DELL™ LATITUDE™ E6430 LAPTOPS FASTER WITH SAMSUNG® SSDs
THAN WITH HDDs

▶ **6.65 times better** disk performance

▶ **38% more** battery life after spending the weekend in Sleep mode

When it comes to your employees' notebook computers, every second counts. A zippy system can boost productivity and make the workday go more smoothly. Choosing or upgrading to a Samsung solid-state drive (SSD) instead of a spindle-based hard disk drive (HDD) can take a notebook from fast to super-fast. This means your employees will enjoy not only improved overall performance, but also reduced time to perform everyday tasks such as booting up, shutting down, and launching applications.

SSDs also allow you to take advantage of certain technologies, such as Intel Rapid Start Technology™ (IRST), which dramatically reduces the amount of power a system consumes when it is not in use.

In our labs, Principled Technologies tested two nearly identical notebook systems, an SSD-based Dell Latitude E6430 and an HDD-based Dell Latitude E6430, both running Microsoft® Windows® 8 Pro. We found that the SSD-based Latitude outperformed its counterpart in both business application performance and system responsiveness. Also, thanks to IRST, the battery in the SSD-based system remained fully charged after a weekend in Sleep mode. This makes Samsung SSDs an excellent choice when choosing a Dell notebook for your employees.
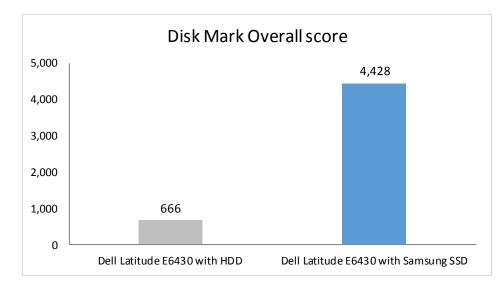
SPEEDY = EFFECTIVE

Today's workers do not like to wait. A notebook that performs everyday tasks briskly can make employees' work lives much more pleasant and allow them to work more efficiently. Because notebook performance is so important to today's worker, we took a Dell Latitude E6430 running Windows 8 and conducted a range of tests to examine the effects of replacing the standard rotational HDD with a Samsung SSD. We conducted every test three times and present the results for the median run of each test. Across the board, the SSD-based system outperformed the HDD-based system. We provide complete system configuration information in Appendix A and the details of our testing in Appendix B.

System performance

We used two industry-standard benchmarks to rate the performance of the Dell Latitude E6430 with the two different storage options. We provide the overall scores below and detailed test results in Appendix C.
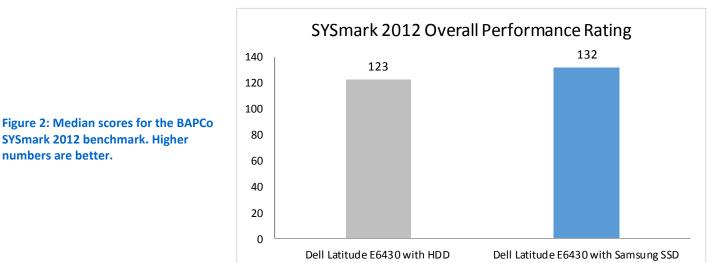
The Disk Mark component of the PassMark® PerformanceTest™ measures read and write speed to one or more disks. As Figure 1 shows, the Samsung SSD-based Dell Latitude E6430 scored 565 percent higher overall on the PassMark DiskMark test than the HDD-based system. It also scored 433 percent higher on the PassMark Sequential Read test, 413 percent higher on the PassMark Sequential Write test, and 413 percent higher on the PassMark Random Seek + RW score.

Figure 1: Median scores for the PassMark Disk Mark benchmark.

Disk Mark Overall score

	Dell Latitude E6430 with HDD	Dell Latitude E6430 with Samsung SSD
Score	666	4,428

BAPCo® SYSmark® 2012 measures system performance for a number of common tasks including office productivity and media creation. As Figure 2 shows, the Samsung SSD-based notebook achieved a higher SYSmark2012 Overall Performance Rating than the HDD-based notebook. In the Office Productivity section of the test, the Samsung SSD-based notebook outperformed the HDD-based notebook by an impressive

15.4 percent. This means that your employees will feel a noticeable difference as they use email and word processing.

SYSmark 2012 Overall Performance Rating

Figure 2: Median scores for the BAPCo SYSmark 2012 benchmark. Higher numbers are better.

Battery charge after Sleep

Because battery life is so important to today's worker, we compared the percentage battery charge remaining after the two systems had been in Sleep mode for an extended period. As Figure 3 shows, after sleeping for 63 hours (from 5 PM Friday to 8 AM Monday), the battery charge on the HDD-based system dropped to 62 percent, while the battery on the Samsung SSD-based system remained fully charged.[1]

Percentage battery charge remaining after being in Sleep mode for…	Dell Latitude E6430 with HDD	Dell Latitude E6430 with Samsung SSD	Percentage improvement with Samsung SSD
63 hours (5 PM Friday to 8 AM Monday)	62%	100%	38%

Figure 3: The percentage battery charge remaining upon exiting Sleep mode. Higher numbers are better.

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[1] The difference is battery life is due to Intel Rapid Start Technology, which is available only with a solid-state drive. IRST lets you start your system more quickly than resuming from hibernation, and works to keep your battery charged.

THE BENCHMARK TESTS WE USED

In this section, we present a brief overview of the two benchmarks we used. For detailed system configuration information, see Appendix A. For step-by-step details on how we tested, see Appendix B.

PassMark DiskMark

The DiskMark component of PassMark's Performance Test measures data transfer speed when reading or writing data both sequentially and randomly to one or more disks. Many factors affect this speed, and the Advanced Disk Drive Test allows the user to vary most of these factors and compare the results. For more information on this benchmark, see http://www.passmark.com/products/pt.htm.

BAPCo SYSmark 2012

BAPCo SYSmark 2012 is an application-based benchmark that tests performance in the following office workload scenarios: office productivity, media creation, Web development, data/financial analysis, 3D modeling, and system management. SYSmark 2012 records the time the system takes to complete each individual operation in each scenario. For more information on this benchmark, see www.bapco.com/products/sysmark2012/.

IN CONCLUSION

A zippy Samsung SSD-based notebook computer can speed up your employees' experience at work; saving a few seconds here and there over the course of the day might sound inconsequential, but can add up. Being able to take advantage of a power-saving feature such as Intel Rapid Start Technology extends battery life, which can make employees' lives easier. Investing in Samsung SSDs for your Dell Latitude E6430 notebooks can deliver this improved speed and battery life, boosting both productivity and morale.

APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 4 provides detailed configuration information for the test system.

System	Dell Latitude E6430
General	
Number of processor packages	2
Number of cores per processor	2
Number of hardware threads per core	1
Total number of Threads	4
System power management policy	Dell
Processor power-saving option	EIST
System dimensions (depth x width x height)	9.49" x 13.86" x 1.27"
System weight	4.95 lbs.
CPU	
Vendor	Intel®
Name	Core® i5
Model number	3210M
Stepping	E1
Socket type and number of pins	Socket 988B rPGA
Core frequency (GHz)	2.50 (Max Turbo Frequency 3.10)
Bus frequency	DMI bus 5 GT/s
L1 cache	32 KB + 32 KB per core
L2 cache	512 KB (256 KB per core)
L3 cache	3 MB (shared)
Platform	
Vendor	Dell
Motherboard model number	0X6W22
Motherboard chipset	Intel QM77
BIOS name and version	Dell A07 (10/08/2012)
Memory module(s)	
Vendor and model number	Samsung M471B5273DH0-CK0
Type	PC3-12800
Speed (MHz)	1,600
Speed running in the system (MHz)	1,600
Timing/Latency (tCL-tRCD-tRP-tRASmin)	11-11-11-28
Size (MB)	4,096
Number of memory module(s)	1
Chip organization (single-sided/double-sided)	Double-sided
Channel (single/dual)	Single
Storage	
Storage option #1 – Spindle HDD	
Vendor and model number	Western Digital® WD3200BEKT-75PVMT1
Number of disks in system	1
Size (GB)	320
Buffer size (MB)	16

System	Dell Latitude E6430
RPM	7,200
Type	SATA 3.0 Gb/s
Controller	Intel Mobile Express Chipset SATA RAID Controller
Driver	Intel 11.0.0.1032 (11/29/2011)
Storage option #2 – SSD	
Vendor and model number	Samsung SSD SM841
Number of disks in system	1
Size (GB)	256
Controller	Intel Mobile Express Chipset SATA RAID Controller
Driver	Intel 11.5.0.1207 (07/09/2012)
Operating system	
Name	Microsoft Windows 8 Professional
Build number	6.2.9200
Service Pack	N/A
File system	NTFS
Kernel	X64-based PC
Language	English
Microsoft DirectX version	11
Graphics	
Vendor and model number	Intel HD Graphics 4000
Type	Integrated
Chipset	Intel HD Graphics 4000
BIOS version	2137.9
Total available graphics memory (MB)	1,696
Dedicated video memory (MB)	64
System video memory (MB)	0
Shared system memory (MB)	1,632
Resolution	1,366 x 768
Driver	Intel 9.17.10.2932 (12/12/2012)
Sound card/subsystem	
Vendor and model number	IDT High Definition Audio CODEC
Driver	IDT 6.10.0.6388 (02/13/2012)
Ethernet	
Vendor and model number	Intel 82579LM Gigabit
Driver	Intel 11.15.12.0 (11/30/2011)
Wireless	
Vendor and model number	Intel Centrino™ Ultimate-N 6300 AGN
Driver	Intel 15.1.1.1 (03/12/2012)
Optical drive(s)	
Vendor and model number	LG DU70N
Type	DVD-ROM

System	Dell Latitude E6430
USB ports	
Number	4
Type	2 x USB 3.0 1 x USB 2.0 1 x USB 2.0/eSATA
Other	HDMI, VGA
IEEE 1394 ports	
Number	0
Monitor	
LCD type	HD Anti-Glare LED-backlit
Screen size	14.0"
Refresh rate	60 Hz
Battery	
Type	Dell T54FJ Lithium-Ion
Size (depth x width x height)	2" x 8.3" x 0.8"
Rated capacity	11.1V / 5,400mAh / 60 Wh
Weight	0.7 lb.

Figure 4: Detailed information for the system configurations we tested.

APPENDIX B - HOW WE TESTED

Measuring disk performance with PassMark PerformanceTest 8

Setting up the test

1. Download PassMark PerformanceTest Professional 8.0 from http://www.passmark.com/products/pt.htm.
2. Double-click petst.exe to run setup.
3. At the Welcome screen, click Next.
4. Accept the license agreement, and click Next.
5. At the Choose Install Location screen, accept the default location of C:\Program Files\PerformanceTest, and click Next.
6. At the Select Start Menu Folder screen, click Next.
7. At the Ready to Install screen, click Install.
8. At the Completing the PerformanceTest Setup Wizard screen, deselect View Readme.txt, and click Finish to launch PerformanceTest.
9. At the Purchasing information screen, copy and paste the Username and key, and click Continue.
10. At the Key accepted screen, click OK.

Running the test

1. Boot the system and double-click the desktop icon to launch PassMark PerformanceTest.
2. Bring up an elevated command prompt:
    a. Select Windows Start orb.
    b. Type `cmd` and press Control-Shift-Enter.
3. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks`
4. Do not interact with the system until the command completes.
5. After the command completes, wait 5 minutes before running the test.
6. From the top menu, click Tests→Disk→All.
7. After the run has finished, record the PassMark Disk Mark results containing Sequential Read, Sequential Write, and Random Seek results.
8. Power the system off.
9. Repeat the steps 1 through 7 two more times.

Measuring system performance with SYSmark 2012

Avoiding antivirus software conflicts

SYSmark 2012 is not compatible with any virus-scanning software, so we uninstalled any such software that was present on the notebook PCs before we installed the benchmark.

Avoiding pre-installed software conflicts

SYSmark 2012 installs the following applications, which its test scripts employ:

- ABBYY® FineReader Pro 10.0
- Adobe® Acrobat® Pro 9
- Adobe® After Effects® CS5
- Adobe® Dreamweaver® CS5
- Adobe® Photoshop® CS5 Extended

- Adobe® Premiere® Pro CS5
- Adobe® Flash® Player 10.1
- Autodesk® 3DS Max® 2011
- Autodesk® AutoCAD® 2011
- Google SketchUp™ Pro 8
- Microsoft® Internet Explorer®
- Microsoft® Office® 2010
- Mozilla® Firefox® Installer
- Mozilla® Firefox® 3.6.8
- WinZip® Pro 14.5

If any of these applications are already on the system under test, they will cause problems with the benchmark due to software conflicts. To avoid any such issues, before we installed the benchmark, we uninstalled all conflicting pre-installed software applications, including different versions of any of the programs SYSmark 2012 uses.

Setting up the test using the SYSmark built-in Configuration Tool

This tool supports three levels of configuration:

1. Only makes changes that are REQUIRED in order for the benchmark to run.
2. Additionally, makes changes that are RECOMMENDED for repeatable results.
3. Additionally, makes OPTIONAL changes that help ensure best results.

The Configuration tool makes the following configuration changes at each of the three levels:

Level 1 - Required
- Disables User Account Control (UAC)
- Disables Windows Update
- Disables System Sleep and Hibernate
- Disables Low Battery Actions
- Disables Network Proxies

Level 2 - Recommended
- Creates BAPCo power scheme
- Sets Power Plan Type to High Performance
- Disables Windows Firewall
- Disables Windows Sidebar/Gadgets
- Disables Windows Pop-ups
- Disables Incoming Remote Desktop Connections
- Disables Windows Error Reporting
- Disables Screen Saver and Monitor Timeout
- Sets CPU Adaptive Mode
- Disables Desktop Slideshow
- Disables Disk Defrag

Level 3 - Optional
- Sets Hard Disk Timeout
- Disables Windows Defender
- Disables System Restore
- Ignores Laptop Lid Close
- Sets Maximum Display Brightness

- Disables Adaptive Brightness

  We chose all options listed - Level 3- in the Configuration tool.

1. Insert the SYSmark 2012 Install DVD into the notebook PC's DVD drive.
2. When the Autoplay menu appears, click Run SYSmark2012_setup.exe.
3. At the Welcome screen, click Next.
4. Enter the serial number, and click Next.
5. Accept the license agreement, and click Next.
6. At the Choose Components screen, select Full, and click Next.
7. At the Choose Install Location screen, accept the default location of C:\Program Files (x86)\BAPCo\SYSmark2012, and click Next.
8. At the Choose Start Menu Folder screen, click Install.
9. Insert Disc 2 when prompted.
10. At the InstallShield Wizard Complete screen, click Finish.
11. Download and install SYSmark 2012 Patch 2 http://www.bapco.com/support/.
12. Launch SYSmark 2012.
13. Click Configuration and choose only the Required options.
14. Click Apply, and restart the computer when prompted.

Running the test
1. Launch SYSmark 2012 by double-clicking the desktop icon.
2. Enter a Project name and choose 3 iterations.
3. Click Run Benchmark.

Getting the SYSmark 2012 results
When SYSmark 2012 has completed, the Test Results Viewer appears. To submit these results to BAPCo, we saved the test results by performing the following steps:

1. Click Save.
2. Enter a name, and select FDR to save the results as an FDR file.
3. Click Save again, and select PDF to save the results as a PDF file.
4. Browse to the Documents directory where the result FDR and PDF files were saved.

Measuring battery charge with Intel Rapid Start Technology
IRST enabled - Sleep
1. Using the Intel Rapid Start Technology Manager application, set the iRST timer to 0 minutes.
2. Charge the battery to 100%.
3. Boot the system and bring up an administrative command prompt.
4. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks`
   Do not interact with the system until the command completes.
5. After the command completes, wait 5 minutes before running the test.
6. Unplug the system.
7. Simultaneously start the timer and put the system into sleep mode (Start→Sleep).
8. Stop the timer when the power LED starts to blink.
9. Record the result as the sleep time.
10. Allow the system to sleep for 8, 24, or 63 hours.
11. At the end of test period, press the power button to resume from sleep mode.
12. Record the battery percentage.

APPENDIX C – DETAILED SYSTEM PERFORMANCE TEST RESULTS

Figures 5 and 6 provide the detailed results from the two industry-standard benchmark tests we conducted on the Dell Latitude E6430 with the two different storage options.

PassMark 8 Disk Mark	Dell Latitude E6430 with HDD	Dell Latitude E6430 with Samsung SSD	Percentage win with Samsung SSD
Disk Mark Overall score	**666**	**4,428**	**565%**
Sequential Read (MB/sec)	92.3	491.7	433%
Sequential Write (MB/sec)	85.5	438.9	413%
Random Seek + RW (MB/sec)	85.5	438.9	413%

Figure 5: Median scores for the PassMark 8 Disk Mark benchmark.

BAPCo SYSmark 2012	Dell LatitudeE6430 with HDD	Dell LatitudeE6430 with Samsung SSD	Percentage win with Samsung SSD
SYSmark 2012 Overall Performance Rating	**123**	**132**	**7.3%**
SYSmark 2012 – Office Productivity	117	135	15.4%
SYSmark 2012 – Media Creation	120	122	1.7%
SYSmark 2012 – Web Development	113	121	7.1%
SYSmark 2012 – Data/Financial Analysis	148	142	-4.1%
SYSmark 2012 – 3D Modeling	115	117	1.7%
SYSmark 2012 – System Management	130	157	20.8%

Figure 6: Median scores for the BAPCo SYSmark 2012 benchmark. Higher numbers are better.

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies, Inc.
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We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

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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.