

# Upgrading your practice to the Dell™ OptiPlex™ desktop with the Intel® Core™ i5 processor is a smart investment in your staff and your time



## OUR FINDINGS

Medical practices know that time is money; reducing the time you spend on routine daily tasks can have a powerful cumulative effect on the number of patients you treat. Upgrading from a 3- to 5-year-old desktop system to the current Dell OptiPlex 980 with the Intel Core i5 processor can save considerable time. In Principled Technologies' tests in our labs, we found that making this upgrade let medical providers and office workers carry out routine daily tasks as much as 77 percent faster, making such an upgrade a wise investment in your practice.

## OUR PROCESS

To determine how upgrading to a Dell OptiPlex 980 would benefit a medical practice, we developed several scenarios involving tasks commonly performed in medical offices. We then measured the response time of both the Dell OptiPlex 980 and an older Dell OptiPlex desktop system. We also performed a benchmark test that measures general system performance on typical tasks.



## PROJECT OVERVIEW

The goal of this report is to show the timesaving benefits of upgrading to a Dell OptiPlex with the Intel Core i5 processor from a 3- to 5-year old Dell OptiPlex with the Intel Core 2 Duo processor. (Appendix A provides detailed configuration information for the two test systems.) We measured each system on how quickly a user could perform four medical office scenarios that can cause users to wait.

We also measured the performance of the two systems using the SYSmark benchmark as a general indication of how well they handle applications, in general.

As the following testing scenarios show, the Dell OptiPlex 980 can save medical practice staff considerable time. We present detailed results in the What We Found section below and provide step-by-step details of our testing in Appendix B.

### Scenario 1: Launching and using 3D Slicer to view medical images

The doctor has just received a set of brain scans from the MRI technician. One tool he uses to visualize and quantify medical image data is the open-source application, 3D Slicer (<http://www.slicer.org/>). He launches the application on his 3-year old Dell OptiPlex 755, and opens the images. After he reviews the images, he takes them to his colleague's newly purchased Dell OptiPlex 980 desktop to discuss his findings.

As Figure 1 shows, launching the 3D Slicer application is 47.6 percent faster (saving 25 seconds) on the Dell OptiPlex 980 than on the 3-year-old Dell OptiPlex 755. Loading the image is 41.3 percent faster (saving 6 seconds).

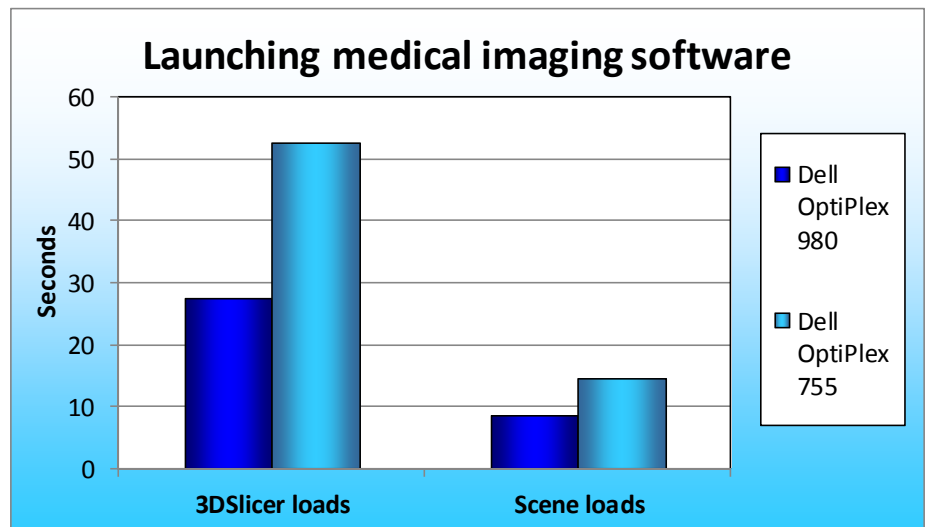


Figure 1: Time, in seconds, to complete launching and using 3D Slicer scenario on the two systems we tested. Lower numbers are better.

**Scenario 2: Recalculating last month’s medical insurance reimbursement in a Microsoft® Office Excel® spreadsheet while a virus scan and a hosted EMR solution run**

A billing specialist who works in the practice’s back office is logged into a representative hosted EMR on his new Dell OptiPlex, reviewing the practice’s insurance reimbursement records from the last month. After he downloads the records, he runs a macro in

Excel that creates charts of all the data. As he clicks the macro button to start the chart creation, the McAfee VirusScan® anti-virus software on his system begins a scan.

As Figure 2 shows, the Dell OptiPlex 980 lets him complete the Excel recalculation task 33.8 percent faster than on the 3-year-old Dell OptiPlex 755 he was using previously, and the McAfee VirusScan scan completes 21.5 percent faster.

**Scenario 3: Converting the doctor’s monthly meeting from a PowerPoint document to PDF while a virus scan and a hosted EMR solution run**

An administrative assistant is using her new Dell OptiPlex to publish the slides from the practice’s monthly meeting to PDF, while being logged onto the hosted EMR site with her browser in the background as usual. As she clicks to begin converting the Microsoft PowerPoint® 2010 document to PDF, the McAfee VirusScan anti-virus software on her system begins a scan.

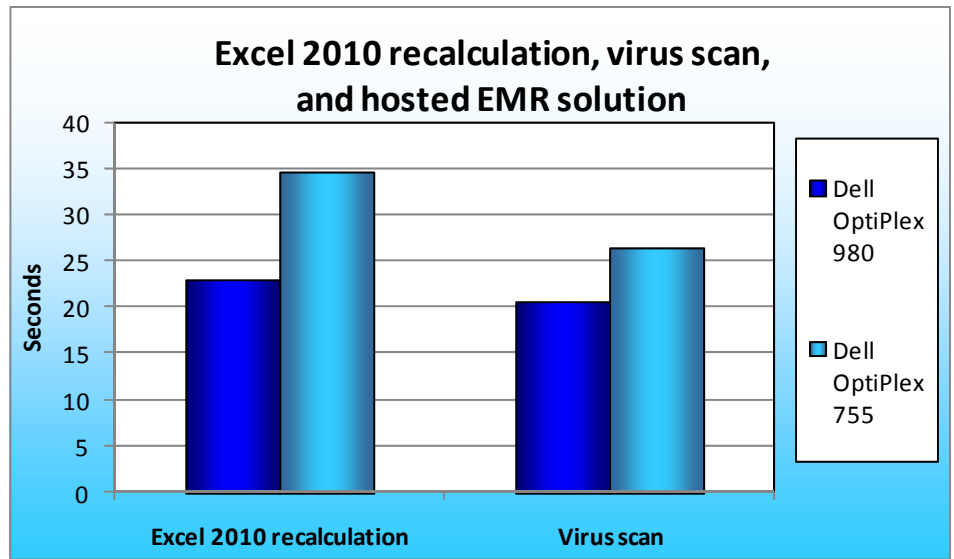


Figure 2: Time, in seconds, to complete Excel recalculation and virus scan while running a hosted EMR solution on the two systems we tested. Lower numbers are better.

As Figure 3 shows, her new system lets her complete the PDF conversion 77.0 percent faster (saving 21 seconds) than on the 3-year-old Dell OptiPlex 755 she had been using previously. The virus scan is 52.7 percent faster (saving almost 20 seconds).

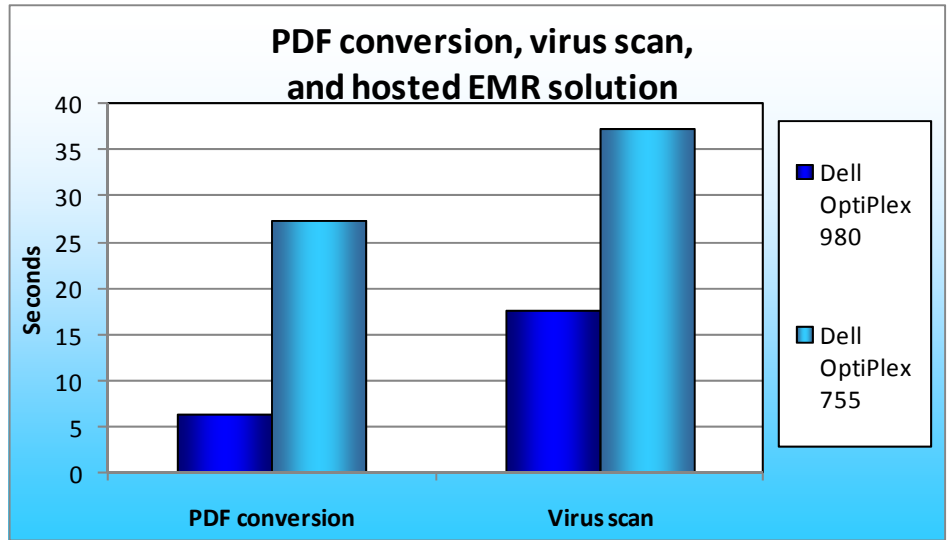


Figure 3: Time, in seconds, to complete PDF conversion with virus scan scenario on the two systems we tested. Lower numbers are better.

**Scenario 4: Converting MRI images to a smaller format for emailing and converting a PowerPoint document to PDF while a virus scan runs**

While logged onto the hosted EMR site with her new Dell OptiPlex system, a nurse practitioner opens a folder containing MRI images to review them, and to verify that they are the correct images to send to a colleague. Noting that they are, she converts the accompanying PowerPoint to a PDF, and, to save space in the email, converts the images to JPEG. She does this just as her McAfee VirusScan application begins to run in the background.

As Figure 4 shows, completing the PDF conversion is 55.1 percent faster than on the 3-year-old Dell OptiPlex 755 that she had been using previously. The virus scan is 37.1 percent faster (saving 13 seconds) and the JPG conversion is slightly faster as well.

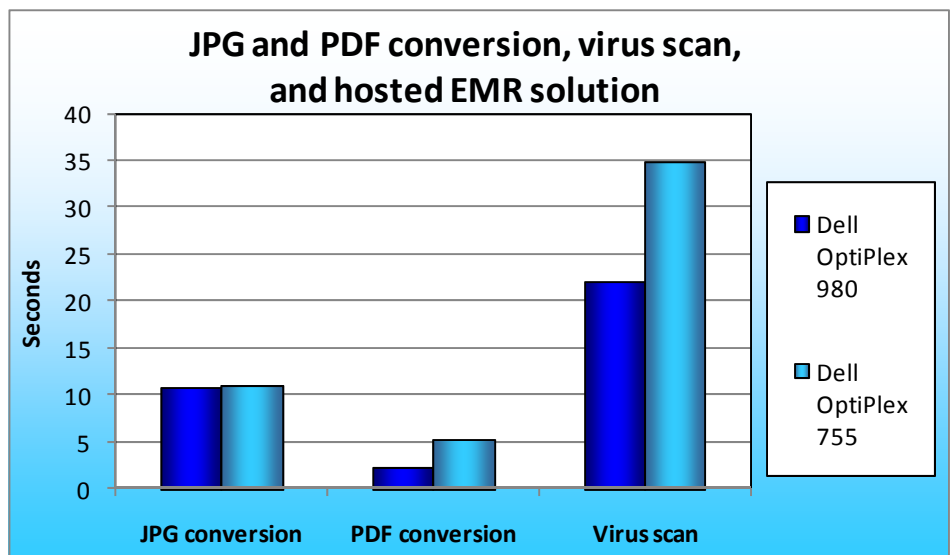


Figure 4: Time, in seconds, to complete JPG and PDF conversion with virus scan scenario on the two systems we tested. Lower numbers are better.

## WHAT WE FOUND

Figure 5 presents the time in seconds to complete everyday office scenarios on the two systems and the time that upgrading to the Dell OptiPlex 980 with an Intel Core i5 processor can save a medical practice.

	Dell OptiPlex 980	Dell OptiPlex 755	Time saved
Scenario 1: Launching and using 3D Slicer			
3DSlicer loads	27.55	52.62	25.07
Scene loads	8.59	14.64	6.05
Scenario 2: Excel recalculation with virus scan			
Excel 2010 recalculation	22.97	34.69	11.72
Virus scan	20.67	26.33	5.66
Scenario 3: PDF conversion with virus scan			
Publish to PDF	6.28	27.28	21.0
Virus scan	17.67	37.33	19.66
Scenario 4: JPG and PDF conversion with virus scan			
JPG conversion	10.9	10.95	0.05
PDF conversion	2.33	5.19	2.86
Virus scan	22	35	13

Figure 5: Time, in seconds, to complete everyday office scenarios on the two systems. Lower numbers are better.

In addition to the four test scenarios composed of typical medical office tasks, we also used a benchmarking tool to measure system performance, SYSmark 2007 Preview. SYSmark 2007 Preview determines its overall rating from four workload scenarios: e-learning, office productivity, video creation, and 3D modeling. To learn more, visit

<http://www.bapco.com/support/sysmark2007preview/Help/Help.html>.

As Figure 6 shows, the Dell OptiPlex 980 received a SYSmark 2007 rating score of 202, 46.4 percent better than the 3-year-old Dell OptiPlex 755 score of 138.

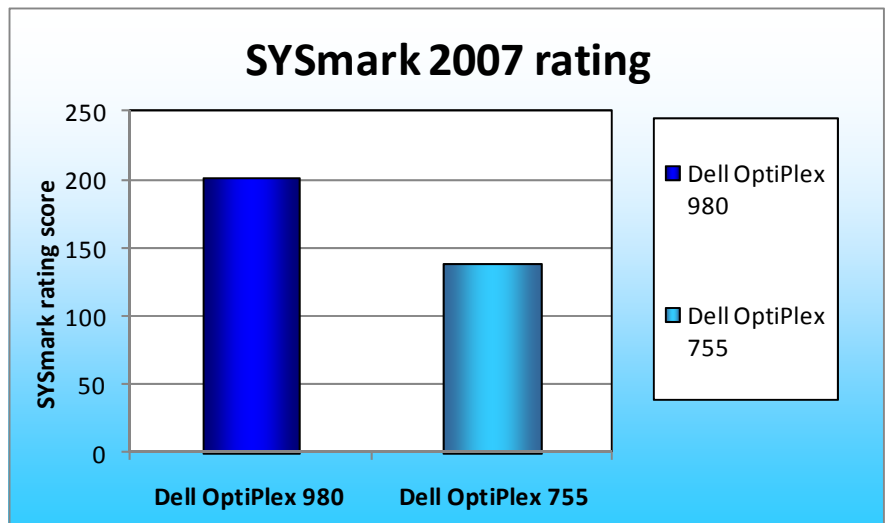


Figure 6: SYSmark 2007 rating score for the two systems we tested. Higher numbers are better.

## APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 7 provides detailed configuration information about each of the test PCs, which we list in alphabetical order.

System	Dell OptiPlex 980 Intel Core i5-650 3.20 GHz	Dell OptiPlex 755 Intel Core 2 Duo E6550 2.33 GHz
<b>General</b>		
Number of processor packages	1	1
Number of cores per processor	2	2
Number of hardware threads per core	2	1
System power management policy	Balanced	Home/Office Desk
Processor power-saving option	Enhanced Intel SpeedStep® Technology	Enhanced Intel SpeedStep Technology
<b>CPU</b>		
Vendor	Intel	Intel
Name	Core i5	Core 2 Duo
Model number	650	E6550
Stepping	K0	G0
Socket type	Socket LGA1156	Socket LGA775
Core frequency (GHz)	3.20	2.33
Bus frequency	DMI 2.5 GT/s	1,333 MHz
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache	256 KB (per core)	4 MB (shared)
L3 cache	4 MB (shared)	N/A
<b>Platform</b>		
Vendor	Dell	Dell
Motherboard model number	0D441T	0GM819
Motherboard chipset	Intel Q57	Intel Q35
BIOS name and version	Dell A04 (09/11/2010)	Dell A17 (04/06/2010)
BIOS settings	Default	Default
<b>Memory module(s)</b>		
Vendor and model number	Nanya Technology NT2GC64B8HC0NF-CG	Hyundai Electronics HYMP164U64CP6-Y5
Type	PC3-10600	PC2-5300
Speed (MHz)	1,333	667
Speed running in the system (MHz)	1,333	667
Timing/Latency (tCL-tRCD-tRP-tRASmin)	9-9-9-24	5-5-5-15
Size (MB)	4,096	1,024

System	Dell OptiPlex 980 Intel Core i5-650 3.20 GHz	Dell OptiPlex 755 Intel Core 2 Duo E6550 2.33 GHz
Number of memory module(s)	2 x 2,048 MB	2 x 512 MB
Chip organization	Double-sided	Single-sided
Channel	Dual	Dual
<b>Hard disk</b>		
Vendor and model number	Seagate ST3250318AS	Western Digital WD800JD-75MSA3
Number of disks in system	1	1
Size (GB)	250	80
Buffer size (MB)	8	8
RPM	7,200	7,200
Type	SATA 3.0 Gb/s	SATA 3.0 Gb/s
Controller	Intel ICH8R/ICH9R/ICH10R/DO/PCH SATA RAID Controller	Intel 82801IO (ICH9DO)
Controller driver	Intel 8.9.0.1023 (06/04/2009)	Intel 7.8.0.1012 (09/29/2007)
<b>Operating system</b>		
Name	Windows® 7 Professional	Windows XP Professional
Build number	7600	2600
Service pack	N/A	3
File system	NTFS	NTFS
Kernel	ACPI x86-based PC	ACPI Multiprocessor PC
Language	English	English
Microsoft DirectX version	DirectX 11	DirectX 9.0c
<b>Graphics</b>		
Vendor and model number	ATI Radeon™ HD 4550	Intel GMA 3100
Type	Discrete	Integrated
Chipset	ATI display adapter	Intel Q35 Express Chipset
BIOS version	113-BA4701-104	1459.0
Total available graphics memory (MB)	2,043	384
Dedicated video memory (MB)	512	N/A
System video memory (MB)	0	N/A
Shared system memory (MB)	1,531	N/A
Resolution	1,680 x 1,050 x 32-bit	1,280 x 1,024 x 32-bit
Driver	ATI 8.791.0.0 (10/26/2010)	Intel 6.14.10.4957 (06/11/2008)
<b>Sound card/subsystem</b>		
Vendor and model number	Realtek High Definition Audio	SoundMAX Integrated Digital HD
Driver	Realtek 6.0.1.5876 (11/16/2009)	Analog Devices 5.10.1.7255 (05/18/2009)

<b>System</b>	<b>Dell OptiPlex 980 Intel Core i5-650 3.20 GHz</b>	<b>Dell OptiPlex 755 Intel Core 2 Duo E6550 2.33 GHz</b>
<b>Ethernet</b>		
Vendor and model number	Intel 82578DM Gigabit	Intel 82566DM-2 Gigabit
Driver	Intel 11.6.92.0 (04/12/2010)	Intel 9.8.20.0 (04/13/2007)
<b>Optical drive(s)</b>		
Vendor and model number	LG GH50N	TSSTcorp TS-H353B
Type	DVD-RW	DVD-ROM
<b>USB ports</b>		
Number	8	8
Type	2.0	2.0
Other	N/A	N/A
<b>IEEE 1394</b>		
Number	N/A	N/A
<b>Monitor</b>		
Type	Dell 2009Wt	Dell 2009Wt
Screen size (inches)	21	21
Refresh rate (Hz)	60	60

Figure 7: Configuration information for the test PCs.



## APPENDIX B – DETAILED TEST METHODOLOGY

### Scenario 1: Launching and using 3D Slicer to view medical images

#### Application required

This scenario requires one application:

- 3D Slicer

#### Scenario setup

1. Browse to [www.slicer.org](http://www.slicer.org), and click Downloads.
2. For type of download, select Stable Releases; for Operating System, select Windows; and then click Download.
3. Browse to the Slicer executable file, and double-click it. If a security warning appears, click Run.
4. On the Welcome Screen for Slicer, click Next, and click I Agree on the License Agreement screen.
5. Select where the program is to be installed, and click Next, and click Install. When the Installation completes, click Finish.
6. Browse to [http://www.slicer.org/slicerWiki/index.php/Slicer\\_3.6:Training](http://www.slicer.org/slicerWiki/index.php/Slicer_3.6:Training).
7. Under Sample Data, click Slicer3Minute Data.
8. Create a new folder on the C: drive.
9. Browse to the zipped Slicer file and extract it to the newly created folder.

#### Test process

1. Click Start→All Programs→Slicer3 3.6.2010-11-03, and position the mouse over the Start Menu shortcut to the 3D Slicer executable.
2. Prepare the stopwatch. Simultaneously click Slicer to launch the program and start the stopwatch. The 3D Slicer splash screen appears.
3. Stop the stopwatch when splash screen closes and 3D Slicer opens. Record the time as Time to Launch Slicer.
4. Click File→Load Scene. Browse to the folder where the training files were unzipped in Scenario setup. Prepare the stopwatch.
5. Simultaneously start the stopwatch and click slicer3minute.mml.
6. Stop the stopwatch when Slicer finishes drawing the screen, and record the time as Time to Open Scene.

### Scenario 2: Recalculating last month's medical insurance reimbursement in an Excel spreadsheet while a virus scan and a hosted EMR solution run

#### Applications required

This scenario requires four applications:

- Microsoft Internet Explorer® 8
- McAfee VirusScan
- Microsoft Office Outlook® 2010
- Microsoft Office Excel 2010

## Scenario setup

1. Place the documents in the following locations:
  - a. Excel thumbnail charts 3\_12\_07.xls in Documents directory (C:\Users\User\Documents)
  - b. Outlook Personal Folder File (Outlook.pst) in C:\Users\Username\AppData\Local\Microsoft\Outlook (Use Instant Search to find Appdata, which is a hidden folder.)
  - c. Three uniquely named copies of VirusWL directory to (C:\VirusWL). The contents of the folders should be identical.
2. Launch Internet Explorer and browse to the hosted EMR.
3. Set this page as the home page by doing the following:
  - a. In Internet Explorer 8, open the Home drop-down menu by pressing ALT-M.
  - b. Select Add or Change Home Page.
  - c. In the Add or Change Home Page dialog box, select Use this webpage as your only home page.
  - d. Click the Yes button.

## Test process

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

1. Reboot the system under test.
2. Wait 4 minutes.
3. Launch Internet Explorer: Start→All Programs→Internet Explorer.
4. Launch Outlook 2010: Start→All Programs→Microsoft Office→Microsoft Outlook 2010.
5. Launch Excel 2010: Start→All Programs→Microsoft Office→Microsoft Excel 2010.
6. In Excel, click File→Open→Documents.
7. Select Excel thumbnail charts 3\_12\_07.xls, and click Open.
8. Press Alt+Tab to bring Outlook 2010 to the foreground.
9. Press Alt+Tab to bring Excel 2010 to the foreground.
10. Right-click Start, click Open Windows Explorer, and click C:. Right-click the VirusWL folder, and click Scan.
14. Press Alt+Tab to bring Excel 2010 to the foreground.
15. Prepare the stopwatch.
16. Simultaneously start the macro by clicking the embedded Update Figures From Pattern button and start the stopwatch.
17. Stop the stopwatch when Excel 2010 finishes recalculating every graph.
18. Record this time as the Excel 2010 recalculation task test result.
19. Wait for the Scan completed alert to pop up in the lower right-hand corner of the desktop.
20. Click View scan details in the pop up alert.
21. Click Done.
22. Click Navigation→History and Logs.
23. Click Scan Information.
24. Calculate the difference between the Start and Stop times, and record it as Virus scan duration.
25. Repeat the test process two more times for a total of three runs. For each run, use a different VirusWL folder.

## Scenario 3: Converting the doctor's monthly meeting from a PowerPoint document to PDF while a virus scan and a hosted EMR solution run

### Applications required

This scenario requires five applications:

- Adobe® Reader X
- Microsoft Internet Explorer 8
- McAfee VirusScan
- Microsoft Office Outlook 2010
- Microsoft Office Word 2010

### Scenario setup

1. Place the documents in the following locations:
  - a. OSHA.docx to the Documents directory (C:\Users\User\Documents)
    - i. Open this file, and click File→Options→Proofing.
    - ii. Uncheck: Check spelling as you type, and Mark grammar errors as you type.
  - b. Outlook Personal Folder File (Outlook.pst) to C:\Users\Username\AppData\Local\Microsoft\Outlook (Use Search Programs and File to find Appdata, which is a hidden folder.)
  - c. Three uniquely named copies of VirusWL directory to (C:\VirusWL). The contents of the folders should be identical.
2. Launch Internet Explorer, and browse to the hosted EMR.
3. Set this page as the home page by doing the following:
  - a. In Internet Explorer 8, open the Home drop-down menu by pressing ALT-M.
  - b. Select Add or Change Home Page.
  - c. In the Add or Change Home Page dialog box, select Use this webpage as your only home page.
  - d. Click the Yes button.

### Test process

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

1. Reboot the system under test.
2. Wait 4 minutes.
3. Launch Internet Explorer: Start→All Programs→Internet Explorer.
4. Launch Outlook 2010: Start→All Programs→Microsoft Office→Microsoft Outlook 2010.
5. Launch Word 2010: Start→All Programs→Microsoft Office→Microsoft Word 2010.
6. In Word click File→Open→Documents.
7. Select Open OSHA.docx and click Open.
8. In the OSHA.docx document, click File→Save As→and select PDF from the Save as type drop down menu.
9. Right-click Start, and click Open Windows Explorer click C:. Right-click the VirusWL folder, and click Scan.
10. Right-click the VirusWL folder, and click Scan.
11. Press Alt+Tab to bring Word 2010 to the foreground.

12. Prepare the stopwatch.
13. Simultaneously click Save and start the stopwatch.
14. Stop the stopwatch when Adobe Reader X completes loading the newly created PDF file.
15. Record this time as the Publish to PDF task test result.
16. Wait for the Scan completed alert to pop up in the lower right-hand corner of the desktop.
17. Click View scan details in the pop-up alert.
18. Click Done.
19. Click Navigation→History and Logs.
20. Click Scan Information.
21. Calculate the difference between the Start and Stop times, and record it as Virus scan duration.
22. Delete the newly created OSHA.pdf file.
23. Empty the Recycle Bin.
24. Repeat the test process two more times for a total of three runs. For each run, use a different VirusWL folder.

## Scenario 4: Converting MRI images to a smaller format for emailing and converting a PowerPoint document to PDF while a virus scan runs

### Applications required

This scenario requires five applications:

- Adobe Photoshop® CS5
- Microsoft Internet Explorer 8
- McAfee VirusScan
- Microsoft Office Outlook 2010
- Microsoft Office PowerPoint 2010

### Scenario setup

1. Place all of the files in the following locations:
  - a. Outlook Personal Folder File (Outlook.pst) in C:\Users\Username\AppData\Local\Microsoft\Outlook (Use Instant Search to find Appdata, which is a hidden folder.)
  - b. Photoshop Images folder to Pictures (C:\Users\Username\Pictures)
  - c. Wolcroft software.ppt in Documents (C:\Users\Username\Documents)
  - d. Three uniquely named copies of VirusWL directory to (C:\VirusWL). The contents of the folders should be identical.
2. Launch Internet Explorer, and browse to the hosted EMR.
3. Set this page as the home page by doing the following:
  - a. In Internet Explorer 8, open the Home drop-down menu by pressing ALT-M.
  - b. Select Add or Change Home Page.
  - c. In the Add or Change Home Page dialog box, select Use this webpage as your only home page.
  - d. Click the Yes button.

### Test process

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

1. Reboot the system under test.
2. Wait 4 minutes.
3. Launch Internet Explorer: Start→All Programs→Internet Explorer.
4. Right-click Start, click Open Windows Explorer, and click C:. Right-click the VirusWL folder, and click Scan.
5. Right-click the VirusWL folder, and click Scan.
6. Launch Outlook 2010: Start→All Programs→Microsoft Office→Microsoft Outlook 2010.
7. Launch Photoshop: Start→All Programs→Adobe→Adobe Photoshop CS5.
8. Click File→Scripts→Image Processor.
9. Under Select the images to process in the Image Processor dialog box, click Select Folder.
10. Browse to the Photoshop Images folder in Pictures (C:\Users\User\Pictures), and click OK.
11. Under Select location to save processed images in the Image Processor dialog box, verify that Desktop is selected as the destination.
12. Under File Type in the Image Processor dialog box, verify that Save as JPEG is selected and the Quality is set to 5.
13. Prepare the stopwatch.
14. Simultaneously click Run and start the stopwatch.
15. Stop the stopwatch when the conversion process is complete (the flashing placeholder images will disappear).
16. Record this time as the JPEG conversion task test result.
17. Launch PowerPoint 2010: Start→All Programs→Microsoft Office→Microsoft PowerPoint 2010.
18. Click File→Open and browse to Wolcsoft software PPT deck 3\_12\_07, and click Open.
19. Click File→Save As→PDF.
20. In the Save as dialogue box, leave the default File name and verify that PDF is selected in the Save as type drop-down menu.
21. Verify that the box next to Open file after Saving is checked.
22. Prepare the stopwatch.
23. Simultaneously start the stopwatch and click Save.
24. Stop the stopwatch when the newly created PDF opens.
25. Record this time as the PDF conversion task test result.
26. Wait for the Scan completed alert to pop up in the lower right-hand corner of the desktop.
27. Click View scan details in the pop-up alert.
28. Click Done.
29. Click Navigation→History and Logs.
30. Click Scan Information.
31. Calculate the difference between the Start and Stop times, and record it as Virus scan duration.
32. Close each of the open applications, and click No if the application asks if you want to save a file.
33. Delete the JPEG and PDF files.
34. Empty the Recycle Bin.
35. Repeat the test process two more times for a total of three runs. For each run, use a different VirusWL folder.

## ABOUT PRINCIPLED TECHNOLOGIES



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