

## A performance comparison of current and previous generation Dell OptiPlex desktop 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™ OptiPlex™ desktop systems. We tested one current Dell OptiPlex desktop system:

- Dell OptiPlex 960 with Intel® Core™ 2 Duo Processor E8400

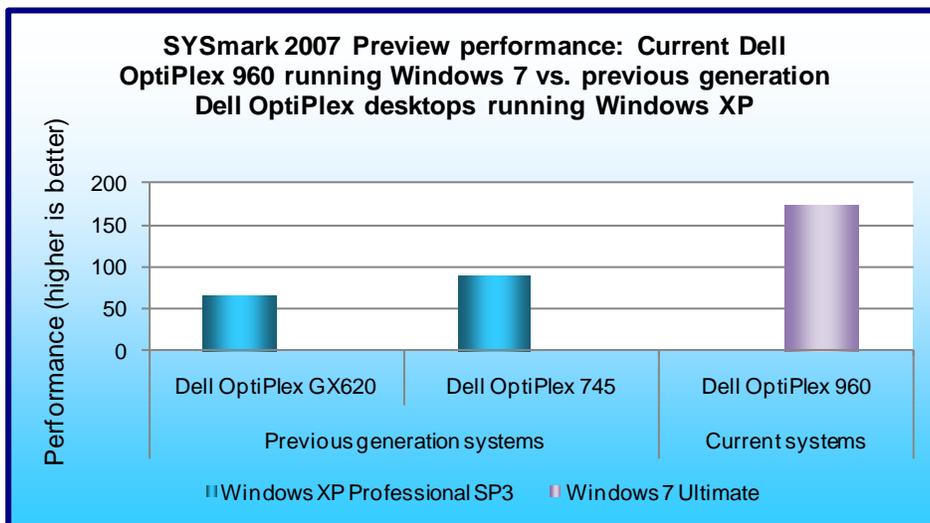
We compared performance of Microsoft Windows® 7 Ultimate (Windows 7), Microsoft Windows Vista® Ultimate SP2 (Windows Vista), and Windows® XP Professional SP3 (Windows XP) on one current Dell OptiPlex desktop and of Windows XP on the following two previous generation Dell OptiPlex desktops:

- Dell OptiPlex GX620 desktop with Intel® Pentium® 4 Processor 630 (4-year-old system)
- Dell OptiPlex 745 desktop with Intel Pentium Processor E2160 (3-year-old system)

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

### KEY FINDINGS

- The current Dell OptiPlex 960 desktop running Windows 7 provided 165% greater SYSmark Preview 2007 system performance than that of the previous generation Dell OptiPlex GX620. (See Figure 1.)
- The current Dell OptiPlex 960 desktop running Windows 7 provided 97% greater SYSmark Preview 2007 system performance than that of the previous generation Dell OptiPlex 745. (See Figure 1.)
- The current Dell OptiPlex 960 desktop running Windows 7 provided up to 12% faster application responsiveness than that of the previous generation Dell OptiPlex desktops. (See Figure 2.)
- The current Dell OptiPlex 960 desktop running Windows 7 provided up to 22% faster system responsiveness than that of the previous generation Dell OptiPlex desktops (See Figure 3.)



**Figure 1: SYSMARK 2007 Preview performance results for our test systems. Higher numbers are better.**

for both the current Dell OptiPlex 960 running Windows 7 and the previous generation Dell OptiPlex desktops running Windows XP. The current Dell OptiPlex 960 running Windows 7 outperformed the previous generation Dell OptiPlex GX620 by 165 percent, and outperformed the previous generation Dell OptiPlex 745 by 97 percent.

We compared the systems in three categories of tests: performance, application responsiveness, and system responsiveness. We used SYSMARK 2007 Preview v1.06 to test overall system performance. We used custom hand-timed tests to measure application and system responsiveness. In most instances, we found the current Dell OptiPlex 960 desktop running Windows 7 outperformed the previous generation Dell OptiPlex desktops running Windows XP.

Figure 1 shows the SYSMARK 2007 Preview performance

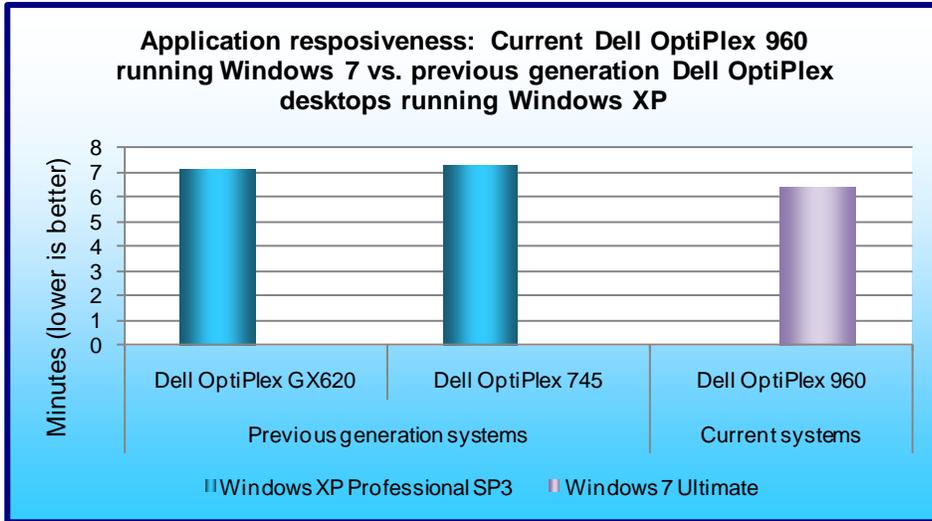


Figure 2: Application responsiveness results for our test systems – the sum of the averages for all application responsiveness tests. Lower numbers are better.

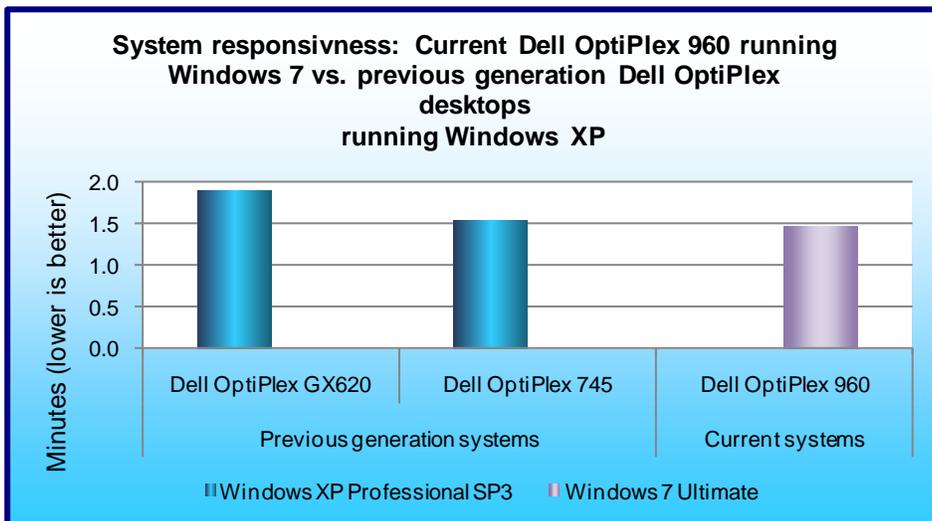


Figure 3: System responsiveness results for our test systems – the sum of the average for all system responsiveness tests. Lower numbers are better.

Figure 2 shows the application responsiveness for both the current Dell OptiPlex 960 running Windows 7 and the previous generation Dell OptiPlex desktops running Windows XP. The current Dell OptiPlex 960 running Windows 7 responded 12 percent faster on our application tests than the previous generation Dell OptiPlex 745, or 54 seconds faster. The current Dell OptiPlex 960 running Windows 7 also responded 11 percent faster than the previous generation Dell OptiPlex GX620, or 47 seconds faster.

Figure 3 shows the system responsiveness for both the current Dell OptiPlex 960 running Windows 7 and the previous generation Dell OptiPlex desktops running Windows XP. The current Dell OptiPlex 960 running Windows 7 responded 22 percent faster than the previous generation Dell OptiPlex GX620, or 25 seconds faster. The current Dell OptiPlex 960 running Windows 7 also responded 4 percent faster than the previous generation Dell OptiPlex 745, or 4 seconds faster.

## 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>.

## Test results

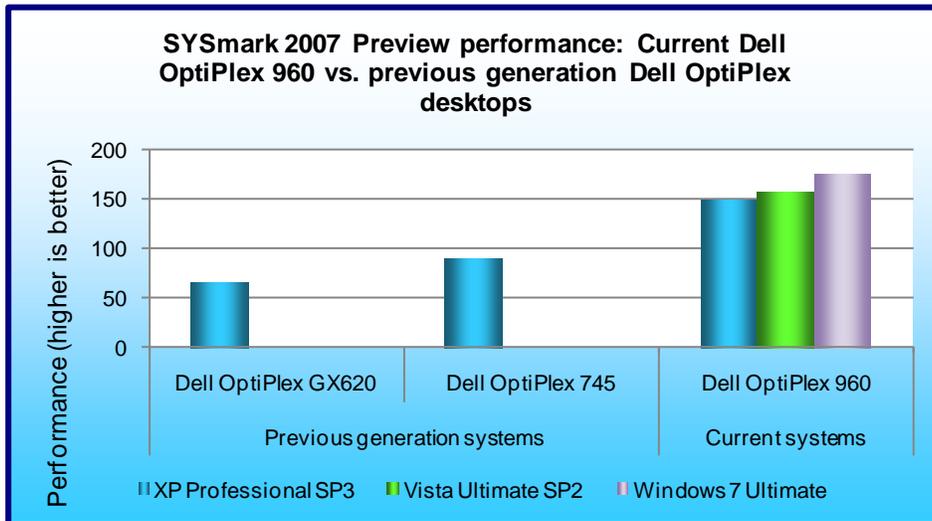


Figure 4: SYSmark 2007 Preview performance results for our test systems. Higher numbers are better.

Figure 4 shows the SYSmark 2007 Preview performance for both the current Dell OptiPlex 960 running Windows 7, Windows Vista, and Windows XP, and the previous generation Dell OptiPlex desktops running Windows XP. The current Dell OptiPlex 960 running Windows 7 outperformed the previous generation Dell OptiPlex desktops by an average of 131 percent. Windows 7, when running on the current Dell OptiPlex 960, demonstrated an 11 percent performance improvement over Windows Vista.

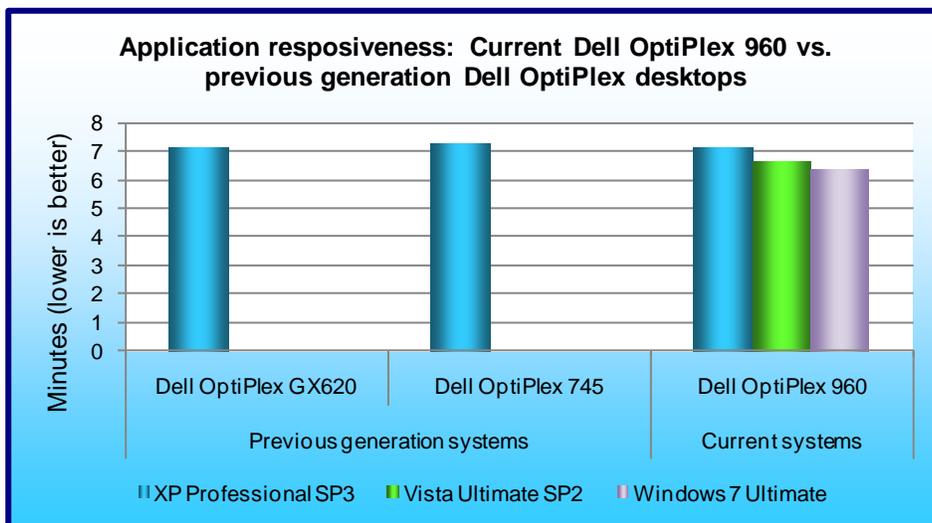
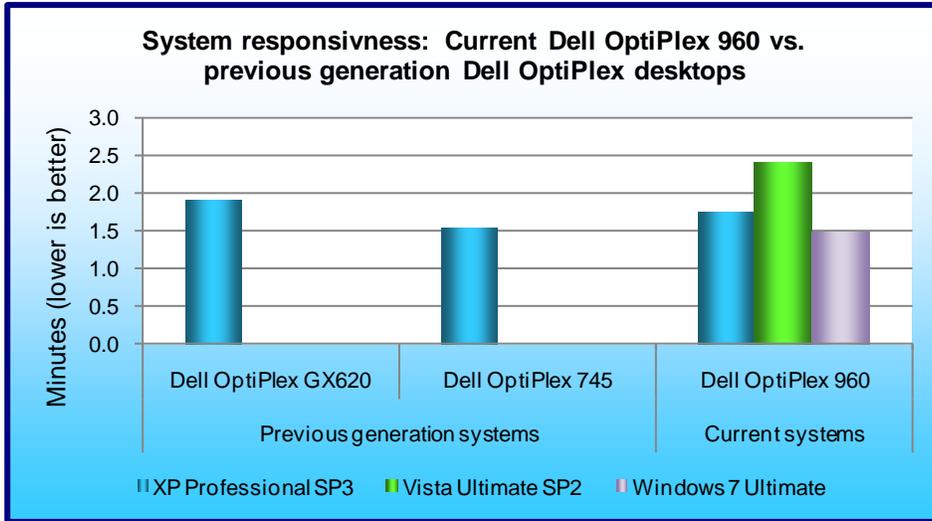


Figure 5: Application responsiveness results for our test systems – the sum of the averages for all application responsiveness tests. Lower numbers are better.

Figure 5 shows the application responsiveness for both the current Dell OptiPlex 960 running Windows 7, Windows Vista, and Windows XP, and the previous generation Dell OptiPlex desktops running Windows XP. The current Dell OptiPlex 960 running Windows 7 responded faster on our application tests than the previous generation Dell OptiPlex desktops by an average of 12 percent, for an average improvement of 50 seconds. Windows 7, when running on the current Dell OptiPlex 960, demonstrated a 5 percent improvement in application responsiveness over Windows Vista, for an improvement of 19 seconds.



**Figure 6: System responsiveness results for our test systems – the sum of the averages for all system responsiveness tests. Lower numbers are better.**

Figure 6 shows the system responsiveness for both the current Dell OptiPlex 960 desktop running Windows 7, Windows Vista, and Windows XP, and the previous generation Dell OptiPlex 960 desktops running Windows XP. The current Dell OptiPlex 960 desktop running Windows 7 responded faster than the previous generation Dell OptiPlex desktops by an average of 13 percent, for an average improvement of 15 seconds. Windows 7, when running on the current Dell OptiPlex 960, demonstrated a 38 percent improvement in system responsiveness over

Windows Vista, for an improvement of 55 seconds.

Figure 7 shows a more detailed breakdown of application and system responsiveness results for the current Dell OptiPlex 960 desktop running Windows 7 and the previous generation Dell OptiPlex GX620 desktop running Windows XP. The current Dell OptiPlex 960 running Windows 7 completed the below tasks over 38 seconds faster than did the previous generation Dell OptiPlex GX620. For 100 users, this translates over 1 hour of time saved moving to the current Dell OptiPlex 960 running Windows 7.

Application responsiveness and system responsiveness tasks	Previous generation Dell OptiPlex GX620 running Windows XP	Current Dell OptiPlex 960 running Windows 7	Time saved with upgrading to current Dell OptiPlex 960 desktop
Opening local Word document	5.30s	2.47s	2.83s
Opening local Excel spreadsheet	2.25s	1.95s	0.30s
Opening local PowerPoint deck	1.21s	0.76s	0.45s
Opening Word document over network connection	5.79s	2.54s	3.25s
Opening Excel spreadsheet over network connection	2.41s	2.01s	0.40s
Opening PowerPoint deck over network connection	1.28s	0.83s	0.45s
Copying files locally	13.66s	3.77s	9.89s
Copying files to a USB stick	286.84s	285.01s	1.83s
Copying files from a USB stick to hard drive	31.43s	29.39s	2.04s
Playing a widescreen format DVD - time to first frame	26.50s	23.88s	2.62s
Playing a standard format DVD – time to first frame	26.19s	19.66s	6.53s

Application responsiveness and system responsiveness tasks	Previous generation Dell OptiPlex GX620 running Windows XP	Current Dell OptiPlex 960 running Windows 7	Time saved with upgrading to current Dell OptiPlex 960 desktop
Time to boot, launch Microsoft Outlook and connect to Exchange server	39.53s	40.25s	-0.72s
Standby	3.48s	2.47s	1.01s
Resume from standby	8.85s	4.60s	4.25s
Shutdown	12.00s	6.88s	5.12s
<b>Total</b>	<b>435.29s</b>	<b>397.08s</b>	<b>38.21s</b>

Figure 7: Application and system responsiveness, in seconds. Lower numbers are better.

## Test methodology

In this section, we provide the methodology for three sets of tests: SYSmark 2007 Preview 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.

### 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.

#### **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 -1` 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 -1` 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 testusb1 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).

## Playing a DVD

This test requires a stopwatch and the following two DVDs:

- Lord of the Rings: The Return of the King – Widescreen Edition
- Monty Python’s Flying Circus

### Setting up the test

1. Reboot the system.
2. Allow the system to idle for 3 minutes before running the test.

### Running the test

1. Open Windows Media Player.
2. Simultaneously insert the Lord of the Rings DVD and start the timer.
3. Stop the timer when the first frame begins to play. Note: This may be any of the following:
  - a. the FBI anti-piracy screen
  - b. Introductory scenes prior to the DVD menu appearing
  - c. A warning about the opinions expressed not being those of the studio
  - d. A splash screen for the movie studio
  - e. Previews
  - f. The DVD menu itself
4. Close Windows Media Player, and remove the DVD.
5. Open Windows Media Player.
6. Simultaneously insert the Monty Python’s Flying Circus DVD and start the timer.
7. Stop the timer when the first frame begins to play. Note: This may be any of the following:
  - a. The FBI anti-piracy screen
  - b. Introductory scenes prior to the DVD menu appearing
  - c. A warning about the opinions expressed not being those of the studio
  - d. A splash screen for the movie studio
  - e. Previews
  - f. The DVD menu itself
8. Close Windows Media Player, and remove the DVD.
9. Repeat steps 1 through 8 two more times.

## 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 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

Figure 8 presents the current desktop system and the details of its configuration.

Current desktop system	Dell OptiPlex 960
<b>General</b>	
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P,2C,2L / MP
System power management policy Windows XP	Dell Desktop Power Methodology
System power management policy Windows Vista	Dell Desktop Power Methodology
System power management policy Windows 7	Dell Desktop Power Methodology
Processor power-saving option	EIST
<b>CPU</b>	
Vendor	Intel
Name	Core 2 Duo
Model number	E8400
Stepping	E0
Socket type and number of pins	LGA775
Core frequency (GHz)	3.00
Front-side bus frequency (MHz)	1,333
L1 cache	32 KB + 32 KB (per core)
L2 cache (MB)	6
<b>Platform</b>	
Vendor	Dell
Motherboard model number	0F428D
Motherboard chipset	Intel Q45
Motherboard revision number	03
System/motherboard serial number	DBLVTK1
BIOS name and version	Dell A04 (04/29/2009)
BIOS settings	Default
<b>Memory module(s)</b>	
Vendor and model number	Samsung M378T5663EH3-CF7
Type	PC2-6400
Speed (MHz)	800
Speed running in the system (MHz)	800
Timing/Latency (tCL-tRCD-tRP-tRASmin)	6-6-6-18
Size (MB)	4,096
Number of memory module(s)	2 x 2,048 MB
Channel (single/dual)	Dual
<b>Hard disk</b>	
Vendor and model number	Seagate ST3160318AS
Size (GB)	160
Buffer size (MB)	8
RPM	7,200
Type	SATA 3.0 Gb/s
Controller	Intel 82801JB (ICH10)
Driver Windows XP	Intel 8.8.0.1009 (02/11/2009)
Driver Windows Vista	Intel 8.8.0.1009 (02/11/2009)
Driver Windows 7	Intel 8.9.2.1002 (08/07/2009)

<b>Current desktop system</b>	<b>Dell OptiPlex 960</b>
<b>Operating system</b>	
<b>Windows XP</b>	
Name	Microsoft Windows XP Professional
Build number	2600
Service pack	3
File system	NTFS
Kernel	ACPI Multiprocessor PC
Language	English
Microsoft DirectX version	9.0c
<b>Windows Vista</b>	
Name	Microsoft Windows Vista Ultimate
Build number	6002
Service pack	2
File system	NTFS
Kernel	ACPI x86-based PC
Language	English
Microsoft DirectX version	10
<b>Windows 7</b>	
Name	Microsoft Windows 7 Ultimate
Build number	7600
Service Pack	NA
File system	NTFS
Kernel	ACPI x86-based PC
Language	English
Microsoft DirectX version	11
<b>Graphics</b>	
Vendor and model number	ATI Radeon HD 3470
Type	Discrete
Chipset	ATI Radeon Graphics Processor
BIOS version	113-B40309-107
Total available graphics memory (MB)	1,662
Dedicated video memory (MB)	256
System video memory (MB)	NA
Shared system memory (MB)	1,406
Resolution	1,280 x 1,024 x 32 bit
Driver Windows XP	ATI 8.650.0.0 (8/13/2009)
Driver Windows Vista	ATI 8.593.0.0 (03/12/2009)
Driver Windows 7	ATI 8.640.0.0 (07/14/2009)
<b>Sound card/subsystem</b>	
Vendor and model number	SoundMAX Integrated Digital High Definition Audio
Driver Windows XP	Analog Devices 5.10.1.7255 (05/18/2009)
Driver Windows Vista	Analog Devices 6.10.1.5853 (02/13/2009)
Driver Windows 7	Analog Devices 6.10.1.7250 (04/23/2009)
<b>Ethernet</b>	
Vendor and model number	Intel 82567LM-3 Gigabit
Driver Windows XP	Intel 10.3.39.0 (06/05/2008)
Driver Windows Vista	Intel 10.7.31.250 (07/30/2009)

<b>Current desktop system</b>		<b>Dell OptiPlex 960</b>
Driver Windows 7	Intel 11.0.41.250 (07/31/2009)	
<b>Optical drive(s)</b>		
Vendor and model number	PLDS DH-16AAS	
Type	DVD-RW	
Interface	SATA	
Dual/Single layer	Dual	
<b>USB ports</b>		
Number	8	
Type	USB 2.0	
Other	eSATA	
<b>IEEE 1394 ports</b>		
Number	NA	
<b>Monitor</b>		
LCD type	Dell E2210H	
Screen size	21.5"	
Refresh rate (Hz)	60	

Figure 8. Detailed system configuration for the current Dell OptiPlex desktop.

Figure 9 presents each previous generation desktop system and the details of its configuration.

<b>Previous generation desktop systems</b>	<b>Dell OptiPlex GX620</b>	<b>Dell OptiPlex 745</b>
<b>General</b>		
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P,1C,2L / MP	1P,1C,2L / MP
System power management policy Windows XP	Dell Desktop Power Methodology	Dell Desktop Power Methodology
System power management policy Windows Vista	NA	NA
System power management policy Windows 7	NA	NA
Processor power-saving option	EIST	EIST
<b>CPU</b>		
Vendor	Intel	Intel
Name	Pentium 4	Pentium
Model number	630	E2160
Stepping	N0	L2
Socket type and number of pins	LGA 775	LGA 775
Core frequency (GHz)	3.00	1.80
Front-side bus frequency (MHz)	800	800
L1 cache	16 KB + 12 KB (per core)	32 KB + 32 KB (per core)
L2 cache (MB)	2	1
<b>Platform</b>		
Vendor	Dell	Dell
Motherboard model number	0HH807	0HR330
Motherboard chipset	Intel i945G	Intel Q965
Motherboard revision number	A2	C1
System/motherboard serial number	6FHZZ91	PS060808
BIOS name and version	Dell A11 (11/30/2006)	Dell 2.6.2 (08/12/2008)

<b>Previous generation desktop systems</b>	<b>Dell OptiPlex GX620</b>	<b>Dell OptiPlex 745</b>
BIOS settings	Default	Default
<b>Memory module(s)</b>		
Vendor and model number	Infineon 64T32000HU3.7A	Kingston KC6844-ELG37
Type	PC2-4200	PC2-4200
Speed (MHz)	533	533
Speed running in the system (MHz)	533	533
Timing/Latency (tCL-tRCD-tRP-tRASmin)	4-4-4-12	4-4-4-12
Size (MB)	1,024	2,048
Number of memory module(s)	4	2
Channel (single/dual)	Dual	Dual
<b>Hard disk</b>		
Vendor and model number	2 x Western Digital WD400BD-75JMC0	Western Digital WD800JD-75MSA3
Size (GB)	40	80
Buffer size (MB)	8	8
RPM	7,200	7,200
Type	SATA 1.5 Gb/s	SATA 3.0 Gb/s
Controller	Intel 82801GB (ICH7/R)	Intel 82801HB/HR (ICH8/R)
Driver Windows XP	Intel 7.0.0.1020 (05/23/2005)	Intel 8.0.0.1008 (04/10/2006)
Driver Windows Vista	NA	NA
Driver Windows 7	NA	NA
<b>Operating system</b>		
Name	Microsoft Windows XP Professional	Microsoft Windows XP Professional
Build number	2600	2600
Service pack	3	3
File system	NTFS	NTFS
Kernel	ACPI Multiprocessor PC	ACPI Multiprocessor PC
Language	English	English
Microsoft DirectX version	9.0c	9.0c
<b>Graphics</b>		
Vendor and model number	Intel GMA 950	Intel GMA 3000
Type	Integrated	Integrated
Chipset	Intel 82945G Express Chipset	Intel 965 Express Chipset
BIOS version	1215	1345
Total available graphics memory (MB)	224	256
Resolution	1,280 x 1,024 x 32 bit	1,280 x 1,024 x 32 bit
Driver Windows XP	Intel 6.14.10.4543 (03/23/2006)	Intel 6.14.10.4943 (04/02/2008)
Driver Windows Vista	NA	NA
Driver Windows 7	NA	NA
<b>Sound card/subsystem</b>		
Vendor and model number	SoundMAX Integrated Digital Audio	SoundMAX Integrated Digital HD Audio
Driver Windows XP	Analog Devices 5.12.1.5246 (01/27/2005)	Analog Devices 5.10.1.4542 (07/05/2006)
Driver Windows Vista	NA	NA

<b>Previous generation desktop systems</b>	<b>Dell OptiPlex GX620</b>	<b>Dell OptiPlex 745</b>
Driver Windows 7	NA	NA
<b>Ethernet</b>		
Vendor and model number	Broadcom NetXtreme 57xx Gigabit	Broadcom NetXtreme 57xx Gigabit
Driver Windows XP	Broadcom 8.22.1.0 (04/20/2005)	Broadcom 10.39.0.0 (06/05/2007)
Driver Windows Vista	NA	NA
Driver Windows 7	NA	NA
<b>Optical drive(s)</b>		
Vendor and model number	TSSTcorp TS-H492C	TSSTcorp TS-H493B
Type	DVD-ROM / CD-RW	DVD-ROM / CD-RW
Interface	IDE	SATA
Dual/Single layer	Dual	Dual
<b>USB ports</b>		
Number	8	8
Type	USB 2.0	USB 2.0
Other	NA	NA
<b>IEEE 1394 ports</b>		
Number	NA	NA
<b>Monitor</b>		
LCD type	ViewSonic Optiquest Q7	ViewSonic Optiquest Q7
Screen size	17"	17"
Refresh rate (Hz)	60	60

Figure 9. Detailed system configuration for the two previous generation Dell OptiPlex desktops.

## Appendix B – Detailed results

Figures 10 through 11 present the detailed test results for the systems.

Previous generation desktop systems	Dell OptiPlex GX620	Dell OptiPlex 745
Operating system	XP Professional SP3	XP Professional SP3
<b>Application responsiveness</b>		
<b>Test case 1a: Opening files using common office applications (local HDD)</b>		
<i>Word document appears - median</i>	00:05.30	00:05.49
<i>Excel workbook appears - median</i>	00:02.25	00:02.25
<i>PowerPoint slide appears - median</i>	00:01.21	00:01.17
<b>Test case 1b: Opening files using common office applications (wired)</b>		
<i>Word document appears - median</i>	00:05.79	00:05.59
<i>Excel workbook appears - median</i>	00:02.41	00:02.34
<i>PowerPoint slide appears - median</i>	00:01.28	00:01.32
<b>Test case 2: Installing/re-inserting a USB drive</b>		
<i>Installing PNY USB stick - median</i>	00:09.98	00:09.90
<i>Installing Kingston USB stick - median</i>	00:11.04	00:10.48
<i>Re-inserting PNY USB stick - median</i>	00:02.18	00:01.85
<i>Re-inserting Kingston USB stick - median</i>	00:01.71	00:01.56
<b>Test case 3: Copying files locally</b>		
<i>Copying files to another location on the C: drive - median</i>	00:13.66	00:13.88
<i>Copying files from the hard drive to a USB stick - median</i>	04:46.84	04:46.12
<i>Copying files from a USB stick to the hard drive - median</i>	00:31.43	00:31.45
<b>Test case 4: Playing a DVD</b>		
<i>Lord of the Rings - median</i>	00:26.50	00:31.79
<i>Monty Python - median</i>	00:26.19	00:29.20
<b>On/off tests</b>		
<b>Test case 1: Boot experience</b>		
<i>COLD: Taskbar appears - median</i>	00:28.55	00:24.95
<i>COLD: Home page loads - median</i>	00:11.31	00:11.16
<b>Test case 2: Boot experience with Office 2007 SP2</b>		
<i>COLD: Time to connect to Exchange Server after booting system - median</i>	00:10.98	00:09.41
<b>Test case 3: Cold standby experience</b>		
<i>COLD: Time to standby - median</i>	00:03.43	00:02.73
<i>COLD: Time to resume from standby - median</i>	00:08.83	00:07.78
<b>Test case 4: Warm standby experience</b>		
<i>WARM: Time to standby - median</i>	00:03.53	00:01.77
<i>WARM: Time to resume from standby - median</i>	00:08.87	00:04.91
<b>Test case 5 (wired): Cold standby experience with applications open</b>		
<i>COLD: Time to standby - median</i>	00:04.11	00:02.88
<i>COLD: Time to connect to Exchange Server after resume from standby - median</i>	00:09.18	00:08.16
<b>Test case 6 (wired): Warm standby experience with applications open</b>		
<i>WARM: Time to standby - median</i>	00:03.79	00:02.30

Previous generation desktop systems	Dell OptiPlex GX620	Dell OptiPlex 745
<i>WARM: Time to connect to Exchange Server after resume from standby - median</i>	00:09.17	00:05.60
<b>Test case 7: Shutdown experience</b>		
<i>Time to turn system off - median</i>	00:12.00	00:10.90
<b>Industry standard benchmarks</b>		
<b>BAPCo SYSmark 2007 Preview v1.06</b>		
<i>SYSmark 2007 Preview v1.06 Rating</i>	66	89

Figure 10: Detailed test results for the previous generation desktop systems.

Current desktop system	Dell OptiPlex 960	Dell OptiPlex 960	Dell OptiPlex 960
<b>Operating systems</b>	XP Professional SP3	Vista Ultimate SP2	Windows 7 Ultimate
<b>Application responsiveness</b>			
<b>Test case 1a: Opening files using common office applications (local HDD)</b>			
<i>Word document appears - median</i>	00:02.57	00:02.65	00:02.47
<i>Excel workbook appears - median</i>	00:01.96	00:01.44	00:01.95
<i>PowerPoint slide appears - median</i>	00:01.09	00:00.91	00:00.76
<b>Test case 1b: Opening files using common office applications (wired)</b>			
<i>Word document appears - median</i>	00:02.71	00:02.75	00:02.54
<i>Excel workbook appears - median</i>	00:01.98	00:01.80	00:02.01
<i>PowerPoint slide appears - median</i>	00:01.04	00:01.06	00:00.83
<b>Test case 2: Installing/re-inserting a USB drive</b>			
<i>Installing PNY USB stick - median</i>	00:09.30	00:02.43	00:02.59
<i>Installing Kingston USB stick - median</i>	00:09.45	00:02.74	00:02.81
<i>Re-inserting PNY USB stick - median</i>	00:01.71	00:01.71	00:01.74
<i>Re-inserting Kingston USB stick - median</i>	00:01.47	00:01.40	00:01.36
<b>Test case 3: Copying files locally</b>			
<i>Copying files to another location on the C: drive - median</i>	00:11.81	00:04.38	00:03.77
<i>Copying files from the hard drive to a USB stick - median</i>	04:50.66	04:59.47	04:45.01
<i>Copying files from a USB stick to the hard drive - median</i>	00:29.87	00:31.66	00:29.39
<b>Test case 4: Playing a DVD</b>			
<i>Lord of the Rings - median</i>	00:33.04	00:24.84	00:23.88
<i>Monty Python - median</i>	00:29.16	00:20.68	00:19.66
<b>On/off tests</b>			
<b>Test case 1: Boot experience</b>			
<i>COLD: Taskbar appears - median</i>	00:30.77	00:42.29	00:30.72
<i>COLD: Home page loads - median</i>	00:11.79	00:02.83	00:03.61
<b>Test case 2: Boot experience with Office 2007 SP2</b>			
<i>COLD: Time to connect to Exchange Server after booting system - median</i>	00:12.74	00:09.47	00:09.53
<b>Test case 3: Cold standby experience</b>			
<i>COLD: Time to standby - median</i>	00:01.58	00:02.76	00:02.38
<i>COLD: Time to resume from standby - median</i>	00:05.98	00:04.56	00:04.77
<b>Test case 4: Warm standby experience</b>			

<i>WARM: Time to standby - median</i>	00:01.31	00:02.26	00:02.56
<i>WARM: Time to resume from standby - median</i>	00:06.12	00:04.41	00:04.43
<b>Test case 5 (wired): Cold standby experience with applications open</b>			
<i>COLD: Time to standby - median</i>	00:01.51	00:03.90	00:03.01
<i>COLD: Time to connect to Exchange Server after resume from standby - median</i>	00:10.39	00:30.12	00:09.48
<b>Test case 6 (wired): Warm standby experience with applications open</b>			
<i>WARM: Time to standby - median</i>	00:01.94	00:02.31	00:02.12
<i>WARM: Time to connect to Exchange Server after resume from standby - median</i>	00:10.56	00:29.66	00:09.03
<b>Test case 7: Shutdown experience</b>			
<i>Time to turn system off - median</i>	00:10.88	00:09.24	00:06.88
<b>Industry standard benchmarks</b>			
<b>BAPCo SYSmark 2007 Preview v1.06</b>			
<i>SYSmark 2007 Preview v1.06 Rating</i>	150	158	175

Figure 11: Detailed test results for the current OptiPlex 960 desktop.

## 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
9/12/2007	12:57 AM	675,901	3boat-Jerome10 (2).pdf
9/12/2007	12:57 AM	1,071,399	3boat-Jerome10 (2).xps
9/3/2007	11:35 PM	617,349	3boat-Jerome10.docx
9/12/2007	12:57 AM	675,901	3boat-Jerome10.pdf
9/12/2007	12:57 AM	1,071,399	3boat-Jerome10.xps
9/9/2007	1:32 AM	11,947	Adjustable Meeting Agenda template1 (2).xlsx
9/9/2007	1:32 AM	11,947	Adjustable Meeting Agenda template1.xlsx
9/9/2007	2:01 AM	197,621	Adventure Works (2).pptx
9/9/2007	2:01 AM	197,621	Adventure Works.pptx
9/9/2007	1:18 AM	11,953	Agenda1 (2).xlsx
9/9/2007	1:18 AM	11,953	Agenda1.xlsx
9/3/2007	6:14 PM	11,968	Agenda10 (2).xlsx
9/3/2007	6:14 PM	11,968	Agenda10.xlsx
9/3/2007	5:58 PM	774,350	alice-carroll10 (2).docx
9/12/2007	12:56 AM	518,539	alice-carroll10 (2).pdf
9/12/2007	12:56 AM	629,597	alice-carroll10 (2).xps
9/3/2007	5:58 PM	774,350	alice-carroll10.docx
9/12/2007	12:56 AM	518,539	alice-carroll10.pdf
9/12/2007	12:56 AM	629,597	alice-carroll10.xps
7/28/2003	7:56 AM	70,144	Analysis (2).xls
7/28/2003	7:56 AM	70,144	Analysis.xls
			Ancient christian stone marking Patrick's well.JPG
9/16/2005	8:39 PM	1,074,183	Art Gallery.JPG
8/26/2005	5:12 PM	1,041,140	Automation (2).rar
9/10/2007	1:16 AM	26,694	Automation.rar
12/19/2003	11:42 PM	16,896	bank24 (2).xls
12/19/2003	11:42 PM	16,896	bank24.xls
12/19/2003	11:42 PM	16,384	bank24temp (2).xls
12/19/2003	11:42 PM	16,384	bank24temp.xls
			Bidder comparison worksheet and process1 (2).xlsx
			Bidder comparison worksheet and process1.xlsx
9/9/2007	1:13 AM	19,547	Breakeven analysis10 (2).xlsx
9/3/2007	6:15 PM	24,480	Breakeven analysis10.xlsx
9/3/2007	6:15 PM	24,480	Breakeven analysis10.xlsx
9/9/2005	4:22 PM	1,236,485	Bust of Collins.JPG
12/19/2003	11:42 PM	27,136	capbudget (2).xls
12/19/2003	11:42 PM	27,136	capbudget.xls
12/19/2003	11:42 PM	26,624	capbudgettemp (2).xls
12/19/2003	11:42 PM	26,624	capbudgettemp.xls
9/16/2005	8:38 PM	1,135,462	Christ Church 1038 AD.JPG
9/9/2007	12:16 AM	118,051	ChristmasCarol (2).docx

9/12/2007	12:56 AM	287,538	ChristmasCarol (2).pdf
9/12/2007	12:55 AM	507,684	ChristmasCarol (2).xps
9/9/2007	12:16 AM	118,051	ChristmasCarol.docx
9/12/2007	12:56 AM	287,538	ChristmasCarol.pdf
9/12/2007	12:55 AM	507,684	ChristmasCarol.xps
9/9/2005	4:21 PM	1,160,640	Church Altar-All Mosaic! (2).JPG
9/9/2005	4:21 PM	1,160,640	Church Altar-All Mosaic!.JPG
12/19/2003	11:42 PM	24,064	ciscoexpo (2).xls
12/19/2003	11:42 PM	24,064	ciscoexpo.xls
12/19/2003	11:43 PM	15,872	ciscoexpotemp (2).xls
12/19/2003	11:43 PM	15,872	ciscoexpotemp.xls
9/9/2005	4:21 PM	1,049,553	Clonakilty (2).JPG
9/9/2005	4:21 PM	1,049,553	Clonakilty.JPG
9/9/2007	2:03 AM	107,778	Communicating Bad News (2).pptx
9/9/2007	2:03 AM	107,778	Communicating Bad News.pptx
9/9/2007	2:23 AM	142,036	Company Handbook (2).pptx
9/9/2007	2:23 AM	142,036	Company Handbook.pptx
9/9/2007	2:24 AM	137,524	Company Meeting Title (2).pptx
9/9/2007	2:24 AM	137,524	Company Meeting Title.pptx
9/9/2007	2:09 AM	126,324	Company Meeting3 (2).pptx
9/9/2007	2:09 AM	126,324	Company Meeting3.pptx
9/9/2007	1:58 AM	252,618	Company Name (2).pptx
9/9/2007	1:58 AM	252,618	Company Name.pptx
9/9/2007	2:05 AM	340,381	Company Name2 (2).pptx
9/9/2007	2:05 AM	340,381	Company Name2.pptx
9/9/2007	2:18 AM	165,587	Company Name4 (2).pptx
9/9/2007	2:17 AM	165,587	Company Name4.pptx
9/9/2007	9:46 PM	1,467,429	conference (2).pptx
9/9/2007	9:46 PM	1,467,429	conference.pptx
9/11/2007	12:31 AM	1,468,617	conferenceA (2).pptx
9/11/2007	12:31 AM	1,468,617	conferenceA.pptx
9/11/2007	12:31 AM	1,468,621	conferenceC (2).pptx
9/11/2007	12:31 AM	1,468,621	conferenceC.pptx
9/11/2007	12:32 AM	1,468,505	conferenceD (2).pptx
9/11/2007	12:32 AM	1,468,505	conferenceD.pptx
9/11/2007	12:33 AM	1,468,329	conferenceE (2).pptx
9/11/2007	12:32 AM	1,468,329	conferenceE.pptx
9/9/2007	12:10 AM	448,701	ConnecticutYankee (2).docx
9/12/2007	12:53 AM	1,020,765	ConnecticutYankee (2).pdf
9/12/2007	12:53 AM	1,826,512	ConnecticutYankee (2).xps
9/9/2007	12:10 AM	448,701	ConnecticutYankee.docx
9/12/2007	12:53 AM	1,020,765	ConnecticutYankee.pdf
9/12/2007	12:53 AM	1,826,512	ConnecticutYankee.xps
9/3/2007	6:34 PM	1,342,932	copperfield10 (2).docx
9/3/2007	6:34 PM	1,342,932	copperfield10.docx
8/26/2005	5:12 PM	1,673,202	Crossing to UCC (2).JPG
8/26/2005	5:12 PM	1,673,202	Crossing to UCC.JPG
9/8/2007	8:41 PM	1,260,859	DavidCopperfield (2).docx
9/12/2007	12:58 AM	3,485,857	DavidCopperfield (2).pdf
9/8/2007	8:41 PM	1,260,859	DavidCopperfield.docx

9/12/2007	12:58 AM	3,485,857	DavidCopperfield.pdf
9/12/2007	12:59 AM	5,214,877	DavidCopperfield.xps
9/11/2007	1:30 AM	1,398,507	DavidCopperfieldA.docx
9/11/2007	1:31 AM	1,383,386	DavidCopperfieldB.docx
9/11/2007	1:32 AM	1,424,127	DavidCopperfieldC.docx
9/11/2007	1:33 AM	1,446,638	DavidCopperfieldD.docx
9/11/2007	1:34 AM	1,482,655	DavidCopperfieldE.docx
12/19/2003	11:42 PM	59,392	discretessim.xls
12/19/2003	11:43 PM	27,136	discretessimtemp.xls
9/8/2007	9:52 PM	1,343,812	DombeyandSon.docx
9/12/2007	12:41 AM	3,703,813	DombeyandSon.pdf
9/12/2007	12:55 AM	5,402,560	DombeyandSon.xps
9/11/2007	1:40 AM	1,596,493	DombeyandSonA.docx
9/11/2007	1:40 AM	1,594,242	DombeyandSonB.docx
9/11/2007	1:41 AM	1,566,559	DombeyandSonC.docx
9/11/2007	1:41 AM	1,581,002	DombeyandSonD.docx
9/11/2007	1:42 AM	1,495,818	DombeyandSonE.docx
9/16/2005	8:40 PM	1,334,598	Doorways of Cashel.JPG
9/9/2007	1:10 AM	26,103	Due diligence assessment model1.xlsx
8/26/2005	5:12 PM	1,235,942	Entering Campus.JPG
9/3/2007	6:39 PM	65,287	Excellfiles10.rar
9/3/2007	6:13 PM	15,249	Expense budget10.xlsx
12/19/2003	11:42 PM	13,824	exponentialdata.xls
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9/11/2007	12:43 AM	800,998	Microsoft© Office B.pptx
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9/9/2007	12:51 PM	803,809	Microsoft© Office9.pptx
9/9/2007	4:07 PM	702,034	Microsoft© Office9.rar

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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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