Principled Technologies®

TEST REPORT
OCTOBER 2009

A performance comparison of current and previous generation Dell Latitude notebook systems

Executive summary

Dell Inc. (Dell) commissioned Principled Technologies (PT) to run a set of performance tests on a mix of current and previous generation Intel® processor-based Dell™ Latitude™ notebook systems. We tested the following current Dell Latitude notebook systems:

- Dell Latitude E6500 with Intel® Core™ 2 Duo Mobile Processor P8700
- Dell Latitude E6400 with Intel Core 2 Duo Mobile Processor P8700
- Dell Latitude E5500 with Intel Core 2 Duo Mobile Processor T7250
- Dell Latitude E5400 with Intel Core 2 Duo Mobile Processor T7250
- Dell Latitude E4300 with Intel Core 2 Duo Processor SP9400
- Dell Latitude E4200 with Intel Core 2 Duo Processor SU9600
- Dell Latitude XT2 with Intel Core 2 Duo Processor SU9600

KEY FINDINGS

- The current Dell Latitude notebooks running Windows 7 provided up to 120% greater SYSmark Preview 2007 system performance than that of the previous generation Dell Latitude notebooks. (See Figure 1.)
- The current Dell Latitude notebooks running Windows 7 provided up to 132% longer, or almost 4 hours more, MobileMark 2007 battery life than that of the two previous generation Dell Latitude notebooks. (See Figure 2.)
- The current Dell Latitude notebooks running Windows 7 provided up to 19% faster application responsiveness than that of the previous generation Dell notebooks. (See Figure 3).
- The current Dell Latitude notebooks running Windows 7 provided up to 28% faster system responsiveness than that of the previous generation Dell notebooks (See Figure 4.)

We compared performance of Microsoft Windows® 7 Ultimate (Windows 7), Microsoft Windows Vista® Ultimate SP2 (Windows Vista), and Windows® XP Professional SP3 (Windows XP) on seven current Dell Latitude notebooks and of Windows XP on the following two previous generation Dell Latitude notebooks:

- Dell Latitude D610 notebook with Intel® Pentium® M Processor 740 (4-year-old system)
- Dell Latitude D620 notebook with Intel Core Duo T2400 Processor (3-year-old system)

Appendix A provides detailed system configuration information. For the current notebook systems, we installed 32-bit versions of the following operating systems: Windows XP, Windows Vista, and Windows 7. For the previous generation notebook systems, we installed 32-bit Windows XP.

We compared the systems in four categories of tests: performance, battery life, application responsiveness, and system responsiveness. We used SYSmark 2007 Preview v1.06 to test overall system performance and used MobileMark 2007 v1.06 Productivity 2007 to test battery life performance. We used custom hand-timed tests to measure application and system responsiveness. In most instances, we found that current Dell Latitude notebooks running Windows 7 outperform the previous generation Dell Latitude notebooks running Windows XP.

Figure 1 shows the SYSmark 2007 Preview performance for both the current Dell Latitude notebooks running Windows 7 and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 outperformed the previous generation Dell Latitude D610 by between 61 percent and 120 percent, and outperformed the previous generation Dell Latitude D620 by between 23 percent and 68 percent.

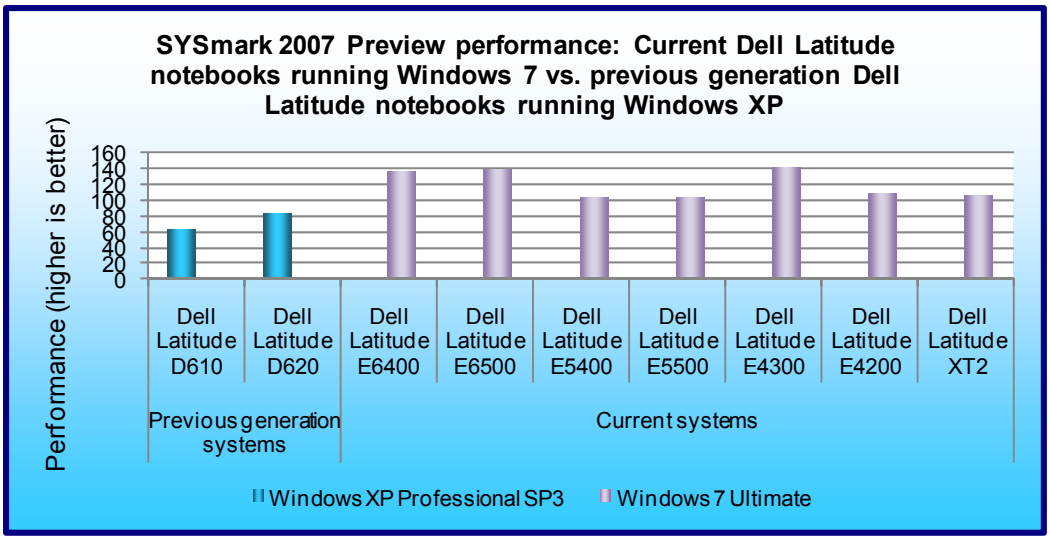

Figure 1: SYSmark 2007 Preview productivity results for our test systems. Higher numbers are better.

Figure 2 shows the MobileMark 2007 battery life scores for both the current Dell Latitude notebooks running Windows 7 and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 outperformed the previous generation Dell Latitude D610 by between 59 percent and 132 percent, for between almost 2 hours to over 4 hours of additional battery life. The current Dell Latitude notebooks running Windows 7 also outlasted the previous generation Dell Latitude D620 by between 45 percent and 112 percent, for between 1.5 hours to almost 4 hours of additional battery life.

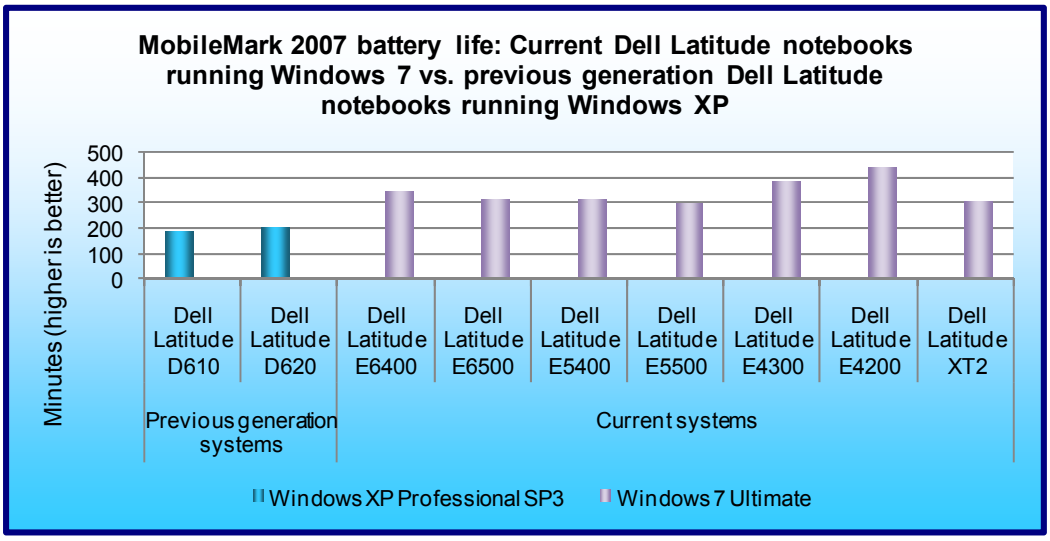

Figure 2: MobileMark 2007 Preview productivity results for our test systems. Higher numbers are better.

Figure 3 shows the application responsiveness for both the current Dell Latitude notebooks running Windows 7 and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 responded between 6 percent and 19 percent faster on our application tests than the previous generation Dell Latitude D610, or between 25 seconds to 84 seconds faster. Current Dell Latitude notebooks running Windows 7 also responded between 7 percent and 13 percent faster than the previous generation Dell Latitude D620, or between 28 seconds to 55 seconds faster.

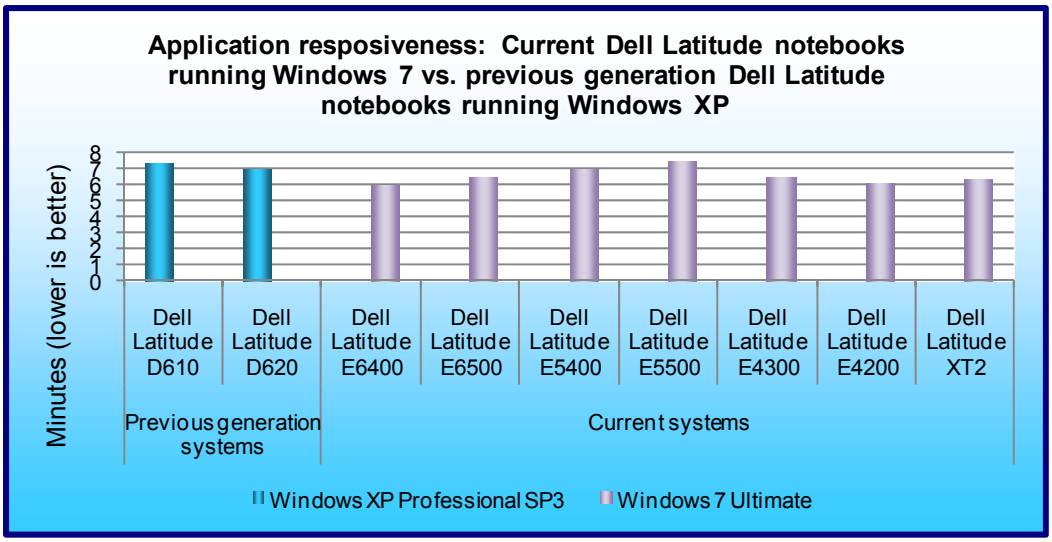

Figure 3: Application responsiveness results for our test systems – the sum of the averages for all application responsiveness tests. Lower numbers are better.

Figure 4 shows the system responsiveness for both the current Dell Latitude notebooks running Windows 7 and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 responded between 15 percent and 28 percent faster than the previous generation Dell Latitude D610, or between 50 seconds to 95 seconds faster. Current Dell Latitude notebooks running Windows 7 also responded between less than 1 percent to 14 percent faster than the previous generation Dell Latitude D620, or between less than 1 second to 39 seconds faster.

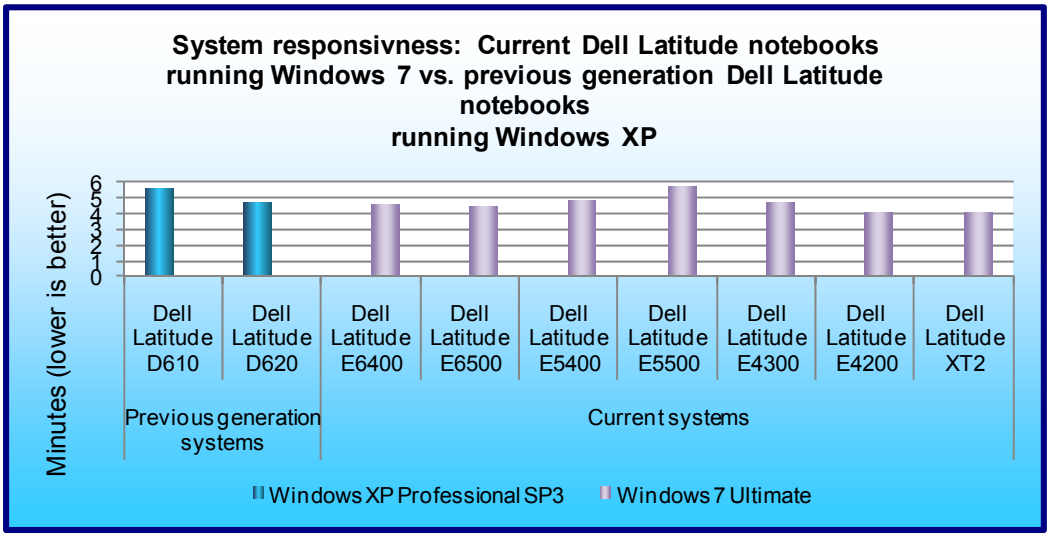

Figure 4: System responsiveness results for our test systems – the sum of the averages for all system responsiveness tests. Lower numbers are better.

Workload

SYSmark 2007 Preview v1.06

SYSmark 2007 Preview is a performance metric BAPCo created to measure system performance.

SYSmark 2007 Preview determines its overall rating from the mean result from four workload scenarios: e-learning, office productivity, video creation, and 3D modeling. SYSmark 2007 Preview records the time the system takes to complete each individual operation in each scenario.

SYSmark 2007 Preview consists of the following applications and corresponding tasks: Adobe® After® Effects 7 (e-learning), Adobe® Illustrator® CS2 (video creation), Adobe® Photoshop® CS2 (video creation), AutoDesk® 3ds Max® 8 (3D modeling), Macromedia® Flash 8 (e-learning), Microsoft® Excel 2003 (office productivity), Microsoft® Outlook 2003 (office productivity), Microsoft® PowerPoint 2003 (office productivity), Microsoft® Word 2003 (office productivity), Microsoft® Project 2003 (office productivity), Microsoft® Windows Media™ Encoder 9 series (video creation), Sony® Vegas 7 (video creation), SketchUp 5 (3D modeling), and WinZip® 10.0 (office productivity).

To learn more, visit http://www.bapco.com/support/sysmark2007preview/Help/Help.html.

MobileMark 2007 v1.06

MobileMark 2007 is an industry-standard benchmark BAPCo created to measure system battery life and performance.

MobileMark 2007 measures system battery life in minutes. MobileMark 2007 records system battery life at the start of the Productivity 2007 benchmark, and repeats the benchmark workload until the system battery life is depleted, or until the notebook system powers down due to low battery life. At the 7 percent battery life setting, MobileMark 2007 records a timestamp once per minute. At the end of the benchmark, it compares the beginning timestamp to the final (last recorded) timestamp. MobileMark 2007 derives its system battery life rating as the number of minutes between the start and end timestamps.

MobileMark 2007 Productivity 2007 consists of the following applications and corresponding tasks: Microsoft Project 2003 (project management), Microsoft Excel 2003 (calculation sheets), Microsoft Outlook 2003 (emails, calendars, scheduler), Microsoft PowerPoint 2003 (slide presentations), Microsoft Word 2003 (formatted text documents), WinZip Computing and WinZip Pro 10.0 (compressed archives), Adobe Photoshop CS2 (manipulated and compressed images), Adobe Illustrator CS2 (manipulated images), and Adobe Flash 8 (vector graphics, animation).

We followed the run rules that MobileMark 2007 specifies here: http://www.bapco.com/support/mobilemark2007/Manual/rules.html.

Test results

Figure 5 shows the SYSmark 2007 Preview performance for both the current Dell Latitude notebooks running Windows 7, Windows Vista, and Windows XP, and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 outperformed the previous generation Dell Latitude D610 by an average of 86 percent, and outperformed the previous generation Dell Latitude D620 by an average of 42 percent. Windows 7, when running on the current Dell Latitude notebooks, demonstrated a 3 percent performance improvement over Windows Vista.

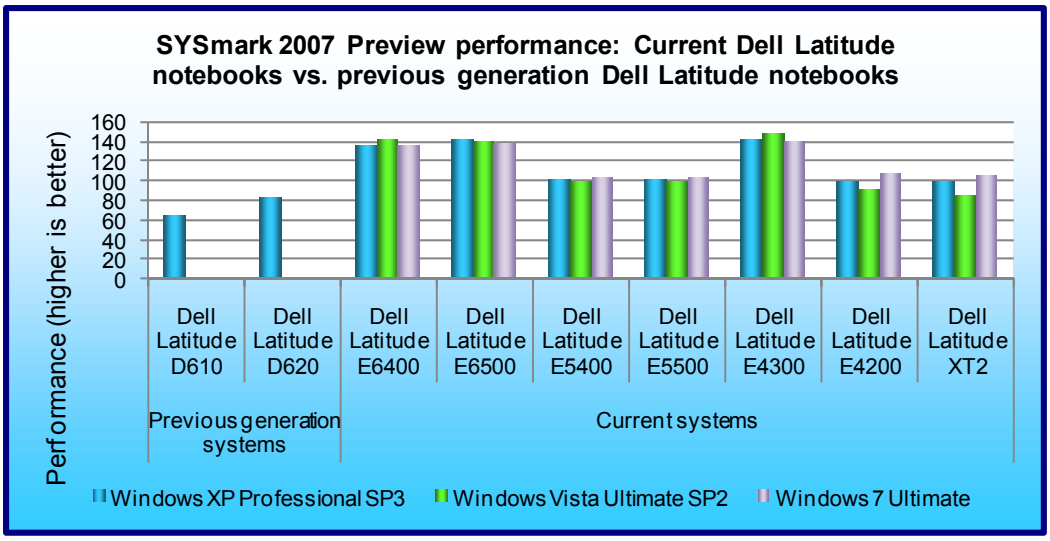

Figure 5: SYSmark 2007 Preview productivity results for our test systems. Higher numbers are better.

Figure 6 shows the MobileMark 2007 battery life scores for both the current Dell Latitude notebooks running Windows 7, Windows Vista, and Windows XP, and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 outlasted the previous generation Dell Latitude D610 by an average of 82 percent, or 2.5 hours, and outlasted the previous generation Dell Latitude D620 by an average of 66 percent, or over 2 hours. Windows 7, when running on the current Dell Latitude notebooks, demonstrated a 1 percent improvement in battery life over Windows Vista.

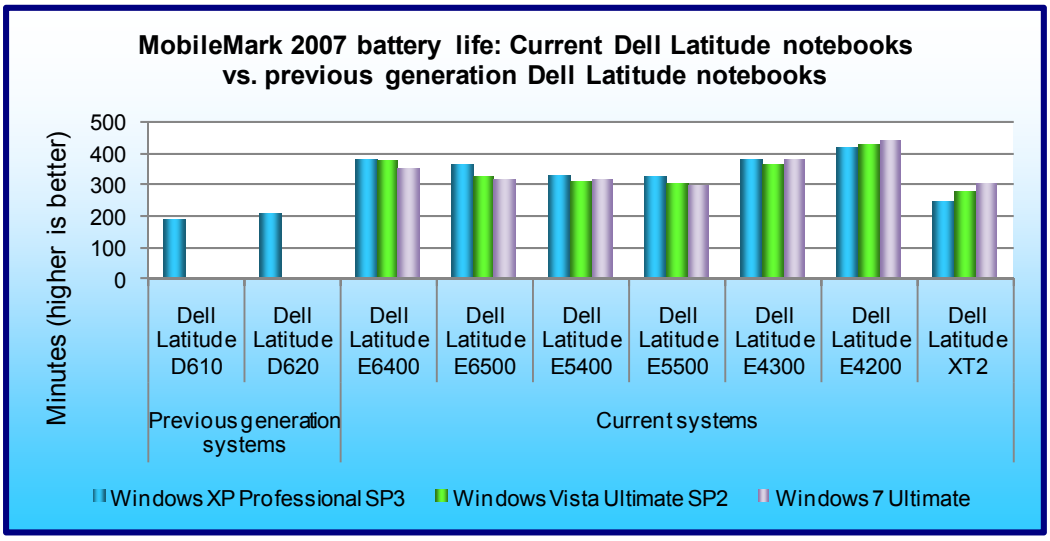

Figure 6: MobileMark 2007 Preview productivity results for our test systems. Higher numbers are better.

Figure 7 shows the application responsiveness for both the current Dell Latitude notebooks running Windows 7, Windows Vista, and Windows XP, and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 responded faster on our application tests than the previous generation Dell Latitude D610 by an average of 12 percent, or 52 seconds, and responded faster than the previous generation Dell Latitude D620 by an average of 6 percent, or 24 seconds. Windows 7, when running on the current Dell Latitude notebooks, demonstrated a 9 percent improvement in application responsiveness over Windows Vista, an improvement of 42 seconds.

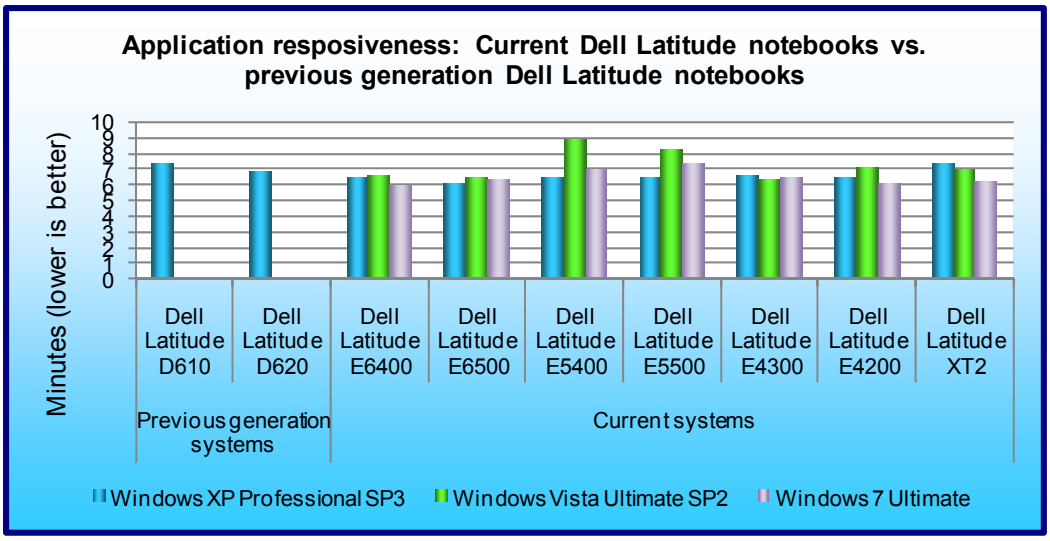

Figure 7: Application responsiveness results for our test systems – the sum of the averages for all application responsiveness tests. Lower numbers are better.

Figure 8 shows the system responsiveness for both the current Dell Latitude notebooks running Windows 7, Windows Vista, and Windows XP, and the previous generation Dell Latitude notebooks running Windows XP. Current Dell Latitude notebooks running Windows 7 responded faster than the previous generation Dell Latitude D610 by an average of 18 percent, or 61 seconds, and responded faster than the previous generation Dell Latitude D620 by an average of 2 percent, or 5 seconds. Windows 7, when running on the current Dell Latitude notebooks, demonstrated a 29 percent improvement in system responsiveness over Windows Vista, an average improvement of almost 2 minutes.

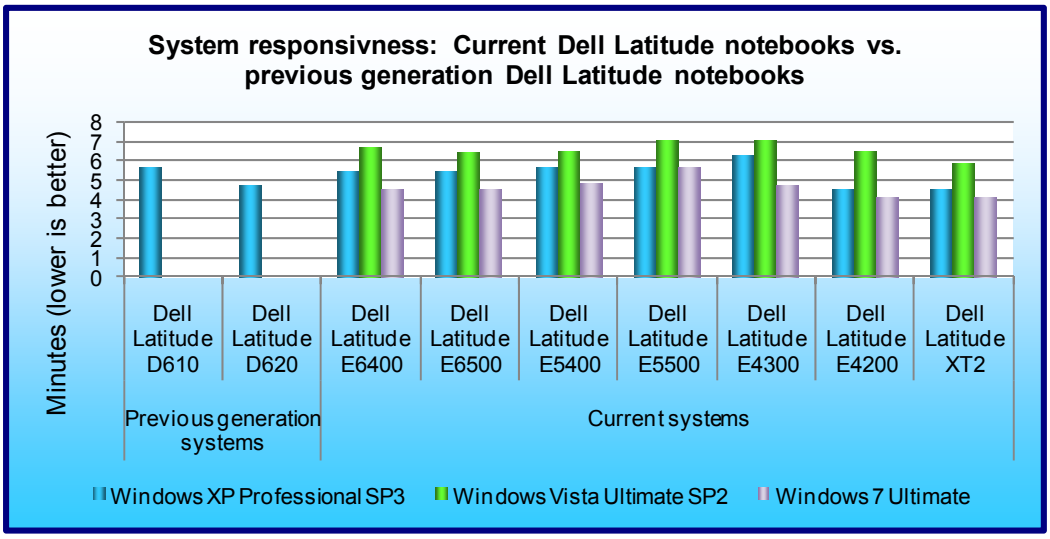

Figure 8: System responsiveness results for our test systems – the sum of the averages for all application responsiveness tests. Lower numbers are better.

Figure 9 shows a more detailed breakdown of application and system responsiveness results for the current Dell Latitude notebooks running Windows 7 and the previous generation Dell Latitude D610 running Windows XP. The current Dell Latitude notebooks running Windows 7 complete the below tasks around 84 seconds faster than the previous generation Dell Latitude D610, based on the median result for the current Dell Latitude notebooks on each tasks. For 100 users, this translates to almost 2.5 hours of time saved moving to current Dell Latitude notebooks running Windows 7.

Application responsiveness and system responsiveness tasks	Previous generation Dell Latitude D610 running Windows XP	Median current Dell Latitude notebook running Windows 7	Time saved with upgrading to current Dell Latitude notebook
Opening local Word document	4.49s	4.16s	0.33s
Opening local Excel spreadsheet	2.49s	2.09s	0.40s
Opening local PowerPoint deck	1.94s	1.19s	0.75s
Opening Word document over network connection	5.51s	4.42s	1.09s
Opening Excel spreadsheet over network connection	2.82s	2.68s	0.14s
Opening PowerPoint deck over network connection	2.43s	1.42s	1.01s
Copying files locally	51.40s	10.01s	41.39s
Copying files to a USB stick	304.84s	296.10s	8.74s
Time to boot, launch Microsoft Outlook and connect to Exchange server	45.46s	39.60s	5.86s
Hibernate	12.14s	9.37s	2.77s
Hibernate with applications open	16.68s	11.67s	5.01s
Standby	5.28s	3.30s	1.98s
Resume from standby	7.96s	2.67s	5.29s
Standby with applications open	6.16s	3.74s	2.42s
Resume from standby and connect to Exchange server	7.60s	5.19s	2.41s
Shutdown	13.42s	9.15s	4.27s
Total	**490.62s**	**406.76s**	**83.86s**

Figure 9: Application and system responsiveness, in seconds. Lower numbers are better.

Test methodology

In this section, we provide the methodology for four sets of tests: SYSmark 2007 Preview v.1.06, MobileMark 2007 v.1.06, system responsiveness, and application responsiveness. For the application responsiveness and system responsiveness tests, we ran each test three times, taking the median of the three runs.

MobileMark 2007 v.1.06

Preparing to measure battery life with MobileMark 2007 v.1.06

We conditioned the battery prior to testing. To do so, we performed two complete drains of the battery, starting from a battery at 100 percent charge. To expedite the draining process, we ran the MobileMark 2007 Productivity 2007 test until the battery completely discharged. We recorded the room temperature at the beginning of each official run.

Antivirus software conflicts

MobileMark 2007 is not compatible with any virus-scanning software, so we uninstalled any such software that was present on the notebook PCs before we installed the benchmark.

Pre-installed software conflicts

MobileMark 2007 installs the following applications, which its test scripts employ:

- Adobe Photoshop 6.0.1
- InterVideo WinDVD 6.0
- Macromedia Flash 5.0
- Microsoft Excel 2002

- Microsoft Outlook 2002
- Microsoft PowerPoint 2002
- Microsoft Word 2002
- Netscape Communicator 6.01
- Network Associates McAfee VirusScan 5.13
- WinZip Computing WinZip 8.0

If any of these applications are already on the system under test, they will cause problems with the benchmark due to software conflicts. To avoid any such issues, before we installed the benchmark, we uninstalled all conflicting pre-installed software applications, including different versions of any of the programs MobileMark 2007 uses.

Installing MobileMark 2007 v.1.06

1. Reset the notebook to the base image using Symantec's Ghost product.
2. Turn off the wireless network adapter by using the external toggle switch.
3. Insert the MobileMark 2007 Install DVD in the notebook PC's DVD drive.
4. At the Welcome screen, click Next.
5. Accept the license agreement, and click Next.
6. At the Ready to Install the Program screen, click Install.
7. Run the BAPCo Auto-configuration tool, v.1.3.2, to set the power options.
    a. Insert the Auto-configuration tool in the notebook PC's DVD drive.
    b. Double-click BAPCo_AutoConfig.exe.
    c. Type `M` to choose MobileMark 2007.
    d. Type `3` to choose the changes that produce the best possible scores, as follows:
        1. Set Critical battery alarm to 0%.
        2. Set Low battery alarm to 0%.
        3. Disable screen saver.
        4. Stop and disable Windows Update.
        5. Disable desktop cleanup wizard.
        6. Disable Windows Security Center warnings.
        7. Disable Windows Firewall.
        8. Disable incoming Remote Desktop connections.
        9. Disable Windows Error Reporting to Microsoft.
        10. Disable Windows Defender.

Displaying brightness and power settings

Because the brightness of a notebook's display affects its battery life, BAPCo required that, before we tested with MobileMark 2007, we made sure the brightness of the notebook's monitor was greater than or equal to 60 nits on a completely white screen while the notebook was unplugged and running on battery power. The measurement follows the standards from the Video Electronics Standards Association (www.vesa.org/Standards/summary/2001_6a.htm).

We complied with this standard for all the tests we ran by setting each notebook PC's brightness as close to 60 nits as we could without going below that brightness level. We used the following procedure, which assumes we began with the notebook plugged into the power supply, to meet this requirement before we started each test:

1. To create a completely blank white screen, open Microsoft Paint by clicking Start→All Programs→Accessories→Paint.
2. Open the Attributes by pressing Ctrl+E.
3. Enter dimensions that are larger than the current screen resolution. For example, if the screen resolution is 1,280 x 800, enter 1,600 for Width and 1,200 for Height.
4. Click OK.
5. Press Ctrl+F to view the bitmap image and render the screen completely white.
6. Wait 45 minutes to allow the screen to warm.
7. Unplug the notebook from the power supply, and measure the display's brightness using a luminance meter in the center of the screen. (We use the Gossen Mavolux5032C.)

8. If the reading is below or significantly greater than 60 nits, use the notebook's keyboard screen-brightness-adjustment keys to bring the display as close to 60 nits as possible, then retest.
9. Allow the notebook to run on battery power for 10 minutes, re-measure the display, and adjust the brightness up or down as necessary.
10. Verify that the notebook saved the brightness setting by plugging in the system, unplugging it, and taking another reading. If the notebook did not save this setting, use its power-management application(s) to set the brightness appropriately, and save that setting.

Conditioning the battery

1. Plug the AC power adapter into the notebook PC, and completely charge the battery.
2. Install MobileMark 2007 v1.05, following the steps we outlined in the Installing MobileMark 2007 section.
3. Double-click the MobileMark 2007 icon on the desktop.
4. Highlight the Productivity 2007 item in the left panel.
5. Enter a name for this test in the Project Name field at the top-right panel, and click Next Step.
6. If MobileMark lists no problems or warnings, click Next Step. If it does list any problems or warnings, close MobileMark 2007, and correct the problem(s) before proceeding.
7. Unplug the AC power adapter. The Productivity 2007 test begins immediately.
8. The test is complete when the notebook PC has fully depleted its battery and is no longer operational when running on battery power.
9. Repeat steps 3 through 8 for the second conditioning run and for all official runs.
10. Plug the AC power adapter into the notebook PC, and completely charge the battery.

Measuring battery life with MobileMark 2007 v.1.06

We performed the following steps to run the MobileMark Productivity 2007 benchmark:

1. Double-click the MobileMark 2007 icon on the desktop.
2. Select the Productivity 2007 test by highlighting it in the left panel.
3. Enter a name for this test in the Project Name field in the top right panel, and click Next Step.
4. If MobileMark lists no problems or warnings, click Next. If it does list any problems or warnings, close MobileMark 2007, and correct the problem(s) before proceeding.
5. Unplug the AC power adapter. The test begins immediately.
6. The Productivity 2007 test is complete when the notebook PC has fully depleted its battery and is no longer operational when running on battery power.

We executed the Productivity 2007 test three times on each system configuration and used the average result of each set of three as the representative score for that test.

1. Configure the notebook with the standard battery and the BAPCo recommendations for running MobileMark 2007.
2. Execute the Productivity 2007 test three times in this configuration.
3. Configure the notebook with the maximum-sized battery available at the time of purchase and the BAPCo recommendations for running MobileMark 2007.
4. Execute the Productivity 2007 test three times in this configuration.

Getting the MobileMark 2007 results

After each MobileMark test completed, we plugged the AC power adapter into the notebook PC and turned on the system. MobileMark 2007 started automatically after the system booted, analyzed the test scores, and opened the Test Results Viewer with the results from the last test.

To submit these results to BAPCo, we saved the test results directory. To do so, we performed the following steps:

1. Browse to the C:\ Program Files\BAPCo\MobileMark 2007\results directory.
    a. Select My Computer.
    b. Select Local Disk (C:).
    c. Select the Program Files directory.
    d. Select the BAPCo directory.
    e. Select the MobileMark2007 directory.

f. Select the results directory. (Note: The name of the directory for the Productivity 2007 results is the name you gave the test in Step 6 of the MobileMark Productivity 2007 process.)

Measuring performance with BAPCo SYSmark 2007 Preview v1.06

Setting up the test

1. Reset the system to the base test image.
2. Disable the User Account Control.
    a. Click Start→Control Panel.
    b. At the User Accounts and Family Safety settings screen, click Add or remove user account.
    c. At the User Account Control screen, click Continue.
    d. Click Go to the main User Accounts page.
    e. At the Make changes to your user account screen, click Turn User Account Control on or off.
    f. At the User Account Control screen, click Continue.
    g. Uncheck Use User Account Control to help protect your computer, and click OK.
    h. At the You must restart your computer to apply these changes screen, click Restart Now.
3. Purchase and install SYSmark 2007 Preview v1.05 from https://www.bapcostore.com/store/product.php?productid=16165&cat=251&page=1.
4. At the Welcome to InstallShield Wizard screen, click Next.
5. At the License Agreement screen, select I accept the terms in the License Agreement, and click Next.
6. At the Choose Destination Location screen, click Next.
7. At the Ready to Install the Program screen, click Install.
8. When the installation is complete, click Finish.

Running the test

1. Launch SYSmark 2007 Preview by double-clicking the desktop icon.
2. Click Run.
3. Select Official Run, choose 3 Iterations, check the box beside run conditioning run, and enter a name for that run.
4. When the benchmark completes and the main SYSmark 2007 Preview menu appears, click Save FDR to create a report.

Record the results for each iteration.

Application responsiveness tests

Setting up the test workload

We used a specific test workload for four of five test cases (see Appendix C). Before running the test on a system image, we copied the workload to both the system itself and to a target system. While the workload is the same for four test cases, we gave the workload folder a unique name for each test case. We describe the initial setup of the test workload below. When applicable, we include steps for renaming the test workload in the setup for the specific test case.

Setting up the test workload on the test system

1. Reset the system to the base image.
2. Copy the Corpus workload folder to the Documents folder (Windows 7, Windows Vista) or the My Documents folder (Windows XP). Note: For simplicity, we will refer to this folder only as the Documents folder throughout this report.

Setting up the test workload on the target system

1. Copy the Corpus folder to the target system.
2. Rename the Corpus folder to `openfiles2`.

Opening Microsoft Office files (local HDD)

This test requires a stopwatch. We used the following test documents:

- TwoCities.docx 496 KB (507,904 bytes)
- Supply Requisition Form2.xlsx 820 KB (839,680 bytes)

- Welcome!.pptx 352 KB (360,448 bytes)

Setting up the test

1. Rename the Corpus folder to `openfiles1`.
2. Reboot the system.
3. Allow the system to idle for 3 minutes before running the test.

Running the test

1. Open the openfiles1 folder.
2. Click once on the TwoCities.docx file to highlight the file.
3. Simultaneously press Enter to open the test document and start the timer.
4. Stop the timer when the document appears.
5. Close Word.
6. Wait 30 seconds.
7. Click the Supply Requisition Form2.xlsx file once to highlight the file.
8. Simultaneously press Enter to open the test spreadsheet and start the timer.
9. Stop the timer when the workbook appears.
10. Close Excel.
11. Wait 30 seconds.
12. Click the Welcome!.pptx file once to highlight the file.
13. Simultaneously press Enter to open the test slide deck and start the timer.
14. Stop the timer when the first slide appears.
15. Close PowerPoint.
16. Repeat steps 2 through 15 two times, and report the median.
17. Close the openfiles1 folder.

Opening Microsoft Office files (over a network using a wired connection)

This test requires a target system on the network and a stopwatch. We used the following test documents:

- TwoCities.docx 496 KB (507,904 bytes)
- Supply Requisition Form2.xlsx 820 KB (839,680 bytes)
- Welcome!.pptx 352 KB (360,448 bytes)

Note: We installed Windows 7 Ultimate (32-bit) on the target system.

Setting up the test

1. Disable the wireless network connection on the test system.
2. Verify the wired network connection works properly.
    a. Open the openfiles2 folder on the test system.
    b. Close the folder.
3. Reboot the system.
4. Allow the system to idle for 3 minutes before running the test.

Running the test

1. Browse to the target system on the network using the test system's wired network connection, and open the openfiles2 folder.
2. Click the TwoCities.docx file once to highlight the file.
3. Simultaneously press Enter to open the test document and start the timer.
4. Stop the timer when the document appears.
5. Close Word.
6. Wait 30 seconds.
7. Click the Supply Requisition Form2.xlsx file once to highlight the file.
8. Simultaneously press Enter to open the test spreadsheet and start the timer.
9. Stop the timer when the workbook appears.
10. Close Excel.
11. Wait 30 seconds.

12. Click the Welcome!.pptx file once to highlight the file.
13. Simultaneously press Enter to open the test slide deck and start the timer.
14. Stop the timer when the first slide appears.
15. Close PowerPoint.
16. Repeat steps 2 through 15 two times, and report the median.
17. Close the openfiles2 folder.

Opening Microsoft Office files (over a network using a wireless connection)

This test requires a target system on the network and a stopwatch. We used the following test documents:

- TwoCities.docx 496 KB (507,904 bytes)
- Supply Requisition Form2.xlsx 820 KB (839,680 bytes)
- Welcome!.pptx 352 KB (360,448 bytes)

Note: We installed Windows 7 Ultimate RC1 (32-bit) on the target system.

Setting up the test

1. Disable the wired network connection and enable the wireless network connection on the test system.
2. Verify the wireless network connection works properly.
    a. Open the Documents folder on the target system.
3. Rename the openfiles2 folder on the target system to `openfiles3` and close the folder.
4. Reboot the test system.
5. Allow the system to idle for 3 minutes before running the test.

Running the test

1. Browse to the target system on the network using the test system's wired network connection, and open the openfiles3 folder.
2. Click the TwoCities.docx file once to highlight the file.
3. Simultaneously press Enter to open the test document and start the timer.
4. Stop the timer when the document appears.
5. Close Word.
6. Wait 30 seconds.
7. Click the Supply Requisition Form2.xlsx file once to highlight the file.
8. Simultaneously press Enter to open the test spreadsheet and start the timer.
9. Stop the timer when the workbook appears.
10. Close Excel.
11. Wait 30 seconds.
12. Click the Welcome!.pptx file once to highlight the file.
13. Simultaneously press Enter to open the test slide deck and start the timer.
14. Stop the timer when the first slide appears.
15. Close PowerPoint.
16. Repeat steps 2 through 15 two times, and report the median.
17. Close the openfiles3 folder.

Installing/re-inserting a USB drive

This test requires a stopwatch, a 1GB PNY USB stick, and a 1GB Kingston Traveler USB stick.

Setting up the test

1. Copy the test.mp3 file from the Corpus folder to the PNY USB stick.
2. Copy the test.mp3 file from the Corpus folder to the Kingston USB stick.
3. Copy the 32-bit decay.exe device driver removal tool to the hard drive (e.g., C:\decay.exe).
4. Run the decay.exe tool.
    a. Open an administrative command prompt.
        i. In Windows 7 and Windows Vista, click the Start button, type `cmd` in Start Search, and press Ctrl+Shift+Enter.
        ii. In Windows XP, click the Start button, click Run, type `cmd` and press Enter.

b. Type `cd C:\` and press Enter.
c. Type `decay.exe -l` and press Enter to view drivers installed by the two USB sticks.
d. Type `decay.exe` and press Enter to run the tool and remove these device drivers.
e. Type `decay.exe -l` and press Enter to confirm that the tool removed the USB device drivers.
5. Reboot the system.
6. Allow the system to idle for 3 minutes before running the test.

Running the test

1. Simultaneously insert the PNY USB stick into USB port #1 and start the timer.
2. Stop the timer when the AutoPlay menu for the USB stick appears on the desktop.
3. After the USB device driver software installs successfully, remove the USB stick using the Safely Remove Hardware tool.
4. Wait 30 seconds.
5. Simultaneously insert the PNY USB stick into USB port #2 and start the timer.
6. Stop the timer when the AutoPlay menu for the USB stick appears on the desktop.
7. Remove the USB stick using the Safely Remove Hardware tool.
8. Wait 30 seconds.
9. Simultaneously insert the Kingston USB stick into USB port #1 and start the timer.
10. Stop the timer when the AutoPlay menu for the USB stick appears on the desktop.
11. After the USB device driver software installs successfully, remove the USB stick using the Safely Remove Hardware tool.
12. Wait 30 seconds.
13. Simultaneously insert the Kingston USB stick into USB port #2 and start the timer.
14. Stop the timer when the AutoPlay menu for the USB stick appears on the desktop.
15. Remove the USB stick using the Safely Remove Hardware tool.
16. Run the decay.exe tool.
    a. Open an administrative command prompt.
        i. In Windows 7 and Windows Vista, click the Start button, type `cmd` in Start Search, and press Ctrl+Shift+Enter.
        ii. In Windows XP, click the Start button, click Run, type `cmd` and press Enter.
    b. Type `cd C:\` and press Enter.
    c. Type `decay.exe -l` and press Enter to view drivers installed by the two USB sticks.
    d. Type `decay.exe` and press Enter to run the tool and remove these device drivers.
    e. Type `decay.exe -l` and press Enter to confirm that the tool removed the USB device drivers.
17. Repeat steps 1 through 16 two times, and report the median.

Copying files

This test requires a stopwatch, a 1GB Kingston Traveler USB stick, and the following workload:

- Corpus: 426 MB (446,697,472 bytes)

Setting up the test

1. Rename the openfiles1 folder to `copyfileslocal1`.
2. Right-click the copyfileslocal1 folder, and select Copy.
3. Right-click the Document folder, and select Paste.
4. Rename the new folder to `copyfilesusb1`.
5. Create two new output folders in the in Documents folder (e.g., `testouta1` and `testoutb1`).
6. Insert the USB stick, and create one output folder on the USB drive (e.g., E:\`testusbout1`).
7. Remove the USB stick using the Safely Remove Hardware tool.
8. Reboot the system.
9. Allow the system to idle for 3 minutes before running the test.

Running the test

1. Open the copyfileslocal1 workload folder in the Documents folder.
2. Press Ctrl+A to select all files, right-click the files, and select Copy.

3. Open the testouta1 folder.
4. Right-click the testouta1 folder.
5. Simultaneously select Paste and start the timer.
6. Stop the timer when the copy operation is complete, as indicated by the disappearance of the copy status bar.
7. Delete the testouta1 folder from the Documents folder and empty the Recycle Bin.
8. Insert the USB stick into a USB port.
9. Open the copyfilesusb1 workload folder in the Documents folder.
10. Press Ctrl+A to select all files, right-click the files, and select Copy.
11. Open the testusbout1 folder on the USB stick.
12. Right-click the testusbout1 folder.
13. Simultaneously select Paste and start the timer.
14. Stop the timer when the copy operation is complete, as indicated by the disappearance of the copy status bar.
15. Rename the testusbout1 folder to `testusbin1` and remove the USB stick using the Safely Remove Hardware tool.
16. Re-insert the USB stick into the same USB port.
17. Open the testusbin1 folder.
18. Press Ctrl+A to select all files, right-click the files, and select Copy.
19. Open the testoutb1 folder in the Documents folder.
20. Right-click the testoutb1 folder.
21. Simultaneously select Paste and start the timer.
22. Stop the timer when the copy operation is complete, as indicated by the disappearance of the copy status bar.
23. Repeat steps 1 through 22 two more times, using the following steps to set up the test for each subsequent run.
    a. Delete the testusbin1 folder from the USB stick.
    b. Create a new output folder with a different unique name on the USB drive (e.g., E:\`testusbout2`).
    c. Remove the USB stick using the Safely Remove Hardware tool.
    d. Delete the testoutb1 folder from the Documents folder and empty the Recycle Bin.
    e. Create two new output folders with unique names in the Documents folder (e.g., `testouta2` and `testoutb2`).
    f. Rename both the copyfileslocal1 and copyfilesusb2 workloads to unique names (e.g., `copyfileslocal2` and `copyfilesusb2`).

System responsiveness tests

Boot experience

This test requires a stopwatch with multiple timers.

Setting up the test

1. Reset the system to the base image.

Running the test

1. Simultaneously start the timer and boot the system.
2. Stop timer 1 when the taskbar appears.
3. Launch Internet Explorer from the taskbar immediately after the taskbar appears.
4. Stop timer 2 when the home page appears.
5. Wait 3 minutes before shutting the system down.
6. Repeat steps 1 through 5 two times, and report the median.

Boot experience with Outlook 2007 SP2

This test requires a stopwatch. This test requires no setup.

Running the test

1. Boot the system.
2. Simultaneously launch Outlook and start the timer.
3. Stop the timer when the system connects to Microsoft Exchange, as indicated by the status bar in Outlook 2007.
4. Wait 3 minutes before shutting the system down.
5. Repeat steps 1 through 4 two times, and report the median.

Shutdown experience

This test requires a stopwatch. This test requires no setup.

Running the test

1. Boot the system.
2. Wait 2 minutes.
3. Simultaneously start the timer and shut down the system: Start→Turn Off Computer→Shut Down (Windows XP), Start→Shut Down (Windows Vista, Windows 7).
4. Repeat steps 1 through 3 two times, and report the median.

Cold hibernate experience

This test requires a stopwatch. This test requires no setup.

Running the test

1. Boot the system.
2. Wait 5 minutes.
3. Put the system in hibernate mode: Start→Turn Off Computer→Hibernate (Windows XP) or Start→Hibernate.
4. Simultaneously start the timer and select Hibernate.
5. Reset the timer.
6. Simultaneously start the timer and press the power button to resume from hibernate mode.
7. Stop the timer when the system displays the desktop.
8. Shut down the system.
9. Repeat steps 1 through 8 two times, and report the median, but do not shut down the system after the final run.

Warm hibernate experience

This test requires a stopwatch. This test requires no setup.

Running the test

1. Wait 1 minute.
2. Put the system in hibernate mode: Start→Turn Off Computer→Hibernate (Windows XP) or Start→Hibernate.
3. Simultaneously start the timer and select Hibernate.
4. Reset the timer.
5. Simultaneously start the timer and press the power button to resume from hibernate mode.
6. Stop the timer when the system displays the desktop.
7. Repeat steps 1 through 6 two times, and report the median.

Cold hibernate experience with applications open with Outlook

This test requires a stopwatch. We used the following test documents:

- TwoCities.docx 496 KB (507,904 bytes)
- Supply Requisition Form2.xlsx 820 KB (839,680 bytes)
- Welcome!.pptx 352 KB (360,448 bytes)

Note: We performed this test over both wired and wireless networks.

Setting up the test

1. Reboot the system.

Running the test

1. Launch Outlook, and wait until the system is online with Microsoft Exchange, as indicated by the status bar in Outlook 2007.
2. Launch PowerPoint, and open Welcome!.pptx.
3. Launch Excel, and open Supply Requisition Form2.xlsx.
4. Launch Word, and open TwoCities.docx.
5. Select Outlook from the taskbar to bring it to the forefront.
6. Wait 5 minutes.
7. With the documents open, put the system in hibernate mode: Start→Turn Off Computer→Hibernate (Windows XP) or Start→Hibernate.
8. Simultaneously start the timer and select Hibernate.
9. Reset the timer.
10. Simultaneously start the timer and press the power button to resume from hibernate mode.
11. Stop the timer when the system is online with Microsoft Exchange, as indicated by the status bar in Outlook 2007.
12. Shut down the system.
13. Repeat steps 1 through 12 two times, and report the median, but do not shut down the system after the final timed run.

Warm hibernate experience with applications open with Outlook 2007 SP2

This test requires a stopwatch. This test requires no setup. We used the following test documents:

- TwoCities.docx 496 KB (507,904 bytes)
- Supply Requisition Form2.xlsx 820 KB (839,680 bytes)
- Welcome!.pptx 352 KB (360,448 bytes)

Note: We performed this test over both wired and wireless networks.

Running the test

1. Wait 1 minute.
2. With the documents still open, put the system in hibernate mode: Start→Turn Off Computer→Hibernate (Windows XP) or Start→Hibernate.
3. Simultaneously start the timer and select Hibernate.
4. Reset the timer.
5. Simultaneously start the timer and press the power button to resume from hibernate mode.
6. Stop the timer when the system is online with Microsoft Exchange, as indicated by the status bar in Outlook 2007.
7. Repeat steps 1 through 6 two times, and report the median.
8. Shut down the system.

Cold standby experience

This test requires a stopwatch. This test requires no setup.

Running the test

1. Boot the system.
2. Wait 5 minutes.
3. Put the system in standby/sleep mode: Start→Turn Off Computer→Standby (Windows XP) or Start→Sleep (Windows Vista, Windows 7).
4. Simultaneously start the timer and select Standby/Sleep.
5. Reset the timer.
6. Simultaneously start the timer and press the power button to resume from standby/sleep mode.
7. Stop the timer when the system displays the desktop.
8. Shut down the system.

9. Repeat steps 1 through 8 two times, and report the median, but do not shut down the system after the final timed run.

Warm standby experience

This test requires a stopwatch. This test requires no setup.

Running the test

1. Wait 1 minute.
2. Put the system in standby mode: Start→Turn Off Computer→Standby (Windows XP) or Start→Sleep (Windows Vista, Windows 7).
3. Simultaneously start the timer and select Standby/Sleep.
4. Reset the timer.
5. Simultaneously start the timer and press the power button to resume from standby/sleep mode.
6. Stop the timer when the system displays the desktop.
7. Repeat steps 1 through 6 two times, and report the median.

Cold standby experience with applications open with Outlook 2007 SP2

This test requires a stopwatch. We used the following test documents:

- TwoCities.docx 496 KB (507,904 bytes)
- Supply Requisition Form2.xlsx 820 KB (839,680 bytes)
- Welcome!.pptx 352 KB (360,448 bytes)

Note: We performed this test over both wired and wireless networks.

Setting up the test

1. Reboot the system.

Running the test

1. Launch Outlook, and wait until the system is online with Microsoft Exchange, as indicated by the status bar in Outlook 2007.
2. Launch PowerPoint, and open Welcome!.pptx.
3. Launch Excel, and open Supply Requisition Form2.xlsx.
4. Launch Word, and open TwoCities.docx.
5. Wait 5 minutes.
6. With the documents open, put the system in standby/sleep mode: Start→Turn Off Computer→Standby (Windows XP) or Start→Sleep (Windows Vista, Windows 7).
7. Simultaneously start the timer and select Standby/Sleep.
8. Reset the timer.
9. Simultaneously start the timer and press the power button to resume from standby/sleep mode.
10. Stop the timer when the system is online with Microsoft Exchange, as indicated by the status bar in Outlook 2007.
11. Shut down the system.
12. Repeat steps 1 through 11 two times, and report the median, but do not shut down the system after the final timed run.

Warm standby experience with applications open with Outlook

This test requires a stopwatch. This test requires no setup. We used the following test documents:

- TwoCities.docx 496 KB (507,904 bytes)
- Supply Requisition Form2.xlsx 820 KB (839,680 bytes)
- Welcome!.pptx 352 KB (360,448 bytes)

Note: We performed this test over both wired and wireless networks.

Running the test

1. Wait 1 minute.

2. With the documents still open, put the system in standby/sleep mode: Start→Turn Off Computer→Standby (Windows XP) or Start→Sleep (Windows Vista, Windows 7).
3. Simultaneously start the timer and select Standby/Sleep.
4. Reset the timer.
5. Simultaneously start the timer and press the power button to resume from standby/sleep mode.
6. Stop the timer when the system is online with Microsoft Exchange, as indicated by the status bar in Outlook 2007.
7. Repeat steps 1 through 6 two times, and report the median.
8. Shut down the system.

Appendix A – Detailed system configuration information

Figures 10 through 12 present each test system and the details of its configuration.

Previous generation notebook systems	Dell Latitude D610	Dell Latitude D620
General		
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P,1C,1L / UP	1P,2C,2L / MP
System power management policy Windows XP	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology
Processor power-saving option	EIST	EIST
System dimensions (length x width x height)	12.5" x 10.30" x 1.5"	13.25" x 9.5" x 1.5"
System weight	5 lbs. 6 oz.	5 lbs. 5 oz.
CPU		
Vendor	Intel	Intel
Name	Pentium M	Core Duo
Model number	740	T2400
Stepping	C0	C0
Socket type and number of pins	Socket 479	Socket 479
Core frequency (GHz)	1.73	1.83
Front-side bus frequency	533	667
L1 cache	32 KB + 32 KB	32 KB + 32 KB (per core)
L2 cache (MB)	2	2
Platform		
Vendor	Dell	Dell
Motherboard model number	0M7181	0TD761
Motherboard chipset	Intel i915GM	Intel i945GM
Motherboard revision number	03	03
System/motherboard serial number	J8H54B1	BX49XB1
BIOS name and version	Dell A06 (10/02/2005)	Dell A10 (05/16/2008)
BIOS settings	Default	Default
Memory module(s)		
Vendor and model number	Hyundai HYMP512S64BP8-C4	Hyundai HYMP512S64BP8-Y5
Type	PC2-4200	PC2-5300
Speed (MHz)	533	667
Speed running in the system (MHz)	533	667
Timing/Latency (tCL-tRCD-tRP-tRASmin)	4-4-4-12	5-5-5-15
Size (MB)	1,024	2,048
Number of memory module(s)	1	2
Channel (single/dual)	Single	Dual
Hard disk		
Vendor and model number	Seagate ST9408114A	Toshiba MK4034GSX
Size (GB)	40	40
Buffer size (MB)	8	8
RPM	5,400	5,400
Type	ATA-100	SATA 1.5 Gb/s
Controller	Intel 82801FBM (ICH6-M)	Intel 82801GHM (ICH7-M/U)

Previous generation notebook systems	Dell Latitude D610	Dell Latitude D620
Driver Windows XP	Microsoft 5.1.2600.5512 (07/01/2001)	Intel 7.0.0.1020 (05/23/2005)
Operating system		
Name	Microsoft Windows XP Professional	Microsoft Windows XP Professional
Build number	2600	2600
Service pack	3	3
File system	NTFS	NTFS
Kernel	ACPI Uniprocessor PC	ACPI Multiprocessor PC
Language	English	English
Microsoft DirectX version	9.0c	9.0c
Graphics		
Vendor and model number	ATI Mobility Radeon X300	Mobile Intel GMA 950
Type	Integrated	Integrated
Chipset	ATI Mobility Radeon X300	Mobile Intel 945GM Express Chipset
BIOS version	BK-ATI VER008.017M.192.062	1343
Total available graphics memory (MB)	64	224
Resolution	1,024 x 768 x 32 bit	1,024 x 768 x 32 bit
Driver Windows XP	ATI 6.14.10.6568 (07/06/2005)	Intel 6.14.10.4814 (03/30/2007)
Sound card/subsystem		
Vendor and model number	SigmaTel C-Major Audio	SigmaTel High Definition Audio CODEC
Driver Windows XP	SigmaTel 5.10.0.4255 (03/11/2005)	SigmaTel 5.10.0.5515 (05/10/2007)
Ethernet		
Vendor and model number	Broadcom NetXtreme 57xx Gigabit	Broadcom NetXtreme 57xx Gigabit
Driver Windows XP	Broadcom 7.86.0.0 (08/23/2004)	Broadcom 8.48.0.0 (10/31/2005)
Wireless		
Vendor and model number	Dell Wireless 1470 Dual Band WLAN Mini-PCI Card	Dell Wireless 1490 Dual Band WLAN Mini-Card
Driver Windows XP	Broadcom 4.100.15.5 (10/12/2006)	Broadcom 5.10.79.14 (02/20/2009)
Modem		
Vendor and model number	Conexant HDA D110 MDC V.92	Conexant HDA D110 MDC V.92
Driver Windows XP	Conexant 7.23.1.0 (05/03/2005)	Conexant 7.38.0.0 (12/02/2005)
Optical drive(s)		
Vendor and model number	TEAC DV28EV	Optiarc AD-5540A
Type	DVD-ROM	DVD-RW
Interface	ATA	ATA
Dual/Single layer	NA	Single
USB ports		
Number	4	4
Type	USB 2.0	USB 2.0
Other	NA	NA
IEEE 1394 ports		
Number	NA	NA

Previous generation notebook systems	Dell Latitude D610	Dell Latitude D620
Power adapter		
Type	Dell DA90PS1-00 90W	Dell DA90PS1-00 90W
Monitor		
LCD type	XGA	WXGA
Screen size	14.1"	14.1"
Refresh rate (Hz)	60	60
Battery		
Type	Dell C1295 lithium-ion	Dell PC764 lithium-ion
Size (length x width x height)	5" x 3" x .80"	7.25" x 2.6" x .9"
Rated capacity	4700 mAh / 11.1V (53Wh)	5050 mAh / 11.1V (56Wh)
Weight (oz)	11	12

Figure 10. Detailed system configuration for the previous generation notebooks.

Current notebook systems	Dell Latitude E6400	Dell Latitude E6500	Dell Latitude E5400	Dell Latitude E5500
General				
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P2C2L / MP	1P2C2L / MP	1P2C2L / MP	1P2C2L / MP
System power management policy Windows XP	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology
System power management policy Windows Vista	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology
System power management policy Windows 7	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology
Processor power-saving option	EIST	EIST	EIST	EIST
System dimensions (length x width x height)	13.25" x 9.6" x 1.25"	14.1" x 10.1" x 1.5"	13.4" x 9.6" x 1.6"	14" x 10.25" x 1.6"
System weight	5 lbs. 2 oz.	6 lbs.	5 lbs. 10 oz.	6 lbs. 7 oz.
CPU				
Vendor	Intel	Intel	Intel	Intel
Name	Core 2 Duo	Core 2 Duo	Core 2 Duo	Core 2 Duo
Model number	P8700	P8700	T7250	T7250
Stepping	R0	R0	M0	M0
Socket type and number of pins	Socket P (478)	Socket P (478)	Socket P (478)	Socket P (478)
Core frequency (GHz)	2.53	2.53	2.00	2.00
Front-side bus frequency (MHz)	1,066	1,066	800	800
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache (MB)	3	3	2	2
Platform				
Vendor	Dell	Dell	Dell	Dell
Motherboard model number	0W620R	0W612R	0D695C	0DW634
Motherboard chipset	Intel GM45	Intel GM45	Intel GM45	Intel GM45
Motherboard revision number	07	07	07	07

Current notebook systems	Dell Latitude E6400	Dell Latitude E6500	Dell Latitude E5400	Dell Latitude E5500
System/motherboard serial number	JBCWTK1	F2NCVK1	6NJ1VK1	JQG1VK1
BIOS name and version	Dell A15 (07/31/2009)	Dell A14 (07/31/2009)	Dell A13 (08/11/2009)	Dell A13 (08/11/2009)
BIOS settings	Default	Default	Default	Default
Memory module(s)				
Vendor and model number	Nanya NT1GT64UH8D 0FN-AD	Hyundai HYMP112S64C P6-S6	Nanya NT1GT64UH8D 0FN-AD	Nanya NT1GT64UH8D 0FN-AD
Type	PC2-6400	PC2-6400	PC2-6400	PC2-6400
Speed (MHz)	800	800	800	800
Speed running in the system (MHz)	800	800	800	800
Timing/Latency (tCL-tRCD-tRP-tRASmin)	6-6-6-18	6-6-6-18	6-6-6-18	6-6-6-18
Size (MB)	2,048	2,048	2,048	2,048
Number of memory module(s)	2	2	2	2
Channel (single/dual)	Dual	Dual	Dual	Dual
Hard disk				
Vendor and model number	Seagate ST980313AS	Seagate ST980412ASG	Seagate ST9120312AS	Seagate ST9120312AS
Size (GB)	80	80	120	120
Buffer size (MB)	8	16	8	8
RPM	5,400	7,200	5,400	5,400
Type	SATA 3.0 Gb/s	SATA 3.0 Gb/s	SATA 3.0 Gb/s	SATA 3.0 Gb/s
Controller	Intel 82801IM (ICH9-M)	Intel 82801IM (ICH9-M)	Intel 82801IM (ICH9-M)	Intel 82801IM (ICH9-M)
Driver Windows XP	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)
Driver Windows Vista	Intel 8.8.0.1009 (02/11/2009)	Intel 8.9.2.1002 (08/07/2009)	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)
Driver Windows 7	Intel 8.9.2.1002 (08/07/2009)	Intel 8.9.2.1002 (08/07/2009)	Intel 8.9.2.1002 (08/07/2009)	Intel 8.9.2.1002 (08/07/2009)
Operating system				
Windows XP				
Name	Microsoft Windows XP Professional	Microsoft Windows XP Professional	Microsoft Windows XP Professional	Microsoft Windows XP Professional
Build number	2600	2600	2600	2600
Service pack	3	3	3	3
File system	NTFS	NTFS	NTFS	NTFS
Kernel	ACPI Multiprocessor PC	ACPI Multiprocessor PC	ACPI Multiprocessor PC	ACPI Multiprocessor PC
Language	English	English	English	English
Microsoft DirectX version	9.0c	9.0c	9.0c	9.0c
Windows Vista				
Name	Microsoft Windows Vista Ultimate	Microsoft Windows Vista Ultimate	Microsoft Windows Vista Ultimate	Microsoft Windows Vista Ultimate

Current notebook systems	Dell Latitude E6400	Dell Latitude E6500	Dell Latitude E5400	Dell Latitude E5500
Build number	6002	6002	6002	6002
Service pack	2	2	2	2
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	10	10	10	10
Windows 7				
Name	Microsoft Windows 7 Ultimate	Microsoft Windows 7 Ultimate	Microsoft Windows 7 Ultimate	Microsoft Windows 7 Ultimate
Build number	7600	7600	7600	7600
Service pack	NA	NA	NA	NA
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	11	11	11	11
Graphics				
Vendor and model number	Mobile Intel GMA 4500MHD	Mobile Intel GMA 4500MHD	Mobile Intel GMA X4500HD	Mobile Intel GMA X4500HD
Type	Integrated	Integrated	Integrated	Integrated
Chipset	Mobile Intel 4 Series Express Chipset	Mobile Intel 4 Series Express Chipset	Mobile Intel 4 Series Express Chipset	Mobile Intel 4 Series Express Chipset
BIOS version	1659.0	1659.0	1659.0	1659.0
Total available graphics memory (MB)	743	743	776	777
Dedicated video memory (MB)	32	32	32	32
System video memory (MB)	32	32	96	32
Shared system memory (MB)	679	679	648	713
Resolution	1,024 x 768 x 32 bit	1,024 x 768 x 32 bit	1,024 x 768 x 32 bit	1,024 x 768 x 32 bit
Driver Windows XP	Intel 6.14.10.5082 (06/25/2009)	Intel 6.14.10.5082 (06/25/2009)	Intel 6.14.10.5082 (06/25/2009)	Intel 6.14.10.5082 (06/25/2009)
Driver Windows Vista	Intel 7.15.10.1861 (07/31/2009)	Intel 7.15.10.1861 (07/31/2009)	Intel 7.15.10.1861 (07/31/2009)	Intel 7.15.10.1861 (07/31/2009)
Driver Windows 7	Intel 8.15.10.1855 (07/28/2009)	Intel 8.15.10.1855 (07/28/2009)	Intel 8.15.10.1855 (07/28/2009)	Intel 8.15.10.1855 (07/28/2009)
Sound card/subsystem				
Vendor and model number	IDT High Definition Audio CODEC, Intel High Definition Audio HDMI	IDT High Definition Audio CODEC, Intel High Definition Audio HDMI	IDT High Definition Audio CODEC, Intel High Definition Audio HDMI	IDT High Definition Audio CODEC, Intel High Definition Audio HDMI

Current notebook systems	Dell Latitude E6400	Dell Latitude E6500	Dell Latitude E5400	Dell Latitude E5500
Driver Windows XP	IDT 5.10.5607.0 (09/05/2007), Intel 5.10.1.1048 (12/05/2008)	IDT 5.10.0.6159 (02/23/2009), Intel 5.10.1.1048 (12/05/2008)	IDT 5.10.5607.0 (09/05/2007), Intel 5.10.1.1048 (12/05/2008)	IDT 5.10.5607.0 (09/05/2007), Intel 5.10.1.1048 (12/05/2008)
Driver Windows Vista	Microsoft 6.0.6002.18005 (06/21/2006), Intel 6.10.1.2077 (07/10/2009)	IDT 6.10.0.6187 (04/09/2009), Intel 6.10.1.2077 (07/10/2009)	Microsoft 6.0.6002.18005 (06/21/2006), Intel 6.10.1.2077 (07/10/2009)	Microsoft 6.0.6002.18005 (06/21/2006), Intel 6.10.1.2077 (07/10/2009)
Driver Windows 7	Microsoft 6.1.7600.16385 (07/13/2009), Intel 6.10.1.2073 (05/26/2009)	Microsoft 6.1.7600.16385 (07/13/2009), Intel 6.10.1.2073 (05/26/2009)	Microsoft 6.1.7600.16385 (07/13/2009), Intel 6.10.1.2073 (05/26/2009)	Microsoft 6.1.7600.16385 (07/13/2009), Intel 6.10.1.2073 (05/26/2009)
Ethernet				
Vendor and model number	Intel 82567LM Gigabit	Intel 82567LM Gigabit	Broadcom NetXtreme 57xx Gigabit	Broadcom NetXtreme 57xx Gigabit
Driver Windows XP	Intel 9.50.14.2 (04/04/2008)	Intel 9.50.14.2 (04/04/2008)	Broadcom 11.7.2.0 (11/26/2008)	Broadcom 11.7.2.0 (11/26/2008)
Driver Windows Vista	Intel 9.50.14.2 (04/04/2008)	Intel 9.50.14.2 (04/04/2008)	Broadcom 11.7.2.0 (10/22/2008)	Broadcom 11.7.2.0 (10/22/2008)
Driver Windows 7	Intel 10.0.6.0 (06/12/2009)	Intel 10.0.6.0 (06/12/2009)	Microsoft 10.100.4.0 (04/26/2009)	Microsoft 10.100.4.0 (04/26/2009)
Wireless				
Vendor and model number	Intel 5100 AGN	Intel 5100 AGN	Dell Wireless 1397 WLAN Mini-Card	Dell Wireless 1397 WLAN Mini-Card
Driver Windows XP	Intel 12.4.3.9 (05/28/2009)	Intel 12.0.0.82 (07/08/2008)	Broadcom 5.10.79.14 (02/20/2009)	Broadcom 5.10.79.14 (02/20/2009)
Driver Windows Vista	Intel 12.4.3.9 (05/28/2009)	Intel 12.4.3.9 (05/28/2009)	Broadcom 5.10.79.14 (02/20/2009)	Broadcom 5.10.79.14 (02/20/2009)
Driver Windows 7	Intel 12.4.1.11 (05/14/2009)	Intel 12.4.1.11 (05/14/2009)	Broadcom 5.30.21.0 (07/07/2009)	Broadcom 5.30.21.0 (07/07/2009)
Bluetooth				
Vendor and model number	NA	NA	NA	NA
Driver Windows XP	NA	NA	NA	NA
Driver Windows Vista	NA	NA	NA	NA
Driver Windows 7	NA	NA	NA	NA
Modem				
Vendor and model number	NA	NA	NA	NA

Current notebook systems	Dell Latitude E6400	Dell Latitude E6500	Dell Latitude E5400	Dell Latitude E5500
Driver Windows XP	NA	NA	NA	NA
Driver Windows Vista	NA	NA	NA	NA
Driver Windows 7	NA	NA	NA	NA
Optical drive(s)				
Vendor and model number	Matshita UJ862A	Matshita UJ862A	LG GT10N	LG GT10N
Type	DVD-RW	DVD-RW	DVD-RW	DVD-RW
Interface	SATA	SATA	SATA	SATA
Dual/Single layer	Dual	Dual	Dual	Dual
USB ports				
Number	4	4	4	4
Type	USB 2.0	USB 2.0	USB 2.0	USB 2.0
Other	Media card reader	eSATA/USB 2.0, media card reader	Media card reader	Media card reader
IEEE 1394 ports				
Number	1 (4-pin)	1 (4-pin)	1 (4-pin)	1 (4-pin)
Monitor				
LCD type	WXGA	WXGA	WXGA	WXGA
Screen size	14.1"	15.1"	14.1"	15.4"
Refresh rate (Hz)	60	60	60	60
Power Adapter				
Type	Dell DA90PE1-00 90W	Dell DA90PE1-00 90W	Dell DA90PE1-00 90W	Dell DA90PE1-00 90W
Battery				
Type	Dell PT434 lithium-ion	Dell PT434 lithium-ion	Dell KM742 lithium-ion	Dell KM742 lithium-ion
Size (length x width x height)	8.25" x 2" x .80"	8.25" x 2" x .80"	8.10" x 2" x .75"	8.10" x 2" x .75"
Rated capacity	5050 mAh / 11.1V (56Wh)	5050 mAh / 11.1V (56Wh)	5050 mAh / 11.1V (56Wh)	5050 mAh / 11.1V (56Wh)
Weight (oz)	11	11	11	11

Figure 11. Detailed system configuration for four of the seven current notebooks.

Current notebook systems	Dell Latitude E4300	Dell Latitude E4200	Dell Latitude XT2
General			
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P2C2L / MP	1P,2C,2L / MP	1P,2C,2L / MP
System power management policy Windows XP	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology
System power management policy Windows Vista	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology
System power management policy Windows 7	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology	Dell Mobile Battery Methodology
Processor power-saving option	EIST	EIST	EIST
System dimensions (length x width x height)	12.25" x 9.75" x 1.25"	11.75" x 9" x .9"	11.7" x 9.1" x 1"
System weight	3 lbs. 14 oz.	2 lbs. 10 oz.	3 lbs. 12 oz.

Current notebook systems	Dell Latitude E4300	Dell Latitude E4200	Dell Latitude XT2
CPU			
Vendor	Intel	Intel	Intel
Name	Core 2 Duo	Core 2 Duo	Core 2 Duo
Model number	SP9400	SU9600	SU9600
Stepping	C0	R0	R0
Socket type and number of pins	Socket P (478)	Socket P 478	Socket P 478
Core frequency (GHz)	2.40	1.60	1.60
Front-side bus frequency (MHz)	1,066	800	800
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache (MB)	6	3	3
Platform			
Vendor	Dell	Dell	Dell
Motherboard model number	0MR506	0X271R	0M373P
Motherboard chipset	Intel GS45	Intel GS45	Intel GS45
Motherboard revision number	07	07	07
System/motherboard serial number	G3K4VK1	F8HWTK1	85VVTK1
BIOS name and version	Dell A09 (08/03/2009)	Dell A08 (08/03/2009)	Dell A02 (08/05/2009)
BIOS settings	Default	Default	Default
Memory module(s)			
Vendor and model number	Hyundai HMT125S6BFR8C-G7	1 x Hyundai HMT112S6AFP8C-G7N0, 1 x Hyundai HMT125S6BFR8C-G7	1 x Samsung M378B2873CZ0-CF7, 1 x Hyundai HMT112S6BFR6C-G7
Type	PC3-8500	PC3-8500	Samsung PC3-6400, Hyundai PC3-8500
Speed (MHz)	1,066	1,066	800, 1,066
Speed running in the system (MHz)	1,066	1,066	800
Timing/Latency (tCL-tRCD-tRP-tRASmin)	7-7-7-20	6-6-6-15	6-6-6-15
Size (MB)	4,096	3,072	2,048
Number of memory module(s)	2	2	2
Channel (single/dual)	Dual	Dual	Dual
Hard disk			
Vendor and model number	Seagate ST9160414ASG	Samsung PB22-JS3 SSD	Samsung PB22-JS3 SSD
Size (GB)	160	128	128
Buffer size (MB)	16	NA	NA
RPM	7,200	NA	NA
Type	SATA 3.0 Gb/s	SATA 3.0 Gb/s	SATA 3.0 Gb/s
Controller	Intel 82801IM (ICH9-M)	Intel 82801IM (ICH9-M)	Intel 82801IM (ICH9-M)
Driver Windows XP	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)
Driver Windows Vista	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)	Intel 8.8.0.1009 (02/11/2009)
Driver Windows 7	Intel 8.9.2.1002 (08/07/2009)	Intel 8.9.2.1002 (08/07/2009)	Intel 8.9.2.1002 (08/07/2009)

Current notebook systems	Dell Latitude E4300	Dell Latitude E4200	Dell Latitude XT2
Operating system			
Windows XP			
Name	Microsoft Windows XP Professional	Microsoft Windows XP Professional	Microsoft Windows XP Professional
Build number	2600	2600	2600
Service pack	3	3	3
File system	NTFS	NTFS	NTFS
Kernel	ACPI Multiprocessor PC	ACPI Multiprocessor PC	ACPI Multiprocessor PC
Language	English	English	English
Microsoft DirectX version	9.0c	9.0c	9.0c
Windows Vista			
Name	Microsoft Windows Vista Ultimate	Microsoft Windows Vista Ultimate	Microsoft Windows Vista Ultimate
Build number	6002	6002	6002
Service pack	2	2	2
File system	NTFS	NTFS	NTFS
Kernel	ACPI x86-based PC	ACPI x86-based PC	ACPI x86-based PC
Language	English	English	English
Microsoft DirectX version	10	10	10
Windows 7			
Name	Microsoft Windows 7 Ultimate	Microsoft Windows 7 Ultimate	Microsoft Windows 7 Ultimate
Build number	7600	7600	7600
Service Pack	NA	NA	NA
File system	NTFS	NTFS	NTFS
Kernel	ACPI x86-based PC	ACPI x86-based PC	ACPI x86-based PC
Language	English	English	English
Microsoft DirectX version	11	11	11
Graphics			
Vendor and model number	Mobile Intel GMA 4500MHD	Mobile Intel GMA 4500MHD	Mobile Intel GMA 4500MHD
Type	Integrated	Integrated	Integrated
Chipset	Mobile Intel 4 Series Express Chipset	Mobile Intel 4 Series Express Chipset	Mobile Intel 4 Series Express Chipset
BIOS version	1659.0	1659.0	1676.0
Total available graphics memory (MB)	1,543	1,254	775
Dedicated video memory (MB)	32	32	32
System video memory (MB)	32	96	32
Shared system memory (MB)	1,479	1,126	711
Resolution	1,024 x 768 x 32 bit	1,024 x 768 x 32 bit	1,024 x 768 x 32 bit
Driver Windows XP	Intel 6.14.10.5029 (01/21/2009)	Intel 6.14.10.5029 (01/21/2009)	Intel 6.14.10.5002 (10/21/2008)
Driver Windows Vista	Intel 7.15.10.1637 (01/16/2009)	Intel 7.15.10.1637 (01/16/2009)	Intel 7.15.10.1576 (10/07/2008)
Driver Windows 7	Intel 8.15.10.1855 (07/28/2009)	Intel 8.15.10.1855 (07/28/2009)	Intel 8.15.10.1808 (06/03/2009)

Current notebook systems	Dell Latitude E4300	Dell Latitude E4200	Dell Latitude XT2
Sound card/subsystem			
Vendor and model number	IDT High Definition Audio CODEC, Intel High Definition Audio HDMI	IDT High Definition Audio CODEC, Intel High Definition Audio HDMI	IDT High Definition Audio CODEC
Driver Windows XP	IDT 5.10.0.6159 (02/23/2009), Intel 5.10.0.1047 (09/22/2008)	IDT 5.10.0.6159 (02/23/2009), Intel 5.10.0.1047 (09/22/2008)	IDT 5.10.0.6159 (02/23/2009)
Driver Windows Vista	IDT 6.10.0.6187 (04/09/2009), Intel 6.10.0.2067 (09/22/2008)	IDT 6.10.0.6227 (07/31/2009), Intel 6.10.0.2067 (09/22/2008)	IDT 6.10.0.6227 (07/31/2009)
Driver Windows 7	IDT 6.10.0.6227 (07/31/2009), Intel 6.10.1.2073 (05/26/2009)	IDT 6.10.0.6227 (07/31/2009), Intel 6.10.1.2073 (05/26/2009)	IDT 6.10.0.6227 (07/31/2009)
Ethernet			
Vendor and model number	Intel 82567LM Gigabit	Intel 82567LM Gigabit	Intel 82567LM Gigabit
Driver Windows XP	Intel 9.50.14.2 (04/04/2008)	Intel 9.50.14.2 (04/04/2008)	Intel 9.50.14.2 (04/04/2008)
Driver Windows Vista	Intel 9.50.14.2 (04/04/2008)	Intel 9.50.14.2 (04/04/2008)	Intel 9.50.14.2 (04/04/2008)
Driver Windows 7	Intel 10.0.6.0 (06/12/2009)	Intel 10.0.6.0 (06/12/2009)	Intel 10.0.6.0 (06/12/2009)
Wireless			
Vendor and model number	Intel 5300 AGN	Intel 5300 AGN	Dell Wireless 1397 WLAN Mini-Card
Driver Windows XP	Intel 12.0.0.82 (07/08/2008)	Intel 12.4.3.9 (05/28/2009)	Broadcom 5.10.79.14 (02/20/2009)
Driver Windows Vista	Intel 12.0.0.82 (07/08/2008)	Intel 12.4.3.9 (05/28/2009)	Broadcom 5.10.79.14 (02/20/2009)
Driver Windows 7	Intel 12.4.1.11 (05/14/2009)	Intel 12.4.1.11 (05/14/2009)	Microsoft 4.176.75.23 (10/01/2008)
Bluetooth			
Vendor and model number	Dell Wireless 365 Bluetooth	Dell Wireless 365 Bluetooth	Dell Wireless 365 Bluetooth
Driver Windows XP	NA	Broadcom 5.5.0.3205 (08/03/2008)	NA
Driver Windows Vista	Broadcom 6.2.0.4600 (10/27/2008)	Broadcom 6.1.0.4100 (01/31/2008)	Broadcom 6.2.0.4600 (10/27/2008)
Driver Windows 7	NA	NA	NA
Modem			
Vendor and model number	NA	NA	NA
Driver Windows XP	NA	NA	NA
Driver Windows Vista	NA	NA	NA
Driver Windows 7	NA	NA	NA
Optical drive(s)			
Vendor and model number	Matshita UJ862A	TSSTcorp TS-U633A	TSSTcorp TS-U633A
Type	DVD-RW	DVD-RW	DVD-RW

Current notebook systems	Dell Latitude E4300	Dell Latitude E4200	Dell Latitude XT2
Interface	SATA	eSATA external	eSATA external
Dual/Single layer	Dual	Dual	Dual
USB ports			
Number	2	2	4
Type	USB 2.0	USB 2.0	USB 2.0
Other	eSATA/USB 2.0, media card reader	eSATA/USB 2.0, media card reader	2 x eSATA/USB2.0 , media card reader
IEEE 1394 ports			
Number	1 (4-pin)	1 (4-pin)	1 (4-pin)
Power adapter			
Type	Dell HA65NE1-00 65W	Dell LA45NS0-00 45W	Dell LA45NS0-00 45W
Monitor			
LCD type	WXGA	WXGA	WXGA
Screen size	13.3”	12.1"	12.1"
Refresh rate (Hz)	60	60	60
Battery			
Type	Dell XX327 lithium-ion	Dell Y085C lithium-ion	Dell PU536 lithium-ion
Size (length x width x height)	8.25" x 2.25" x .80"	8.25" x 2.75" x .9"	10.5" x 3.75" x .5"
Rated capacity	5400 mAh / 11.1V (60Wh)	5200 mAh / 11.1 (58Wh)	3800 mAh / 11.1V (42Wh)
Weight (oz)	12	13	11

Figure 12. Detailed system configuration for three of the seven current notebooks.

Appendix B – Detailed results

Figures 13 through 17 present the detailed test results for the systems.

Previous generation notebook systems	Dell Latitude D610	Dell Latitude D620
Operating System	**XP Professional SP3**	**XP Professional SP3**
Application responsiveness		
Test case 1a: Opening files using common office applications (local HDD)		
Word document appears - median	00:04.49	00:04.28
Excel workbook appears - median	00:02.49	00:02.34
PowerPoint slide appears - median	00:01.94	00:02.25
Test case 1b: Opening files using common office applications (wired)		
Word document appears - median	00:05.36	00:04.15
Excel workbook appears - median	00:02.83	00:02.54
PowerPoint slide appears - median	00:02.31	00:02.39
Test case 1c: Opening files using common office applications (wireless)		
Word document appears - median	00:05.66	00:04.32
Excel workbook appears - median	00:02.81	00:02.74
PowerPoint slide appears - median	00:02.55	00:02.44
Test case 2: Installing/re-inserting a USB drive		
Installing PNY USB stick - median	00:10.96	00:10.22
Installing Kingston USB stick - median	00:09.89	00:10.57
Re-inserting PNY USB stick - median	00:01.86	00:02.08
Re-inserting Kingston USB stick - median	00:01.50	00:01.98
Test case 3: Copying files locally		
Copying files to another location on the C: drive - median	00:51.40	00:26.84
Copying files from the hard drive to a USB stick - median	05:04.84	05:01.08
Copying files from a USB stick to the hard drive - median	00:32.71	00:34.88
On/off tests		
Test case 1: Boot experience		
COLD: Taskbar appears - median	00:29.73	00:27.65
COLD: Home page loads - median	00:15.54	00:13.55
Test case 2: Boot experience with Office 2007 SP2		
COLD: Time to connect to Exchange Server after booting system - median	00:15.73	00:20.88
Test case 3: Cold hibernate experience		
COLD: Time to hibernate - median	00:12.47	00:08.02
COLD: Time to resume from hibernate - median	00:13.86	00:16.96
Test case 4: Warm hibernate experience		
WARM: Time to hibernate - median	00:11.81	00:07.62
WARM: Time to resume from hibernate - median	00:13.27	00:16.84
Test case 5 (wired): Cold hibernate experience with applications open		
COLD: Time to hibernate - median	00:17.81	00:11.38
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:16.56	00:19.88
Test case 6 (wired): Warm hibernate experience with applications open		
WARM: Time to hibernate - median	00:15.65	00:10.86

Previous generation notebook systems	Dell Latitude D610	Dell Latitude D620
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:15.23	00:20.19
Test case 5 (wireless): Cold hibernate experience with applications open		
COLD: Time to hibernate - median	00:15.64	00:10.82
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:16.00	00:11.14
Test case 6 (wireless): Warm hibernate experience with applications open		
WARM: Time to hibernate - median	00:17.62	00:11.30
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:17.43	00:11.84
Test case 7: Cold standby experience		
COLD: Time to standby - median	00:05.75	00:02.94
COLD: Time to resume from standby - median	00:07.96	00:05.30
Test case 8: Warm standby experience		
WARM: Time to standby - median	00:04.81	00:02.59
WARM: Time to resume from standby - median	00:07.96	00:06.39
Test case 9 (wired): Cold standby experience with applications open		
COLD: Time to standby - median	00:06.78	00:03.67
COLD: Time to connect to Exchange Server after resume from standby - median	00:09.47	00:08.27
Test case 10 (wired): Warm standby experience with applications open		
WARM: Time to standby - median	00:05.36	00:02.79
WARM: Time to connect to Exchange Server after resume from standby - median	00:08.71	00:07.61
Test case 9 (wireless): Cold standby experience with applications open		
COLD: Time to standby - median	00:05.36	00:02.90
COLD: Time to connect to Exchange Server after resume from standby - median	00:05.20	00:02.79
Test case 10 (wireless): Warm standby experience with applications open		
WARM: Time to standby - median	00:07.13	00:03.59
WARM: Time to connect to Exchange Server after resume from standby - median	00:07.03	00:03.77
Test case 11: Shutdown experience		
Time to turn system off - median	00:13.42	00:12.22
Industry standard benchmarks		
BAPCo MobileMark 2007 1.06 Battery Life Rating (Higher is better)		
Battery Life - median	189.00	207.00
Performance Qualification - median	123.50	161.00
BAPCo SYSmark 2007 Preview v1.06		
SYSmark 2007 Preview v1.06 Rating	64.00	84.00

Figure 13: Detailed test results for the previous generation notebook systems.

Current notebook systems	Dell Latitude E6400	Dell Latitude E6400	Dell Latitude E6400	Dell Latitude E6500	Dell Latitude E6500	Dell Latitude E6500
Operating systems	**XP Professional SP3**	**Vista Ultimate SP2**	**Windows 7 Ultimate**	**XP Professional SP3**	**Vista Ultimate SP2**	**Windows 7 Ultimate**
Application responsiveness						
Test case 1a: Opening files using common office applications (local HDD)						
Word document appears - median	00:03.10	00:03.46	00:03.05	00:02.70	00:03.40	00:03.41
Excel workbook appears - median	00:02.06	00:01.84	00:01.87	00:01.79	00:02.10	00:01.84
PowerPoint slide appears - median	00:01.38	00:01.03	00:01.04	00:00.91	00:01.24	00:01.00
Test case 1b: Opening files using common office applications (wired)						
Word document appears - median	00:02.99	00:03.14	00:02.95	00:02.84	00:03.62	00:03.43
Excel workbook appears - median	00:02.13	00:02.06	00:02.07	00:01.90	00:02.34	00:01.95
PowerPoint slide appears - median	00:01.25	00:01.10	00:01.06	00:01.10	00:01.34	00:01.19
Test case 1c: Opening files using common office applications (wireless)						
Word document appears - median	00:03.53	00:03.47	00:03.33	00:03.42	00:03.75	00:04.71
Excel workbook appears - median	00:02.24	00:02.69	00:02.42	00:02.34	00:02.68	00:02.61
PowerPoint slide appears - median	00:02.22	00:01.23	00:01.55	00:01.25	00:01.39	00:01.64
Test case 2: Installing/re-inserting a USB drive						
Installing PNY USB stick - median	00:09.56	00:03.15	00:02.40	00:09.54	00:03.28	00:03.15
Installing Kingston USB stick - median	00:09.45	00:03.62	00:02.65	00:09.61	00:02.86	00:02.75
Re-inserting PNY USB stick - median	00:02.10	00:01.73	00:01.69	00:01.98	00:01.97	00:01.85
Re-inserting Kingston USB stick - median	00:01.80	00:01.35	00:01.16	00:01.59	00:01.46	00:01.33
Test case 3: Copying files locally						
Copying files to another location on the C: drive - median	00:15.58	00:24.25	00:09.60	00:11.64	00:20.72	00:17.13
Copying files from the hard drive to a USB stick - median	04:57.03	05:04.28	04:48.88	04:39.34	04:57.32	04:56.10
Copying files from a USB stick to the hard drive - median	00:30.87	00:34.76	00:34.32	00:35.31	00:37.96	00:39.93
On/off tests						
Test case 1: Boot experience						
COLD: Taskbar appears - median	00:25.13	00:46.70	00:28.89	00:24.53	00:31.90	00:30.60
COLD: Home page loads - median	00:13.51	00:07.75	00:03.47	00:23.45	00:03.27	00:03.67
Test case 2: Boot experience with Office 2007 SP2						
COLD: Time to connect to Exchange Server after booting system - median	00:13.41	00:09.68	00:12.53	00:15.96	00:12.51	00:09.00
Test case 3: Cold hibernate experience						
COLD: Time to hibernate - median	00:08.57	00:10.71	00:09.16	00:08.86	00:11.41	00:09.37
COLD: Time to resume from hibernate - median	00:17.73	00:30.97	00:13.66	00:15.88	00:31.53	00:14.31
Test case 4: Warm hibernate experience						
WARM: Time to hibernate - median	00:08.52	00:10.71	00:08.46	00:09.03	00:11.18	00:08.68
WARM: Time to resume from hibernate - median	00:15.80	00:31.29	00:12.22	00:17.75	00:30.31	00:13.46
Test case 5 (wired): Cold hibernate experience with applications open						
COLD: Time to hibernate - median	00:10.15	00:11.71	00:13.52	00:10.78	00:15.31	00:12.60
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:19.52	00:33.37	00:25.97	00:19.52	00:35.01	00:17.59
Test case 6 (wired): Warm hibernate experience with applications open						
WARM: Time to hibernate - median	00:10.29	00:12.90	00:10.07	00:10.80	00:12.46	00:09.58

Current notebook systems	Dell Latitude E6400	Dell Latitude E6400	Dell Latitude E6400	Dell Latitude E6500	Dell Latitude E6500	Dell Latitude E6500
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:19.15	00:31.86	00:15.09	00:17.65	00:31.30	00:16.94
Test case 5 (wireless): Cold hibernate experience with applications open						
COLD: Time to hibernate - median	00:10.59	00:14.04	00:12.67	00:10.75	00:17.21	00:17.64
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:20.21	00:33.55	00:22.78	00:20.21	00:35.89	00:19.12
Test case 6 (wireless): Warm hibernate experience with applications open						
WARM: Time to hibernate - median	00:10.68	00:14.18	00:10.26	00:10.90	00:13.18	00:09.73
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:23.03	00:34.31	00:16.88	00:20.23	00:32.38	00:14.77
Test case 7: Cold standby experience						
COLD: Time to standby - median	00:03.09	00:03.22	00:03.06	00:03.22	00:03.08	00:03.05
COLD: Time to resume from standby - median	00:06.81	00:03.65	00:02.15	00:02.60	00:03.52	00:02.59
Test case 8: Warm standby experience						
WARM: Time to standby - median	00:06.44	00:02.80	00:02.42	00:03.30	00:02.79	00:02.84
WARM: Time to resume from standby - median	00:02.93	00:03.74	00:02.21	00:02.42	00:03.43	00:02.33
Test case 9 (wired): Cold standby experience with applications open						
COLD: Time to standby - median	00:03.22	00:03.03	00:03.17	00:03.59	00:03.64	00:05.96
COLD: Time to connect to Exchange Server after resume from standby - median	00:11.31	00:07.74	00:07.18	00:08.53	00:05.27	00:07.56
Test case 10 (wired): Warm standby experience with applications open						
WARM: Time to standby - median	00:07.03	00:03.50	00:02.76	00:03.66	00:03.02	00:02.98
WARM: Time to connect to Exchange Server after resume from standby - median	00:07.19	00:06.99	00:07.10	00:07.98	00:03.93	00:07.13
Test case 9 (wireless): Cold standby experience with applications open						
COLD: Time to standby - median	00:03.07	00:03.54	00:03.19	00:03.68	00:03.14	00:06.95
COLD: Time to connect to Exchange Server after resume from standby - median	00:14.39	00:08.80	00:07.29	00:08.62	00:04.80	00:06.01
Test case 10 (wireless): Warm standby experience with applications open						
WARM: Time to standby - median	00:07.25	00:03.23	00:02.67	00:03.84	00:02.90	00:02.91
WARM: Time to connect to Exchange Server after resume from standby - median	00:12.75	00:07.21	00:06.88	00:06.28	00:04.78	00:05.46
Test case 11: Shutdown experience						
Time to turn system off - median	00:11.32	00:08.57	00:07.27	00:32.34	00:10.40	00:09.55
Industry standard benchmarks						
BAPCo MobileMark 2007 1.06 Battery Life Rating (Higher is better)						
Battery Life - median	379.00	374.00	350.00	362.00	323.00	317.00
Performance Qualification - median	248.00	238.00	228.00	257.00	239.00	221.00
BAPCo SYSmark 2007 Preview v1.06						
SYSmark 2007 Preview v1.06 Rating	137.00	143.00	137.00	142.00	141.00	138.00

Figure 14: Detailed test results for the current notebook systems.

Current notebook systems	Dell Latitude E5400	Dell Latitude E5400	Dell Latitude E5400	Dell Latitude E5500	Dell Latitude E5500	Dell Latitude E5500
Operating systems	**XP Professional SP3**	**Vista Ultimate SP2**	**Windows 7 Ultimate**	**XP Professional SP3**	**Vista Ultimate SP2**	**Windows 7 Ultimate**
Application responsiveness						
Test case 1a: Opening files using common office applications (local HDD)						
Word document appears - median	00:04.02	00:04.93	00:04.16	00:03.82	00:04.03	00:04.25
Excel workbook appears - median	00:02.78	00:02.68	00:02.93	00:02.46	00:02.36	00:02.81
PowerPoint slide appears - median	00:01.54	00:01.64	00:01.72	00:01.34	00:01.83	00:01.43
Test case 1b: Opening files using common office applications (wired)						
Word document appears - median	00:04.80	00:04.33	00:04.47	00:03.99	00:04.31	00:04.12
Excel workbook appears - median	00:03.00	00:02.69	00:02.67	00:02.51	00:02.45	00:02.71
PowerPoint slide appears - median	00:01.47	00:01.53	00:01.40	00:01.31	00:01.90	00:01.21
Test case 1c: Opening files using common office applications (wireless)						
Word document appears - median	00:04.81	00:05.76	00:05.43	00:04.40	00:04.75	00:04.63
Excel workbook appears - median	00:03.54	00:03.65	00:03.71	00:03.03	00:03.57	00:02.74
PowerPoint slide appears - median	00:01.84	00:02.21	00:01.63	00:01.59	00:01.85	00:01.46
Test case 2: Installing/re-inserting a USB drive						
Installing PNY USB stick - median	00:10.37	00:03.41	00:04.23	00:09.44	00:03.87	00:03.67
Installing Kingston USB stick - median	00:09.33	00:03.10	00:02.01	00:09.50	00:03.46	00:02.93
Re-inserting PNY USB stick - median	00:01.78	00:01.83	00:03.58	00:01.60	00:01.93	00:01.84
Re-inserting Kingston USB stick - median	00:01.34	00:01.33	00:01.59	00:01.43	00:01.46	00:01.31
Test case 3: Copying files locally						
Copying files to another location on the C: drive - median	00:18.38	00:41.73	00:24.49	00:26.53	00:41.96	00:23.90
Copying files from the hard drive to a USB stick - median	04:39.25	06:54.61	05:15.46	04:37.87	06:18.71	05:45.75
Copying files from a USB stick to the hard drive - median	00:42.74	00:38.02	00:39.59	00:36.59	00:38.25	00:39.66
On/off tests						
Test case 1: Boot experience						
COLD: Taskbar appears - median	00:33.83	00:33.90	00:46.32	00:35.10	00:45.32	00:40.78
COLD: Home page loads - median	00:14.62	00:02.93	00:03.85	00:12.33	00:26.69	00:23.88
Test case 2: Boot experience with Office 2007 SP2						
COLD: Time to connect to Exchange Server after booting system - median	00:15.53	00:14.09	00:06.53	00:15.92	00:13.57	00:11.13
Test case 3: Cold hibernate experience						
COLD: Time to hibernate - median	00:10.34	00:16.40	00:12.40	00:10.41	00:19.15	00:11.93
COLD: Time to resume from hibernate - median	00:17.11	00:23.96	00:15.15	00:17.96	00:24.91	00:13.78
Test case 4: Warm hibernate experience						
WARM: Time to hibernate - median	00:10.16	00:14.72	00:11.26	00:10.52	00:14.93	00:11.09
WARM: Time to resume from hibernate - median	00:16.40	00:22.81	00:14.87	00:16.69	00:21.96	00:16.34
Test case 5 (wired): Cold hibernate experience with applications open						
COLD: Time to hibernate - median	00:12.35	00:21.73	00:12.78	00:12.71	00:19.05	00:15.68
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:21.80	00:33.32	00:18.87	00:23.32	00:34.41	00:21.74
Test case 6 (wired): Warm hibernate experience with applications open						
WARM: Time to hibernate - median	00:12.28	00:17.19	00:11.88	00:12.39	00:17.05	00:11.96

Current notebook systems	Dell Latitude E5400	Dell Latitude E5400	Dell Latitude E5400	Dell Latitude E5500	Dell Latitude E5500	Dell Latitude E5500
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:21.80	00:26.56	00:16.68	00:20.62	00:26.52	00:17.60
Test case 5 (wireless): Cold hibernate experience with applications open						
COLD: Time to hibernate - median	00:13.07	00:20.83	00:12.99	00:13.14	00:18.60	00:15.27
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:26.59	00:27.03	00:18.70	00:21.81	00:27.83	00:18.69
Test case 6 (wireless): Warm hibernate experience with applications open						
WARM: Time to hibernate - median	00:12.63	00:17.31	00:11.71	00:12.60	00:17.10	00:10.68
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:24.09	00:24.21	00:17.56	00:22.21	00:23.62	00:18.24
Test case 7: Cold standby experience						
COLD: Time to standby - median	00:03.97	00:04.87	00:04.35	00:02.65	00:05.70	00:05.98
COLD: Time to resume from standby - median	00:06.50	00:03.86	00:02.84	00:07.29	00:04.44	00:02.85
Test case 8: Warm standby experience						
WARM: Time to standby - median	00:03.31	00:03.96	00:04.11	00:02.28	00:04.03	00:03.90
WARM: Time to resume from standby - median	00:02.27	00:03.84	00:02.72	00:02.37	00:03.67	00:02.90
Test case 9 (wired): Cold standby experience with applications open						
COLD: Time to standby - median	00:04.42	00:04.94	00:04.44	00:04.29	00:05.65	00:06.28
COLD: Time to connect to Exchange Server after resume from standby - median	00:09.68	00:12.54	00:05.52	00:10.93	00:08.43	00:15.36
Test case 10 (wired): Warm standby experience with applications open						
WARM: Time to standby - median	00:03.78	00:04.18	00:03.50	00:03.36	00:04.15	00:04.10
WARM: Time to connect to Exchange Server after resume from standby - median	00:06.64	00:10.84	00:04.71	00:05.71	00:10.71	00:15.60
Test case 9 (wireless): Cold standby experience with applications open						
COLD: Time to standby - median	00:04.73	00:05.28	00:04.71	00:05.42	00:05.14	00:09.18
COLD: Time to connect to Exchange Server after resume from standby - median	00:12.23	00:05.21	00:04.19	00:12.21	00:05.70	00:10.47
Test case 10 (wireless): Warm standby experience with applications open						
WARM: Time to standby - median	00:03.84	00:04.29	00:03.15	00:03.99	00:04.37	00:02.85
WARM: Time to connect to Exchange Server after resume from standby - median	00:05.50	00:04.81	00:04.15	00:07.13	00:04.82	00:04.26
Test case 11: Shutdown experience						
Time to turn system off - median	00:12.31	00:11.87	00:10.21	00:11.47	00:10.55	00:11.83
Industry standard benchmarks						
BAPCo MobileMark 2007 1.06 Battery Life Rating (Higher is better)						
Battery Life - median	333.00	309.00	319.00	322.00	306.00	301.00
Performance Qualification - median	179.00	168.00	163.00	180.00	165.00	160.00
BAPCo SYSmark 2007 Preview v1.06						
SYSmark 2007 Preview v1.06 Rating	101.00	100.00	103.00	102.00	99.00	103.00

Figure 15: Detailed test results for the current notebook systems.

Current notebook systems	Dell Latitude E4300	Dell Latitude E4300	Dell Latitude E4300	Dell Latitude E4200	Dell Latitude E4200	Dell Latitud e E4200
Operating systems	**XP Professional SP3**	**Vista Ultimate SP2**	**Windows 7 Ultimate**	**XP Professional SP3**	**Vista Ultimate SP2**	**Windows 7 Ultimate**
Application responsiveness						
Test case 1a: Opening files using common office applications (local HDD)						
Word document appears - median	00:02.93	00:03.49	00:03.45	00:04.20	00:05.08	00:04.30
Excel workbook appears - median	00:01.83	00:02.13	00:02.03	00:02.19	00:02.45	00:02.09
PowerPoint slide appears - median	00:01.03	00:01.30	00:00.99	00:01.66	00:01.45	00:01.19
Test case 1b: Opening files using common office applications (wired)						
Word document appears - median	00:02.96	00:03.83	00:03.43	00:04.13	00:04.62	00:04.84
Excel workbook appears - median	00:01.75	00:02.35	00:02.15	00:02.40	00:02.99	00:02.62
PowerPoint slide appears - median	00:01.02	00:01.60	00:01.04	00:01.29	00:01.39	00:01.30
Test case 1c: Opening files using common office applications (wireless)						
Word document appears - median	00:03.52	00:03.82	00:03.43	00:04.39	00:05.62	00:05.22
Excel workbook appears - median	00:02.47	00:02.81	00:02.63	00:02.69	00:03.57	00:03.24
PowerPoint slide appears - median	00:01.45	00:01.62	00:01.55	00:01.58	00:01.78	00:01.62
Test case 2: Installing/re-inserting a USB drive						
Installing PNY USB stick - median	00:09.35	00:03.51	00:02.74	00:09.66	00:03.01	00:03.12
Installing Kingston USB stick - median	00:09.36	00:02.86	00:02.68	00:09.86	00:03.37	00:02.84
Re-inserting PNY USB stick - median	00:01.77	00:01.93	00:01.81	00:01.82	00:01.86	00:01.67
Re-inserting Kingston USB stick - median	00:01.41	00:01.47	00:01.30	00:01.55	00:01.46	00:01.33
Test case 3: Copying files locally						
Copying files to another location on the C: drive - median	00:11.45	00:04.71	00:04.01	00:11.75	00:42.56	00:07.56
Copying files from the hard drive to a USB stick - median	05:10.78	05:09.44	05:15.68	04:53.12	05:04.14	04:46.69
Copying files from a USB stick to the hard drive - median	00:35.59	00:33.64	00:38.49	00:38.51	00:40.99	00:38.06
On/off tests						
Test case 1: Boot experience						
COLD: Taskbar appears - median	00:35.49	00:51.46	00:31.08	00:22.96	00:36.24	00:24.29
COLD: Home page loads - median	00:25.39	00:09.67	00:06.17	00:12.46	00:02.48	00:02.89
Test case 2: Boot experience with Office 2007 SP2						
COLD: Time to connect to Exchange Server after booting system - median	00:20.87	00:10.94	00:08.02	00:11.78	00:07.68	00:03.78
Test case 3: Cold hibernate experience						
COLD: Time to hibernate - median	00:08.98	00:16.68	00:09.15	00:06.90	00:18.84	00:11.33
COLD: Time to resume from hibernate - median	00:16.15	00:25.22	00:14.07	00:15.58	00:20.78	00:13.56
Test case 4: Warm hibernate experience						
WARM: Time to hibernate - median	00:09.01	00:13.88	00:09.77	00:06.90	00:17.19	00:09.37
WARM: Time to resume from hibernate - median	00:15.87	00:27.59	00:14.94	00:15.57	00:22.10	00:13.32
Test case 5 (wired): Cold hibernate experience with applications open						
COLD: Time to hibernate - median	00:10.02	00:18.34	00:14.26	00:08.27	00:21.47	00:14.25
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:20.16	00:28.43	00:20.04	00:18.03	00:27.71	00:20.39
Test case 6 (wired): Warm hibernate experience with applications open						
WARM: Time to hibernate - median	00:10.13	00:15.92	00:10.80	00:08.18	00:20.13	00:10.23

Current notebook systems	Dell Latitude E4300	Dell Latitude E4300	Dell Latitude E4300	Dell Latitude E4200	Dell Latitude E4200	Dell Latitud e E4200
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:20.40	00:29.61	00:19.28	00:17.58	00:28.68	00:19.39
Test case 5 (wireless): Cold hibernate experience with applications open						
COLD: Time to hibernate - median	00:11.12	00:18.34	00:12.36	00:08.60	00:23.07	00:12.58
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:29.63	00:28.43	00:17.84	00:19.38	00:32.21	00:16.74
Test case 6 (wireless): Warm hibernate experience with applications open						
WARM: Time to hibernate - median	00:10.97	00:15.92	00:11.30	00:08.53	00:20.38	00:10.08
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:24.88	00:29.61	00:17.46	00:17.88	00:30.56	00:16.46
Test case 7: Cold standby experience						
COLD: Time to standby - median	00:03.51	00:04.41	00:04.91	00:02.71	00:04.78	00:02.07
COLD: Time to resume from standby - median	00:06.62	00:04.73	00:02.79	00:06.12	00:03.88	00:02.73
Test case 8: Warm standby experience						
WARM: Time to standby - median	00:04.62	00:05.89	00:05.21	00:02.69	00:03.67	00:01.88
WARM: Time to resume from standby - median	00:02.43	00:05.38	00:02.61	00:06.18	00:03.46	00:02.66
Test case 9 (wired): Cold standby experience with applications open						
COLD: Time to standby - median	00:04.16	00:04.68	00:04.97	00:02.89	00:04.27	00:02.17
COLD: Time to connect to Exchange Server after resume from standby - median	00:08.35	00:06.43	00:07.54	00:07.63	00:05.64	00:07.37
Test case 10 (wired): Warm standby experience with applications open						
WARM: Time to standby - median	00:04.94	00:06.01	00:05.33	00:02.94	00:03.62	00:02.31
WARM: Time to connect to Exchange Server after resume from standby - median	00:07.84	00:06.61	00:07.59	00:07.40	00:05.21	00:07.50
Test case 9 (wireless): Cold standby experience with applications open						
COLD: Time to standby - median	00:04.03	00:04.68	00:05.56	00:03.17	00:03.82	00:02.31
COLD: Time to connect to Exchange Server after resume from standby - median	00:09.86	00:06.43	00:04.52	00:07.91	00:04.84	00:03.53
Test case 10 (wireless): Warm standby experience with applications open						
WARM: Time to standby - median	00:04.78	00:06.01	00:05.30	00:02.59	00:03.50	00:02.06
WARM: Time to connect to Exchange Server after resume from standby - median	00:12.13	00:06.61	00:04.43	00:07.39	00:04.10	00:04.56
Test case 11: Shutdown experience						
Time to turn system off - median	00:32.83	00:10.90	00:09.15	00:12.65	00:11.96	00:07.79
Industry standard benchmarks						
BAPCo MobileMark 2007 1.06 Battery Life Rating (Higher is better)						
Battery Life - median	382.00	363.00	383.00	421.00	427.00	438.00
Performance Qualification - median	267.00	257.00	242.00	199.00	183.00	184.00
BAPCo SYSmark 2007 Preview v1.06						
SYSmark 2007 Preview v1.06 Rating	142.00	148.00	141.00	100.00	91.00	108.00

Figure 16: Detailed test results for the current notebook systems.

Current notebook systems	Dell Latitude XT2	Dell Latitude XT2	Dell Latitude XT2
Operating systems	**XP Professional SP3**	**Vista Ultimate SP2**	**Windows 7 Ultimate**
Application responsiveness			
Test case 1a: Opening files using common office applications (local HDD)			
Word document appears - median	00:03.92	00:04.17	00:04.45
Excel workbook appears - median	00:02.30	00:02.07	00:02.52
PowerPoint slide appears - median	00:01.08	00:01.54	00:01.61
Test case 1b: Opening files using common office applications (wired)			
Word document appears - median	00:04.03	00:05.09	00:04.62
Excel workbook appears - median	00:02.41	00:03.07	00:02.89
PowerPoint slide appears - median	00:01.28	00:01.66	00:01.57
Test case 1c: Opening files using common office applications (wireless)			
Word document appears - median	00:04.40	00:05.04	00:06.31
Excel workbook appears - median	00:02.95	00:03.53	00:04.19
PowerPoint slide appears - median	00:01.66	00:01.93	00:02.86
Test case 2: Installing/re-inserting a USB drive			
Installing PNY USB stick - median	00:09.21	00:03.37	00:03.12
Installing Kingston USB stick - median	00:09.31	00:02.81	00:02.72
Re-inserting PNY USB stick - median	00:01.62	00:01.84	00:01.65
Re-inserting Kingston USB stick - median	00:01.39	00:01.48	00:01.58
Test case 3: Copying files locally			
Copying files to another location on the C: drive - median	00:42.42	00:19.34	00:10.01
Copying files from the hard drive to a USB stick - median	05:07.28	05:00.22	04:47.67
Copying files from a USB stick to the hard drive - median	00:43.73	00:59.62	00:38.58
On/off tests			
Test case 1: Boot experience			
COLD: Taskbar appears - median	00:24.43	00:32.53	00:21.53
COLD: Home page loads - median	00:10.26	00:03.27	00:04.50
Test case 2: Boot experience with Office 2007 SP2			
COLD: Time to connect to Exchange Server after booting system - median	00:19.34	00:05.98	00:03.37
Test case 3: Cold hibernate experience			
COLD: Time to hibernate - median	00:05.52	00:14.47	00:09.07
COLD: Time to resume from hibernate - median	00:13.68	00:22.33	00:14.81
Test case 4: Warm hibernate experience			
WARM: Time to hibernate - median	00:05.27	00:12.11	00:08.07
WARM: Time to resume from hibernate - median	00:11.93	00:24.28	00:13.37
Test case 5 (wired): Cold hibernate experience with applications open			
COLD: Time to hibernate - median	00:06.90	00:18.02	00:10.30
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:16.78	00:27.98	00:30.86
Test case 6 (wired): Warm hibernate experience with applications open			
WARM: Time to hibernate - median	00:06.67	00:15.59	00:09.49
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:13.77	00:24.59	00:18.90

Test case 5 (wireless): Cold hibernate experience with applications open			
COLD: Time to hibernate - median	00:07.45	00:18.87	00:10.12
COLD: Time to connect to Exchange Server after resume from hibernate - median	00:20.30	00:25.42	00:17.43
Test case 6 (wireless): Warm hibernate experience with applications open			
WARM: Time to hibernate - median	00:06.70	00:17.62	00:09.86
WARM: Time to connect to Exchange Server after resume from hibernate - median	00:20.15	00:26.11	00:16.96
Test case 7: Cold standby experience			
COLD: Time to standby - median	00:02.26	00:03.37	00:02.87
COLD: Time to resume from standby - median	00:05.18	00:04.21	00:02.27
Test case 8: Warm standby experience			
WARM: Time to standby - median	00:02.21	00:02.31	00:03.54
WARM: Time to resume from standby - median	00:04.81	00:04.53	00:02.18
Test case 9 (wired): Cold standby experience with applications open			
COLD: Time to standby - median	00:02.65	00:02.96	00:02.90
COLD: Time to connect to Exchange Server after resume from standby - median	00:06.47	00:10.87	00:06.61
Test case 10 (wired): Warm standby experience with applications open			
WARM: Time to standby - median	00:02.59	00:02.77	00:03.68
WARM: Time to connect to Exchange Server after resume from standby - median	00:08.84	00:09.08	00:06.37
Test case 9 (wireless): Cold standby experience with applications open			
COLD: Time to standby - median	00:02.70	00:03.81	00:02.92
COLD: Time to connect to Exchange Server after resume from standby - median	00:13.40	00:05.06	00:04.12
Test case 10 (wireless): Warm standby experience with applications open			
WARM: Time to standby - median	00:02.50	00:03.33	00:03.68
WARM: Time to connect to Exchange Server after resume from standby - median	00:13.14	00:04.98	00:04.12
Test case 11: Shutdown experience			
Time to turn system off - median	00:09.71	00:11.81	00:06.33
Industry standard benchmarks			
BAPCo MobileMark 2007 1.06 Battery Life Rating (Higher is better)			
Battery Life - median	249.00	281.00	304.00
Performance Qualification - median	203.00	162.00	171.00
BAPCo SYSmark 2007 Preview v1.06			
SYSmark 2007 Preview v1.06 Rating	99.00	86.00	105.00

Figure 17: Detailed test results for the current notebook systems.

Appendix C – Corpus contents

The 426MB (446,697,762 bytes) test workload included the following files:

11/6/2005	7:14 PM	1,161,163	19th Century Asylum.JPG
9/3/2007	6:10 PM	14,239	2008 calendar10 (2).xlsx
9/3/2007	6:10 PM	14,239	2008 calendar10.xlsx
9/3/2007	11:35 PM	617,349	3boat-Jerome10 (2).docx
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9/9/2007	9:38 PM	547,570	Microsoft© Office74.pptx
9/9/2007	9:39 PM	587,596	Microsoft© Office75.pptx
9/9/2007	9:40 PM	247,814	Microsoft© Office76.pptx
9/9/2007	9:40 PM	386,262	Microsoft© Office77.pptx
9/9/2007	9:41 PM	435,885	Microsoft© Office78.pptx
9/9/2007	9:42 PM	260,788	Microsoft© Office79.pptx
9/11/2007	12:48 AM	1,672,311	Microsoft© Office7A.pptx
9/11/2007	12:48 AM	1,672,332	Microsoft© Office7B.pptx
9/11/2007	12:49 AM	1,672,329	Microsoft© Office7C.pptx
9/11/2007	12:49 AM	1,672,323	Microsoft© Office7D.pptx
9/11/2007	12:50 AM	1,672,355	Microsoft© Office7E.pptx
9/9/2007	12:51 PM	1,464,915	Microsoft© Office8.pptx
9/9/2007	9:44 PM	349,939	Microsoft© Office80.pptx
9/9/2007	9:44 PM	298,069	Microsoft© Office81.pptx
9/9/2007	9:57 PM	635,975	Microsoft© Office82.pptx
9/9/2007	10:00 PM	451,882	Microsoft© Office83.pptx
9/12/2007	12:00 AM	1,465,093	Microsoft© Office8A.pptx
9/12/2007	12:38 AM	1,465,103	Microsoft© Office8B.pptx
9/12/2007	12:38 AM	1,465,058	Microsoft© Office8C.pptx
9/12/2007	12:39 AM	1,465,089	Microsoft© Office8D.pptx
9/12/2007	12:39 AM	1,465,168	Microsoft© Office8E.pptx
9/9/2007	12:51 PM	803,809	Microsoft© Office9.pptx
9/9/2007	4:07 PM	702,034	Microsoft© Office9.rar

9/9/2007	1:21 AM	69,239	MONDAY.docx
10/1/2005	8:20 PM	1,292,403	Mountain stream.JPG
10/1/2005	8:18 PM	1,263,306	Muckross House.JPG
9/9/2007	2:33 AM	161,083	MysteriousStranger.docx
12/19/2003	11:42 PM	92,160	NBA01_02.xls
12/19/2003	11:42 PM	136,704	nba02_03.xls
12/19/2003	11:42 PM	29,184	nfl01.xls
12/19/2003	11:42 PM	68,096	NFL2002ratings.xls
12/19/2003	11:42 PM	216,576	nfl2002temp.xls
9/9/2007	3:55 PM	1,250,320	NicholasNickleby.docx
12/19/2003	11:42 PM	59,392	normalsim.xls
12/19/2003	11:43 PM	27,136	normalsimtemp.xls
9/9/2007	2:30 AM	828,326	OldCuriosityShop.docx
9/9/2007	4:07 PM	827,783	OldCuriosityShop.rar
9/9/2007	2:15 AM	625,145	OliverTwist.docx
9/3/2007	11:23 PM	417,426	Organization Chart10.pptx
9/9/2007	1:40 AM	1,230,430	OurMutualFriend.docx
9/16/2005	8:39 PM	1,045,606	Out to the valley of Cashel.JPG
7/28/2003	7:56 AM	26,624	Pacific Guitar Sales.xls
9/3/2007	6:36 PM	201,756	Pan10.docx
9/9/2007	12:42 AM	1,195,872	PickWickPapers.docx
9/9/2007	1:59 AM	177,375	Pitchbook.pptx
9/3/2007	6:18 PM	357,410	Plant10.pptx
12/19/2003	11:42 PM	15,872	pmt.xls
12/19/2003	11:42 PM	13,824	pmttemp.xls
9/3/2007	5:48 PM	14,454,815	PPTfiles10.rar
9/9/2007	10:57 AM	42,444	Presentation1.pptx
9/3/2007	6:19 PM	136,034	Presentation10.pptx
9/9/2007	9:50 PM	317,684	presentation2.pptx
9/9/2007	9:51 PM	74,504	presentation3.pptx
9/9/2007	9:51 PM	134,559	Presentation4.pptx
9/9/2007	9:52 PM	53,903	Presentation5.pptx
12/19/2003	11:42 PM	16,384	pressdata.xls
9/9/2007	12:32 AM	277,232	PrinceandPauper.docx
9/3/2007	5:33 PM	144,246	Process diagram10.pptx
12/19/2003	11:42 PM	28,160	prodmix.xls
12/19/2003	11:42 PM	26,112	prodmixtemp.xls
9/9/2007	2:11 AM	87,243	Product Name.pptx
9/9/2007	2:21 AM	300,846	Product Name5.pptx
9/9/2007	2:00 AM	283,493	Product Name].pptx
9/3/2007	6:10 PM	18,598	Project compare10.xlsx
9/9/2007	2:07 AM	206,208	Project Overview.pptx
9/9/2007	1:53 AM	11,852	Purchase order with sales tax1.xlsx
9/9/2007	1:49 AM	16,460	Purchase order(2)1.xlsx
9/9/2007	1:50 AM	15,854	Purchase order(3)1.xlsx
9/9/2007	1:51 AM	15,734	Purchase order(4)1.xlsx
9/9/2007	1:48 AM	21,972	PURCHASE ORDER.docx
9/3/2007	6:16 PM	15,819	Purchase order10.xlsx
12/19/2003	11:42 PM	13,824	PV.xls
12/19/2003	11:42 PM	13,824	PVtemp.xls

9/9/2007	2:13 AM	75,931	Quarterly Results and.pptx
12/19/2003	11:42 PM	41,984	randdemo.xls
12/19/2003	11:43 PM	27,136	randdemotemp.xls
9/9/2007	2:18 AM	76,882	Recommending a Strategy.pptx
12/19/2003	11:42 PM	17,920	ReorderPoint_Backorder.xls
12/19/2003	11:42 PM	17,920	ReorderPoint_Lostsales.xls
9/9/2007	2:23 AM	122,701	Reporting Progress or Status.pptx
9/9/2007	2:06 AM	161,158	Return on Investment.pptx
10/1/2005	8:19 PM	1,288,715	Ring of Kerry.JPG
11/5/2005	6:39 PM	1,070,887	River Lee rising.JPG
11/6/2005	7:13 PM	1,109,309	River Rising.JPG
9/9/2007	2:27 PM	632,401	RoughingIt.docx
9/11/2007	12:03 AM	45,764	s1-s10.rar
12/19/2003	11:42 PM	13,824	s10_1.xls
12/19/2003	11:42 PM	13,824	s10_10.xls
12/19/2003	11:42 PM	13,824	s10_2.xls
12/19/2003	11:42 PM	15,872	s10_3.xls
12/19/2003	11:42 PM	13,824	s10_4.xls
12/19/2003	11:42 PM	13,824	s10_5.xls
12/19/2003	11:42 PM	14,336	s10_6.xls
12/19/2003	11:42 PM	97,280	S10_7.xls
12/19/2003	11:42 PM	97,280	s10_8.xls
12/19/2003	11:42 PM	13,824	s10_9.xls
9/11/2007	12:04 AM	10,898	s24.rar
12/19/2003	11:42 PM	13,824	s24_1.xls
12/19/2003	11:42 PM	13,824	s24_2.xls
12/19/2003	11:42 PM	13,824	s24_3.xls
12/19/2003	11:42 PM	13,824	s24_4.xls
12/19/2003	11:42 PM	13,824	s24_5.xls
12/19/2003	11:42 PM	13,824	s24_6.xls
12/19/2003	11:42 PM	13,824	s24_7.xls
9/11/2007	12:04 AM	11,542	s25.zip
12/19/2003	11:42 PM	14,848	s25_1.xls
12/19/2003	11:42 PM	15,360	s25_2.xls
12/19/2003	11:42 PM	14,848	s25_3.xls
12/19/2003	11:42 PM	14,848	s25_4.xls
12/19/2003	11:42 PM	15,360	s25_5.xls
9/11/2007	12:05 AM	12,276	s26.zip
12/19/2003	11:42 PM	16,384	s26_1.xls
12/19/2003	11:42 PM	16,896	s26_2.xls
12/19/2003	11:42 PM	19,968	s26_3.xls
12/19/2003	11:42 PM	15,360	s26_4.xls
12/19/2003	11:42 PM	16,896	s27_1.xls
12/19/2003	11:42 PM	17,920	s27_2.xls
12/19/2003	11:42 PM	16,896	s27_3.xls
12/19/2003	11:42 PM	15,360	s27_4.xls
12/19/2003	11:42 PM	29,696	s28_1.xls
12/19/2003	11:42 PM	17,408	s28_2.xls
12/19/2003	11:42 PM	23,552	s29_1.xls
12/19/2003	11:42 PM	23,552	s29_2.xls

12/19/2003	11:42 PM	16,384	s29_3.xls
12/19/2003	11:42 PM	26,112	s29_4.xls
12/19/2003	11:42 PM	15,872	s29_5.xls
12/19/2003	11:42 PM	264,192	S30_1.xls
12/19/2003	11:42 PM	259,584	s30_2.xls
12/19/2003	11:42 PM	56,832	s30_3.xls
12/19/2003	11:42 PM	13,824	s30_4.xls
12/19/2003	11:42 PM	13,824	s30_5.xls
12/19/2003	11:42 PM	22,016	S42problems1thru4.xls
12/19/2003	11:42 PM	21,504	S42problems1thru5.xls
9/11/2007	12:06 AM	149,171	s58.zip
12/19/2003	11:42 PM	404,480	s58_1.xls
12/19/2003	11:42 PM	207,360	s58_2.xls
12/19/2003	11:42 PM	17,408	s66_1.xls
12/19/2003	11:42 PM	16,896	s66_2.xls
12/19/2003	11:42 PM	13,824	s66_3.xls
9/3/2007	6:20 PM	30,418	Sales effectiveness.xlsx
9/9/2007	1:52 AM	15,474	Sales order1.xlsx
9/9/2007	2:20 AM	164,904	Sales proposal.pptx
9/9/2007	2:17 AM	54,168	Sales Training.pptx
9/9/2007	9:58 PM	54,185	Sales Training2.pptx
9/9/2007	10:02 PM	48,145	Sales Training3.pptx
1/24/2008	10:26 AM	109	Search
1/24/2008	12:21 PM	0	SearchCorpus.txt
9/9/2007	2:12 AM	68,502	Selling a Product or Service.pptx
12/19/2003	11:42 PM	18,944	ServiceLevelReorder.xls
9/9/2007	1:46 AM	12,139	Software Inventory1.xlsx
9/9/2007	9:55 PM	68,590	Staff Training.pptx
7/28/2003	7:56 AM	150,016	Staff.xls
7/28/2003	7:56 AM	142,336	Staff2.xls
9/3/2007	5:31 PM	139,054	Status charts10.pptx
11/6/2005	7:15 PM	1,744,412	Stone path.JPG
9/11/2007	12:15 AM	1,741,369	Stone path.zip
11/6/2005	7:15 PM	1,752,998	Stone staircase.JPG
9/11/2007	12:18 AM	837,626	Supply Requisition Form2.xlsx
9/11/2007	12:18 AM	838,128	Supply Requisition Form3.xlsx
9/11/2007	12:19 AM	837,886	Supply Requisition Form4.xlsx
9/11/2007	12:20 AM	837,884	Supply Requisition Form5.xlsx
1/24/2008	10:20 AM	1,463,296	Test methodology.doc
1/16/2000	5:48 PM	3,941,355	test.mp3
9/9/2007	9:56 PM	90,037	Title of Training Presentation.pptx
9/9/2007	10:01 PM	58,226	Title of Training Presentation2.pptx
9/9/2007	12:29 AM	281,104	TomSawyer.docx
9/9/2007	12:27 AM	124,045	TomSawyerAbroad.docx
9/9/2007	10:03 PM	172,469	Training Presentation.pptx
12/19/2003	11:42 PM	18,944	transport.xls
12/19/2003	11:42 PM	16,384	transporttemp.xls
9/9/2007	1:14 AM	25,007	Treasury analysis worksheet1.xlsx
7/28/2003	7:56 AM	27,136	TreeOrders.xls
9/9/2007	12:24 AM	504,476	TwoCities.docx

12/19/2003	11:42 PM	177,664	valentine.xls
12/19/2003	11:43 PM	13,824	valentinetemp.xls
9/9/2007	1:58 AM	357,867	Welcome!.pptx
9/9/2007	2:21 AM	121,946	Welcome!2.pptx
9/9/2007	10:56 AM	174,213	Widescreen Presentation.pptx
9/3/2007	6:13 PM	38,404	worker hours10.xlsx

About Principled Technologies

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.
When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help you assess how it will fare against its competition, its performance, whether it's ready to go to market, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

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