



# MCTS Self-Paced Training Kit (Exam 70-620): Configuring Windows Vista™ Client

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# Table of Contents

<b>Introduction</b>	<b>xxiii</b>
Hardware Requirements	xxiii
Software Requirements	xxiv
Using the CD and DVD	xxv
How to Install the Practice Tests	xxv
How to Use the Practice Tests	xxv
How to Uninstall the Practice Tests	xxvi
Microsoft Certified Professional Program	xxvii
Technical Support	xxvii
Evaluation Edition Software Support	xxvii
<b>1 Installing Windows Vista Client</b>	<b>1</b>
Before You Begin	2
Lesson 1: Identifying Hardware Requirements	3
Assessing Hardware Requirements	3
Comparing Windows Vista Editions	4
Differentiating Windows Vista Logos	7
Running Windows Vista Upgrade Advisor	8
Practice: Evaluating a Computer Prior to Installing Windows Vista	10
Lesson Summary	12
Lesson Review	12
Lesson 2: Installing Windows Vista	14
Performing the Windows Vista Installation	14
Performing a Custom Installation	18

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	Dual Booting . . . . .	23
	Practice: Installing Windows Vista Business . . . . .	25
	Lesson Summary . . . . .	31
	Lesson Review. . . . .	31
	Lesson 3: Installing, Updating, and Troubleshooting Windows Vista	
	Device Drivers . . . . .	33
	Installing Drivers . . . . .	33
	Driver Signing . . . . .	36
	Updating Drivers. . . . .	37
	Troubleshooting Drivers. . . . .	39
	Practice: Managing Windows Vista Device Drivers . . . . .	42
	Lesson Summary . . . . .	44
	Lesson Review. . . . .	44
	Chapter Review . . . . .	46
	Chapter Summary. . . . .	46
	Key Terms . . . . .	46
	Case Scenarios. . . . .	47
	Case Scenario 1: Recommending Windows Vista Editions . . . . .	47
	Case Scenario 2: Diagnosing and Troubleshooting Device Driver Problems. . . . .	47
	Suggested Practices . . . . .	48
	Identify Hardware Requirements . . . . .	48
	Perform a Clean Installation . . . . .	48
	Install and Configure Windows Vista Drivers. . . . .	48
	Take a Practice Test. . . . .	49
<b>2</b>	<b>Windows Vista Upgrades and Migrations . . . . .</b>	<b>51</b>
	Before You Begin . . . . .	52
	Lesson 1: Upgrading and Migrating to Windows Vista . . . . .	53
	Upgrade and Migration Concepts . . . . .	53
	Identifying Valid Upgrade Paths. . . . .	54
	Migrating to Windows Vista . . . . .	56
	Upgrading to Windows Vista . . . . .	62
	Identifying Application Compatibility Requirements . . . . .	64

Practice: Migrating and Upgrading. . . . .	65
Lesson Summary. . . . .	71
Lesson Review. . . . .	71
Lesson 2: Upgrading Between Windows Vista Editions . . . . .	73
Upgrading Windows Vista Editions. . . . .	73
Practice: Upgrading Windows Vista Business to Windows Vista Ultimate . . .	77
Lesson Summary. . . . .	79
Lesson Review. . . . .	80
Lesson 3: Troubleshooting Installations and Upgrades . . . . .	81
Resolving Application Compatibility Problems . . . . .	81
Troubleshooting Windows Vista Installation and Upgrades . . . . .	83
Configuring System Recovery Options. . . . .	86
Practice: Creating and Reverting to a System Restore Point. . . . .	89
Lesson Summary. . . . .	93
Lesson Review. . . . .	93
Chapter Review. . . . .	95
Chapter Summary . . . . .	95
Key Terms . . . . .	96
Case Scenarios . . . . .	96
Case Scenario 1: Upgrading and Migrating . . . . .	96
Case Scenario 2: Troubleshooting. . . . .	97
Suggested Practices. . . . .	97
Upgrade to Windows Vista from Previous Versions of Windows. . . . .	97
Upgrade from One Edition of Windows Vista to Another Edition. . . . .	98
Troubleshoot Installation Problems. . . . .	98
Take a Practice Test . . . . .	98
<b>3 Troubleshooting Post-Installation System Settings. . . . .</b>	<b>99</b>
Before You Begin . . . . .	100
Lesson 1: Troubleshooting Post-Installation Configuration Issues . . . . .	101
Device Manager Troubleshooting . . . . .	101
Using the Reliability Monitor in Post-Installation Troubleshooting . . . . .	107
Problem Reports and Solutions . . . . .	109
Display Settings . . . . .	110

	Visual Appearance Settings. . . . .	119
	Practice: Post-Installation Troubleshooting. . . . .	121
	Lesson Summary. . . . .	125
	Lesson Review. . . . .	125
	Lesson 2: Configuring and Troubleshooting Windows Aero. . . . .	128
	Troubleshooting Windows Aero. . . . .	128
	Windows Genuine Advantage. . . . .	133
	The System Performance Rating Tool. . . . .	137
	Practice: Product Activation and Windows Genuine Advantage. . . . .	138
	Lesson Summary. . . . .	143
	Lesson Review. . . . .	143
	Chapter Review. . . . .	146
	Chapter Summary. . . . .	146
	Key Terms. . . . .	146
	Case Scenarios. . . . .	147
	Case Scenario 1: Post-Installation Troubleshooting. . . . .	147
	Case Scenario 2: Troubleshooting Aero and Display Settings. . . . .	147
	Suggested Practices. . . . .	147
	Troubleshoot Post-Installation Configuration Issues. . . . .	148
	Configure and Troubleshoot Windows Aero. . . . .	148
	Take a Practice Test. . . . .	148
<b>4</b>	<b>Configuring and Troubleshooting Internet Access . . . . .</b>	<b>149</b>
	Before You Begin. . . . .	150
	Lesson 1: Configuring and Troubleshooting Parental Controls and Content Advisor. . . . .	151
	Setting Up Users and Configuring System Access. . . . .	152
	Addressing Web Browsing Issues. . . . .	154
	Controlling Program Access. . . . .	156
	Addressing Gaming Issues. . . . .	157
	Troubleshooting Parental Controls and Content Advisor. . . . .	158
	Practice: Configuring Parental Controls and Content Advisor. . . . .	158
	Lesson Summary. . . . .	173
	Lesson Review. . . . .	173

Lesson 2: Configuring Internet Explorer 7+ .....	177
Configuring News Feeds (RSS Feeds) .....	178
Configuring Print and Viewing Controls .....	180
Configuring the IE7+ Search Bar and Adding Search Providers.....	182
Practice: Configuring News Feeds, Webpage Printing, and the IE7+ Search Bar.....	183
Lesson Summary.....	191
Lesson Review.....	191
Chapter Review.....	193
Chapter Summary .....	193
Key Terms .....	193
Case Scenarios .....	194
Case Scenario 1: Advising Users on How to Configure Parental Controls .....	194
Case Scenario 2: Printing Webpages .....	194
Suggested Practices.....	195
Configure and Troubleshoot Parental Controls.....	195
Configure Internet Explorer 7+ .....	195
Take a Practice Test .....	196
<b>5 User Account Control .....</b>	<b>197</b>
Before You Begin .....	198
Lesson 1: Configuring and Troubleshooting User Account Control .....	200
How User Account Control Works.....	200
Running User Accounts as Standard Users.....	205
Elevating User Privileges .....	206
Using Local Security Policies to Configure User Account Control .....	208
Troubleshooting UAC and Program Compatibility.....	215
Practice: Configuring UAC and Testing Your Settings .....	217
Optional Practice: Configuring Legacy Software to Run In Windows Vista .....	227
Lesson Summary.....	230
Lesson Review.....	231
Chapter Review.....	233

Chapter Summary . . . . .	233
Key Terms . . . . .	233
Case Scenarios . . . . .	234
Case Scenario 1: Giving Advice On User Account Control . . . . .	234
Case Scenario 2: Running Legacy Programs . . . . .	234
Suggested Practices . . . . .	235
Configure and Troubleshoot User Account Control . . . . .	235
Configure Legacy Programs to Run in Windows Vista . . . . .	235
Take a Practice Test . . . . .	235
<b>6 Configuring Internet Explorer Security . . . . .</b>	<b>237</b>
Before You Begin . . . . .	238
Lesson 1: Configuring Windows Defender . . . . .	239
Real-Time Protection . . . . .	239
Internet Explorer Integration . . . . .	246
Configuring Custom Scans . . . . .	247
Working with Windows Defender Definitions . . . . .	251
Troubleshooting Spyware Removal . . . . .	255
Managing Applications by Using Software Explorer . . . . .	257
Practice: Configuring Windows Defender Scans . . . . .	260
Lesson Summary . . . . .	264
Lesson Review . . . . .	264
Lesson 2: Configuring Dynamic Security for Internet Explorer 7+ . . . . .	266
Resolving Protected Mode Issues . . . . .	267
Configuring the Phishing Filter . . . . .	269
Using the Pop-Up Blocker . . . . .	273
Utilizing Security Zones . . . . .	276
Configuring Privacy Settings . . . . .	279
Managing Add-Ons . . . . .	283
Practice: Configuring and Testing the Phishing Filter . . . . .	285
Lesson Summary . . . . .	287
Lesson Review . . . . .	288
Chapter Review . . . . .	290
Chapter Summary . . . . .	290

Key Terms .....	290
Case Scenarios .....	291
Case Scenario 1: Giving Advice on a Windows Defender Setting .....	291
Case Scenario 2: Advising Customers About IE7+ Security Settings. ....	291
Suggested Practices. ....	292
Learn More About Windows Defender Settings. ....	292
Experiment with Dynamic Security Settings for IE 7+ .....	292
Take a Practice Test .....	293
<b>7     Configuring Network Connectivity. ....</b>	<b>295</b>
Before You Begin .....	295
Lesson 1: Using the Network And Sharing Center to Configure Networking ...	297
Introduction to Networking and TCP/IP. ....	297
Connecting to a Network .....	307
Setting Up a Network Connection .....	312
Adding a Wireless Device to a Network. ....	314
Managing Network Connections. ....	317
Managing Preferred Wireless Networks. ....	320
Sharing Files and Folders .....	323
Practice: Joining Devices to a Wireless Network. ....	326
Lesson Summary. ....	331
Lesson Review .....	332
Lesson 2: Troubleshooting Connectivity Issues. ....	334
Basic Troubleshooting .....	335
Troubleshooting IP Configuration. ....	338
Troubleshooting Wireless Network Settings .....	342
Configuring Wireless Network Security .....	344
Using the Diagnose Internet Connection Tool to Troubleshoot Connectivity Issues. ....	346
Configuring Network Settings in Windows Firewall. ....	348
Practice: Configuring MAC Security on a WAP and Disabling Automatic Switching .....	354
Lesson Summary. ....	357
Lesson Review .....	357



Chapter Review . . . . .	360
Chapter Summary . . . . .	360
Key Terms . . . . .	360
Case Scenarios . . . . .	361
Case Scenario 1: Advising Customers About Network Configuration . . . . .	361
Case Scenario 2: Troubleshooting a Network . . . . .	362
Suggested Practices . . . . .	362
Learn More About Network Configuration . . . . .	362
Become Familiar with Troubleshooting and Firewall Configuration . . . . .	363
Take a Practice Test . . . . .	363
<b>8 Configuring Firewall and Remote Support Settings . . . . .</b>	<b>365</b>
Before You Begin . . . . .	366
Lesson 1: Configuring Security Settings in Windows Firewall . . . . .	367
Firewall Basics . . . . .	367
Profiles and Network Location Awareness . . . . .	369
Windows Firewall . . . . .	369
Windows Firewall with Advanced Security . . . . .	374
Practice: Windows Firewall Configuration . . . . .	381
Lesson Summary . . . . .	383
Lesson Review . . . . .	384
Lesson 2: Configuring Remote Support . . . . .	385
Remote Assistance . . . . .	385
Remote Desktop . . . . .	397
Practice: Providing Remote Support . . . . .	406
Lesson Summary . . . . .	408
Lesson Review . . . . .	409
Chapter Review . . . . .	411
Chapter Summary . . . . .	411
Key Terms . . . . .	411
Case Scenarios . . . . .	412
Case Scenario 1: University Firewalls . . . . .	412
Case Scenario 2: Antarctic Desktop Support . . . . .	412
Suggested Practices . . . . .	412

	Configure Security Settings in Windows Firewall .....	413
	Configure Remote Access .....	413
	Take a Practice Test .....	413
<b>9</b>	<b>Configuring Communications Applications Included with Windows Vista .....</b>	<b>415</b>
	Before You Begin .....	416
	Lesson 1: Configuring Windows Mail .....	417
	Using Windows Mail as an E-mail Client .....	417
	Using Newsgroups with Windows Mail .....	428
	Troubleshooting Windows Mail .....	439
	Practice: Customizing Windows Mail .....	439
	Lesson Summary .....	443
	Lesson Review .....	444
	Lesson 2: Configuring Windows Contacts and Windows Calendar .....	446
	Windows Contacts .....	446
	Windows Calendar .....	451
	Practice: Windows Contacts and Windows Calendar .....	456
	Lesson Summary .....	457
	Lesson Review .....	458
	Lesson 3: Configuring Windows Meeting Space .....	460
	Windows Meeting Space Capabilities .....	460
	Configuring People Near Me .....	461
	Using Meeting Space .....	463
	Troubleshooting Meeting Space .....	470
	Practice: Configuring People Near Me and Windows Meeting Space .....	470
	Lesson Summary .....	474
	Lesson Review .....	474
	Chapter Review .....	477
	Chapter Summary .....	477
	Key Terms .....	477
	Case Scenarios .....	478
	Case Scenario 1: University Calendars .....	478

	Case Scenario 2: Presenting a Business Proposal Using Windows Meeting Space. . . . .	478
	Suggested Practices . . . . .	479
	Configure Windows Mail. . . . .	479
	Configure Windows Meeting Space . . . . .	479
	Configure Windows Calendar. . . . .	479
	Take a Practice Test. . . . .	480
<b>10</b>	<b>Configuring Faxes, Media Applications, and the Windows Sidebar . . . . .</b>	<b>481</b>
	Before You Begin . . . . .	482
	Lesson 1: Configuring and Troubleshooting Media Applications . . . . .	483
	Configuring Windows Media Center. . . . .	483
	Configuring Windows Media Player . . . . .	492
	Practice: Configuring Windows Media Center and Using Windows Media Player . . . . .	496
	Lesson Summary . . . . .	500
	Lesson Review . . . . .	500
	Lesson 2: Configuring Windows Fax and Scan . . . . .	503
	Setting Up Fax and Scan . . . . .	503
	Practice: Setting up Windows Fax and Scan. . . . .	507
	Lesson Summary . . . . .	510
	Lesson Review . . . . .	511
	Lesson 3: Configuring Windows Sidebar. . . . .	513
	Configuring Sidebar Settings . . . . .	513
	Configuring Gadgets . . . . .	516
	Practice: Windows Sidebar and Gadgets. . . . .	518
	Lesson Summary . . . . .	519
	Lesson Review . . . . .	520
	Chapter Review. . . . .	522
	Chapter Summary. . . . .	522
	Key Terms. . . . .	522
	Case Scenarios. . . . .	523
	Case Scenario 1: Family Media Center Extender . . . . .	523

Case Scenario 2: Home Office Fax Solution . . . . .	523
Suggested Practices . . . . .	524
Configure and Troubleshoot Media Applications . . . . .	524
Configure Windows Fax and Scan . . . . .	524
Configure Windows Sidebar . . . . .	524
Take a Practice Test . . . . .	525
<b>11 Maintaining and Optimizing Windows Vista . . . . .</b>	<b>527</b>
Before You Begin . . . . .	528
Lesson 1: Troubleshooting Performance Issues . . . . .	530
Implementing ReadyBoost . . . . .	531
Using Performance Information and Tools to Troubleshoot Performance Issues . . . . .	539
Resolving Startup, Shutdown, and Hanging Issues . . . . .	545
Practice: Implementing ReadyBoost and Adjusting Performance Options . . . . .	547
Lesson Summary . . . . .	553
Lesson Review . . . . .	554
Lesson 2: Troubleshooting Reliability Issues by Using Built-in Diagnostic Tools . . . . .	556
Using the Windows Experience Index Tool . . . . .	557
Using Event Viewer . . . . .	559
Using the Problem Reports and Solutions Tool . . . . .	563
Using Advanced Diagnostic and Analysis Tools . . . . .	566
Practice: Creating a Custom View and Capturing Network Diagnostic Event Logs . . . . .	574
Lesson Summary . . . . .	579
Lesson Review . . . . .	580
Chapter Review . . . . .	582
Chapter Summary . . . . .	582
Key Terms . . . . .	582
Case Scenarios . . . . .	583
Case Scenario 1: Troubleshooting Performance Issues . . . . .	583
Case Scenario 2: Troubleshooting Reliability Issues . . . . .	583

	Suggested Practices . . . . .	584
	Troubleshoot Performance Issues. . . . .	584
	Become Familiar with the Built-in Tools for Troubleshooting Reliability Issues. . . . .	585
	Take a Practice Test. . . . .	585
<b>12</b>	<b>Configuring Updates and Protecting Data . . . . .</b>	<b>587</b>
	Before You Begin . . . . .	588
	Lesson 1: Configuring Windows Update . . . . .	589
	Configuring Windows Update Settings . . . . .	591
	Hiding Updates and Restoring Hidden Updates . . . . .	598
	Viewing Update History . . . . .	600
	Practice: Configuring Windows Update . . . . .	603
	Lesson Summary . . . . .	609
	Lesson Review . . . . .	609
	Lesson 2: Configuring Data Protection . . . . .	611
	Using Windows Backup and Restore . . . . .	612
	Using System Restore. . . . .	626
	Using Complete PC Backup. . . . .	628
	Restoring Damaged or Deleted Files by Using Previous Versions . . . . .	631
	Summary of Backup and Restore Types and When to Use Them. . . . .	633
	Practice: Recovering Files and Creating a Complete PC Backup. . . . .	634
	Lesson Summary . . . . .	639
	Lesson Review . . . . .	640
	Chapter Review . . . . .	642
	Chapter Summary. . . . .	642
	Key Terms. . . . .	642
	Case Scenarios. . . . .	643
	Case Scenario 1: Configuring Windows Update. . . . .	643
	Case Scenario 2: Configuring Data Protection . . . . .	643
	Suggested Practices . . . . .	644
	Configure Windows Update . . . . .	644
	Configure Data Protection . . . . .	644
	Take a Practice Test. . . . .	645

<b>13</b>	<b>Configuring Mobile Devices</b>	<b>647</b>
	Before You Begin	648
	Lesson 1: Configuring Mobile Display Settings	650
	Using the Windows Mobility Center	650
	Configuring Presentation Settings	652
	Configuring Multiple Monitors	653
	Using a Network Projector	654
	Practice: Connecting to an External Monitor and Configuring Presentation Settings	660
	Lesson Summary	663
	Lesson Review	663
	Lesson 2: Configuring Mobile Devices	666
	Using the Sync Center to Synchronize Network Files	667
	Using the Windows Mobile Device Center	673
	Configuring and Troubleshooting Windows SideShow Devices	682
	Practice: Recovering Files and Creating a Complete PC Backup	689
	Lesson Summary	695
	Lesson Review	695
	Chapter Review	698
	Chapter Summary	698
	Key Terms	698
	Case Scenarios	699
	Case Scenario 1: Configuring Mobile Display Settings	699
	Case Scenario 2: Configuring Mobile Devices	699
	Suggested Practices	700
	Configure Mobile Display Settings	700
	Configure Mobile Devices	700
	Take a Practice Test	701
<b>14</b>	<b>Working with a Tablet PC</b>	<b>703</b>
	Before You Begin	703
	Lesson 1: Configuring Tablet PC Software	705
	Tablet PC	705
	Configuring Handwriting Recognition	707

Configuring Pens and Input Devices . . . . .	711
Tablet PC Input Panel . . . . .	714
Practice: Customizing Tablet PC Input Options . . . . .	716
Lesson Summary . . . . .	720
Lesson Review . . . . .	721
Lesson 2: Configuring Power Options . . . . .	723
Power Option Basics . . . . .	723
Power Plans . . . . .	724
Configuring Button Behavior and Security . . . . .	728
Practice: Customizing Windows Vista Power Options . . . . .	729
Lesson Summary . . . . .	732
Lesson Review . . . . .	732
Chapter Review . . . . .	735
Chapter Summary . . . . .	735
Key Terms . . . . .	735
Case Scenarios . . . . .	736
Case Scenario 1: Tablet PCs at Tailspin Toys . . . . .	736
Case Scenario 2: Individualized Power Plans . . . . .	736
Suggested Practices . . . . .	737
Configure Tablet PC Software . . . . .	737
Configure Power Options . . . . .	737
Take a Practice Test . . . . .	737
Answers . . . . .	739
Glossary . . . . .	793
Index . . . . .	801

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## Chapter 11

# Maintaining and Optimizing Windows Vista

Windows Vista offers a considerable number of features designed to enhance user experience, of which the Aero user interface is probably the most obvious example. Many other enhancements, particularly to security, work in the background invisible to the user. Microsoft has announced that Windows Vista contains more than 500 new features and enhancements.

It would be surprising if this number of enhancements came with no cost to overall performance. A user with a new Windows Vista-capable computer that has a reasonable specification is unlikely to notice any problems. If, however, you are supporting users who have upgraded from Microsoft Windows XP to Windows Vista, such users might report poorer performance—particularly if their computers are at the lower end of the hardware specification. A computer with 512 megabytes (MB) of random access memory (RAM) can run Windows XP quite happily, provided that the user does not run any high-end graphics applications. Such a computer will not be comfortable running Windows Vista.

Users do not expect a drop in performance when their machines have been upgraded—in fact, they expect the new operating system (OS) to make things smoother and faster. Managers are unlikely to be responsive to requests for hardware upgrades when they have just spent money on an OS upgrade. Home users are even less likely to be pleased about needing to buy more memory or a new graphics card. Fortunately, Windows Vista provides tools for tuning and optimizing performance and diagnosing reliability problems. This chapter discusses these tools.

### Exam objectives in this chapter:

- Troubleshoot performance issues.
- Troubleshoot reliability issues by using built-in diagnostic tools.

### Lessons in this chapter:

- Lesson 1: Troubleshooting Performance Issues . . . . . 530
- Lesson 2: Troubleshooting Reliability Issues by Using Built-in Diagnostic Tools . . . 556



## Before You Begin

To complete the lessons in this chapter, you must have done the following:

- Installed Windows Vista Ultimate on a personal computer, as described in Chapter 1, “Installing Windows Vista Client,” and Chapter 2, “Windows Vista Upgrades and Migrations.”
- Created an administrator account and standard accounts and enabled the Run command on the Start menu, as described in Practices 1, 2, and 3 of Lesson 1, “Configuring and Troubleshooting Parental Controls and Content Advisor,” in Chapter 4, “Configuring and Troubleshooting Internet Access.”
- Internet access is required for some of the practices.
- You need a USB 2.0 flash memory pen drive that supports ReadyBoost (almost all modern devices do) and a second flash drive that does not support ReadyBoost (less than 256 MB free) to carry out the practice session in Lesson 1.
- If you choose to install the evaluation copy of Windows Vista Enterprise that is provided with this book, you can still carry out all the practice sessions as written.

### Real World

*Ian McLean*

The first computer with which I came in contact in 1958 (I was 11 years old) had one kilobit of core store memory. You could see the individual magnetized cores. I counted them one day and there were 1024 of them. Having learned about the binary numbering system only a week before, I was rather pleased with this number. The computer filled a room and had lots of flashing lights, whirring tape drives, chattering line printers, and noisy Hollerith card readers. It impressed senior managers and visiting dignitaries.

The first computer of my own that I considered a professional machine had 32 MB of memory and a 250-MB hard disk. It was a Pentium 1 machine—P90 to be precise. I upgraded to 64 MB of RAM and added a second 1-GB disk. Colleagues thought I was crazy (they still do). Who could possibly need a whole gigabyte of hard disk space?

This was not an inconsiderable machine. I used it at a high level to run advanced courses in a well-known computer-aided vector graphics drawing package for professionals who used this software every day. The computer ran Microsoft Windows 95 and Microsoft Office 4.0 and did not break down once in 10 years. It was short on flashing lights, although the unbelievably fast 56 Kbps modem did make a most satisfactory noise when connecting to the Internet.

I now carry four times the total amount of storage that was on that computer on a universal serial bus (USB) flash memory pen in my inside pocket. This device makes no sound and is distinctly under-provisioned when it comes to flashing lights. I hardly ever show it to visiting dignitaries. In this chapter, I'm about to describe a laptop with 512 MB of RAM as a low-specification computer.

The point is that no matter how wildly you try to overestimate future technology advances, you will probably underestimate. But you can't sit on your hands and refuse to update until the next new gizmo comes on the market. That way lies stagnation and commercial disaster. At the same time, I often wonder whether a modern PC, technically wonderful though it is, will ever be quite as useful as my old P90. And if I want to impress senior management, I'm sure I can find a first generation computer with lots of flashing lights and whirring tape drives somewhere.

## Lesson 1: Troubleshooting Performance Issues

Technology typically provides the answer to performance problems. Windows Vista-specific hardware, such as DirectX 10-compliant video cards and solid state or hybrid hard disks, will in the future (possibly by the time you read this book) provide significant improvements in Windows Vista performance. In the meantime, the tools provided by the Performance Information and Tools feature help you diagnose the areas where performance is less than optimal and to tune for best performance.

Where RAM is a bottleneck—and it frequently is—the new ReadyBoost feature makes use of considerable advances in USB and flash memory technology to provide a quick, easy, and inexpensive method to increase performance that is virtually foolproof and does not require technical knowledge or administrator privileges. This chapter looks at the tools Windows Vista provides for diagnosing bottlenecks and tuning performance and at how you, and the users you support, can use ReadyBoost to solve problems caused by insufficient RAM and excessive paging.

---

**NOTE Do not disable Aero**

If a computer's hardware and OS is capable of supporting Aero—that is, the OS is not Windows Vista Starter or Windows Vista Home Basic—and the computer has a compatible graphics processor, you will get better performance with Aero enabled. Aero performs onscreen rendering and processing in the graphics processing unit (GPU), which frees your system's microprocessor for other tasks. This applies even if your graphics card uses shared RAM. The shared memory will still be allocated to the graphics adapter regardless of whether you are using Aero or not. The Aero rendering process is also inherently more reliable than a software renderer.

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**After this lesson, you will be able to:**

- Use the features provided by the Performance Information and Tools feature to diagnose problems and tune performance.
- Use the ReadyBoost feature to improve system performance.
- Address problems that cause slow startup or shutdown or that cause programs to hang.
- Explain the advantages of hybrid and solid state hard disk drives and prepare a technical case for using such devices.

**Estimated lesson time: 50 minutes**

## Implementing ReadyBoost

ReadyBoost uses spare space on USB-based storage devices—flash memory, for example—to improve computer performance. It does this by caching information to the USB device, which is typically faster than writing to a swap file on the hard disk drive. Information cached to the device is encrypted, so it cannot be read on other systems. The memory must be fast flash, and the computer needs a USB 2.0 port.

### Swap File

A swap file is hard disk space used to extend RAM, and it allows your computer's OS to operate as if the computer has more RAM than it actually does. The least recently used files in RAM can be swapped out, or paged, to your hard disk until they are needed later and new files can be paged into RAM.

An advantage of a swap file is that it can be organized as a single contiguous space so that fewer input/output (I/O) operations are required to read or write a complete file. The disadvantage is that it takes time for a standard hard disk to access virtual memory. If a computer's memory is not sufficient for a memory-intensive operation, this can lead to excessive paging to hard disk and a consequent drop in performance.

Windows Vista (and other Windows OSs) provides a swap file, known as virtual memory, with default initial and maximum sizes. An administrator can reconfigure virtual memory size. The swap file is also known as the page file or paging file.

## Configuring a Flash Memory Device for ReadyBoost

The user inserts a suitable flash memory device (typically, but not necessarily, a USB device) into a Windows Vista computer. The Autoplay dialog box appears, giving the user the option either to use the device to store files or to speed up the system. On choosing the second option, the user then needs to specify, in the ReadyBoost tab of the device's Properties dialog box, that Windows Vista should use the device for this purpose and how much flash memory it should allocate. By default, Windows Vista allocates 95 percent of free space on a flash memory device for ReadyBoost. Microsoft recommends configuring ReadyBoost with one to three times the amount of RAM that is installed in the system. So if a computer has 512 MB of RAM, the user should dedicate between 512 MB and 1.5 gigabytes (GB) of space for ReadyBoost. ReadyBoost recommends the ideal amount, based on the capacity of the device and the system's RAM. You enable ReadyBoost in the practice session later in this lesson.

**NOTE Using the device's Properties dialog box**

If the flash memory device is already connected or Autoplay is disabled, you can enable ReadyBoost by opening the device's Properties dialog box and selecting the ReadyBoost tab. If you want to disable ReadyBoost on a flash memory device, you can access the same tab and select Do Not Use This Device.

A user does not require elevated privileges to implement ReadyBoost. The operation can be completed in three mouse clicks if the default memory allocation is accepted. There is no requirement to open the computer's case and plug-in memory, and no technical knowledge is required. You can use ReadyBoost to improve performance on computers that already have the maximum amount of RAM that their motherboards allow installed. Flash memory not used for ReadyBoost can be used to store files. You can safely remove the USB device from the computer, if necessary, with no degradation of the computer's original performance, although the benefit of ReadyBoost would, of course, be lost.

**Some Facts About ReadyBoost**

The following information was extracted from answers given by Matt Ayers, the program manager in the Microsoft Windows Client Performance group, to questions about ReadyBoost. This appeared in a blog (online diary) written by Tom Archer, the program manager for the Windows Software Development Kit (SDK) Tools and Build Environment. The current URL is <http://blogs.msdn.com/tomarcher/archive/2006/06/02/615199.aspx>, but it is uncertain how long this will be available.

- ReadyBoost needs fast, consistent flash random performance memory—2.5 MB/sec throughput for 4 KB random reads and 1.75 MB/sec throughput for 512 KB random writes. Some devices have fast sequential performance but slow random performance. Other devices have 128 KB fast flash memory, but the rest is slow.
- You can use up to 4 GB of flash memory for ReadyBoost. This limitation is caused by FAT32 file system limits. The smallest flash memory cache you can use is 235 MB—which means you can use some, but not all, 256 MB devices, although larger capacities are recommended.
- ReadyBoost does not put the paging file on to flash memory. In fact, you cannot allocate ReadyBoost flash memory as virtual memory. ReadyBoost Memory is cache. The paging file is still stored on disk. If the data is not found in the ReadyBoost cache, Windows Vista reads it from the hard disk drive. ReadyBoost reduces paging because it increases the amount of RAM the system can use for caching, but ReadyBoost cache memory is not virtual memory.

- If a user pulls the ReadyBoost USB flash memory device out of the computer, Windows Vista does not crash but instead finds the information it needs on the hard disk. All pages on the USB device are backed by a page on disk. ReadyBoost is not a page-file store but rather a cache to speed up access to frequently used data.
- Everything that is written to a ReadyBoost device is encrypted by using the AES-128 algorithm. ReadyBoost is not a security risk.
- You can use only one ReadyBoost device per machine. This might change in future editions of Windows Vista. You can use some memory cards on internal buses for ReadyBoost, but you cannot currently use external card readers. USB hard disk drives (HDDs) are not (currently) fast enough for ReadyBoost, and there is in any case no benefit to using a USB HDD for ReadyBoost. MP3 players do not support ReadyBoost.
- Microsoft is currently working with manufacturers to create a program that will allow them to identify ReadyBoost-capable devices on their packaging. However, it is likely that most flash memory devices coming on the market will support ReadyBoost.

## ReadyBoost Considerations

The main caveat is that flash memory used for ReadyBoost cannot be used for storing files. It is possible that an unsophisticated user might implement ReadyBoost by accident and be unable to store files on the flash drive. However, the default selection in the Properties dialog box is not to use the device for ReadyBoost, so the likelihood of a user's enabling ReadyBoost by accident is greatly reduced. Even if it does happen, enabling ReadyBoost does not delete any files on the device; nor is the USB device damaged by accidentally enabling ReadyBoost. You might need to assist the user to move his or her files to another storage device and reformat the flash memory, although given the current low price of such devices this might not be worth the effort.

In any case, if a flash memory device used for ReadyBoost does fail, nothing much is broken. The computer still works, although a bit more slowly. The user needs only to plug in another inexpensive device and configure it for ReadyBoost with three mouse clicks. However, with this in mind, it is probably a good idea to discourage your users from saving valuable files on the same device they use for ReadyBoost. It is also a good idea to persuade users to back up any valuable files, but, as any administrator knows, this is not an easy thing to do.

**NOTE Not all flash memory devices support ReadyBoost**

Not all flash memory devices are fast enough to support ReadyBoost, and if you use a USB device, the computer must have a USB 2.0 port. You might need to explain to users you support that even some relatively new flash memory devices do not support sufficiently fast random performance for ReadyBoost or are a combination of fast and slow flash memory.

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**Quick Check**

- You want to implement ReadyBoost on a computer running Windows Vista. The computer has 750 MB of RAM installed. Following Microsoft's recommendations, how much flash memory should you dedicate for this purpose?

**Quick Check Answer**

- Microsoft recommends dedicating between one and three times the capacity of the installed RAM—in this case, from 750 MB through 2.25 GB of RAM. You can dedicate more or less flash memory if you want to. The minimum amount of free space you need in flash memory is 235 MB. The maximum you can use is 4 GB.

A flash memory device that uses ReadyBoost to improve performance on a computer can improve performance only on that computer. You cannot plug it into another computer and expect it to automatically boost that machine's performance.

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**MORE INFO USB flash memory**

It is difficult to find authoritative documentation about USB flash memory without encountering large quantities of manufacturers' hype. You can find information by searching the Internet and accessing sites such as <http://www.intel.com/design/flash/articles/what.htm> and [http://www.pcdoctor-guide.com/wordpress/?page\\_id=408](http://www.pcdoctor-guide.com/wordpress/?page_id=408). For more information about USB, access <http://support.microsoft.com/?kbid=822603> and <http://www.microsoft.com/whdc/system/bus/usb/default.mspx>.

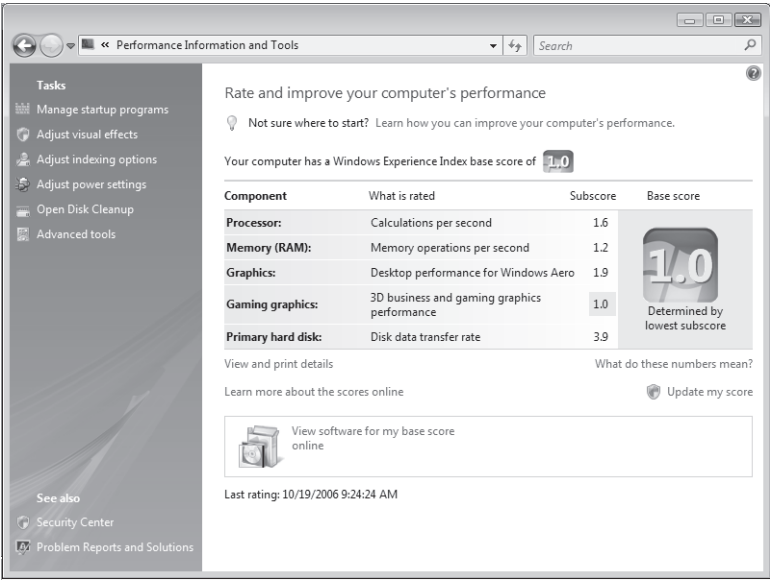
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**Improving Performance with ReadyBoost**

ReadyBoost works best on computers with limited memory. You will obtain a more significant improvement adding ReadyBoost flash memory to a computer with 512 MB of memory than to a high-specification workstation with 4 GB of RAM. A computer that has a limited amount of RAM needs to page information more often into and out of its swap file on hard disk. ReadyBoost flash memory provides a cache that reduces the need for paging and is therefore particularly effective on computers where RAM resource is a bottleneck.

As previously stated, Microsoft recommends configuring ReadyBoost with one to three times the amount of RAM you have installed in your system. So if you have 512 MB of RAM, you should try to dedicate between 512 MB and 1.5 GB of space for ReadyBoost on a flash memory device.

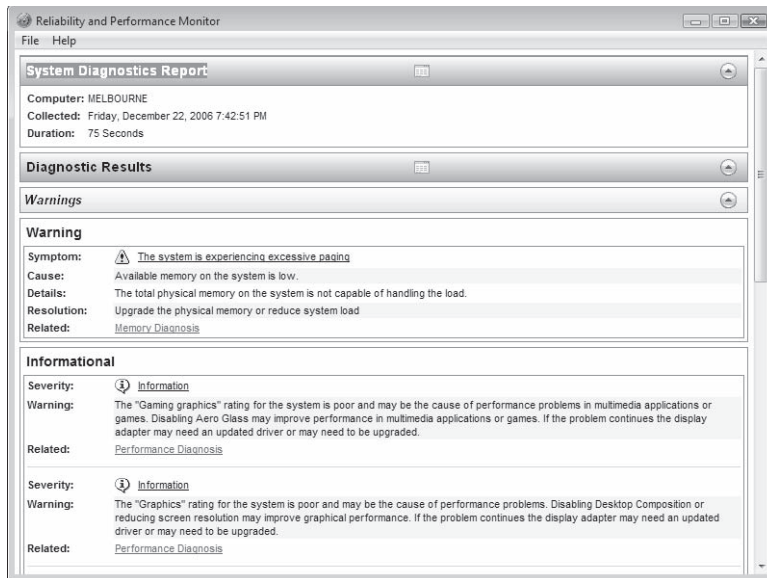
Chapter 3, “Troubleshooting Post-Installation System Settings,” described the Windows Experience Index available from the Performance Information and Tools feature. If you are not familiar with this feature, you can access it by opening Control Panel, clicking System And Maintenance, and then clicking Performance Information And Tools. Figure 11-1 shows a Windows Experience Index analysis for a low-specification laptop with 512 MB of memory. Unsurprisingly, a low score is returned. However, you need to analyze the results with care. The lowest index score is for gaming graphics, which is not relevant because the PC is not used for gaming or 3D graphics.



**Figure 11-1** Windows Experience Index analysis for a low-specification laptop computer

A more significant figure is the 1.2 score for Memory (RAM). You can carry out problem analysis on a PC by clicking Advanced Tools in the Performance Information And Tools dialog box and then clicking Generate A System Health Report. Click Continue in the User Account Control dialog box. Figure 11-2 shows a system health report for the same low-specification laptop indicating that inadequate RAM is a major problem. In the practice session later in this chapter you use the ReadyBoost feature to improve the performance of a computer whose performance is limited by low RAM.





**Figure 11-2** System Diagnostics Report for a low-specification laptop computer

## Real World

*Ian McLean*

The first time I rebooted my laptop after configuring a USB flash memory device for ReadyBoost, I experienced a few moments of panic. The machine seemed to be completely dead. Fortunately, I noticed the light-emitting diode (LED) on my USB pen drive flashing and worked out what was happening. Instead of the noise of my hard disk drive thrashing about looking for files, the computer was silently finding the same files in flash memory. The screen soon lit up and all was well.

This demonstrated that ReadyBoost was working and also made me realize just how noisy the boot-up cycle on my computer previously had been. However, it is something you should warn your more nervous users about and be aware of yourself. Be prepared for support calls that start "it's completely dead" and continue "oh, it's working now." If ReadyBoost is implemented, you might also get calls from users reporting delays following logon. Although ReadyBoost improves overall performance, it can cause post-logon delays while Windows Vista copies information to ReadyBoost flash memory.

## Transfer Rate Considerations

Flash memory is not as fast as RAM. It has a reasonable read speed but a slower write speed. The transfer rate for even fast flash is comparable with that of a good mechanical disk drive. The USB 2.0 standard offers a data transfer rate up to 480 Mbps. In practice, a USB flash memory device seldom achieves that speed and peaks at about 300 Mbps. An internal fiber channel hard disk drive can achieve a data transfer rate in excess of 200 Mbps, external FireWire hard disk drives claim data transfer speeds of up to 400 Mbps, and 7200 rpm Serial Advanced Technology Attachment (SATA) drives can hit data transfer speeds of almost 500 Mbps. Manufacturers appear to be constantly announcing new technologies and faster drives.

Where flash memory wins out is in access time. A disk head on a mechanical actuator takes time to find the correct position on the disk platter before data reading and writing can occur. Access to data on flash memory is, in comparison, instantaneous.

Microsoft has designed ReadyBoost very carefully. If flash memory were used for all operations that would otherwise require paging to hard disk, then the slower write performance of flash would reduce the effectiveness of the technique. Also, flash memory has a limited life in terms of read and write cycles, particularly write cycles. A system program can write to memory thousands of times per second and could dramatically reduce the life of a flash memory device. Rather than being used for general paging, ReadyBoost flash memory holds files that change seldom but are read many times. This results in significant performance gains with very little reduction in device life. In Microsoft's judgment a flash memory device used for ReadyBoost should last for approximately 10 years—although this has yet to be tested.

## Page-File vs. Solid State Hard Disk Drive

Rather than implementing ReadyBoost, you can use the flash memory device to hold the page file. Lesson 2, "Troubleshooting Reliability Issues by Using Built-In Diagnostic Tools," describes how to configure virtual memory. In addition to moving virtual memory to a second hard disk, you can also allocate flash memory for this purpose, provided this flash memory has not already been allocated to ReadyBoost. Currently there is very little advantage to doing this, and there are several disadvantages. Flash memory used in this fashion does not boost performance as much as ReadyBoost and might not boost performance at all if the computer is paging large contiguous files. Using flash memory to hold the paging file can significantly reduce the life of the flash memory device and (unlike ReadyBoost) you can, and probably will, lose data if the device is removed while the computer is working.

However, hybrid and solid state storage devices with built-in RAM (as opposed to plug-in USB flash memory) could change this situation. We shall therefore look briefly at these technologies.

## Hybrid Hard Disk Drives

Like many features that look like the answer we have all been waiting for when they are first introduced, ReadyBoost might be overtaken by other technologies. Hybrid hard disk drives (H-HDDs)—for example, the Samsung H-HDD or the Gigabyte i-RAM Storage Device—offer a combination of mechanical hard disk and RAM. In some cases, the solid state memory is synchronous dynamic RAM (SDRAM) and requires battery backup when the computer is switched off, while others—for example, the Samsung devices—use flash memory so that information is not lost in the case of battery failure.

Windows Vista's ReadyDrive feature takes advantage of H-HDD technology by using the built-in RAM to intercept data and then dispatching data to the hard disk for long-term storage. ReadyDrive improves battery life in laptops by reducing mechanical hard disk usage and enables faster recovery from the Sleep stage.

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### **MORE INFO** ReadyDrive

For more information about ReadyDrive (and a very nice Microsoft PowerPoint presentation), access [http://download.microsoft.com/download/5/b/9/5b97017b-e28a-4bae-ba48-174cf47d23cd/STO008\\_WH06.ppt](http://download.microsoft.com/download/5/b/9/5b97017b-e28a-4bae-ba48-174cf47d23cd/STO008_WH06.ppt).

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However, H-HDDs are likely to be fitted as standard only on high-range workstations (until the price falls, as it almost certainly will). Most H-HDDs require Windows Vista as the client OS. On lower-specification client computers, and on older machines that have been upgraded from XP to Windows Vista, ReadyBoost provides a quick, easy, and inexpensive method of boosting performance.

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### **MORE INFO** Hard disk speeds and H-HDDs

For more information about data transfer rates, access [http://www.pcwatch.com/QB/hard\\_disk/hard\\_disk.htm](http://www.pcwatch.com/QB/hard_disk/hard_disk.htm) and <http://www.pcmag.com/article2/0,1759,1046951,00.asp>. For more information about H-HDDs, access [http://www.samsung.com/Products/HardDiskDrive/whitepapers/WhitePaper\\_12.htm](http://www.samsung.com/Products/HardDiskDrive/whitepapers/WhitePaper_12.htm).

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## Solid State Hard Disk

Although H-HDDs represent a significant advance in technology, they are generally seen as an interim solution. The explosion in compact MP3 players has led to a demand for inexpensive, reliable, high-capacity solid-state storage devices. Currently, 4 GB flash memory devices are

common, and up to 64 GB are available. However, although larger capacity and faster flash memory devices might be the technology that provides solid state drives (SSDs), nobody can guarantee what the future will bring. Some other technology—for example, Phase-change Random Access Memory (PRAM)—might (and probably will) implement SSDs in the near future—possibly even by the time you are reading this book.

One thing is certain—expensive and unreliable mechanical devices will be phased out in future computers. Soon the only moving part will be the fan, and possibly future devices will be so efficient and generate so little heat that not even the fan will be needed.

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**MORE INFO Solid state disks and PRAM**

For more information about SSDs, access <http://www.tft.info/content/view/100/>. For more information about PRAM, access [http://www.samsung.com/PressCenter/PressRelease/PressRelease.asp?seq=20060911\\_0000286481](http://www.samsung.com/PressCenter/PressRelease/PressRelease.asp?seq=20060911_0000286481).

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## Using Performance Information and Tools to Troubleshoot Performance Issues

The left pane of the Performance Information And Tools dialog box lists facilities that can help you tune the performance of those computers for which you are responsible. Elevated privileges are required to use some of the features. Standard users can use other features provided they are tuning only their own user experience. Adjusting settings for other users on the same computer requires elevated privileges.

However, unless your users are fairly sophisticated, you will probably be asked for your advice and support even for those tasks that do not require elevated privileges. Sometimes the implications of settings are not obvious, and many users are reluctant to change settings without first consulting their administrator or technical support person. The following features are available from the Performance Information And Tools dialog box:

- Manage Startup Programs
- Adjust Visual Effects
- Adjust Indexing Options
- Adjust Power Settings
- Open Disk Cleanup
- Advanced Tools

## Benchmarking

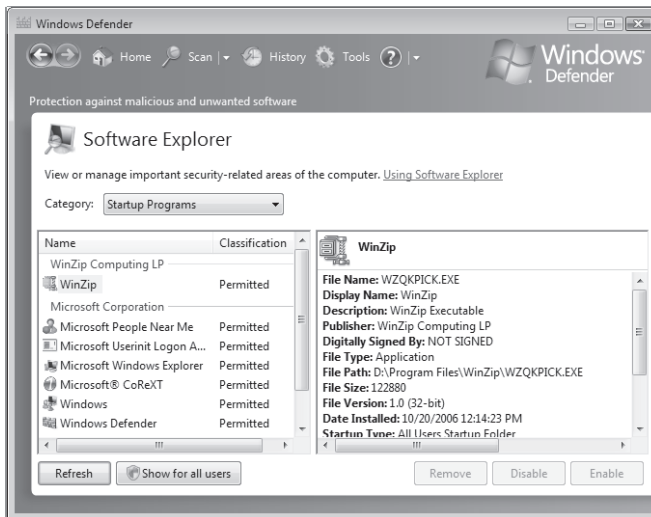
Usually if you do something to improve the performance of a computer, it is sufficient for the user to tell you that it is working a lot better now. However, sometimes you are asked to prove and quantify performance improvements. Formal benchmarking is beyond the scope of this chapter, but it does discuss tools for measuring performance. You have already seen the Windows Experience Index and System Diagnostics Report outputs (Figures 11-1 and 11-2). If you have upgraded hardware, you can obtain an indication of the improvements you have made by obtaining a new Windows Experience Index and examining the subscores. This is not always as informative as you might like—for example, implementing ReadyBoost might not significantly increase the RAM subscore because of the way this is measured. If a system health report reported a problem and a new report following a hardware upgrade does not, you can be reasonably sure that the upgrade solved the problem.

To obtain figures for performance improvement, you need to use the tools described in Lesson 2, “Troubleshooting Reliability Issues by Using Built-In Diagnostic Tools.” If you have identified an area of poor performance by examining resource usage in (for example) Task Manager or Reliability and Performance Monitor and then tuned performance settings, you can use the same tools under the same conditions to observe and quantify the improvement. Lesson 2 discusses this for each of these tools.

## Managing Startup Programs

Some programs start automatically when you start Windows Vista. If too many of these programs open at the same time or if a program that opens automatically hangs or takes longer than it should to open—possibly because of corruption—this can slow down your computer’s startup dramatically. You could encounter this problem if, for example, you or users you support purchase computers with the OS preinstalled. Many computer manufacturers install their own programs, which can impose significant performance burdens for questionable user benefit.

Selecting Manage Startup Programs opens Software Explorer in Windows Defender. Lesson 1, “Configuring Windows Defender,” of Chapter 6, “Configuring Internet Explorer Security,” discussed Windows Defender and Software Explorer in depth. If you suspect that a program is slowing a computer’s startup, you can disable that program to check whether your suspicions are correct. If you discover that the program is the culprit, you might need to reinstall it. This facility also allows you to check whether any programs that you do not recognize or trust run at startup. Figure 11-3 shows the Software Explorer window. You do not need elevated privileges to run this task unless you want to manage startup programs for all users.



**Figure 11-3** The Software Explorer window

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#### **MORE INFO** Managing startup programs

For more information, search for "Stop a program from running automatically when Windows starts" in Windows Help and Support.

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## **Adjusting Visual Effects**

You can optimize performance and change how menus and windows appear by clicking Adjust Visual Effects. This task requires elevated privileges. In the Visual Effects tab of the Performance Options dialog box, you can allow Windows to choose what is best for your computer (recommended), adjust for best appearance, and adjust for best performance, or you can select Custom and configure the visual effects individually.

---

#### **NOTE** The Performance Options dialog box

The Performance Options dialog box is shown in Figure 11-11 as part of this lesson's practice session, which is more useful than having it here. However, some explanation is required to avoid confusion. Although you access the dialog box by clicking Adjust Visual Effects in Performance Information and Tools, you use only one tab in the dialog box for this purpose. The Data Execution Prevention tab lets you configure a security setting rather than tune performance, and the Advanced tab lets you configure processor scheduling and virtual memory. It can be confusing when you access these functions by clicking Adjust Visual Effects (at least it confused me).

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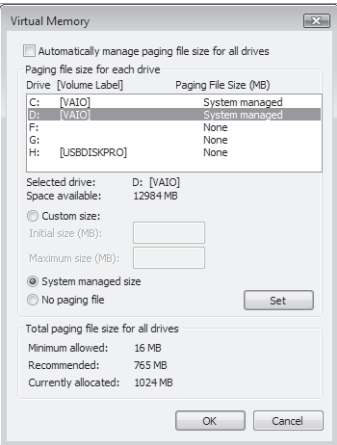
In the Data Execution Prevention tab, you can ensure that data execution prevention (DEP) is enabled either for essential Windows programs and services or for all programs and services

except those you specify. DEP is a security feature that can help prevent damage to a computer from viruses and other types of malware that attack Windows by attempting to execute code from system memory locations reserved for Windows and other authorized programs. DEP helps to protect the computer by monitoring programs to make sure that they use system memory safely. If DEP notices a program using memory incorrectly, it closes the program and notifies the user. You will need to provide administrative support for users who receive such messages and possibly disinfect their computers and ensure that antivirus and other security-related software is operating correctly.

**MORE INFO** Data execution prevention

For more information about DEP, click How Does It Work in the Data Execution Prevention tab of the Performance Options dialog box. Note that, as the message on this tab informs you, some processors do not support hardware-based DEP.

Possibly the most significant tab in the Performance Options dialog box as far as performance tuning and troubleshooting is concerned is the Advanced tab. In this tab (which you can also access by clicking System And Maintenance in Control Panel, clicking System, clicking Advanced System Settings, and then clicking Settings), you can specify whether processor scheduling gives priority to programs or background services. In a client computer it is usually better to prioritize programs. You can click Change in the Virtual Memory section and adjust the virtual memory settings for the computer, as shown in Figure 11-4. If your computer has more than one hard disk drive, you can usually improve performance by putting the paging file on the disk that does not hold the system files (files used by the OS). If you have allocated all of USB flash memory to ReadyBoost, you cannot use it for paging. It is, in any case, not a good idea to page to flash memory, because it reduces the life of the device.



**Figure 11-4** Virtual Memory settings

## Adjusting Indexing Options

Indexing options can speed up the search function on a computer. You can narrow your search to focus on those files and folders in common use. You can obtain more information by clicking How Does Indexing Affect Searches in the Indexing Options dialog box. Configuring settings by clicking Advanced requires elevated privileges. In the Advanced Options dialog box, you can adjust indexing settings, restore defaults, specify where the index is stored, and specify the file types to be indexed. You can get more information by clicking Advanced Indexing Help in the Index Settings tab.

## Adjusting Power Settings

The Adjust Power Settings facility lets you change power-related settings. You can increase performance at the cost of battery life and vice versa. You would normally adjust power settings only on laptop computers. You can choose a power plan and customize it by changing the settings that are listed in the left-hand pane of the Power Options dialog box. Elevated privileges are not required to choose a power plan but are needed for some settings, such as specifying whether a password is required on wakeup. For more information, click Tell Me More About Power Plans in the Power Options dialog box. Chapter 14, “Working with TabletPC,” discusses power settings in detail.

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### **NOTE** Power and Indexing Options

You can also access the Power and Indexing Options tools directly from the System And Maintenance dialog box that you open from Control Panel.

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## Performing a Disk Cleanup

When you click Open Disk Cleanup, you are prompted to select the disk drive you want to clean up and you then need to specify whether you want to clean up only your own files or files owned by all users of the computer. The latter option requires elevated privileges. You then select the drive you want to clean up and click OK. The Disk Cleanup tool deletes unnecessary or temporary files on your hard disk, so you can increase the amount of storage space available. It presents you with a list of files that can be deleted and identifies the types of file that it considers unnecessary by selecting the check box beside the file type. The tool gives you the option of viewing files and selecting or clearing files for deletion. Cleaning up files and defragmenting your disks regularly can significantly improve hard disk performance.

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### **MORE INFO** Defragmentation

For more information about hard disk defragmentation, search for “What is disk defragmentation” in Windows Help and Support.

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## Using Advanced Tools

As a frontline support technician you will access advanced tools whenever the users you support report performance problems or ask you if you can make their computers go faster. If you provide remote help desk support, you will advise users who might have administrator accounts on their own computers how to use the advanced tools. System administrators and information technology (IT) professionals often use advanced system tools to solve problems.

By accessing the Advanced Tools dialog box, you can also view notifications about performance-related issues and what to do about them. If, for example, Windows Vista detects a driver that is reducing performance, it generates a notification. You can click the notification to learn which driver is causing the problem and to view help files that tell you how to update the driver. If Windows Vista detects a number of issues, those at the beginning of the list are affecting the system more than those later in the list.

Lesson 2 of this chapter, “Troubleshooting Reliability Issues by Using Built-in Diagnostic Tools,” discusses the advanced tools. The Visual Effects tool described earlier in this lesson also appears in the advanced tool list, and an advanced tool was used to generate the System Diagnostics Report, shown in Figure 11-2. Figure 11-5 shows the tools that are available when you click Advanced Tools in Performance Information and Tools.

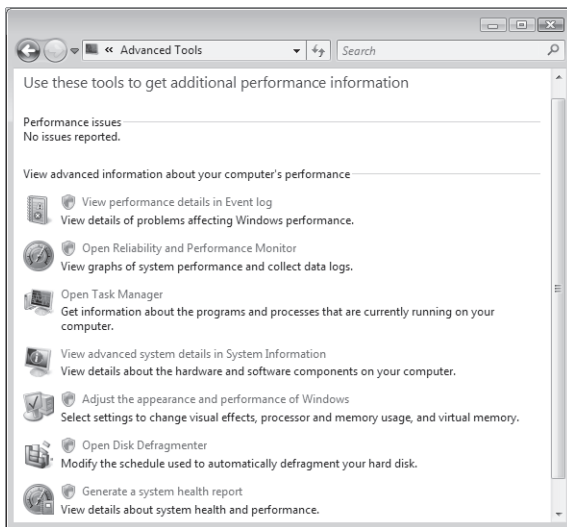


Figure 11-5 Advanced system tools

## Resolving Startup, Shutdown, and Hanging Issues

The previous section described how you can use the Software Explorer tool in Windows Defender to identify programs that cause startup delays. Often, if a program or a driver causes startup delays, it can also cause shutdown delays. In this case, the issue might be listed in the Advanced Tools dialog box, and you can address it.

Sometimes a program or driver can be out of date or incompatible with Windows Vista. Configuring Windows Update so that the computers for which you are responsible regularly access the Microsoft Update site reduces this problem but does not eliminate it. Possibly a user you support has an item of hardware—for example, a digital camera—that does not have a corresponding Windows Vista-compatible driver. If the user has administrator privileges, he or she might have installed an unsigned driver located on the Internet, and this could be causing problems. Microsoft Update cannot help in this situation, and you need to explain to the user that he or she cannot use the hardware with a Windows Vista computer.

If a program—for example, Windows Defender—is performing a scan on a computer or if a disk is being defragmented, then the computer needs more time to shut down gracefully, without losing information, than would otherwise be the case. If a user has switched a computer off or pulled out the power cable rather than powering down in the correct fashion, the computer will take longer than normal to start up again. Both these situations are normal behavior, and there is nothing wrong with the computer.

### Using the Problem Reports and Solutions Tool

Sometimes a program or driver simply hangs or operates unacceptably slowly during startup, shutdown, or normal operation. Millions of things need to go right for software to run normally, and only one thing need go wrong for it to crash. However, if slow startup or shutdown is a recurring problem or if the computer hangs frequently, there is probably a reason.

When a crash occurs, the user is given the option either to send an error report to Microsoft automatically or to be prompted to send such a report. Often, a solution to the problem is uploaded to the computer, and action can be taken. The Problem Reports And Solutions tool, available from System and Maintenance in Control Panel, displays problem solutions that are available and gives information on reported problems that do not have an immediately downloadable solution.

Sometimes a solution is not available when the user reports a problem but becomes available later. The Problem Reports and Solutions tool stores a problem history and provides the option to check for new solutions. This facility retransmits the information in the Problem History store to Microsoft to discover any new solutions. The report is available only if the user clicks the option to check for solutions when a problem occurs or if the user changes the settings to have Windows Vista automatically check for solutions. You can also view the problem history by using this tool. Figure 11-6 displays a problem history report.

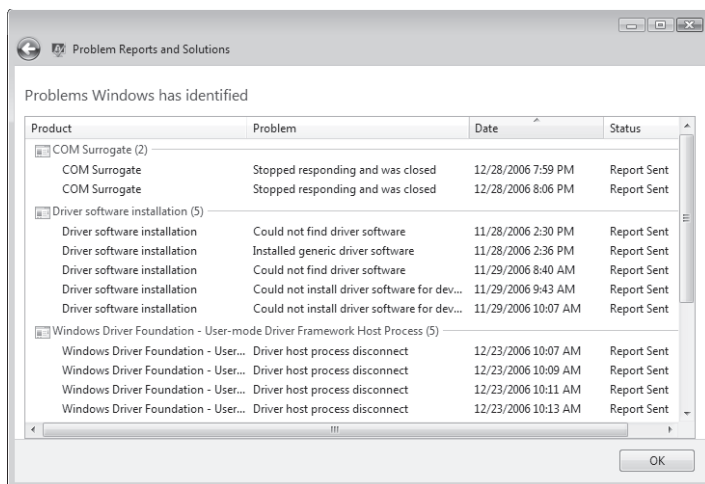


Figure 11-6 Problem history report

## Dealing with Unresponsive Programs

A program that is not responding interacts more slowly than usual with Windows Vista (if it interacts at all). Typically, this occurs because a problem has occurred in the program. If the problem is temporary and the user chooses to wait, Windows Vista can often find the problem and fix it automatically so the program starts responding again. Otherwise, the user can choose to close or restart the program by using Task Manager.

If a user closes a program that stops responding, Windows Vista closes all files or documents that the user opened by using the program. Some programs might try to save information, but that depends on the program. You need to explain this to users you support and encourage them to save their work frequently.

If the program that stops responding is the computer's browser—typically Internet Explorer—this could be for one of several reasons. If this is the first time Internet Explorer stopped responding, the problem is probably temporary. Advise the user to restart the browser and all will be well.

If, on the other hand, Internet Explorer hangs regularly, the computer could be infected with spyware or a virus, the user could have installed an inappropriate add-on, or a file that Internet Explorer is trying to access could be corrupt. Chapter 6, "Configuring Internet Explorer Security," discussed Internet Explorer security in some detail, and you need to ensure that virus and malware protection is installed on any computer you support and regularly check for suspicious add-ons. Also, ensure that Windows Update settings include recommended as well as important updates. The Problem Reports and Solutions tool described earlier in this section lets you report problems with Internet Explorer (and other software) to Microsoft and check

for solutions. Microsoft will notify you if there are steps you can take to solve problems and will use the information you send to generate new solutions.

Internet Explorer sometimes stops responding because it is trying to access a corrupted file stored in a temporary storage location. Temporary Internet files, cookies, and history files can all cause problems. If you suspect this is the problem, try deleting temporary Internet files first, then history files, and finally cookies. You need to warn your users that if cookies are deleted, they will lose personalization on websites that they visit regularly and might be required to reenter names and passwords for website access.

## Practice: Implementing ReadyBoost and Adjusting Performance Options

In this practice session, you implement the ReadyBoost feature on a computer running Windows Vista. In an optional second practice, you attempt to implement ReadyBoost on a flash memory device that is not suitable for this purpose and observe the results. Both of these practices ask you to log on by using the standard account (parent\_standard) that you created in Chapter 4, “Configuring and Troubleshooting Internet Access.” If you have not created this account, or if you do not want to switch users before completing the third practice in the session, you can instead log on by using the Kim\_Ackers account you created when installing Windows Vista. However, you should remember that implementing ReadyBoost does not require elevated privileges.

In the third practice, you adjust performance options—visual effects, for example—for maximum performance. This practice requires elevated privileges and asks you to log on by using the Kim\_Ackers account that you created when you installed Windows Vista. If you want to, you can remain logged on with a standard account and provide credentials for the Kim\_Ackers account when prompted.

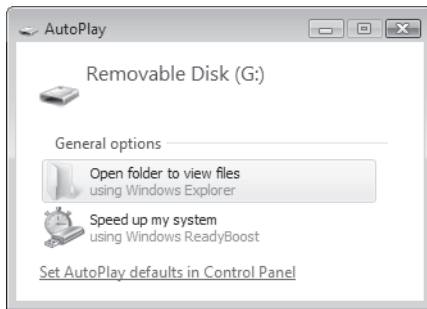
You can complete the practices on any Windows Vista computer, but you will see the greatest effect if you use a computer at the lower end of the hardware specification range. The figures were captured on a laptop computer with 512 MB of RAM, and a 1 GB USB flash memory device was configured for ReadyBoost.

### ► Practice 1: Implementing ReadyBoost

In this practice, you implement ReadyBoost. You will need a USB flash memory device with a capacity between one and three times the capacity of your computer’s RAM. You can use a flash memory device that already has files saved on it, or you can use part of the flash memory for file storage and the remainder for ReadyBoost. The practice as written uses the full capacity of a flash memory device.

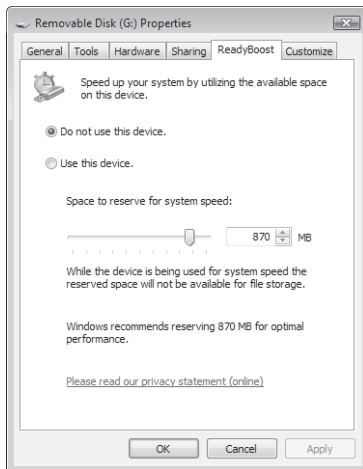
1. Log on by using a standard account—for example, the parent\_standard account that you created in Chapter 4, “Configuring and Troubleshooting Internet Access.”

2. Insert the USB flash drive that you want to use to enhance system performance. You should see an AutoPlay dialog box similar to that shown in Figure 11-7.



**Figure 11-7** The AutoPlay dialog box

3. Click Speed Up My System Using Windows ReadyBoost.
4. The ReadyBoost tab of the Properties dialog box for the USB flash drive opens, as shown in Figure 11-8. Select Use This Device.



**Figure 11-8** The ReadyBoost tab of the Properties dialog box for the USB flash drive

5. If you do not need to use any of the memory in the flash drive for file storage, you can increase the Space To Reserve For System Speed to the maximum capacity of the drive. Otherwise, accept the recommended setting. Click OK.
6. Use Windows Explorer to examine the contents of the USB flash drive. As shown in Figure 11-9, in this practice, all available flash memory is used for ReadyBoost cache.

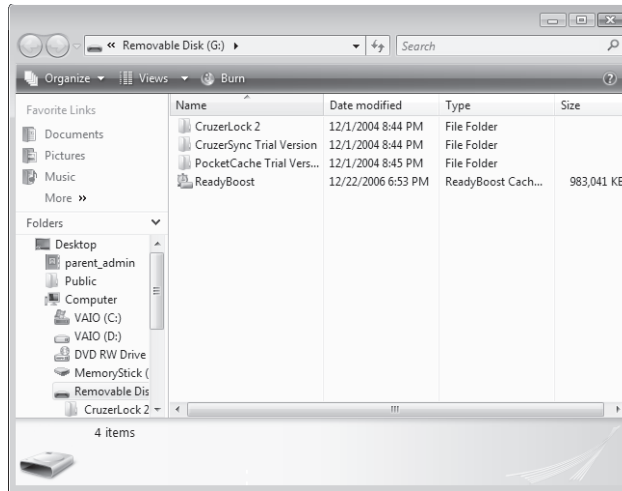


Figure 11-9 Flash memory used for ReadyBoost cache

► **Practice 2 (Optional): Attempting to Implement ReadyBoost on an Unsuitable USB Flash Memory Device**

In this practice, you attempt to implement ReadyBoost on a flash memory device that is unsuitable for the purpose. You could use a flash memory device with a capacity of less than 256 MB (the minimum is 235 MB, but devices come in standard sizes); you could use a larger capacity device that already holds files, so its spare capacity is less than 235 MB; or you could use a device that is not fast random access flash or a hybrid device with (say) 128 MB of fast random access flash and the rest slow flash.

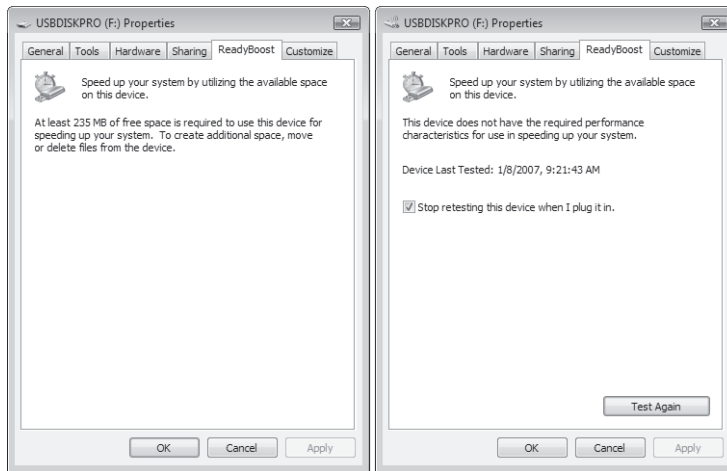
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**Exam Tip** Implementing ReadyBoost is a straightforward process, and only a very limited number of examination questions can be asked about it. However, ReadyBoost implementation could fail in a variety of ways, and you could be asked to identify suitable and unsuitable flash memory devices.

---

1. If necessary, log on by using a standard account—for example, the parent\_standard account that you created in Chapter 4, “Configuring and Troubleshooting Internet Access.”
2. If you completed Practice 1, disable ReadyBoost on the device you configured by accessing the ReadyBoost tab on the device’s Properties box (refer to Figure 11-8 in the previous practice), selecting Do Not Use This Device, and clicking OK. Alternatively, if you are short of USB slots, you can simply unplug the device.
3. Insert the USB flash drive that is unsuitable for ReadyBoost. Click Speed Up My System Using Windows ReadyBoost in the Autoplay dialog box.

- Depending on the device you inserted, you should see one of the two messages shown in Figure 11-10.



**Figure 11-10** ReadyBoost implementation failure dialog boxes

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**NOTE Stop Retesting This Device When I Plug It In**

Figure 11-10 shows that when the performance of a device is inadequate, the Stop Retesting This Device When I Plug It In check box is selected by default. This prevents the Speed Up My System Using Windows ReadyBoost option appearing in the Autoplay dialog box whenever the device is plugged in. The same check box is not available when the device has inadequate capacity because Windows Vista assumes you might want to delete some files and attempt to configure ReadyBoost again.

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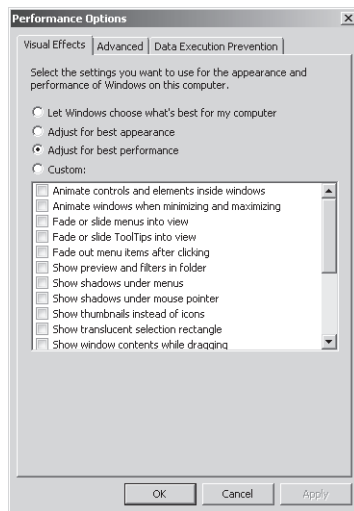
- If you want ReadyBoost enabled on your computer, reenable it on the flash memory device you used in Practice 1 by accessing the Properties dialog box for that device, selecting Use This Device in the ReadyBoost tab, and clicking OK.

► **Practice 3: Configuring Visual Effects and Virtual Memory for Maximum Performance**

In this practice, you configure the visual effects on a computer to maximize performance. You would do this on a computer with a modest hardware specification that needs the best performance boost it can get and on which attractive effects, such as shadows under the mouse pointer and under menus, are not required.

The practice also asks you to move virtual memory from the C partition to the D partition. If the computer you use does not have two hard disk drives or a hard disk drive with two partitions, you cannot perform this part of the practice as written. In this case, reconfigure the other virtual memory settings as described. If the computer has only one hard disk drive but two partitions, you can perform the practice as written, but you should be aware that you will not boost computer performance as you would if the partitions were on separate disks.

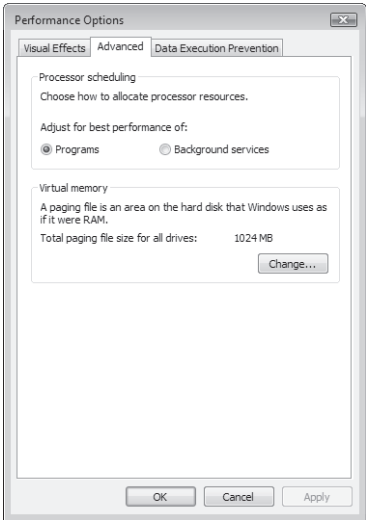
1. If necessary, log on by using the account that you created when you installed Windows Vista.
2. From Settings on the Start Menu, select Control Panel.
3. In Control Panel, Click System And Maintenance, and then Performance Information And Tools.
4. On the left pane, click Adjust Visual Effects. Supply administrator credentials or click Continue as prompted to close the UAC dialog box.
5. In the Visual Effects tab of the Performance Options dialog box, select Adjust For Best Performance. This disables all visual effects. If you prefer, you can select Custom and select or clear the check box for each visual effect in turn to meet user requirements.
6. Click Apply. Applying the new visual effects settings can take some time, especially if you have several windows open. When the settings have been applied, the Apply button is dimmed, as shown in Figure 11-11. You should also notice that the appearance of the Start button has changed.



**Figure 11-11** Visual effects settings have been applied

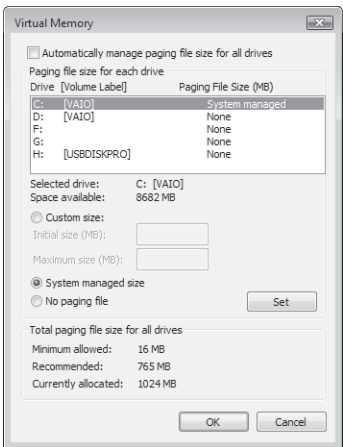
7. In the Data Execution Prevention tab of the Performance Options dialog box, ensure that Turn On DEP For Essential Windows Programs And Services Only is selected. Click How Does It Work to find out more about this setting. Close Windows Help And Support when you are finished reviewing this topic.
8. In the Advanced tab of the Performance Options dialog box, ensure that Adjust For Best Performance Of Programs is selected, as shown in Figure 11-12.





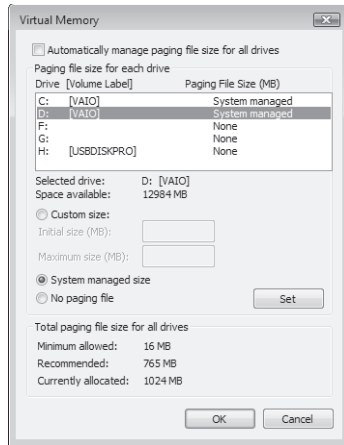
**Figure 11-12** Allocating processor resources for best performance of programs

9. Click Change in the Virtual Memory section of the Advanced tab. In the Virtual Memory tab, clear the Automatically Manage Paging File Size For All Drives check box, as shown in Figure 11-13.



**Figure 11-13** Disabling automatic virtual memory allocation

10. If the computer has a D partition, select it. Select System Managed Size, and then click Set. Figure 11-14 shows the result of this modification.



**Figure 11-14** Allocating virtual memory to the D drive

11. If you do not have a D drive, you should instead select the Automatically Manage Paging File Size For All Drives check box.

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**CAUTION** Let the system manage virtual memory

It is tempting to select No Paging File for the C drive so that all paging is done to the D drive. However, if you do this, problems can occur with error reporting. You could select Custom for the C drive and allocate 200 MB of virtual memory on that drive to prevent such problems, but in general, it is better to let the OS sort this out automatically. By the same token, you could select Custom for both drives and allocate virtual memory manually to each. Long experience with several OSs has taught me that the system can usually allocate virtual memory better than I can.

---

12. When you are happy with the virtual memory settings, click OK. You might be prompted to overwrite a d:\page file.sys file. If so, click OK.
13. Restart the computer.

## Lesson Summary

- You can use ReadyBoost to improve hardware performance, especially in computers where the RAM resource is a bottleneck.
- You can use the Manage Startup Programs option in Performance Information and Tools to disable a program that is causing delays from running at startup. This option opens Software Explorer in Windows Defender.

- You can improve performance by configuring visual effects settings and virtual memory settings in the Performance Options dialog box. You access this dialog box by selecting Adjust Visual Effects in Performance Information and Tools.
- You can improve search performance by modifying indexing settings in the Indexing Options dialog box. You access this dialog box by selecting Adjust Indexing Options in Performance Information and Tools.

## Lesson Review

You can use the following questions to test your knowledge of the information in Lesson 1, “Troubleshooting Performance Issues.” The questions are also available on the companion CD if you prefer to review them in electronic form.

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### NOTE Answers

Answers to these questions and explanations of why each answer choice is correct or incorrect are located in the “Answers” section at the end of the book.

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1. Ian McLean is writing Chapter 11 of a book about Windows Vista. He is changing settings in the Performance Options dialog box and capturing screen dumps. Ian finds that screen dumps of dialog boxes no longer have a black line all the way around them. What setting has he changed to cause this?
  - A. He has changed virtual memory settings.
  - B. He has adjusted the allocation of processor resources to achieve best performance of background services.
  - C. He has adjusted visual effects for best performance.
  - D. He has adjusted visual effects for best appearance.
2. You receive a help desk request from a colleague whose computer has recently been upgraded from Windows XP to Windows Vista. He is running a graphics application and reports poor performance. He also reports that his hard disk indicator LED is lit almost continuously. He does not have an administrator account on the computer. He needs to finish the project he is working on by the close of business that day. What do you advise?
  - A. The user needs to install a faster, higher capacity hard disk.
  - B. The user can insert a USB flash memory device and configure it for ReadyBoost.
  - C. The user needs to install more RAM.
  - D. The user should change the virtual memory settings.

3. You want to implement ReadyBoost on a laptop computer with 750 MB of RAM. You have four new USB flash memory devices of different capacities. You intend to use the full capacity of the device you choose. According to Microsoft guidelines, which of the following devices can you use for this purpose? (Choose all that apply.)
  - A. 256 MB flash memory
  - B. 512 MB flash memory
  - C. 1 GB flash memory
  - D. 2 GB flash memory
4. You want to reconfigure virtual memory settings on a computer. You already have the Performance Information And Tools dialog box open on the desktop. You want to use the quickest method of accessing the Virtual Memory dialog box. What do you click next?
  - A. Adjust Visual Effects
  - B. Adjust Indexing Options
  - C. Adjust Power Settings
  - D. Advanced Tools
5. Two weeks ago, Windows Vista encountered a problem that caused a data analysis program to hang. Although you automatically send information about such events to Microsoft, you received no solution to this problem. Tomorrow you intend to use this program again. How can you quickly check whether a solution has been found in the meantime?
  - A. On the Start menu, select Windows Update. In the Windows Update dialog box, click View Update History.
  - B. In Control Panel, select System And Maintenance. In the System And Maintenance dialog box, under Problem Reports And Solutions, click Check For New Solutions.
  - C. On the Start menu, select Windows Update. In the Windows Update dialog box, click Restore Hidden Updates.
  - D. In Control Panel, select System And Maintenance. In the System And Maintenance dialog box, under Problem Reports And Solutions, click View Problem History.

## Lesson 2: Troubleshooting Reliability Issues by Using Built-in Diagnostic Tools

Lesson 1, “Troubleshooting Performance Issues,” discussed various methods you can use to improve performance on a computer that is not working as quickly as its user believes it should. At worst, the computer might occasionally hang or take longer than expected to start up or shut down. In summary, Lesson 1 is about performance tuning.

Sometimes, however, the problems associated with a computer go beyond the scope of tuning. If a hardware component is inadequate for the task that the computer needs to perform, you should identify that component and either upgrade or replace it. If a driver or OS component needs to be updated, you might need to download an executable file from the Microsoft Update site and also find out why that file was not downloaded automatically. If a problem occurs regularly but is not reported to Microsoft, you might not be informed about a downloadable Microsoft solution. You need to both implement the solution and find out why the problem was not reported.

The Windows Experience Index tool (sometimes known as the System Performance Rating tool) was discussed in Chapter 3, “Troubleshooting Post-Installation System Settings,” and mentioned again in Lesson 1 of this chapter, “Troubleshooting Performance Issues.” This lesson also discusses the tool. Chapter 3 and Lesson 1 also introduced the Problem Reports and Solutions tool, and this lesson looks at this tool in more depth.

Selecting Advanced Tools in the Performance Information And Tools dialog box lets you access a number of tools that help you diagnose and address performance issues. You can view performance details in the event log, view graphs of system performance and collect data logs in the Reliability and Performance Monitor, get information about currently running programs and processes in Task Manager, view details about hardware and software components in System Monitor, adjust the appearance and performance of the computer by accessing the Performance Options dialog box, schedule disk defragmentation, and generate a system health report. Lesson 1, “Troubleshooting Performance Issues,” discussed the Performance Options dialog box, and Figure 11-2 showed a system health report. This lesson discusses the other diagnostic tools.

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**NOTE Disk defragmentation**

If you subscribe to Microsoft Windows One-Care, one of the features of this package is that it defragments the computer’s hard disks regularly.

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**After this lesson, you will be able to:**

- Use the Windows Experience Index tool to determine which hardware components are generating performance bottlenecks on your computer and to get an indication of overall computer performance.
- Use the Problem Reports and Solutions tool to control when Windows Vista reports faults to Microsoft and to access any new solutions to faults that were previously reported.
- Use event logs to obtain information about significant events on a computer.
- Use the Reliability and Performance Monitor, Task Manager, and the system monitor to obtain information to help you diagnose performance and reliability problems.

**Estimated lesson time: 45 minutes**

## Using the Windows Experience Index Tool

Chapter 3, “Troubleshooting Post-Installation System Settings,” discussed the Windows Experience Index tool. However, this tool is included in the objectives specified for this chapter and is therefore also mentioned here. You can access the tool either by opening the Performance Information And Tools dialog box or by opening the System And Maintenance dialog box from Control Panel and clicking Check Your Computer’s Windows Experience Index Base Score under System. In either case, clicking Update My Score recalculates the Windows Experience Index score.

You can use the Windows Experience Index score to determine whether a computer running Windows Vista has sufficient resources to run a particular application. An application has a recommended Windows Experience Index rating. If your computer meets that score, the application should perform adequately. If your computer has a Windows Experience Index rating below that score, the application might still run but might not do so in an acceptable way.

In practice, you need to analyze the index base score carefully. It is not an average score but is instead the score returned by the least adequate component. If, for example, the application has no requirement for three-dimensional (3D) graphics but the gaming graphics component returns a low score, then the application might run satisfactorily even though the index score is below what it specifies. If the index base score is above what an application specifies, that application will perform adequately. If the index base score is below the value specified, the application might still run adequately depending upon which component returned the low subscore.

Table 11-1 lists the components that are tested when calculating the Windows Experience Index base score. This table is also in Chapter 3 but is repeated here for convenience.

**Table 11-1 Components Used to Determine System Performance**

Component	Measurement
Processor	Calculations per second
Physical Memory (RAM)	Memory operations per second
Graphics	Windows Aero Desktop performance
Gaming graphics	3D graphics performance
Primary hard disk	Disk data transfer rate

A computer that is rated between 1 and 2 can usually perform basic tasks adequately but should not be used for games or multimedia. A computer rated at 3 can run Aero and play DVDs but might have problems displaying high-definition television (HDTV). A computer rated 4 or above will run software and multimedia applications well. Currently, an index score of 5 is seen only on a state-of-the-art high-performance workstation, but this situation will change as more powerful client computers designed to run Windows Vista come on the market.

The Windows Experience Index base score is generated automatically during the installation of Windows Vista. You can reevaluate the score at any time, but you would typically do so if you add a new graphics adapter, processor, motherboard, RAM, or hard disk drive. As described earlier in this lesson, you generate a new Windows Experience Index score by clicking Update My Score in the Performance Information And Tools dialog box. You need to supply administrator credentials and to be connected to the Internet to perform this operation.

If you are attempting to identify the component in your computer that could be causing performance or reliability problems, it is a good idea to look at both the Windows Experience Index score and a system health report, as we did in Lesson 1, “Troubleshooting Performance Issues.” You can obtain a system health report by selecting Advanced Tools in the Performance Information And Tools dialog box and clicking Generate A System Health Report. This operation requires elevated privileges and Internet access. It can also take quite a long time to complete.

**Quick Check**

1. What system components are evaluated when calculating a Windows Experience Index score?
2. Which system component is rated by calculations per second when calculating a Windows Experience Index score?

**Quick Check Answers**

1. Processor, physical memory (RAM), graphics, gaming graphics, and primary hard disk
2. Processor

## Using Event Viewer

You can access Event Viewer from the Advanced Tools dialog box (refer to Figure 11-5 earlier in this chapter) or from the Administrative Tools menu. You can supply administrator credentials if you have logged on by using a standard account, but some event logs might not then be accessible. It is easier to use this tool if you log on as an administrator.

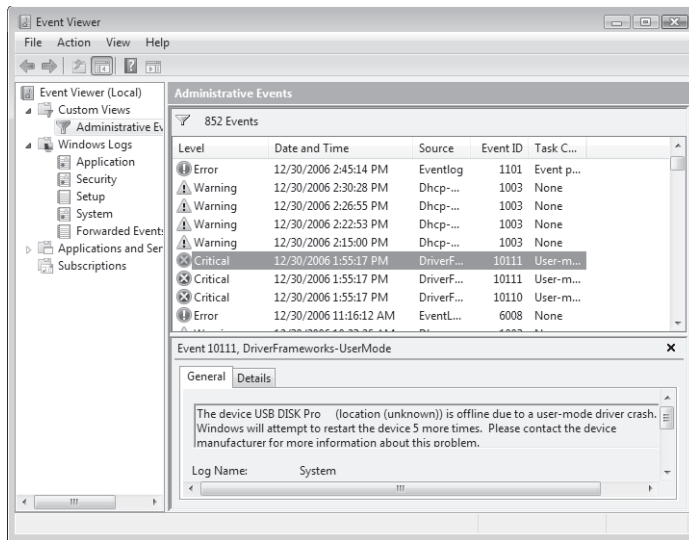
Event Viewer displays event logs, which are files that record significant events on a computer—for example, when a user logs on or when a program encounters an error. You will find the details in event logs helpful when troubleshooting problems with the Windows Vista OS, drivers, and application programs. The events recorded fall into the following categories:

- Critical
- Error
- Warning
- Information

The security log contains two more event categories that are used for auditing purposes: Audit Success and Audit Failure.

Figure 11-15 shows details of a critical event. This is a failure in a USB driver that could (and did) cause information in a file to be lost.





**Figure 11-15** A critical event

Event Viewer tracks information in different logs. Windows logs include the following:

- **Application** Stores program events. Events are classified as error, warning, or information, depending on the severity of the event. An error is a significant problem, such as loss of data. A warning is an event that is not necessarily significant but might indicate a possible future problem. An information event describes the successful operation of a program, driver, or service. The critical error classification is not used in the Application log.
- **Security** Stores security-related audit events that can be successful or failed. For example, the Security log records an audit success if a user trying to log on to the computer was successful.
- **Setup** Stores setup events. Computers that are configured as domain controllers in an Active Directory directory service domain have log files displayed here.

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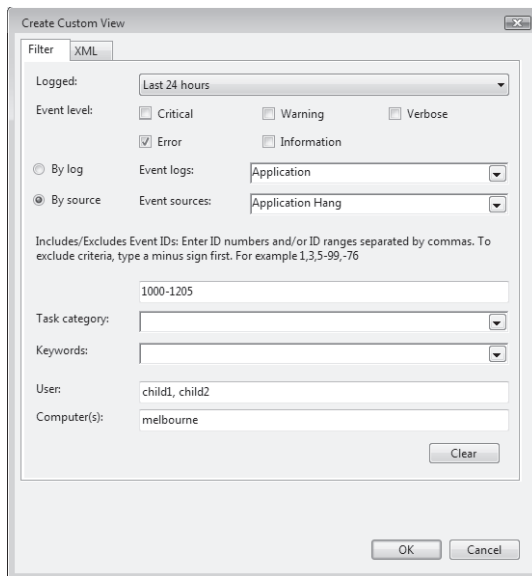
**Exam Tip** The 70-620 examination objectives do not specify Active Directory domains, and you are unlikely to encounter any questions about the Setup log.

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- **System** Stores system events that are logged by Windows Vista and Windows Vista system services. System events are classified as critical, error, warning, or information.
- **Forwarded Events** Stores events that are forwarded by other computers.

## Custom Views

You can create custom views by clicking Create Custom View in the Event Viewer Action menu, specifying the source logs or events and filtering by level, time logged, event identity (ID), task category, keywords, user, or computer. You are unlikely to specify all of these criteria, but this facility enables you to refine your search to where you think a problem might be occurring rather than searching through a very large number of events. Figure 11-16 shows a custom view specification.



**Figure 11-16** Specifying a custom view

Windows Vista provides the Administrative Events custom view by default. This view contains critical, error, and warning events from all administrative logs.

## Applications and Services Logs

Event Viewer provides a number of Applications and Services logs. These include logs for programs that run on the computer and detailed logs that store information about specific Windows services. For example, these logs can include the following:

- Distributed file system (DFS) replication log
- Encrypted file system (EFS) debug log
- Function discovery provider host service tracing log
- Hardware events log
- Internet Explorer log

- Key management service log
- Media center log
- A large number of Microsoft Windows logs
- Microsoft Windows services performance diagnostic provider diagnostic log

## Attaching Tasks to Events

Sometimes you want to be notified by e-mail if a particular event occurs, or you might want a specified program to start—for example, one that activates a pager. Typically, you might want an event in the Security log—such as a failed logon or a successful logon by a user who should not be able to log on to a particular computer—to trigger this action. To implement this functionality, you attach a task to the event so that you receive a notification.

To do this, open Event Viewer, and navigate to the log that contains the event you want to be notified about. Typically, this would be the Security log in Windows logs, but you can implement this in other Windows logs or in Applications and Services logs if you want to. You can select the event and click Action, click the event and go to the Actions pane, or right-click the event, and then select Attach Task To This Event.

This opens the Create Basic Task Wizard. You name and describe the task and then click Next. The When A Specific Event Is Logged page summarizes the event, and you can make sure that you have chosen the correct event before clicking Next. The Action page gives you the option of starting a program, sending an e-mail, or specifying a message. When you make your choice and click Next, you configure the task. For example, if you want to send an e-mail, you would specify source address, destination address, subject, task, attachment (if required), and the name of the Simple Mail Transfer Protocol (SMTP) server. You click Next, and then click Finish.

## Using Network Diagnostics with Event Viewer

When you run Windows Network Diagnostics, any problem found, along with solutions, is displayed in the Network Diagnostics dialog box. If, however, more detailed information about the problem and potential solutions is available, Windows Vista saves this in one or more event logs. As a network administrator or technical support technician, you will use the information in the event logs to analyze connectivity problems or help interpret the conclusions.

Chapter 7, “Configuring Network Connectivity,” described how you run Network Diagnostics from the Network And Sharing Center, which you access by clicking Network And Internet in Control Panel. You can also start the tool from the message that Internet Explorer returns if you fail to connect to a webpage. You can filter for network diagnostics and Transmission Control Protocol/Internet Protocol (TCP/IP) events by specifying Network-diagnostics and Tcpip event sources and capturing events from these sources in a custom view. You do this in the practice session later in this lesson.

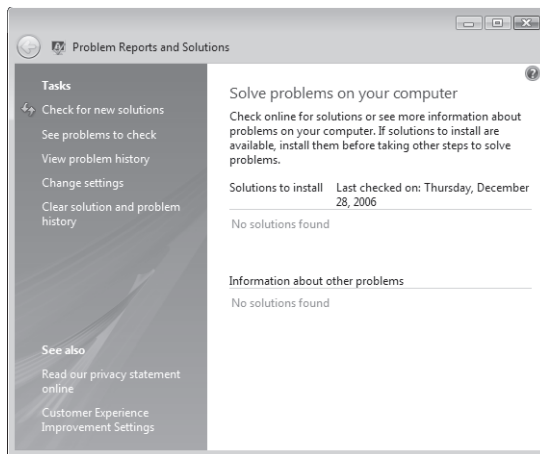
If Network Diagnostics identifies a problem with a wireless network, it saves information in the event logs as either helper class events or informational events. Helper class events provide a summary of the diagnostics results and repeat information displayed in the Network Diagnostics dialog box. They can also provide additional information for troubleshooting, such as details about the connection that was diagnosed, diagnostics results, and the capabilities of the wireless network and the adapter being diagnosed.

Informational events can include information about the connection that was diagnosed, the wireless network settings on the computer and the network, visible networks and routers or access points in range at the time of diagnosis, the computer's preferred wireless network list, connection history, and connection statistics—for example, packet statistics and roaming history. They also summarize connection attempts, list their status, and tell you what phases of the connection (such as preassociation, association, and security setup) succeeded, failed, or did not start.

There can be one or more helper class events per diagnostics session, but only one informational event per session.

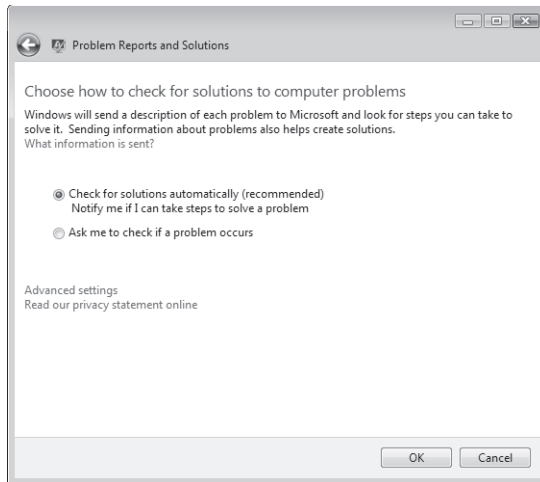
## Using the Problem Reports and Solutions Tool

If a program stops working or responding, Windows Vista, by default, automatically reports the problem to Microsoft and checks for a solution. You can verify or change this default by opening the Problem Reports and Solutions tool. You access this tool by clicking System And Maintenance in Control Panel and then clicking Problem Reports And Solutions. The Problem Reports and Solutions tool is shown in Figure 11-17.



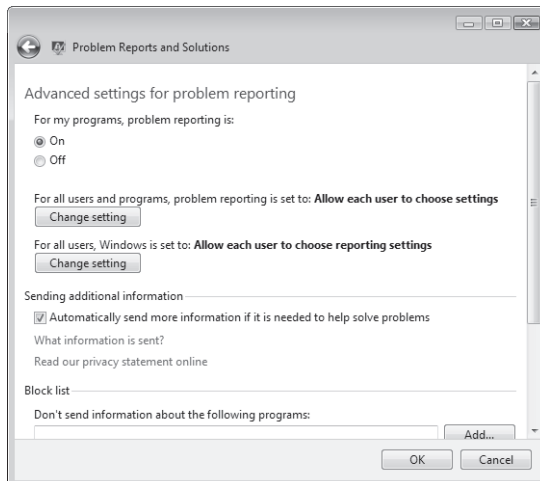
**Figure 11-17** The Problem Reports and Solutions tool

To check current settings, click **Change Settings** in the tool's left pane. Unless you have a good reason for changing it (for example, no Internet connectivity), the default setting **Check For Solutions Automatically (Recommended)** should be enabled, as shown in Figure 11-18.



**Figure 11-18** The Problem Reports and Solutions tool settings

Clicking **Advanced Settings** in the dialog box, shown in Figure 11-18, lets you specify whether all users on a computer can alter the settings for the Problem Reports and Solutions tool or if they can specify whether they want to send reports to Microsoft or not, as shown in Figure 11-19. Changing advanced settings on the tool requires elevated privileges.



**Figure 11-19** The Problem Reports and Solutions tool advanced settings

If a problem occurs, Windows Vista automatically sends information to Microsoft, except when the problem is such that sending information could reveal details about the user or the computer, in which case Windows Vista asks the user for permission to send problem details. If there are steps the user can take to prevent or solve the problem or if Microsoft needs more information to find or create a solution, the user is notified. This happens whether the user has logged on by using a standard or an administrator account, and you need to advise users you support what is happening and what the implications are.

Windows Vista uses the information in the report that is sent to Microsoft and any information Microsoft uploads about the problem to match the problem description to a solution. Windows Vista notifies the user when steps can be taken to solve the problem or to find more information. If a solution is not yet available, the information that a user sends in a problem report can help Microsoft find or create a new solution.

Sometimes the suggested solution requires elevated privileges. In this case, you need to assist the users you support to implement the solution.

If the Problem Reports and Solutions tool is not configured to report problems to Microsoft automatically, the user is prompted to check for a solution whenever a problem occurs. The tool records the details of any problems that occur in a Problem History file. Figure 11-6 showed such a file. If problems are not sent automatically to Microsoft and the user chooses not to send details when a problem occurs, then the user can click See Problems To Check in the Problem Reports and Solutions tool. The tool then uses the Problem History file to populate the Check For Solutions To These Problems dialog box, as shown in Figure 11-20. The user can select the check boxes for all or some of the problems listed and click Check For Solutions. Alternatively, you can send details of all the problems in the Problem History file by clicking Check For New Solutions in the left-hand pane of the Problem Reports and Solutions tool.

If no solution was available for a particular problem when it occurred, a user can determine whether Microsoft has developed a solution by clicking Check For Solutions in the Check For Solutions To These Problems dialog box or by clicking Check For New Solutions in the left pane of the Problem Reports and Solutions tool, as previously described.

The Problem Reports and Solutions tool also lets users clear the solution and problem history. You need to impress on users you support that they should do this only if they are confident that all current problems have been solved. Clicking Clear Solution And Problem History generates a warning, but this operation does not, by default, require elevated privileges.

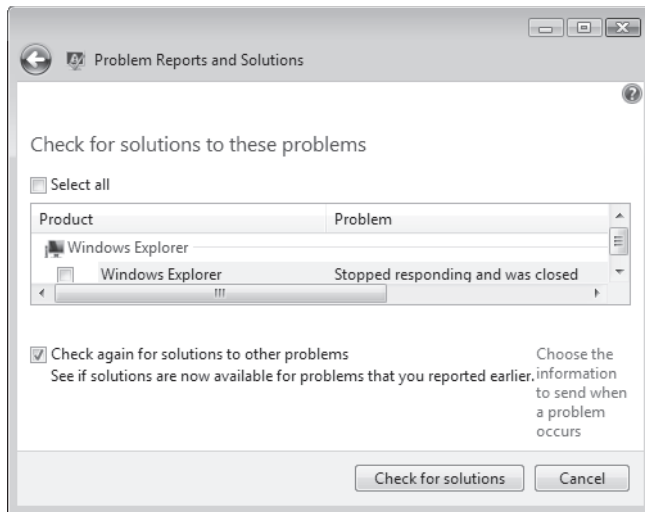


Figure 11-20 The Check For Solutions To These Problems dialog box

## Using Advanced Diagnostic and Analysis Tools

The Reliability and Performance Monitor, Task Manager, and System Information tools are available from the Advanced Tools dialog box that you access from Performance Information and Tools. You can also open the Reliability and Performance Monitor from the Administrative Tools menu or as a Microsoft Management Console (MMC) snap-in. You can open Task Manager by right-clicking the taskbar at the foot of the screen and selecting Task Manager or by pressing Ctrl+Alt+Del. Usually, you can open Task Manager even when the computer appears to have crashed completely and use it to close the application that is causing the crash.

### Reliability and Performance Monitor

You use the Reliability and Performance Monitor to analyze system performance. This tool lets you monitor application and hardware performance in real time, customize the data you want to collect in logs, define thresholds for alerts, generate reports, and view past performance data.

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#### **NOTE** Windows XP equivalents

Reliability and Performance Monitor combines the functionality of several Microsoft Windows XP stand-alone tools, including Performance Logs and Alerts (PLA), Server Performance Advisor (SPA), and System Monitor.

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Reliability and Performance Monitor provides three monitoring tools: Resource View, Performance Monitor, and Reliability Monitor. This tool performs data collection and logging by using data collector sets.

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**MORE INFO** Data collector sets

For more information about data collector sets, access <http://technet2.microsoft.com/WindowsVista/en/library/53582ab0-24a0-411c-9c7a-7b24667416991033.mspx?mfr=true>, <http://technet2.microsoft.com/WindowsVista/en/library/55ae9400-d7a9-4bf0-838a-ec981be903641033.mspx?mfr=true>, and <http://technet2.microsoft.com/WindowsVista/en/library/b37b4bd8-2e2d-4a0c-a850-09899d6cb9dd1033.mspx?mfr=true>.

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As an administrator, you can use all the features of Reliability and Performance Monitor. Standard users can view log files in Performance Monitor and change the display properties while viewing historical data. They can also use Reliability Monitor.

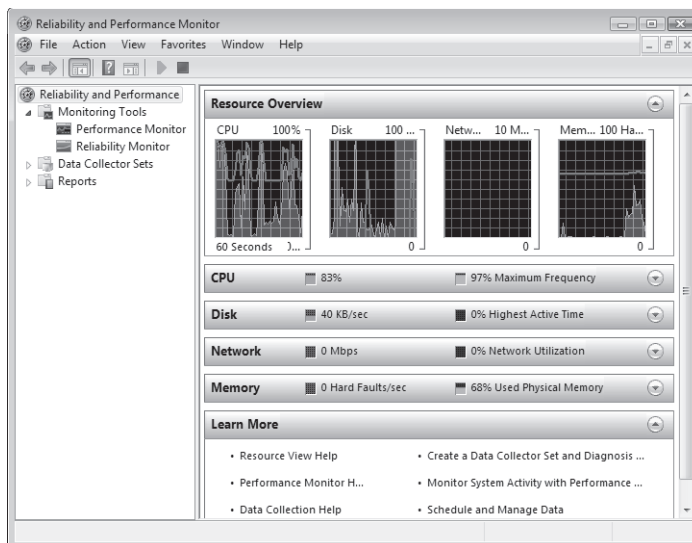
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**NOTE** Other user groups

If you want to give other users more privileges when using Reliability and Performance Monitor, you can add their accounts to the Performance Monitor Users group or to the Performance Log Users group. However, this is typically done in an Active Directory domain that has a lot of users and several levels of administration and is beyond the scope of this chapter.

---

**Resource View** The Resource Overview window is the Windows Reliability and Performance Monitor home page, as shown in Figure 11-21. This view lets you monitor the usage and performance of CPU, disk, network, and memory resources in real time. You can get information about which processes are using which resources by clicking the down-arrow beside each resource.



**Figure 11-21** Windows Reliability and Performance Monitor Resource Overview



**Performance Monitor** Performance Monitor, shown in Figure 11-22, provides a visual display of built-in Windows performance counters—for example, the Memory:Pages/sec and Processor:%Processor time counters—either in real time or as performance data collector sets that let you create baselines and review historical data. You can add performance counters to Performance Monitor by dragging and dropping or by creating custom data collector sets. Performance Monitor provides multiple views—you can view data in a report format or in real time as a line graph or histogram. You can create custom views in Performance Monitor that can be exported as data collector sets for use with performance and logging features.

**MORE INFO** Performance counters

There are a lot of performance counters, and many have multiple instances (for example, if a computer has two processors, two instances of Processor:%Processor time exist). It is impractical to list every counter or to state acceptable and unacceptable values for each—for example, a value in excess of 80 percent for a significant period returned by Processor:%Processor time indicates CPU problems, and a value greater than 20 for Memory:Pages/sec could indicate RAM problems. However, if you want more information about performance and reliability monitoring and performance counters, access <http://technet2.microsoft.com/WindowsVista/en/library/ab3b2cfc-b177-43ec-8a4d-0bfac62d88961033.mspx?mfr=true>.

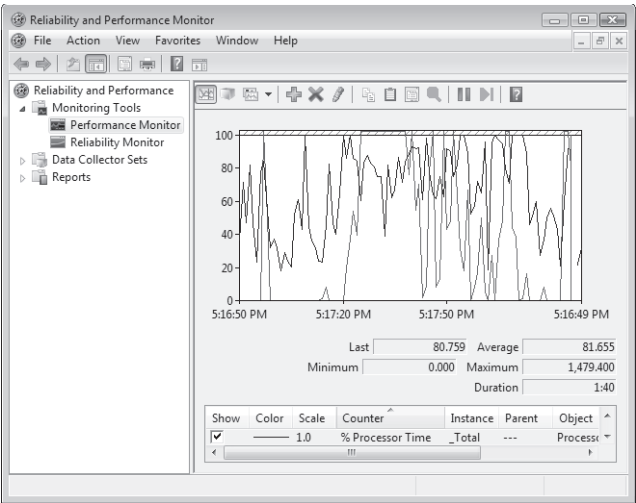
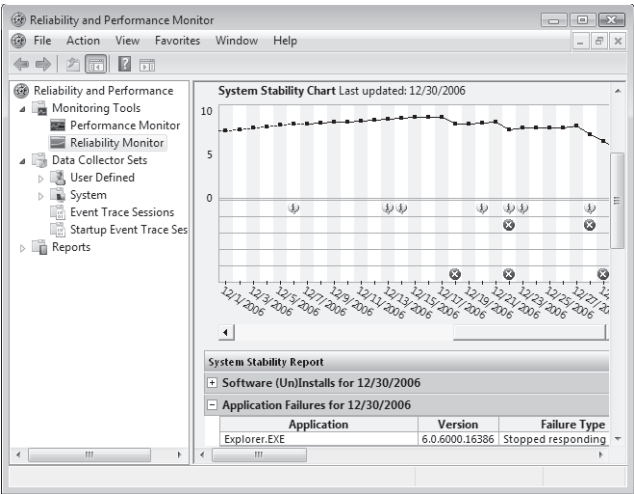


Figure 11-22 Performance Monitor

**NOTE    Benchmarking with Performance Monitor**

One of the most important functions of performance monitoring is to obtain benchmarks for system performance. You can use the Performance Monitor tool to collect data from counters that measure resource usage during a quiet period, at the peak of a day's activity, and at a period of average usage. You can then repeat the process later (particularly if the computer is experiencing performance problems) and see what has changed. If you are tuning performance or upgrading hardware, it is a good idea to capture benchmark data before and after you make the changes to determine what improvement, if any, has been made. You need to take care that you capture both sets of performance data under (as much as possible) the same load conditions.

**Reliability Monitor**    Reliability Monitor, shown in Figure 11-23, provides an overview of system stability and trend analysis. It lets you view detailed information about individual events that could affect the system's overall stability, such as software installations, OS updates, and hardware failures. It starts collecting data as soon as Windows Vista is installed.



**Figure 11-23    Reliability Monitor**

**MORE INFO    Windows Reliability and Performance Monitor**

For more information about this powerful and versatile tool, access <http://technet2.microsoft.com/WindowsVista/en/library/53582ab0-24a0-411c-9c7a-7b24667416991033.mspx?mfr=true>.

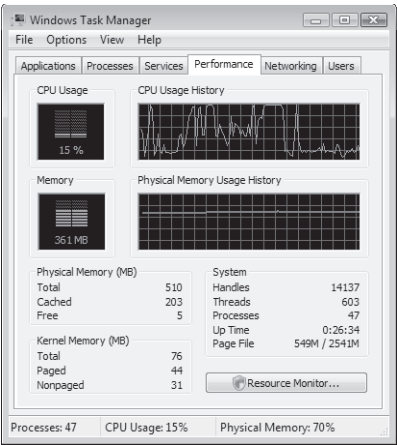
## Task Manager

If a program stops responding, Windows Vista tries to find the problem and fix it automatically. Alternatively, if the system seems to have crashed completely and Windows Vista has not resolved the problem, the user can end the program by opening Task Manager and accessing the Applications tab.

**NOTE** Encourage users to wait

Using Task Manager to end a program might be faster than waiting, but any unsaved changes will be lost. Encourage the users you support to wait a few minutes and let Windows Vista try to fix the problem first, rather than immediately pressing Ctrl+Alt+Del.

The Performance tab in Task Manager provides details about how a computer is using system resources—for example, RAM and CPU. As shown in Figure 11-24, the Performance tab has four graphs. The first two show the percentage of CPU resource that the system is using, both at the moment and for the past few minutes. A high percentage usage over a significant period indicates that programs or processes require a lot of CPU resources. This can affect computer performance. If the percentage appears frozen at or near 100 percent, a program might not be responding. If the CPU Usage History graph is split, the computer either has multiple CPUs, a single dual-core CPU, or both.



**Figure 11-24** Task Manager Performance tab

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**NOTE Processor usage**

If processor usage is consistently high—say 80 percent or higher for a significant period—you should consider installing a second processor or replacing the current processor even if the Windows Experience Index subscore does not identify the processor as a resource bottleneck. However, before you do so it is worth capturing processor usage data by using Performance Monitor rather than relying on snapshots obtained by using Task Manager.

---

The next two graphs display how much RAM is being used, both at the moment and for the past few minutes. The percentage of memory being used is listed at the bottom of the Task Manager window. If memory use appears to be consistently high or slows your computer's performance noticeably, try reducing the number of programs that are open at one time (or encourage users you support to close any applications they are not currently using). If the problem persists, you might need to install more RAM or implement ReadyBoost.

---

**NOTE Benchmarking with Task Manager**

Task Manager is not the primary tool for benchmarking. The Performance Monitor tool in Reliability and Performance Monitor can capture and display historical data, but Task Manager can display information only over the last few minutes. Nevertheless, if you are testing the effect of reconfiguring a setting or upgrading hardware, it can be useful to look at resource usage in Task Manager before and after the change.

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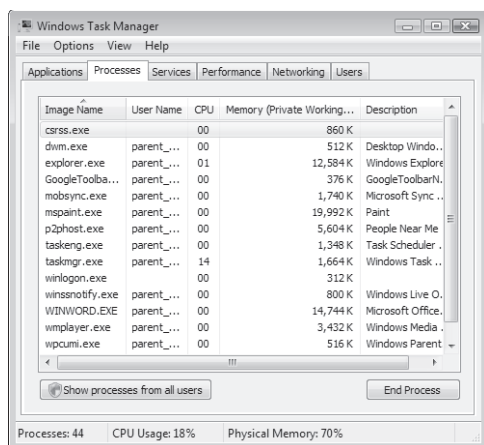
Three tables below the graphs list various details about memory and resource usage. In the Physical Memory (MB) table, Total is the amount of RAM installed on your computer, Cached refers to the amount of physical memory used recently for system resources, and Free is the amount of memory that is currently unused and available.

In the Kernel Memory (MB) table, Total is the amount of memory being used by the core part of Windows, called the kernel; Paged refers to the amount of virtual memory the kernel is using; Nonpaged is the amount of RAM memory used by the kernel.

The System table has five fields: Handles, Threads, Processes, Up Time, and Page File. A detailed description of these parameters is beyond the scope of this chapter, but if you want more information, search for “See details about your computer's performance using Task Manager” in Windows Help and Support.

If you need more information about how memory and CPU resources are being used, click the Resource Monitor button. This displays the Windows Reliability and Performance Monitor Resource View that was described earlier in this lesson. You require elevated privileges to access Resource Monitor.

You can determine how much memory an individual process uses by selecting the Task Manager Processes tab. As shown in Figure 11-25, the Memory (Private Working Set) column is selected by default. A private working set indicates the amount of memory a process is using that other processes cannot share. This information can be useful in identifying a “leaky” application—an application that, if left open, uses more and more memory resource and does not release memory resource that it is no longer using.



**Figure 11-25** Task Manager Processes tab

You can click View, click Select Columns, and then select a memory value to view other memory usage details on the Processes tab, for example:

- **Memory - Working Set** Amount of memory in the private working set plus the amount of memory the process is using that can be shared by other processes
- **Memory - Peak Working Set** Maximum amount of working set memory used by the process
- **Memory - Working Set Delta** Amount of change in working set memory used by the process
- **Memory - Commit Size** Amount of virtual memory that is reserved for use by a process
- **Memory - Paged Pool** Amount of committed virtual memory for a process that can be written to another storage medium, such as the hard disk
- **Memory - Nonpaged Pool** Amount of committed virtual memory for a process that cannot be written to another storage medium

You can use the Task Manager Processes tab to end a process, to end a process tree (stops the process and all processes on which it depends), and to set process priority.

The Task Manager Services tab shows which services are running and which are stopped. You can stop or start a service or go to a process that depends on that service. If you want more details about or more control over the services available on a computer, you can click Services to access the Services administrative tool. You require elevated privileges to use the Services tool.

The Task Manager Networking tab lets you view network usage. The Users tab tells you what users are connected to the computer and lets you disconnect a user.

## System Information

System Information shows details about hardware configuration, computer components, and software, including drivers. (You open System Information by clicking Start, All Programs, Accessories, System Tools, and then System Information.) As shown in Figure 11-26, System Information lists categories in the left pane and details about each category in the right pane. The categories include the following:

- **System Summary** Shows general information about the computer and its OS, such as the computer name and manufacturer, the type of basic input/output system (BIOS), and the amount of memory that is installed
- **Hardware Resources** Displays details about a computer's hardware
- **Components** Displays information about disk drives, sound devices, modems, and other components
- **Software Environment** Shows information about drivers and network connections and displays other program-related information

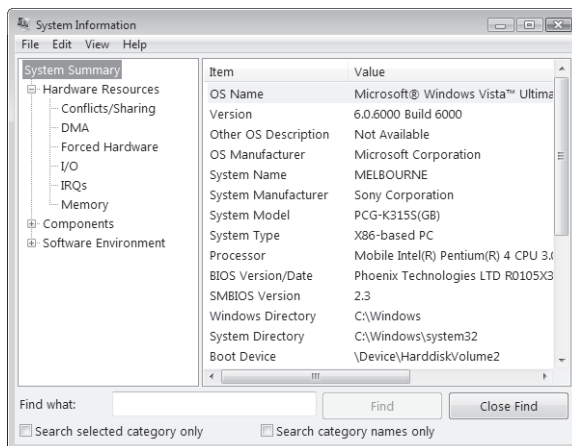


Figure 11-26 System Information

If you want to find specific details in System Information, type the information you are looking for in the Find What text box at the bottom of its window. For example, if you want to determine a computer's Internet Protocol (IP) address, type **ip address** in the Find What box, and then click Find.

### Quick Check

- You want to change the priority of a process on a computer. How do you do this?

### Quick Check Answer

- Open Task Manager. In the Processes tab, right-click the process. Click Select Priority. You can choose Realtime, High, Above Normal, Normal, Below Normal, or Low.

## Practice: Creating a Custom View and Capturing Network Diagnostic Event Logs

In this practice session, you create a custom view in Event Viewer to record Network Diagnostic and TCP/IP events. You then generate some events to populate the view. These are administrator tasks, and you should log on by using an administrator account as the practices stipulate.

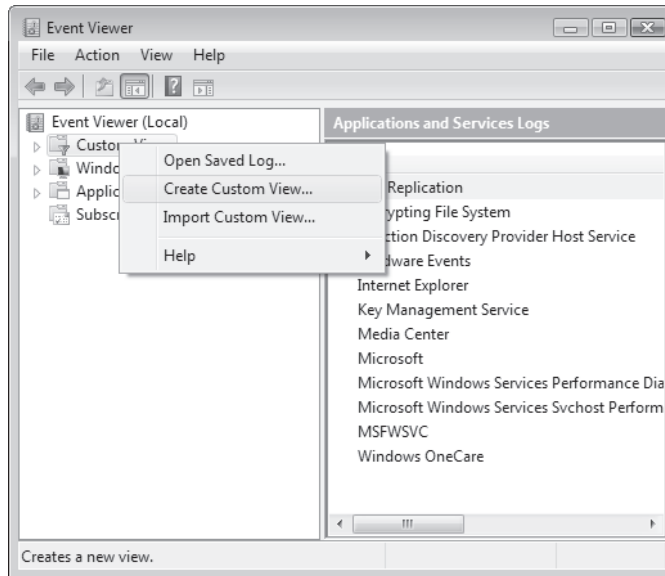
As written, you carry out Practice 2 on a wireless-enabled PC connected to a wireless network. If you do not have a wireless-enabled PC, you can still carry out the practice. However, your view will not record events that are specific to diagnosing a wireless connection.

### ► Practice 1: Creating a Custom View

In this practice, you create a custom view in Event Viewer to capture network diagnostic and TCP/IP events.

1. If necessary, log on by using the account that you created when you installed Windows Vista (Kim\_Ackers).
2. Open Control Panel, click System And Maintenance, click Advanced Tools, and click View Performance Details In Event Log.
3. As prompted, supply administrator credentials or click Continue to close the UAC dialog box.

4. In Event Viewer, right-click Custom Views, and select Create Custom View, as shown in Figure 11-27.



**Figure 11-27** Creating a custom view

5. In the Filter tab of the Create Custom View dialog box, select the Critical, Error, Warning, and Information event level check boxes.
6. Select By Source. In the Event Sources drop-down list, select the Diagnostics-Networking, TCP/IP, and Tcpip check boxes. The Custom View dialog box should look similar to Figure 11-28.

---

**NOTE** Configuring your custom view filter

In this practice, it is (arguably) sufficient to configure your filter to include only events with the Diagnostics-Networking event source or even to include only events with Event ID 6100. However, Diagnostics-Networking sourced events with Event IDs 1000, 2400, and 4000 can give useful information, as can Tcpip sourced events with Event ID 4201. By the same token, it is arguably unnecessary to include Critical events, which are unlikely to have these event sources. Although too much information is a bad thing, it is also unwise to specify your filtering criteria too narrowly because you might miss valuable information.

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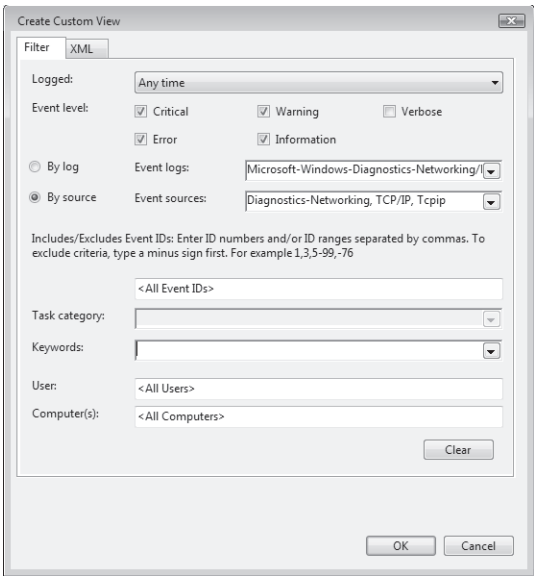


Figure 11-28 The Custom View dialog box

- 7. Click OK. In the Save Filter To Custom View dialog box, enter a name and description for the custom view, as shown in Figure 11-29.

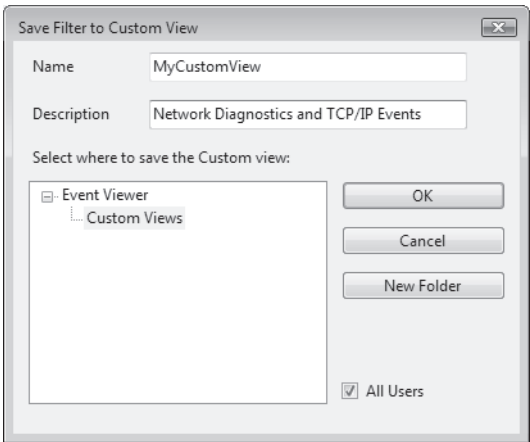
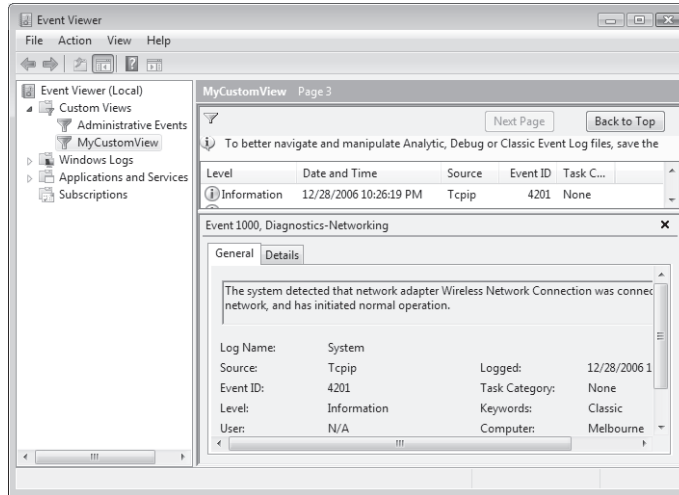


Figure 11-29 Naming the custom view

8. Click OK.
9. In Event Viewer, select the custom view you have created (unless it is already selected). As shown in Figure 11-30, the view might already show events from the last time you ran Network Diagnostics.

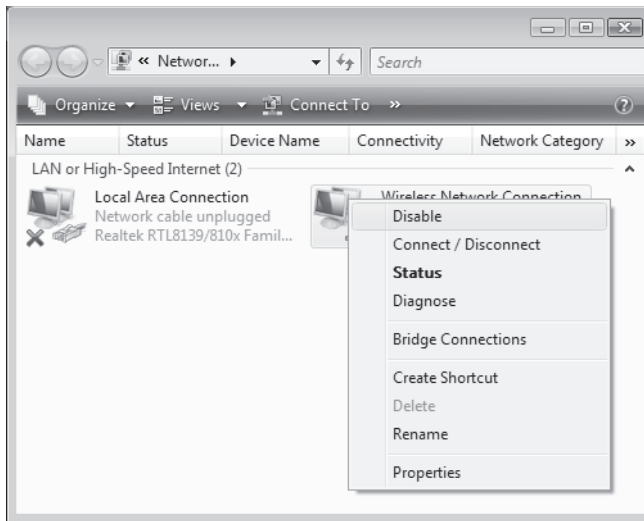


**Figure 11-30** Selecting the custom view

### ► Practice 2: Diagnosing a Network Problem and Viewing Related Events

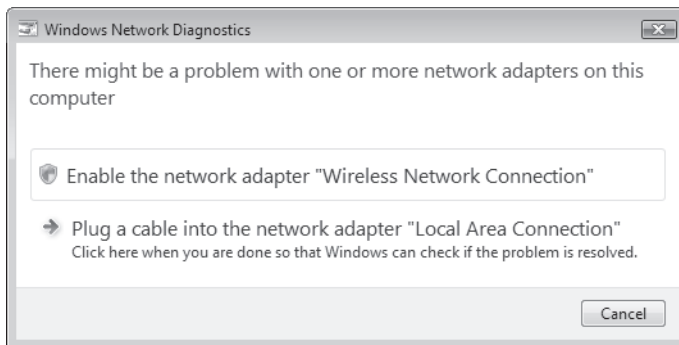
In this practice, you use Network Diagnostics to diagnose and repair a network problem and then examine the events that this process has generated in Event Viewer.

1. If necessary, log on by using the account that you created when you installed Windows Vista (Kim\_Ackers).
2. Open Control Panel, click Network And Internet, click Network And Sharing Center, and click Manage Network Connections.
3. Right-click the network connection (preferably wireless) that you use to connect to the Internet, and click Disable, as shown in Figure 11-31.



**Figure 11-31** Disabling a network connection

4. As prompted, supply administrator credentials or click Continue to close the UAC dialog box.
5. The Network And Sharing Center should show you are no longer connected to the Internet. Click Diagnose And Repair.
6. Windows Network Diagnostics diagnoses the fault, as shown in Figure 11-32. Enable the network adapter you previously disabled.



**Figure 11-32** Fault diagnosis

7. As prompted, supply administrator credentials or click Continue to close the UAC dialog box.
8. In the Network And Sharing Center, check that network connectivity has been restored.

9. If necessary, open Event Viewer as described in Practice 1, and select the custom view you created earlier.
10. Select an event that has been added to the custom view. You can identify such events by date and time. Double-click the event to read its properties, as shown in Figure 11-33. Repeat the process for other events.

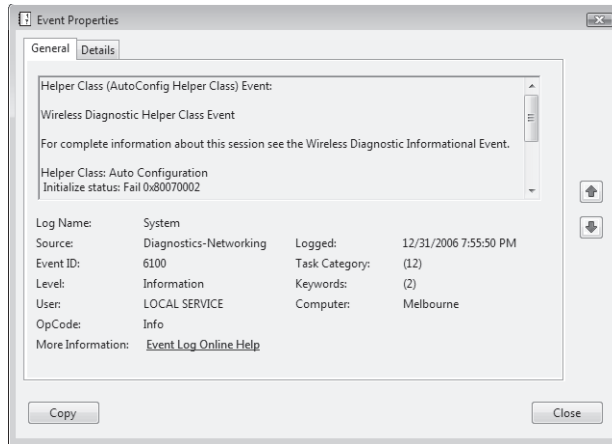


Figure 11-33 Properties of a Network Diagnostics event

## Lesson Summary

- You can use the Windows Experience Index tool to calculate a base index score whenever you change a computer's hardware configuration. The base index score indicates how well a computer will run various programs.
- The Problem Reports and Solutions tool lets you configure whether problem reports are sent automatically to Microsoft. The tool generates a problem history, lets you review problems, and lets you resubmit problems to find out whether a solution has been found since a problem was previously submitted.
- Event Viewer collects events on the computer in various event logs. Events can have critical, error, warning, or information levels. The System log contains system auditing events classed as audit success and audit failure.
- The Reliability and Performance Monitor lets you monitor counters that measure resource usage on a computer and provides both real-time and historical data. It can generate an alert if a counter goes above or below a predefined value. The Reliability Monitor gives a graphical record of system stability.
- Task Manager gives a snapshot of resource usage and lets you control services and processes. System Information gives you advanced information about system details.

Lesson Review

You can use the following questions to test your knowledge of the information in Lesson 2, “Troubleshooting Reliability Issues by Using Built-In Diagnostic Tools.” The questions are also available on the companion CD if you prefer to review them in electronic form.

NOTE Answers

Answers to these questions and explanations of why each answer choice is correct or incorrect are located in the “Answers” section at the end of the book.

- 1. You have upgraded the hardware on a computer that a mathematician in your company uses for highly complex calculations that require a large amount of processor resource. You use the Windows Experience Index tool to generate a new base score. The subscores for each component are shown in Table 11-2.

Table 11-2 Windows Experience Index Subscores

Component	Subscore
Processor	4.1
Physical Memory (RAM)	3.3
Graphics	3.6
Gaming Graphics	2.3
Primary Hard Disk	4.4

Based on these figures, what is the Windows Experience Index base score?

- A. 2.3
  - B. 3.5
  - C. 4.1
  - D. 4.4
- 2. You have an administrator account on a computer in your organization’s workgroup. You want to set a default so that every other user who has an account on the computer automatically checks for solutions when a problem occurs. You do not want to give users the option of changing this default behavior. How do you do this?
  - A. Open Problem Reports And Solutions. Click Change Settings. Select Check For Solutions Automatically.
  - B. Open Problem Reports And Solutions. Click See Problems To Check. Select the problems you want to check. Click Check For Solutions.
  - C. Open Problem Reports And Solutions. Click Change Settings. Select Advanced Settings. Under Allow Each User To Choose Settings, click Change Setting. Select For All Users Turn Windows Problem Reporting On.

- D. Open Problem Reports And Solutions. Click Change Settings. Select Advanced Settings. Under Allow Each User To Choose Reporting Settings, click Change Setting. Select Automatically Check For Solutions (Recommended).
3. Which Event Viewer Windows log records Audit Success and Audit Failure events?
- A. Application
  - B. Security
  - C. Setup
  - D. System
4. You are troubleshooting reliability problems on a computer running Windows Vista. You want to obtain data about critical driver crashes, errors caused by application failures, and warnings and information events that were generated when applications accessed the registry. You are interested only in events that occurred in the last 24 hours. How best can you obtain this information?
- A. Access the System log because only this log stores critical events.
  - B. Access the Applications log. Drivers are applications, so all the required information is in this log.
  - C. Create a new Applications and Services log.
  - D. Create a custom view.
5. You want to record information such as the number of paging operations carried out per second and the percentage of available processor time used when a computer is carrying out several resource-intensive tasks simultaneously. For the purposes of comparison, you want the same information for a time when the computer is only lightly used. In addition to recording historical data, you want to see what is happening in real time when the computer's performance appears to drop. How do you access the best tool for this purpose?
- A. In Control Panel, select System And Maintenance. Click Problem Reports And Solutions. Select View Problem History.
  - B. In Control Panel, select System And Maintenance. Click Performance Information And Tools. Click Advanced Tools. Select Open Task Manager.
  - C. In Control Panel, select System And Maintenance. Click Performance Information And Tools. Click Advanced Tools. Select View Performance Details In Event Log.
  - D. In Control Panel, select System And Maintenance. Click Performance Information And Tools. Click Advanced Tools. Select Open Reliability And Performance Monitor.

# Chapter Review

To further practice and reinforce the skills you learned in this chapter, you can perform the following tasks:

- Review the chapter summary.
- Review the list of key terms introduced in this chapter.
- Complete the case scenarios. These scenarios set up real-world situations involving the topics of this chapter and ask you to create a solution.
- Complete the suggested practices.
- Take a practice test.

## Chapter Summary

- Features such as ReadyBoost can improve hardware performance. Future developments in solid state hard disk technology could eventually make such techniques unnecessary.
- Performance Information and Tools provide options that you can use to adjust computer performance. These include Manage Startup Programs, Adjust Visual Effects, and Adjust Indexing Options.
- The Windows Experience Index base score gives a measure of a computer's hardware performance and how well it can run specified programs.
- The Problem Reports and Solutions tool lets you control problem reporting and obtain solutions from Microsoft.
- Event Viewer, Reliability and Performance Monitor, Task Manager, and System Information provide powerful tools for diagnosing problems that affect system performance, reliability, and stability.

## Key Terms

Do you know what these key terms mean? You can check your answers by looking up the terms in the glossary at the end of the book.

- bottleneck
- DirectX 10-compliant
- FireWire
- flash memory
- hybrid hard disk
- paging

- solid state hard disk
- swap file
- transfer rate
- universal serial bus (USB)
- virtual memory

## Case Scenarios

In the following case scenarios, you will apply what you have learned about maintaining and optimizing Windows Vista. You can find answers to these questions in the “Answers” section at the end of this book.

### Case Scenario 1: Troubleshooting Performance Issues

You provide frontline technical support for Trey Research, a small organization that uses a workgroup structure and does not have an Active Directory domain. Trey Research has recently upgraded its computer OSs from Windows XP to Windows Vista. Currently only a very small budget is available for hardware upgrades. You have improved hardware performance by implementing ReadyBoost on all the machines. Answer the following questions:

1. A colleague reports that she cannot back up any files to a USB flash memory device on her machine. She has accessed the device properties and cannot see any files stored on it, although all the memory space on the device is shown as being used. She asks you if there is a hardware fault. What do you tell her?
2. A supervisor reports that his computer is taking a very long time to start whenever he reboots it. You check that Windows Defender is running on his computer and that no malware has been reported. What should you advise him to do next?
3. A researcher wants to use a new analysis program that uses 3D graphics. The program has a required index rating of 1.0 and a recommended rating of 2.7. The current Windows Experience Index base score on his computer is 2.0, which is also the subscore for 3D business and gaming graphics performance. What do you advise?

### Case Scenario 2: Troubleshooting Reliability Issues

You work for a company that supplies computer equipment to small businesses. One such business reports that computers are hanging and that its network is generally unreliable. Further questions tell you that most of the problems occur on two machines that are used for high-resolution multimedia applications. The machines both have adequate hardware specifications. You visit the customer to investigate the problems as part of an extended warranty agreement. Answer the following questions:



1. You inspect the settings on the Problem Reports and Solutions tool on one of the computers that are experiencing problems and find that it is not configured to report problems automatically. You want to obtain details about problems that have occurred and select problems to report to Microsoft and find out if solutions are available. What option should you use in the Problem Reports and Solutions tool?
2. You suspect that hardware problems in the RAM in one of the computers could be causing unreliability. However, the customer does not want you to take the computer offline and remove the case to replace the RAM hardware until you are sure this is the problem. You want to record memory usage over a 24-hour period. How do you do this?
3. You suspect that critical system errors linked with device drivers could be causing one of the computers to crash. How would you obtain information about such events?
4. You want to see a graphical display of system stability since a computer was installed and find out on which days applications failures, hardware failures, Windows failures, and miscellaneous failures occurred. What tool should you use for this purpose?

## Suggested Practices

To help you successfully master the exam objectives presented in this chapter, complete the following tasks.

### Troubleshoot Performance Issues

- **Practice 1: Implement ReadyBoost** If you have access to a number of computers that are used for different purposes, implement ReadyBoost, and observe the effect on performance on each computer. Find out whether computers that perform a lot of graphics or run multimedia applications benefit from ReadyBoost or whether the improvement is more noticeable on computers that do a lot of number-crunching.
- **Practice 2: Configure Performance Options** Open Performance Information and Tools, and select Adjust Visual Effects. In the Visual Effects tab, select Custom, and determine the effect on both performance and appearance of changing individual display options. In the Advanced tab, experiment with virtual memory settings. Perform the last practice on a test computer, not on a production machine.
- **Practice 3: Adjust Indexing Options** Open Performance Information and Tools, and select Adjust Indexing Options. Click Advanced, and experiment with the options available.

## Become Familiar with the Built-in Tools for Troubleshooting Reliability Issues

- **Practice 1: Use Event Viewer** Event Viewer is a powerful tool that can provide you with a great deal of information about what is happening on a computer. Look at the contents of the Windows logs. Become familiar with some of the more common events and what they indicate. If you know the Event IDs of events that are of interest, you will find this helps you create custom views quickly and easily. Experiment with custom views.
- **Practice 2: Use Task Manager** Although Task Manager mainly provides snapshots of performance and closes crashed applications, this tool has other features, particularly linked to processes and services, which you will find very useful when you become familiar with them.
- **Practice 3: Use Performance Monitor** The Performance Monitor tool in Reliability and Performance Monitor is both complex and powerful. A very large chapter, if not an entire book, would be required to describe this tool in depth. However, you will learn more by using it than by reading about it. Learn how to generate performance data collector sets in addition to looking at performance in real time. Find out about reports. Learn how to use alerts. In the Add Counters dialog box, select Show Description, and find out what the various counters measure.

## Take a Practice Test

The practice tests on this book's companion CD offer many options. For example, you can test yourself on just one exam objective, or you can test yourself on all the 70-620 certification exam content. You can set up the test so that it closely simulates the experience of taking a certification exam, or you can set it up in study mode so that you can look at the correct answers and explanations after you answer each question.

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### **MORE INFO** Practice tests

For details about all the practice test options available, see the "How to Use the Practice Tests" section in this book's Introduction.

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