



## System performance in common professional find/use/share scenarios in Microsoft Windows Vista

### Executive summary

Intel Corporation (Intel) commissioned Principled Technologies (PT) to compare the performance on Microsoft Windows Vista of an Intel vPro technology based PC with that of three other platforms on common business professional find/use/share scenarios. We tested four scenarios that involve data security, finding and using information, and real-time communication and collaboration with Microsoft Office 2007 and other common office applications. We compared the performance of the following four platforms on these scenarios:

- Intel Core 2 Duo processor E6700 on an Intel vPro 965 (DQ965GF) motherboard
- Intel Pentium D processor 930 on an Intel D945GTP motherboard
- Intel Pentium 4 processor 630 on an Intel D945GTP motherboard
- Intel Pentium 4 processor 2.8GHz on an Intel D865GBF motherboard

### KEY FINDINGS

- The Intel® vPro™ technology based PC with the Intel® Core™ 2 Duo processor E6700 yielded significant performance advantages for users on our business professional find/use/share tests.
- The Intel vPro technology-based PC with the Intel Core 2 Duo processor E6700 finished our four scenarios on average 1.50 times faster than the Intel® Pentium® D processor 930-based PC.
- The Intel vPro technology based PC with the Intel Core™ 2 Duo processor E6700 also finished our tasks on average 2.38 times faster than the Intel® Pentium® 4 processor 2.8GHz based PC with the Intel D865GBF motherboard.
- These performance improvements translate into multi-second time savings that would be significant to users.

Figure 1 shows the normalized results for the foreground tasks, the ones on which users typically wait for the system to respond, on all four test scenarios on all the test systems. As it shows, the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 significantly outperformed the other PCs in all the test scenarios. The Intel vPro technology based PC with the Intel Core 2

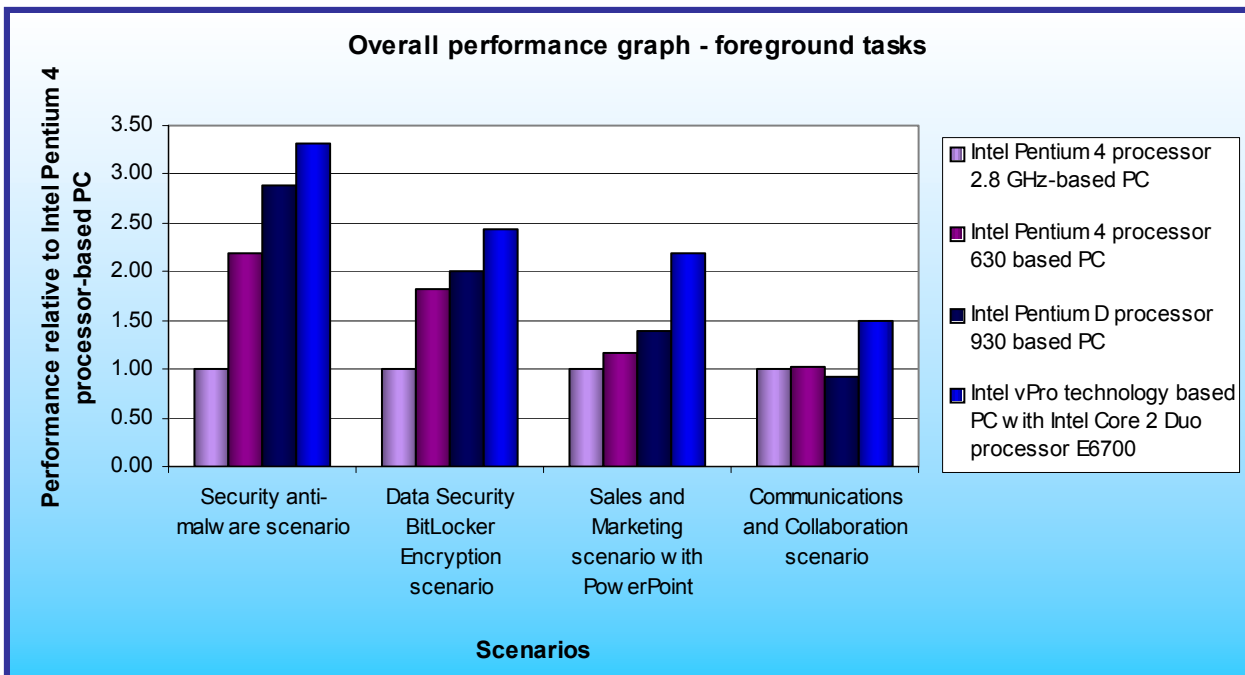


Figure 1: Normalized results for the foreground tasks on all test systems on all four scenarios. Larger numbers indicate better performance.

Duo processor E6700 was from 1.15 times to 2.89 times faster on our foreground and background tasks than the Intel Pentium D processor 930 based PC and averaged 1.50 times faster across all the tasks. (In all comparisons in which we cite the average of task times, we use the geometric mean of the normalized times for each task.)

The Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 was from 1.49 to 3.32 times faster on our tests and averaged 2.38 times faster than the PC with the Intel Pentium 4 processor 2.8GHz on the Intel D865GBF motherboard.

These performance improvements translated into multi-second time savings that users would notice and appreciate. For example, the longest background task took 65.92 seconds on the Intel Pentium D processor 930 - based PC but only 22.79 seconds--over 43 seconds faster--on the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700.

So that we could make the four test systems as similar as reasonably possible while varying the processors and motherboards, we built the systems rather than purchasing them from vendors. Intel specified the general system types and supplied the processors and motherboards. We purchased common such components as RAM, hard disks, and optical drives. Each test system had the following basic components (see Appendix A for detailed configuration information):

- 1GB of the fastest RAM its motherboard supported
- 80GB hard disk with an 8MB buffer (SATA)
- DVD-RW optical drive
- Microsoft Windows Vista Ultimate

We used the following common office and collaborative applications, which we list in alphabetical order:

- Microsoft Office Groove 2007 (available only in Microsoft Office Enterprise 2007 Edition)
- Microsoft Office Outlook 2007
- Microsoft Office PowerPoint 2007
- Microsoft Office Word 2007

We also used the following common security applications, which we list in alphabetical order:

- Windows Defender
- Windows Vista BitLocker Drive Encryption (available only in Windows Vista Ultimate or Windows Vista Enterprise Editions)

The application scenarios we tested included such common functions as:

- Opening files
- Editing files
- Receiving email
- Syncing workgroup content
- Copying encrypted folders
- Scanning for malware

In the following sections we look more closely at our test application scenarios (Application scenarios), examine the results of our tests (Test results and analysis), and give detailed information about how we actually performed the tests (Test methodology). In the appendices, we present the configurations of the test systems and explain how to manually execute the application functions in our scenarios.

## Application scenarios

We chose scenarios that involve common office applications and finding, using, and sharing business information. Three of the scenarios involve Microsoft Office 2007 applications, while the fourth takes advantage of the new BitLocker security feature available only in the Windows Vista Ultimate and Windows Vista Enterprise Editions. Some scenarios involve a single task, while others involve multiple tasks running at the same time. In the multitasking scenarios, we time both the foreground task (FG), which is typically a function that users initiate and wait for the system to complete, and the background task (BG), which is usually a function users start and then leave to run while they do other work.

### Security anti-malware scenario: Creating a PDF with Microsoft Word while a Windows Defender scan runs

Jenny Carlson, a quality assurance analyst in the science and math testing department at Acme Academics, had shut down her computer while she was off-site at one of the regional grading centers. When she turns her system on, it starts a Windows Defender scan that was scheduled by the IT department. She lets it run in the background while she catches up on her work. One of Jenny's supervisors has assigned her the task of developing a style guide for the manuals their department provides for their educational and testing software. Jenny is evaluating a sample manual she likes, the Microsoft Office 2003 installation guide. She plans to post her style guide on the company's intranet site once she finishes the document. The other documents accessible from that page are PDFs, so she must also post in PDF format. Jenny is concerned about the size of the PDF files she will end up posting, because her supervisor has strict rules about all files being reasonable sizes. Jenny opens the sample document in Word and converts it to a PDF from within Word to get an idea of how big her style guide is likely to be.

We timed:

- the PDF creation (FG) from when Jenny clicks the Publish button in the Publish as PDF or XPS dialog box until Adobe Reader 7.08 completes loading the newly created PDF file
- the malware scan (BG), Windows Defender reports the scan time

### Data security Windows Vista BitLocker encryption scenario: Copying a folder on an encrypted volume

Luke Morningstar works as a research and development scientist at Glantec Pharmaceuticals. Nearly all of his work is highly confidential and must be encrypted, so the IT department has employed Windows Vista's BitLocker technology to encrypt his entire hard disk partition. Thus, all of Luke's work now occurs on an encrypted drive. He is preparing to go through the test results files from one of Glantec's latest clinical studies. Luke opens the folder where he keeps a golden, unchanging version of those files and makes a working copy of them on his desktop.

We timed:

- the folder copy from when Luke right-clicks the BitLockerWorkload test folder and chooses Copy Here until the dialog box with the progress bar disappears

### Sales and marketing scenario with PowerPoint: Opening and editing a Microsoft PowerPoint 2007 presentation

Sameer Gupta, the head of sales and marketing for educational testing at Acme Academics, has the task of proposing to management the minimum PC configurations that the company will recommend to educational institutions and testing centers. As preparation for his proposal, Sameer is studying a PowerPoint presentation of test results comparing different types of PCs. He opens the PowerPoint deck and decides to change the background of all of its slides to one he believes management will prefer.

We timed the following two tasks and then combined those times to produce the result we report:

- the file open from when Sameer opens the PowerPoint presentation by double-clicking the file on the desktop until PowerPoint has completely rendered all the slides

- the file edit from when Sameer changes the slide theme to until the last slide switches to the Apex theme

### Communications and collaboration scenario: Opening a compressed Outlook message attachment, an XML file, in Microsoft Word 2007 while a Microsoft Groove 2007 workspace synchronization runs

Sheila Craig, an IT manager, is working on an internal audit of the systems at the Acme Academics grading center. She has Microsoft Outlook running on her PC so she can receive an email she is expecting from her co-worker, Jenny. Sheila checks her email and sees that Jenny has sent her the file she needs to study. The file is an XML document that shows the advantages of some of the system upgrades Jenny is recommending for the grading center. At the same time, someone has added a large group of files to the IT department's Microsoft Groove workspace. While Sheila is opening the attached zip file, Groove begins to automatically synchronize her machine with the workspace. While the Groove synchronization runs in the background, Sheila opens Jenny's XML document in Word to study its contents.

We timed:

- the XML file open (FG) from when Sheila presses Enter to open the attached XML file until the file open completes
- the Microsoft Groove sync (BG) from when Microsoft Office Groove 2007 launches until the content sync countdown disappears

For more details on how we executed and measured these scenarios, our specific test functions, and the files the scenarios use, see Appendix B.

### Test results and analysis

In this section we examine the results of each of our tests. Figure 2 shows the times, in seconds, that each test system needed to complete each scenario. The times we show for each platform for each scenario are from the median run of the five test runs of that scenario on that platform. (We defined the median run as the one with the median sum of the times of its timed tasks.)

Tests	Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF
<b>Security anti-malware</b>				
Creating a PDF with Microsoft Office Word 2007 (FG)	18.28	8.30	6.34	5.50
Windows Defender scan (BG)	39.00	25.00	21.00	18.00
<b>Data security Windows Vista BitLocker encryption</b>				
Copying a folder on an encrypted volume	64.00	35.01	31.79	26.34
<b>Sales and marketing with PowerPoint</b>				
Opening and editing a MS PowerPoint presentation	12.44	10.72	8.91	5.70
<b>Communications and collaboration</b>				
Opening a compressed Outlook XML file attachment (FG)	20.15	19.49	22.01	13.56
Microsoft Groove 2007 sync (BG)	74.06	65.59	65.92	22.79

Figure 2: Median test times, in seconds, for all test systems on all four scenarios. Lower numbers are better.

In the following sub-sections we explore these results in more detail. To make comparisons easier, we always show results normalized to those of the slowest system in the group, the Intel Pentium 4 processor 2.8GHz-based PC with the Intel D865GBF motherboard. To compute those normalized results, we divided each system's time by

the time it took the slowest system. The result for the Intel Pentium 4 processor 2.8GHz-based PC with the Intel D865GBF motherboard is thus always 1.00, because it's the comparison basis. Results higher than 1.00 indicate how much faster a system is than that system. Because of the normalization, higher result numbers are better. For example, a result of 1.80 would mean the system in question was 80 percent faster than the Intel Pentium 4 processor 2.8GHz-based PC.

## Security anti-malware scenario: Creating a PDF with Microsoft Word 2007 while a Windows Defender scan runs

As Figures 3 and 4 show, the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 was 1.15 times faster than the Intel Pentium D processor 930-based PC on the foreground task and 1.17 times faster on the background task. Additionally, the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 was 3.32 times faster than the PC with the Intel Pentium 4 processor 2.8GHz and the Intel D865GBF

motherboard on the foreground task and 2.17 times faster on the background task.

As Figure 4 illustrates, these differences can represent significant improvements in the time it takes to perform each task. For example, compared to the PC with the Intel Pentium 4 processor 2.8 GHz on the Intel D865GBF motherboard, the Intel vPro technology based

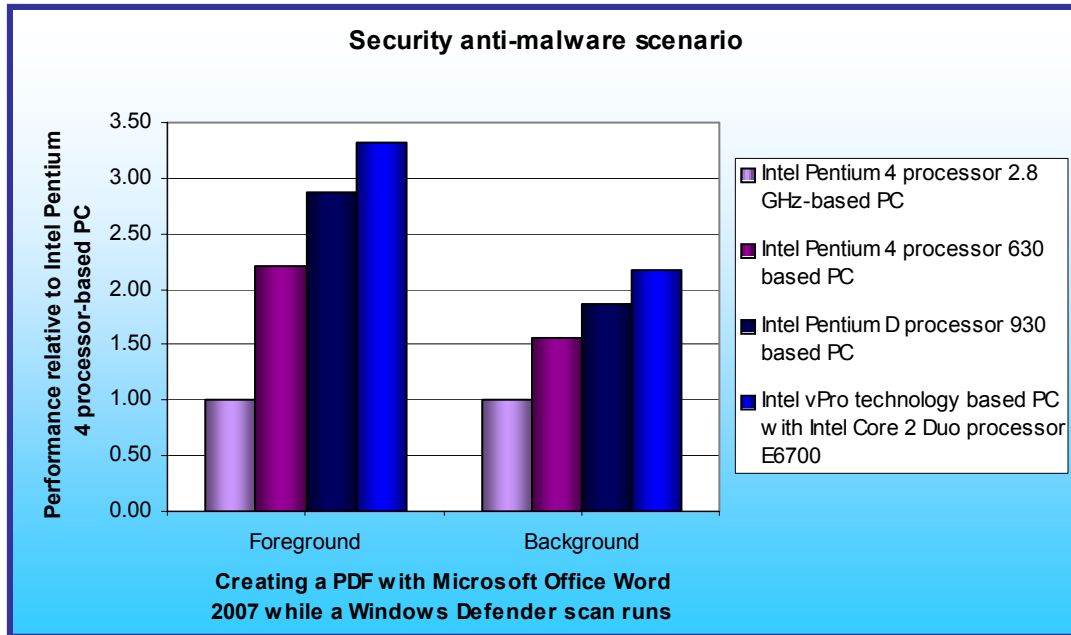


Figure 3: Normalized results for the Data backup and security scenario for all test systems. Larger numbers indicate better performance.

PC with the Intel Core 2 Duo processor E6700 decreased the elapsed time from 18.28 to 5.50 seconds on the foreground task and from 39.00 to 18.00 seconds on the background task.

PERFORMANCE RESULTS (seconds)				TASKS	COMPARATIVE RATING			
Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF		Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF
18.28	8.30	6.34	5.50	Foreground: Creating a PDF with Word	1.00	2.20	2.88	3.32
39.00	25.00	21.00	18.00	Background: Windows Defender scan	1.00	1.56	1.86	2.17

Figure 4: Results for the Security anti-malware scenario for all test systems. Lower performance results are better. Higher comparative ratings are better.

## Data security BitLocker encryption scenario: Copying a folder on an encrypted volume

Figures 5 and 6 demonstrate that the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 was 1.21 times faster on this test than the Intel Pentium D processor 930-based PC and 2.43 times faster than

the PC with the Intel Pentium 4 processor 2.8GHz on the Intel D865GBF motherboard.

As Figure 6 shows, these differences can represent significant improvements in the time it takes to perform each task. Compared to the PC with the Intel Pentium 4 processor 2.8 GHz on the Intel D865GBF motherboard, the Intel vPro technology based

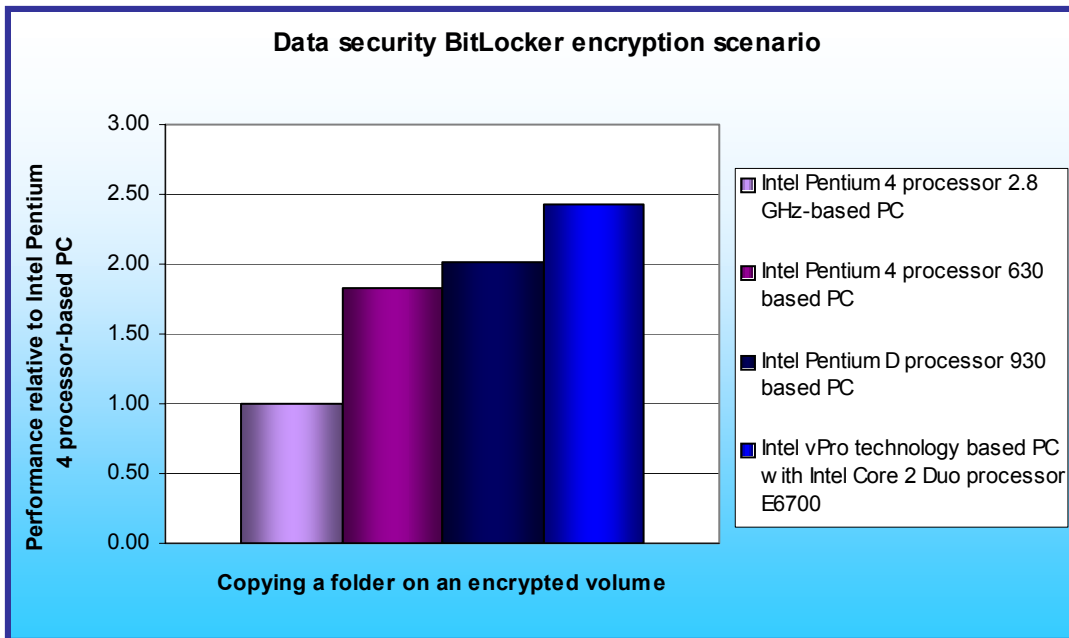


Figure 5: Normalized results for the Data security BitLocker encryption scenario for all test systems. Larger numbers indicate better performance.

PC with the Intel Core 2 Duo processor E6700 decreased the elapsed time from 64.00 to 26.34 seconds.

PERFORMANCE RESULTS (seconds)				TASK	COMPARATIVE RATING			
Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF		Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF
64.00	35.01	31.79	26.34	Copying a folder on an encrypted volume	1.00	1.83	2.01	2.43

Figure 6: Results for the Data security BitLocker encryption scenario for all test systems. Lower Performance Results are better. A higher Comparative Rating is better.

The Intel vPro technology-based PC with the Intel Core 2 Duo processor E6700 used the built-in TPM 1.2 chip for BitLocker key storage. The three other systems stored the BitLocker key on a USB flash drive during BitLocker configuration; we removed the flash drive once Windows Vista recognized the BitLocker key and a USB flash drive removal prompt appeared. (Though the two systems with the Intel D945GTP motherboard support TPM, Windows Vista would not work with TPM on them.)

## Sales and Marketing scenario with PowerPoint: Opening and editing a Microsoft PowerPoint 2007 presentation

Figures 7 and 8 illustrate the results of this test, which involves a common and simple set of operations with Microsoft PowerPoint 2007. The Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 was 1.56 times faster than the Intel Pentium D processor 930-based PC and 2.18 times faster than the PC with the Intel Pentium 4 processor 2.8GHz on the Intel D865GBF motherboard.

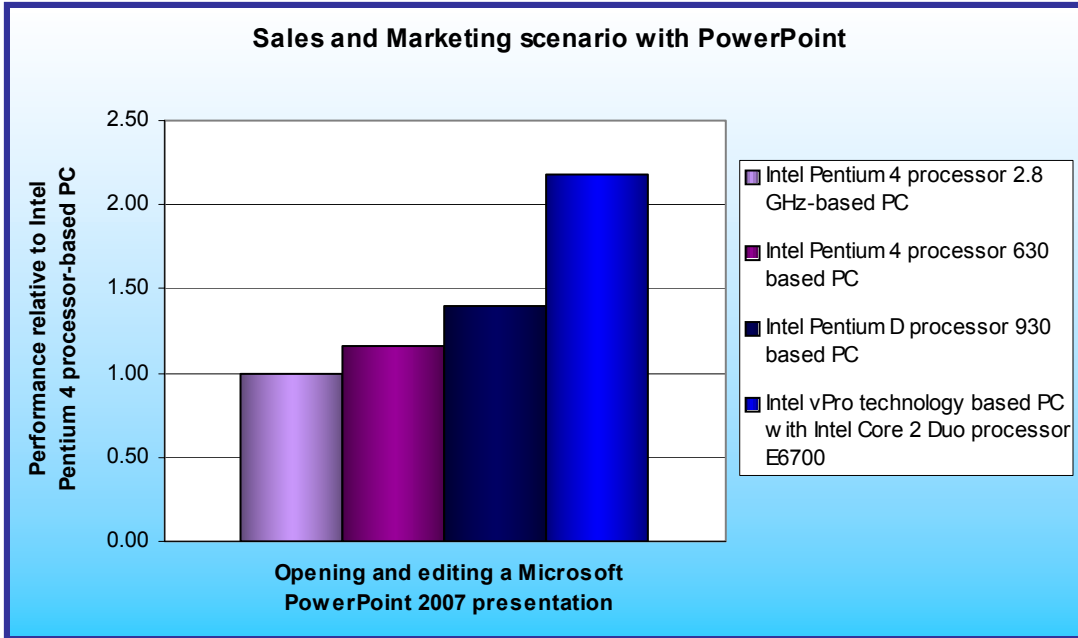


Figure 7: Normalized results for the Sales and marketing scenario with PowerPoint for all test systems. Larger numbers indicate better performance.

PERFORMANCE RESULTS (seconds)				TASKS	COMPARATIVE RATING			
Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF		Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF
12.44	10.72	8.91	5.70	Opening and editing a PowerPoint presentation	1.00	1.16	1.40	2.18

Figure 8: Results for the Sales and Marketing scenario with PowerPoint for all test systems. Lower performance results are better. Higher comparative ratings are better.



## Communications and collaboration scenario: Opening a compressed Outlook message attachment, an XML file, in Microsoft Word 2007 while a Microsoft Groove workspace synchronization runs

As Figures 9 and 10 show, the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 was 1.62 times faster than the Intel Pentium D processor 930-based PC on the foreground task and 2.89 times faster on the background task. Additionally the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 was 1.49 times faster than the PC with the Intel Pentium 4 processor 2.8GHz and the Intel D865GBF motherboard on the foreground task and 3.25 times faster on the background task.

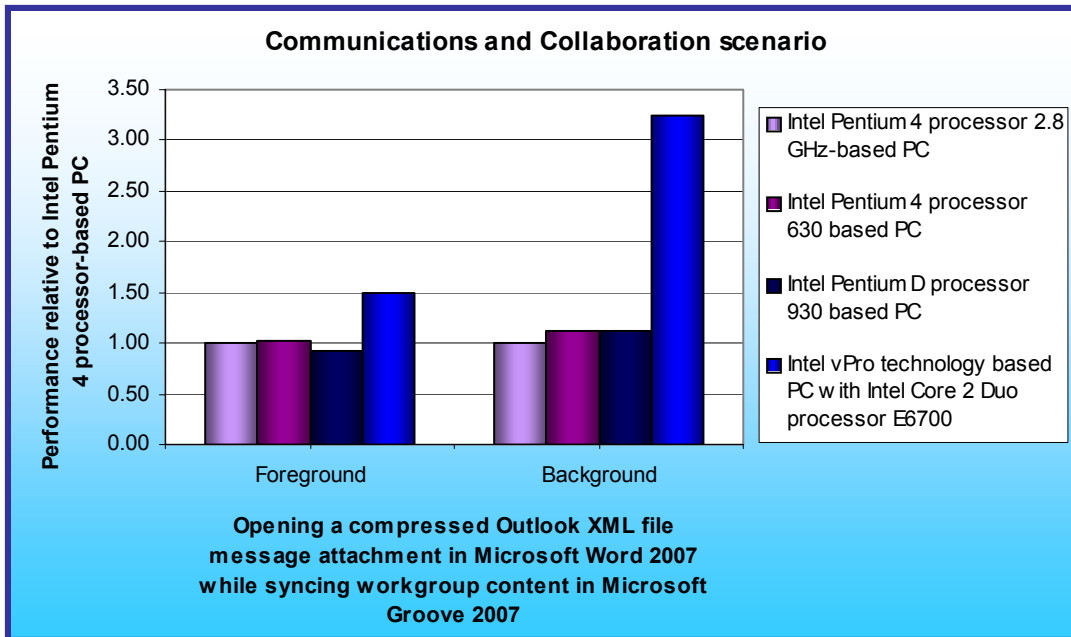


Figure 9: Normalized results for the Communications and collaboration scenario for all test systems. Larger numbers indicate better performance.

As Figure 10 shows, these differences represent significant improvements in the time it takes to perform each task. Compared to the Intel Pentium D processor 930-based PC, the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 decreased the elapsed time from 22.01 to 13.56 seconds on the foreground task and from 65.92 to 22.79 seconds on

the background task. Compared to the PC with the Intel Pentium 4 processor 2.8GHz on the Intel D865GBF motherboard, the Intel vPro technology based PC with the Intel Core 2 Duo processor E6700 decreased the elapsed time from 20.15 to 13.56 seconds on the foreground task and from 74.06 to 22.79 seconds on the background task.

PERFORMANCE RESULTS (seconds)				TASKS	COMPARATIVE RATING			
Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF		Intel Pentium 4 processor 2.8 GHz on Intel D865GBF	Intel Pentium 4 processor 630 on Intel D945GTP	Intel Pentium D processor 930 on Intel D945GTP	Intel vPro with Core 2 Duo processor E6700 on Intel DQ965GF
20.15	19.49	22.01	13.56	Foreground: Opening a compressed Outlook XML file attachment	1.00	1.03	0.92	1.49
74.06	65.59	65.92	22.79	Background: Microsoft Groove 2007 sync	1.00	1.13	1.12	3.25

Figure 10: Results for the Communications and collaboration scenario for all test systems. Lower performance results are better. Higher comparative ratings are better.

## Test methodology

### Setting up the test systems

To get the most accurate and repeatable results possible, start with a clean hard disk and set up all the test systems using the following procedures.

#### Installing Microsoft Windows Vista Ultimate

Use the following process to install a clean version of Windows Vista Ultimate on each system under test:

1. Install Windows Vista Ultimate Build 6000.
  - a. Boot to a Windows Vista Ultimate Build 6000 DVD.
  - b. When prompted, press any key to boot from CD or DVD.
  - c. At the language and preference screen, accept the default options, and click Next.
  - d. Click Install now.
  - e. Do not enter a Product key. Uncheck Automatically activate Windows when I'm online, and click Next.
  - f. At the Do you want to enter your product key now screen, click No.
  - g. Select Windows Vista Ultimate, and check I have selected the edition of Windows that I purchased.
  - h. Click Next.
  - i. Check I accept the license terms.
  - j. Click Next.
  - k. At the Which type of installation do you want screen, select Custom (advanced).
  - l. Click Drive options (advanced).
  - m. Select the destination Disk for the operating system.
  - n. Click Format.
  - o. Click OK at the all data stored will be permanently deleted dialog.
  - p. Once the system finishes formatting the disk, click Next.
  - q. Fill in the Username and Password fields, and click Next.
  - r. Fill in the computer name field, and click Next.
  - s. When presented with the option to enable Automatic Updates, click Ask me later.
  - t. Select the correct time zone, date, and time, and click Next.
  - u. At the Select your computer's current location screen, click Public location.
  - v. Click Start at the Thank you screen.
  - w. When the Windows Vista Ultimate installation completes, close the Welcome Center Dialog.
  - x. At the Set network location screen, click Public location.
  - y. Click Close.
2. Set the test resolution.
  - a. Right-click on the desktop.
  - b. Select Personalize.
  - c. Click Display Settings.
  - d. If the monitor resolution is not already 1280 by 1024, adjust it to that setting.
  - e. Click OK.
3. Verify that Windows Automatic Updates are off.
  - a. Click Start.
  - b. Select Control Panel.
  - c. Click Security.
  - d. Under Security Center, select Turn automatic updating off.
  - e. Select the Never check for updates radio button.
  - f. Click OK.
4. Turn off System Restore. Doing so prevents such events from occurring during testing and affecting results.
  - a. Click Start.
  - b. Right-click Computer.
  - c. Select Properties.
  - d. Select System protection on the left.
  - e. Click Continue.

- f. Uncheck each box under Automatic restore points.
  - g. Select Turn System Restore Off at the System Protection pop-up window.
  - h. Click OK.
5. Add the system to the test domain.
- a. Click Start.
  - b. Right-click Computer
  - c. Select Properties.
  - d. Select Change settings.
  - e. Click Continue.
  - f. Click Change.
  - g. Select the Domain radio button.
  - h. Type the test domain name.
  - i. Click OK.
  - j. Type the administrator credentials in the User name and Password fields.
  - k. Click OK.
  - l. Click OK at the Computer Name/Domain Changes dialog box.
  - m. Click OK again.
  - n. Close the System Properties window.
  - o. Close all other open windows before clicking Restart Now.
  - p. Log in.
  - q. Uncheck the Run at startup box on the Welcome Center before closing it.
6. Add the user to the Administrators group.
- a. Click Start.
  - b. Right-click Computer.
  - c. Select Manage.
  - d. Click Continue.
  - e. Select Local Users and Groups on the left.
  - f. Double-click Groups in the center.
  - g. Select Administrators.
  - h. Click Add..., and type the domain test user account.
  - i. Click OK.
  - j. Type the administrator credentials in the User name and Password fields.
  - k. Click Apply.
  - l. Click OK.
  - m. Close all windows.
  - n. Click Start.
  - o. Click the arrow→.
  - p. Select Log Off.
  - q. Press Ctrl + Alt + Delete at the prompt.
  - r. Click Switch User, and select Other User.
  - s. Type the test user's credential in the User name and Password fields.
  - t. Press Enter.
7. Turn all Power Management settings to Performance.
- a. Click Start.
  - b. Select Control Panel.
  - c. Select Appearance and Personalization.
  - d. Under Personalization, click Change screen saver.
  - e. Select (None) from the Screen saver drop-down menu.
  - f. Click the Change power settings link.
  - g. Click the High performance radio button.
  - h. Select Never for the Turn off the display and Put the computer to sleep drop-down menus.
  - i. Click Change advanced power settings.
  - j. Click Hard disk→Turn off hard disk after→Setting (Minutes), then type Never.
  - k. Scroll down, and click Sleep→Sleep after→Setting (Minutes), and type Never.
  - l. Click Sleep→Allow Hybrid Sleep→Setting.

- m. Select Off.
- n. Scroll down, and click Display→Turn off display after→Setting, then type Never.
- o. Click OK.
- p. Click Save changes.
- q. Close the Power Options window.
- r. Click OK on the Screen Saver Settings.

### **Installing Adobe Acrobat Reader 7.0.8**

Use the following process to install a clean version of Adobe Acrobat Reader 7.0.8:

1. Download Adobe Acrobat Reader 7.0.8 from: <http://www.adobe.com/products/acrobat/readstep2.html>.
2. Install Adobe Acrobat Reader 7.0.8 with default settings.
  - a. Double-click the Adobe Acrobat Reader executable.
  - b. Click Run at the Security Warning screen.
  - c. Click Continue.
  - d. Click Next at the Setup screen.
  - e. Click Next at the Welcome screen.
  - f. Accept the default installation path, and click Next.
  - g. Click Install.
  - h. Click Finish.

### **Installing Adobe Flash Player 9.0**

Use the following process to install a clean version of Adobe Flash Player 9:

1. Install Adobe Flash Player 9 from [http://www.adobe.com/shockwave/download/download.cgi?P1\\_Prod\\_Version=ShockwaveFlash&promoid=BLOW](http://www.adobe.com/shockwave/download/download.cgi?P1_Prod_Version=ShockwaveFlash&promoid=BLOW).
  - a. Uncheck the box next to YAHOO! toolbar, and click Install Now.
  - b. Click Continue at the User Account Control dialog.
  - c. Click Install at the Security Warning dialog.
  - d. Flash Player is successfully installed when the flash installation completion movie plays.

## Setting up the test network

To mimic the environment in which business PCs run, we set up a test network with servers handling Microsoft Exchange, Microsoft Active Directory, Microsoft Office Groove Manager, and Microsoft Groove Relay. Figure 12 shows a basic diagram of this test network.

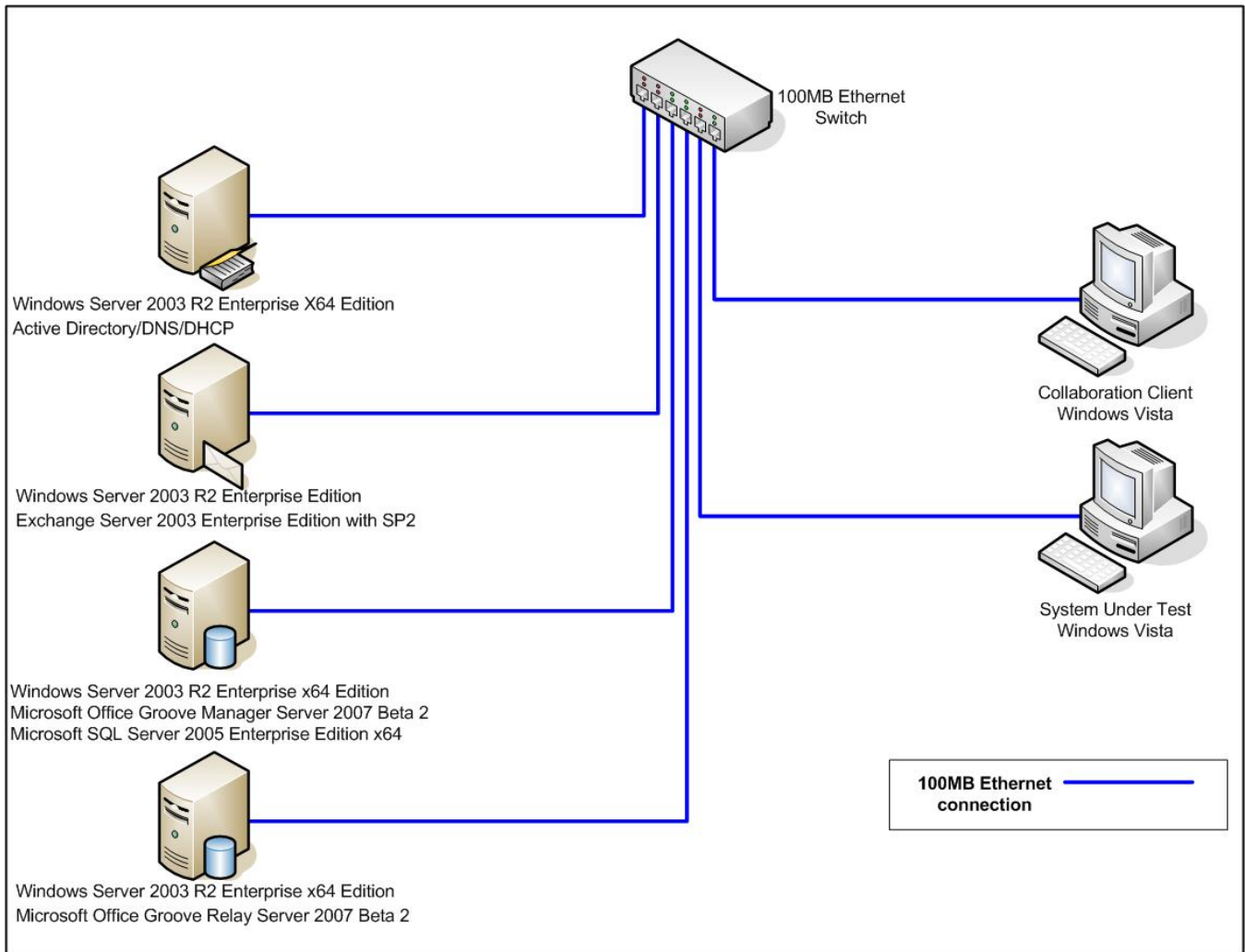


Figure 11: Diagram of the test network.

Appendix A provides configuration details for both the systems we tested and the other systems in this test network.

The follow subsections outline how to set up the servers in this network.

## Setting up the Active Directory/DNS/DHCP server

1. Install Windows Server 2003 R2, Enterprise x64 Edition on the server.
  - a. Insert and boot from the HP SmartStart 7.60 CD.
  - b. Select English (the default), and click Continue.
  - c. At the SmartStart Home screen, click Deploy Server.
  - d. At the Server Deployment – Hardware Configuration screen, click Continue.
  - e. At the Server Deployment – Operating System Selection screen, expand Microsoft Windows 2003 and select Microsoft Windows Server 2003 R2, Enterprise x64 Edition. Click Continue.
  - f. At the Server Deployment – Operating System Media Source screen, select CD-ROM as the source type and Flat files as the source format. Click Continue.
  - g. At the Server Deployment – Disk Partitioning Options screen, click Continue.
  - h. At the Server Deployment – Operating System Configuration Information screen, enter the User Name, Organization Name, and Product Key.
  - i. Set License Type to Per Seat (the default), and click Continue.
  - j. At the Server Deployment – SNMP Configuration screen, click Continue.
  - k. At the Server Deployment – Ready to Install screen, click Continue. Setup will begin.
  - l. The setup program will prompt you at the Server Deployment screen to Please insert the operating system media and click Continue. Insert the Microsoft Windows Server 2003 R2 Enterprise Edition CD Disc 1 into the CD-ROM drive, and click Continue. Setup will verify the media and begin copying data files. Once setup finishes copying the files it needs your system will automatically reboot.
2. Set the Administrator account password to Password1, the server name to SERVER1-AD, and the Workgroup to ACME.
3. Disable the second network card by right-clicking the taskbar icon and selecting disable.
4. Set the server name and give this server a unique static IP address. (The IP addresses in these instructions are simply samples; your IP addresses will depend on your domain.)
  - Name: SERVER1-AD
  - IP Address: 192.168.0.1
  - Subnet mask: 255.255.255.0
  - Default gateway: 192.168.0.254
  - DNS: 192.168.0.1
  - Workgroup: ACME
5. Install the latest security updates from the Windows Update site.
6. Set up Active Directory.
  - a. From Manage Your Server, click Add or remove a role.
  - b. Click Next.
  - c. If you have 1 or more network connections that are disconnected, you will receive a warning message stating that fact. Click Continue if this message appears.
  - d. From the Configuration Options screen, select Typical configuration for a first server, and click Next.
  - e. The Active Directory domain name will default to ACME.local; accept this name, and click Next.
  - f. The NetBIOS domain name will default to ACME; accept this name, and click Next.
  - g. At the summary, click Next.
  - h. Click OK when the restart message screen appears.
  - i. Insert the Windows 2003 Disc 1 CD when the system prompts you to do so. Your server reboot automatically during this setup process.
  - j. Once it reboots, login and click Next when the Configure Your Server Wizard appears.
  - k. Click Finish. Installation is now complete.
7. Configure Active Directory setup by changing the domain mode from Windows 2000 mixed to Windows Server 2003.
  - a. Open Start->Administrative Tools->Active Directory Users and Computers.
  - b. Right-click the ACME.local domain from the list.
  - c. Select Raise Domain Functional Level.
  - d. In the drop-down menu, select Windows Server 2003, and click Raise.
  - e. Click OK when the warning screen appears.

8. Set up the router address in DHCP.
  - a. Open Start->Administrative Tools->DHCP.
  - b. Expand the domain.
  - c. Right-click Server Options, and select Configure Options.
  - d. From the General tab, select the 003 Router option, and make sure it is checked.
  - e. In the Data entry frame, in the IP address: field, enter the IP address of the router (192.168.0.254).
  - f. Click Add.
  - g. Click OK.

## Setting up the Exchange server

1. Install Windows Server 2003 R2 Enterprise Edition on the server.
  - a. Insert and boot from the HP SmartStart 7.60 CD.
  - b. Select English (the default), and click Continue.
  - c. At the SmartStart Home screen, click Deploy Server.
  - d. At the Server Deployment – Hardware Configuration screen, click Continue.
  - e. At the Server Deployment – Operating System Selection screen, expand Microsoft Windows 2003 and select Microsoft Windows Server 2003 R2, Enterprise Edition. Click Continue.
  - f. At the Server Deployment – Operating System Media Source screen, select CD-ROM as the source type and Flat files as the source format. Click Continue.
  - g. At the Server Deployment – Disk Partitioning Options screen, click Continue.
  - h. At the Server Deployment – Operating System Configuration Information screen, enter the User Name, Organization Name, and Product Key.
  - i. Set License Type to Per Seat (the default), and click Continue.
  - j. At the Server Deployment – SNMP Configuration screen, click Continue.
  - k. At the Server Deployment – Ready to Install screen, click Continue. Setup will begin.
  - l. The setup program will prompt you at the Server Deployment screen to Please insert the operating system media and click Continue. Insert the Microsoft Windows Server 2003 R2 Enterprise Edition CD Disc 1 into the CD-ROM drive, and click Continue. Setup will verify the media and begin copying data files. Once setup finishes copying the files it needs your system will automatically reboot.
2. Set the Administrator account password to Password1, the server name to SERVER2-EX, and the Workgroup to ACME.
3. Disable the second network card by right-clicking the taskbar icon and selecting disable.
4. Set the server name and give this server a unique static IP address. (The IP addresses in these instructions are simply samples; your IP addresses will depend on your domain.)
  - Name: SERVER2-EX
  - IP Address: 192.168.0.2
  - Subnet mask: 255.255.255.0
  - Default gateway: 192.168.0.254
  - DNS: 192.168.0.1
  - Workgroup: ACME
5. Install the latest security updates from the Windows Update site.
6. Add SERVER2-EX to the ACME domain.
  - a. Go to Control Panel->System.
  - b. On the Computer Name tab, click Change.
  - c. Select Domain, and enter ACME.local as the domain. Click OK.
  - d. When prompted, enter the username Administrator and the password Password1, then click OK.
  - e. Click OK.
  - f. Click OK.
  - g. Click OK.
  - h. Click Yes to restart.
  - i. After restart, press Ctrl-Alt-Delete at the login screen and click Options.
  - j. Select the ACME domain, and login as Administrator.
7. Set up Microsoft Internet Information Services (IIS) 6.0. (You must set up IIS on the server before you install Microsoft Exchange Server 2003.)



- a. To install IIS 6.0 on Windows 2003 Enterprise or Standard Edition, use Add or Remove Programs in the Windows Control Panel.
- b. Choose Add/Remove Windows Components.
- c. Select the Internet Information Services (IIS) component
8. Installing Exchange Server 2003 Enterprise Edition.
  - a. Insert the Exchange Server 2003 Enterprise Edition CD.
  - b. Click Exchange Deployment Tools.
  - c. Accept all default settings, and finish with the install.
9. Install Exchange Server 2003 SP2 with the default installation options.
10. Set up the user accounts. (The scenario tests require one user account for each system under test, plus an account for the collaboration scenario client.) To do this, run Active Directory Users and Computers from the Administrative Tools menu, and add the user accounts. Active Directory and Exchange will automatically assign each user an Exchange email address.

### Setting up the server for Groove Manager/SQL server

1. Install Windows Server 2003 R2 Enterprise x64 Edition on the server.
  - a. Insert and boot from the HP SmartStart 7.60 CD.
  - b. Select English (the default), click Continue.
  - c. At the SmartStart Home screen, click Deploy Server.
  - d. At the Server Deployment – Hardware Configuration screen, click Continue.
  - e. At the Server Deployment – Operating System Selection screen, expand Microsoft Windows 2003 and Select Microsoft Windows Server 2003 R2, Enterprise x64 Edition. Click Continue.
  - f. At the Server Deployment – Operating System Media Source screen, select CD-ROM as the source type and Flat files as the source format. Click Continue.
  - g. At the Server Deployment – Disk Partitioning Options screen, click Continue.
  - h. At the Server Deployment – Operating System Configuration Information screen, enter the User Name, Organization Name, and Product Key.
  - i. Set License Type to Per Seat (the default). Click Continue.
  - j. At the Server Deployment – SNMP Configuration screen, click Continue.
  - k. At the Server Deployment – Ready to Install screen, click Continue. Setup will begin.
  - l. The setup program will prompt you at the Server Deployment screen to Please insert the operating system media and click Continue. Insert the Microsoft Windows Server 2003 R2 Enterprise Edition CD Disc 1 into the CD-ROM drive, and click Continue. Setup will verify the media and begin copying data files. Once setup finishes copying the files it needs your system will automatically reboot.
2. Set the Administrator account password to Password1, the server name to SERVER3-GS, and the Workgroup to ACME.
3. Disable the second network card by right-clicking the taskbar icon and selecting disable.
4. Set the server name and give this server a unique static IP address. (The IP addresses in these instructions are simply samples; your IP addresses will depend on your domain.)
  - Name: SERVER3-GS
  - IP Address: 192.168.0.3
  - Subnet mask: 255.255.255.0
  - Default gateway: 192.168.0.254
  - DNS: 192.168.0.1
5. Install the latest security updates from the Windows Update site.
6. Add SERVER3-GS to the ACME domain.
  - a. Go to Control Panel→System.
  - b. On the Computer Name tab, click Change.
  - c. Select Domain, and enter ACME.local as the domain. Click OK.
  - d. When prompted, enter the username Administrator and the password Password1, then Click OK.
  - e. Click OK.
  - f. Click OK.
  - g. Click OK.
  - h. Click Yes to restart.
  - i. After restart, press Ctrl + Alt + Delete at the login screen, and click Options.

- j. Select the ACME domain, and login as Administrator.
- 7. Set up Microsoft IIS 6.0.
  - a. To install IIS 6.0 on Windows 2003 Enterprise or Standard Edition, use Add or Remove Programs in the Windows Control Panel.
  - b. Choose Add/Remove Windows Components.
  - c. Select the Internet Information Services component.
  - d. From IIS, enable SMTP and configure it so that administrators can send email containing account configuration codes to Groove users.
- 8. Install Microsoft SQL Server 2005 Enterprise Edition x64.
  - a. Insert the Microsoft SQL Server 2005 Enterprise Edition x64 CD-ROM drive. The installation wizard will automatically appear.
  - b. At the Feature Selection Setup Screen, select:
    - i. Database Services
    - ii. Integration Services
    - iii. Client Components
  - c. For Instance Name, select the Default, and click Next.
  - d. At Service Account, select Use the built-in System account, chose Local system, and click Next.
  - e. At the Authentication Mode, select Mixed Authentication Mode, and click Next.
  - f. For the Collation Settings screen, keep all the default settings, and click Next.
  - g. For Error and Usage Report Settings screen, leave both check boxes unchecked, and click Next.
  - h. At the Ready to Install screen, click Install.
  - i. When the Installation Complete screen appears, click Finish.
- 9. Run Windows Update again and install any new security updates.
- 10. Install and configure the Microsoft Groove Manager.
  - a. Insert the Microsoft Office Groove Server Beta 2 CD into the drive.
  - b. Select the option to install Microsoft Office Groove Server 2007 Groove Manager.
  - c. Follow the Setup instructions and enter the product ID key code when the installation software prompts you to do so.
  - d. Accept the Microsoft license agreement.
  - e. Once the Office components and settings are installed, select the Basic installation option.
  - f. When the Groove Manager Configuration wizard starts, enter the following Groove Manager configuration information:
 

Administrator E-mail Address	<a href="mailto:jcarlson@ACME.local">jcarlson@ACME.local</a>
Organization Name	ACME
URL of Groove Manager Server	<a href="http://server3-gs.acme.local">http://server3-gs.acme.local</a>
Certification Authority Name	server3-gs.acme.local
Configure Groove Audit Server Components	Do not select this option
  - g. Click Next.
  - h. When the system prompts you to do so, enter the following SQL Server information. (The Groove Manager uses this information to establish a connection to the database server on which the Groove Manager depends for data storage. Give the account administrative permissions on the database.)
 

Use the Following SQL Server Login	Select this checkbox.
User Name	Administrator
Password	Password1
SQL Server Name	server3-gs.acme.local
Database Name	Accept the default name (gmsDb)
  - i. Click Next.
  - j. Follow the Install wizard to the end, accepting defaults, and click Finish.
- 11. To access the Groove Manager administrative Web interface, follow these steps:
  - a. Open an Internet Explorer browser.
  - b. Enter the URL for the Groove Manager site (<http://server3-gs>).

- c. Log in with the username Administrator and the password Password1.
  - d. Select Members from the navigation pane.
  - e. Click Add Members in the toolbar. A list of user deployment options appears.
  - f. Click Add Single Member, then click Next. The Select Member Settings page appears.
  - g. From the Select Member Settings page, accept the default policy templates and relay server sets.
  - h. Click Next. The Add Single Member page appears.
  - i. From the Add Single Member page, type the user data into the fields to create the following two identities the test scenarios require. This data will appear in the user's Groove Contact Properties.
    - i. Full name - Jenny Carlson
    - ii. Email address - jcarlson@acme.local
  - j. Click the Save and Create Another button to repeat the above process for the next user.
    - i. Full name - Sheila Craig
    - ii. Email address [scraig@acme.local](mailto:scraig@acme.local)
  - k. When you finish adding member information, click the Finish button.
12. Send a Groove account configuration code with its associated identity information to Groove users from a Groove Manager email message.
- a. From the Members page, select target recipients for the email.
  - b. Click the top check box to select all users.
  - c. Select the Manage Members drop-down menu in the toolbar.
  - d. Click Send Groove Account Configuration Code. The Send Groove Account Configuration Code window appears with an email form that shows any default email.
  - e. Enter the following information in the fields on the default email page:
    - i. Select Sample account configuration email to display the initial default account restoration email.
    - ii. Enter administrator@acme.local as the email address.
    - iii. Enter Groove for the email subject.
    - iv. Click the Send button. This sends the email, along with the Account configuration code for the individual Groove accounts.

## Setting up the Groove Relay server

1. Install Windows Server 2003 R2 Enterprise x64 Edition on the server.
  - a. Insert the Windows Server 2003 R2 Enterprise x64 Edition CD.
  - b. When a screen appears prompting you to press any key to boot from the CD, press any key.
  - c. Press Enter at the Welcome to Setup screen to setup Windows Server 2003.
  - d. Press F8 at the Windows License Agreement screen.
  - e. If a previous version of Windows Server was installed on the drive, the installation software will ask if you would like to repair the damaged installation. Press Esc to continue installing a fresh copy of Windows without repairing.
  - f. At the Windows Server 2003 Setup screen, delete any existing C: partitions by selecting the partition to delete and pressing the D key.
  - g. Hit Enter to confirm the deletion.
  - h. Press L to confirm the deletion.
  - i. You will return to the Windows Server 2003 Setup screen. Select the Unpartitioned Space, and press Enter.
  - j. Using the arrow keys, select Format the partition using the NTFS file system (Quick), and press Enter.
  - k. Once the formatting and the file copy complete, the installation software will prompt you to restart the system. Press Enter to restart.
  - l. A Windows Server 2003 loading screen and then a Windows installation screen will appear.
  - m. Click Next at the Regional and Language Options screen.
  - n. At the Personalize Your Software screen, enter Server as the name, leave the organization field blank, and click Next.
  - o. At the Your Product Key screen, type the product key. and click Next.
  - p. Leave the default settings at the Licensing Modes screen, and click Next.
  - q. For computer name, type Server5-GR, and for administrator's password, type Password1. Type Password1 to again confirm. Click Next.

- r. At the Date and Time Settings screen, select the current date and time and the (GMT -05:00) Eastern Time (US and Canada) time zone. Leave the Automatically adjust clock for daylight savings changes checked, and click Next.
  - s. Windows Server 2003 will automatically complete the installation process and restart the server.
  - t. Press Ctrl + Alt + Delete after the system restarts.
  - u. Log on to windows using the password you selected earlier.
  - v. At the Windows Setup Screen, the installation software will ask you to insert the Windows Server 2003 CD 2. Insert the CD, and click OK.
  - w. At the Windows Server 2003 R2 Setup Wizard Welcome Screen, click Next.
  - x. At the Windows Server 2003 R2 Setup Wizard Setup Summary, click Next.
  - y. The installer will copy more files to the server. When the Windows Server 2003 R2 Setup Wizard Completing Windows Server Setup screen appears, click Finish.
  - z. At the Windows Server Post-Setup Security Updates screen, click Finish.
  - aa. At the Windows Server Post-Setup Security Updates WARNING pop-up, click Yes to close the page.
  - bb. At the Manage Your Server screen, check the box next to Don't display this page at logon, and click the X in the top right corner to close the screen.
2. Set Administrator account password to Password1, the server name to SERVER5-GR, and the Workgroup to ACME.
  3. Set the server name and give this server a unique static IP address. (The IP addresses in these instructions are simply samples; your IP addresses will depend on your domain.)
    - Name: SERVER5-GR
    - IP Address: 192.168.0.5
    - Subnet mask: 255.255.255.0
    - Default gateway: leave blank
    - DNS: 192.168.0.1
  4. Add SERVER5-GR to the ACME domain:
    - a. Go to Control Panel→System.
    - b. On the Computer Name tab, click Change.
    - c. Select Domain, and enter ACME.local as the domain. Click OK.
    - d. When prompted, enter the username Administrator and the password Password1. Click OK.
    - e. Click OK.
    - f. Click OK.
    - g. Click OK.
    - h. Click Yes to restart.
    - i. After restart, press Ctrl + Alt + Delete at the login screen, and click Options.
    - j. Select the ACME domain, and login as Administrator.
  5. Configure the system performance options.
    - a. Open the System control panel applet, and click the Advanced tab.
    - b. Click the Performance Options button.
    - c. In the Optimize performance for field, select Background services.
    - d. Click the Change button to display the Virtual Memory options.
    - e. Set the initial virtual memory to 8192MB and the maximum to 16384MB.
    - f. Click OK.
  6. Configure each external network connection on the server.
    - a. Right-click My Network Places, then select Properties to open the Network Connections window.
    - b. Right-click the network interface card that you want to edit, and select Properties.
    - c. Disable the Client for Microsoft Networks component.
    - d. Disable the File and Printer Sharing for Microsoft Networks component.
    - e. If the Internet Protocol (TCP/IP) component is not already enabled, enable it.
    - f. Disable NetBIOS over TCP/IP by selecting Internet Protocol (TCP/IP), pressing the Properties button, clicking the Advanced button to open the Advance TCP/IP Settings window, clicking the WINS tab, and then selecting the Disable NetBIOS over TCP/IP option.
    - g. Click the DNS tab, and make any changes necessary to support your network configuration.
    - h. Click the IP Settings tab, and make any necessary changes to support your network configuration.
    - i. Click OK until you return to the Network and Dial-Up Connections window.

7. Install the latest security updates from the Windows update site.
8. Install Groove Relay server:
  - a. From the Windows server machine, insert the Microsoft Office Groove Server 2007 Beta 2 CD into the drive.
  - b. Select the option to install Microsoft Office Groove Server 2007 Groove Relay. (The installation instructions are in the GettingStarted.htm file in the \grs subdirectory of the installation media. The Groove Relay Administrators Guide and release notes are also in this directory).
  - c. Start the setup program by double-clicking the Groove Relay Setup link in the Getting Started.htm file.
  - d. Follow the Setup wizard instructions. Entering the product ID key code when the installation software prompts you to do so.
  - e. If the Microsoft Installer must be updated, the update will occur at this point. If it occurs, you will have to reboot the server. After reboot, manually start the setup process and continue.
  - f. Accept the Microsoft license agreement.
  - g. When the installation of the Office components and settings completes, choose Advanced installation.
  - h. Select the Programs component, then click the Change button to override the default installation directory.
  - i. Click Next
  - j. Click the Change buttons to edit the paths for the Database and log files. Set the database and log files to use the path F:\Groove Relay\Data.
  - k. Click the Feedback tab, and select No thank you.
  - l. Click Next 3 times.
  - m. Click Install.
  - n. Click Finish to install the Groove Relay. The installer now launches the Groove Relay Configuration control panel applet.
9. Identify the Groove Relay and Generating Groove Relay Key Files to enable the secure provisioning of managed Groove users to the Groove Relay.
  - a. If the Groove Relay Configuration control panel applet is not already open, do the following:
    - i. Open the Control Panel from the Start menu.
    - ii. Double-click the Groove Relay Configuration control panel applet.
  - b. From the Server tab, set the field values as in the following table:

Relay Server Name	server5-gr.acme.local
Administrative User Name	Administrator
Administrative Realm	<a href="mailto:server5-gr@acme.local">server5-gr@acme.local</a>
Administrative Password	Password1
Private Key File Name	Default: privkey.dat
Certificate File Name	Default: ServerCertificate.cer
Unattended Startup	Default: selected (enable unattended startup)

- c. Enter the Administrative Password, and generate the Groove Relay private key and certificate files by clicking the Generate Files button.
  - d. Click Next. (This button will not be available if you have not completed all the required fields.)
10. Configure the Groove Relay SOAP interface for communications between the Groove Relay and Groove Manager servers.
  - a. From the Groove Relay Configuration control panel applet SOAP tab, enter the information in the fields as in the following table:

Relay SOAP Interface Name	<a href="http://server5-gr.acme.local">http://server5-gr.acme.local</a>
Private Key File Name	Accept the default file name. Default: ServerSOAPKeyStore.xml
Certificate File Name	Accept the default file name, then click the Generate Files button to create the private key and certificate files. Default: ServerSOAPCertificate.cer
Export ID	Accept the default name of the Serverid.xml file, then click the Export ID File button to generate the file and update the

File Name	<p>following registry key: HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Office Server\Groove\Groove Relay\Parameters</p> <p>Remember where you save this file. You must specify the location of this file in the Groove Manager administrative Web interface so you can upload it to the Groove Manager server.</p> <p>To identify the Groove Manager to the Groove Relay, you must copy the Groove Manager's registry key file (ManagementServer.reg) to the Groove Relay and install it in the local registry. Only Groove Manager servers whose registry keys are written to the Groove Relay can communicate with the Groove Relay. Successful upload of the ServerID file to Groove Manager and the writing of the Groove Manager registry file to the Groove Relay are necessary to enable and secure communication between the two servers.</p> <p>Default: serverID.xml</p>
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- b. Once you have generated the SOAP private key and certificate files by clicking the Generate Files button and clicked the Export ID File button, click the Next button to continue to the Security tab.
  - c. Click the Finish button to complete the initial Groove Relay server configuration and exit the control panel.
  - d. A pop-up window appears and prompts you to back up the newly generated key files. Insert a USB drive or other removable media and click OK.
11. Start the Groove Relay server.
- a. Go to Start→Programs→Administrative Tools→Services.
  - b. Right-click the service Groove Relay, and click Start.
  - c. To test the server installation, open a browser and enter the URL <http://localhost:8010/>.
12. Add the Relay Server to the Groove Manager.
- a. From the Groove Relay server, open a browser, and enter <http://server3-gs/gms/>.
  - b. On the navigation pane, click the domain Relay Server Sets heading.
  - c. The Relay Server Sets tab appears with a list of relay server sets. The Groove Manager provides an initial default relay server set, which is empty if you have not added servers to the set.
  - d. Click the Relay Servers tab.
  - e. Click Add Server in the toolbar
  - f. Select Onsite Relay Server for the Groove Relay.
  - g. From the Add Relay Server page, click the Download Public Key button to download ManagementServer.reg. The File Download dialogue box appears. This .reg file contains the Groove Manager's certificate with its public key and identifying information.
  - h. Select Save this file, and then click OK.
  - i. Select a location for saving the file (c:\ drive).
  - j. Click the Save button.
  - k. Click the Close button.
  - l. From the Groove Relay server, double-click the c:\ManagementServer.reg file to update the Groove Relay registry.
  - m. From the Add Relay Server page on the Groove Manager, browse to the location of the Groove Relay ID file (serverID.xml) which you generated and saved to removable media above.
  - n. Click OK to upload the Groove Relay ID file to the Groove Manager domain.
13. Restart the Groove Relay server.
- a. From the Relay server, go to Start→Programs→Administrative Tools→Services.
  - b. Right-click the service Groove Relay, and click Restart.
  - c. To test if the relay server is running, open a browser, and enter the URL <http://localhost:8010/>.
14. Configure the Groove Relay service startup and recovery settings.
- a. Go to Start→Programs→Administrative Tools→Services.
  - b. Double-click Groove Relay.
  - c. Set Startup type to Automatic.
  - d. Go to the Log On tab, and make sure that Log on as: Local System Account is selected.
  - e. Configure the Groove Relay service recovery settings options under Logon as: Local System Account by clicking the check box Allow service to interact with the desktop.
  - f. Click the Recovery tab and enter the values in the following table:

Groove Relay Service Recovery Settings	Values
First Failure	Restart the Service

Second Failure	Restart the Service
Subsequent Failure	Restart the Service
Reset Failure Count	999
Restart service after	1 minute

- g. Click Apply, and then click OK.
15. Perform a full restart of the Groove Relay server.
  16. When the server has finished booting, log in and verify that the Groove Relay service is running by opening a browser and entering the URL <http://localhost:8010/>.

## Appendix A – Test system configuration information

This appendix provides detailed configuration information about each of the test systems and the servers and client we used in the tests.

System processor and motherboard	Intel vPro with Intel Core 2 Duo processor E6700 (2.66 GHz Dual-Core) on Intel DQ965GF motherboard	Intel Pentium D processor 930 (3.0 GHz Dual-Core) on Intel D945GTP motherboard	Intel Pentium 4 processor 630 (3.0 GHz) on Intel D945GTP motherboard	Intel Pentium 4 processor (2.8 GHz) on Intel D865GBF motherboard
<b>General</b>				
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P2C2L / MP	1P2C2L / MP	1P1C2L / MP	1P1C1L / UP
Number of physical processors	1	1	1	1
Single/Dual-Core processors	Dual	Dual	Single	Single
Processor HT status	NA	NA	Enabled	NA
System Power Management Policy	High Performance	High Performance	High Performance	High Performance
<b>CPU</b>				
Vendor	Intel	Intel	Intel	Intel
Name	Core 2 Duo	Pentium D	Pentium 4	Pentium 4
Model Number	E6700	930	630	NA
Stepping	6	2	3	7
Socket type	LGA775	LGA775	LGA775	Socket 478
Core frequency (GHz)	2.66	3.0	3.0	2.8
Front-side bus frequency (MHz)	1066	800	800	533
L1 Cache	32 KB + 32 KB (per core)	16 KB + 12 Kμops (per core)	16 KB + 12 Kμops	8 KB + 12 Kμops
L2 Cache	4 MB (shared)	4 MB (2 MB per core)	2 MB	512 KB
<b>Platform</b>				
Vendor	Intel	Intel	Intel	Intel
Motherboard model number	DQ965GF	D945GTP	D945GTP	D865GBF
Motherboard chipset	Intel Q965	Intel i945G	Intel i945G	Intel i865G
Motherboard revision number	C1	A2	A2	A2
Motherboard serial number	BQGF63500GE9 / AAD41676-305	LATP61618159 / AAC97837-301	LATP61618114 / AAC97837-301	ABBF31715528 / AAC28142-401
BIOS name and version	Intel CO96510J.86A.54 93.2006.1102.172 8	Intel NT94510J.86A.39 43.2006.0707.140 5	Intel NT94510J.86A.39 43.2006.0707.140 5	Intel BF86510A.86A.00 58.P15.04040500 12
BIOS settings	Setup default	Setup default	Setup default	Setup default
<b>Memory module(s)</b>				



Vendor and model number	Corsair CM2X512A-6400	Micron 8HTF6464AY-667D7	Micron 8HTF6464AY-667D7	Samsung M3 68L6423FTN-CCC
Type	PC2-6400	PC2-5300	PC2-5300	PC3200
Speed (MHz)	800	667	667	400
Speed running in the system (MHz)	400	333	333	166
Timing/Latency (tCL-tRCD-tRP-tRASmin)	5-5-5-18	5-5-5-15	5-5-5-15	2.5-3-3-7
Size	1024 MB	1024 MB	1024 MB	1024 MB
Number of memory modules	2 x 512 MB	2 x 512 MB	2 x 512 MB	2 x 512 MB
Chip organization	Double-sided	Double-sided	Double-sided	Double-sided
Channel	Dual	Dual	Dual	Dual
<b>Hard disk</b>				
Vendor and model number	Seagate ST3808110AS	Seagate ST380811AS	Seagate ST380811AS	Seagate ST3802110A
Size	80 GB	80 GB	80 GB	80 GB
Buffer Size	8 MB	8 MB	8 MB	2 MB
RPM	7200	7200	7200	7200
Type	SATA 300 MB/s	SATA 150 MB/s	SATA 150 MB/s	ATA 100
Controller	Intel 82801HR (ICH8)	Intel 82801GB (ICH7)	Intel 82801GB (ICH7)	Intel 82801EB (ICH5)
Driver	Intel 6.2.0.2002	Microsoft 6.0.6000.16384	Microsoft 6.0.6000.16384	Microsoft 6.0.6000.16384
<b>Operating system</b>				
Name	Microsoft Windows Vista Ultimate RTM	Microsoft Windows Vista Ultimate RTM	Microsoft Windows Vista Ultimate RTM	Microsoft Windows Vista Ultimate RTM
Build number	6000	6000	6000	6000
File system	NTFS	NTFS	NTFS	NTFS
Kernel	ACPI x86-based PC	ACPI x86-based PC	ACPI x86-based PC	ACPI x86-based PC
Language	English	English	English	English
Microsoft DirectX version	DirectX 10	DirectX 10	DirectX 10	DirectX 10
<b>Graphics</b>				
Vendor and model number	Intel GMA 3000	Intel GMA 950	Intel GMA 950	Intel Extreme Graphics 2
Type	Integrated	Integrated	Integrated	Integrated
Chipset	Intel Q965 Express Chipset	Intel 945G Express Chipset	Intel 945G Express Chipset	Intel 865G
BIOS version	1377	1256	1256	1318
Memory size	256 MB Shared	128 MB Shared	128 MB Shared	224 MB
Resolution (for single-monitor tests)	1280 x 1024 x 32 @ 60Hz	1280 x 1024 x 32 @ 60Hz	1280 x 1024 x 32 @ 60Hz	1280 x 1024 x 32 @ 60Hz
Driver	Intel 7.14.10.1111	Intel 7.14.10.1111	Intel 7.14.10.1111	Intel 6.14.10.4656
Adaptor for dual display tests	PixelView ADD-7307-DVI-N	PixelView ADD-7307-DVI-N	PixelView ADD-7307-DVI-N	NA
<b>Sound card/subsystem</b>				
Vendor and model number	SigmaTel 92XX High Definition Audio	SigmaTel 92XX High Definition Audio	SigmaTel 92XX High Definition Audio	SoundMAX Integrated Digital Audio Device

Driver	Microsoft 6.0.6000.16386	Microsoft 6.0.6000.16384	Microsoft 6.0.6000.16384	Analog Devices 5.12.1.5410
<b>Ethernet</b>				
Vendor and model number	Intel 82566DM Gigabit	Intel PRO/1000 PM	Intel PRO/1000 PM	Intel PRO/1000 CT
Driver	Intel 9.6.8.0	Microsoft 9.6.8.0	Microsoft 9.6.8.0	Microsoft 8.1.37.2
<b>Optical drive(s)</b>				
Vendor and model number	Lite-On DVDRW SHW-160P6S	Lite-On DVDRW SHW-160P6S	Lite-On DVDRW SHW-160P6S	Lite-On DVDRW SHW-160P6S
Type	DVD-RW	DVD-RW	DVD-RW	DVD-RW
Dual/Single layer	Dual	Dual	Dual	Dual
<b>USB ports</b>				
# of ports	8	6	6	4
Type of ports (USB1.1, USB2.0)	USB 2.0	USB 2.0	USB 2.0	USB 2.0
<b>IEEE 1394 ports</b>				
# of ports	1	1	1	0
<b>Monitor</b>				
Model	Samsung SyncMaster 997DF	Samsung SyncMaster 997DF	Samsung SyncMaster 997DF	Samsung SyncMaster 997DF
Screen size	19"	19"	19"	19"

Figure 12: Detailed system configuration information for each of the test PCs.

Server	HP ProLiant DL320 1U Rack Server G3 (Exchange server)	HP ProLiant DL360 1U Rack Server G4p (Active Directory/DHCP/DNS server)
<b>General</b>		
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P1C2L / MP	1P1C2L / MP
Number of physical processors	1	1
Single/Dual-Core processors	Single	Single
System Power Management Policy	AC/Always On	AC/Always On
<b>CPU</b>		
Vendor	Intel	Intel
Name	Intel Pentium 4 650	Intel Xeon
Stepping	3	A
Socket type	LGA775	mPGA-604
Core frequency (GHz)	3.4	3.4
Front-side bus frequency (MHz)	800	800
L1 Cache	16 KB + 12 Kμops	16 KB + 12 Kμops
L2 Cache	2 MB	2 MB
<b>Platform</b>		
Vendor	HP	HP
Motherboard model number	374295-405	382146-405
Motherboard chipset	Intel E7221 Chipset	Intel E7520 Chipset
Motherboard revision number	A03	A05
Motherboard serial number	USE617N1VL	USE617N2DF
BIOS name and version	HP D18	HP P54
BIOS settings	Default	Default
<b>Memory module(s)</b>		
Vendor and model number	Micron MT18VDDT12872AG-40BD1	Infineon HYS72T128000HR-5-A
Type	PC3200 DDR	PC2-3200 DDR-2
Speed (MHz)	400	400
Speed running in the system (MHz)	200	200
Timing/Latency (tCL-tRCD-iRP-tRASmin)	3-3-3-8	3-3-3-11
Size	2048 MB	2048 MB
Number of RAM modules	2	2
Chip organization	Double-sided	Double-sided
Channel	Single	Single
<b>Hard disk</b>		
Vendor and model number	Maxtor 6L160M0	Maxtor 6L160M0
Number of disks in system	1	1
Size	160GB	160GB
Buffer Size	8 MB	8 MB
RPM	7200	7200
Type	SATA	SATA
Controller	Intel 82801FB (ICH6)	Intel 6300ESB (ICH-S)
Controller driver	Microsoft 5.2.3790.1830	Microsoft 5.2.3790.1830
<b>Operating system</b>		

Name	Microsoft Windows Server 2003 R2 Enterprise Edition	Microsoft Windows Server 2003 R2 Enterprise x64 Edition
Build number	3790	3790
Service Pack	SP1	SP1
File system	NTFS	NTFS
Kernel	ACPI Multiprocessor PC	ACPI Multiprocessor x64-based PC
Language	English	English
Microsoft DirectX version	9.0c	9.0c
<b>Graphics</b>		
Vendor and model number	ATI Rage XL	ATI Rage XL
BIOS version	GR-xlcpq-5.882-4.333	GR-xlcpq-5.882-4.333
Type	Integrated	Integrated
Memory size	8 MB shared	8 MB shared
Resolution	1024 x 768	1024 x 768
Driver	ATI 5.10.2600.6014	ATI 6.14.10.6025
<b>Network card/subsystem</b>		
Vendor and model number	HP NC7782 Dual-port Gigabit Server Adapter	HP NC7782 Dual-port Gigabit Server Adapter
Type	Integrated	Integrated
Driver	HP 9.52.0.0	HP 9.52.0.0
<b>Optical drive</b>		
Vendor and model number	Teac DW-224E-C	HLDS GCR-8240N
Type	DVD-ROM/CD-RW	CD-ROM
<b>USB ports</b>		
# of ports	3	2
Type of ports (USB 1.1, USB 2.0)	USB 2.0	USB 2.0

Figure 13: Detailed system configuration information for the Exchange and Active Directory/DHCP/DNS servers in our test configuration.

Server	Custom-built server (Groove Relay server)	HP ProLiant DL360 1U rack server G4p (Groove Manager/SQL server)
<b>General</b>		
Processor and OS kernel: (physical, core, logical) / (UP, MP)	2P4C4L	1P1C2L / MP
Number of physical processors	2	1
Single/Dual-Core processors	Dual	Single
System Power Management Policy	AC/Always On	AC/Always On
<b>CPU</b>		
Vendor	Intel	Intel
Name	Dual-Core Intel Xeon processor 5160	Intel Xeon
Stepping	4	A
Socket type	LGA 771	mPGA-604
Core frequency (GHz)	3.0	3.4
Front-side bus frequency (MHz)	1333	800
L1 Cache	32KB + 32KB	16 KB + 12 Kμops
L2 Cache	4MB (shared by 2 cores)	2 MB
<b>Platform</b>		
Vendor	Supermicro	HP
Motherboard model number	X7DB8+	382146-405
Motherboard chipset	Intel 5000P Chipset	Intel E7520 Chipset
Motherboard revision number	92	A05
Motherboard serial number	TM63S00221	USE617N2DF
BIOS name and version	Phoenix Technologies 6.00 5/03/2006	HP P54
BIOS settings	Default	Default
<b>Memory module(s)</b>		
Vendor and model number	Micron MT18HTF12872FDY	Infineon HYS72T128000HR-5-A
Type	PC2-4300	PC2-3200 DDR-2
Speed (MHz)	533	400
Speed running in the system (MHz)	533	200
Timing/Latency (tCL-tRCD-iRP-tRASmin)	4-4-4-12	3-3-3-11
Size	8192MB	2048 MB
Number of RAM modules	8	2
Chip organization	Double-sided	Double-sided
Channel	Dual	Single
<b>Hard disk</b>		
Vendor and model number	Hitachi HDT722516DLA38	Maxtor 6L160M0
Number of disks in system	2	1
Size	160GB	160GB
Buffer Size	8MB	8 MB
RPM	7200	7200
Additional disk drive vendor and model number	Western Digital WD800GD	NA
Size	80GB	NA
Buffer Size	8MB	NA

RPM	10000	NA
Type	SATA	SATA
Controller	Intel 631xESB Serial ATA	Intel 6300ESB (ICH-S)
Controller driver	Intel 7.4.0.1005	Microsoft 5.2.3790.1830
<b>Operating system</b>		
Name	Microsoft Windows 2003 Server R2 x64 Enterprise Edition	Microsoft Windows Server 2003 R2 Enterprise x64 Edition
Build number	3790	3790
Service Pack	SP1	SP1
File system	NTFS	NTFS
Kernel	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC
Language	English	English
Microsoft DirectX version	9.0c	9.0c
<b>Graphics</b>		
Vendor and model number	ATI Rage XL	ATI Rage XL
BIOS version	GR-xlints3y.09a-4.332	GR-xlcpq-5.882-4.333
Type	Integrated	Integrated
Memory size	8 MB shared	8 MB shared
Resolution	1024 x 768	1024 x 768
Driver	ATI 6.14.10.6025	ATI 6.14.10.6025
<b>Network card/subsystem</b>		
Vendor and model number	Intel PRO/1000 EB Network Connection	HP NC7782 Dual-port Gigabit Server Adapter
Type	Integrated	Integrated
Driver	Intel 9.5.12.0	HP 9.52.0.0
<b>Optical drive</b>		
Vendor and model number	LITE-ON SOHC-5236V	HLDS GCR-8240N
Type	DVD-ROM/CD-RW	CD-ROM
<b>USB ports</b>		
# of ports	4	2
Type of ports (USB 1.1, USB 2.0)	USB 2.0	USB 2.0

Figure 14: Detailed system configuration information for the Groove servers in our test configuration.

System	Collaboration client
<b>General</b>	
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P1C1L / UP
Number of physical processors	1
Single/Dual-Core processors	Single
Processor HT status	N/A
System Power Management Policy	Balanced
<b>CPU</b>	
Vendor	Intel
Name	Celeron
Model number	325
Stepping	1
Socket type	Socket 478
Core frequency (GHz)	2.53
Front-side bus frequency (MHz)	533
L1 Cache	16 KB + 12 Kμops
L2 Cache	256 KB
<b>Platform</b>	
Vendor	Dell
Motherboard model number	0WF887
Motherboard chipset	Intel 865G
Motherboard revision number	A2
Motherboard serial number	62XTH91
BIOS name and version	Dell A00
BIOS settings	Setup default
<b>Memory module(s)</b>	
Vendor and model number	MOSEL V826632K24SCTG-D3
Type	PC 3200
Speed (MHz)	400
Speed running in the system (MHz)	166
Timing/Latency (tCL-tRCD-tRP-tRASmin)	2.5-3-3-7
Size	512 MB
Number of memory modules	2 x 256 MB
Chip organization	Single-Sided
Channel	Dual
<b>Hard disk</b>	
Vendor and model number	Maxtor 6L160P0
Size	160 GB
Buffer Size	8 MB
RPM	7200
Type	ATA 133
Controller	Intel 82801EB (ICH5)
Driver	Microsoft 6.0.6000.16386
<b>Operating system</b>	
Name	Microsoft Windows Vista Ultimate RTM
Build number	6000
File system	NTFS
Kernel	ACPI x86-based PC

Language	English
Microsoft DirectX version	DirectX 10
<b>Graphics</b>	
Vendor and model number	Intel Extreme Graphics 2
Type	Integrated
Chipset	Intel 865G
BIOS version	Intel Video BIOS
Memory size	224 MB
Resolution	1280 x 1024 x 32 bit @ 60Hz
Driver	Intel 6.14.10.4656
<b>Sound card/subsystem</b>	
Vendor and model number	SoundMAX Integrated Digital Audio Device
Driver	Analog Devices 5.12.1.7000
<b>Ethernet</b>	
Vendor and model number	Intel PRO/100+ PCI Adapter
Driver	6.4.14.81
<b>Optical drive(s)</b>	
Vendor and model number	Philips DVD-RW DVD8701
Type	DVD-RW
Dual/Single layer	Dual
<b>USB ports</b>	
# of ports	6
Type of ports (USB1.1, USB2.0)	2.0
<b>IEEE 1394 ports</b>	
# of ports	0
<b>Monitor</b>	
Model	ViewSonic Optiquest Q7
Screen size	17"

Figure 15: Detailed system configuration information for the Collaboration client PC, which collaborated with the PC under test via Microsoft Groove and Microsoft Outlook.



## Appendix B – Instructions for running the application scenarios

We evaluated the performance of each of the test systems on each of the application scenarios (see the Application scenarios section for more information on them) by hand-timing the tasks in those scenarios.

We collected results for five runs of each scenario in each system configuration. We refer in this paper only to the median results of those runs on each system configuration. Lower times to complete a given function indicate better performance. We round those times to hundredths of seconds in this report.

In the following instructions, we assume you have already completed all of the setup work in the Test Methodology section.

### Creating a PDF while running a Windows Defender Custom Scan

#### The applications involved

This scenario requires two applications:

- Microsoft Office Word 2007
- Windows Defender

#### The data files involved

This scenario uses two files or folders:

- Office11 Install Guide.doc, a 3.7MB Word document that is the installation guide for Office 2003
- C:\Defender Workload, a 26.4MB folder

#### The test process

First, prepare each system by following these steps once:

1. Copy the Windows Defender workload to C:\DefenderWorkload1.
2. Make four more copies of this workload, renaming them to DefenderWorkload2 to DefenderWorkload5.
3. Copy the Office11 Install Guide.doc test document to the desktop.

To execute the test, follow these instructions. You will need one stopwatch.

1. Reboot the system under test.
2. Log in.
3. Wait 2.5 minutes to be sure the system has completed booting and is in a consistent starting state.
4. Open the test Word file.
5. Launch Windows Defender (Start→All Programs→Windows Defender).
6. Click the drop-down menu next to Scan in the Windows Defender menu.
7. Choose Custom Scan from the drop-down menu.
8. Click the radio button next to Scan selected drives and folders.
9. Click Select.
10. Browse to the Windows Defender workload directory by expanding C:\ and checking the box next to DefenderWorkload $n$ , where  $n$  is equal to the current test run.
11. Click OK.
12. Click the Office Button in Word 2007.
13. Left-click the arrow to the right of Save As. A dialog box titled Save a copy of the document will open.
14. Select PDF or XPS.
15. Prepare the stopwatch.
16. Bring Windows Defender to the foreground.
17. Click Scan Now. (Windows Defender reports the time elapsed under Scan Statistics.)
18. When the scan has run for 10 seconds, switch to Word 2007 (alt-Tab), and simultaneously click the Publish button in the Publish as PDF or XPS dialog box and start the stopwatch.
19. Stop the stopwatch when Adobe Reader 7.08 completes loading the newly created PDF file.
20. Record this time as the PDF creation test's result.

21. Wait one minute, and then bring Windows Defender to the foreground.
22. Record the scan time Windows Defender reports as the scan time's test result.
23. Delete the newly-created Office11 Install Guide.pdf file.
24. Repeat these steps four more times for a total of five runs.

We report the time, in seconds, that Microsoft Office Word 2007 took to perform the file conversion. We also report the time, in seconds, that Windows Defender took to perform a scan of the DefenderWorkload directory. Lower times indicate faster performance and so are better.

## Copying a folder on an encrypted volume

### The applications involved

The scenario requires one application:

- Windows Vista BitLocker Drive Encryption

### The data files involved

This scenario uses one folder:

- BitLocker WL, a 499 MB folder with 307 files

### The test process

First, prepare each system by following these steps once:

1. Copy the BitLockerWorkload directory to C:.
2. Make four copies of this directory.
3. Rename these directories BitLockerWorkload1 through BitLockerWorkload5.

### Enable TPM in the BIOS

Enable the Trusted Platform Module (TPM) in the BIOS on test systems that support it. Check each motherboard manufacturer's instructions for the procedure for enabling TPM.

### Turn on TPM in Windows Vista

1. Click Start, and type tpm.msc in the Search box.
2. Press Enter.
3. If the User Account Control dialog box appears, verify that the proposed action is what you requested, and then click Continue.
4. From the Trusted Platform Module Management screen, click Turn TPM On...

### For systems that do not support TPM or systems with a TPM that is incompatible with Windows Vista:

#### Edit the group policy for BitLocker

1. Click Start, and type gpedit.msc in the Search box.
2. Press Enter.
3. If the User Account Control dialog box appears, verify that the proposed action is what you requested.
4. Click Continue.
5. From the Group Policy Object Editor screen, take the following actions:
  - a. Click Local Computer Policy.
  - b. Click Administrative Templates.
  - c. Click Windows Components.
  - d. Double-click BitLocker Drive Encryption.
  - e. Choose Control Panel Setup: Enable Advanced Setup Options.
  - f. Change the radio button selection to Enabled.
  - g. Choose Allow BitLocker without a compatible TPM.
  - h. Choose Disallow startup key with TPM in the drop-down menu under Configure TPM startup key option.

- i. Choose Disallow startup PIN with TPM in the drop-down menu under Configure TPM startup PIN option.
- j. Click OK to change the group policy to use a Startup Key.
6. Click Start, and type gpupdate.exe in the Search box. Press Enter.
7. Wait for the process to finish.

#### **Encrypt the boot partition with BitLocker on systems that do not have a Vista-compatible TPM**

1. Click Start, and type BitLocker in the Search box.
2. Press Enter.
3. If the User Account Control dialog box appears, verify that the proposed action is what you requested.
4. Click Continue.
5. From the BitLocker Drive Encryption screen, click Turn On BitLocker on the operating system volume.
6. From the Set BitLocker Startup Preferences screen, choose Require Startup USB Key at every startup.
7. Insert a USB flash drive in the computer, if one is not already present.
8. From the Save the user Startup Key dialog box, choose the location of the USB flash drive.
9. Click Save.
10. In the Save the recovery password dialog box, the following options appear:
  - Save the password on a USB drive.
  - Save the password in a folder.
  - Print the password.
11. Choose the Save the password on a USB drive option to preserve the recovery password.
12. Click Next.
13. From the Encrypt the selected disk volume dialog box, confirm the Run BitLocker System Check box is unchecked.
14. Click Continue.
15. The Encryption in Progress status bar appears.
16. Encryption is complete when that progress bar disappears. The process required from 30 to 60 minutes on the test systems.

#### **Encrypt the boot partition with BitLocker on systems that have a Vista-compatible TPM**

1. Click Start, and type BitLocker in the Search box.
2. Press Enter.
3. If the User Account Control dialog box appears, verify that the proposed action is what you requested.
4. Click Continue.
5. From the BitLocker Drive Encryption screen, click Turn On BitLocker on the operating system volume.
6. Insert a USB flash drive in the computer, if one is not already present.
7. In the Save the recovery password dialog box, the following options will appear:
  - Save the password on a USB drive.
  - Save the password in a folder.
  - Print the password.
8. Choose the Save the password on a USB drive option to preserve the recovery password.
9. From the Encrypt the selected disk volume dialog box, confirm the Run BitLocker System Check box is checked.
10. Click Continue.
11. Confirm the user wants to reboot the computer by clicking Restart Now.
12. BitLocker ensures that the system is BitLocker-compatible and ready for encryption as the system reboots. If the system does not meet those requirements, an error message will alert you to the problem(s) before encryption starts.
13. Remove the USB key when the system prompts you to do so during reboot.
14. Log in.
15. If the system is ready for encryption, the Encryption in Progress status bar will appear.
16. Encryption is complete when that progress bar disappears. The process required from 30 to 60 minutes on the test systems.

To execute the test, follow these instructions. You will need one stopwatch.

1. Reboot the system under test.
2. Log in.
3. Wait 2.5 minutes to be sure the system has completed booting and is in a consistent starting state.
4. Prepare the stopwatch.
5. Right-click the BitLockerWorkload $n$  test folder, where  $n$  equals the number of the test run.
6. Drag the folder to the desktop.
7. Release the right mouse button.
8. Simultaneously choose Copy Here from the Windows pop-up and start the stopwatch.
9. Stop the stopwatch when the dialog box with the progress bar disappears.
10. Record this time as the test's result.
11. Delete the copy of the folder.
12. Repeat these steps four times for a total of five runs.

We report the time, in seconds, that the system took to make a copy of the folder on an encrypted volume. Lower times indicate faster performance and so are better.

## Opening and editing a Microsoft PowerPoint 2007 presentation

### The applications involved

The scenario requires one application:

- Microsoft Office PowerPoint 2007

### The data files involved

This scenario uses one file:

- PC Test Results.ppt, a 2.9MB PowerPoint presentation.

### The test process

First, prepare each system by following these steps once:

1. Copy the PC Test Results.ppt test file to the desktop of the system under test.
2. Open Microsoft Office PowerPoint 2007 by clicking Start→All Programs→Microsoft Office→Microsoft Office PowerPoint 2007.
3. Click the Office Button.
4. Click PowerPoint Options.
5. Click Advanced.
6. In the Display section of the Advanced options for working with PowerPoint dialog box, select Slide Sorter from the drop-down menu.
7. Click OK.
8. Close Microsoft Office PowerPoint 2007.

This test involves two timed events. To execute the first part of this test, follow these instructions. You will need one stopwatch.

### Opening the file

1. Reboot the system under test.
2. Log in.
3. Wait 2.5 minutes to be sure the system has completed booting and is in a consistent starting state.
4. Prepare the stopwatch.
5. Simultaneously open the PowerPoint presentation by double-clicking the file on the desktop and start the stopwatch.
6. Stop the stopwatch when PowerPoint has completely rendered all the slides.
7. Record this time as the PowerPoint open time.

To execute the second part of this test, immediately follow these instructions. You will need one stopwatch.

## Editing the file

1. Change the background in the PowerPoint slide show.
  - a. Click View on the PowerPoint menu.
  - b. Click Slide Sorter.
  - c. Click Design on the PowerPoint menu.
  - d. Prepare the stopwatch.
  - e. Simultaneously change the slide theme to Apex by clicking the third theme choice on the Design menu and start the stopwatch.
2. Stop the stopwatch when the last slide switches to the Apex theme.
3. Record this time as the PowerPoint background change time.
4. Close PowerPoint without saving the file.
5. Repeat these two sets of steps four times for a total of five runs.

We report the combined time, in seconds, that PowerPoint took to open the presentation and change the design of the slides. Lower times indicate faster performance and so are better.

## Opening a compressed Outlook message attachment, an XML file, in Microsoft Word 2007 while a Groove workspace synchronization runs

### The applications involved

The scenario requires three applications:

- Microsoft Office Outlook 2007
- Microsoft Office Word 2007
- Microsoft Office Groove 2007

### The data files involved

This scenario uses two files and two folders:

- vProC&P0806-XM.xml, a 9.64MB Word document within a 3.92MB compressed folder
- Project Photos, a 119MB folder with 50 JPEG images.
- Brochure.pdf, a 4.7MB PDF file
- Installation.doc, a 3.7MB Word document

### The test process

First, prepare each system by following these steps once:

1. Launch Microsoft Groove 2007 on the Collaboration client, which is the PC that will populate the Groove workspace.
2. On the Collaboration client, add Sheila Craig to Jenny Carlson's Contact list by performing the following steps:
  - a. Click the Contacts tab in the Microsoft Groove Launch bar.
  - b. Click the New Contact hyperlink. A Find User dialog box will open.
  - c. In the Search For text box, type Sheila Craig's name.
  - d. Click Find.
  - e. Select Sheila Craig's name from the list.
  - f. Click Add.
3. Create a Groove Workspace template on the Collaboration client by performing the following steps:
  - a. Click the New Workspace link in the Workspaces section of the Microsoft Office Groove Launch bar.
  - b. In the Create New Workspace dialog box that appears, type ACME Workspace Template in the Name of Workspace field, and select Standard, if it is not already selected.
  - c. Click OK. The ACME Workspace Template Workspace will open.
  - d. Click Add Tools in the Common Tasks area of the Microsoft Office Groove Launch bar in the bottom right-hand corner of the Workspace.
  - e. Select all tools from the More Tools dialog box by placing a check next to each tool.
  - f. Click OK.
  - g. Select File→Save Workspace As→Template.

- h. Click the Save button in the Save As dialog box to save the template in the default location.
  - i. Do not make any selections in the Template Options dialog box, and click OK.
  - j. Close the ACME Workspace Template workspace after it launches.
4. Make five copies of the vProC&P0806-XML*n*.xml E-mail test document, where *n* is equal to the test run.
  5. Create a compressed folder of the five XML test documents by performing the following steps: Right-click→Send To→Compressed (zipped) Folder.
  6. Attach and send the five compressed XML test documents to Sheila Craig in five separate messages.
  7. Launch Microsoft Office Outlook 2007 on the system under test to verify it has received the five test messages.
  8. Close Microsoft Office Outlook 2007 on the system under test.

To execute the test, follow these instructions. You will need two stopwatches.

1. Create a test Workspace named IT Workspace on the Collaboration client by performing the following steps:
  - a. Click the New Workspace link in the Workspaces section of the Microsoft Office Groove Launch bar.
  - b. In the Create New Workspace dialog box that opens, select Template, and select ACME Workspace Template from the drop-down box.
  - c. Type IT Workspace in the Name of Workspace field.
  - d. Click OK. The IT Workspace will open on the Collaboration client.
2. Invite Sheila Craig to the IT Workspace by performing the following steps:
  - a. Right-click IT Workspace in the Collaboration client's Microsoft Office Groove Launch bar.
  - b. Select Invite to Workspace.
  - c. A Send Invitation dialog box will appear.
  - d. Select Sheila Craig/ACME from the To: drop-down box.
  - e. Click the Invite button.
  - f. A Groove alert will appear near the system tray on the system under test with a hyperlink stating Invitation for Sheila Craig/ACME from Jenny Carlson/ACME
  - g. Click the link.
  - h. In the Respond to Invitation dialog box, click Accept.
  - i. Allow IT Workspace to sync on the system under test, as indicated by a Groove alert stating "IT Workspace ready (click to open)."
  - j. Click this Groove alert to open the IT Workspace on the system under test.
3. Close the IT Workspace on the system under test.
4. Close Microsoft Office Groove on the system under test by selecting File→Exit. Click Yes when Groove prompts you.
5. Reboot the system under test.
6. Copy the test files into the Files (Root Folder) Tool in the IT Workspace on the Collaboration client.
7. When the file copy finishes, close Microsoft Office Groove on the Collaboration client by selecting File→Exit. Click Yes when Groove prompts you.
8. Log in to the system under test.
9. Wait 2.5 minutes to be sure the system has completed booting and is in a consistent starting state.
10. Launch Microsoft Office Outlook 2007 by clicking Start→E-mail—Microsoft Office Outlook.
11. Select the test message for this test run on the system under test.
12. Double-click the zip archive to open it.
13. Prepare both stopwatches.
14. On the system under test, simultaneously launch Microsoft Office Groove 2007 by clicking Start→All Programs→Microsoft Office→Microsoft Office Groove 2007 and start the first stopwatch. (On the system under test, Microsoft Office Groove will begin to sync with the IT Workspace information on the Groove Relay server.)
15. Highlight the vProC&P0806-XML*n*.xml document in the email message attachment on the system under test by clicking the file once.
16. When the Groove launch and sync has run for five seconds on the system under test, simultaneously press Enter to open the vProC&P0806-XML*n*.xml document and start the second stopwatch.

17. Stop the second stopwatch when the vProC&P0806-XMLn.xml file-open completes (which is when the Word page count turns from gray to black in the Status Bar).
18. Record this time as the file-open test's result.
19. Microsoft Office Groove shows the progress of the sync in the Incoming data section along the bottom of its Launch bar. As the sync progresses, Microsoft Office Groove counts down to zero in megabytes as the content syncs on the system under test.
20. Stop the second stopwatch when the content sync countdown disappears.
21. Record this time as the Microsoft Office Groove sync test's result. Leave Microsoft Office Groove open.
22. Delete the IT Workspace by performing the following steps:
  - a. Launch Microsoft Office Groove 2007 on the Collaboration client by clicking Start→All Programs→Microsoft Office→Microsoft Office Groove 2007.
  - b. Right-click IT Workspace on the Collaboration client in the Workspaces area of the Microsoft Office Groove Launch bar.
  - c. Select Delete→For All Members.
  - d. Allow this deletion process to complete on the system under test before exiting Microsoft Office Groove.
  - e. Reboot the system under test.
23. Repeat these steps four more times for a total of five runs.

We report the time, in seconds, that the XML file took to open from an email attachment. We also report the time, in seconds, that Microsoft Office Groove took to perform the synchronization of the workspace. Lower times indicate faster performance and so are better.



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