovery, 1407
  - Sysvol data, 1414–1415
  - volumes, of, 1403
  - Windows Complete PC Restore, 1377
  - Windows Error Recovery mode, 1418–1419
  - Windows Memory Diagnostics Tools, 1377
  - Windows Recovery Environment, 1377
  - Windows Server Backup for, 1388
- Recycle Bins, quota management effects, 527
- redundancy
  - components for improving, 1312
  - power supply, 1314
- refreshing Group Policy objects, 1268–1278
- Regedt32, 250, 278
- Regional and Language Options utility, 125
- Registries
  - 32-bit and 64-bit keys, 252
  - access control to, 277–278
  - adding values and keys, 266
  - application settings storage, 247
  - auditing access to, 283–284
  - backing up, 272
  - command line for editing, 271
  - Components subkey, 253–254
  - configuration data sets, 368
  - control sets, 257
  - creation of data in, 260–261
  - data types in, 261–262
  - database nature of, 248–249
  - device enumeration, 257
  - Directory Replicator remote access requirement, 282
  - driver configuration settings, 222
  - Editor, 250, 262–271
  - Editor, modifying permissions on, 277
  - hardware profiles, 257
  - Hardware subkey, 254–255
  - hives, 249, 260–261, 270
  - HKEY\_CLASSES\_ROOT (HKCR), 252, 258–259
  - HKEY\_CURRENT\_CONFIG (HKCC), 252, 259
  - HKEY\_CURRENT\_USER (HKCU), 252, 259
  - HKEY\_LOCAL\_MACHINE (HKLM), 252–258
  - HKEY\_USERS (HKU), 252, 258
  - importing and exporting Registry data, 267–269
  - keys, 251
  - loading hives, 270
  - maintenance overview, 273–274
  - modifying values, 264–265
  - organization of, 246
  - paths, parsing, 251
  - permissions on keys, 278–282
  - purpose of, 245–246
  - redundancy of, 260
  - REG command, 271
  - REG command, modifying permissions on, 277–278
  - regedit command, 262
  - Regedt32, 250, 278
  - remote access, blocking, 281–283
  - remote machine modification, 267
  - Remote Registry service, 283
  - removing damaged settings, 276
  - removing settings for failed installations, 276
  - removing values and keys, 266
  - restoring, 272
  - root keys, 251–259
  - SAM (Security Accounts Manager) subkey, 255

- searching, 263
- security issues, 276–284
- Security subkey, 255
- size of, 249
- Software subkeys, 255–256
- Spooler Service remote access requirement, 282
- standard user tokens, 247
- storage in memory, 249–250
- structure of, 248–251
- subtrees, 251
- subtrees, table of, 251–252
- System subkey, 256–258
- Terminal Services configuration for applications, 942–943
- tools as interfaces for, 248
- Transactional, 247
- Uninstall Or Change A Program utility, 273
- unloading hives, 270
- value entry paths, 248–249
- values, 251
- virtualization, 246–248
- virtualization for legacy applications, 296
- Windows Installer Clean Up Utility, 273–274
- Windows Installer Zapper, 275–276
- relay agents, DHCP, 689–693
- release management teams, 32
- Reliability And Performance Monitor console**
  - CPU statistics, 345
  - data collector sets, 363–364
  - Disk statistics, 345
  - Memory statistics, 345
  - Network statistics, 345
  - Performance Monitor. *See* Performance Monitor
  - Performance Monitor location, 346
  - purpose of, 108
  - reliability. *See* Reliability Monitor
  - starting, 344–345
- Reliability Monitor**
  - location of, 346
  - pinpointing stability problems with, 346
  - purpose of, 343
- remote access**
  - administrating file sharing, 556
  - administration with. *See* Remote Desktop for Administration; Remote Desktops snap-in
  - enabling Remote Desktop, 324–325
  - MMCs with, 162–163
  - performance monitoring with, 354–355
  - Registry, blocking access to, 281–283
- remote administration. *See* Remote Desktop for Administration
- Remote Application, Terminal Services**
  - applications available through. *See* RemoteApps
  - function of, 920
- Remote Assistance, 12**
- Remote Desktop for Administration**
  - admin mode, 608, 615
  - Allow Connections configuration options, 609–610
  - authentication certificates required, 610
  - BitLocker booting issue, 478
  - client settings tabs, 617–619
  - configuration, starting, 114
  - connection speed settings, 618
  - data prioritization settings, 614
  - defined, 12
  - device management, 221
  - disconnecting vs. logging off, 624
  - enabling, 324–325, 607, 609
  - encryption issues, 613
  - ending sessions, 620, 624
  - enhanced experience settings, 614
  - firewalls with, 610
  - flow control settings, 614
  - limitations of, 608
  - logons, 616–617, 619
  - lost connections, 613, 619
  - monitor spanning, 613
  - number of active administrators allowed, 608
  - organizational policy for, 608
  - passwords, 610
  - permissions for, 610–612
  - Plug and Play device redirection, 615
  - printers with, 618
  - purpose of, 607
  - RDC (Remote Desktop Connection) with, 607
  - RDC client features, 613–614
  - Registries, editing, 267
  - Remote Desktop Users group, 610–611
  - Remote Desktops snap-in for connecting to, 620–622
  - Remote Registry service, 283
  - resource redirection, 615
  - restricting users and groups from, 612
  - RSAT (Remote Server Administration Tools), 189
  - sessions allowed, 325
  - specifying computer to connect to, 616
  - starting clients, 615–616
  - Terminal Services policy configuration, 612–613
  - Terminal Services, relation to, 607
  - tracking logged-on clients, 623–624
  - virtual mode, 608, 616
  - Windows Firewall with, 610

**Remote Desktop Users group**

- Terminal Services, 924
- Terminal Services, adding to, 938

**Remote Desktops snap-in. *See also* Remote Desktop for Administration**

- disconnecting, 621
- establishing connections, 620
- purpose of, 609
- saving configurations, 622
- screen options, 621–622
- starting, 620

**RemoteApp Manager, Terminal Services**

- configuring RemoteApps with, 966–975
- purpose of, 922–923

**RemoteApps**

- .rdp file creation for, 969–971
- Alias property, 967
- appearance to clients, 968
- automatic installation with Terminal Server, 966
- choosing programs step, 966–967
- client access methods, 969
- client computer devices and resources, 974–975
- Command Line Arguments property, 967
- defined, 966
- deleting programs, 975
- deploying the applications, 968–969
- deployment setting configuration, 973–975
- deployment settings for, copying, 922–923
- farm names, 973
- file extensions, taking over, 973
- Icon property, 967
- Location property, 967
- making programs available as, 966–968
- modifying program properties, 975
- Program Name property, 967
- Properties options, 967–968
- RDP port numbers, 973
- RemoteApp Wizard, starting, 966
- server authentication settings, 973
- server names, 973
- TS Gateway settings, 974
- TS RemoteApp Manager, starting, 966
- TS Web Access availability property, 967
- TS Web Access deployment setting, 974
- TS Web Access, client access with, 969–970
- unlisted programs settings, 974
- Windows Installer package creation, 971–973

**removable disks, 434****Remove Computer From Docking Station privilege, 1180****repairs. *See also* troubleshooting**

- Repair Your Computer, 1377–1378
- Startup Repair Tool (StR), 22–24, 1408–1409

**reparse points, 517–518****Replace A Process Level Token privilege, 1180****replication**

- Active Directory, 991–992
- Active Directory design consideration, 1008–1009
- Administrator, Replication (Rep Admin), 1302–1303
- architecture of, 1082–1088
- attribute designation, 1014–1016
- attribute management, 1076
- automatic compression between sites, 1072, 1077
- bandwidth considerations, 1097
- bridgehead server configuration, 1298–1301
- bridgehead servers, 1089–1091, 1094–1095
- compression of traffic, 1089
- CPU requirements for, 1108
- designing structure of, 1098–1105
- DFS for. *See* DFS (Distributed File System)
- domain design considerations, 1059
- enhancements in 2008, 1076–1077
- FRS for. *See* FRS (File Replication Service)
- global catalog partitions, 1095
- groups, of, 1216
- intersite, 1076–1077, 1089–1091
- intersite replication topology design, 1100–1101
- intrasite, 1085
- ISTG. *See* ISTG (Inter-Site Topology Generator)
- Kerberos role in, 1083
- link bridge costs, 1101–1104
- link costs, 1100–1101
- mapping network infrastructure, 1096–1098
- maximum latency, intrasite, 1091–1092
- monitoring, 1302–1304
- partitions, of, 1093–1095
- Performance Monitor, tracking with, 1303–1304
- ports used for, 1084
- priority, 1086
- pull model, 1085
- RDC (Remote Differential Compression), 1078
- ring topology model, 1085–1087, 1093–1094
- RODCs with, 1142, 1154
- RPC role in, 1083
- scheduling for intersite, 1077, 1089, 1100
- schema changes, 1088
- services needed for, 1084
- single vs. multiple forest designs, 1057
- sites, between, 1072–1075
- steps in procedure of, 1082–1083
- Sysvol, 1077–1082
- time delays for, 1085–1086
- topology based on number of domain controllers, 1092
- transactional processing effects, 1076
- troubleshooting, 1302–1303

- up-to-dateness vectors, 1088
- urgent, 1086
- USNs for, 1087-1088
- reservations, DHCP, 686, 713-716, 718
- reset disks, 1214-1215
- resolver caches, 681-683, 811
- resources
  - IRQ settings, 240-243
  - Resources And Support section, Server Manager console, 118
- Restart Manager, 22
- restarts, troubleshooting, 1419
- restores
  - authoritative restores of Active Directory, 1412-1414
  - Group Policy objects, of, 1280-1281
  - registries, 272
  - Restore Files And Directories privilege, 1181
  - Startup Repair Tool, 1408-1409
- reverse lookups, DNS
  - queries, 743-744
  - zone creation, 781-782, 785-786
  - zones defined, 774
- RID (relative ID) masters, 57, 1044-1046
- rights
  - assigning user rights for domains and OUs, 1182-1183
  - logon. *See* logon rights
  - user. *See* user rights
- ring topology model of replication, 1085-1087. *See also* ISTG (Inter-Site Topology Generator)
- roaming user profiles
  - adding to Administrators group, 1197
  - configuring, 1200-1201
  - data storage, 1196
  - defined, 1196
  - denying access on per-computer basis, 1197
  - folder path, specifying, 1197
  - location for storage of, 1196
  - preconfigured, creating, 1198-1199
  - preventing changes from propagating, 1197
  - switching to local, 1202
- RODCs (read-only domain controllers)
  - account access, viewing, 1163-1164
  - account password policies for, 1148
  - ACLs for, 1158
  - Active Directory Domain Services Installation Wizard step, 1150
  - Add Roles Wizard step for installing, 1150
  - additional domain controllers in existing domains, 1155-1156
  - administrative advantages of, 1145
  - administrative permissions, delegation of, 1149, 1153, 1165
  - adprep /rodcprep command requirement, 1149
  - Advanced Installation mode advantages, 1149
  - Advanced Installation mode selection, 1150
  - advantages of, 1141
  - Allowed RODC Password Replication group, 1159-1160
  - application readiness for, 1143
  - authentication process, 1144-1145
  - caching of credentials by, 1144-1145
  - credentials management, 1162-1164
  - defined, 1008
  - Denied Accounts list, 1160
  - Denied RODC Password Replication group, 1159-1160
  - deployment configuration options step, 1150
  - design considerations for, 1145-1148
  - DNS on, 1143
  - DNS requirements, 1149
  - DNS server option, 1151
  - domain functional level requirements, 1148
  - domain selection step, 1151
  - dsmgmt command with, 1165
  - editing Password Application Policy, 1160-1162
  - Enterprise Read-Only Domain Controller group, 1159
  - exporting settings to answer files, 1155
  - file locations, configuring, 1154-1155
  - forest functional level requirements, 1148
  - future changes likely in, 1141
  - global catalog server option, 1151
  - global catalog server requirements, 1148
  - groups specific to RODCs, 1159
  - install from media option, 1149, 1154
  - installing, 1148-1158
  - IP address issues, 1150, 1152
  - KDC advertisement of, 1144-1145
  - Kerberos Target account of, 1144-1145
  - limited functions of, 1145
  - media installations of, 1156-1158
  - multi-valued directory attributes, 1159
  - Network Credentials step, 1151
  - overview of, 1141-1142
  - Password Replication Policy configuration, 1149, 1152, 1158-1165
  - PDC emulator requirements, 1145, 1148
  - preinstallation check list, 1148-1149
  - prerequisite operating systems, 1141
  - Read-Only Domain Controller group, 1159
  - replication fundamentals for, 1142, 1146
  - replication of partitions, 1146-1147
  - replication partners, choosing, 1154
  - Restore Mode password selection, 1155
  - site selection step, 1151
  - sites, relationship to, 1145-1148
  - WANs with, 1148

**roles**

- AD CS (Active Directory Certificate Services), 186
- AD DS (Active Directory Domain Services), 186, 193
- AD FS (Active Directory Federation Services), 186
- AD LDS (Active Directory Lightweight Directory Services), 186
- AD RMS (Active Directory Rights Management Services), 186
- adding roles, 192–195
- additional required features, 194
- Application Server, 186
- command line management of. *See* ServerManagerCmd
- component names, 202–207
- configuration overview, 185
- DHCP Server, 186
- DNS Server, 186
- Fax Server, 186
- features, 185
- features, adding, 199
- features, removing, 199–200
- features, table of, 188–190
- File Services, 187
- managing. *See* Server Manager console
- NPAS (Network Policy And Access Services), 187
- operations master, set of, 1044–1046
- overview in Server Manager console, 117–118
- Print Services, 187
- removing server roles, 195–196
- role services, 185
- role services, adding, 197
- role services, removing, 198
- server roles, 185
- table of primary roles and services, 185–187
- Terminal Services, 187
- UDDI (Universal Description Discovery Integration) Services, 187
- WDS (Windows Deployment Services), 187
- Web Server (IIS), 187
- Windows SharePoint Services, 187
- WSUS (Windows Server Update Services), 187
- Rollback wizard, 1378
- rolling back installations, 84
- root domains, 1000, 1003–1004
- round-robin load balancing
  - DNS for, 797
  - Terminal Services with, 944–945
  - TS Session Broker servers, 950–951
- routers**
  - DHCP console router address specification, 706
  - IPv4 addresses for, 639
  - Network Load Balancing with, 1334
  - obtaining addresses of, 678
  - troubleshooting, 678–679
  - zone IDs of, 678

**Routing and Remote Access Services, 737–739****Routing Compartments, 632****RPC (Remote Procedure Call) over HTTP Proxy**

- print server connections, 847–848

- purpose of, 189

- replication role, 1083

- site connections using, 1288

**RRAS (Routing and Remote Access Service)**

- DHCP, integration with, 686–687

- setting options for, 722–723

**RSAT (Remote Server Administration Tools), 189****RSM (Removable Storage Manager), 189****RSOP (Resultant Set of Policy)**

- granting permissions for, 1253

- permissions to determine, 1251

**run levels**

- configuring, 298–299

- RunAsAdmin, 297

- RunAsHighest, 297

- RunAsInvoker, 296

- security settings related to, 299–301

- security tokens for, 247

**RWDCs (read/writable domain controllers). *See* domain controllers****S****SA (Software Assurance), 66****Safe Mode, 1416–1418****SAM (Security Accounts Manager)**

- Active Directory use of, 990

- Registry subkey, 255

- role in non-Active Directory systems, 990

- Windows NT 4 with Active Directory, 992

**SANs (storage area networks)**

- Active Directory configuration issues, 1110–1111

- booting from, 409–411

- clusters using, 409–411

- command-line tools for managing, list of, 409

- defined, 406–407

- DFS (Distributed File System), 408

- failover clustering with, 1351–1352

- FRS (File Replication Service), 408

- LUNs (logical unit numbers), 411

- Multipath I/O, 408, 411–414

- sites, multiple physical, 1329–1330

- Storage Explorer tool, 108

- Storage Manager for SANs, 189, 411

- troubleshooting, 410

- VDS (Virtual Disk Service), 408

- volume automounting, 408

- VSS (Volume Shadow Copy Service), 407

SATA devices, 211–212

scalability

- clustering, limits by OS version, 1326
- goal of clustering servers, 1325
- Terminal Services, improvement of, 927–928

schedules for projects, setting, 46–47

schema master role, 1044–1047

schemas, Active Directory

- forests, sharing for domains in, 1055
- replication, 1088

scopes for IP addresses

- activation of, 716–717
- adding during DHCP installations, 697
- defined, 686
- exclusions, 712–713
- multicast, 702
- Netsh command for management, 710–711
- normal IPv4 scopes, 702–707
- normal IPv6 scopes, 708–710
- normal scopes, 701
- planning address ranges for, 702
- superscopes, 702
- TCP/IP scope options, 718
- types of scopes supported, 701–702

screen savers, 121

scripts

- running in clustered environments, 1363
- Terminal Services application compatibility scripts, 942

Search box, 132–133

secondary DNS servers

- notification configuration, 793–794
- purpose of, 750
- zone creation, 775
- zone setup, 770–771

sectors, 497–498

secure desktop, 298

security

- Admin Approval Mode, 290–293
- auditing file and folder access, 581–585
- authentication for. *See* authentication
- design planning issues, 51
- DHCP issues, 688–689
- direct physical access issues, 467
- disabling secure communications requirement, 1111
- DNSSEC (DNS Security), 757–758
- drive encryption. *See* BitLocker Drive Encryption; EFS (Encrypting File System)
- encryption, file. *See* EFS (Encrypting File System)
- firewalls for. *See* firewalls
- intrusion detection, 1319–1320
- Local Security Policy console, 1241–1242
- logons. *See* logon rights

man-in-the-middle attacks, 1111

passwords for. *See* passwords

permission settings. *See* permissions

physical, 1370

planning for deployments, 41–42

policies for. *See* Group Policy

printer. *See* printer permissions

Registry protection, 276–284

Registry subkeys, 255

Security Configuration And Analysis snap-in, 1266–1268

Security log, 327

security template configuration, 1266–1268

standards selection, 52–53

subsystem. *See* security subsystem

Terminal Services, 961–964

tokens for applications, 247

tokens, generation of, 1020–1022

TPM. *See* TPM (Trusted Platform Module) Services

UAC. *See* UAC (User Account Control)

viewing status with Server Manager, 118

Windows Defender, 12

Security Accounts Manager. *See* SAM (Security Accounts Manager)

security descriptors, 1188

security groups, 1216

security subsystem

- Active Directory a subset of, 987
- authentication mechanisms, list of, 989
- authentication procedure, 990
- Directory service (Ntdsa.dll), 990
- key areas used with Active Directory, 989–990
- logon/access features used with Active Directory, 989–990
- LSA (Local Security Authority), 988–989
- LSA Server use with Active Directory, 990
- NET LOGON, 989
- non-Active Directory systems, 990
- Security Accounts Manager, 990
- user mode, 987

seismic protection, 1315

Selected Acknowledgments (SACKs)

- Extended, 631
- SACK-based Loss Recovery, 632

selective startups, 385–388

Self-Healing NTFS, 520–521

separator pages

- customization, 905–906
- default pages, 902–903
- defined, 902
- interpreting code for, 905
- printer-installed pages, 903

separator pages, *continued*

- problems caused by, 918
- selecting, 903
- testing, 904
- variables, table of, 904–905

## server farms, 1325–1326

## Server Manager console

- adding roles, 192–195
- command line counterpart of, 185
- Computer Information section, 117
- Configuration node, 117
- Device Manager, opening, 219–220
- device display options, 221
- Diagnostics node, 117
- downloadable components, 190–191
- Features node, 117
- Features Summary section, 118
- groupings of roles, services, and features, 185
- IE ESC, 118
- installing Active Directory with, 1112
- purpose of, 116
- removing server roles, 195–196
- Resources And Support section, 118
- role services, adding, 197
- role services, removing, 198
- Roles node, 117
- Roles Summary section, 118
- Security Information section, 118
- starting, 116–117
- viewing configured roles and services, 191

server roles. *See also* roles

- defined, 185
- planning for, 57–61

## ServerManagerCmd

- component names, 202–207
- determining installed components, 207
- inputPath, 201
- install command, 201
- installing components, 208–209
- parameters for, 201–202
- purpose of, 200
- query command, 201, 207
- remove command, 201
- removing components, 209
- version command, 201

## servers

- Active Directory. *See* domain controllers
- clusters. *See* clusters, server
- DHCP. *See* DHCP (Dynamic Host Configuration Protocol)
- DNS. *See* DNS (Domain Name System)
- hardware components of. *See* hardware

- planning issues, 58–61
- printer. *See* print servers
- server rooms. *See* structures and facilities

## services

- control commands for, 322
- delegating authentication for, 1040–1043
- failure recovery, 19
- get-service command, PowerShell, 310
- restarting, 322
- startup problems from, 387
- viewing information on, 321–322

## Services tool, 108

## Session Directory Computers group, 944, 946–947

## session state maintenance with NLB, 1335

## session tickets

- KDC servers handling of, 1025–1026
- Kerberos policy settings, 1173

## sessions, Terminal Server, 325–326

setting up Windows Server 2008. *See* installing Windows Server 2008

## Setup log, 327

## Setup.exe

- alternate file folder option, 70
- answer file specification, 70
- baud rate for EMS option, 71
- booting methods, 70
- debug mode, 96–97
- drive location for temporary files, specifying, 70
- Emergency Management Services options, 70–71
- general installation parameters, 70–71
- no reboot option, 70
- rolling back, 84
- starting, 84
- Stop errors, 98–99

## shadow copies

- API for, 589
- autoretry interval, 599
- backups, advantages for, 1383
- clients for, 592
- clustered servers issues, 595
- configuring in Computer Management, 593–596
- copying snapshots, 605
- Create Now command, 596
- defragmentation issues
- deleting shadow copies of volumes, 597
- deleting specific snapshots, 596, 601–602
- differential copy procedure, 590
- disabling shadow copies, 597, 602
- enabling from command line, 598–599
- file recovery by users goal of, 588
- files centrally manageable with, 588–589
- how it works, 589–590

- key issues for implementing, 590
- locations for files, 591, 594
- manual snapshot creation, 596, 599
- Maximum Size option, 594–595
- mount point issues, 594
- opening copies in Windows Explorer, 605
- overview, 587
- planning deployment of, 588–592
- Previous Versions client feature, 603–605
- purpose of, 587–588
- restoring folders, 605
- reverting entire volumes, 597–598, 602–603
- scheduled runs of, 590–592, 595–596
- service writers installed, 589
- settings, changing, 596
- snapshot creation, 588, 596–597
- storage information, viewing, 601
- storage requirements for, 590–591
- user instructions for, 592
- viewing allotted storage, 591
- viewing information on, 600–601
- volume selection for, 590–591, 594
- Volume Shadow Copy Service, 581–585
- VSSAdmin command-line commands, 598–603
- Share And Storage Management console, 415
- Shared Configuration feature, 1337
- SharePoint (Windows SharePoint Services), 187
- sharing files. *See* file sharing
- shortcut trusts
  - creating, 1035–1038
  - purpose of, 1003
  - rapid authentication effects of, 1028–1029
- shrinking partitions, 446–447
- Shut Down The System privilege, 1181
- shutdowns, troubleshooting, 1419
- SIDs (security identifiers)
  - Active Directory use of, 993
  - user account, 1210
- Simple TCP/IP Services, 189
- simple volumes, 453–454
- site links
  - adding sites to, 1290
  - advanced link options, 1301–1302
  - bridgehead server configuration, 1298–1301
  - choosing during site creation, 1284–1285
  - compression option, 1302
  - costs, 1289, 1295
  - creating, 1289–1292
  - default, 1287
  - endpoints of, 1289
  - firewall port issues, 1289
  - IP replication transport, 1288
  - ISTG with, 1287, 1297–1298
  - management overview, 1287–1288
  - naming, 1290
  - notification for replication option, 1301–1302
  - purpose of, 1287
  - replication interval, 1289, 1291–1292
  - replication issues, 1287
  - replication schedule, 1289, 1291–1294
  - replication schedules, 1297
  - replication transports for, 1288
  - RPC over IP with, 1288
  - site link bridges, configuring, 1295–1297
  - SMTP replication transport, 1288
  - testing replication, 1305–1306
  - three hop rule, 1292
  - transitive links, disabling, 1297
  - transitive nature of, 1288
  - transport folder selection, 1291
  - two-way synchronization option, 1302
- sites, Active Directory
  - bandwidth considerations, 1075, 1097
  - boundary determination, 1075
  - bridgehead servers, 1072, 1089–1091
  - compression of traffic, 1077, 1089
  - creating, 1283–1285
  - Default-First-Site-Name creation, 1283
  - defined, 1071
  - designing, 1098–1105
  - DFS with, 1073–1074
  - DHCP server placement, 1105
  - DNS server placement, 1105
  - domain controller placement, 1104–1105
  - domain controller requirements, 1285
  - domain controllers, associating with, 1286–1287
  - domains, relation to, 1071
  - first site creation, 1283
  - global catalog requirements, 1073, 1105, 1285
  - Group Policy inheritance order, 1254
  - Group Policy Management Console (GPMC) with, 1244
  - intersite replication, 1076–1077, 1089–1091
  - intersite replication topology design, 1100–1101
  - intersite vs. intrasite replication, 1071
  - intrasite replication, 1085
  - ISTG (Inter-Site Topology Generator), 1089–1091
  - KCC (knowledge consistency checker), 1077, 1085, 1091–1092
  - LANs and WANs, relation to, 1071
  - link bridge costs, 1101–1104. *See also* site links
  - link costs, 1100–1101
  - links. *See* site links
  - mapping network infrastructure, 1096–1098
  - mapping networks to site structures, 1098–1099

- sites, Active Directory, *continued*
  - name resolution requirements, 1073
  - naming, 1099–1100, 1284
  - partitions, replication of, 1093–1095
  - replication architecture, 1082–1088
  - replication between, 1072–1075
  - RODCs, designs with, 1145–1148
  - scheduling for intersite replication, 1077, 1089
  - scheduling replication, 1100
  - server placement, 1104–1105
  - single vs. multiple site designs, 1072–1074
  - site-aware applications and services, 1073–1074
  - subnet creation, 1285
  - subnet requirements, 1071
  - subnets, associating with, 1285–1286
  - subnets, relationship with, 1283
  - Sysvol replication, 1077–1082
- sites, multiple physical, 1329–1330
- sleep states, 379–380
- smart cards, requiring for logons, 1192
- SMB (Server Message Block) version 2, 17
- SMTP (Simple Mail Transfer Protocol) Server
  - purpose of, 189
  - replication transport, 1288
- snap-ins. *See* MMCs (Microsoft Management Consoles)
- SNMP (Simple Network Management Protocol), 189
- Software Assurance, 66
- Software Explorer, terminating processes with, 288
- software installation
  - 2008 compliance requirements, 285–286
  - backups recommended before, 286
  - configuration after installs, 287–288
  - diagnosing problems, 286
  - downloaded programs, 287
  - elevated privileges requirement for, 285
  - failed installation procedure, 287
  - installer program requirements, 286
  - known compatibility issue detection, 286
  - Programs And Features page for, 287–288
  - run-level designations, 296–297
  - security settings related to, 299–301
  - Software Explorer, 288
- software licensing programs. *See* licensing
- sound schemes, 121
- spanned volumes
  - creating, 453–454
  - defined, 452
  - recovering, 455–456
- spare parts, 1312
- sparse files, 518–519
- special permissions, file and folder, 573–578
- special shares, 553–555
- split-brain DNS design, 762–763
- spool folder permissions, 881
- spoolers, printer. *See* Print Spooler service
- Spurious Retransmission Timeout Detection, 632
- spyware protection, 12
- SQL Server clustering requirements, 1349
- SRA (Secure Remote Access), 18
- SRKs (Storage Root Keys), 468
- SSO (Single Sign On), 18
- SSTP (Secure Socket Tunneling Protocol), 18
- stabilizing phase of MSF (Microsoft Solutions Framework), 28
- Standard edition, Windows Server 2008
  - features of, 5
  - hardware requirements for installations, 72–73
  - selection criteria, 61
- standard file sharing
  - configuring, 549
  - defined, 547
  - hidden shares, 553
  - mapping share folders as network drives, 550–551
- standard user tokens
  - default nature of, 294
  - purpose of, 247
- standardization of hardware for high availability, 1311–1312
- standardized software components for system services, 1310
- standby state, Windows Vista configuration of, 378
- standby systems, 1312
- Start menu
  - adding items, 134–135
  - All Programs button, 133
  - changes from 2003, 130–131
  - copying items, 135–136
  - folder options, 131–132
  - frequently used programs list, 133, 137–140
  - hiding items, 136–137
  - highlighted items, 136–137
  - optional folders, 132
  - pinned items, 133
  - removing items, 141
  - renaming items, 141
  - saving custom console tools to, 172–173
  - Search box, 132–133
  - sorting items, 140
  - standard menu new features, 133–134
  - views available, 129–130
- startup
  - issues compounded in 2008, 377. *See also* boot configuration
  - Startup And Recovery dialog box, 384–385

- Startup Recovery Options wizard, 1378
- Startup Repair wizard, 1374–1375
- startup scripts, Group Policy, 1264–1265
- stop errors, recovering from, 1378–1380
- System Configuration, 385–388
- troubleshooting, 1416–1418
  - Windows Error Recovery mode, 1418–1419
- Startup folder, taskbar, 145–147
- Startup Repair Tool (StR), 22–24, 1408–1409
- static IP addresses, assignment of, 660–663
- stop errors
  - causes of, 98–99
  - recovering from, 1378–1380
- storage. *See also file systems*
  - Active Directory requirements for, 1108
  - adding new disks, 423–424
  - allocation unit size, 438
  - availability, 414
  - backups, selecting for, 1390
  - basic disk type, 428–432
  - capacity requirements, 413–414
  - clusters with, 409–411
  - command-line tools for managing, list of, 409
  - Computer Management Storage Tools, 116
  - DAS (direct-attached storage), 405–406
  - deleting volumes, 448
  - DFS (Distributed File System), 408
  - DFS command-line tools, 409
  - Dfscmd tool, 409
  - disk I/O subsystem, 497
  - Disk Management. *See* Disk Management snap-in
  - disk quota management, 415
  - disk write caching, 424
  - DiskPart tool, 409
  - disks for. *See* hard disk drives
  - drive letter configuration, 440–442
  - drives. *See* hard disk drives
  - dynamic disks, 428–432
  - ESP partition type, 449–450
  - extending partitions, 443–446
  - external storage, 406
  - fault tolerance, 1312
  - file services for. *See* File Services
  - formatting partitions, 437–439
  - FRS (File Replication Service), 408
  - FSutil tool, 409
  - hot-swapping disks, 423
  - importance of managing soundly, 405
  - increasing need for, 405
  - internal storage, 405–406
  - LDM partitions, 451–452
  - LUNs (logical unit numbers), 411
    - managing GPT partitions on basic disks, 449–452
    - managing MBR partitions on basic disks, 434–448
  - mirrored volumes, 452, 457–462, 464–466
  - mount points, 442–443
  - moving dynamic disks, 456–457
  - MSR partitions, 450–451
  - Multipath I/O, 408, 411–414
  - NAS, 406
  - NTFS recommended file format, 437
  - OEM partitions, 452
  - partition styles, 425–428
  - partitions. *See* partitions, drive
  - performance requirements, 413–414, 424
  - primary partitions, 451
  - RAID. *See* RAID (redundant array of independent disks)
  - recovering disks, 455–456
  - recovery plans, 1318–1319
  - removable disks, 434
  - report generation, 415
  - SANs, 406–407. *See also* SANs (storage area networks)
  - shadow copy requirements for, 590–591
  - shrinking partitions, 446–447
  - simple volumes, 453–454
  - spanned volumes, 452–454
  - striped volumes, 452, 454–455, 462–463
  - types, 428
  - VDS (Virtual Disk Service), 408
  - volume automounting, 408
  - volumes. *See* volumes
  - VSS (Volume Shadow Copy Service), 407
  - Vssadmin tool, 409
- storage area networks. *See* SANs (storage area networks)
- Storage Manager for SANs, 189
- Store Passwords Using Reversible Encryption setting, 1171, 1175
- StR. *See* Startup Repair Tool (StR)
- striped volumes
  - configuring RAID 0, 454–455
  - configuring RAID 5, 462–463
  - defined, 452
  - recovering, 455–456
- strong passwords, 88
- structures and facilities
  - access control systems, physical, 1315
  - cabling, 1314
  - checklist, 1315–1316
  - dust and air quality, 1314
  - factors to consider, list of, 1313
  - fire suppression systems, 1315
  - humidity, 1314
  - importance of, 1313
  - power supplies, 1314

structures and facilities, *continued*

- seismic protection, 1315
- sites, multiple physical, 1329–1330
- surveillance, physical, 1315
- temperature, 1313–1314
- UPS (uninterruptible power supplies), 1314

**subnets**

- allocating, 641–642
- broadcasts, 637
- class A network subnets, 642–644
- class B network subnets, 644–645
- class C network subnets, 645–646
- creating, 1285
- defined, 639
- mapping network infrastructure, 1096–1098
- masks, 639–640
- masks assigned to adapters, viewing, 673
- network prefix notation, 640–641
- public addresses with, 640
- purpose of, 639
- sites, Active Directory, relation to, 1071, 1283
- sites, associating with, 1285–1286
- static IP address assignment, 661–663
- troubleshooting, 677

**superscopes, 702**

**support architecture**

- Network Diagnostics Framework, 15–18
- overview of, 14–15
- WDI (Windows Diagnostics Infrastructure), 19–25

**surveillance, physical, 1315**

**Synchronize Directory Service Data privilege, 1181**

**System Configuration, 385–388**

**System Console, 126–128**

**System log, 327**

**system partitions**

- defined, 77
- mirrored system volumes, 459–462
- striped and spanned volumes, prohibited on, 429

**system state data**

- backups of, 1382–1383
- recovery of, 1407

**system tray, 145–148**

**System utility Startup And Recovery panel, 1378–1380**

**Sysvol**

- Group Policy components in, 1237
- location choices, 1109
- location for, selecting, 1119
- media-based Active Directory installations, 1126–1129
- replication of, 1077–1082
- restoring, 1414–1415

## T

**Take Ownership Of Files Or Other Objects privilege, 1181**

**Take Ownership special permission, 575, 880**

### Task Manager

- Applications tab, 314
- CPU statistics, 311–313
- image names, 308
- memory usage, 312–313
- Networking tab, 323–324
- opening, 308
- performance monitoring features, 308–309
- Performance tab, 311–313
- processes, 308, 314–320
- Services tab, 321–322
- System statistics, 312
- Terminal Services connection data, 325–326

### Task Scheduler

- purpose of, 12
- shadow copy dependence on, 596

### taskbars

- Address toolbar, 149–150
- areas of, 143
- Auto Hide feature, 144
- creating personal toolbars, 150–151
- Desktop toolbar, 150
- grouping items, 145
- icon control, 147
- Links toolbar, 150
- location, changing, 143–144
- locking, 144–145
- Notification area, 143, 145–148
- program control with, 145–148
- Programs/Toolbars area, 143
- purpose of, 143
- Quick Launch, 143, 148–149
- resizing, 143–144
- Startup folder, 145–147
- system tray, 145–148
- toolbar optimization, 148–151

### taskpads

- Active Directory Users And Computers example, 174
- creating, 176–178
- editing, 178
- editing tasks, 183
- items allowed in, 173
- menu command task creation, 179–180
- navigation task creation, 181–183
- New Task Wizard, 179–183
- purpose of, 173
- removing tasks, 183
- shell command task creation, 180–181
- task creation, 179–183

- tasks defined, 173
- view styles, 174–176
- TCP (Transmission Control Protocol). *See also* TCP/IP (Transmission Control Protocol/Internet Protocol)
  - Automatic Black Hole Router Detection, 631
  - Compound TCP, 631
  - defined, 627
  - TCP Extended Statistics, 632
- TCP/IP (Transmission Control Protocol/Internet Protocol)
  - addressing. *See* IP addresses
  - automatic address assignment. *See* DHCP (Dynamic Host Configuration Protocol)
  - Automatic Black Hole Router Detection, 631
  - configuring. *See* configuring TCP/IP networking
  - defined, 627
  - DHCP, setting options with. *See* TCP/IP options under DHCP
  - DHCPv6 capable client, 632
  - dual IP architecture, 631
  - Extended Selected Acknowledgments, 631
  - host IDs, 633
  - installing. *See* installing TCP/IP networking
  - IPv4. *See* IPv4 (Internet Protocol version 4)
  - IPv6. *See* IPv6 (Internet Protocol version 6)
  - Modified Fast Recovery Algorithm, 631
  - NAT (Network Address Translation), 635–636
  - Neighbor-Unreachability Detection, 631
  - network IDs, 633
  - Next Generation TCP/IP stack, 631–632
  - port monitor settings for printers, 863–865
  - Receive Window Auto Tuning, 632
  - SACK-Based Loss Recovery, 632
  - Simple TCP/IP Services, 189
  - Spurious Retransmission Timeout Detection, 632
  - subnetting. *See* subnets
  - Windows Filtering Platform, 632
- TCP/IP options under DHCP
  - class options, 718
  - client-specific options, 718
  - Default Router Metric Base option, 721
  - default user classes, 719–720
  - directly connected clients, setting options for, 723–724
  - Disable NetBIOS option, 721
  - DNS Domain Name option, 719
  - DNS Servers option, 719
  - levels of options, 717–718
  - message limitations, 717
  - Microsoft Add-On options, 720–721
  - NAP clients, setting options for, 722–723
  - NetBIOS Scope option, 719
  - predefined options, 717
  - Release DHCP Lease On Shutdown option, 721
  - reservation options, 718
  - Router option, 719
  - RRAS clients, setting options for, 722–723
  - scope options, 718
  - server options, 718
  - setting options for all clients at a level, 721
  - standard options, table of, 718–719
  - user class memberships, viewing, 720
  - user-defined classes, 724–726
  - vendor classes, 720–721
  - WINS/NBNS Servers option, 719
  - WINS/NBT Node Type option, 719
- team identification for planning deployments
  - architecture teams, 31
  - defined, 29
  - departmental representation on teams, 32–33
  - development teams, 32
  - management team growth issues, 37
  - Microsoft Solutions Framework Team Model, 31–32
  - outsourcing responsibilities, 33
  - product management teams, 31
  - program management teams, 32
  - release management teams, 32
  - size of teams, 31
  - testing teams, 32
  - user experience teams, 32
- technical specification development. *See* designing new networks
- temperature of server rooms, 1313–1314
- Terminal Services
  - activating license servers, 954–957
  - adding terminal servers to specific groups, 976
  - adding user and group permissions, 963–964
  - adding users and groups, 938–939
  - administration tools for, 921–925
  - advantages of, 919
  - application compatibility scripts, 942
  - applications, choosing, 939–940
  - applications, installing, 932–934, 936–937, 939–943
  - auditing access to, 964–966
  - authentication method selection, 937
  - Automatic Connection licensing method, 955
  - bandwidth requirements, 920
  - CAL Installation Wizard, 954–957
  - capacity planning, 927–931
  - Change Logon command, 941
  - Change Port command, 941
  - Change User command, 941
  - Client Licensing Wizard, 956–957
  - client overview, 919–921
  - command-line commands for managing, 978–980

Terminal Services, *continued*

- Configuration tool, 922, 957–958
- connecting to a specific server for managing, 976
- connecting to a user's session, 977
- CPU impact on capacity, 928–930
- data entry worker clients, 928
- defined, 60, 187
- Delete Temporary Folders On Exit setting, 960
- Desktop Experience feature, 938
- disconnecting active sessions, 977
- disk performance requirements, 931
- editing settings, 960–961
- encryption support, 924, 959
- environment settings, 959
- Execute mode, 940
- experience settings, 930
- feature dependence on bandwidth, 920
- Full Control permission, 961
- Gateway, 920, 924, 932
- Gateway Manager, 923
- global connection settings, 958–960
- grace period for license servers, 952
- groups of servers, actions available for, 976
- Guest Access permission, 961
- HKCU and HKLM, 940–941
- importing information from TS Session Broker, 976
- Install mode, 940–941
- installing for multi-server deployments, 934–935
- installing for single-server deployments, 932–933
- installing license servers, 952–953
- installing terminal servers, steps for, 936–938
- key elements of, 919
- knowledge worker clients, 928
- License Server Discovery Mode setting, 961
- license servers, setting up, 951–957
- licensing, 925–927, 937
- Licensing Manager, 922, 954–957
- listing terminal servers, 976
- listing user connections to, 325–326
- load balancing with, 933–935. *See also* TS Session Broker servers
- logging off users administratively, 977
- Logoff command, 980
- logon settings, 959
- Manager, 921, 975–978
- Member Of Farm In TS Session Broker setting, 961
- memory requirements, 930
- modifying applications after installation, 942–943
- Msg command, 980
- multi-server deployments, 933–935
- network bandwidth requirements, 931
- new group creation for terminal servers, 976
- number of users, restraints on, 928–931
- organizational structure planning, 931–932
- OUs, separate for, 613
- performance tuning Registry values, 943
- permissions, viewing, 962
- policy configuration, 612–613
- printing enhancements, 924–925
- processes running on terminal servers, ending, 977–978
- productivity worker clients, 928
- purpose of, 919
- Query commands, 978–979
- RDC client, 919–921. *See also* RDC (Remote Desktop Connection)
- RDP (Remote Desktop Protocol), 920
- RDP configuration, 958–960
- RDP over HTTPS for Gateway, 924
- Redirect Only The Default Client Printer setting, 925
- refreshing server information, 976
- Registry configuration for applications, 942–943
- Remote Application, 920
- remote connection verification, 939
- remote control of user sessions, 977, 979, 981
- remote control settings, 959
- Remote Desktop mode. *See* Remote Desktop for Administration
- Remote Desktop Users group, 924, 938–939
- RemoteApp Manager, 922–923, 966–975
- RemoteApps feature. *See* RemoteApps
- removing terminal servers from specific groups, 976
- Reset Session command, 980
- resetting user sessions, 977
- Restrict Each User To A Single Session setting, 960–961
- Resume Configuration Wizard, 938
- RootDrv.cmd, 942
- scalability improvements, 927–928
- security changes in 2008 version, 924
- security configuration, 961–964
- security permissions settings, 960
- sending messages to users, 978, 980
- server setup basics, 921–925
- session management. *See* TS Session Broker servers
- session settings, 959
- SetPaths.cmd, 942
- setting user file paths to drive letters, 942
- Shadow command, 979
- single-server deployments, 932–933
- special permissions, table of, 961–962
- standard options of, 920–921
- system architecture issues, 920–921
- Terminal Services Licensing Mode setting, 961
- tsadmin.exe command, 975

- TSCon command, 980
- tsconfig.msc tool, invoking, 957–958
- TSDisCon command, 980
- TSKill command, 980
- Use Temporary Folders Per Session setting, 960
- User Access permission, 961
- user impact on performance, 928–930
- User Logon Mode setting, 961
- user profiles, 982–983
- user sessions, displaying status of, 978
- user sessions, managing, 976–978
- virtual sessions, 919, 933–934
- Web Access, 920, 932
- Web Access Administration, 923
- Web access type servers, 921
- Windows System Resource Manager with, 938
- testing for high availability, 1310
- testing teams, 32
- themes, 121–122
- threads
  - bottlenecks from, 359
  - statistics for, 315
- tickets. *See* session tickets
- time
  - Date And Time utility, 122–123
  - Windows Time, 13
- toolbars
  - Address toolbar, 149–150
  - creating personal, 150–151
  - Desktop toolbar, 150
  - displaying, 150
  - Links toolbar, 150
  - Quick Launch toolbar, 143, 148–149
- top-level domains, 653
- TPM (Trusted Platform Module) Services
  - BitLocker with, 468, 477–478
  - boot file validation, 468
  - changing owner passwords, 476
  - clearing, 475–476
  - error, starting console without TPM on, 469–470
  - firmware compliance, 469
  - Initialize The TPM Security Hardware wizard, 469, 471–473
  - initializing for first use, 471–473
  - management console for, 469
  - master wrapping keys, 468
  - password creation for ownership, 471–473
  - purpose of, 467–468
  - sealed keys, 468
  - setting ownership, 471–473
  - SRKs, 468
  - status indicators, 470
  - strength of, 468
  - TCG-compliant firmware, 469
  - TPM microchips, 467–468
  - turning off, 473–474
  - turning on in firmware, 469
  - turning on with Management console, 474–475
- Tracerpt command, 372–373
- Tracert command, 678
- traces
  - startup event traces, 364
  - trace data sets, 364, 367–368
  - Tracerpt command, 372–373
- transactional NTFS, 520
- Transactional Registries, 247
- Transmission Control Protocol/Internet Protocol. *See* TCP/IP (Transmission Control Protocol/Internet Protocol)
- Traverse Folder special permission, 573
- trees, Active Directory
  - creating new domains or trees in existing forests, 1125–1126
  - defined, 1053
  - privileges required for installing first domain controller, 1113
  - root domains for, 1054–1055
  - searching, 1010–1011
  - structure of, 999–1000
- troubleshooting
  - computer accounts, 1230–1231
  - CPU-based install issues, 98–99
  - deployments, initial, 1322
  - disk drive issues, 100
  - DNS, 808–821. *See also* DNS (Domain Name System)
  - file sharing, 579–581
  - firmware issues, 100
  - Group Policy, 1268–1282
  - hardware, 237–243
  - hardware removal during installations, 97
  - installations of Windows Server 2008, 96–100
  - logs of events. *See* Event Viewer; events
  - networking, 323
  - networks. *See* network troubleshooting
  - printing, 913–918
  - replication, 1302–1303
  - SANs, 410
  - shutdowns, 1419
  - startup issues, 385–388, 1416–1418
  - trust relationships, 1039–1040
  - user accounts, 1195
- trust paths, 1002–1003

**trusts**

- creating, steps for, 1035–1038
- cross-forest transitive trusts, 1030–1032, 1035
- defined, 1001
- delegating authentication, 1040–1043
- direction of trust property, 1035–1037
- domain administrators, 1002
- enterprise administrators, 1002
- explicit trusts, 1028–1029
- external trusts, 1003
- forests, automatic creation between domains in, 1001
- forests, configurations in, 1055
- Kerberos for, 1026–1027
- New Trust Wizard, 1035–1038
- outgoing trust authentication levels, 1038
- passwords for, 1037–1038
- paths, 1002–1003
- permission availability, 1001
- realm trusts, 1034–1038
- shortcut trusts, 1003, 1028–1029, 1036
- transitivity, 1035
- troubleshooting, 1039–1040
- trust trees, 1027–1028
- Trust Type property, 1034
- trusted domains, 1002
- trusting domains, 1001
- two-way transitive trusts, 1027–1028
- validation, 1039–1040
- viewing existing trusts, 1033–1035

**TS Gateway**

- function of, 920
- RDP over HTTPS for, 924
- RemoteApps settings for, 974
- system requirements for, 932

**TS Licensing Manager, 954–957****TS RemoteApp Manager. *See* RemoteApps****TS Session Broker servers**

- authorizing Terminal Servers to use, 946–948
- automatic startup of service, 944
- configuring, 945–946
- configuring terminal servers to join, 948–950
- Enterprise version requirement, 944
- farm names, 949
- Member Of Farm In TS Session Broker setting, 961
- multi-server environment for, 934–935
- overview of, 944–945
- redirection configuration, 950
- relative-weighting load balancing, 944–945, 949
- round-robin load balancing, 944–945, 950–951
- Session Directory Computers group, 944, 946–947
- Terminal Services Configuration tool, 948–950
- third-party router-based solutions issues, 950
- TS Session Broker Farm Name policy settings, 948

tsconfig command, 948

workgroup computer account authorization, 947–948

**TS Web Access**

- function of, 920
- RemoteApps availability property for, 967
- RemoteApps deployment setting, 974
- RemoteApps, client access with, 969–970
- system requirements for, 932

**tuning performance**

- bottleneck overview, 356
- CPU bottlenecks, resolving, 359–360
- memory bottlenecks, 356–358
- Performance Options dialog box, 305
- processor scheduling options, 304–305
- purpose of, 303
- virtual memory, 305–308
- visual effects, minimizing, 303–304

**two-way transitive trusts, 1027–1028****Typeperf command, 370–372****U****UAC (User Account Control)**

- Admin Approval Mode, 290–293
- administrator applications, 295
- administrator user tokens
- application integrity, 294
- application settings storage, 247
- background tasks for, 290
- color coding of elevation prompts, 297–298
- configuring settings for, 292–293
- elevation, 290
- legacy applications, 296
- Permissions icons, 289
- prompts, criteria for, 289
- purpose of, 288–289
- run levels, 296–299
- security settings related to, 299–301
- software installation elevated privileges requirement, 285
- standard user tokens, 294
- user applications, 295

**UDDI (Universal Description Discovery Integration)**

Services, 187

**unattended installing, 69–70****unicast IP addresses**

- IPv4, 633–636
- IPv6, 651

**Unidrv, 846****Uninstall Or Change A Program utility, 273****uninstalling Active Directory, 1129–1133****uninstalling programs**

- Windows Installer Clean Up Utility, 273–274
- Windows Installer Zapper, 275–276

- universal groups
    - caching, 1215–1216
    - defined, 1217
    - global catalog replication, 1218
    - member inclusion, 1218
    - membership caching, 1020–1022
    - nesting limitations, 1218
    - permissions, 1218
    - reasons for using, 1219–1220
  - UNIX
    - interoperability, configuring for, 417
    - print servers, 860
    - Subsystem for UNIX-based Applications, 190
  - Unlock Account check box, 1191
  - updates, 74–75
  - upgrading to Windows Server 2008
    - migration, 88
    - overview, 73–74
    - performing the upgrade, 88
    - supported paths for, 74
  - UPNs (user principal names), 1021
  - UPS (uninterruptible power supplies), 1314, 1370–1371
  - up-to-dateness vectors, 1088
  - USB 2.0, 213–214
  - USB flash keys for password resets, 1214–1215
  - user accounts
    - Administrator. *See* Administrator account
    - backing up passwords, 1214–1215
    - command line creation of, 1186
    - creating, 1184–1187
    - default user accounts, 1168
    - delegated authentication, 1041–1043
    - deleting, 1210–1211
    - disabling, 1191, 1193, 1195, 1211
    - domain. *See* domain user accounts
    - Effective Permissions tool, 1188–1189
    - enabling, 1211
    - expiration options for, 1192
    - folder redirection, 1203–1207
    - Guest account, 1168
    - Home Folder, 1194
    - importance of availability of data, 1203
    - Kerberos options, 1192
    - local, 1167, 1169. *See also* local user accounts
    - maintenance overview, 1210
    - moving, 1211
    - multiple users, selecting, 1211
    - naming accounts, 1168
    - options, managing, 1189–1192
    - profile settings, 1193–1194
    - properties, viewing and setting, 1187–1188
    - renaming, 1211–1212
    - resetting passwords, 1212–1213
    - SIDs (security identifiers) of, 1210
    - troubleshooting, 1195
    - unlocking, 1213–1214
    - user profiles. *See* user profiles
  - user applications, 295
  - user data management
    - file synchronization, 1209–1210
    - folder redirection, 1203–1207
    - importance of availability of data, 1203
    - offline files, 1207–1209
  - user experience teams, 32
  - user mode of security subsystem, 987–988
  - user principal names. *See* UPNs (user principal names)
  - user profiles
    - data storage, 1196
    - deleting unused automatically, 1197
    - deleting while in use, 1196
    - HKEY\_CURRENT\_USER (HKCU), 259
    - HKEY\_USERS (HKU) Registry key, 258
    - local, 1196
    - location for storage of, 1196
    - mandatory, 1196
    - permissions for preconfigured, 1199
    - policies for, 1197
    - preconfigured, creating, 1198–1199
    - purpose of, 1195
    - roaming, 1196
    - switching from local to roaming, 1202
    - Terminal Services, 982–983
    - types of, 1196
    - User Profiles dialog box, launching, 1198
  - user rights
    - assigning for domains and OUs, 1182–1183
    - assigning for specific computers, 1184
  - Userevnt.dll, 1236
  - UserName environment variable, 1194
  - USN (update sequence number) change journals, 514–515
  - USNs (update sequence numbers), 1087–1088
- ## V
- VDS (Virtual Disk Service), 408
  - Virtual Disk Service (VDS), 408
  - virtual memory
    - bottleneck issues, 356–358
    - tuning performance of, 305–308
  - virtual servers, 9–10
  - virtual sessions, 919
  - virtualization
    - Hypervisor Settings entries, 397
    - Registry, 246–248

Vista. *See* Windows Vista

Visual Effects tab, 304

volume automounting, 408

Volume Shadow Copy Service (VSS), 407, 587. *See also* shadow copies

#### volumes

basic, 428–432

creating, 435–439

defined, 77

defragmenting, 541–546

deleting, 448

DiskPart tool, 409

drive letter configuration, 440–442

dynamic, 428–432. *See also* dynamic disks

dynamic, types of, 452

extending, 443–446

formatting, 437–440

labels, setting, 438

mirrored volumes, 452, 457–462, 464–466

mount points, 442–443

quotas for users. *See* quota management

RAID-5 volumes, 452

removing, shadow copy issues, 597

sharing. *See* file sharing

shrinking, 446–447

simple, 453–454

size, setting, 435–436

spanned, 452–454

striped, 452, 454–455, 462–463

#### VPNs (virtual private networks)

computer account settings, 1230

SRA (Secure Remote Access), 18

SSTP (Secure Socket Tunneling Protocol), 18

VPN with NLB, 1336

VSS (Volume Shadow Copy Service). *See also* shadow copies

advantages of, 407

purpose of, 587

snapshots, 407

VSSAdmin command-line commands, 598–603

Vssadmin tool, 409

Windows Server Backup use of, 1387, 1399

## W

#### WANs (wide area networks)

RODCs with, 1148

sites, relation to, 1071

watermarks, printer, 893–894

Wbadmin, 1390

WDI (Windows Diagnostics Infrastructure), 19–25

WDS (Windows Deployment Services), 187

Web Server (IIS) role, 187

Web Server edition of Windows Server 2008

features of, 6–7

hardware requirements for installations, 72–73

selection criteria, 63

#### Web servers

farms, 1325

hardware for failover clustering, 1349–1351

planning for, 60

WIM (Windows Imaging Format), 14

Windows 2000 Server native mode domains, 1017

Windows Backup, 1384. *See also* backups

#### Windows Boot Manager

overview, 13–14

purpose of, 383

Windows Complete PC Restore, 1377

#### Windows Defender

purpose of, 12

Software Explorer in, 288

Windows Error Recovery mode, 1418–1419

#### Windows Explorer

adding users or groups for permissions, 576

Apply Onto options, 577–578

clearing inherited permissions, 569–570

creating shares with, 556–559

file sharing with, 556

Permissions tab, accessing, 569

removing users or groups for permissions, 577

setting special permissions for files and folders, 576–577

special permissions, viewing, 573

viewing permissions for files and folders, 571

Windows Filtering Platform, 632

#### Windows Firewall

backup exceptions, 1390

defined, 13

network troubleshooting issues, 679

Remote Desktop for Administration with, 610

#### Windows Installer

Clean Up Utility, 273–274

RemoteApps, package creation for, 971–973

Zapper, 275–276

Windows Internal Database, 190

Windows logs, 327

Windows Memory Diagnostics Tools, 1377

#### Windows Network Diagnostics

accessing from Network And Sharing Center, 630

Internet connections, 675

local area connection troubleshooting with, 674–675

Windows NT 4.0 NTLM, 1023–1024

Windows PC environment (WinPE), 1377–1378

Windows PowerShell. *See* PowerShell

Windows Process Activation Service, 190

Windows Product Activation (WPA), 66

- Windows Recovery Environment, 190, 1377
- Windows Registry. *See* Registries
- Windows Search Service
  - configuring, 419
  - purpose of, 416
- Windows Server 2003
  - native mode domains, 1017–1018
  - universal group membership caching, 1020–1022
- Windows Server 2008 Datacenter, 6
- Windows Server 2008 Enterprise, 6
- Windows Server 2008 Standard, 5
- Windows Server Backup
  - Always Perform Full Backup option, 1389
  - Always Perform Incremental Backup option, 1389
  - automatic management by, 1387
  - Backup Once Wizard, 1396–1400
  - capabilities of, 1387
  - configuring backup type, 1389
  - current server data recovery, 1402–1405
  - Custom options, 1389, 1392, 1397
  - destination selection, 1393, 1398
  - event logs, 1400–1401
  - feature description, 190
  - first backup after installation, 1388–1389
  - installing, 1388
  - manual backups, 1396–1400
  - Modify Backup option, 1395
  - recovery capabilities, 1388
  - recovery details summaries, 1405
  - Recovery Wizard, 1402–1407
  - remote server data recovery, 1406–1407
  - scheduling, 1391–1395
  - starting, 1388
  - Stop Backup option, 1395
  - system state recovery, 1407
  - tracking backups, 1400–1401
  - VSS with, 1387, 1399
  - Wbadmin command line equivalent, 1390
- Windows Server Catalog, 1311
- Windows services in clustered environments, 1363
- Windows System Resource Manager
  - editions available in, 62
  - Terminal Services with, 938
- Windows Time, 13
- Windows Update, 74–75
- Windows Vista
  - Active Directory with, 10–11
  - editions of, 10
  - kernel architecture, 11–13
  - power state management, 378
- Windows Web Server 2008, 6–7
- WinPE (Windows PC environment), 1377–1378
- Winprint, 901–902
- WINS (Windows Internet Naming Service)
  - active registrations, viewing, 835–836
  - backing up databases, 838
  - backups of, 1384
  - B-Nodes, 824
  - burst handling, 832–833
  - caches, 825
  - clients, 823
  - clustering with, 1363
  - compacting databases, 838
  - configuring, 669–671, 826–827, 832–836
  - console for, 826, 833
  - database maintenance, 836–839
  - database of mappings, 824
  - DHCP setup with, 697
  - DNS-based lookups, enabling, 839
  - H-Nodes, 824
  - installing server service, 826
  - legacy support function, 823
  - M-Nodes, 824
  - multiple servers recommended, 825
  - name registration, 824–825
  - NetBIOS names, 823
  - NetBIOS scope, 824
  - Netsh command-line commands, 827
  - Netsh info command, 835
  - Netsh statistics command, 834
  - node types, 824
  - overview of, 654–655
  - persistent connections, 825
  - planning deployments of, 40, 60
  - P-Nodes, 824
  - record export, 825
  - remote management of, 827
  - replication, 825, 828–831
  - restoring databases, 839
  - scavenging records, 836
  - small networks with, 824
  - status, viewing, 833–835
  - tombstoning records, 825, 835–836
  - troubleshooting, 828, 834
  - verifying database consistency, 837
  - wireless network security issues, 689
- Wireless Networking, 13
- wiring, 1314
- workgroups
  - DHCP, setting up for, 697
  - viewing, 126
- WPA (Windows Product Activation), 66, 71–72
- Write Attributes special permission, 574
- Write permission, 572
- WSRM (Windows System Resource Manager), 190
- WSUS (Windows Server Update Services), 74–75, 187

## Z

### zones, DNS

- Active Directory–integrated type, 750, 752–755, 780, 784
- automatic record creation, 794
- conditional forwarding, 754, 756
- defined, 749
- domain-based zone structure, 751
- forward lookup zone creation, 774–781, 783–785
- GlobalNames zone, 803–804
- ISP zone maintenance, 776
- listing, 819–820
- non-domain-based zone structure, 751–752
- polling intervals, 813
- primary DNS servers, 750–751, 779, 783
- primary zone creation, 775
- records of a particular zone, displaying, 820–821

- replication scope, 780, 784
- restart issues, 754–755
- reverse lookup zone creation, 781–782, 785–786
- secondary DNS servers, 750, 779, 781, 784
- secondary notification configuration, 793–794
- secondary zone creation, 775
- secondary zone setup, 770–771
- secondary zones, 755
- standard primary type, 749
- standard secondary type, 750
- stub type, 750, 755–756, 779, 784
- transfers, 750–751, 791–793
- types supported, 749–750
- zone files, 781–782

**zones, Internet security, 118**