



Get more done with an HP ZBook Firefly G11 A Mobile Workstation PC

We compared system responsiveness and battery life on an AMD Ryzen 7 PRO 8840HS processor-powered 14-inch HP ZBook Firefly G11 A Mobile Workstation PC to Intel Core Ultra 7 165H processor-based Dell Precision and Lenovo ThinkPad mobile workstations

While artificial intelligence (AI) is a hot topic in personal computing, it's the neural processing unit (NPU) that's driving innovation behind the scenes in mobile workstations. Smartphones have been using NPUs for years—but AMD® and Intel® have only recently added NPUs to the central processing unit (CPU) and graphics processing unit (GPU) architecture built into many HP, Dell™, and Lenovo® AI laptops and mobile workstations.^{1,2,3} While many mobile workstations still rely on integrated GPUs (iGPUs) to handle the bulk of AI workstation tasks, workstation apps that run on the NPU are in development.

Which mobile workstation and processor combo can best help creative and technical professionals get projects out the door and embrace new and emerging AI technologies with better performance now and in the future?

To find out, we used industry-standard benchmarks to compare performance in general and processor-intensive scenarios, measured real-world battery life in a variety of ways, and recorded noise levels under load on three mobile workstations: an HP ZBook Firefly G11 A Mobile Workstation PC powered by an AMD Ryzen™ 7 PRO 8840HS processor; a Dell Precision® 3490 Mobile Workstation powered by Intel vPro® with Intel Core™ Ultra 7 processor 165H; and a Lenovo ThinkPad® P14s Gen 5 Mobile Workstation powered by Intel vPro with Intel Core Ultra 7 processor 165H.

We found that the AMD Ryzen 7 PRO 8840HS processor-powered HP ZBook Firefly G11 A Mobile Workstation PC brought many advantages to the table when compared to Intel vPro with Intel Core™ Ultra 7 processor 165H-powered Dell Precision and Lenovo ThinkPad mobile workstations.



Run probability simulations faster

Up to 39.5% higher SPECworkstation® 3.1 Financial Services overall score



Get answers faster with neural networks

Up to 5.9X higher Geekbench AI Half Precision score



Work where you want without compromise

Up to 13 hr and 8 min of battery life*

This project was commissioned by HP and AMD.

*UL Procyon™ Battery Life Benchmark results in Windows 11 Best power efficiency power mode.

How we tested

We focused our testing on processor capabilities and battery life—but we recognize that random access memory (RAM) and storage also play important roles in the overarching performance picture. To make sure we had more than enough RAM and storage to run our tests, we equipped each 14-inch Windows 11 Pro test system with 32 GB of DDR5-5600 RAM and 512 GB of PCIe® NVMe™ storage. Both the AMD Ryzen 7 PRO 8840HS processor and the Intel vPro with Intel Core Ultra 7 processors 165H contain employ architectures with CPUs, GPUs, and NPUs.

HP ZBook Firefly G11 A Mobile Workstation PC

- 8-core/16-thread AMD Ryzen 7 PRO 8840HS processor
- Integrated AMD Radeon™ 780M Graphics
- Integrated Ryzen AI NPU
- 56-WHr battery

Dell Precision 3490 Mobile Workstation

- 16-core/22-thread Intel vPro with Intel Core Ultra 7 processor 165H
- Integrated Intel Arc™ Graphics
- Integrated Intel AI Boost NPU
- 54-WHr batter

Lenovo ThinkPad P14s Gen 5 Mobile Workstation

- 16-core/22-thread Intel vPro with Intel Core Ultra 7 processor 165H
- Integrated Intel Arc Graphics
- Integrated Intel AI Boost NPU
- 57-WHr battery



First, we evaluated the 14-inch mobile workstations' performance using these general productivity, content creation, and AI benchmarking tools:

- Blender Benchmark
- Geekbench AI
- LM Studio
- Maxon Redshift Benchmark
- PassMark PerformanceTest 11
- SPECapc® for Creo 9
- SPECworkstation 3.1

We also tested the HP claim that users can “open large files and run pro apps simultaneously” by running Revit 2024 RFO and Chaos V-Ray® benchmarks at the same time.

Then, to see how Windows 11 power settings can affect battery life, we ran the MobileMark 30 benchmark in the Windows 11 Balanced power mode. Next, we ran the MobileMark 30 battery life benchmark and UL Procyon Battery Life benchmarks in the Windows 11 Best power efficiency power mode. Finally, we measured battery life during a Microsoft Teams video meeting with nine participants in the Windows 11 Best power efficiency power mode.

To determine how much noise the mobile workstations emitted while running a sustained, processor-intensive load, we measured acoustics while they were plugged in and running the Cinebench 2024 benchmark for 90 minutes.⁴

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](#).

General performance

We evaluated the workstations' general performance using the PassMark PerformanceTest 11 and SPECworkstation 3.1 benchmarks.

PassMark PerformanceTest 11 combines CPU, 2D and 3D graphics, storage, and memory test performance metrics into an overall PassMark rating.⁵



About the HP ZBook Firefly G11 A Mobile Workstation PC

The Firefly is the most compact member of the HP ZBook workstation lineup. It is recommended for professional content creation and design. The 14-inch HP Firefly G11 A Mobile Workstation PC offers AMD CPUs up to AMD Ryzen 9 PRO 8945HS CPU, integrated AMD Radeon Graphics, up to 64 GB of SODMM DDR5 memory, and up to 2 TB of PCIe NVMe SSD storage.⁷ Additional benefits of HP ZBook mobile workstations include:

Durability and reliability: To ensure durability, each system goes through the HP System Validation Test Protocol, which includes yanking out cables, subjecting screens to abrasion tests, and opening and closing the clamshell tens of thousands of times. All HP ZBook mobile workstations must also survive military-grade durability tests (i.e., drop, vibration, explosive atmosphere, dust, and humidity). Current-gen HP ZBook mobile Workstation PCs have undergone over 120,000 hours of testing and validation to make sure they are "hardened and designed for ultimate reliability."⁸

Privacy and security: HP enables professionals to protect onscreen data from prying eyes with HP Sure View, which increases privacy through a proprietary backlight and light control film.⁹ Organizations and users can also strengthen security with HP Sure Click, which traps and deletes malware.¹⁰

PassMark PerformanceTest 11.0 overall ratings

(higher is better)

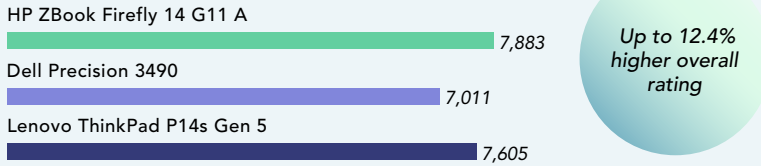
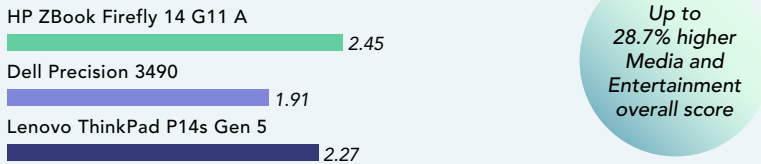


Figure 1: PassMark PerformanceTest 11.0 overall ratings. Higher is better. Source: Principled Technologies.

SPECworkstation 3.1 measures CPU, graphics, I/O, and memory bandwidth in media and entertainment workloads (e.g., 3D animation, video encoding, and rendering) as well as financial services workloads (e.g., probability simulation and pricing models).⁶

SPECworkstation 3.1 overall scores (higher is better)

Media and Entertainment



Financial Services

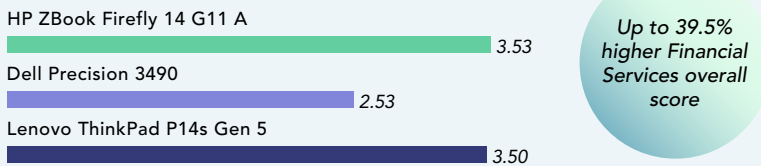


Figure 2: SPECworkstation 3.1 overall scores. Higher is better. Source: Principled Technologies.

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.

About the AMD Ryzen 7 PRO 8840HS processor

The AMD Ryzen 7 PRO 8840HS processor is an AMD Ryzen AI processor built on Zen 4 technology. According to AMD, "Ryzen AI is built directly into your PC so your CPU and GPU can focus on other tasks while you use AI to help generate concepts and designs and accelerate your productivity with incredible power efficiency, speed, and quiet operation."¹¹

The 8-core, 16-thread AMD Ryzen 7 PRO 8840HS processor has integrated AMD Radeon 780M iGPU and Ryzen AI capabilities with up to 16 trillions of operations (TOPs) of NPU performance. Clock speeds are between 3.3 and 5.1 GHz.¹² The AMD Ryzen 7 PRO 8840HS processor also includes a suite of dedicated technologies for creative and technical professionals:

- **PRO graphics:** AMD Radeon PRO GPUs are designed to improve 3D modeling and design experiences.
- **PRO security:** AMD Shadow Stack and AMD Memory Guard multi-layered security features protect sensitive data.
- **PRO manageability:** Cloud-based Windows Autopilot and Microsoft Endpoint Manager can help simplify PC deployment and management.¹³

You can learn more about AMD Ryzen AI processors at: <https://www.amd.com/en/products/processors/business-systems/ryzen-ai.html>.

Processor-intensive workload performance

To provide valuable results to creative and technical professionals, we ran industry-standard benchmarks that stressed the mobile workstations' processors with a variety of workloads.

3D rendering performance

In our tests, the AMD Ryzen 7 PRO 8840HS processor-powered HP ZBook Firefly G11 A Mobile Workstation PC received higher 3D rendering performance scores than the Intel vPro with Intel Core Ultra 7 processor 165H-based Dell Precision 3490 and Lenovo ThinkPad P14s Gen 5 mobile workstations we tested. Higher scores here could help architects, product designers, and other 3D artists get completed projects in front of their audiences faster.

Blender Benchmark measures how quickly the Cycles production render engine can render path-tracing samples on the CPU of each mobile workstation.¹⁴

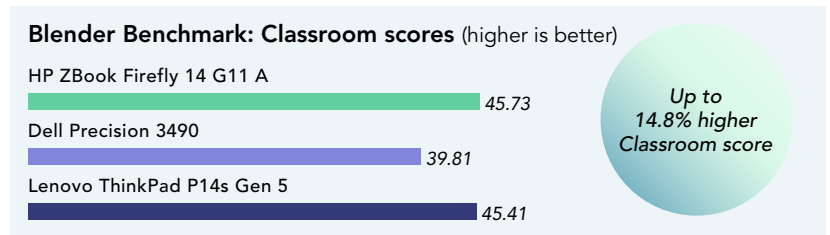


Figure 3: Blender 4.2 CPU Classroom workload scores. Higher is better. Source: Principled Technologies.

The **Maxon Redshift Benchmark** measures GPU rendering performance and reports how long it takes to render a scene.¹⁵

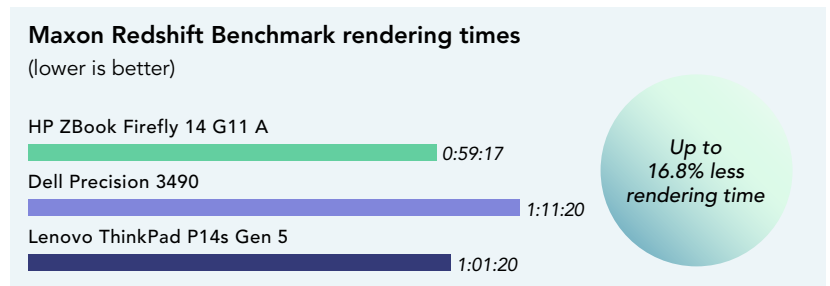


Figure 4: Maxon Redshift Benchmark render times. Times in hours, minutes, and seconds (hr:m:ss). Less rendering time is better. Source: Principled Technologies.

CAD design performance

The **SPECapc for Creo 9** benchmark taxes all aspects of system performance and generates composite scores for both CPU and GPU.¹⁶ We found that the AMD Ryzen 7 PRO 8840HS processor-powered HP ZBook Firefly G11 A Mobile Workstation PC received higher CPU and GPU composite scores than the Intel vPro with Intel Core Ultra 7 processor 165H-based Dell Precision 3490 and Lenovo ThinkPad P14s Gen 5 mobile workstations we tested. Higher scores here could help manufacturers, engineers, and design firms speed product conceptualization, design, analysis, and validation processes.

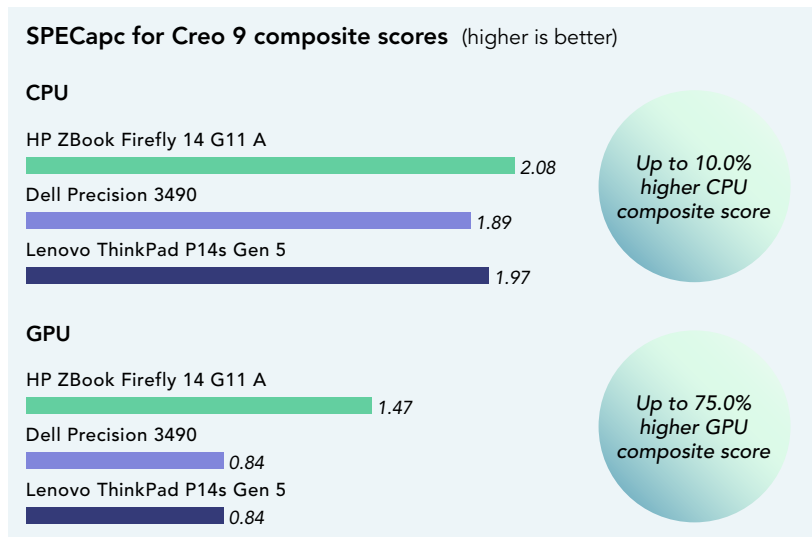


Figure 5: SPECapc for Creo 9 benchmark scores. Higher is better. Source: Principled Technologies.



Multitasking performance

To test the HP claim that users can “open large files and run pro apps simultaneously,” we ran the Revit 2024 RFO Benchmark with the Chaos V-Ray benchmark running simultaneously in the background.¹⁷ The **Revit 2024 RFO** benchmark measures performance while tackling 3D modeling and design tasks and the **Chaos V-Ray** benchmark measures rendering speed.¹⁸ We found that the AMD Ryzen 7 PRO 8840HS processor-powered HP ZBook Firefly G11 A Mobile Workstation PC completed all three tasks in 5 minutes and 2 seconds—that’s over a minute and a half faster than the Intel vPro with Intel Core Ultra 7 processor 165H-powered Dell Precision 3490 and 13 seconds faster than the Intel vPro with Intel Core Ultra 7 processor 165H-powered Lenovo ThinkPad P14s Gen 5. If you’re creating large scenes or completing rendering tasks multiple times a day, those time savings can quickly add up.

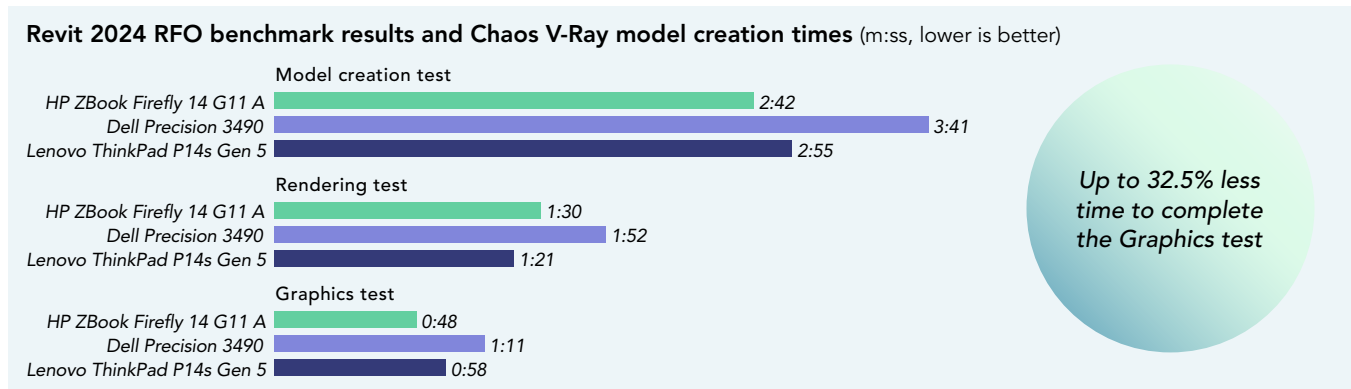


Figure 6: Revit 2024 RFO benchmark results with the Chaos V-Ray benchmark running in the background. Time in minutes and seconds (m:ss). Lower is better. Source: Principled Technologies.



AI/ML workload performance

Geekbench AI evaluates different levels of real-world AI performance.¹⁹ In our testing, we used the Open Neural Network Exchange (ONNX) AI framework and DirectML AI backend for machine learning on Windows. **Single Precision scores** are relevant for such use cases as medicine and deep learning, where higher levels of precision are necessary for hyper-accurate image analysis and object classification. **Half Precision scores** are relevant for data scientists working with small datasets or models that need more precision than Quantized scores provide—but not as much as Single Precision requires. **Quantized scores** are relevant for such use cases as surveillance and security, where you need enough precision to identify whether an animal or human being is activating a vision-based sensor.

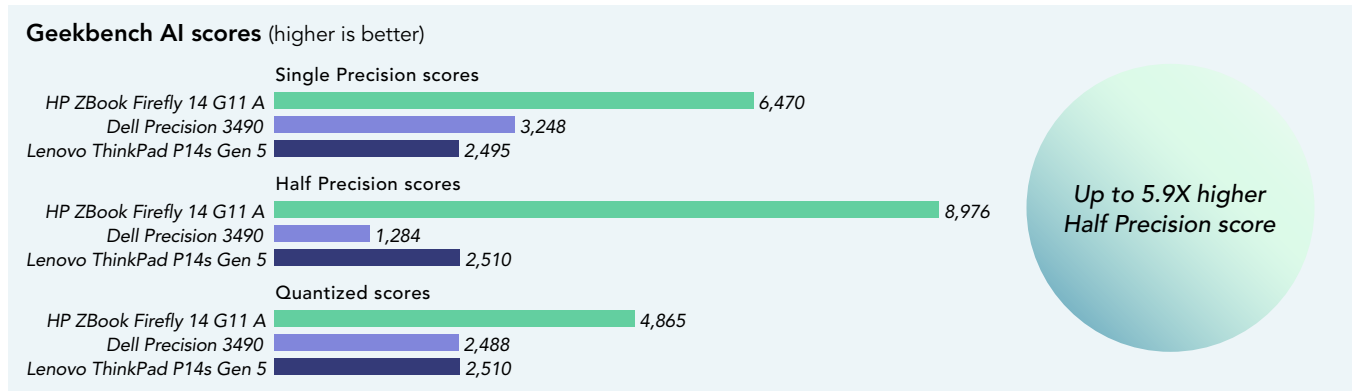


Figure 7: Geekbench AI ONNX DirectML inference scores. Higher is better. Source: Principled Technologies.

LM Studio uses large language models (LLMs) to evaluate AI chat capabilities.²⁰ In our testing, we used the Meta-Llama-3.1-8B-Instruct-Q4_K_M model to capture token metrics—where tokens are words, subwords, or characters. The LLM’s job is to predict the most likely token to follow a sequence of input tokens and generate valuable output.²¹ The more tokens per second a mobile workstation can process, the richer the context for content creation, language translation, sentiment analysis, and question answering.

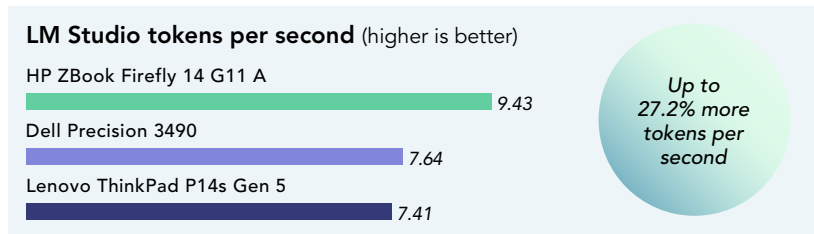


Figure 8: LM Studio tokens per second results. Higher is better. Source: Principled Technologies.



Battery life and system efficiency

For general battery life assessment, we ran the UL Procyon Battery Life benchmark in Windows 11 Best power efficiency power mode. We also measured unplugged battery life while conducting a Microsoft Teams video meeting with nine participants in Windows 11 Best power efficiency power mode. Then, to see how changing Windows 11 power modes affected performance and battery life, we ran MobileMark 30 in Windows 11 Balanced and Best power efficiency power modes. In our tests, the AMD Ryzen 7 PRO 8840HS processor-powered HP ZBook Firefly G11 A Mobile Workstation PC lasted longer unplugged and received higher minutes per WHr scores than the Intel vPro with Intel Core Ultra 7 processor 165H-based Dell Precision 3490 and Lenovo ThinkPad P14s Gen 5 mobile workstations we tested. Higher minutes per WHr results reflect better system efficiency.

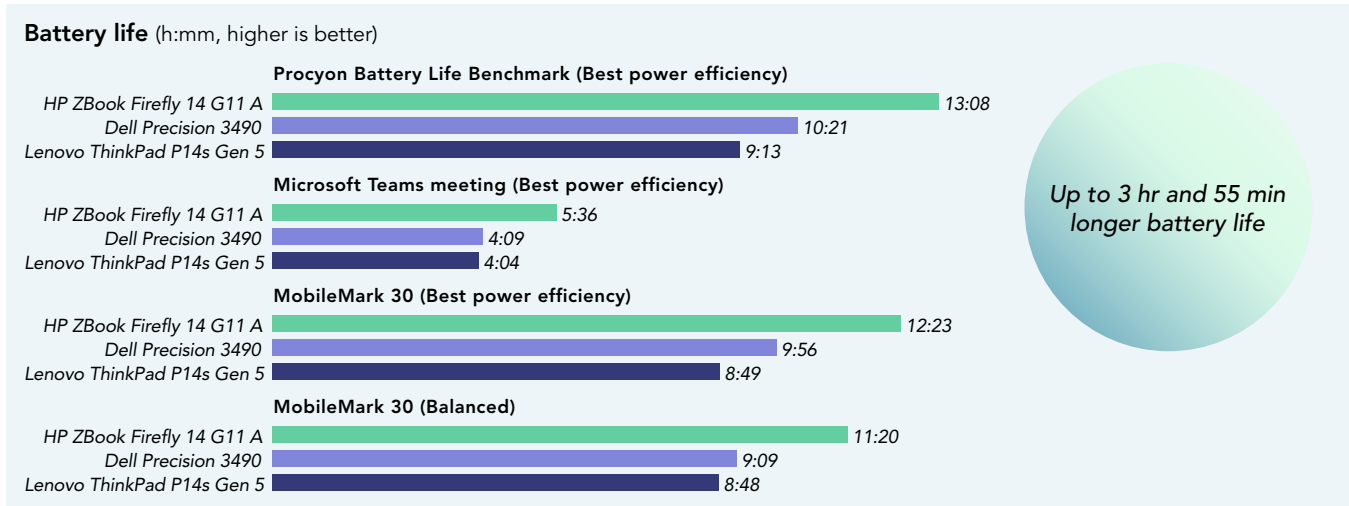


Figure 9: Battery life benchmark results. More time is better. Source: Principled Technologies.

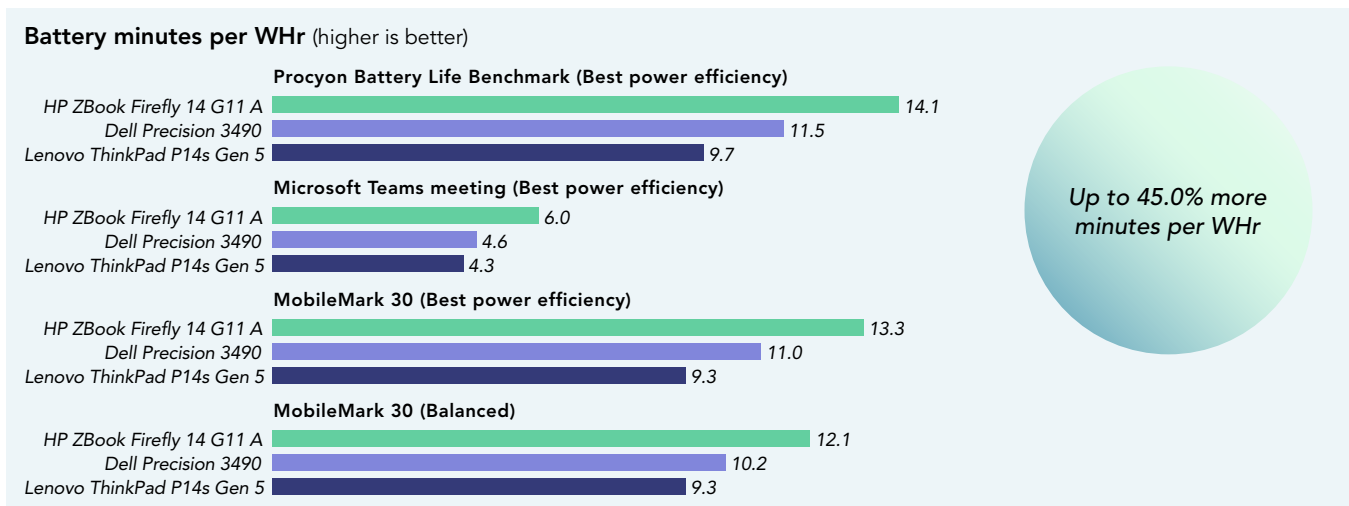
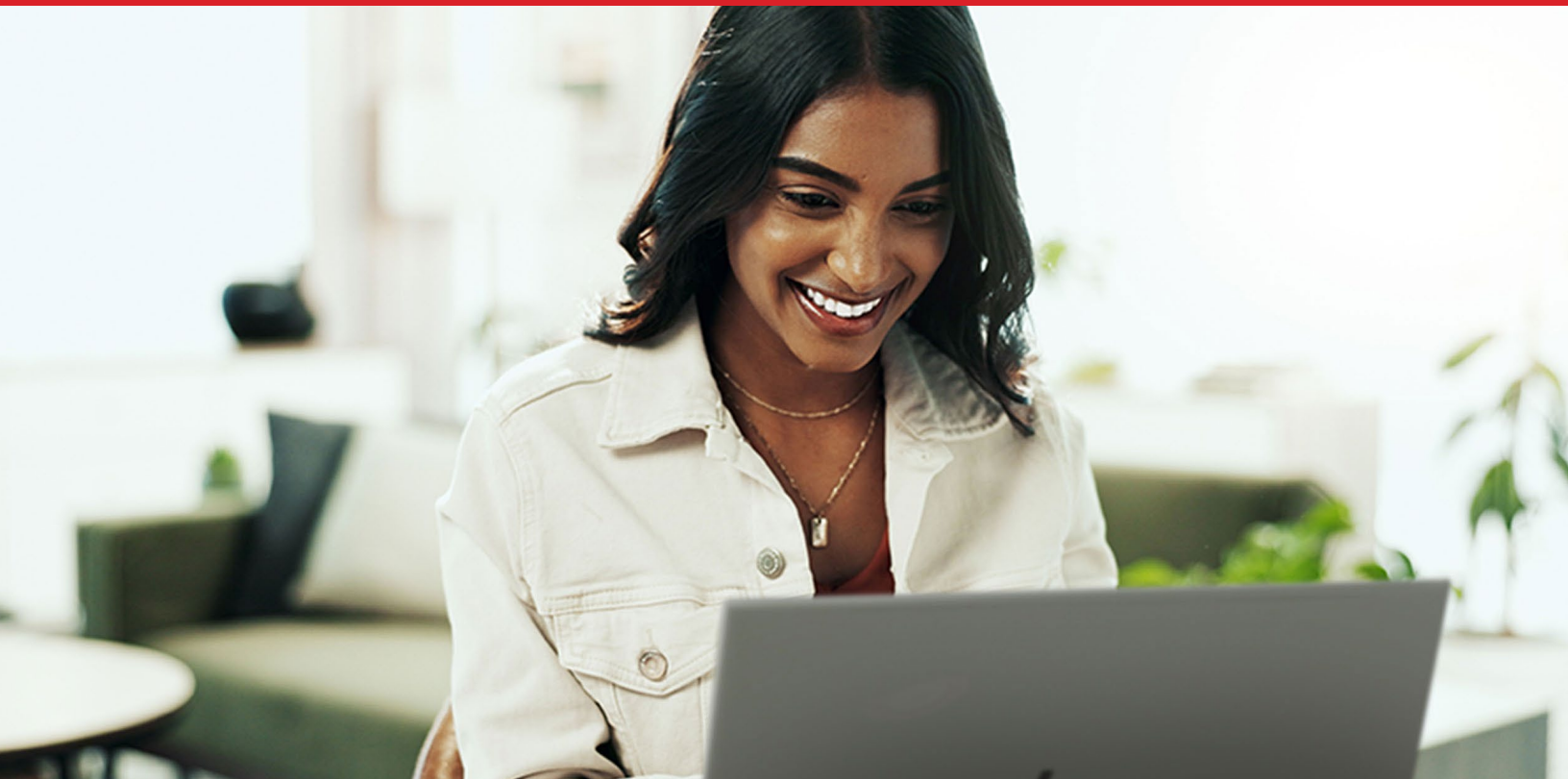


Figure 10: Battery life benchmark minutes per WHr results. Higher is better. Source: Principled Technologies.



Noise levels under load

Some workstations can be very loud—especially when they’re running processor-intensive applications. The ambient room noise before we started testing was 23.2 decibels (dBA). We plugged in the HP, Dell, and Lenovo mobile workstations and ran the Cinebench 2024 benchmark for 90 minutes. During the last 30 minutes of testing, we measured acoustics while the systems were under load. For reference, 10dBA is equivalent to normal breathing, 30dBA is whispering, and 40dBA is what you’d hear in a quiet office or residential area.²²

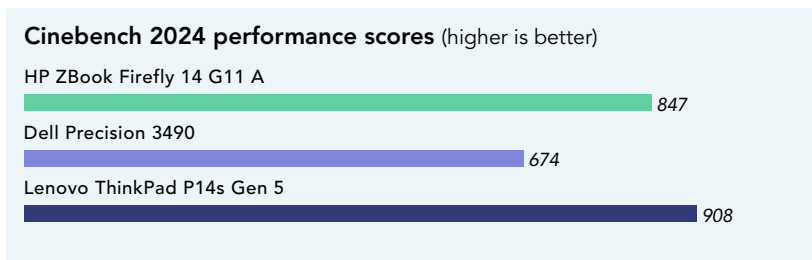


Figure 11: Performance scores while the PCs were plugged in and running the Cinebench 2024 benchmark for 30 minutes. Higher performance scores are better. Source: Principled Technologies.

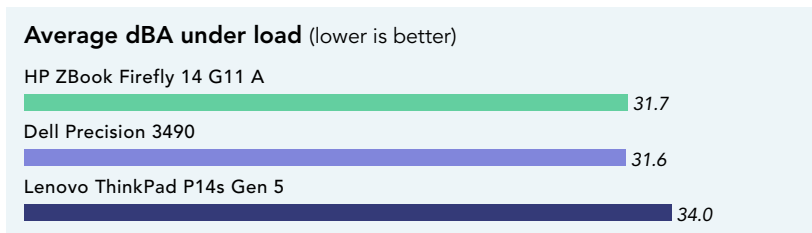


Figure 12: Acoustic results while the PCs were plugged in and running the Cinebench 2024 benchmark for 30 minutes. Lower decibels are better. Source: Principled Technologies.

Conclusion

Good performance can help speed product conceptualization, design, analysis, and validation processes as well as enabling the exploration of emerging AI technologies. In our hands-on tests, we found that the AMD Ryzen 7 PRO 8840HS processor-powered HP ZBook Firefly G11 A Mobile Workstation PC received higher general productivity, content creation, and AI benchmark scores than the Intel vPro with Intel Core Ultra 7 processor 165H-powered Dell Precision 3490 and Lenovo ThinkPad P14s Gen 5 mobile workstations. As an added bonus, the AMD Ryzen 7 PRO 8840HS processor-powered HP ZBook Firefly G11 A Mobile Workstation PC also delivered significantly longer battery life.

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