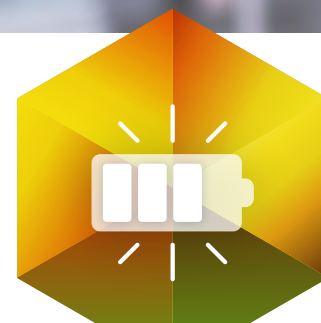




Dell Latitude 7410 Business Laptop with an Intel Core i7-10610U vPro processor outperformed Lenovo ThinkPad T14s Laptop with an AMD Ryzen 7 PRO 4750U processor

We compared battery life and system responsiveness on two 14-inch Microsoft Windows-based premium business laptops: the Dell Latitude™ 7410 powered by an Intel® Core™ i7-10610U vPro® processor and the Lenovo® ThinkPad® T14s powered by an AMD Ryzen™ 7 PRO 4750U processor.

For battery life and performance metrics, we ran the MobileMark® 2018 and SYSmark® 2018 benchmarks, which use actual applications in real-world workloads that reflect business worker usage patterns.



Enjoy over 13 hours unplugged

based on MobileMark 2018 battery life results



Get more done with 43% faster system responsiveness

based on MobileMark 2018 overall performance scores



Dell Latitude 7410 Business Laptop

This 14-inch premium business laptop comes with Dell Optimizer, your choice of a range of 10th Gen Intel Core vPro processors, and a 4K low blue light panel.¹ The vPro platform, according to Intel, “delivers much more than the sum of its parts—combining performance, security, manageability, and stability to provide what IT needs and your users want.”²

What we tested

We left each premium business laptop in the default “better performance” power mode and equipped both with 16 GB of memory, 512 GB of PCIe® SSD storage, and the largest capacity batteries available for each model:

- **Dell Latitude 7410 Business Laptop**

powered by a 10th Gen Intel Core i7-10610U vPro processor with integrated Intel UHD Graphics and a 6-cell 68-Whr ExpressCharge™ capable battery

- **Lenovo ThinkPad T14s Laptop**

powered by an AMD Ryzen 7 PRO 4750U processor with integrated AMD Radeon™ Graphics and a 3-cell 57-Whr battery with rapid-charge technology

The MobileMark 2018 performance-qualified battery life and SYSmark 2018 application-based benchmarks put the devices under test through real-world workloads running the same applications business users use every day.^{3,4}

The overall battery life and performance qualification scores we report reflect the specific Dell Latitude 7410 Business Laptop and Lenovo ThinkPad T14S Laptop configurations we tested. Any difference in the configurations you test, as well as screen brightness, network traffic, or software additions, can affect these results. For a deeper dive into our testing parameters and procedures, see the [appendices](#).

Longer battery life without sacrificing performance

Without a hit to performance, the Dell Latitude 7410 Business Laptop, powered by an Intel Core i7-10610U vPro processor and a 68-Whr battery, delivered higher battery efficiency than the Lenovo ThinkPad T14s Laptop powered by an AMD Ryzen 7 PRO 4750U processor and a 57-Whr battery. This higher battery efficiency, which we discuss in detail in the [appendices](#), is one of the reasons why the Dell Latitude 7410 Business Laptop, powered by an Intel Core i7-10610U vPro processor and a 68-Whr battery, provided over thirteen hours of battery life.

Over 4 hours and 53 minutes longer battery life

Based on MobileMark 2018 overall battery life

Time (hh:mm)

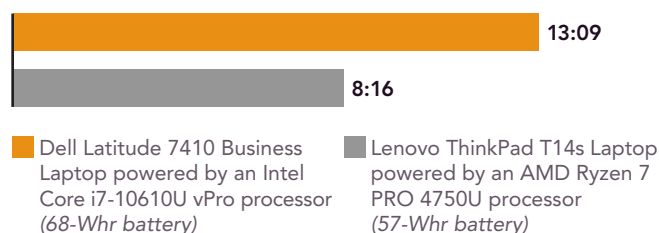


Figure 1: MobileMark 2018 overall battery life results. Time (hh:mm). More time is better.
Source: Principled Technologies.

43% faster system responsiveness

Based on MobileMark 2018 overall performance qualification

Score

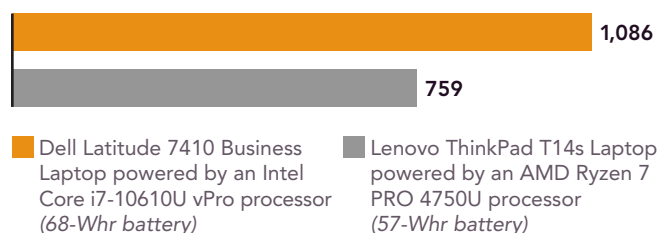


Figure 2: MobileMark 2018 overall performance qualification score. Higher is better.
Source: Principled Technologies.

A different perspective on performance while working unplugged

To get another view on unplugged performance, we prepared the systems identically using the SYSmark configuration tool (see [page 10 in the appendices](#) for more information). Then, using the same system and benchmark settings for both business laptops, we ran them through the SYSmark 2018 benchmark testing twice—first to measure system performance when they were plugged in and the second time to measure system performance when they were unplugged. For the plugged-in results, we allowed SYSmark to run the devices through its workloads three times and took the median score of those three runs. For the unplugged results, we fully charged each system and ran the benchmark once. We repeated this process a total of three times on each system and reported the median score.

In the plugged-in test, the Dell Latitude 7410 Business Laptop, powered by an Intel Core i7-10610U vPro processor and a 68-Whr battery, delivered 9 percent faster system responsiveness.

9% faster system responsiveness

Based on SYSmark 2018 overall rating while plugged in

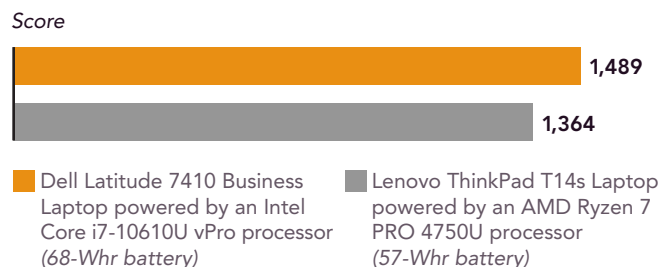


Figure 3: SYSmark 2018 overall performance rating while plugged in. Higher is better.
Source: Principled Technologies.

36% faster system responsiveness

Based on SYSmark 2018 overall rating while unplugged

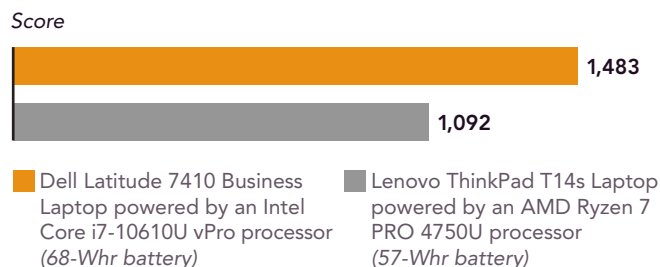


Figure 4: SYSmark 2018 overall performance rating while running on battery. Higher is better.
Source: Principled Technologies.

In the unplugged test, the performance numbers for the Lenovo ThinkPad T14s Laptop, powered by an AMD Ryzen 7 PRO 4750U processor and a 57-Whr battery, dropped 24 percent, giving the Dell Latitude 7410 Business Laptop, powered by an Intel Core i5-10310U vPro processor and a 68-Whr battery, a 36 percent win when running on battery.

For a deeper dive into the individual results as well as our testing parameters and procedures, see [the appendices](#).

- 1 Dell, "New Latitude 7410 Business Laptop," accessed November 10, 2020, <https://www.dell.com/en-us/work/shop/dell-laptops-and-notebooks/new-latitude-7410-business-laptop-or-2-in-1/spd/latitude-14-7410-2-in-1-laptop>.
- 2 Intel, "More of What You Want. Less of What You Don't," accessed November 10, 2020, <https://www.intel.com/content/www/us/en/now/morewithvpro.html>.
- 3 BAPCo, "An Overview of MobileMark 2018," accessed November 10, 2020, https://bapco.com/wp-content/uploads/2019/10/MobileMark_2018_White_Paper_v1.1.pdf.
- 4 BAPCo, "An Overview of SYSmark 2018," accessed November 10, 2020, https://bapco.com/wp-content/uploads/2019/06/BAPCo_SYSmark_2018_White_Paper_1.1.pdf.

Appendices

We concluded our hands-on testing on October 30, 2020. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on August 5, 2020 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

Table 1: Results of our benchmark testing. These scores are the median of three runs.

	Dell Latitude 7410 Business Laptop powered by an Intel Core i7-10610U vPro processor	Lenovo ThinkPad T14s Laptop powered by an AMD Ryzen 7 PRO 4750U processor
MobileMark 2018		
Overall battery life (hh:mm)	13:09	8:16
Overall performance qualification	1,086	759
Battery efficiency (min/Whr ratio)	11.60	8.70
SYSMark 2018		
Overall rating while plugged in	1,489	1,364
Overall rating while on battery	1,483	1,092

The 17 percent larger Whr capacity of the battery in the Dell Latitude 7410 might suggest that the business laptop should last unplugged approximately 17 percent longer than the Lenovo ThinkPad T14s, if all other factors (e.g., system configuration, screen brightness, network traffic, software) were equal; however, in our tests the Dell Latitude 7410 lasted unplugged for four hours and 53 minutes (or 59 percent) longer. It thus seems likely that battery capacity is not the only factor in this longer battery life.

System configuration information

Table 2: Detailed information on the systems we tested.

System configuration information	Dell Latitude 7410 Business Laptop powered by an Intel Core i7-10610U vPro processor	Lenovo ThinkPad T14s Laptop powered by an AMD Ryzen 7 PRO 4750U processor
Processor		
Vendor	Intel	AMD
Name	Core i7	Ryzen 7 PRO
Model number	10610U	4750U
Base - max frequency (GHz)	1.8-4.9	1.7-4.1
Number of cores	4	8
Memory		
Amount (GB)	16	16
Type	DDR4	DDR4
Speed (MHz)	2,667	3,200

System configuration information		Dell Latitude 7410 Business Laptop powered by an Intel Core i7-10610U vPro processor	Lenovo ThinkPad T14s Laptop powered by an AMD Ryzen 7 PRO 4750U processor
Graphics			
Vendor		Intel	AMD
Model number		UHD Graphics	AMD Radeon Graphics
Storage			
Vendor		Western Digital®	Western Digital
Model number		PC SN520	PC SN730
Amount (GB)		512	512
Type		M.2 PCIe NVMe	M.2 PCIe NVMe
Connectivity/expansion			
Wired internet		N/A	Realtek PCIe Gbe
Wireless internet		Intel Wi-Fi 6 AX201	Intel Wi-Fi 6 AX200
Bluetooth		5.1	5.1
USB		1 x USB 3.2, 1 x USB 3.2 with PowerShare 2 x Thunderbolt™ 3 with DisplayPort™ and Power Delivery	2 x USB 3.2 2 x USB Type-C with DisplayPort and Power Delivery
Video		HDMI® 2.0	HDMI 2.0
Battery			
Type		Lithium-Ion	Lithium-Ion
Rated capacity (W/hr)		68	57
Display			
Size (in.)		14	14
Type		FHD AR, AS	FHD IPS anti-glare
Resolution		1,920 x 1,080	1,920 x 1,080
Touchscreen		Yes	No
Operating system			
Vendor		Microsoft	Microsoft
Name		Windows 10 Pro	Windows 10 Pro
Build number or version		10.0.18363	10.0.18363
BIOS			
BIOS name and version		Dell Inc. 1.2.11	Lenovo R1CET36W(1.05)
Dimensions			
Height (in)		0.68-0.76	0.66
Width (in)		12.65	12.94
Depth (in)		8.22	8.9
Weight (lbs.)		3.22	2.8

How we tested

Setting up the systems

Capturing driver information from the OEM factory image

1. Connect an external HDD to the system.
2. On the external drive, create a directory named Drivers.
3. Hold the Shift key, and restart the system.
4. Choose Troubleshoot→Advanced options→Command prompt.
5. Type `DISM /image:C: /export-driver /destination:D:\drivers` (Note: In this scenario, the external drive is labeled D; however, this name may differ depending on the configuration of the system.)

Installing Windows 10 Pro

1. Connect an external HDD to the system.
2. In the BIOS, disable SecureBoot.
3. Install a clean version of Windows 10 Pro onto the test system.
4. To complete installation, follow the on-screen instructions, using the default selections when appropriate.
5. To install any missing drivers, open Device Manager, and use the OEM factory drivers captured onto the external HDD.
6. To install the latest chipset and graphics drivers available, go to either <https://www.intel.com/content/www/us/en/support.html> or <https://www.amd.com/en/support>.
7. Run Windows Update, and install all updates available.
8. Launch the Windows Store app, and install all Store app updates.
9. Verify the date and time are correct, and synchronize the system clock with the time server.
10. Disable Automatic Windows Update.
11. Right-click Start.
12. Select Computer Management.
13. Select Services and Applications.
14. Select Services.
15. Scroll down, and double-click Windows Update.
16. Click Stop.
17. From the Startup type drop-down menu, select Disabled.

Capturing an image

1. Connect an external HDD to the system.
2. Right-click the desktop, and select Personalize→Home→Update & security→Backup→More options→See advanced settings→System Image Backup→Create a system image.
3. Verify that the external HDD is selected as the save drive, and click Next.
4. Verify that all drives are selected to back up, and click Next.
5. Click Start backup.
6. At Do you want to create a system repair disc, select No, and close the dialogs.

Restoring an image

1. Connect an external HDD to the system.
2. Press and hold the Shift key while restarting the system.
3. Select Troubleshoot.
4. Select Advanced options.
5. Select System image recovery.
6. Select the User account.
7. Enter the system password, and click Continue.
8. Verify that the external HDD is selected, and click Next.
9. Once the recovery has completed, click Finish.

Measuring performance-qualified battery life

MobileMark 2018

Avoiding antivirus software conflicts

MobileMark 2018 is not compatible with any virus-scanning software, so we uninstalled any such software present on the laptops before we installed the benchmark.

Avoiding pre-installed software conflicts

MobileMark 2018 installs the following applications, which its test scripts employ:

Productivity

- Adobe® Acrobat® Pro DC
- AutoIT 3.3.14.2
- Google® Chrome™
- Microsoft Excel 2016
- Microsoft OneNote 2016
- Microsoft Outlook 2016
- Microsoft PowerPoint 2016
- Microsoft Word 2016
- Windows Zip

Creativity

- Adobe Photoshop® CC
- Adobe Lightroom® Classic CC
- CyberLink PowerDirector® 2015

Web Browsing

- Google Chrome
- Microsoft Movies & TV

If any of these applications already exist on the system under test, they could cause problems with the benchmark due to software conflicts. To avoid any such issues, we uninstalled all conflicting pre-installed software applications—including different versions of any of the programs MobileMark 2018 uses—before we installed the benchmark.

Adjusting display brightness and power settings

The brightness of a laptop's display affects its battery life. Therefore, BAPCo requires that, before you test with MobileMark 2018, you ensure the brightness of the laptop's monitor is greater than or equal to 200 nits in the center of a completely white screen while the laptop is unplugged and running on battery power. The measurement follows the standards from the Video Electronics Standards Association (www.vesa.org).

We complied with this standard for all our tests by setting each laptop's brightness as close to 200 nits as we could without going below that level. We used the following procedure before we started each test. Note: This procedure assumes we began with the plugged into the power supply.

1. To create a completely blank, white screen, open Microsoft Paint by clicking Start→All Programs→Accessories→Paint.
2. To open the Resize and Skew dialog, press Ctrl+W.
3. Under Horizontal and Vertical, enter 200, and click OK.
4. Click the View tab.
5. To view a white screen, click Full screen.
6. To allow the screen to warm, wait 45 minutes.
7. Unplug the laptop from the power supply, and measure the display's brightness using a luminance meter in the center of the screen. (We used a Gossen Mavolux5032C luxmeter.)
8. If the reading is below or significantly greater than 200 nits, adjust the screen brightness to as close to 200 nits as you can without going under, and retest:
 - a. Click Start.
 - b. In the Windows Start search box, type `display settings`
 - c. Adjust the slider to change the Display brightness to the correct percentage that produces no less than 200 nits.
9. Allow the laptop to run on battery power for 10 minutes, re-measure the display, and adjust the brightness up or down as necessary.
10. Verify that the laptop saved the brightness setting by plugging in the system, unplugging it, and taking another reading.

Using the MobileMark built-in configuration tool

This tool supports three levels of configuration:

1. Only makes changes that are REQUIRED 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)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update
- Enables Windows Search

Level 2 - Recommended

- Create BAPCo power scheme
- Set Power Plan Type to Balanced
- Set CPU Adaptive Mode
- Disables Battery Saver Dimming
- Verifies Battery Saver Threshold
- Disables Disk Defrag
- Disables Windows Error Reporting
- Disables Windows Lock Screen
- Disables Windows Pop-ups
- Disables Screen Saver and Monitor Timeout
- Disables Windows Sidebar/Gadgets
- Disables Desktop Slideshow
- Disables Windows Defender
- Disables Windows Firewall
- Set Font Smoothing

Level 3 - Optional

- Disables Hard Disk Timeout
- Disables System Restore
- Ignores Laptop Lid Close

We chose the official BAPCo 'Run Benchmark' default as outlined in the BAPCo MobileMark2018 User Guide http://bapco.com/wp-content/uploads/2019/03/BAPCo_MobileMark2018_user_guide_v1.3.pdf, which runs the benchmark using the Required and Recommended options.

Setting up the performance-qualified battery life test

1. Verify that the wireless adapter is enabled and connected to a wireless router that is not connected to the Internet.
2. Verify that the screen brightness is set to no less than 200 nits.
3. Install MobileMark 2018 with the default options.

Running the performance-qualified battery life test

1. Launch MobileMark 2018.
2. Click the Settings Gear icon.
3. Verify that Conditioning Run is enabled.
4. Enable Process Idle Tasks.
5. Enter a name for the benchmark run.
6. To return to the main menu, click Back.
7. Click Run Benchmark.
8. When prompted, unplug the AC power adapter. The test will begin immediately.
9. The benchmark is complete when the laptop has fully depleted its battery and is no longer operational when running on battery power.
10. Repeat steps 1 through 9 twice more, and record the median battery life and performance qualification results.

Measuring performance

SYSmark 2018

Avoiding antivirus software conflicts

SYSmark 2018 is not compatible with any virus-scanning software, so we uninstalled any such software present on the laptops before we installed the benchmark.

Avoiding pre-installed software conflicts

SYSmark 2018 installs the following applications, which its test scripts employ:

Productivity

- Adobe Acrobat Pro DC
- AutoIT 3.3.14.2
- BowPad64-2.3.3 installer
- Google Chrome
- Microsoft Excel 2016
- Microsoft OneNote 2016
- Microsoft Outlook 2016
- Microsoft PowerPoint 2016
- Microsoft Word 2016
- Windows Zip

Creativity

- Adobe Photoshop CC 2017
- Adobe Lightroom Classic CC
- CyberLink PowerDirector 2015

Responsiveness

- Adobe Acrobat Pro DC
- Adobe Lightroom Classic CC
- Adobe Photoshop CC 2017
- CyberLink PowerDirector 2015
- Google Chrome
- Microsoft Excel 2016
- Microsoft OneNote 2016
- Microsoft Outlook 2016
- Microsoft PowerPoint 2016
- Microsoft Word 2016

If any of these applications already exist on the system under test, they could cause problems with the benchmark due to software conflicts. To avoid any such issues, we uninstalled all conflicting pre-installed software applications—including different versions of any of the programs SYSmark 2018 uses—before we installed the benchmark.

Using the SYSmark built-in configuration tool

This tool supports three levels of configuration:

1. Only makes changes that are **REQUIRED** 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)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update

Level 2 - Recommended

- Disables User Account Control (UAC)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update
- Create BAPCo power scheme
- Set Power Plan Type to High Performance
- Set CPU High Performance
- Disables Disk Defrag
- Disables Windows Error Reporting
- Disables Windows Lock Screen
- Disables Windows Pop-ups
- Disables Screen Saver and Monitor Timeout
- Disables Windows Sidebar/Gadgets
- Disables Desktop Slideshow
- Disables Windows Defender
- Disables Windows Firewall
- Set Font Smoothing

Level 3 - Optional

- Disables Hard Disk Timeout
- Disables System Restore
- Ignores Laptop Lid Close

We chose the official BAPCo 'Run Benchmark' default as outlined in the BAPCo SYSmark2018 User Guide http://bapco.com/wp-content/uploads/2018/10/BAPCo_SYSmark2018_user_guide.pdf which runs the benchmark using the Required and Recommended options.

Setting up the test

1. Install SYSmark 2018 with the default options.

Running the test while the device is plugged in

1. Launch SYSmark 2018.
2. Click on the Settings Gear icon.
3. For iterations, type 3.
4. Verify that Conditioning Run is enabled.
5. Enable Process Idle Tasks.
6. Enter a name for the benchmark run.
7. To return to the main menu, click Back.
8. Click Run Benchmark.
9. When the benchmark finishes, record the SYSmark 2018 benchmark results.

Running the test while the device is unplugged

1. Plug in the laptop charger, and fully charge the system.
2. Launch SYSmark 2018.
3. Click on the Settings Gear icon.
4. For iterations, enter 1.
5. Verify that Conditioning Run is disabled.
6. Enable Process Idle Tasks.
7. Enter a name for the benchmark run.
8. To return to the main menu, click Back.
9. Unplug the system charger.
10. Click Run Benchmark.
11. When the benchmark finishes, record the SYSmark 2018 benchmark results.
12. Complete steps 1 through 11 two more times, and record the median results.

This project was commissioned by Dell Technologies.



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