Run intensive workloads faster

Up to **98.7% higher** Cinebench 2024 score*

Get GenAI answers sooner

Up to **69.9% less time** to first token†

Work from anywhere

Up to **15 hrs and 11 min** of battery life††

* Cinebench 2024 CPU multi-core score vs. Dell Pro 14 Premium
† LM Studio (Llama 3) test vs. Dell Pro 14 Premium
†† MobileMark® 30 benchmark results in Best power efficiency mode

This project was commissioned by HP and AMD.

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

The AMD Ryzen™ AI PRO processor-powered HP AI PC outperformed Intel Core Ultra processor-based Dell and Lenovo PCs across a range of tests

Across industries, AI is changing the business landscape. With AI tools integrated directly into devices, PCs that leverage on-device AI processing can speed workflows while enhancing security.[1] Equipping your team with systems purpose-built for AI, such as HP EliteBook X G1a 14 inch Notebook Next Gen AI PCs, can boost their productivity.

At Principled Technologies, we put three PCs to the test: an HP EliteBook X G1a 14 inch Notebook Next Gen AI PC powered by an AMD Ryzen™ AI 9 HX PRO 375 processor, a Dell™ Pro 14 Premium laptop powered by an Intel® Core™ Ultra 7 268V processor with Intel vPro®, and a Lenovo® ThinkPad X9 14 Gen 1 laptop powered by an Intel Core Ultra 7 268V processor with Intel vPro.

Our results show that the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC achieved higher performance in productivity and AI workloads. Additionally, with long-lasting battery life, easy-to-replace parts, a built-in AI assistant, and useful privacy features, this AI PC could be the key to getting more out of your workdays—now and into the AI-powered future.

What and how we tested

We equipped three PCs with Windows 11 Pro, 32 GB of memory, and 512 GB of SSD storage:*

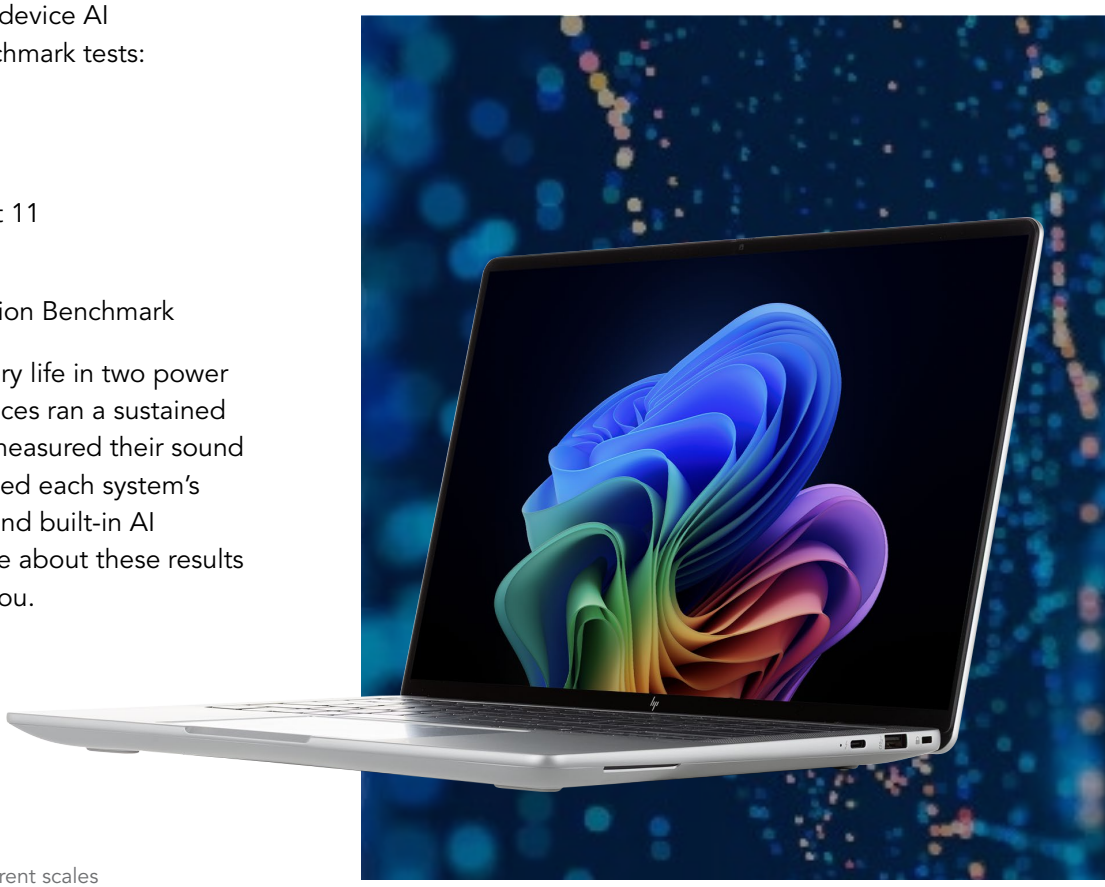
HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Dell Pro 14 Premium	Lenovo ThinkPad X9 14 Gen 1
12-core AMD Ryzen™ AI 9 HX PRO 375 processor	8-core Intel Core Ultra 7 268V processor with Intel vPro	8-core Intel Core Ultra 7 268V processor with Intel vPro
• Integrated AMD Radeon™ 890M graphics • Integrated AMD Ryzen™ AI neural processing unit (NPU) at up to 55 trillions of operations per second (TOPS) • 74.5-Whr battery	• Integrated Intel Arc™ 140V graphics • Integrated Intel AI Boost NPU at up to 48 TOPS • 65-Whr battery	• Integrated Intel Arc 140V graphics • Integrated Intel AI Boost NPU at up to 48 TOPS • 57-Whr battery

*The results we report reflect the specific configurations we tested. Any difference in the configurations—as well as screen brightness, network traffic, and software additions—can affect these results. For a deeper dive into our testing parameters and procedures, see the science behind the report.

To measure productivity and on-device AI performance, we ran these benchmark tests:

- Cinebench 2024
- Geekbench 6
- PassMark PerformanceTest 11
- LM Studio
- Procyon® AI Computer Vision Benchmark

Our testing also examined battery life in two power modes. Additionally, as the devices ran a sustained Cinebench 2024 workload, we measured their sound and heat output. We also assessed each system's privacy features, serviceability, and built-in AI assistants. Read on to learn more about these results and what they might meant to you.



Note: The graphs in this report use different scales to keep a consistent size. Please be mindful of each graph's data range as you compare.

Productivity testing

Check off to-do list items faster

We ran three benchmark tests to assess each device's performance capabilities. The Cinebench 2024 benchmark evaluates processor performance by rendering a 3D scene with CPU-intensive Redshift for Cinema 4D software.[2] The Geekbench 6 benchmark also stresses the processor, executing multiple CPU-intensive tasks simultaneously.[3] PassMark PerformanceTest 11 combines CPU, 2D and 3D graphics, storage, and memory test performance metrics into an overall PassMark rating—higher scores indicate better performance.[4]

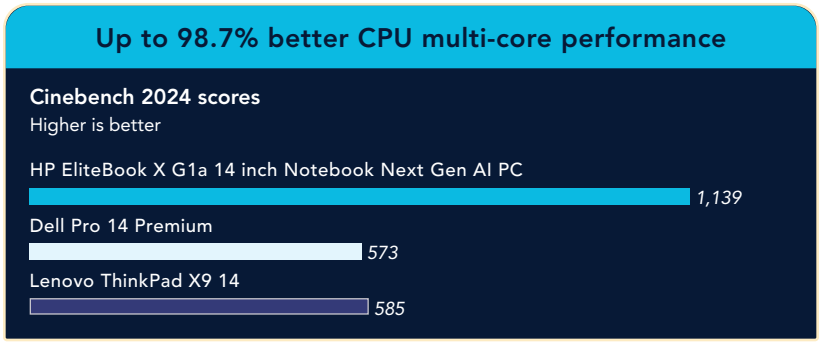


Figure 1: Cinebench 2024 multi-core scores. Source: PT.

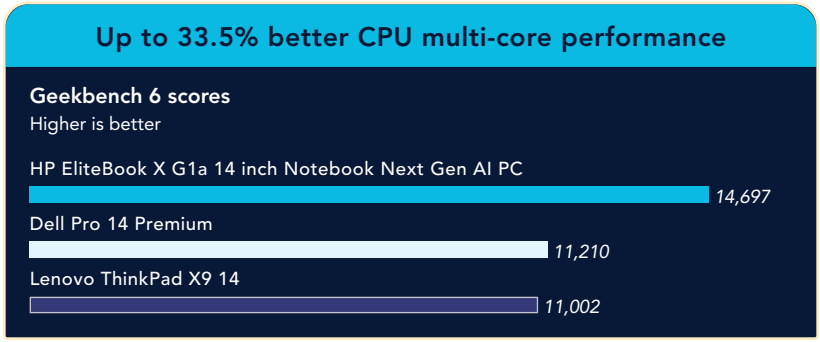


Figure 2: Geekbench 6 multi-core scores. Source: PT.

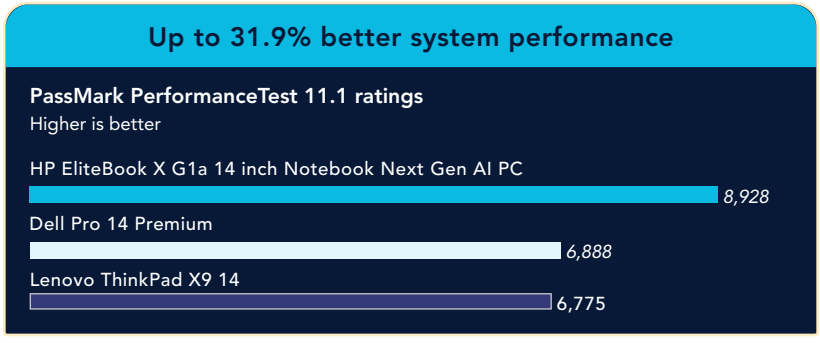


Figure 3: PassMark PerformanceTest 11.1 overall ratings. Source: PT.

About the AMD Ryzen™ AI 9 HX PRO 375 processor

The processor we used in our testing is part of the AMD Ryzen™ AI PRO 300 Series created specifically for the age of AI. With 12 cores, 24 threads, and max clock speeds of 5.1 GHz, the AMD Ryzen™ AI 9 HX PRO 375 processor features AMD Radeon™ 890M graphics and the Ryzen™ AI engine with NPU performance at up to 55 TOPS.[5] These processors are built on AMD "Zen 5" architecture, which AMD calls a "cutting-edge 4nm technology" for "best-in-class CPU, GPU and NPU performance with exceptional responsiveness and swift multitasking across productivity, entertainment, and content creation."[6]

Learn more from AMD about Ryzen™ AI PRO 300 Series processors.

About the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC

This 14-inch Windows 11 Pro PC includes an AMD Ryzen™ AI 9 HX PRO 375 processor, integrated AMD Radeon™ 890M graphics, up to 64 GB of memory, and up to 1 TB of PCIe® Gen4 NVMe® storage.[7] Designed to accelerate business performance and take advantage of AI features, the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC is also equipped with built-in HP Wolf Security, HP Sure Sense, and HP Sure Click to strengthen security. With Poly Camera Pro features and a 360° clamshell, this AI PC empowers collaboration and flexibility.[8]

HP says that the EliteBook X series can "supercharge your AI performance."[9]
Find out more from HP.

AI testing

Maximize on-device AI performance

The LM Studio benchmark uses large language models (LLMs) to evaluate the AI chat capabilities that many of us use every day.[10] We ran the test on CPU with the Meta-Llama-3.1-8B-Instruct-Q4_K_M LLM to measure the time to first token and rate of tokens per second. Tokens are "the basic units of input and output in a language," typically words, subwords, or characters.[11] The LLM predicts the most likely token to follow a sequence of input tokens and generates valuable output. The more tokens per second a system can process, the faster it can enable content creation, language translation, sentiment analysis, and question answering.[12] And the less time users must wait for the first token—or first part of their answer—the smoother their experience will feel.

For more on using LLMs locally on the devices, see Assessing built-in AI assistants.

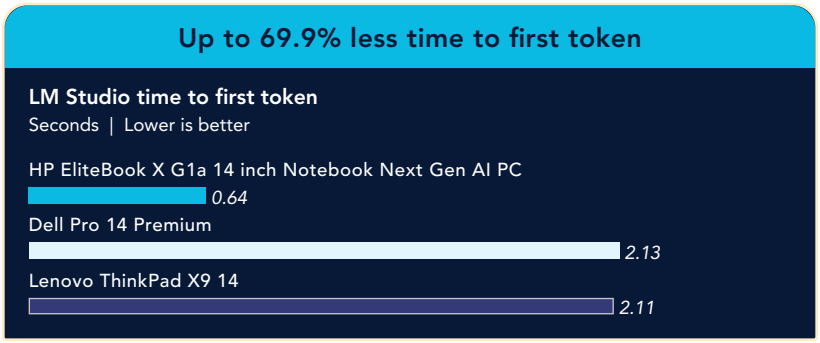


Figure 4: LM Studio (Llama 3) time to first token results. Source: PT.

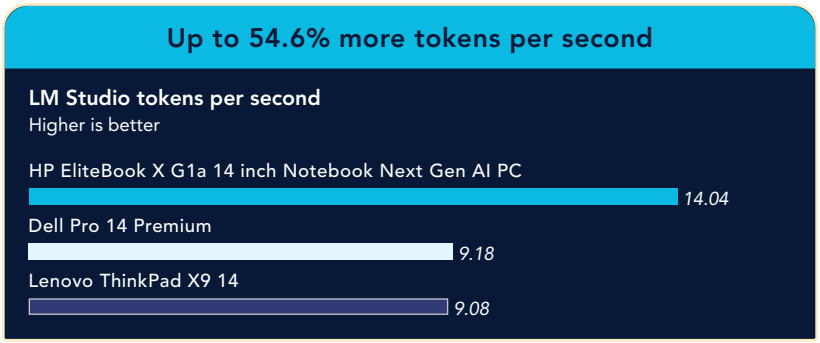


Figure 5: LM Studio (Llama 3) tokens per second results. Source: PT.

The Procyon Computer Vision Benchmark measures AI inference performance with various engines.[13] In our testing, we used the API optimized for each system's CPU, GPU, and NPU inference: the AMD Ryzen™ AI API on the AMD processor-based system and the Intel OpenVINO™ inference API on the Intel processor-based systems. The AI interface engines and their use cases include:

- **MobileNetV3 and Inception-v4:** Research institutions, tech companies, and individuals use these models for image recognition, object detection, and image classification tasks.[14,15]
- **YOLOv3:** Video surveillance companies, healthcare providers, and manufacturers use these deep neural network (DNN) architectures to distinguish between different objects and features within images and videos.[16]

In integer-optimized testing, we found the wait times were lowest on the MobileNetV3 model, which is designed for real-time applications on mobile devices.[17]

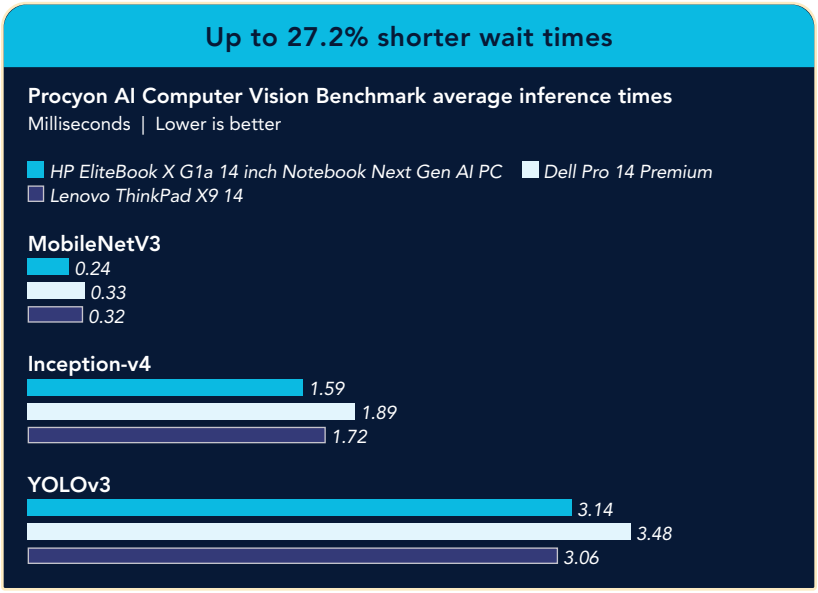


Figure 6: Procyon AI Computer Vision Benchmark average inference times. Source: PT.

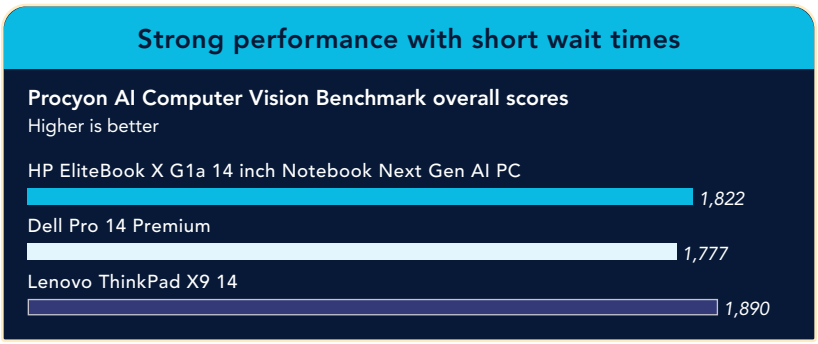


Figure 7: Procyon AI Computer Vision Benchmark overall scores. Source: PT.

Assessing built-in AI assistants

In addition to its superior performance in our LLM testing, the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC offers HP AI companion, a built-in AI assistant. When we compared it to the Lenovo device's AI assistant, we found that it offered more features and functionality (see Table 1). Note: At the time of our testing, Dell did not have a proprietary AI assistant.

If you're in search of an AI-ready device to power your business, the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC can deliver fast-paced LLM performance paired with an integrated, feature-rich AI assistant.

Table 1: Device OEM AI assistant features we researched.

	Description	HP AI Companion[18]	Lenovo AI Now[19]	Dell (no OEM AI assistant)
General Q&A chat/ generative text	AI-driven chat feature that answers user questions, summarizes information, and drafts text content	Yes	Yes	N/A
Personal file analysis	Enables users to select and query local files for summaries, comparisons, and insights	Yes	Yes	N/A
Natural language PC settings control	Enables users to adjust device settings directly using natural language prompts	Yes	Yes	N/A
Automatic system updates/ optimization	Automatically updates drivers, firmware, and settings to maintain optimal system performance	Yes	No*	N/A
Troubleshooting/ support agent	Integrates support directly within its AI interface and provides OEM-specific troubleshooting guidance, personalized device recommendations, and usage tips	Yes	Yes	N/A
Hybrid processing	Supports AI processing in the cloud, as well as on-device processing for certain features	Yes†	Yes†	N/A
Voice input	Supports voice input, allowing users to speak queries and commands, with voice data remaining private and processing locally on the device	Yes	No	N/A

*Apps such as Lenovo Vantage[20] can perform system updates and offer optimization tools, but they are not integrated with the AI assistant.
†While HP AI Companion offers both cloud and on-device processing for generative chat and personal file analysis,[21] Lenovo AI Now only offers on-device processing for personal file analysis and cloud processing for generative chat.[22]

Battery life

Stay unplugged for nearly 2 workdays

To test battery life, we ran the MobileMark 30 benchmark in Windows 11 Best power efficiency and Balanced modes. For another angle on performance, we also ran the UL Procyon Battery Life benchmark in the devices' Best power efficiency mode. We tested with the office productivity scenario, which uses real-world Microsoft 365 applications to simulate battery usage during a typical workday.[21]

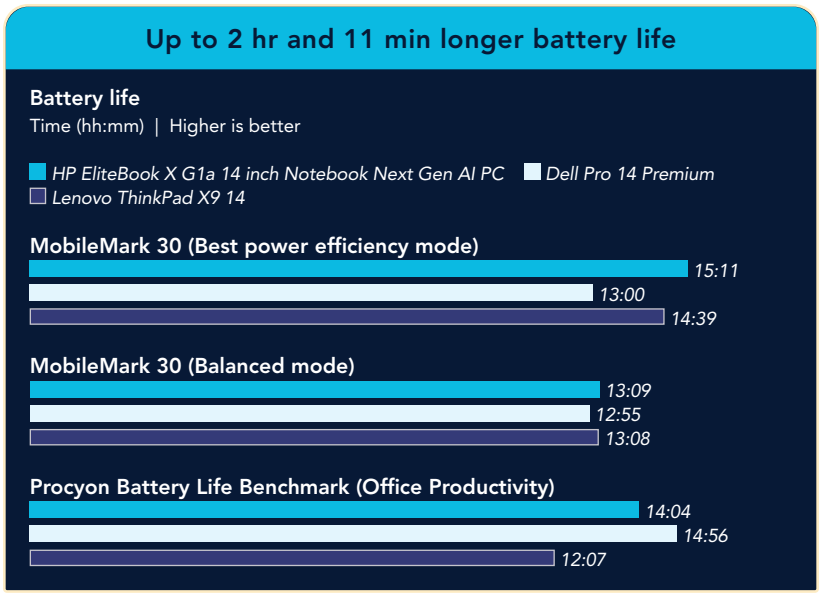


Figure 8: Battery life benchmark results. Source: PT.

Physical user experience

Cut down on thermal and acoustic distractions

Running punishing workloads on high-performing devices and processors might mean dealing with more heat and noise output. This distracting and uncomfortable user experience could disrupt workflows.

The HP EliteBook X G1a 14 inch Notebook Next Gen AI PC includes HP Smart Sense, to "optimize PC performance. Work without distraction with HP Smart Sense which makes automatic adjustments keeping your system cool and quiet and lets you enable performance mode when you need it most," according to HP.[24] The other PCs we tested also include intelligent thermal management features: Dell Optimizer for the Dell Pro 14 Premium, and Lenovo Intelligent Cooling for the Lenovo ThinkPad X9 14. For our physical user experience testing, we turned on each device's intelligent feature.

When we ran a Cinebench 2024 workload for 30 minutes, the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC scored significantly higher under this intensive workload (see Figure 9). And, it achieved this score while staying up to 13.6°F cooler than the Lenovo ThinkPad X9 (see Figure 10). Figure 11 shows that during the sustained Cinebench workload, all three PCs also output between 23 and 28 A-weighted decibels—noise levels comparable to a whisper.[25] The results are clear: The HP EliteBook X G1a 14 inch Notebook Next Gen AI PC didn't need to compromise on performance to remain cool and quiet under load.

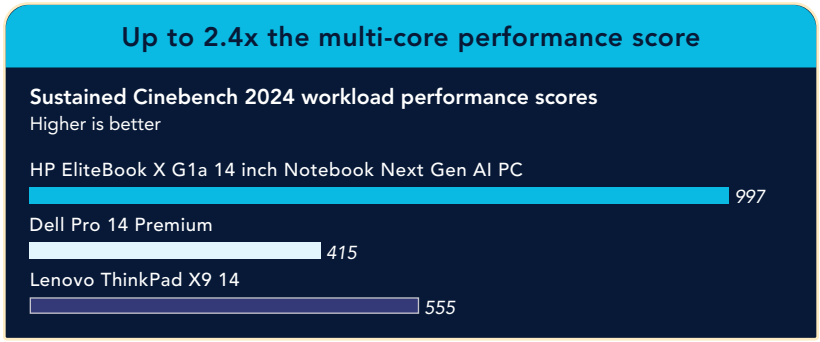


Figure 9: Median performance scores while the PCs were plugged in and running the Cinebench 2024 benchmark for 30 minutes. Source: PT.

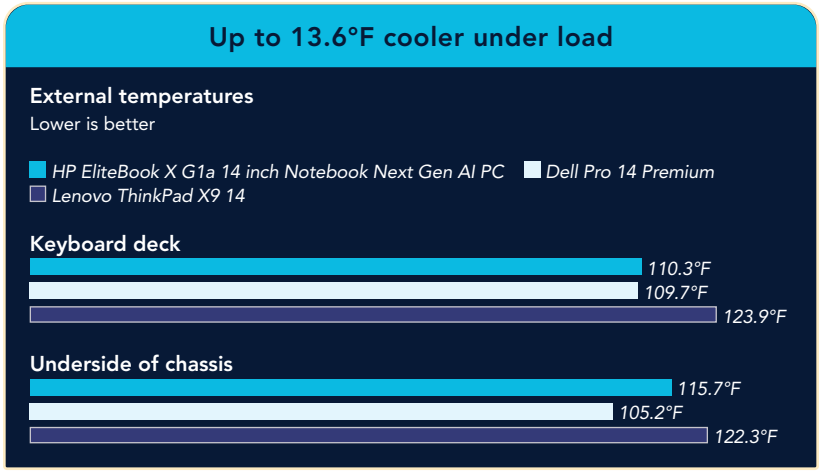


Figure 10: Median thermal results while the PCs were plugged in and running the Cinebench 2024 benchmark for 30 minutes. Source: PT.

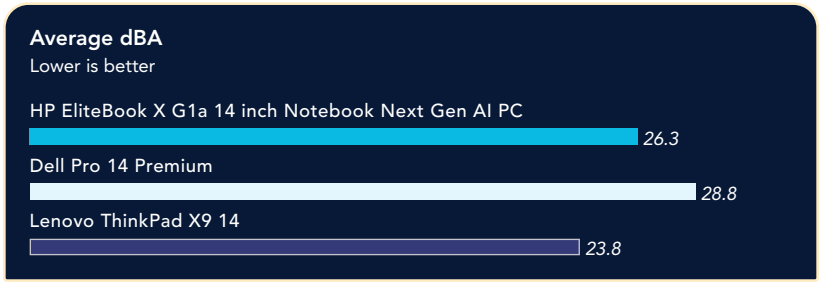
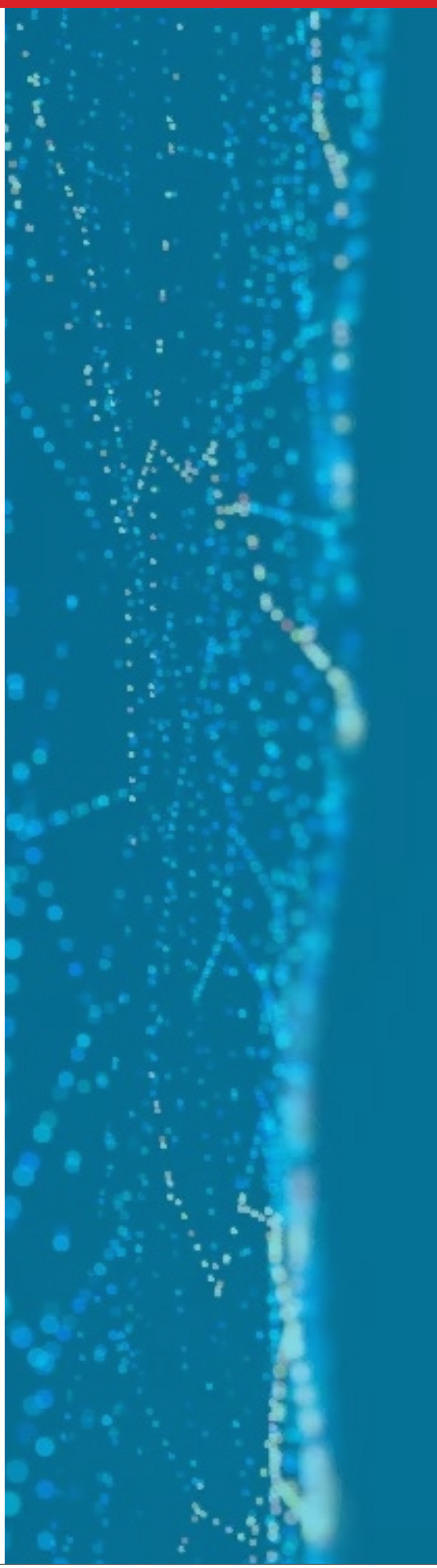


Figure 11: Median acoustic results while the PCs were plugged in and running the Cinebench 2024 benchmark for 30 minutes. Source: PT.



Serviceability

Quickly repair devices across the fleet

When the unexpected happens, you could reduce downtime and repair costs if your team can easily replace components. More serviceable devices also support sustainability goals, helping your team avoid replacing systems altogether.

In our tests, the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC enabled us to service two components in less time than the competitors (see Figures 12 and 13. For an entire fleet, these time savings can make a significant difference to budget and uptime.

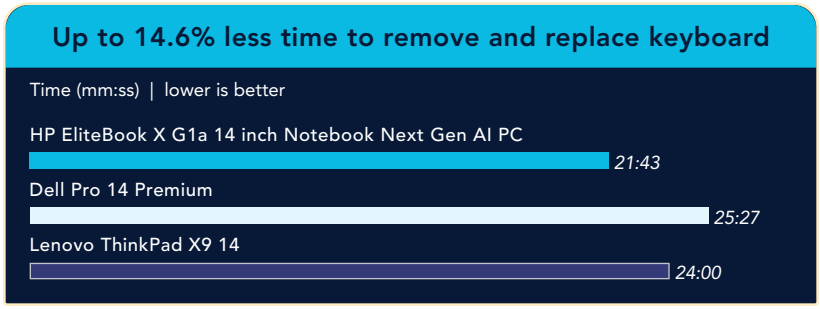


Figure 12: Time to remove and replace the keyboard. Source: PT.

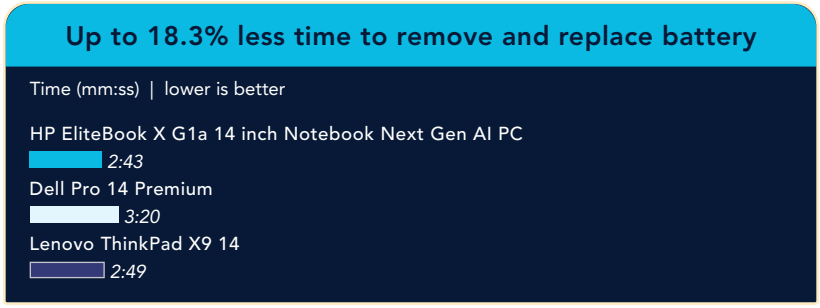


Figure 13: Time to remove and replace the battery. Source: PT.

Built-in privacy protection

We evaluated two presence-detection features in the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC and compared them to that of the other two devices:

- **Wake on approach,** part of Presence Sensing in Windows 11, uses proximity sensors to determine "when you are near the device and automatically turns on the screen. This way, you can sign in and start using your device right away."[26]
- **Onlooker detection,** enabled in the myHP app, "utilizes an AI-powered webcam sensor to alert users when prying eyes are detected and automatically blur the screen if needed."[27]

Table 2: A comparison of built-in privacy features each device supported. Less time is better.

	HP EliteBook X G1a 14 inch Notebook Next Gen AI PC	Dell Pro 14 Premium	Lenovo ThinkPad X9 14
Wake on approach	Yes	Yes	No*
Time to wake on approach (sec.)	2.6	2.8	N/A
Onlooker detection	Yes	No	No*†
Time to detect onlooker and blur screen (sec.)	1.5	N/A	N/A

*Based on our research, we believe the touchscreen version of the Lenovo ThinkPad X9 14 may support these features.[28,29] We did not select a touchscreen model for this study, as we believe that could have negatively impacted the PC's benchmark and battery performance.
†This device did offer an onlooker blurring option in Lenovo Vantage, but it did not work in our tests.

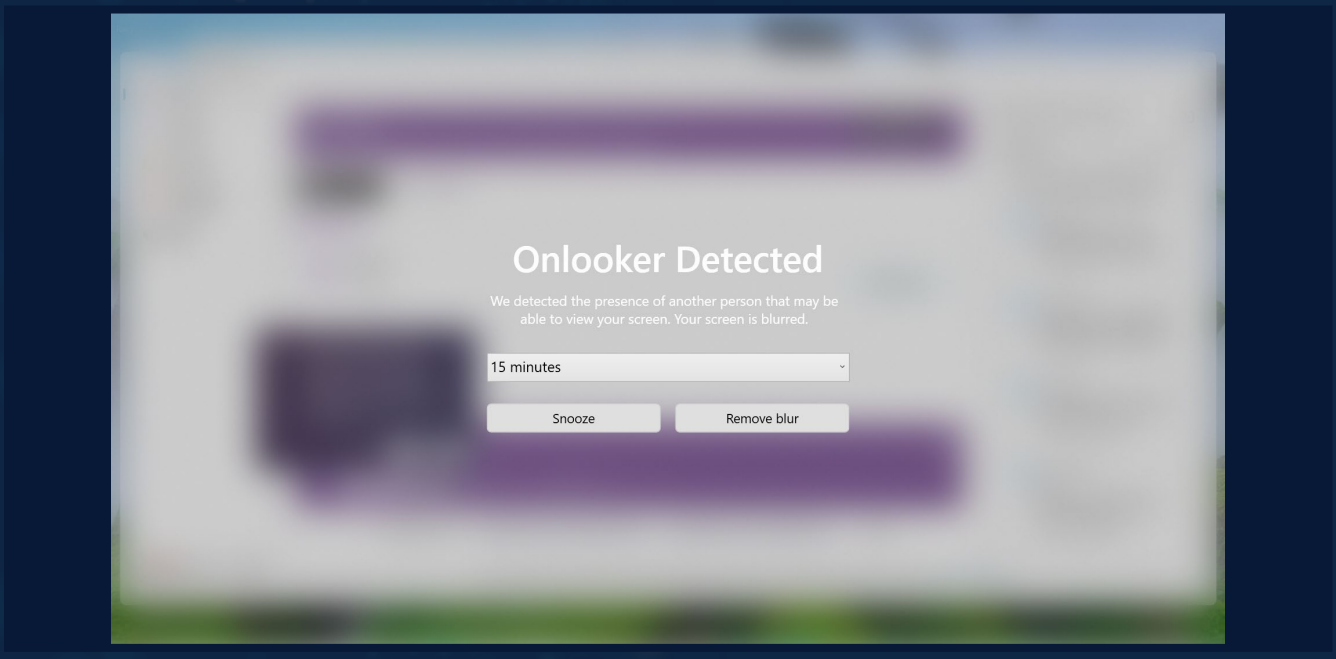
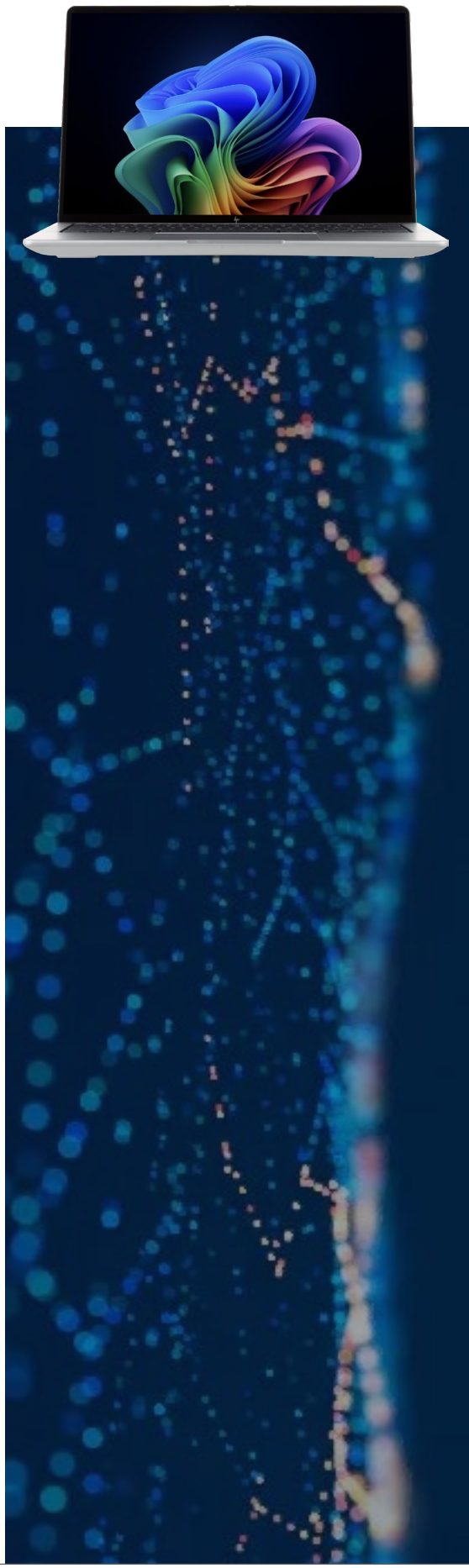


Figure 14: Screenshot of the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC's onlooker detection privacy feature from our testing. Source: PT.

Conclusion

A device and processor built to tackle tough AI workloads can empower users to make the most of today's and tomorrow's tech. With a nearly two-workday battery life, the HP EliteBook X G1a 14 inch Notebook Next Gen AI PC we tested also offered strong benchmark performance, comfortable physical user experiences, serviceable parts, a built-in AI assistant, and smart privacy protection features.

Our test results indicate that compared to a Dell Pro 14 Premium and a Lenovo ThinkPad X9 14, each powered by an Intel Core Ultra 7 268V processor with Intel vPro, the AMD Ryzen™ AI 9 HX PRO 375 processor-powered HP EliteBook X G1a 14 inch Notebook Next Gen AI PC is a standout choice for performance and features.



1. 8allocate, "Understanding On-Device AI: Benefits and Applications," accessed August 7, 2025, https://8allocate.com/blog/understanding-on-device-ai-benefits-and-applications/.
2. Maxon, Cinebench," accessed July 2, 2025, https://www.maxon.net/en/cinebench?srsltid=AfmBOoq3jePUR91HPyM-2RkVYTezcZaasjsWPMI9ulTTC_EYQCB6TL6JC.
3. Geekbench, "Introducing Geekbench 6," accesses July 2, 2025, https://www.geekbench.com.
4. PassMark Software, "PerformanceTest," accessed July 7, 2025, https://www.passmark.com/products/performancetest/index.php.
5. AMD, "AMD Ryzen™ AI 9 HX PRO 375," accessed July 8, 2025, https://www.amd.com/en/products/processors/laptop/ryzen-pro/ai-300-series/amd-ryzen-ai-9-hx-pro-375.html.
6. AMD, "AMD Ryzen™ AI 300 Series Processors," accessed July 8, 2025, https://www.amd.com/en/partner/articles/ryzen-ai-300-series-processors.html.
7. HP, "HP EliteBook X G1a 14 inch Notebook Next Gen AI PC," accessed July 8, 2025, https://www.hp.com/us-en/shop/pdp/hp-elitebook-x-g1a-14-inch-notebook-next-gen-ai-pc-p-b69ysua-aba-1.
8. HP, "HP EliteBook X series AI PCs for business," https://www.hp.com/us-en/laptops/business/elitebooks/x-series.html, accessed July 8, 2025.
9. HP, "HP EliteBook X series AI PCs for business."
10. LM Studio, "Your local AI toolkit," accessed July 7, 2025, https://lmstudio.ai/.
11. Alisdair Broshar, "What are LLMs? An intro into AI, models, tokens, parameters, weights, quantization, and more," accessed July 7, 2025, https://www.koyeb.com/blog/what-are-large-language-models.
12. Alisdair Broshar, "What are LLMs? An intro into AI, models, tokens, parameters, weights, quantization, and more."
13. UL Solutions, "Procyon® AI Computer Vision Benchmark," accessed June 2, 2025, https://benchmarks.ul.com/procyon/ai-inference-benchmark-for-windows.
14. Activeloop, "MobileNetV3," accessed May 27, 2025, https://www.activeloop.ai/resources/glossary/mobile-net-v-3/.

15. GeeksforGeeks, "Inception-V4 and Inception-ResNets," accessed May 27, 2025, https://www.geeksforgeeks.org/inception-v4-and-inception-resnets/.
16. Petru Potrimba, "What is YOLOv3? An Introductory Guide," accessed May 27, 2025, https://blog.roboflow.com/what-is-yolov3/.
17. Mohammad Alaliwi, "VGG vs ResNet vs Inception vs MobileNet," accessed May 27, 2025, https://www.kaggle.com/discussions/getting-started/433540.
18. HP, "AI Companion FAQ," accessed June 4, 2025, https://www.hp.com/us-en/ai-solutions/ai-companion-faq.html.
19. Lenovo, "Lenovo showcases Smarter AI for All across comprehensive AI devices, solutions, and concepts portfolio at Tech World 2024," accessed June 4, 2025, https://news.lenovo.com/pressroom/press-releases/smarter-ai-for-all-comprehensive-devices-solutions-concepts-tech-world-2024/.
20. Lenovo, "Lenovo Vantage - Using your PC just got easier," accessed June 4, 2025, https://support.lenovo.com/us/en/solutions/ht505081-lenovo-vantage-using-your-pc-just-got-easier.
21. HP, "AI Companion FAQ," accessed June 4, 2025, https://www.hp.com/us-en/ai-solutions/ai-companion-faq.html.
22. Lenovo, "Frequently Asked Questions - Lenovo AI Now," accessed August 7, 2025, https://support.lenovo.com/us/en/solutions/ht516940-frequently-asked-questions-lenovo-ai-now#1-6.
23. UL Solutions, "Procyon® Battery Life Benchmark," accessed July 8, 2025, https://benchmarks.ul.com/procyon/battery-life-benchmark.
24. We received this description from an HP representative on August 8, 2025.
25. International Noise Awareness Day, "Common Noise Levels – How Loud is Too Loud?" accessed July 8, 2025, https://noiseawareness.org/info-center/common-noise-levels/.
26. Microsoft, "Lock your PC on leave, wake on approach with Presence Sensing," accessed July 8, 2025, https://www.microsoft.com/en-us/windows/tips/presence-sensing.
27. HP, "HP Transforms the Future of Work," accessed July 8, 2025, https://www.hp.com/us-en/newsroom/press-releases/2024/hp-transforms-future-of-work.html.
28. Lenovo, "ThinkPad X9-14 Gen 1 User Guide," accessed July 8, 2025, https://download.lenovo.com/manual/thinkpad_x9_14/user_guide/en/Human_presence_sensing.html.
29. Lenovo, "ThinkPad X9-14 Gen 1 Product Specifications Reference," accessed July 8, 2025, https://psref.lenovo.com/syspool/Sys/PDF/ThinkPad/ThinkPad_X9_14_Gen_1/ThinkPad_X9_14_Gen_1_Spec.pdf.

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