Principled Technologies®

TEST REPORT
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Mobile PC Performance: Built-To-Order Systems

Executive summary

Intel Corporation (Intel) commissioned Principled Technologies (PT) to run a set of performance tests on two pairs of built-to-order Acer laptops:

- Acer TravelMate 4402WLMi (with an AMD Turion 64 ML-30 processor; $1,099 at time of purchase), which we compared to an
- Acer TravelMate 4062WLMi (with an Intel Pentium M 740 processor; $974 at time of purchase)
- Acer TravelMate 4404WLMi (with an AMD Turion 64 ML-34 processor; $1,199 at time of purchase, but $1,149 on 03/03/06), which we compared to an
- Acer TravelMate 4202WLMi (with an Intel Core Duo T2300 processor; $1,274 at time of purchase, but $1,099 on 03/03/06)

Key findings

- The Intel Pentium M 740 processor-based system ran from 7 to 23 percent faster than the AMD Turion 64 ML-30 processor-based system on all performance tests.
- The Intel Pentium M 740 processor-based system consumed from 66 to 86 percent less power than the AMD Turion 64 ML-30 processor- based system during all performance tests.
- The Intel Core Duo T2300 processor-based system ran from 36 to 100 percent faster than the AMD Turion 64 ML-34 processor-based system on all performance tests.
- The Intel Core Duo T2300 processor-based system consumed from 133 to 219 percent less power than the AMD Turion 64 ML-34 processor-based system during all performance tests.

The goal in choosing the systems was to find units as close in price and configuration as possible.

The goal of the testing was to gauge the performance and energy consumption that laptop buyers would experience on systems they purchased online from such well-known sites as www.newegg.com using five custom performance tests. Intel identified the test systems, tests, test procedures, and test settings. PT purchased and set up the systems, and PT executed all tests. We ran performance tests using the following applications:

Performance test applications

- Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0
- Apple iTunes 6.0.3
- InterVideo iVideoToGo for PSP
- Microsoft Windows Movie Maker 2.1
- Pinnacle Studio 10

Appendix A provides the purchase price of all four systems, and Appendix B details their configurations.

Test results

Tables 1 and 2 summarize the performance results and power measurements of each test. Each result is the median of three runs on each system. (In the event of a tie we chose the run with the higher power consumption. If the power consumption score was also tied, we then chose the first run we executed with those scores.) For these performance and power measurement tests, lower scores are better because they represent the time or the power the system required to complete each workload.

We used the Intel Power Acquisition Recording Kit (iPARK) in the power measurement tests. The iPARK device is an external unit that connects to a host computer through a USB cable. It also has a DC power cable that powers the system under test. We used the iPARK device to monitor the average DC power consumption of each system while under load. We then multiplied iPARK's average DC power score by the

time the workload took to complete to calculate the Workload Energy Consumption (WEC) in Watt-seconds. We divided the WEC Watt-seconds score by 3600 (the number of seconds in an hour) to calculate the WEC Watt-hours we reported below.

Because screen brightness can affect the amount of power a system consumes, for each pair of comparison systems we set the brightness to be as close as we could make it to the brightness of the dimmer of the two systems. Consequently, each Intel-based system was actually slightly brighter than its AMD-based comparison system. The nits measurements in parentheses below each system name in Table 1 and Table 2 give the tested brightness for each system.

In the rightmost column of each result set, we compare the median results of the systems. We calculate this comparison by dividing the AMD-based system's score by the Intel-based system's score. Consequently, comparative results above 1.00 indicate tests on which the Intel-based system performed better or was more power-efficient, and those below 1.00 indicate tests on which the AMD-based system performed better or was more power-efficient. See Appendix C for the detailed results of each test run.

PERFORMANCE RESULTS (seconds)			TESTS	POWER CONSUMPTION RESULTS (watt hours)		
Acer TM4402WLMi AMD Turion 64 ML-30 1.6 GHz (135 nits)	Acer TM4062WLMi Intel Pentium M 740 1.73 GHz (142 nits)	Comparative Rating		Acer TM4402WLMi AMD Turion 64 ML-30 1.6 GHz (135 nits)	Acer TM4062WLMi Intel Pentium M 740 1.73 GHz (142 nits)	Comparative Rating
502	433	**1.16**	Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0	8.03	4.61	**1.74**
260	224	**1.16**	Apple iTunes 6.0.3	4.23	2.40	**1.76**
64	52	**1.23**	InterVideo iVideoToGo for PSP	1.01	0.55	**1.84**
203	165	**1.23**	Microsoft Windows Movie Maker 2.1	3.34	1.81	**1.85**
287	269	**1.07**	Pinnacle Studio 10	4.70	2.84	**1.65**

Table 1: Results of performance and power measurement tests on the AMD-based Acer TravelMate 4402WLMi and the Intel-based Acer TravelMate 4062WLMi. Lower scores are better on both execution time and Workload Energy Consumption.

PERFORMANCE RESULTS (seconds)			TESTS	POWER CONSUMPTION RESULTS (watt hours)		
Acer TM 4404WLMi AMD Turion 64 ML-34 1.8 GHz (165 nits)	Acer TM4202WLMi Intel Core Duo T2300 1.66 GHz (174 nits)	Comparative Rating		Acer TM 4404WLMi AMD Turion 64 ML-34 1.8 GHz (165 nits)	Acer TM4202WLMi Intel Core Duo T2300 1.66 GHz (174 nits)	Comparative Rating
444	249	**1.78**	Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0	7.67	2.66	**2.88**
248	131	**1.89**	Apple iTunes 6.0.3	4.10	1.40	**2.93**
57	42	**1.36**	InterVideo iVideoToGo for PSP	0.96	0.41	**2.34**
182	91	**2.00**	Microsoft Windows Movie Maker 2.1	3.19	1.00	**3.19**
261	172	**1.52**	Pinnacle Studio 10	4.44	1.71	**2.60**

Table 2: Results of performance and power measurement tests on the AMD-based Acer TravelMate 4404WLMi and the Intel-based Acer TravelMate 4202WLMi. Lower scores are better on both execution time and Workload Energy Consumption.

Test methodology

This section details the methodologies we followed in testing the systems.

Configuration differences

We purchased the built-to-order systems from www.newegg.com. We made them as identical as possible and as close in price as possible, but we could not avoid the following differences:

- The motherboards for the AMD-based systems support only DDR RAM. These units contained DDR-333 single channel SDRAM. The motherboard for the Intel-based TravelMate 4062WLMi system supports DDR2-533 dual channel SDRAM, which it contained. The motherboard for the Intel-based TravelMate 4202WLMi system supports DDR2-667 dual channel SDRAM, but it came configured with DDR2-533 dual channel SDRAM.
- The hard drive controllers in the systems also differ. Though both are Ultra ATA/100 devices, the AMD-based systems use the ATI SB400 controller, while the Intel-based TravelMate 4062WLMi uses the Intel 82801FBM (ICH6-M) controller, and the Intel-based TravelMate 4202WLMi uses the Intel 82801GHM (ICH7-M DH) controller.
- The Intel-based TravelMate 4062WLMi system came with the integrated Intel GMA 900 video adapter with 128 MB of shared video RAM. The Intel-based TravelMate 4202WLMi came with the integrated Intel GMA 950 video adapter with 224 MB of shared video RAM. The AMD-based systems, by contrast, came with the PCI Express ATI Mobility Radeon X700 video adapters with 64 MB of dedicated video RAM.
- The Intel-based systems came with the integrated Realtek High Definition audio adapter, while the AMD-based systems came with the integrated Realtek AC'97 audio adapter.
- The AMD-based systems came with 1 S-Video out port, 1 IEEE1394 mini-port, and an integrated multimedia card reader. The Intel-based systems did not have any of these ports or readers.
- The prices differ. (We exclude shipping and tax charges here.) The AMD-based TravelMate 4402WLMi cost $1,099.00, while the comparison Intel-based TravelMate 4062WLMi cost $974.00. The AMD-based TravelMate 4404WLMi cost $1,199.00 when we purchased it (but was $1,149.00 on 03/03/06), while the comparison Intel-based TravelMate 4202WLMi cost $1,274.00 when we purchased it (but was $1,099.00 on 03/03/06).

Appendix A provides complete cost information for both systems, and Appendix B details their configurations.

Initial setup

When the systems arrived, we unpacked and set up each one. We went through the following process with each PC the first time we booted it:

1. Pressed Next at the Welcome to Microsoft Windows screen.
2. Selected United States, English and U.S. keyboard. Pressed Next.
3. Selected Eastern Time. Pressed Next.
4. Selected Yes, I accept the Microsoft End User License Agreement. Pressed Next.
5. Selected Not right now to automatic updates, because our goal was to test each PC as it came out of the box. Pressed Next.
6. Named each computer with its model (TM4062WLMi).
7. Left each computer description blank. Pressed Next.
8. Left Administrator password blank. Pressed Next.
9. Selected No, don't make this computer part of a domain. Pressed Next.
10. Selected Skip during the An Internet connection could not be chosen part of the setup process. Pressed Next.
11. Selected No, not at this time to registering with Microsoft. Pressed Next.
12. Selected No, not at this time to setting up Internet access. Pressed Next.
13. Entered User in the Your name field. Pressed Next.
14. Selected Finish.
15. Selected OK at the Acer recommendation to install an anti-virus application.
16. Clicked on the Windows Security Center icon on the toolbar.
17. Selected Change the way Security Center alerts me.
18. Unchecked the Do not alert me about virus protection status.
19. Unchecked the Do not alert me about firewall status.

20. Unchecked the Do not alert me about Windows Automatic Updates status.
21. Selected OK and closed Windows Security Center.
22. Right-clicked on the desktop and selected Properties.
23. Under the Desktop tab we selected None for the background and clicked Apply.
24. Under the Screen Saver tab we selected None for the Screen saver and clicked Apply.
25. Also under the Screen Saver tab we selected the Power button. For the AMD-based systems we set the Power Schemes to Always On and all power settings listed under Plugged in to Never, then clicked Apply. The Intel-based systems came with Acer-customized power options, so we created a customized AC mode power scheme that was the equivalent of the AMD Always On power scheme and selected Never to all power settings.
26. Inserted a blank DVD+R and checked Do not show this message again at the Acer eRecovery Management dialog. Pressed Enter.
27. Pressed Next to start NTI factory default image creation process.
28. Pressed OK at the Factory default image Backup disk1 finished dialog.
29. Pressed Exit.

We used Symantec's Ghost product to capture an exact image of the hard disk directly to the internal DVD-RW drive. Each time we ran a new benchmark or test on a machine, we used the Ghost image DVD to return that machine to the above configuration. After re-imaging, we installed the software necessary to run each test and rebooted.

Before starting a test we allowed each laptop screen to warm up for at least 15 minutes. We did this by opening Microsoft Paint, pressing Ctrl-E, and setting the width and height larger than the screen resolution. We then pressed Ctrl-F to make the entire screen display a white background.

Before each test run we used a Gossen Mavolux 5032C luminance meter on the white background to try to normalize the screen brightness between each pair of systems we were comparing. We did this because screen brightness can affect the amount of power a system consumes. For each pair of comparison systems we set the brightness to be as close as we could make it to the brightness of the dimmer of the two systems. Consequently, we set the AMD-based TravelMate 4402WLMi to approximately 135 nits and the Intel-based TravelMate 4062WLMi to approximately 142 nits. Similarly, we set the AMD-based TravelMate 4404WLMi to approximately 165 nits and the Intel-based TravelMate 4202WLMi to approximately 174 nits.

Before each run, we manually deactivated each system's wireless adapter using the external toggle button, because of the effect of the wireless adapter on power consumption.

We rebooted before running each test.

We monitored each system's power consumption with an Intel Pentium 4 Extreme Edition 3.73 GHz host computer using the Intel Power Acquisition Recording Kit (iPARK).

We followed these steps for setting up and running iPARK:

iPARK setup

1. Power off the laptop.
2. Remove the battery from the laptop.
3. Connect the iPARK DC power cable into the laptop's power port.
4. Plug both AC power cables from the iPARK device into the wall. Verify that the blue light on the Targus power brick is on.
5. Connect the iPARK USB cable to the host computer.
6. Turn on the iPARK power switch. A red light should glow.
7. Turn on the host computer.
8. Insert the iPARK software installation CD into the host computer, and install that software as follows:
   a. Click Next at the Welcome screen.
   b. Click Yes at the Software License Agreement screen.
   c. Click Next at the Choose Destination Location screen.

d. Click Next at the Select Program Folder screen.
e. Uncheck View the README file and click Finish.
f. Click OK to the Microsoft .NET Framework v1.1.x not found warning.
g. Click Run at the next two Windows Security Warnings.
h. Click Yes at the Microsoft .NET Framework 1.1 Setup screen.
i. Select I agree at the license agreement and click Install.
j. Click OK at the Installation Complete screen.
k. Reboot the system.
l. Insert the iPARK patch CD, and uncompress the files to the C:\iPARK directory.
m. Select Yes To All when asked about overwriting files.

9. Calibrate the iPARK software by going to Start->All Programs->Intel Power Acquisition Recording Kit->Intel Power Acquisition Recording Kit Calibration.
10. Click OK at the PMD-1208LS (serial# 130) dialog.
11. Highlight the Bd#0-PMD-1208LS (serial# 130), and click on the Configure icon found in the menu bar.
12. Select 8 Single Ended from the no. of Channels field, and click OK.
13. Exit the iPARK calibration tool.
14. Power on the laptop, and make sure it is prepped to run a test.
15. Start the Intel Power Acquisition Recording Kit Logging Tool.
16. In the Name field, type a name that appropriately describes the platform and configuration. We used the following naming convention: test_processor_Runx (e.g., iTunes_CoreDuo_Run1).
17. Use the same naming convention in the Log File field (e.g., iTunes_CoreDuo_Run1).
18. Click the iPARK start button at the same time you start a test to begin logging immediately.
19. Click the iPARK Stop button at the same time you stop a test.
20. Click the Log File button to view the test log.
21. Multiply the time (in seconds) that the system took to complete the test by the Average DC Power (Watts) score. Divide this number by 3600 to calculate the Workload Energy Consumption (WEC) in Watt-Hours.

The following subsections summarize the steps we followed to obtain each of the test results in this report.

Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0

Intel provided the 30 slide files and the background.mp3 file this test uses. The slide files have the following key characteristics:

- Resolution: 2592W x 1944H (180 dpi horizontal x 180 dpi vertical)
- Size: Range from 369KB (377,000 bytes) to 2,667KB (2,730,944 bytes)
- Bit depth: 24-bit color

The background.mp3 file has the following key characteristics:

- Length (hh:mm:ss): 00:02:52
- Size: 3.28 MB (3,443,473 bytes)

We performed the following steps on each PC to make it ready to run this test:

Setup

1. Reset the system to the base test image.
2. Install Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0. Choose the following options during installation.
   a. Select Language, and click OK.
   b. Click Accept at the License Agreement screen.
   c. Click Install Adobe Photoshop Elements.
   d. Click Next at the Welcome screen.
   e. Click Accept at the License Agreement screen.
   f. Enter User Name, Organization, and Serial Number. Click Next.
   g. Click Next at the Destination Folder screen.

h. Accept defaults, and click Next at the file types you would like Photoshop Elements to open.
i. Click Install at the Ready to Install the Program screen.
j. Click Finish.
k. Click Yes to reboot the system.
l. Insert the Adobe Premiere Elements 2.0 DVD into the system.
m. Select Language, and click OK.
n. Click Accept at the License Agreement screen.
o. Click Install Adobe Premiere Elements 2.0.
p. Select language, and click OK.
q. Click Next at the Welcome screen.
r. Enter User Name, Organization, and Serial Number. Click Next.
s. Select NTSC TV Format, and click Next.
t. Click Next at the Destination Folder screen.
u. Click Install at the Ready to Install the Program screen.
v. Click Finish.

3. Copy the 30 slides and the background.mp3 into the My Documents directory.

Running the test

1. Reboot the system.
2. Launch Photoshop Elements by double-clicking the desktop icon.
3. Select the Make Photo Creations icon.
4. Click Register Later at the registration screen.
5. Uncheck Automatically check for updates every month, and click Cancel.
6. Click No to the Photoshop Elements Organizer pop up.
7. From the top menu click File->Get Photos->From Files and Folders.
8. Browse to the My Documents directory.
9. Select all Slides and uncheck the box next to Automatically Fix Red Eyes.
10. Click Get Photos.
11. Check Don't Show Again, and click OK at the Adobe pop up.
12. Select all photos shown by pressing Ctrl-A.
13. Click the Create button on the top menu.
14. Select Slide Show to create a slide show, and click OK.
15. Select 2 seconds for Static Duration and Transition Duration. Set Transition to Fade. Leave other options at their defaults, and click OK.
16. Click the Add Media button, and select the Audio from Folder option.
17. Browse to My Documents, and click Open on the background.mp3 file.
18. From the top menu, click File->Save Slide Show Project.
19. Name the file outdoors, and click Save.
20. Click the Output icon.
21. Choose Burn to Disc, and select the DVD option. Click OK.
22. Click Save to create the outdoors.wmv file while at the same time starting a stopwatch and the iPARK device.
23. A progress bar will appear.
24. Stop the stopwatch and iPARK device when the progress bar disappears.
25. Adobe Premiere Elements 2.0 will automatically launch after the creation of the outdoors.wmv file is complete.
26. Click Do Not Register.
27. Name the New Project photoDVD.
28. Browse to make the Save In directory to My Videos ,and click OK.
29. Select the Adventure Template, and check the radio button that says Apply a Template for a DVD with Menus.
30. Click OK.
31. Click No at the Missing DVD Markers message.
32. Click Burn DVD.
33. Select the Burn to option to be Folder.
34. Click Burn while at the same time starting a stopwatch and the iPARK device.

35. A progress bar will appear.
36. When the progress bar says Export Completed, stop the stopwatch and the iPARK device.
37. Add the two times to get a combined total time.
38. Close Adobe Premiere Elements 2.0, and select No to saving changes.
39. Close the Adobe Photoshop Elements 4.0 window, check Don't Show Again, and click OK at the slide show complete dialog.
40. Right-click the slideshow you just created, and select Delete from Catalog.
41. Click OK.
42. Browse to My Documents, and delete the .wmv file and any DVD files you created.
43. Empty the Recycle Bin.
44. Repeat two times.

We report the combined time, in seconds, that Photoshop Elements 4.0 took to convert the files to .wmv format with the time that Premiere Elements 2.0 took to burn the contents to a folder.

Apple iTunes 6.0.3

Intel provided the file, mixTest.wav, this test uses. The file has the following key characteristics:

- Length (hh:mm:ss): 01:09:29
- Size: 701 MB (735,557,138 bytes)

We performed the following steps to run this test:

Setup

1. Reset the system to the base test image.
2. Download iTunes 6.0.3 from http://www.apple.com/itunes/download/.
3. Launch the iTunes installer with setup defaults.
   a. Choose Setup Language, and click OK.
   b. Click Next at the Welcome to iTunes 6 Installer screen.
   c. Select I accept the terms of the license agreement, and click Next.
   d. Click Next at the About iTunes screen.
   e. Accept the defaults, and click Next at the Setup Type screen.
   f. Click Next at the Choose Destination Location screen.
   g. Click Next at the Born to be together screen.
   h. Click Finish at the Installation Successful screen.
4. Copy the mixTest.wav file to My Music.
5. Launch iTunes via its desktop icon.
6. Click Agree at the License Agreement.
7. Use the following choices for iTunes Setup Assistant.
   a. Click Next at the Welcome to iTunes screen.
   b. Uncheck the Add MP3 and AAC files option.
   c. Uncheck the Add WMA files option, and click Next.
   d. Choose No, I'll change the file and folder names myself, and click Next at the Keep iTunes Music Folder Organized screen.
   e. Choose No, take me to my iTunes Library, and click Finish at the iTunes Music Store screen.
8. Under the Edit menu, select Preferences.
9. Click the Advanced tab.
10. Click the Importing tab.
11. From the drop-down menu next to Import Using, choose MP3 Encoder.
12. Uncheck Play songs while importing.
13. Uncheck Create filenames with track number.
14. Click OK.
15. Exit iTunes.

Running the test

1. Reboot the system.

2. Launch iTunes via its desktop icon.
3. From the file menu, select Add File to Library.
4. Browse to the My Music directory, and choose the test file (mixTest.wav) to add to the library.
5. Click Open after you select the file.
6. iTunes will now show this file in its song-list pane.
7. Right-click the file, and select the option Convert Selection to MP3. Start the iPARK device at the same time you start Convert Selection to MP3.
8. During the encoding process, iTunes shows a new mixTest file being created with an Incomplete in the Time column beside it.
9. When the converting progress bar disappears, stop the iPARK device. iTunes has finished the encoding.
10. Use Windows Explorer to locate the output mixTest.mp3 file in the iTunes directory within the My Music folder.
11. Right-click the file, and choose Properties.
12. Calculate the difference between the file Created and Modified times. This time is how long iTunes took to encode the file to .mp3 format.
13. Highlight the two mixTest items in the iTunes Library.
14. Right click, and select Clear.
15. Check the box that says Do not ask me again, and click Remove.
16. Click Move to Recycle Bin.
17. Empty the Recycle Bin.
18. Repeat two times.

We report the time, in seconds, that iTunes took to convert the file. The time we report is the difference of the file creation and modification times.

InterVideo iVideoToGo for PSP

Intel provided the file, kitesurfing.avi, this test uses. The file has the following key characteristics:

- Length (mm:ss): 02:01
- Size: 416 MB (436,644,352 bytes)
- Video resolution: 720 x 480

We performed the following steps to run this test:

Setup

1. Reset the system to the base test image.
2. Download iVideoToGo for PSP from http://www.intervideo.com/jsp/iVideoToGo_Profile.jsp.
3. Launch the iVideoToGo for PSP installer as follows.
   a. Click Next at the Welcome to iVideoToGo Setup screen.
   b. Click Yes at the License Agreement screen.
   c. Click Next at the Choose Destination Location screen.
   d. Click Next at the Select Program Folder screen.
   e. Click Next at the Third Party Application Setup screen.
   f. Uncheck the options for installing Google Toolbar and Google Desktop Search, and click Next.
   g. Click Finish to reboot the system.
4. Copy the kitesurfing.avi file to My Documents.
5. Launch iVideoToGo for PSP via its desktop icon.
6. Select Please remind me again in 5 days at the iVideoToGo Trial screen, and click Continue.
7. Select Do not display this dialog again at the Registration screen, and click Continue.
8. Exit iVideoToGo.

Running the test

1. Reboot the system.
2. Launch iVideoToGo for PSP via its desktop icon.

3. Select Convert File from the top menu.
4. Click the top right icon, Add video from local.
5. Browse to the My Documents directory, and choose the test file (kitesurfing.ave).
6. Click Open after you select the file.
7. Click the Browse target icon to the right of the Target field.
8. Select the Desktop as the Target directory, and click OK.
9. Click the Start Copying icon located near the bottom right of the screen.
10. Click Yes to create the target path while at the same time starting a stopwatch and the iPARK device.
11. During the encoding process, iVideoToGo a progress bar.
12. When the Copy operation completed pop-up appears, stop the stopwatch and the iPARK device. iVideoToGo has finished the encoding.
13. The stopwatch time is how long iVideoToGo took to encode the file to PSP format.
14. Exit iVideoToGo.
15. Select Yes you want to Exit the program.
16. Select No to saving the changes made to the project.
17. Delete the MP_ROOT directory on the desktop.
18. Empty the Recycle Bin.
19. Repeat two times.

We report the time, in seconds, that iVideoToGo for PSP took to convert the file.

Microsoft Windows Movie Maker 2.1

This application is part of Windows XP Service Pack 2, so we did not need to install it.

Intel provided the file, kitesurfing.avi, this test uses. The file has the following key characteristics:

- Length (mm:ss): 02:01
- Size: 416 MB (436,644,352 bytes)
- Video resolution: 720 x 480

We performed the following steps to run this test:

Setup

1. Reset the system to the base test image.
2. Copy the kitesurfing.avi to the desktop

Running the test

1. Reboot the system.
2. Launch Windows Movie Maker.
3. From the top menu, click File->Import into Collections.
4. Browse to the kitesufing.avi file on the desktop, and click Import.
5. Drag the five scenes into the bottom Timeline.
6. From the top menu, click File->Save Movie File.
7. Select My Computer, and click Next.
8. Leave the default options, and click Next.
9. Click Next while at the same time starting the iPARK device.
10. A progress bar will appear
11. Stop the iPARK device when the Save Movie dialog shows Finish.
12. Uncheck the box next to Play movie when I click Finish, and click Finish.
13. Exit Windows Movie Maker 2.1, and select No to save changes.
14. Use Windows Explorer to locate the output movie.wma file in the My Videos directory.
15. Right-click the file, and choose Properties.
16. Calculate the difference between the file Created and Modified times.
17. Delete the movie.wma file.
18. Empty the Recycle Bin.

19. Repeat two times.

We report the time, in seconds, that Microsoft Windows Movie Maker 2.1 took to convert the file. The time we report is the difference of the file creation and modification times.

Pinnacle Studio 10

Intel provided the file, kitesurfing.avi, this test uses. The file has the following key characteristics:

- Length (mm:ss): 2:01
- Size: 416 MB (436,644,352 bytes)
- Video resolution: 720 x 480

We performed the following steps to run this test:

Setup

1. Reset the system to the base test image.
2. Install Pinnacle Studio 10 as follows:
   a. Choose Setup Language, and click Next.
   b. Enter First Name, Last Name, Email Address, and Serial Number. Uncheck I would like to receive emails.
   c. Click Remind Me Later.
   d. Click Remind Me Later at the 4 good reasons to register screen.
   e. Select I accept the terms of the license agreement, and click Next.
   f. Select Typical, and click Next.
   g. Click Next at the Start Copying Files screen.
   h. Insert CD 2, and click OK.
   i. Click No to inserting Bonus disc #3.
   j. Click Yes to creating a shortcut on the desktop.
   k. Click Finish to reboot the system.
   l. Insert CD 3. It will autorun.
   m. Select Language, and click Next.
   n. Click Next at the Welcome screen.
   o. Click Yes at the License Agreement screen.
   p. Select Yes at the Choose Destination Location screen.
   q. Accept defaults, and click Next at the Select Components screen.
   r. Click Finish.
3. Download and install patch 10.5 from http://www.pinnaclesys.com/PublicSite/us/Support/Consumer+Support/
   a. Select language, and click OK.
   b. Select I accept the terms of the license agreement, and click Next.
   c. Click Next at the Welcome screen.
   d. Click Finish to reboot the system.
4. Copy the kitesurfing.avi file to My Documents.

Running the test

1. Reboot the system.
2. Launch Pinnacle Studio 10 via its desktop icon.
3. Click the icon for Pinnacle Studio Plus.
4. Click Remind Me Later at the registration screen.
5. Click Remind Me Later at the 4 good reasons to register screen.
6. Click No to automatically check for updates.
7. Click OK to the message about periodically checking for updates.
8. Click the icon whose description is Select video files from a different folder.
9. Browse to My Documents and open the kitesurfing.avi file.
10. Drag the four scenes into the bottom My Movie section.

11. Click the Make Movie tab.
12. Select the Create a disc from current project (VCD,SVCD,DVD) icon on the top left of the window.
13. Click the Settings button.
14. Under Audio compression select MPA (MPEG-1 Layer 2).
15. The Bit rate should be 8500 Kbits/sec. If not, set it to that value.
16. Under Video quality / disc usage, select Custom.
17. Under Burn options, select Create disc content but don't burn.
18. Under Image type, select VIDEO_TS folder.
19. Click OK.
20. Click the Select folder to use for auxiliary files icon located near the top middle section of the window.
21. Browse to My Videos, and click OK.
22. Click the green Create image button.
23. Browse to the My Videos directory.
24. Click OK while starting the stopwatch and the iPARK device at the same time.
25. A progress bar will appear.
26. Stop the stopwatch and iPARK device when dialog reads Disc content created successfully.
27. Exit Pinnacle Studio 10, and click No to save changes.
28. Browse to My Documents, and delete the kitesurfing files.
29. Browse to the My Videos directory, and delete the VIDEO_TS folder.
30. Empty the Recycle Bin.
31. Repeat two times.

We report the time, in seconds, that Pinnacle Studio 10 took to burn the contents to a folder.

Appendix A: Test system price and purchase information

We purchased the four Acer laptop systems on February 9, 2006 via www.newegg.com.

Figure 1 below presents the SKU and price information for the laptops.

System	Acer TravelMate 4402WLMi	Acer TravelMate 4062WLMi	Acer TravelMate 4404WLMi	Acer TravelMate 4202WLMi
Processor	AMD Turion 64 ML-30	Intel Pentium M 740	AMD Turion 64 ML-34	Intel Core Duo T2300
Processor frequency	1.6 GHz	1.73 GHz	1.8 GHz	Dual-Core 1.66 GHz
Unit price ($)	1,099.00	974.00	1,199.00	1,274.00
Tax ($) [1]	0.00	0.00	0.00	0.00
Shipping ($)[2]	13.46	13.46	13.46	13.46
Total we paid ($)	1,112.46	987.46	1,212.46	1,287.46

Figure 1: Purchase information for the four Acer laptops.

Notes:
[1] www.newegg.com did not add any tax.
[2] We assigned each system one fourth of the total shipping charge we paid for this order.

Appendix B: Test system configuration information

This appendix provides detailed configuration information about the four test systems.

SYSTEM	Acer TravelMate 4402WLMi	Acer TravelMate 4062WLMi	Acer TravelMate 4404WLMi	Acer TravelMate 4202WLMi
General				
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P1C1L / UP	1P1C1L / UP	1P1C1L / UP	1P2C2L / MP
Number of physical processors	1	1	1	1
Single/Dual Core processors	Single	Single	Single	Dual
Processor HT Status	NA	NA	NA	NA
System power management policy	Windows Power Management-Portable / Laptop	Acer ePower Management Word Processing	Windows Power Management-Portable / Laptop	Acer ePower Management Word Processing
Processor power-saving option	AMD PowerNow! Technology	Enhanced Intel SpeedStep Technology	AMD PowerNow! Technology	Enhanced Intel SpeedStep Technology
System dimensions (length x width x height)	14-5/16 x 10-7/8 x 1-1/2 (min) 11-3/4 (max)	14-5/16 x 10-3/4 x 1-1/2 (min) 11-3/4 (max)	14-5/16 x 10-7/8 x 1-1/2 (min) 11-3/4 (max)	14-1/8 x 10-1/2 x 1-9/16 (min) 11-9/16 (max)
System weight	6 lbs. 12 oz.	6 lbs. 1 oz.	6 lbs. 15 oz.	5 lbs. 14 oz.
CPU				
Vendor	AMD	Intel	AMD	Intel
Name	Turion 64	Pentium M	Turion 64	Core Duo
Model number	ML-30	740	ML-34	T2300
Stepping	SH8-E5	C0	SH8-E5	C0
Socket type and number of pins	Socket 754	mPGA-479M	Socket 754	mPGA-479M
Core frequency (GHz)	1.6	1.73	1.8	1.66
Front-side bus frequency	1600MHz HyperTransport Technology	533MHz	1600MHz HyperTransport Technology	667MHz
L1 Cache	64 KB + 64 KB	32 KB + 32 KB	64 KB + 64 KB	32 KB + 32 KB
L2 Cache	1 MB	2 MB	1 MB	2 MB
Platform				
Vendor	Acer	Acer	Acer	Acer
Motherboard model number	TravelMate 4400	Luganoll	TravelMate 4400	Grapevine
Motherboard chipset	ATI RS482	Intel i915GMS/i910 GML	ATI RS482	Intel i945GM
Motherboard revision number	A	NA	A	NA
System/motherboard serial number	LXT780602355 1065A8KS00	LXTAK0607955 110D16EM00	LXT780609155 20279FKS00	LXTAV0604060 112331ED00
Bios name and version	Phoenix V1.18	Acer 3A05	Phoenix V1.18	Acer V1.30
BIOS settings	Setup default	Setup default	Setup default	Setup default
Memory module(s)				
Vendor and model number	Infineon 64D64020HBDL6C	Nanya Technology NT256T64UH4A0F N-37	Hyundai Electronics HYMD564M646B6-J	Samsung M4 70T6554CZ3-CD5
Type	DDR PC2700	DDR-2 PC4200	DDR PC2700	DDR-2 PC4200

Speed (MHz)	166	266	166	266
Speed running in the system (MHz)	333	533	333	533
Timing/Latency (tCL-tRCD-tRP-tRASmin)	2.5-3-3-7	4-4-4-12	2.5-3-3-7	4-4-4-11
Size	512 MB	512 MB	1 GB	1 GB
Number of memory module(s)	1 x 512 MB	2 x 256 MB	2 x 512 MB	2 x 512 MB
Chip organization (Single-sided, Double-sided)	Double-sided	Single-sided	Double-sided	Double-sided
Channel (Single/Dual)	Single	Dual	Single	Dual
Hard disk				
Vendor and model number	Samsung HM100JC	Seagate ST9100825A	Seagate ST9120824A	Seagate ST9100824A
Size	100 GB	100 GB	120 GB	100 GB
Buffer Size	8 MB	8 MB	8 MB	8 MB
RPM	5400	4200	4200	5400
Type	Ultra ATA 100	Ultra ATA 100	Ultra ATA 100	Ultra ATA 100
Controller	ATI SB400	Intel 82801FBM (ICH6-M)	ATI SB400	Intel 82801GHM (ICH7-M DH)
Driver	ATI 5.10.1000.5	Intel 6.0.0.1013	ATI 5.10.1000.5	Intel 7.0.0.1020
Operating system				
Name	Windows XP Professional	Windows XP Professional	Windows XP Professional	Windows XP Professional
Build number	2600	2600	2600	2600
Service pack	2	2	2	2
File system	FAT32	FAT32	FAT32	FAT32
Kernel	ACPI Uniprocessor PC	ACPI Uniprocessor PC	ACPI Uniprocessor PC	ACPI Multiprocessor PC
Language	English	English	English	English
Microsoft DirectX version	DirectX 9.0c	DirectX 9.0c	DirectX 9.0c	DirectX 9.0c
Graphics				
Vendor and model number	ATI Mobility Radeon X700	Intel GMA 900	ATI Mobility Radeon X700	Intel GMA 950
Type (P=PCI Express, A=AGP 8X, I=Integrated)	P	I	P	I
Chipset	X700	915GM/GMS,910GML Express Chipset Family	X700	I945GM Express Chipset Family
BIOS version	BK-ATI VER009.010.001.000	1219	BK-ATI VER009.010.001.000	1264
Memory size	64 MB	128 MB Shared	64 MB	224 MB Shared
Resolution	1280 x 800	1280 x 800	1280 x 800	1280 x 800
Driver	ATI 6.14.10.6525	Intel 6.14.10.4363	ATI 6.14.10.6525	Intel 6.14.10.4436
Sound card/subsystem				
Vendor and model number	Realtek AC'97 Audio	Realtek High Definition Audio	Realtek AC'97 Audio	Realtek High Definition Audio

Driver	Realtek Semiconductor 5.10.0.5900	Realtek Semiconductor 5.10.0.5148	Realtek Semiconductor 5.10.0.5900	Realtek Semiconductor 5.10.0.5191
Ethernet				
Vendor and model number	Realtek RTL8169/8110 Family Gigabit Ethernet	Realtek RTL8139/810x Family Fast Ethernet	Realtek RTL8169/8110 Family Gigabit Ethernet	Broadcom 440x 10/100 integrated controller
Driver	Realtek Semiconductor 5.620.1202.2004	Realtek Semiconductor 5.621.304.2005	Realtek Semiconductor 5.620.1202.2004	Broadcom 4.37.0.0
Wireless				
Vendor and model number	Broadcom 802.11g	Intel Pro/Wireless 2200BG	Broadcom 802.11g	Intel Pro/Wireless 3945ABG
Driver	Broadcom 3.100.46.0	Intel 9.0.1.9	Broadcom 3.100.46.0	Intel 10.1.0.11
Modem				
Vendor and model number	CXT SoftV90 Data Fax Modem with SmartCP	CXT HDAUDIO Soft Data Fax Modem with SmartCP	CXT SoftV90 Data Fax Modem with SmartCP	CXT HDAUDIO Soft Data Fax Modem with SmartCP
Driver	CXT 7.20.0.0	CXT 7.31.0.50	CXT 7.20.0.0	CXT 7.34.0.0
Optical drive(s)				
Vendor and model number	TSSTcorp TS-L632B	Lite On SOSW-833S	TSSTcorp TS-L632B	LG GSA-4082N
Type (CD-ROM, CD-RW, DVD-ROM, DVD-W)	DVD-RW	DVD-RW	DVD-RW	DVD-RW
USB ports				
Number	4	3	4	4
Type	USB 2.0	USB 2.0	USB 2.0	USB 2.0
Other	MMC/SD/SM/MS/MS Pro/xD Card Reader	NA	MMC/SD/SM/MS/MS Pro/xD Card Reader	NA
IEEE 1394 ports				
Number	1	0	1	0
Monitor				
LCD type	WXGA	WXGA	WXGA	WXGA
Screen size	15.4”	15.4”	15.4”	15.4”
Refresh rate	60	60	60	60
Battery				
Type	Sanyo BTP-96H1 Lithium-Ion	Sanyo 4UR18650F-1-QC192 Lithium-Ion	Sanyo BTP-98H1 Lithium-Ion	Sanyo BATBL50L6 Lithium-Ion
Size (length x width x height)	5-1/2 x 3-1/2 x 7/8	8-5/16 x 2-3/4 x 7/8	5-1/2 x 3-1/2 x 7/8	5-3/8 x 3-1/2 x 3/4
Rated capacity	4400mAh / 14.8V (65Whr)	2000mAh / 14.8V (30WHr)	4400mAh / 14.8V (65WHr)	4000mAh / 11.1V (44WHr)
Weight	15 oz.	9 oz.	14 oz.	11 oz.

Figure 2: System configuration information for the four test systems.

Appendix C: Detailed test results

This appendix provides the complete performance and power measurement results of all the test runs. The nits figure under each system name is the screen brightness at which we tested the system. All performance results are in seconds. In the power measurements, WEC stands for Workload Energy Consumption, which we report in Watt-hours, and ADC stands for Average DC Power, which we report in Watts.

TESTS	Acer TM4402WLMi AMD Turion 64 ML-30 1.6 GHz (135 nits)	Acer TM4062WLMi Intel Pentium M 740 1.73 GHz (142 nits)
Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0 performance results		
Photoshop Elements 4.0 slideshow movie creation - Run 1	181	145
Premier Elements 2.0 DVD burn - Run 1	321	287
Total Time (seconds) – Run 1	***502***	***432***
Photoshop Elements 4.0 slideshow movie creation - Run 2	180	145
Premier Elements 2.0 DVD burn - Run 2	321	289
Total Time (seconds) – Run 2	***501***	***434***
Photoshop Elements 4.0 slideshow movie creation - Run 3	181	145
Premier Elements 2.0 DVD burn - Run 3	322	288
Total Time (seconds) – Run 3	***503***	***433***
Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0 power measurements		
Photoshop Elements 4.0 slideshow movie creation ADC - Run 1	58.24	38.55
Photoshop Elements 4.0 slideshow movie creation – WEC - Run 1	2.93	1.55
Premier Elements 2.0 DVD burn – ADC - Run 1	57.19	37.83
Premier Elements 2.0 DVD burn – WEC - Run 1	5.10	3.02
Total WEC - Run 1	***8.03***	***4.57***
Photoshop Elements 4.0 slideshow movie creation – ADC - Run 2	58.58	38.71
Photoshop Elements 4.0 slideshow movie creation – WEC - Run 2	2.93	1.56
Premier Elements 2.0 DVD burn - ADC - Run 2	58.36	38.29
Premier Elements 2.0 DVD burn – WEC - Run 2	5.20	3.07
Total WEC - Run 2	***8.13***	***4.63***
Photoshop Elements 4.0 slideshow movie creation – ADC - Run 3	58.19	38.64
Photoshop Elements 4.0 slideshow movie creation – WEC - Run 3	2.93	1.56
Premier Elements 3.0 DVD burn – ADC - Run 3	57.37	38.09
Premier Elements 3.0 DVD burn – WEC - Run 3	5.13	3.05
Total WEC - Run 3	***8.06***	***4.61***
Apple iTunes 6.0.3 performance results		
iTunes 6 - Run 1	260	225
iTunes 6 - Run 2	260	224
iTunes 6 - Run 3	260	224
Apple iTunes 6.0.3 power measurements		
ADC - Run 1	58.55	38.55
WEC - Run 1	4.23	2.41
ADC - Run 2	58.50	38.50
WEC - Run 2	4.23	2.40

ADC - Run 3	58.46	38.52
WEC - Run 3	4.22	2.40
InterVideo iVideoToGo for PSP performance results		
iVideoToGo for PSP - Run 1	64	53
iVideoToGo for PSP - Run 2	63	52
iVideoToGo for PSP - Run 3	64	52
InterVideo iVideoToGo for PSP power measurements		
ADC - Run 1	56.48	37.98
WEC - Run 1	1.00	0.56
ADC - Run 2	57.76	38.37
WEC - Run 2	1.01	0.55
ADC - Run 3	56.97	38.07
WEC - Run 3	1.01	0.55
Microsoft Windows Movie Maker 2.1 performance results		
Windows Movie Maker 2.1 - Run 1	203	165
Windows Movie Maker 2.1 - Run 2	203	165
Windows Movie Maker 2.1 - Run 3	203	164
Microsoft Windows Movie Maker 2.1 power measurements		
ADC - Run 1	58.30	39.42
WEC - Run 1	3.29	1.81
ADC - Run 2	58.07	39.31
WEC - Run 2	3.27	1.80
ADC - Run 3	59.29	39.23
WEC - Run 3	3.34	1.79
Pinnacle Studio 10 performance results		
Studio 10 - Run 1	286	264
Studio 10 - Run 2	287	269
Studio 10 - Run 3	288	273
Pinnacle Studio 10 power measurements		
ADC – Run 1	57.12	37.84
WEC - Run 1	4.54	2.77
ADC – Run 2	58.99	37.96
WEC - Run 2	4.70	2.84
ADC – Run 3	57.43	37.61
WEC - Run 3	4.59	2.85

Table 3: Detailed results of performance and power measurement tests on the AMD-based Acer TravelMate 4402WLMi and the Intel-based Acer TravelMate 4062WLMi. Lower scores are better in all cases.

TESTS	Acer TM4404WLMi AMD Turion 64 ML-34 1.8 GHz (165 nits)	Acer TM4202WLMi Intel Core Duo T2300 1.66 GHz (174 nits)
Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0 performance results		
Photoshop Elements 4.0 slideshow movie creation - Run 1	161	80
Premier Elements 2.0 DVD burn - Run 1	282	169
Total Time - Run 1	***443***	***249***
Photoshop Elements 4.0 slideshow movie creation - Run 2	161	81
Premier Elements 2.0 DVD burn - Run 2	284	169
Total Time - Run 2	***445***	***250***
Photoshop Elements 4.0 slideshow movie creation - Run 3	161	80
Premier Elements 2.0 DVD burn - Run 3	283	169

Total Time - Run 3	***444***	***249***
Adobe Photoshop Elements 4.0 with Adobe Premiere Elements 2.0 power measurements		
Photoshop Elements 4.0 slideshow movie creation - ADC - Run 1	62.56	38.39
Photoshop Elements 4.0 slideshow movie creation - WEC - Run 1	2.80	0.85
Premier Elements 2.0 DVD burn - ADC - Run 1	61.77	38.57
Premier Elements 2.0 DVD burn - WEC - Run 1	4.84	1.81
Total WEC - Run 1	***7.64***	***2.66***
Photoshop Elements 4.0 slideshow movie creation - ADC - Run 2	63.01	38.31
Photoshop Elements 4.0 slideshow movie creation - WEC - Run 2	2.82	0.86
Premier Elements 2.0 DVD burn - ADC - Run 2	61.53	38.30
Premier Elements 2.0 DVD burn - WEC - Run 2	4.85	1.80
Total WEC - Run 2	***7.67***	***2.66***
Photoshop Elements 4.0 slideshow movie creation - ADC - Run 3	63.02	38.59
Photoshop Elements 4.0 slideshow movie creation - WEC - Run 3	2.82	0.86
Premier Elements 3.0 DVD burn - ADC - Run 3	61.67	37.77
Premier Elements 3.0 DVD burn - WEC - Run 3	4.85	1.77
Total WEC - Run 3	***7.67***	***2.63***
Apple iTunes 6.0.3 performance results		
iTunes 6 - Run 1	248	132
iTunes 6 - Run 2	248	131
iTunes 6 - Run 3	248	131
Apple iTunes 6.0.3 power measurements		
ADC - Run 1	59.46	38.11
WEC - Run 1	4.10	1.40
ADC - Run 2	59.18	38.37
WEC - Run 2	4.08	1.40
ADC - Run 3	59.21	38.19
WEC - Run 3	4.08	1.39
InterVideo iVideoToGo for PSP performance results		
iVideoToGo for PSP - Run 1	58	43
iVideoToGo for PSP - Run 2	57	42
iVideoToGo for PSP - Run 3	57	42
InterVideo iVideoToGo for PSP power measurements		
ADC - Run 1	60.69	35.33
WEC - Run 1	0.98	0.42
ADC - Run 2	60.91	35.52
WEC - Run 2	0.96	0.41
ADC - Run 3	60.94	35.31
WEC - Run 3	0.96	0.41
Microsoft Windows Movie Maker 2.1 performance results		
Windows Movie Maker 2.1 - Run 1	183	90
Windows Movie Maker 2.1 - Run 2	182	91
Windows Movie Maker 2.1 - Run 3	182	92
Microsoft Windows Movie Maker 2.1 power measurements		
ADC - Run 1	62.91	39.63
WEC - Run 1	3.20	0.99
ADC - Run 2	63.06	39.55

WEC - Run 2	3.19	1.00
ADC - Run 3	63.13	39.64
WEC - Run 3	3.19	1.01
Pinnacle Studio 10 performance results		
Studio 10 - Run 1	255	173
Studio 10 - Run 2	261	172
Studio 10 - Run 3	261	171
Pinnacle Studio 10 power measurements		
ADC - Run 1	60.61	35.95
WEC - Run 1	4.29	1.73
ADC - Run 2	61.31	35.71
WEC - Run 2	4.44	1.71
ADC - Run 3	61.24	36.28
WEC - Run 3	4.44	1.72

Table 4: Detailed results of performance and power measurement tests on the AMD-based Acer TravelMate 4404WLMi and the Intel-based Acer TravelMate 4202WLMi. Lower scores are better in all cases.

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