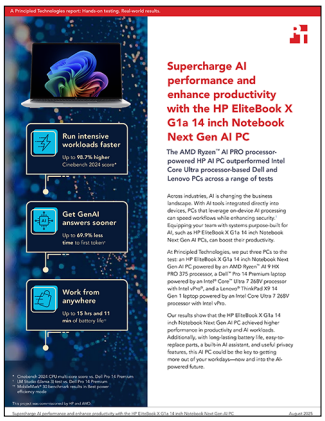

The science behind the report:

Supercharge AI performance and enhance productivity with the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC

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 Supercharge AI performance and enhance productivity with the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC.

We concluded our hands-on testing on July 21, 2025. 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 April 16, 2025 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 1: Results of our performance and productivity testing.

Performance & productivity tests	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo® ThinkPad X9 14 Gen 1	Dell™ Pro 14 Premium
PassMark PerformanceTest			
Overall PassMark rating (higher is better)	8,929	6,775	6,888
CPU Mark score (higher is better)	37,542	22,041	22,389
2D Graphics Mark score (higher is better)	1,062	701	702
3D Graphics Mark score (higher is better)	9,931	5,775	5,794
Memory Mark score (higher is better)	2,635	3,463	3,735
Disk Mark score (higher is better)	44,032	35,904	34,904
GeekBench 6			
CPU multi-core score (higher is better)	14,697	11,002	11,210
CPU single-core score (higher is better)	2,827	2,839	2,837
Cinebench 2024			
CPU multi-core score (higher is better)	1,139	585	573
CPU single-core score (higher is better)	112	125	124

Table 2: Results of our AI testing.

AI tests	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo ThinkPad X9 14 Gen 1	Dell Pro 14 Premium
Procyon AI Computer Vision Benchmark - Integer			
Overall score (higher is better)	1,822	1,890	1,777
MobileNet V3 - Average inference time (ms) (lower is better)	0.24	0.32	0.33
ResNet 50 - Average inference time (ms) (lower is better)	0.77	0.72	0.75
Inception V4 - Average inference time (ms) (lower is better)	1.59	1.72	1.89
DeepLab V3 - Average inference time (ms) (lower is better)	4.55	3.60	3.94
YOLO V3 - Average inference time (ms) (lower is better)	3.14	3.06	3.48
Real-ESRGAN - Average inference time (ms) (lower is better)	99.14	78.39	77.85
LM Studio			
Time to first token (seconds) (lower is better)	0.64	2.11	2.13
Tokens/sec (higher is better)	14.04	9.08	9.18

Table 3: Results of our battery life testing.

Battery life tests	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo ThinkPad X9 14 Gen 1	Dell Pro 14 Premium
MobileMark 30 v1.0.0.17 - Best power efficiency mode			
Battery life (hours:minutes) (higher is better)	15:11	14:39	13:00
DC performance score (higher is better)	924	1,197	958
MobileMark 30 Index (higher is better)	842	1,052	747
MobileMark 30 v1.0.0.17 - Balanced mode			
Battery life (hours:minutes) (higher is better)	13:09	13:08	12:55
DC performance score (higher is better)	1,238	1,341	1,198
MobileMark 30 Index (higher is better)	977	1,056	928
Procyon® Battery Life Benchmark (Office Productivity) - Best power efficiency mode			
Total duration (hours:minutes) (higher is better)	14:04	12:07	14:56
Performance score (higher is better)	93,000	123,000	99,000

Table 4: Results of our thermal and acoustic testing.

Thermal & acoustic tests	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo ThinkPad X9 14 Gen 1	Dell Pro 14 Premium
Sustained Cinebench 2024 workload while running thermal and acoustic tests			
Cinebench 2024 CPU multi-core score (higher is better)	997	555	415
Keyboard deck temperature (°F) (lower is better)	110.30	123.98	109.76
Underside of chassis temperature (°F) (lower is better)	115.70	122.32	105.26
Average dBA under load (lower is better)	26.3	23.8	28.8

Table 5: Results of our privacy testing.

Privacy tests	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo ThinkPad X9 14 Gen 1	Dell Pro 14 Premium
Wake on approach (seconds) (lower is better)	2.66	N/A	2.85
Onlooker detection (seconds) (lower is better)	1.53	N/A	N/A

Table 6: Results of our serviceability testing.

Serviceability tests	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo ThinkPad X9 14 Gen 1	Dell Pro 14 Premium
Time to access and replace keyboard (minutes:seconds) (lower is better)	21:43	24:00	25:27
Time to access and replace battery (minutes:seconds) (lower is better)	2:43	2:49	3:20

System configuration information

Table 7: Detailed information on the systems we tested.

System configuration information	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo ThinkPad X9 14 Gen 1 14"	Dell Pro 14 Premium
Processor			
Vendor	AMD	Intel®	Intel
Model number	Ryzen™ AI 9 HX PRO 375	Core™ Ultra 7 268V with Intel vPro®	Core Ultra 7 268V with Intel vPro
Core frequency (GHz)	2.0–5.1	2.2–5.0	2.2–5.0
Number of cores	12	8	8
Logical processors	24	8	8
Memory module(s)			
Amount (GB)	32	32	32
Type	LPDDR5x	LPDDR5x	LPDDR5x
Graphics			
Vendor	AMD	Intel	Intel
Model number	Radeon™ 890M Graphics	Intel Arc™ 140V	Intel Arc 140V
Storage			
Amount (GB)	512	512	512
Type	SSD	SSD	SSD
Connectivity/expansion			
Wireless internet	MediaTek Wi-Fi 7 MT7925	Intel Wi-Fi 7 BE201	Intel BE201 Wi-Fi 7
Bluetooth	5.4	5.4	5.4
USB	1x USB Type-C (USB Power Delivery, DisplayPort 1.2) 2x Thunderbolt 4 ports 1x USB-A 3.2 ports	2x Thunderbolt 4 ports	2x Thunderbolt 4 ports 1x USB-A 3.2 ports
Battery			
Type	Integrated lithium-polymer	Integrated lithium-polymer	Integrated lithium-polymer
Rated capacity	74.5 Whr	55 Whr	60 Whr
Display			
Size (in.)	14	14	14
Resolution	1,920 x 1,200	1,920 x 1,200	1,920 x 1,200
Operating system			
Vendor	Microsoft	Microsoft	Microsoft
Name	Windows 11 Pro	Windows 11 Pro	Windows 11 Pro
Version	24H2 Build 26100.4061	24H2 Build 26100.4061	24H2 Build 26100.4061

System configuration information	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Lenovo ThinkPad X9 14 Gen 1 14"	Dell Pro 14 Premium
BIOS			
BIOS name and version	HP X88 Ver. 01.01.04, 2/21/2025	Lenovo N4DET30W (1.13), 4/2/2025	Dell Inc. 2.2.1, 4/25/2025
Dimensions			
Height (in.)	0.52	0.51	0.71
Width (in.)	12.29	12.28	12.25
Depth (in.)	8.45	8.35	8.53
Weight (lb.)	3.26	2.70	2.62

How we tested

Setting up the systems

When running the tests, we used a factory provided image. We reset the system image between tests to prevent software from corrupting the test image.

Setting up and updating the OEM image

1. Boot the system.
2. To complete installation, follow the on-screen instructions, using the default selections when appropriate.
3. Set the Windows Power Plan to Best Performance.
4. Set Screen and Sleep options to Never:
    a. Right-click the desktop, and select Display settings.
    b. Select System from the left-hand column.
    c. Click Power.
    d. For all power options listed under Screen and Sleep, select Never.
5. Disable User Account Control notifications:
    a. Select Windows Start, type `UAC` and press the Enter key.
    b. Move the slider control to Never notify, and click OK.
6. Run Windows Update, and install all updates available.
7. Launch each vendor's proprietary utility app installed on each system, and update any drivers or BIOS files:
    a. For Dell, run the Dell Command | Update utility.
    b. For Lenovo, run the Lenovo Commercial Vantage application. Run all Critical and Recommended Updates.
    c. For HP, check for updates using HP PC Hardware Diagnostics Windows. Run the HP Support Assistant Application using a guest login, and run updates.
8. After running updates, in Application settings, disable automatic software updates.
9. Verify the date and time are correct, and synchronize the system clock with the time server.
10. Pause Automatic Windows Updates:
    a. Click Windows Start.
    b. Type `Windows Update settings` and press Enter.
    c. From the Pause updates drop-down menu, select Pause for 5 weeks.

Capturing an image

1. Connect an external HDD to the system.
2. Click the Windows Menu button, and in the search bar, type `Control Panel`. Click Control Panel→System and Security→Backup and Restore (Windows 7)→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. When the system asks if 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 See more recovery options.
6. Select System image recovery.
7. Select the User account.
8. Enter the system password, and click Continue.
9. At the Restore system files and settings screen, select Next.
10. Verify that the external HDD is selected, and click Next.
11. Once the recovery has completed, click Finish.

Running ProcessIdleTasks

Once every 24-hour period, before testing, we rebooted the system and ran the ProcessIdleTasks command, which forces idle processes to complete and minimizes the chance of background tasks affecting test runs.

1. Boot the system.
2. Select Windows Start.
3. Type `cmd` and press Ctrl+Shift+Enter.
4. Type `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.

Running system performance and productivity tests

Measuring performance with PassMark PerformanceTest 11

Setting up the test

1. Download PassMark PerformanceTest from https://www.passmark.com/products/performancetest/download.php.
2. To begin the installation, click Install.
3. Select Accept to accept the license agreement, and click Next.
4. After the installation is complete, deselect Launch Performance Test, and click Finish.

Running the test

1. To launch PassMark PerformanceTest, click the PassMark PerformanceTest icon.
2. To start the benchmark, click Run Benchmark.
3. When the test completes, record the results.
4. Repeat steps 2 through 3 twice more.

Measuring performance with Cinebench 2024

Setting up the test

1. Download and install Cinebench 2024 from https://www.maxon.net/en/downloads/cinebench-2024-downloads.
2. Launch Cinebench 2024.
3. Select File → Advanced benchmark.
4. From the Minimum Test Duration drop-down menu, select Off.

Running the test

1. Launch Cinebench 2024.
2. Click File, Run All tests.
3. Record the result. Wait 10 minutes before rerunning.
4. Repeat steps 1 through 3 twice more.

Measuring performance with Geekbench 6

Setting up the test

1. Purchase a Geekbench Pro license, and download and install Geekbench 6 Pro from https://www.geekbench.com/download/.

Running the test

1. Launch Geekbench.
2. Click Run CPU Benchmark.
3. Record the result.
4. Wait 5 minutes before rerunning.
5. Repeat steps 1 through 4 twice more.

Running AI tests

Measuring performance with Procyon AI Computer Vision Benchmark

Setting up the test

1. Purchase and download the Procyon AI Computer Vision Benchmark from https://benchmarks.ul.com/procyon.
2. Install the Procyon benchmark.
3. Launch Procyon.
4. Select Settings, and input the Procyon AI Computer Vision license key.
5. Close Procyon.

Running the test

1. Launch Procyon.
2. Select the Computer Vision test.
3. For the Integer test, make the following selections:
    a. For AMD processor-based devices, select the AMD Ryzen™ AI tab.
    b. For Intel processor-based devices, select the Intel OpenVINO tab.
4. Select NPU, and select Integer.
5. Click Run.
6. When the test completes, record the results, and wait 15 minutes before rerunning.
7. Complete three runs.

Measuring performance with LM Studio

Setting up the test

1. Download LM Studio from https://lmstudio.ai.
2. Run the installer, and install using all defaults.
3. Launch LM Studio.
4. In the Select a model to load field, download the Llama 3.1 8B model.

Running the test

1. Launch LM Studio.
2. Select Load a model, and choose the Meta-Llama-3.1-8B-Instruct-Q4_K_M model.
3. When the model is fully loaded, in the message field, type: `How can AMD Ryzen Processors in HP workstations help enterprise customers deliver better user experience, productivity performance and ROI?` and click Send.
4. When the test is complete, record the results.
5. Eject the model.
6. Delete the Chat messages.
7. Open a new chat by clicking the + icon, and reload the same model.
8. Wait 5 minutes, open a new chat window, and repeat steps 2 through 7 twice more.

Measuring thermals and sustained performance with Cinebench 2024

These tests require the following:

- A FLIR E6-XT Infrared Camera
- Cinebench 2024

Running the test

1. Start the thermal recorder.
2. Boot the system and leave the system plugged in.
3. Launch Cinebench 2024.
4. Select File → Advanced benchmark.
5. Verify that the Custom Test setting is set to 30 minutes.
6. Select CPU (Multi Core), and click Start.
7. Record the performance results and skin temperatures after 30 minutes. Note the ambient room temperature, and take a skin temperature photo with the FLIR E6xt infrared Camera of the keyboard deck and underside of chassis.
8. Repeat steps 1 through 7 twice more.

Measuring system acoustics with Cinebench 2024

These tests require the following items:

- Extech SDL600 Sound Level Meter/Datalogger with SD card
- Cinebench 2024

Setting up the test

1. Place the system under test in a sound-proofed professional sound booth.
2. Set the Extech SDL600 on a tripod so that it is 2 feet in front of, and 1 foot above, the bottom of the system under test.
3. Download and install Cinebench 2024 from https://www.maxon.net/en/downloads/cinebench-2024-downloads.
4. Launch Cinebench 2024.
5. Select File → Advanced benchmark.
6. Select File → Preferences, and change the Custom Minimum Test Duration to 30 minutes, and click OK.
7. Exit Cinebench, and shut down the system.

Running the test

1. Boot the system.
2. Launch Cinebench 2024.
3. In the Minimum Test Duration field, select Custom (30 minutes).
4. Start the Extech SDL600 Sound Level Meter/Datalogger.
5. Click the Cinebench 2024 CPU (Multi Core) Start button.
6. At the end of the 30-minute Cinebench 2024 run, stop the Extech SDL600, and record the average sound level (dB) while running Cinebench 2024.
7. Shut down the system for 60 minutes, and let it return to room temperature. Repeat steps 1 through 7 twice more.

Measuring battery life

Measuring battery life with MobileMark 30 (Balanced and Best power efficiency modes)

This test **requires an X-Rite - i1Display Plus colorimeter.**

Avoiding antivirus software conflicts

MobileMark 30 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 30 installs the following applications, which its test scripts employ:

Productivity

- Corel WinZip 26.0 Enterprise
- Microsoft Excel 2021 Professional Plus
- Microsoft Outlook 2021 Professional Plus
- Microsoft PowerPoint 2021 Professional Plus
- Microsoft Word 2021 Professional Plus

Creativity

- Adobe Photoshop CC

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 30 uses—before we installed the benchmark.

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
- Disables WinSAT

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 Screen Saver and Monitor Timeout
- Set Font Smoothing

Level 3 - Optional

- Disables Battery Saver
- Disables Hard Disk Timeout
- Disables System Restore
- Ignores Laptop Lid Close
- Enables Dark Mode

For the Balanced runs, we chose the official BAPCo "Run Benchmark" default as outlined in the BAPCo MobileMark30 User Guide (https://bapco.com/wp-content/uploads/2024/04/BAPCo-MobileMark30_User-Guide-v1.0.pdf), which runs the benchmark using the Required and Recommended options. For the Best power efficiency runs we disabled the recommended options for "Set Power Plan Type to balanced" and "Verify Battery Saver Threshold" options.

Setting up the performance-qualified battery life test

1. On a separate PC, install the i1Profiler software from https://www.xrite.com/categories/formulation-and-quality-assurance-software/i1profiler, and connect the X-Rite - i1Display Plus colorimeter to that PC.
2. On the system under test, verify that the wireless adapter is disabled.
3. For the Balanced battery life runs:
    a. Select Windows Start, type `Power, sleep, and battery settings` and press the Enter key.
    b. From the Power mode drop-down menu, select Balanced.
    c. Select Windows Start, type `Battery saver` and press the Enter key.
    d. From the Battery saver drop-down menu, select Turns on at 20%, and click the down arrow. Next to Lower screen brightness when using battery saver, toggle the button to Off.
4. For the Best power efficiency battery life runs:
    a. Select Windows Start, type `Power, sleep, and battery settings` and press the Enter key.
    b. From the Power mode drop-down menu, select Best power efficiency.
    c. Select Windows Start, type `Battery saver` and press the Enter key.
    d. From the Battery saver drop-down menu, select Turns on at Always (100%), and click the down arrow. Next to Lower screen brightness when using battery saver, toggle the button to Off.
5. On the system under test, verify that the volume is set to 50%.
6. On systems with AMD processors, disable Vari-Bright to prevent the screen from dynamically changing the screen brightness based on content:
    a. Launch AMD Software.
    b. Click the Settings gear icon.
    c. Select the Display tab, and disable Vari-Bright.
7. On systems with Intel processors, disable Intel DPST to prevent the screen from dynamically changing the screen brightness based on content:
    a. Open the Intel Graphics Command Center, press the Windows key, type `Intel` and choose Intel Graphics Command Center.
    b. Select System → Power.
    c. In On Battery, set Display Power Savings to Off.
8. Verify the system is no less than 250 nits.
9. On the system under test, install MobileMark 30 with the default options.

Running the performance-qualified battery life test

1. Boot the system.
2. Launch MobileMark 30.
3. Click Run Benchmark.
4. Click the Brightness Profiler button.
5. Allow the white screen to warm up for 30 minutes. After 30 minutes, click Skip.
6. At the Panel Dark Luminance pop-up, select Yes, to use the value that is queried from the display.
7. Place the X-Rite - i1Display Plus colorimeter in the outlined spot on the screen.
8. On the test PC, toggle the F1 button to turn off the test overlay.
9. On the colorimeter PC, start i1Profiler program, and select Advanced.
10. Click Display, and click Profiling.
11. Next to Luminance, click the drop-down menu, and select Measure.
12. In the drop-down menu that appears below, select Paper in booth.
13. In the box with the image that says, "Place your paper in the light booth," scroll down and click the Measure button.
14. On the test PC, adjust the slider until the Target White luminance is met on the colorimeter PC.
15. Once the correct Target White luminance is met on the test PC, click Done.
16. The test will begin immediately. When prompted, unplug the AC power adapter.

The benchmark is complete when the PC has fully depleted its battery and is no longer operational when running on battery power. We executed the MobileMark 30 benchmark three times on the system and took the median battery life score run as the representative performance score result for that test.

Measuring performance with Procyon Office Productivity Battery Life Benchmark

Setting up the test

1. Boot the system.
2. Verify the following display and power settings:
    a. Right-click the desktop, and select Display settings.
    b. Uncheck the box next to Change brightness automatically when lighting changes, if available.
    c. Uncheck the box next to Change brightness based on content, if available.
    d. In the Scale drop-down menu, select 100%.
    e. From the pane on the left, select System.
    f. Click Power & Battery.
    g. For all power options listed under Screen and Sleep, select Never.
    h. Set Power mode while unplugged to the desired setting (i.e., Best power efficiency).
3. On systems with AMD processors, disable Vari-Bright to prevent the screen from dynamically changing the screen brightness based on content:
    a. Launch AMD Software.
    b. Click the Settings gear icon.
    c. Select the Display tab, and disable Vari-Bright.
4. On systems with Intel processors, disable Intel DPST to prevent the screen from dynamically changing the screen brightness based on content:
    a. Open the Intel Graphics Command Center, press the Windows key, type `Intel` and choose Intel Graphics Command Center.
    b. Select System → Power.
    c. In On Battery, set the Display Power Savings to Off.
5. To bring up a white screen, open a web browser and type `about:blank` into the address bar.
6. Unplug the system.
7. Using a nit meter, adjust the screen brightness to as close to 200 nits as possible.
8. Plug in the system.
9. Download and install Procyon.
10. Open Procyon.
11. Click Battery Life Office Productivity Benchmark.
12. Click Register.
13. Enter the license key for the Office Productivity Battery Life Benchmark, and click Register.
14. Close Procyon.
15. Before running the benchmark, make sure to install a licensed version of Microsoft 365, and open Word, Excel, PowerPoint, and Outlook applications. Disable tips when possible.

Running the test

1. Boot the system.
2. Ensure the system is fully charged.
3. Launch Procyon.
4. Select the Procyon Battery Life option.
5. Under the Office Productivity tab, click Run.
6. When prompted, unplug the system.
7. When the benchmark completes, plug in the system and power up the system.
8. Repeat steps 2 through 7 twice more.

Measuring privacy feature performance

Setting up the test

1. Set up a video camera to capture the system's screen and the user/onlooker path in front of the system.
2. On the systems under test, click Start, type `Power` and select Power, sleep and battery settings.
3. On the Power & battery screen, select Screen and sleep.
4. Ensure the following settings are turned on:
   - Turn off my screen when I leave.
   - Wake my device when I approach.
5. Launch each vendor's proprietary management application, and enable onlooker detection:
   - For HP, open the myHP application, select Presence detection, and enable Onlooker detection and Enable screen blur.

Testing Wake on approach

1. Start the video recording.
2. Stand just outside of the system's camera view, and allow the system to enter Sleep mode.
3. When the system has entered Sleep mode, simultaneously start the stopwatch and sit down in front of the system.
4. When the login screen appears, stop the stopwatch, and record the results.
5. Wait 5 minutes. Perform steps 1 through 5 twice more.

Testing Onlooker detection

1. Start the video recording.
2. Sit at the laptop, and have an onlooker stand just outside of the system's camera view.
3. Simultaneously start the stopwatch and have the onlooker walk into the system's camera view.
4. When the screen blurs due to detecting the onlooker, stop the stopwatch, and record the results.
5. Wait 5 minutes. Perform steps 1 through 5 twice more.

Read the report ▶

This project was commissioned by HP and AMD.

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