



The science behind the report:

Dell Latitude 9510: Longer battery life, cooler to the touch, and higher benchmark scores

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report [Dell Latitude 9510: Longer battery life, cooler to the touch, and higher benchmark scores](#).

We concluded our hands-on testing on August 6, 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 June 2, 2020 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

Table 1: Results of our MobileMark® 2018 application-based benchmark battery life and overall performance testing with the Dell™ Latitude™ 9510 (A) with 88-Whr battery. We reported the median result from three runs.

	Dell Latitude 9510 (A) with 88-Whr battery	Lenovo® ThinkPad® X1 Yoga Gen 5
MobileMark 2018		
Overall battery life (hr:min)	19:12	11:24
Overall performance qualification	1,164	605

Table 2: Results of our thermal testing with the Dell Latitude 9510 (B) with 52-Whr battery. We reported the average temperature of three measurements for each hot spot.

	Dell Latitude 9510 (B) with 52-Whr battery		Lenovo ThinkPad X1 Yoga Gen 5	
	Fahrenheit	Celsius	Fahrenheit	Celsius
Thermal testing with Optimized Mode enabled on the Dell Latitude 9510				
Average surface-point temperature of the top hot spot	105.4	40.8	107.0	41.7
Average surface-point temperature of the bottom hot spot	107.2	41.8	119.8	48.8
Maximum surface-point temperature of the top hot spot	110.4	43.6	111.7	44.3
Maximum surface-point temperature of the bottom hot spot	109.5	43.1	125.2	51.8
Thermal testing with Cool Mode enabled on the Dell Latitude 9510				
Average surface-point temperature of the top hot spot	97.3	36.3	106.3	41.3
Average surface-point temperature of the bottom hot spot	99.3	37.4	119.3	48.5
Maximum surface-point temperature of the top hot spot	99.5	37.5	111.0	43.9
Maximum surface-point temperature of the bottom hot spot	102.2	39.0	125.0	51.7

Table 3: Results of our SYSmark® 2018 application-based benchmark overall performance and sign-in experience testing with the Dell Latitude 9510 (B) with 52-Whr battery. Results are based on the median of three runs.

	Dell Latitude 9510 (B) with 52-Whr battery	Lenovo ThinkPad X1 Yoga Gen 5
SYSmark 2018		
Overall rating	1,565	1,463
Sign-in experience: Dell ExpressSign-In vs. Microsoft Windows Hello Face		
Time to sign in (sec)	4.3	7.8

Table 4: Results of our Zoom CPU utilization testing with the Dell Latitude 9510 (B) with 52-Whr battery. For both the Dell and Lenovo laptops, we tested a four-part screen-sharing scenario where the Zoom meeting host started a meeting with one participant and added a second, third, and fourth participant every five minutes—making the complete test scenario 20 minutes long. We ran this test scenario three times on both systems. For the reported CPU utilization difference on page six of the [report](#), we chose the median run from the Host + 2 Participants results listed below.

	Dell Latitude 9510 (B) with 52-Whr battery				Lenovo ThinkPad X1 Yoga Gen 5			
	Run 1	Run 2	Run 3	Median	Run 1	Run 2	Run 3	Median
CPU utilization (% total processor time)								
Host + 1st Participant (0-5m)	30.04	29.31	32.13	30.04	28.48	30.25	29.77	29.77
Host + 2 Participants (5-10m)	25.98	26.79	24.54	25.98	27.32	31.19	32.33	31.19
Host + 3 Participants (10-15m)	32.80	33.91	31.57	32.80	30.39	36.67	36.16	36.16
Host + 4 Participants (15-20m)	29.40	30.19	30.59	30.19	31.71	32.24	33.91	32.24

System configuration information

Table 5: Detailed information on the systems we tested.

System configuration information	Dell Latitude 9510 (A)	Dell Latitude 9510 (B)	Lenovo ThinkPad X1 Yoga Gen 5
Processor			
Vendor	Intel®	Intel	Intel
Name	Core™ i7	Core i7	Core i7
Model number	10610U	10610U	10610U
Core frequency (GHz)	1.8-4.9	1.8-4.9	1.8-4.9
Number of cores	4	4	4
Cache	8 MB Intel Smart Cache	8 MB Intel Smart Cache	8 MB Intel Smart Cache
Memory			
Amount (GB)	8	8	8
Type	LPDDR3	LPDDR3	LPDDR3
Speed (MHz)	2,133	2,133	2,133
Graphics			
Vendor	Intel	Intel	Intel
Model number	UHD Graphics	UHD Graphics	UHD Graphics
Storage			
Vendor	KIOXIA	Samsung	Toshiba
Model Number	KBG40ZNS512G	PM991	KXG6AZNV1T02
Amount (GB)	512	1,024	1,024
Type	M.2 PCIe NVMe™	M.2 PCIe NVMe	M.2 PCIe NVMe
Connectivity/expansion			
Wired internet	NA	NA	NA
Wireless internet	Intel Wi-Fi 6 AX201	Intel Wi-Fi 6 AX201	Intel Wi-Fi 6 AX201
Bluetooth	5.0	5.0	5.0
USB	1 x USB 3.2 Gen 1 Type-A port with PowerShare 2 x USB 3.2 Gen 2 Type-C™ ports with Thunderbolt 3/Power Delivery/DisplayPort	1 x USB 3.2 Gen 1 Type-A port with PowerShare 2 x USB 3.2 Gen 2 Type-C ports with Thunderbolt 3/Power Delivery/DisplayPort	2 x USB-C™ Thunderbolt 3 (Power Delivery, DisplayPort) 2 x USB 3.1 (Gen1) (1 always on)
Video	HDMI 2.0	HDMI 2.0	HDMI 1.4
Camera			
Type	IR camera + proximity sensor	IR camera + proximity sensor	IR + 720p HD camera
Driver	Microsoft 10.0.19041.1	Microsoft 10.0.19041.1	Realtek 10.0.18362.20134

System configuration information	Dell Latitude 9510 (A)	Dell Latitude 9510 (B)	Lenovo ThinkPad X1 Yoga Gen 5
Battery			
Type	Lithium-ion	Lithium-ion	Lithium-ion
Rated capacity (Whr)	88	52	51
Display			
Size (in.)	15.0	15.0	14.0
Type	FHD	FHD	FHD
Resolution	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080
Touchscreen	Yes	Yes	Yes
Operating system			
Vendor	Microsoft	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro	Windows 10 Pro
Build number or version	2004	2004	2004
BIOS			
BIOS name and version	Dell 1.1.2	Dell 1.1.2	Lenovo N2WET16W (1.06)
Dimensions			
Height (in.)	0.32–0.55	0.32–0.55	0.59
Width (in.)	13.39	13.39	12.00
Depth (in.)	8.49	8.49	8.50
Weight (lbs.)	3.30	3.50	2.99

How we tested

To make this comparison as equitable as possible, the Dell Latitude 9510 and Lenovo ThinkPad Yoga X1 Gen 5 2-in-1 laptops we tested were each powered by an Intel Core i7 10610U processor, contained four cores, and had 8 GB of cache memory. The only difference between the two Dell Latitude 9510 laptops we tested was that we configured one 9510 with less storage and a bigger battery [9510 (A)] and the other with more storage and a smaller battery [9510 (B)]. We configured the Lenovo ThinkPad X1 Yoga Gen 5 to match the Latitude 9510 with more storage and a smaller battery because the Lenovo ThinkPad X1 Yoga Gen 5 doesn't offer a battery upgrade.

Setting up the system

Capturing an image

1. To download and install the latest Windows 10 updates, run Windows Updates.
2. Using the Dell SupportAssist tool or the Lenovo Vantage tool download and install the latest manufacturer BIOS and drivers.
3. Connect an external HDD to the system.
4. Right-click on the desktop, and select Personalize→Home→Update & security→Backup→More options→See advanced settings→System Image Backup→Create a system image.
5. Verify that the external HDD is selected as the save drive, and click Next.
6. Verify that all drives are selected to back up, and click Next.
7. Click Start backup.
8. At Do you want to create a system repair disc, click No, and close the dialogs.

Restoring an image

1. Connect an external HDD to the system.
2. Restart the system while pressing and holding the Shift key.
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 system responsiveness with application-based benchmarks

Setting up and running the MobileMark 2018 benchmark

Avoiding antivirus software conflicts

MobileMark 2018 is not compatible with any virus-scanning software, so we uninstalled any such software present on the 2-in-1 laptops 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 2-in-1 laptop's display affects its battery life. Therefore, BAPCo requires that, before you test with MobileMark 2018, you ensure the brightness of the 2-in-1 laptop's monitor is greater than or equal to 200 nits in the center of a completely white screen while the 2-in-1 laptops 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 2-in-1 laptops 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 2-in-1 laptops 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 to view a white screen.
6. To allow the screen to warm, wait 45 minutes to allow the screen to warm.
7. Unplug the 2-in-1 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.
9. Click the Start button.
10. In the search box, type `display settings`.
11. Change the Display brightness to the correct percentage that produces no less than 200 nits by adjusting the slider.
12. Allow the 2-in-1 laptops to run on battery power for 10 minutes, re-measure the display, and adjust the brightness up or down as necessary.
13. Verify that the 2-in-1 laptops 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 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 test

1. Launch MobileMark 2018.
2. Click on 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. Click the Back button to return to the main menu.
7. Click Run Benchmark.
8. When prompted, unplug the AC power adapter. The test will begin immediately.
9. The benchmark is complete when the 2-in-1 laptops PC has fully depleted its battery and is no longer operational when running on battery power.

We executed the MobileMark 2018 benchmark three times on the system and took the median battery life run as the representative score for that test.

Setting up and running the SYSmark 2018 benchmark

Avoiding antivirus software conflicts

SYSmark 2018 is not compatible with any virus-scanning software, so we uninstalled any such software present on the 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), 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

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 the Back button.
8. Click Run Benchmark.
9. When the benchmark finishes, record the SYSmark 2018 benchmark results.

Measuring surface temperatures of the 2-in-1 laptops while running Cinebench R20

This test requires the following items:

- FLIR i7 Thermal Imaging Camera
- Fluke NetDAQ 2680A Data Acquisition System
- Cinebench Release 20

To measure the thermal profile of the laptop systems as they run a performance benchmark requires two specialized tools: a FLIR® i7 thermal imaging camera with FLIR Tools and a Fluke® NetDAQ® 2680A Data Acquisition System with Type T thermocouples, which includes both a hardware device and software that runs on a controller PC.

A thermocouple is a junction between two different metals that produces a voltage related to a temperature difference. We used Type T thermocouples, which are suited for measurements in the -200° to 350°C range.

Data acquisition (DAQ) is the process of sampling signals that measure real-world physical conditions, which, in this case, temperature. For our testing, we installed the Fluke DAQ software on a controller PC connected via Ethernet to the NetDAQ device. Five Type T thermocouples connect to the NetDAQ through a 20-channel input module, and attach to a test point on each laptop PC under test, and an extra probe measured the ambient air temperature. We configured and controlled each of these five channels using the Fluke DAQ software installed on the controller PC. As each benchmark runs, the NetDAQ logs, in real time, the temperature of each of the five test points. After each run, we exported the NetDAQ log to Excel.

We reviewed the output from the NetDAQ. By doing this, we learned how much the surface temperature rises above ambient temperature when the laptop PC runs performance benchmarks.

Surface temperature locations

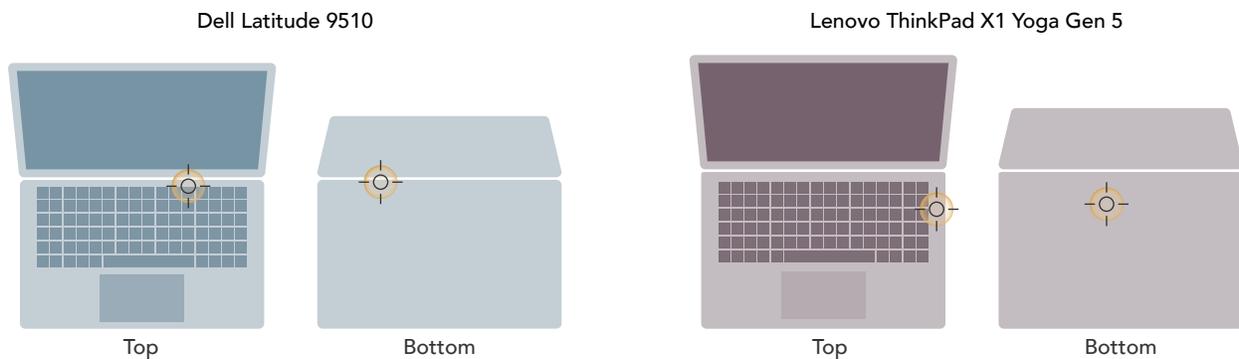


Figure 1: The approximate location on each laptop where we measured GPU and CPU hot spots—which are different in each laptop.

Setting up the test

1. Download and install Cinebench from the Microsoft Store.
2. Launch Cinebench R20.
3. Click File→Preferences and enter 7,200 seconds into the Minimum Test Duration, and click OK.
4. Close Cinebench, and shut down the system.

Setting up the 2-in-1 laptops

1. Place the laptop in a climate-controlled room.
2. Launch Cinebench R20.
3. Click Run.
4. After 15 minutes use the FLIR i7 camera to determine where the surface hot spots are located on the top and bottom surfaces.
5. Attach a type-t thermocouple to each laptop in the locations that is being monitored.
6. Configure the Fluke NetDAQ 2680A Data Acquisition System to take measurements from the four surface temperature probes and one ambient temperature probe using the Fluke DAQ software.
7. Connect the five type-t thermocouples to five channels in the Fluke Fast Analog Input module (FAI).
8. In the Fluke DAQ software, click each surface temperature channel, select Thermocouple from the list of Functions, and choose T from the list of ranges.
9. Label each channel with the laptop associated with each thermocouple.
10. In the Fluke DAQ software, click the ambient temperature channel, select Thermocouple from the list of Functions, and choose T from the list of ranges.
11. Label this channel Ambient.
12. While running each test, use a Fluke 2680A Data Acquisition System to monitor ambient and surface temperature.

Running the test

1. Boot the system.
2. Select Start.
3. Type `cmd`, and press `Ctrl+Shift+Enter`.
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 five minutes before running the test.
6. Start the Fluke 2680A data logger using the Fluke DAQ software.
7. Launch Cinebench R20.
8. Click Run.
9. After 15 minutes, use the Fluke DAQ software to stop the Fluke 2680A data logger.
10. Save the thermal measurement data to a CSV file.
11. Use the thermal measurement CSV file to find and report the highest temperature measured at each location during the test.
12. Shutdown the system under test for 15 minutes before starting the next run.
13. Repeat steps 1 through 12 twice more.

Personal experience

Signing-in with Dell ExpressSign-In or Windows Hello Face

Setting up the test

1. Create a password on each system.
2. Select Start.
3. Type `Sign-in options`
4. Press Enter.
5. Click Password.
6. Click Add.
7. Type in a new password and hint, and click Next.
8. Click Finish.
9. Verify the default Power and Sleep settings for each system.
10. Press Start.
11. Type `Power & Sleep settings`
12. Press Enter.
13. Verify the following screen options:
 - On battery power, turn off after 4 minutes.
 - When plugged in, turn off after 10 minutes.
 - On battery power, PC goes to sleep after 4 minutes.
 - When plugged in, PC goes to sleep after 10 minutes.

14. Adjust the screen brightness to no less than 200 nits.
15. To create a completely blank, white screen, open Microsoft Paint by clicking Start-All→Programs→ Accessories→Paint.
16. Press Ctrl+W to open the Resize and Skew dialog.
17. Under Horizontal and Vertical, enter 200, and click OK.
18. Click the View tab.
19. To view a white screen, click Full screen.
20. To allow the screen to warm, wait 45 minutes to allow the screen to warm.
21. Unplug the 2-in-1 laptops 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.)
22. 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:
23. Click Start.
24. In the Windows Start search box, type display settings.
25. Adjust the slider to change the Display brightness to the correct percentage that produces no less than 200 nits.
26. Allow the 2-in-1 laptops to run on battery power for 10 minutes, re-measure the display, and adjust the brightness up or down as necessary.
27. Verify that the 2-in-1 laptops saved the brightness setting by plugging in the system, unplugging it, and taking another reading.

Setting up ExpressSign-In on the Dell Latitude 9510

This feature was not available on the Lenovo ThinkPad X1 Yoga.

1. Launch the Dell Optimizer application.
2. Select Proximity Sensor.
3. Verify the default settings that Proximity Sensor is Enabled and that it is set to lock at 1 minute.
4. To sign-in instantly, click Setup facial recognition.
5. Select Windows Hello Face.
6. Click Set up.
7. Click Get started.
8. Click Set up PIN.
9. To verify the account, enter the account password and press Enter.
10. Create a 4-digit PIN and press Enter.
11. Close the Sign-in options dialog.
12. Close the Dell Optimizer dialog.

Setting up Windows Hello Face on the Lenovo ThinkPad X1 Yoga.

1. Select Start.
2. Type Sign-in options
3. Press Enter.
4. Click Windows Hello Facet.
5. Click Set up.
6. Click Get started.
7. Click Set up PIN.
8. To verify the account, enter the account password and press Enter.
9. Create a 4-digit PIN and press Enter.
10. Close the Sign-in options dialog.

Camera quality in low light room setting

Taking a selfie using the built-in camera app

1. Set each PC's brightness as close to 200 nits without going below that level.
2. Using a Digital light meter (Dr.meter LX1330B) measure the room brightness at the subject's face facing the camera and verify that this reading matches the level you set in step 1. In our testing, the room brightness was 16.2 LUX.
3. On each system, open the Windows 10 camera app.
4. When positioned correctly, take a picture.

Zoom performance

Preparing for testing

1. Navigate to zoom.us, and set up a free Zoom account for each device under test as a Zoom host.
2. On each host and participant device, install the Zoom Windows 10 desktop client.
3. On each device under test as a Zoom host, create a custom Performance Monitor Data Collector Set:
 - a. From the Windows 10 Start Menu, open Performance Monitor.
 - b. Under Data Collector Sets, right-click User Defined, and click New → Data Collector Set.
 - c. In the Name field, type Zoom.
 - d. Click Next.
 - e. Select System Performance, and click Next.
 - f. Click Next.
 - g. Select Open properties for this data collector set, and click Finish.
 - h. Click the Stop Condition tab, and uncheck the Overall duration box.
 - i. Click OK.
4. Download the screen-sharing test video to each host device under test. We used a 3-minute-long MP4, which was approximately 205MB and 720p.
5. On a host device under test, log into the Zoom account you created in step 1, and modify settings:
 - a. Click Settings.
 - b. Set Waiting Room to disabled.
 - c. Under Host video, set Start meetings with host video set to enabled.
 - d. Under Participants video, set Start meetings with participant video set to enabled.
6. Repeat step 5 for each host device under test.

Testing Zoom host performance on a call with one to four participants

1. On the host device under test, open a Microsoft Edge browser window, and navigate to zoom.us.
2. Under the Host a meeting drop-down at the top-right corner, click With video on.
3. To open the Zoom application, click Open Zoom Meetings.
4. Click Join with Computer Audio, and ensure the host video is enabled.
5. Click Participants, and click Invite.
6. Invite the other four participants via email.
7. On the first participant device, open a Microsoft Edge browser window, navigate to email, and click the Zoom meeting invite link. Note: the first participant device is the other device designated for host testing which is not currently acting as host.
8. Click Open Zoom Meetings, and join the meeting with computer audio and video enabled.
9. On the host device, once both participants are connected to the meeting and can see one another's video streams, launch Performance Monitor from the Start Menu.
10. To set your previously defined name, expand the User Defined menu under Data Collector Sets.
11. Simultaneously start a stopwatch timer and click the Play icon in Performance Monitor.
12. On the second participant device, after 5 minutes have elapsed:
 - a. Open an Edge browser window, navigate to email, and click the Zoom meeting invite link.
 - b. Click Open Zoom Meetings, and join the meeting with computer audio enabled and video disabled.
13. On the third participant device, after 10 minutes have elapsed, repeat steps 12a and 12b.
14. On the fourth participant device, after 15 minutes have elapsed, repeat steps 12a and 12b.
15. To save the performance data from the full test on the host device, after 20 minutes have elapsed, stop the timer, and click the Stop icon in Performance Monitor.

Testing Zoom host performance while screen-sharing a 720p video on a call with one to four participants

1. On the host device under test, open a Microsoft Edge browser window, and navigate to zoom.us.
2. Under the Host a meeting drop-down in the top right, click With video on.
3. To open the Zoom application, click Open Zoom Meetings.
4. Click Join with Computer Audio, and ensure the host video is enabled.
5. Open Windows Explorer, and navigate to the location of the 720p video you want to screen-share.
6. To open in the Windows 10 Movies and TV app, Double-click the video file.
7. Click Share Screen in the Zoom meeting, and select the Movies and TV app window.
8. Ensure Share computer sound and Optimize Screen Sharing for Video Clip are both enabled, and click Share.
9. Click Participants, and click Invite.
10. Invite the other four participants via email.

11. On the first participant device, open a Microsoft Edge browser window, navigate to email, and click the Zoom meeting invite link. Note: the first participant device is the other device designated for host testing which is not currently acting as host.
12. Click Open Zoom Meetings, and join the meeting with computer audio and video enabled.
13. On the host device, once both participants are connected to the meeting and can see one another's video streams and/or screen share, launch Performance Monitor from the Start Menu.
14. To set your previously defined name, expand the User Defined menu under Data Collector Sets.
15. Simultaneously start a stopwatch timer and click the Play icon in Performance Monitor.
16. On the second participant device, after 5 minutes have elapsed:
 - a. Open an Edge browser window, navigate to email, and click the Zoom meeting invite link.
 - b. Click Open Zoom Meetings, and join the meeting with computer audio enabled and video disabled.
17. On the second participant device, after 10 minutes have elapsed, repeat steps 16a and 16b.
18. On the third participant device, after 15 minutes have elapsed, repeat steps 16a and 16b.
19. To save the performance data from the full test on the host device, after 20 minutes have elapsed, stop the timer, and click the Stop icon in Performance Monitor.

Read the report at <http://facts.pt/lkceim0> ►

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