



## Dell Latitude 5310 Business Laptop with an Intel Core i5-10310U vPro processor outperformed Lenovo ThinkPad X13 Laptop with an AMD Ryzen 5 PRO 4650U processor

We compared battery life and system responsiveness on two 13-inch Microsoft Windows-based business laptops: the Dell Latitude™ 5310 powered by an Intel® Core™ i5-10310U vPro® processor and the Lenovo® ThinkPad® X13 powered by an AMD Ryzen™ 5 PRO 4650U 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 14% faster system responsiveness

based on MobileMark 2018 overall performance scores



### Dell Latitude 5310 Business Laptop

This 13-inch business laptop comes with Dell Optimizer, your choice of a range of 10th Gen Intel Core vPro processors, an anti-glare screen, and a camera shutter for privacy.<sup>1</sup> 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.”<sup>2</sup>

## Work unplugged longer

A balance between battery life and performance is important for most users, so we left each 13-inch business laptop in default “better performance” power mode and equipped them with 8 GB of memory, 256 GB of PCIe® SSD storage, and the largest capacity batteries available for each model:

- **Dell Latitude 5310** powered by a 10th Gen Intel Core i5-10310U vPro processor with integrated Intel UHD Graphics 620 and a 4 cell 60-Whr ExpressCharge™ capable battery
- **Lenovo ThinkPad X13** powered by an AMD Ryzen 5 PRO 4650U processor with integrated AMD Radeon™ Graphics and a 6 cell 48-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.<sup>3,4</sup>

The overall battery life and performance qualification scores we report reflect the specific Dell Latitude 5310 Business Laptop and Lenovo ThinkPad X13 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.

## Longer battery life without a performance hit

Whether you or your team is on-the-go or sheltering in place, capable and compact business laptops give everyone freedom over where and how they work.

Without sacrificing performance, the Dell Latitude 5310 Business Laptop, powered by an Intel Core i5-10310U vPro processor and a 60-Whr battery had higher battery efficiency than the Lenovo ThinkPad X13 powered by an AMD Ryzen 5 PRO 4650U processor and a 48-Whr battery. This higher battery efficiency, which we discuss in detail in the [appendices](#), is one of the reasons why the Dell Latitude 5310 Business Laptop, powered by an Intel Core i5-10310U vPro processor and a 60-Whr battery, delivered over thirteen hours of battery life.

### Over 5 hours and 50 minutes longer battery life

Based on MobileMark 2018 overall battery life

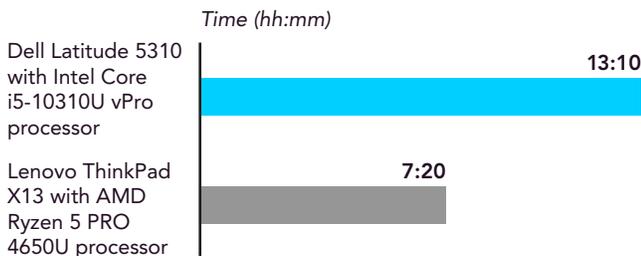


Figure 1: MobileMark 2018 overall battery life results. Time (hh:mm). More time is better. Source: Principled Technologies.

### 14% faster system responsiveness

Based on MobileMark 2018 overall performance qualification

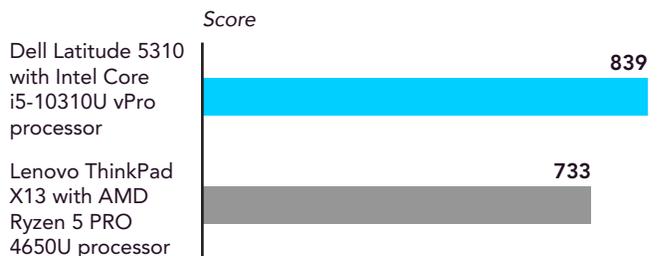


Figure 2: MobileMark 2018 overall performance qualification score. Higher is better. Source: Principled Technologies.

## Do you prioritize performance over battery life?

When we moved the power mode slider on both laptops from default to best performance and ran MobileMark 2018 again, performance on the Dell Latitude 5310 Business Laptop jumped 18 percent. And, while battery life dropped by over four hours, the Dell Latitude 5310 still delivered more time unplugged than the Lenovo ThinkPad X13. There was no noticeable change in battery life or performance on the Lenovo ThinkPad X13 Laptop. To see these results, go to the [appendices](#).

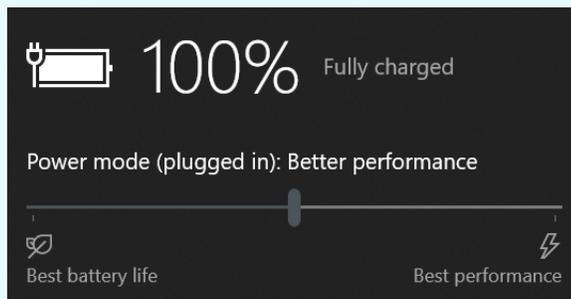


Figure 3: What we saw when we clicked the Battery icon on the Windows 10 taskbar. Source: Principled Technologies.

## Another view of performance while working unplugged

To get a different perspective 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—once to measure system performance when they were plugged in and the second time to measure system performance when they were unplugged. When the two laptops were tethered to an outlet, their SYSmark 2018 results varied by less than one percent. In the unplugged test, however, the performance numbers for the Lenovo ThinkPad X13, powered by an AMD Ryzen 5 PRO 4650U processor and a 48-Whr battery, dropped 20 percent, giving the Dell Latitude 5310 Business Laptop, powered by an Intel Core i5-10310U vPro processor and a 60-Whr battery, a 12 percent win when running on battery.

### 12% faster system responsiveness

Based on SYSmark 2018 overall rating while on battery



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

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

- 1 Dell, "New Latitude 5310 Business Laptop," accessed August 11, 2020, <https://www.dell.com/en-us/work/shop/laptops/new-13-5310/spd/latitude-13-5310-laptop>.
- 2 Intel, "More of What You Want. Less of What You Don't," accessed August 21, 2020, <https://www.intel.com/content/www/us/en/now/morewithvpro.html>
- 3 BAPCo, "An Overview of MobileMark 2018," accessed August 11, 2020, <https://bapco.com/wp-content/uploads/2019/01/MobileMark-2018-White-Paper-v1.0.pdf>.
- 4 BAPCo, "An Overview of SYSmark 2018," accessed August 20, 2020, [http://bapco.com/wp-content/uploads/2019/06/BAPCo\\_SYSmark\\_2018\\_White\\_Paper\\_1.1.pdf](http://bapco.com/wp-content/uploads/2019/06/BAPCo_SYSmark_2018_White_Paper_1.1.pdf).

# Appendices

We concluded our hands-on testing on August 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 5310 with Intel Core i5-10310U vPro processor and 60-Whr battery	Lenovo ThinkPad X13 with AMD Ryzen 5 PRO 4650U processor and 48-Whr battery
<b>MobileMark 2018 (Better performance [default] setting)</b>		
Overall battery life (hh:mm)	13:10	7:20
Overall performance qualification	839	733
Battery efficiency (min/Whr ratio)	13.1	9.1
<b>MobileMark 2018 (Best performance setting)</b>		
Overall battery life (hh:mm)	9:06	7:17
Overall performance qualification	975	737
<b>SYSMark 2018</b>		
Overall rating while plugged in	1,281	1,292
Overall rating while on battery	1,154	1,022

The 25 percent larger Whr capacity of the battery in the Dell Latitude 5310 might suggest that the business laptop should last unplugged approximately 25 percent longer than the Lenovo ThinkPad X13, if all other factors (e.g., system configuration, screen brightness, network traffic, software) were equal; however, in our tests the Dell Latitude 5310 lasted unplugged for five hours and 50 minutes (or 79 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 5310 with Intel Core i5-10310U vPro processor and 60-Whr battery	Lenovo ThinkPad X13 with AMD Ryzen 5 PRO 4650U processor and 48-Whr battery
<b>Processor</b>		
Vendor	Intel	AMD
Name	Core i5 vPro	Ryzen 5 PRO
Model number	10310U	4650U
Core frequency (GHz)	1.7-4.4	2.1-4.0
Number of cores	4	6
<b>Memory</b>		
Amount (GB)	8	8
Type	DDR4	DDR4
Speed (MHz)	2,667	3,200

System configuration information	Dell Latitude 5310 with Intel Core i5-10310U vPro processor and 60-Whr battery	Lenovo ThinkPad X13 with AMD Ryzen 5 PRO 4650U processor and 48-Whr battery
Graphics		
Vendor	Intel	AMD
Model number	UHD Graphics 620	Integrated Radeon Graphics
Storage		
Vendor	KIOXIA	Samsung
Model number	KBG40ZNS256G NVM	MZVLB256HBHQ-000L7
Amount (GB)	256	256
Type	M.2 PCIe NVMe	M.2 PCIe NVMe
Connectivity/expansion		
Wired internet	Intel Ethernet Connection I219-LM	Realtek PCIe Gbe
Wireless internet	Intel Wi-Fi 6 AX201	Intel Wi-Fi 6 AX200
Bluetooth	5.1	5.1
USB	1 x USB 3.1 1 x USB 3.1 with PowerShare 1 x USB Type-C with DisplayPort	2 x USB 3.2 2 x USB Type-C
Video	HDMI 1.4	HDMI 2.0
Battery		
Type	Lithium-Ion	Lithium-Ion
Rated capacity (Whr)	60	48
Display		
Size (in.)	13.3	13.3
Type	FHD Anti-Glare	FHD IPS anti-glare
Resolution	1,920 x 1,080	1,920 x 1,080
Touchscreen	No	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. 1.1.1	Lenovo R1CET36W(1.05)
Dimensions		
Height (in)	0.66-0.75	0.69
Width (in)	12.03	12.3
Depth (in)	8.16	8.6
Weight (lbs.)	2.75	2.84

# How we tested

## Setting up the system

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

We complied with this standard for all our tests by setting each notebook PC'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 notebook plugged into the power supply.

1. To create a completely blank, white screen, open Microsoft Paint by clicking Start→All Programs→Accessories→Paint.
2. Press Ctrl+W to open the Resize and Skew dialog.
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 notebook 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 notebook 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 notebook 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](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. Power mode:
  - For OOB (default) testing, click the battery icon in the taskbar, and verify power mode is set to Better performance.
  - For Best performance testing, click the battery icon in the taskbar, and drag the power mode slider all the way to the right.
2. Launch MobileMark 2018.
3. Click the Settings Gear icon.
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 prompted, unplug the AC power adapter. The test will begin immediately.
10. The benchmark is complete when the notebook PC has fully depleted its battery and is no longer operational when running on battery power.
11. Repeat steps 1 through 10 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 notebook PCs 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](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, enter 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. Launch SYSmark 2018.
2. Click on the Settings Gear icon.
3. For iterations, enter 1.
4. Verify that Conditioning Run is disabled.
5. Enable Process Idle Tasks.
6. Enter a name for the benchmark run.
7. To return to the main menu, click Back.
8. Unplug the system charger.
9. Click Run Benchmark.
10. When the benchmark finishes, record the SYSmark 2018 benchmark results.
11. Plug-in the laptop charger, and fully charge the system.
12. Repeat steps 1-11 two more times.

This project was commissioned by Dell Technologies.



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