

# A USER-EXPERIENCE COMPARISON OF DELL AND HP DESKTOP SYSTEMS

Dell™ desktops powered by the  
2nd generation Intel® Core™ processor family:



## Faster response for a better user experience

versus comparable HP desktops with AMD desktop processors



Workers can be only as productive as their tools allow them to be. On a sluggish system, carrying out routine tasks such as opening and copying files, starting up and shutting down the system, and even entering and leaving hibernation and sleep modes becomes annoying for employees and causes their productivity to suffer. Systems that respond faster improve the user experience and increase office efficiency.

Principled Technologies conducted a series of custom hand-timed tests to measure system responsiveness on tasks that enterprise employees perform throughout the day. We tested two Dell desktops powered by 2<sup>nd</sup> generation Intel Core processors, a mid-range Dell Vostro™ 460 Mini Tower and a high-end Dell OptiPlex™ 990 Mini Tower, and two HP desktops powered by AMD processors, a mid-range HP Pavilion Slimline s5750z and a high-end HP Pavilion p6750z.

The Intel Core processor-based Dell systems consistently performed tasks more quickly—as much as 38.8 percent faster—than the corresponding HP Pavilion systems, making Dell a great choice for an efficient workplace.



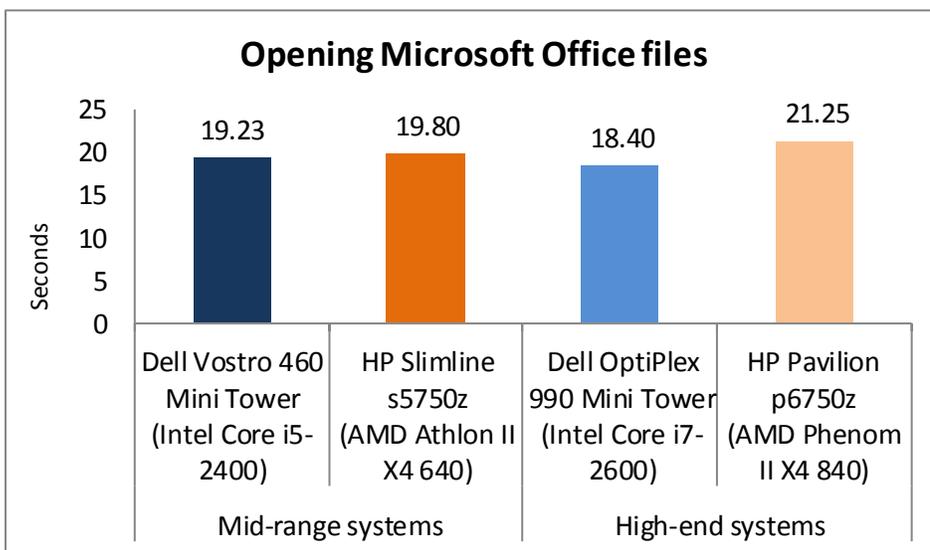
## SPEEDING UP THE WORKDAY WITH DELL AND INTEL

Today's business world is moving faster than ever, and every second counts. Extra seconds and minutes spent doing everyday office tasks add up quickly over time and over a large number of employees. That's why, when choosing desktop systems for the workplace, it makes sense to purchase systems with enough processing power to complete routine tasks quickly and efficiently.

In our tests, we found that the Intel Core processor-based Dell Vostro 460 Mini Tower and Dell OptiPlex 990 sped up everyday tasks considerably over comparable AMD processor-based HP systems – enough to decrease time doing these tasks by up to 17.9 percent. (To learn more about the systems we tested, see [Appendix A](#).)

Figure 1 shows the time that each system took to open three Microsoft Office® files—one Word, one Excel®, and one PowerPoint®. We timed each system opening each of the files two ways—from a local hard drive and from a network share using an Ethernet connection. Each bar represents the number of seconds the system needed to perform all six file-opening tasks. (See the [System Responsiveness Results](#) section for complete results.)

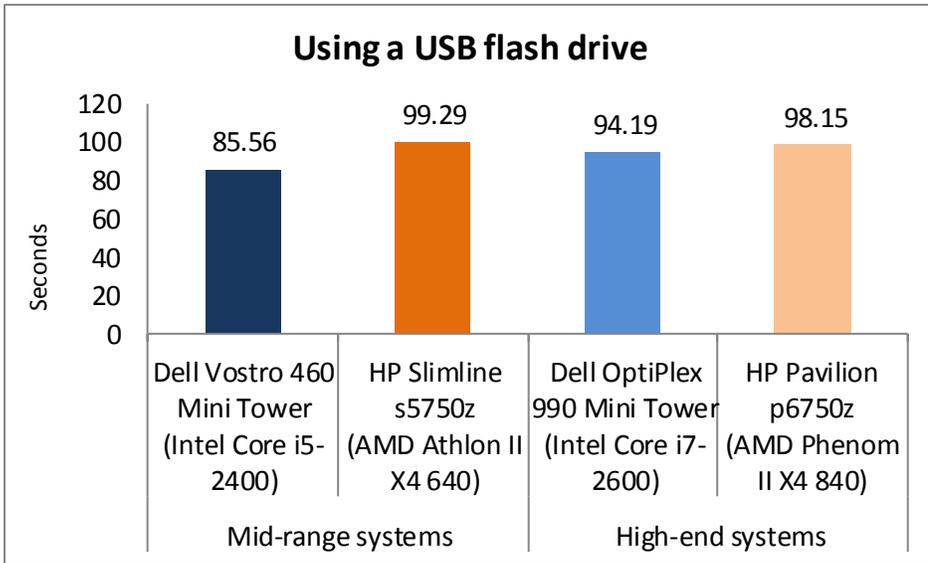
The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 2.9 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 0.57 seconds. The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower desktop took 13.4 percent less time than the AMD Phenom II X4 840-based HP



Pavilion p6750z, a savings of 2.85 seconds.

Figure 2 shows the time that each system took to perform three tasks involving USB flash drives—installing the flash drive, reinserting the flash drive, and copying files to the flash drive. We timed each system performing these tasks with two brands of USB flash drives—Kingston® and PNY®.

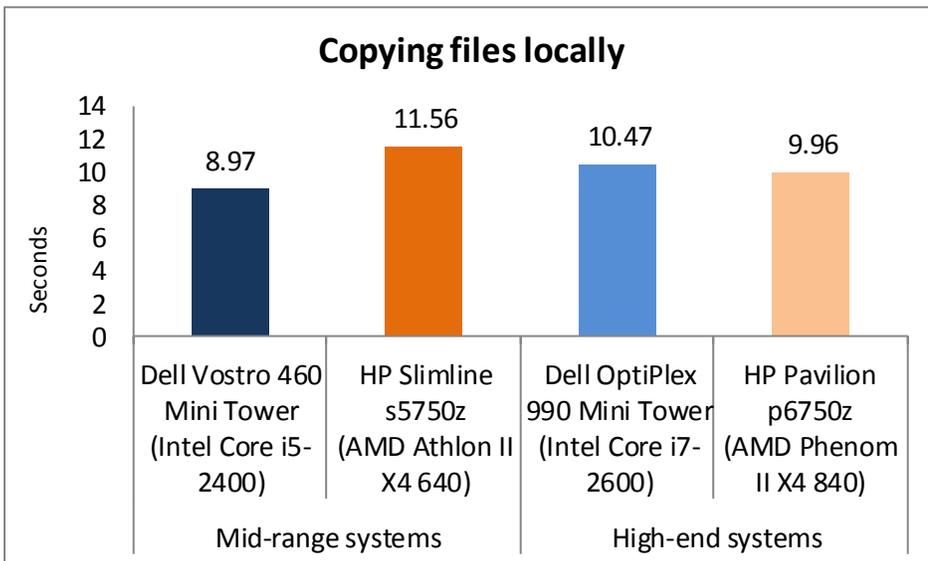
**Figure 1: Combined times, in seconds, the four test systems took to perform six file-opening tasks. Lower numbers are better.**



**Figure 2: Combined times, in seconds, the four test systems took to perform six tasks involving USB flash drives. Lower numbers are better.**

Phenom II X4 840-based HP Pavilion p6750z, a savings of 3.96 seconds.

Figure 3 shows the time each test system took to copy files from one location to another on the local hard drive. The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 22.4 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 2.59 seconds. The Intel Core i7-2600-based



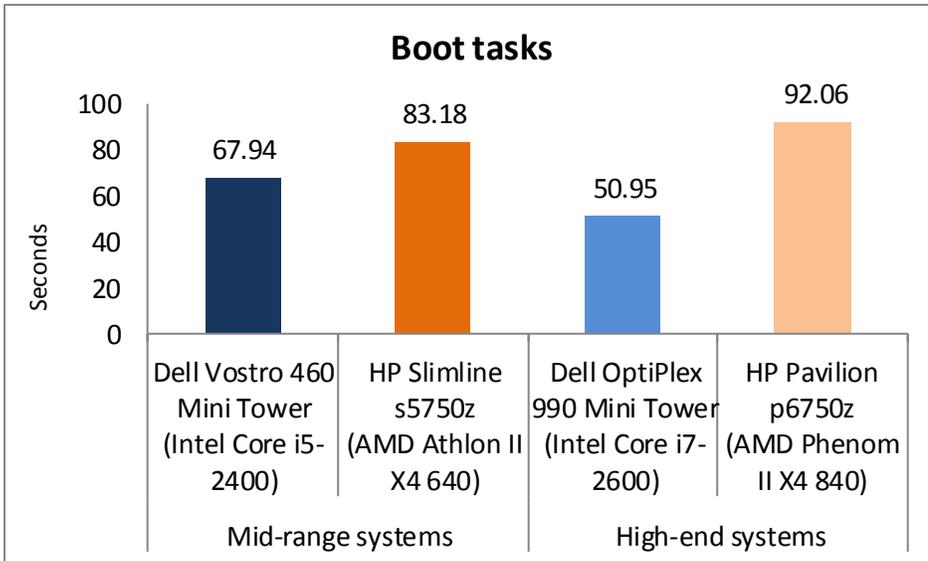
**Figure 3: Time, in seconds, the four test systems took to perform one file-copying task. Lower numbers are better.**

Each bar represents the number of seconds the system needed to perform all six tasks.

The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 13.8 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 13.73 seconds. The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower desktop took 4.0 percent less time than the AMD

Dell OptiPlex 990 Mini Tower desktop took 5.1 percent more time than the AMD Phenom II X4 840-based HP Pavilion p6750z, a difference of .51 seconds.

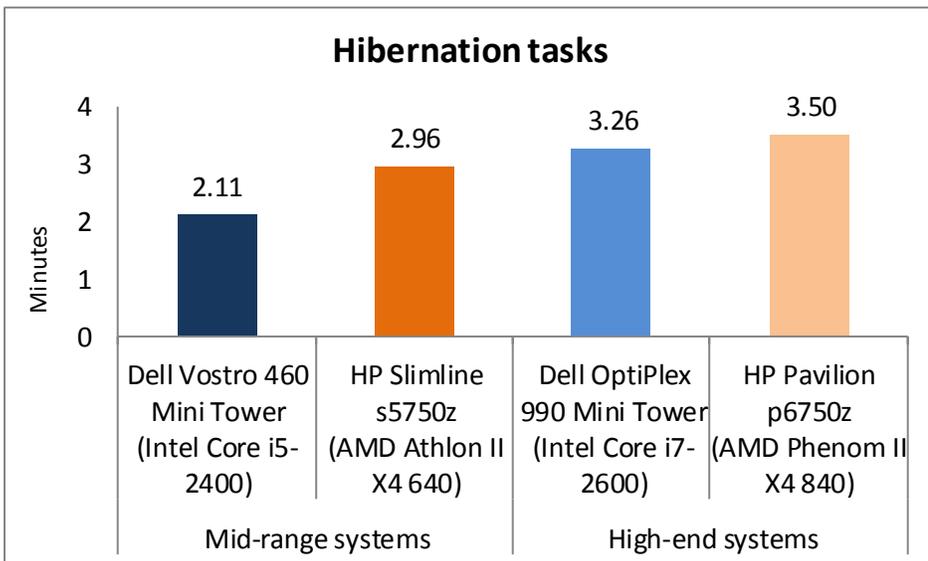
Figure 4 shows the time that each system took for three events to occur as the system boots—the taskbar appearing, indicating the operating system has completely loaded, followed by opening a Word 2010



**Figure 4: Combined times, in seconds, the four test systems took for three events to occur as the system booted. Lower numbers are better.**

HP Pavilion Slimline s5750z, a savings of 15.024 seconds. The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower took 44.7 percent less time than the AMD Phenom II X4 840-based HP Pavilion p6750z, a savings of 41.11 seconds.

Figure 5 shows the time each system took to complete eight tasks related to hibernation. Each bar



**Figure 5: Combined times, in minutes, the four test systems took to complete eight tasks related to hibernation. Lower numbers are better.**

document, indicating the system is useable, and finally, making a connection to an Exchange Server with Outlook® 2010, indicating the network is functioning. Each bar represents the number of seconds the system needed to perform all three tasks in quick succession.

The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 18.3 percent less time than the AMD Athlon II X4 640-based

represents the number of minutes the system needed to perform all eight tasks. (Note: because these tasks take longer than the others we tested, we show the results in minutes rather than seconds.)

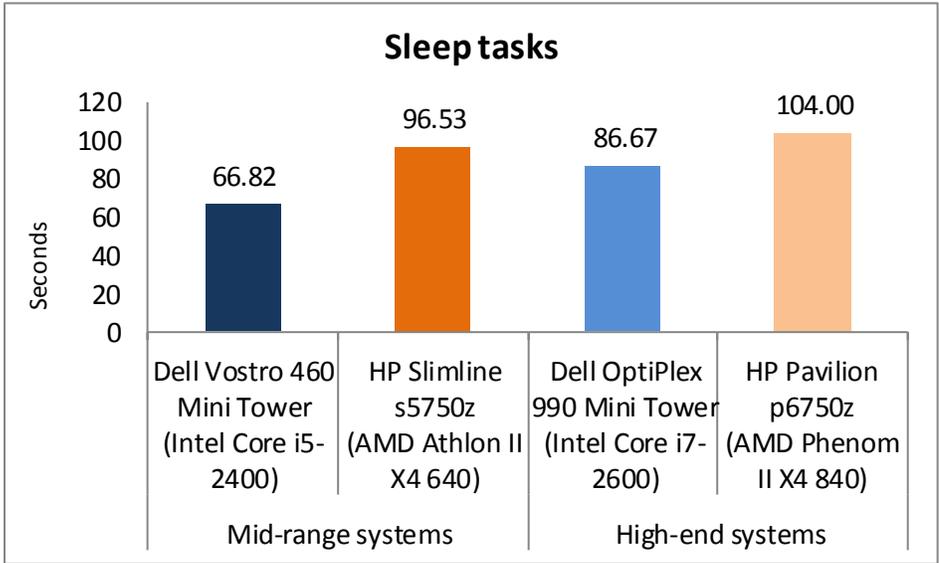


Figure 6: Combined times, in seconds, the four test systems took to complete eight tasks related to sleep mode. Lower numbers are better.

each system took to complete eight tasks related to sleep mode. Each bar represents the number of seconds the system needed to perform all eight tasks. The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 30.8 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 29.71 seconds. The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower desktop took 16.7 percent less time than

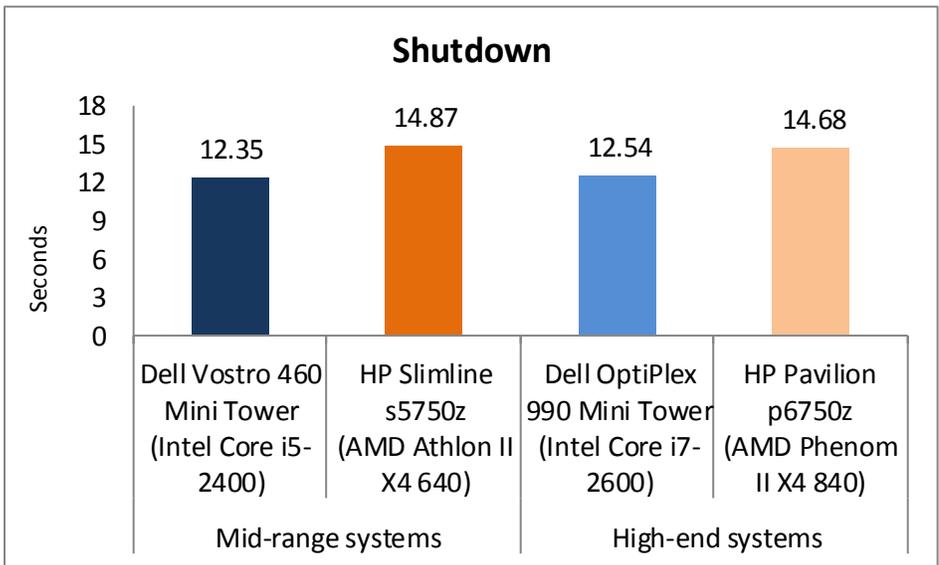
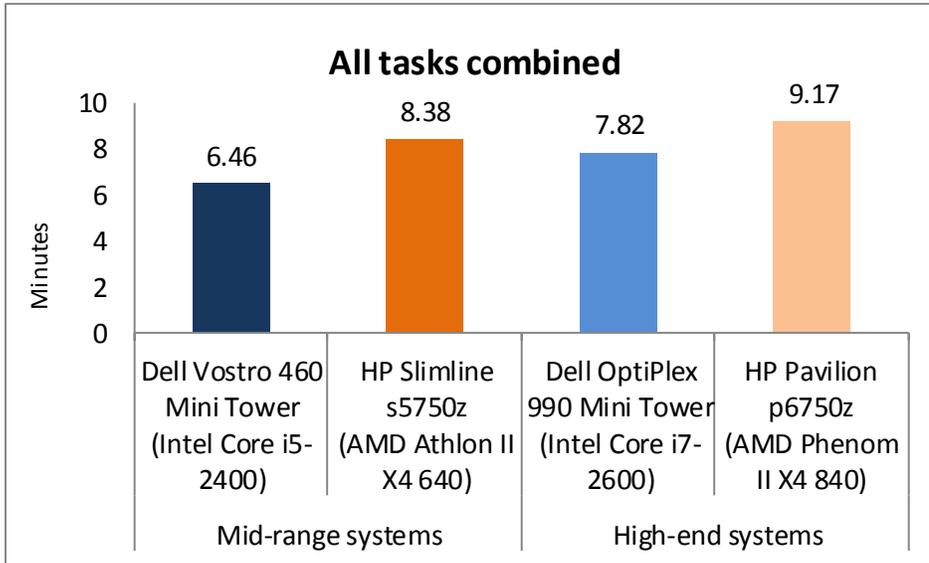


Figure 7: Time, in seconds, the four test systems took to shut down. Lower numbers are better.

The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 28.5 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 0.84 minutes. The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower desktop took 6.9 percent less time than the AMD Phenom II X4 840-based HP Pavilion p6750z, a savings of 0.24 minutes.

Figure 6 shows the time each system took to complete eight tasks related to sleep mode. The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 30.8 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 29.71 seconds. The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower desktop took 16.7 percent less time than the AMD Phenom II X4 840-based HP Pavilion p6750z, a savings of 17.33 seconds.

Figure 7 shows the time each system took to shut down. The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 16.9 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 2.52 seconds. The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower



**Figure 8: Time, in minutes, the four test systems took to complete all tasks. Lower numbers are better.**

minutes. If each worker performed this set of tasks daily, the annual savings for the company would work out to **159.75 hours for 100 employees** and **1,597.50 hours for 1,000 employees**.

The Intel Core i7-2600-based Dell OptiPlex 990 Mini Tower desktop took 14.8 percent less time than the AMD Phenom II X4 840-based HP Pavilion p6750z, a savings of 1.36 minutes. If each worker performed this set of tasks daily, the annual savings for the company would work out to **112.94 hours for 100 employees** and **1,129.44 hours for 1,000 employees**.

desktop took 14.6 percent less time than the AMD Phenom II X4 840-based HP Pavilion p6750z, a savings of 2.14 seconds.

Figure 8 shows the time in minutes each system took to complete all 32 tasks we tested. The Intel Core i5-2400-based Dell Vostro 460 Mini Tower took 22.9 percent less time than the AMD Athlon II X4 640-based HP Pavilion Slimline s5750z, a savings of 1.92

## SYSTEM RESPONSIVENESS RESULTS

Figures 9 and 10 show a detailed breakdown of system responsiveness results, in seconds, for the four test systems. These results represent the median of three test runs. [Appendix C](#) presents the results from all three runs.

Mid-range systems	Dell Vostro 460 Mini Tower (Intel Core i5-2400)	HP Slimline s5750z (AMD Athlon II X4 640)	Time saved with Dell Vostro 460 Mini Tower (Intel Core i5-2400)
<b>Opening Microsoft Office files</b>			
Opening local Word document	04.63	05.22	00.59
Opening local Excel spreadsheet	02.25	02.33	00.08
Opening local PowerPoint deck	01.34	01.55	00.21
Opening Word document - network connection	06.18	05.56	(0.62)
Opening Excel spreadsheet - network connection	02.89	03.05	00.16
Opening PowerPoint deck - network connection	01.94	02.09	00.15
<b>USB flash drive tasks</b>			
Installing PNY USB flash drive	03.20	05.18	01.98
Installing Kingston USB flash drive	02.81	02.37	(0.44)
Re-inserting PNY USB flash drive	02.20	03.55	1.35
Re-inserting Kingston USB flash drive	01.37	01.60	0.23
Copying files to a USB flash drive	58.12	65.96	7.84
Copying files from a USB flash drive	17.86	20.63	02.77
<b>Copying files locally</b>			
Copying files locally	08.97	11.56	02.59
<b>Boot tasks</b>			
Taskbar appears	38.00	33.15	(4.85)
Word document appears	29.94	50.03	20.09
<b>Hibernation tasks</b>			
<b>Cold hibernate experience</b>			
Time to hibernate	12.14	20.51	08.37
Time to resume from hibernate	18.75	23.90	05.15
<b>Warm hibernate experience</b>			
Time to hibernate	10.66	16.40	05.74
Time to resume from hibernate	18.96	24.41	05.45
<b>Cold hibernate experience with applications open</b>			
Time to hibernate	14.28	20.44	06.16
Time to connect to Exchange Server after resume from hibernate	19.76	26.23	06.47

Mid-range systems	Dell Vostro 460 Mini Tower (Intel Core i5-2400)	HP Slimline s5750z (AMD Athlon II X4 640)	Time saved with Dell Vostro 460 Mini Tower (Intel Core i5-2400)
<b>Warm hibernate experience with applications open</b>			
Time to hibernate	12.76	22.58	09.82
Time to connect to Exchange Server after resume from hibernate	19.56	23.06	03.50
<b>Sleep tasks</b>			
<b>Cold sleep experience</b>			
Time to sleep	12.57	18.45	05.88
Time to resume from sleep	05.14	06.22	01.08
<b>Warm sleep experience</b>			
Time to sleep	07.64	12.12	04.48
Time to resume from sleep	04.95	05.37	00.42
<b>Cold sleep experience with applications open</b>			
Time to sleep	15.18	21.80	06.62
Time to connect to Exchange Server after resume from sleep	05.06	07.35	02.29
<b>Warm sleep experience with applications open</b>			
Time to sleep	11.03	18.85	07.82
Time to connect to Exchange Server after resume from sleep	05.25	06.37	01.12
<b>Shutdown</b>			
Time to turn system off	12.35	14.87	02.52
<b>Total seconds</b>	<b>387.74</b>	<b>502.76</b>	<b>115.02</b>
<b>Total minutes</b>	<b>6.46</b>	<b>8.38</b>	<b>1.92</b>

Figure 9: Application and system responsiveness, in seconds, for mid-range systems. Lower numbers are better.

High-end systems	Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)	HP Pavilion p6750z (AMD Phenom II X4 840)	Time saved with Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)
<b>Opening Microsoft Office files</b>			
Opening local Word document	04.55	04.58	00.03
Opening local Excel spreadsheet	02.07	02.35	00.28
Opening local PowerPoint deck	01.56	01.40	(0.16)
Opening Word document - network connection	05.99	06.79	00.80
Opening Excel spreadsheet - network connection	02.40	03.25	00.85
Opening PowerPoint deck - network connection	01.83	02.88	01.05
<b>USB flash drive tasks</b>			
Installing PNY USB flash drive	07.96	07.58	(0.38)
Installing Kingston USB flash drive	02.97	02.49	(0.48)
Re-inserting PNY USB flash drive	02.43	03.41	0.98
Re-inserting Kingston USB flash drive	01.62	01.53	(0.09)
Copying files to a USB flash drive	60.78	62.71	01.93
Copying files from a USB flash drive	18.43	20.43	02.00
<b>Copying files locally</b>			
Copying files locally	10.47	09.96	(0.51)
<b>Boot tasks</b>			
Taskbar appears	39.84	40.47	00.63
Word document appears	11.11	51.59	40.48
<b>Hibernation tasks</b>			
<b>Cold hibernate experience</b>			
Time to hibernate	13.85	22.83	08.98
Time to resume from hibernate	31.56	27.12	(4.44)
<b>Warm hibernate experience</b>			
Time to hibernate	13.08	20.07	06.99
Time to resume from hibernate	30.88	27.56	(3.32)
<b>Cold hibernate experience with applications open</b>			
Time to hibernate	17.21	25.69	08.48
Time to connect to Exchange Server after resume from hibernate	35.11	32.21	(2.90)
<b>Warm hibernate experience with applications open</b>			
Time to hibernate	18.58	21.80	03.22
Time to connect to Exchange Server after resume from hibernate	35.50	32.93	(2.57)
<b>Sleep tasks</b>			
<b>Cold sleep experience</b>			
Time to sleep	14.44	18.78	04.34
Time to resume from sleep	05.92	07.42	01.50
<b>Warm sleep experience</b>			
Time to sleep	10.52	14.15	03.63

High-end systems	Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)	HP Pavilion p6750z (AMD Phenom II X4 840)	Time saved with Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)
Time to resume from sleep	05.64	04.49	(1.15)
<b>Cold sleep experience with applications open</b>			
Time to sleep	18.15	24.52	06.37
Time to connect to Exchange Server after resume from sleep	08.75	07.56	(1.19)
<b>Warm sleep experience with applications open</b>			
Time to sleep	16.90	20.49	03.59
Time to connect to Exchange Server after resume from sleep	06.35	06.59	00.24
<b>Shutdown</b>			
Time to turn system off	12.54	14.68	02.14
<b>Total seconds</b>	<b>468.99</b>	<b>550.31</b>	<b>81.32</b>
<b>Total minutes</b>	<b>7.82</b>	<b>9.17</b>	<b>1.36</b>

Figure 10: Application and system responsiveness, in seconds, for high-end systems. Lower numbers are better.

## SUMMARY

A few seconds here, a few seconds there—over the course of the workday, it may not seem like much, but it adds up to hours of lost time per employee each year. As our tests prove, Dell desktops powered by the Intel Core processor family help your employees save time by running common applications responsively, increasing productivity in your workplace.

## APPENDIX A – DETAILED SYSTEM CONFIGURATION INFORMATION

Figure 11 presents each test system and the details of its configuration.

System	Dell Vostro 460 Mini Tower (Intel Core i5- 2400)	Dell OptiPlex 990 Mini Tower (Intel Core i7- 2600)	HP Slimline s5750z (AMD Athlon II X4 640)	HP Pavilion p6750z (AMD Phenom II X4 840)
<b>General</b>				
Number of processor packages	1	1	1	1
Number of cores per processor	4	4	4	4
Number of hardware threads per core	4	8	4	4
System power management policy	Dell	Dell	Balanced	Balanced
Processor power-saving option	Enhanced Intel SpeedStep® Technology	Enhanced Intel SpeedStep Technology	AMD PowerNow!™ Technology (Cool'n'Quiet™ Technology)	AMD PowerNow! Technology (Cool'n'Quiet Technology)
System dimensions (length x width x height)	17.5" x 7" x 14.25"	16.5" x 7" x 14.25"	15.25" x 4.5" x 12.25"	16.5" x 7" x 15.75"
System weight (lbs.)	22	20	13	18
<b>CPU</b>				
Vendor	Intel	Intel	AMD	AMD
Name	Core i5	Core i7	Athlon II X4	Phenom II X4
Model number	2400	2600	640	840
Stepping	D2	D2	PH-E0	PH-E0
Socket type and number of pins	Socket 1155 LGA	Socket 1155 LGA	Socket AM3 (938)	Socket AM3 (938)
Core frequency (GHz)	3.10	3.40	3.00	2.90
Bus frequency	5 GT/s	5 GT/s	4,000 MHz HyperTransport™ Technology	2,000 MHz HyperTransport Technology
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)	64 KB + 64 KB (per core)	64 KB + 64 KB (per core)
L2 cache	1 MB (256 KB per core)	1 MB (256 KB per core)	2 MB (512 KB per core)	2 MB (512 KB per core)
L3 cache	6 MB	8 MB	N/A	6 MB

System	Dell Vostro 460 Mini Tower (Intel Core i5-2400)	Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)	HP Slimline s5750z (AMD Athlon II X4 640)	HP Pavilion p6750z (AMD Phenom II X4 840)
<b>Platform</b>				
Vendor	Dell	Dell	FOXCONN	FOXCONN
Motherboard model number	OY2MRG	06D7TR	2B1	2AB1
Motherboard chipset	H67	ID1C4E	AMD 785G	AMD 785G
BIOS name and version	Dell A03 (02/15/2011)	Dell Inc. A02 (02/26/2011)	American Megatrends Inc. 6.06 (03/22/2011)	American Megatrends Inc. 6.06 (03/22/2011)
<b>Memory module(s)</b>				
Vendor and model number	Micron Tech. 8JTF25664AZ-1G4D1	Samsung M378B5273DH0-CH9	Samsung M378B5773CH0-CH9	Hyundai HMT125U6TFR8C-H9
Type	PC3-10600	PC3-10600	PC3-10600	PC3-10600
Speed (MHz)	1,333	1,333	1,333	1,333
Speed running in the system (MHz)	1,333	1,333	1,333	1,333
Timing/Latency (tCL-tRCD-tRP-tRASmin)	9-9-9-24	9-9-9-24	9-9-9-24	9-9-9-24
Size (MB)	4,096	8,192	4,096	8,192
Number of memory module(s)	2 x 2,048 MB	2 x 4,096 MB	2 x 2,048 MB	4 x 2,048 MB
Chip organization (single-sided/double-sided)	Single-sided	Double-sided	Single-sided	Double-sided
Channel (single/dual)	Dual	Dual	Dual	Dual
<b>Hard disk</b>				
Vendor and model number	Western Digital WD5000AAKX-753CA0	Seagate ST3500413AS	Western Digital WD50000AAKS-60Z1A0	Seagate ST31500341AS
Number of disks in system	1	1	1	1
Size (GB)	500	500	500	1,500
Buffer size (MB)	16	16	16	32
RPM	7,200	7,200	7,200	7,200
Type	SATA 3Gb/s	SATA 3Gb/s	SATA 3Gb/s	SATA 3Gb/s
Controller	Intel H67	Intel ID1C4E	AMD SB700	AMD SB700
Driver	Intel 10.0.0.1046 (09/13/2010)	Intel 10.1.0.1008 (11/06/2010)	AMD 1.2.1.238 (10/08/2010)	AMD 1.2.1.238 (10/08/2010)

System	Dell Vostro 460 Mini Tower (Intel Core i5-2400)	Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)	HP Slimline s5750z (AMD Athlon II X4 640)	HP Pavilion p6750z (AMD Phenom II X4 840)
<b>Operating system</b>				
Name	Windows® 7 Ultimate	Windows 7 Ultimate	Windows 7 Ultimate	Windows 7 Ultimate
Build number	7600	7600	7600	7600
Service Pack	N/A	N/A	N/A	N/A
File system	NTFS	NTFS	NTFS	NTFS
Kernel	ACPI x64 – based PC	ACPI x64 – based PC	ACPI x64 – based PC	ACPI x64 – based PC
Language	English	English	English	English
Microsoft DirectX® version	DirectX 11	DirectX 11	DirectX 11	DirectX 11
<b>Graphics</b>				
Vendor and model number	AMD Radeon™ HD 6450	2 x AMD Radeon HD 6450	AMD Radeon HD 4200	AMD Radeon HD 6570
Type	Discrete	Discrete	Discrete	Discrete
Chipset	ATI Radeon HD 6450	ATI Radeon HD 6450	ATI Radeon HD 4200	ATI Radeon HD 6570
BIOS version	113-AD00200-101-PE	113-C2640500-100	BR34448.bin	113-AC89900-102-PE
Total available graphics memory (MB)	2,807	4,851	1,919	4,083
Dedicated video memory (MB)	1,024	2,048	256	1,024
System video memory (MB)	0	0	0	0
Shared system memory (MB)	1,783	2,803	1,663	3,059
Resolution	1,280 x 1,024 x 32-bit	1,280 x 1,024 x 32-bit	1,280 x 1,024 x 32-bit	1,280 x 1,024 x 32-bit
Driver	ATI Technologies Inc. 8.812.0.0 (01/04/2011)	ATI Technologies Inc. 8.783.2.2000 (11/16/2010)	ATI Technologies Inc. 8.733.0.0 (05/11/2010)	ATI Technologies Inc. 8.784.1.0 (11/23/2010)
<b>Sound card/subsystem</b>				
Vendor and model number	Realtek High Definition Audio	Realtek High Definition Audio	Realtek High Definition Audio	Creative SB X-Fi

System	Dell Vostro 460 Mini Tower (Intel Core i5-2400)	Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)	HP Slimline s5750z (AMD Athlon II X4 640)	HP Pavilion p6750z (AMD Phenom II X4 840)
Driver	Realtek Semiconductor Corp. 6.0.1.6141 (06/22/2010)	Realtek Semiconductor Corp. 6.0.1.5883 (09/14/2010)	Realtek Semiconductor Corp. 6.0.1.6196 (09/07/2010)	Creative 6.0.1.6 (03/05/2010)
<b>Ethernet</b>				
Vendor and model number	Broadcom NetLink Gigabit	Intel 82579LM Gigabit	Realtek PCIe FE Family	Realtek PCIe FE Family
Driver	Broadcom 14.2.0.7 (07/20/2010)	Intel 11.8.81.0 (10/28/2010)	Realtek 7.26.902.2010 (09/02/2010)	Realtek 7.26.902.2010 (09/02/2010)
<b>Optical drive(s)</b>				
Vendor and model number	HL-DT-ST CH20N	TSSTcorp TS-H653H	HP DH16ABLH	HP DH16ABLH
Type	BD-ROM	CD/DVD-RW	CD/DVD-RW	CD/DVD-RW
<b>USB ports</b>				
Number	8	10	6	6
Type	2.0	2.0	2.0	2.0
Other	eSATA, HDMI, Media Card Reader	eSATA	Media Card Reader	Media Card Reader
<b>Monitor</b>				
LCD type	Optiquest Q7	Optiquest Q7	Optiquest Q7	Optiquest Q7
Screen size	17"	17"	17"	17"
Refresh rate (Hz)	60	60	60	60

Figure 11. Configuration information for the four test systems.

## APPENDIX B - TEST METHODOLOGY

Note: We ran each test three times, and report the results of the median run.

### Setting up the test workload

We used a specific test workload for four of five test cases (see [Appendix D](#)). 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 that 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 flash drive, and a 1GB Kingston Traveler USB flash drive.

### Setting up the test

1. Copy the test.mp3 file from the Corpus folder to the PNY USB flash drive.
2. Copy the test.mp3 file from the Corpus folder to the Kingston USB flash drive.
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 flash drives.
  - 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 flash drive into USB port #1 and start the timer.
2. Stop the timer when the AutoPlay menu for the USB flash drive appears on the desktop.
3. After the USB device driver software installs successfully, remove the USB flash drive using the Safely Remove Hardware tool.
4. Wait 30 seconds.
5. Simultaneously insert the PNY USB flash drive into USB port #2 and start the timer.
6. Stop the timer when the AutoPlay menu for the USB flash drive appears on the desktop.
7. Remove the USB flash drive using the Safely Remove Hardware tool.
8. Wait 30 seconds.
9. Simultaneously insert the Kingston USB flash drive into USB port #1 and start the timer.
10. Stop the timer when the AutoPlay menu for the USB flash drive appears on the desktop.
11. After the USB device driver software installs successfully, remove the USB flash drive using the Safely Remove Hardware tool.
12. Wait 30 seconds.
13. Simultaneously insert the Kingston USB flash drive into USB port #2 and start the timer.
14. Stop the timer when the AutoPlay menu for the USB flash drive appears on the desktop.
15. Remove the USB flash drive 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 flash drives.

- 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.
17. Repeat steps 1 through 16 two times, and report the median.

### Copying files

This test requires a stopwatch, a 1GB Kingston Traveler USB flash drive, 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 flash drive, and create one output folder on the USB drive (e.g., `E:\testusbout1`).
7. Remove the USB flash drive 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 flash drive 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 flash drive.
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 flash drive using the Safely Remove Hardware tool.
16. Re-insert the USB flash drive 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 flash drive.
  - b. Create a new output folder with a different unique name on the USB drive (e.g., E:\testusbout2).
  - c. Remove the USB flash drive 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).

## Boot experience tests

### Cold boot experience

This test requires a stopwatch with multiple timers.

#### Setting up the test

1. Reset the system to the base test image.

#### Running the test

1. Boot the system.
2. Shut down the system, and wait 3 minutes.
3. Simultaneously start the timer and boot the system.
4. Stop timer 1 when the taskbar appears.
5. Immediately after the taskbar appears, click once on the test Word document on the desktop and then press Enter to open the document.
6. Stop timer 2 when the word count for the document appears in the bottom left of the task pane.
7. Wait 3 minutes before shutting the system down.
8. Repeat steps 3 through 8 two more times.

### Trained boot experience

This test requires a stopwatch with multiple timers. This test requires no setup.

#### Running the test

1. Simultaneously start the timer and boot the system.
2. Stop timer 1 when the taskbar appears.
3. Immediately after the taskbar appears, click once on the test Word document on the desktop and then press Enter to open the document.
4. Stop timer 2 when the word count for the document appears in the bottom left of the task pane.
5. Wait 3 minutes before shutting the system down.
6. Repeat steps 1 through 6 two more times.

## Shutdown experience tests

### Shutdown experience

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

#### *Running the test*

1. Boot the system.
2. Wait 2 minutes.
3. Shut down the system: Start→Shut Down.
4. Simultaneously start the timer and select Shut Down.
5. Stop the timer when the hard drive LED turns off.
6. Repeat steps 1 through 5 two more times.

## Hibernate experience tests

### Cold hibernate experience

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

#### *Running the test*

1. Boot the system.
2. Put the system into hibernate mode: Start→Hibernate.
3. Select Hibernate.
4. Press the power button to resume from hibernate mode.
5. Shut down the system.
6. Boot the system.
7. Wait 5 minutes.
8. Put the system in hibernate mode: Start→Hibernate.
9. Simultaneously start the timer and select Hibernate.
10. Stop the timer when the hard drive LED turns off.
11. Reset the timer.
12. Simultaneously start the timer and press the power button to resume from hibernate mode.
13. Stop the timer when the system displays the desktop.
14. Shut down the system.
15. Repeat steps 6 through 14 two more times, but do not shut down the system after the third timed 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→Hibernate.
3. Simultaneously start the timer and select Hibernate.
4. Stop the timer when the hard drive LED turns off.
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. Repeat steps 1 through 7 two more times.

### **Cold hibernate experience with applications open with Outlook**

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

#### ***Running the test***

1. Reboot the system.
2. Launch Outlook, and connect to Exchange Server. A Connected to Microsoft Exchange message appears in the lower right corner of Outlook.
3. Launch PowerPoint, and open the test slide deck.
4. Launch Excel, and open the test spreadsheet.
5. Launch Word, and open the test document.
6. With the documents open, put the system in hibernate mode: Start → Hibernate.
7. Select Hibernate.
8. Press the power button to resume from hibernate mode.
9. Shut down the system.
10. Boot the system.
11. Launch Outlook, and connect to Exchange Server.
12. Launch PowerPoint, and open the test slide deck.
13. Launch Excel, and open the test spreadsheet.
14. Launch Word, and open the test document.
15. Select Outlook from the taskbar to bring it to the forefront.
16. Wait 5 minutes.
17. With the documents open, put the system in hibernate mode: Start → Hibernate.
18. Simultaneously start the timer and select Hibernate.
19. Stop the timer when the hard drive LED turns off.
20. Reset the timer.
21. Simultaneously start the timer and press the power button to resume from hibernate mode.
22. Stop the timer when the system successfully reconnects to Microsoft Exchange Server, as indicated by the connection status bar in Outlook 2007.
23. Shut down the system.
24. Repeat steps 10 through 23 two more times, but do not shut down the system after the third timed run.

### **Warm hibernate experience with applications open with Outlook**

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

#### ***Running the test***

1. Wait 1 minute.
2. With the documents still open, put the system in hibernate mode: Start → Hibernate.
3. Simultaneously start the timer and select Hibernate.
4. Stop the timer when the hard drive LED turns off.
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 successfully reconnects to Microsoft Exchange Server, as indicated by the connection status bar in Outlook 2007.
8. Repeat steps 1 through 7 two more times.

## Sleep experience tests

### Cold sleep experience

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

#### Running the test

1. Reboot the system.
2. Put the system in sleep mode (Start→Sleep).
3. Press the power button to resume from sleep mode.
4. Shut down the system.
5. Boot the system.
6. Wait 5 minutes.
7. Put the system in sleep mode (Start→Sleep).
8. Simultaneously start the timer and select Sleep.
9. Stop the timer when the hard drive LED turns off.
10. Reset the timer.
11. Simultaneously start the timer and press the power button to resume from sleep mode.
12. Stop the timer when the system displays the desktop.
13. Shut down the system.
14. Repeat steps 5 through 13 two more times, but do not shut down the system after the third timed run.

### Warm sleep experience

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

#### Running the test

1. Wait 1 minute.
2. Put the system in sleep mode (Start→Sleep).
3. Simultaneously start the timer and select Sleep.
4. Stop the timer when the hard drive LED turns off.
5. Reset the timer.
6. Simultaneously start the timer and press the power button to resume from sleep mode.
7. Stop the timer when the system displays the desktop.
8. Repeat steps 1 through 7 two more times.

### Cold sleep experience with applications open with Outlook

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

#### Running the test

1. Reboot the system.
2. Launch Outlook, and connect to Exchange Server. A Connected to Microsoft Exchange message appears in the lower right corner of Outlook.
3. Launch PowerPoint, and open the test slide deck.

4. Launch Excel, and open the test spreadsheet.
5. Launch Word, and open the test document.
6. Select Outlook from the taskbar to bring it to the forefront.
7. With the documents still open, put the system in sleep mode (Start→Sleep).
8. Select Sleep.
9. Press the power button to resume from sleep mode.
10. Shut down the system.
11. Boot the system.
12. Launch Outlook, and connect to Exchange Server.
13. Launch PowerPoint, and open the test slide deck.
14. Launch Excel, and open the test spreadsheet.
15. Launch Word, and open the test document.
16. Wait 5 minutes.
17. With the documents open, put the system in sleep mode (Start→Sleep).
18. Simultaneously start the timer and select Sleep.
19. Stop the timer when the hard drive LED turns off.
20. Reset the timer.
21. Simultaneously start the timer and press the power button to resume from sleep mode.
22. Stop the timer when the system successfully reconnects to Microsoft Exchange Server, as indicated by the connection status bar in Outlook 2007.
23. Shut down the system.
24. Repeat steps 11 through 23 two more times, but do not shut down after the third timed run.

#### **Warm sleep experience with applications open with Outlook**

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

##### ***Running the test***

1. Wait 1 minute.
2. With the documents still open, put the system in sleep mode (Start→Sleep).
3. Simultaneously start the timer and select Sleep.
4. Stop the timer when the hard drive LED turns off.
5. Reset the timer.
6. Simultaneously start the timer and press the power button to resume from sleep mode.
7. Stop the timer when the system successfully reconnects to Microsoft Exchange Server, as indicated by the connection status bar in Outlook 2007.
8. Repeat steps 1 through 7 two more times.
9. Shut down the system.

#### **Warm sleep experience with applications open with Outlook**

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

##### ***Running the test***

1. Wait 1 minute.
2. With the documents still open, put the system in sleep mode (Start→Sleep).

3. Simultaneously start the timer and select Sleep.
4. Stop the timer when the hard drive LED turns off.
5. Reset the timer.
6. Simultaneously start the timer and press the power button to resume from sleep mode.
7. Stop the timer when the system successfully reconnects to Windows Live Mail, as indicated by the connection status bar in Windows Live Mail.
8. Repeat steps 1 through 7 two more times.
9. Shut down the system.

## APPENDIX C – DETAILED RESULTS

Figures 12 and 13 present the detailed test results for the systems.

Mid-range systems	Dell Vostro 460 Mini Tower (Intel Core i5-2400)			HP Slimline s5750z (AMD Athlon II X4 640)		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
<b>Opening Microsoft Office files</b>						
Opening local Word document	00:03.34	00:04.63	00:05.02	00:05.22	00:06.46	00:04.91
Opening local Excel spreadsheet	00:02.12	00:02.44	00:02.25	00:02.37	00:02.33	00:02.31
Opening local PowerPoint deck	00:01.46	00:01.29	00:01.34	00:01.48	00:01.87	00:01.55
Opening Word document - network	00:06.18	00:05.78	00:06.21	00:04.65	00:05.56	00:06.48
Opening Excel spreadsheet - network	00:03.21	00:02.89	00:02.45	00:02.53	00:03.09	00:03.05
Opening PowerPoint deck - network	00:01.94	00:01.62	00:02.04	00:01.85	00:02.09	00:02.30
<b>USB flash drive tasks</b>						
Installing PNY USB flash drive	00:02.90	00:03.20	00:03.25	00:03.96	00:05.18	00:06.14
Installing Kingston USB flash drive	00:02.70	00:02.81	00:02.87	00:02.37	00:02.65	00:02.22
Re-inserting PNY USB flash drive	00:02.20	00:02.12	00:02.24	00:03.58	00:03.48	00:03.55
Re-inserting Kingston USB flash drive	00:01.37	00:01.57	00:01.29	00:01.58	00:01.67	00:01.60
<b>Copying files locally</b>						
Copying files locally	00:08.97	00:09.14	00:08.74	00:11.75	00:11.56	00:10.62
Copying files to a USB flash drive	01:01.13	00:58.12	00:57.56	01:04.24	01:06.29	01:05.96
Copying files from a USB flash drive	00:17.86	00:17.90	00:17.75	00:20.63	00:20.47	00:20.93
<b>Boot tasks</b>						
Taskbar appears	00:38.00	00:37.07	00:39.91	00:33.06	00:33.16	00:33.15
Word document appears	00:31.58	00:29.10	00:29.94	00:54.02	00:48.25	00:50.03
<b>Hibernation tasks</b>						
<b>Cold hibernate experience</b>						
Time to hibernate	00:11.94	00:12.14	00:12.18	00:21.55	00:19.05	00:20.51
Time to resume from hibernate	00:18.77	00:18.75	00:18.63	00:23.90	00:23.87	00:23.97
<b>Warm hibernate experience</b>						
Time to hibernate	00:10.66	00:11.18	00:09.84	00:16.40	00:16.50	00:16.40
Time to resume from hibernate	00:18.96	00:18.98	00:18.18	00:26.23	00:24.41	00:25.24
<b>Cold hibernate experience with applications open</b>						
Time to hibernate	00:13.72	00:15.42	00:14.28	00:21.71	00:20.44	00:20.23
Time to connect to Exchange Server after resume from hibernate	00:19.76	00:19.89	00:19.68	00:26.23	00:25.42	00:27.15
<b>Warm hibernate experience with applications open</b>						
Time to hibernate	00:13.66	00:12.76	00:12.57	00:22.27	00:22.58	00:22.90
Time to connect to Exchange Server after resume from hibernate	00:19.96	00:19.56	00:19.14	00:22.81	00:23.06	00:23.38

Mid-range systems	Dell Vostro 460 Mini Tower (Intel Core i5-2400)			HP Slimline s5750z (AMD Athlon II X4 640)		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
<b>Sleep tasks</b>						
<b>Cold sleep experience</b>						
Time to sleep	00:12.57	00:13.17	00:11.79	00:19.17	00:17.75	00:18.45
Time to resume from sleep	00:05.36	00:05.14	00:05.07	00:06.22	00:07.09	00:06.01
<b>Warm sleep experience</b>						
Time to sleep	00:07.64	00:07.59	00:07.86	00:12.48	00:11.20	00:12.12
Time to resume from sleep	00:04.17	00:04.95	00:05.15	00:04.90	00:05.37	00:06.23
<b>Cold sleep experience with applications open</b>						
Time to sleep	00:15.18	00:14.83	00:15.18	00:21.54	00:21.80	00:23.24
Time to connect to Exchange Server after resume from sleep	00:05.00	00:05.06	00:05.11	00:07.35	00:06.23	00:07.46
<b>Warm sleep experience with applications open</b>						
Time to sleep	00:14.71	00:11.03	00:09.84	00:18.85	00:18.77	00:19.12
Time to connect to Exchange Server after resume from sleep	00:05.02	00:05.33	00:05.25	00:06.37	00:06.81	00:06.15
<b>Shutdown</b>						
Time to turn system off	00:12.35	00:11.03	00:12.44	00:14.89	00:14.87	00:13.31

Figure 12: System responsiveness results, in seconds, for the two mid-range desktop systems. Lower numbers are better.

High-end systems	Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)			HP Pavilion p6750z (AMD Phenom II X4 840)		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
<b>Opening Microsoft Office files</b>						
Opening local Word document	00:04.55	00:04.93	00:04.28	00:04.58	00:04.59	00:04.48
Opening local Excel spreadsheet	00:02.07	00:01.87	00:02.33	00:02.35	00:02.34	00:02.45
Opening local PowerPoint deck	00:01.77	00:01.36	00:01.56	00:01.35	00:01.56	00:01.40
Opening Word document - network	00:05.99	00:04.81	00:06.03	00:07.29	00:06.79	00:06.58
Opening Excel spreadsheet - network	00:02.40	00:02.84	00:02.31	00:03.23	00:03.25	00:03.50
Opening PowerPoint deck - network	00:01.84	00:01.81	00:01.83	00:03.08	00:02.88	00:02.02
<b>USB flash drive tasks</b>						
Installing PNY USB flash drive	00:08.48	00:07.84	00:07.96	00:07.66	00:07.35	00:07.58
Installing Kingston USB flash drive	00:02.97	00:02.52	00:03.02	00:02.45	00:02.57	00:02.49
Re-inserting PNY USB flash drive	00:02.43	00:02.68	00:02.42	00:03.41	00:03.43	00:03.26
Re-inserting Kingston USB flash drive	00:01.62	00:01.60	00:01.72	00:01.53	00:01.55	00:01.46
<b>Copying files locally</b>						
Copying files locally	00:13.90	00:10.47	00:10.06	00:11.68	00:09.96	00:09.62
Copying files to a USB flash drive	01:00.78	01:00.87	00:59.42	01:02.86	01:02.33	01:02.71
Copying files from a USB flash drive	00:18.49	00:18.34	00:18.43	00:20.09	00:20.53	00:20.43

High-end systems	Dell OptiPlex 990 Mini Tower (Intel Core i7-2600)			HP Pavilion p6750z (AMD Phenom II X4 840)		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
<b>Boot tasks</b>						
Taskbar appears	00:39.84	00:40.51	00:38.88	00:40.47	00:37.34	00:41.17
Word document appears	00:11.11	00:11.83	00:08.01	00:50.18	00:51.59	00:51.88
<b>Hibernation tasks</b>						
<b>Cold hibernate experience</b>						
Time to hibernate	00:14.18	00:13.15	00:13.85	00:22.83	00:22.60	00:24.45
Time to resume from hibernate	00:31.28	00:31.56	00:34.15	00:27.12	00:29.82	00:26.90
<b>Warm hibernate experience</b>						
Time to hibernate	00:13.20	00:13.08	00:12.65	00:20.28	00:20.07	00:19.00
Time to resume from hibernate	00:30.70	00:30.88	00:32.75	00:27.66	00:27.56	00:27.47
<b>Cold hibernate experience with applications open</b>						
Time to hibernate	00:17.68	00:16.93	00:17.21	00:35.11	00:34.81	00:36.21
Time to connect to Exchange Server after resume from hibernate	00:25.21	00:25.93	00:25.69	00:33.81	00:31.93	00:32.21
<b>Warm hibernate experience with applications open</b>						
Time to hibernate	00:18.36	00:18.58	00:18.66	00:22.10	00:21.80	00:21.47
Time to connect to Exchange Server after resume from hibernate	00:35.47	00:35.50	00:39.17	00:33.48	00:32.93	00:32.33
<b>Sleep tasks</b>						
<b>Cold sleep experience</b>						
Time to sleep	00:13.43	00:14.44	00:15.12	00:18.78	00:18.91	00:18.71
Time to resume from sleep	00:05.85	00:06.04	00:05.92	00:08.48	00:07.42	00:05.85
<b>Warm sleep experience</b>						
Time to sleep	00:10.71	00:10.52	00:10.21	00:13.90	00:14.70	00:14.15
Time to resume from sleep	00:05.64	00:05.64	00:05.47	00:04.84	00:04.23	00:04.49
<b>Cold sleep experience with applications open</b>						
Time to sleep	00:18.15	00:18.16	00:18.05	00:24.15	00:29.99	00:24.52
Time to connect to Exchange Server after resume from sleep	00:11.36	00:08.75	00:08.62	00:07.45	00:08.61	00:07.56
<b>Warm sleep experience with applications open</b>						
Time to sleep	00:16.96	00:16.90	00:16.71	00:23.31	00:20.49	00:20.19
Time to connect to Exchange Server after resume from sleep	00:05.95	00:06.35	00:06.65	00:06.69	00:06.17	00:06.59
<b>Shutdown</b>						
Time to turn system off	00:12.54	00:12.48	00:13.92	00:17.77	00:14.68	00:13.06

Figure 13: System responsiveness results, in seconds, for the two high-end desktop systems. Lower numbers are better.

## APPENDIX D – 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
9/16/2005	8:39 PM	1,074,183	Ancient christian stone marking Patrick's well.JPG
8/26/2005	5:12 PM	1,041,140	Art Gallery.JPG
9/10/2007	1:16 AM	26,694	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
9/9/2007	1:13 AM	19,547	Bidder comparison worksheet and process1 (2).xlsx
9/9/2007	1:13 AM	19,547	Bidder comparison worksheet and process1.xlsx
9/3/2007	6:15 PM	24,480	Breakeven analysis10 (2).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
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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
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12/19/2003	11:42 PM	24,064	ciscoexpo.xls
12/19/2003	11:43 PM	15,872	ciscoexpotemp (2).xls
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9/9/2007	2:09 AM	126,324	Company Meeting3.pptx
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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
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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
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9/12/2007	12:53 AM	1,020,765	ConnecticutYankee (2).pdf
9/12/2007	12:53 AM	1,826,512	ConnecticutYankee (2).xps
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9/12/2007	12:53 AM	1,020,765	ConnecticutYankee.pdf
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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
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9/8/2007	8:41 PM	1,260,859	DavidCopperfield.docx
9/12/2007	12:58 AM	3,485,857	DavidCopperfield.pdf
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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
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9/3/2007	6:12 PM	20,173	Forecasting report10.xlsx
10/1/2005	8:19 PM	1,277,141	Forest stream.JPG
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12/19/2003	11:42 PM	13,824	fvtemp.xls
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9/12/2007	2:53 AM	329,705	Hadleyburg.xps

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9/11/2007	12:34 AM	1,812,476	Introducing PowerPoint 2007A.pptx
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9/11/2007	1:53 AM	1,020,651	MartinChuzzlewitB.docx
9/11/2007	1:54 AM	1,017,247	MartinChuzzlewitC.docx
9/11/2007	1:54 AM	1,023,558	MartinChuzzlewitD.docx
9/11/2007	1:55 AM	1,020,227	MartinChuzzlewitE.docx
9/3/2007	11:47 PM	614,882	Math - Dudeney10.docx
9/11/2007	12:42 AM	800,966	Microsoft© Office A.pptx
9/11/2007	12:43 AM	800,998	Microsoft© Office B.pptx
9/11/2007	12:43 AM	800,994	Microsoft© Office C.pptx
9/11/2007	12:44 AM	800,974	Microsoft© Office D.pptx
9/11/2007	12:44 AM	801,013	Microsoft© Office E.pptx
9/9/2007	10:59 AM	1,025,163	Microsoft© Office.pptx
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9/11/2007	12:53 AM	1,561,260	Microsoft© Office17A.pptx
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9/11/2007	12:54 AM	1,561,564	Microsoft© Office17C.pptx
9/11/2007	12:55 AM	1,561,657	Microsoft© Office17D.pptx
9/11/2007	12:55 AM	1,561,617	Microsoft© Office17E.pptx
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9/9/2007	1:21 PM	712,466	Microsoft© Office2.pptx
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9/11/2007	12:57 AM	1,186,727	Microsoft© Office20C.pptx
9/11/2007	12:58 AM	1,186,726	Microsoft© Office20D.pptx
9/11/2007	12:58 AM	1,186,726	Microsoft© Office20E.pptx
9/9/2007	1:00 PM	949,022	Microsoft© Office21.pptx
9/9/2007	1:02 PM	981,825	Microsoft© Office22.pptx
9/11/2007	1:23 AM	1,200,628	Microsoft© Office23.pptx

9/11/2007	1:23 AM	1,200,641	Microsoft© Office23A.pptx
9/11/2007	1:24 AM	1,200,610	Microsoft© Office23B.pptx
9/11/2007	1:24 AM	1,200,622	Microsoft© Office23C.pptx
9/11/2007	1:25 AM	1,200,706	Microsoft© Office23D.pptx
9/11/2007	1:25 AM	1,200,671	Microsoft© Office23E.pptx
9/9/2007	1:03 PM	1,013,396	Microsoft© Office24.pptx
9/9/2007	1:06 PM	962,131	Microsoft© Office25.pptm
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9/11/2007	12:28 AM	958,094	Microsoft© Office25A.pptx
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9/11/2007	12:29 AM	958,053	Microsoft© Office25D.pptx
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9/11/2007	1:26 AM	1,220,268	Microsoft© Office31C.pptx
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9/9/2007	1:22 PM	322,092	Microsoft© Office35.pptx
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9/9/2007	1:29 PM	230,500	Microsoft© Office38.pptx
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9/11/2007	12:46 AM	1,571,475	Microsoft© Office3C.pptx
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9/9/2007	1:34 PM	355,726	Microsoft© Office43.pptx
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9/9/2007	2:08 PM	390,223	Microsoft© Office45.pptx
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9/9/2007	2:13 PM	341,546	Microsoft© Office47.pptx
9/9/2007	2:15 PM	635,972	Microsoft© Office48.pptx
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9/9/2007	11:03 AM	498,391	Microsoft© Office5.pptx
9/9/2007	2:24 PM	695,362	Microsoft© Office50.pptx
9/9/2007	11:02 AM	1,015,401	Microsoft© Office51.pptx
9/9/2007	4:12 PM	428,908	Microsoft© Office52.pptx
9/9/2007	4:12 PM	350,753	Microsoft© Office53.pptx
9/9/2007	4:13 PM	976,384	Microsoft© Office54.ppt
9/9/2007	4:14 PM	314,015	Microsoft© Office54.pptx
9/11/2007	12:25 AM	554,598	Microsoft© Office54A.pptx
9/11/2007	12:25 AM	554,610	Microsoft© Office54B.pptx
9/11/2007	12:26 AM	554,612	Microsoft© Office54C.pptx
9/11/2007	12:26 AM	554,611	Microsoft© Office54D.pptx
9/11/2007	12:26 AM	554,610	Microsoft© Office54E.pptx
9/9/2007	5:48 PM	437,892	Microsoft© Office55.pptx
9/9/2007	5:49 PM	573,438	Microsoft© Office56.pptx
9/9/2007	8:49 PM	573,428	Microsoft© Office57.pptx
9/9/2007	8:50 PM	525,453	Microsoft© Office58.pptx
9/9/2007	9:21 PM	297,037	Microsoft© Office59.pptx
9/9/2007	11:16 AM	498,382	Microsoft© Office6.pptx
9/9/2007	9:22 PM	569,541	Microsoft© Office60.pptx
9/9/2007	9:25 PM	365,319	Microsoft© Office61.pptx
9/9/2007	9:26 PM	383,562	Microsoft© Office62.pptx
9/9/2007	9:26 PM	356,419	Microsoft© Office63.pptx
9/9/2007	9:27 PM	656,644	Microsoft© Office64.pptx
9/9/2007	9:28 PM	580,065	Microsoft© Office65.pptx
9/9/2007	9:31 PM	453,163	Microsoft© Office66.pptx
9/9/2007	9:31 PM	388,797	Microsoft© Office67.pptx
9/9/2007	9:32 PM	409,618	Microsoft© Office68.pptx
9/9/2007	9:34 PM	618,184	Microsoft© Office69.pptx
9/9/2007	12:43 PM	1,696,999	Microsoft© Office7.pptx
9/9/2007	9:35 PM	304,286	Microsoft© Office70.pptx
9/9/2007	9:36 PM	451,891	Microsoft© Office71.pptx
9/9/2007	9:37 PM	258,210	Microsoft© Office72.pptx
9/9/2007	9:37 PM	473,998	Microsoft© Office73.pptx
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	Muckcross 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



Principled Technologies, Inc.  
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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.

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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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