



Advance your AI journey with a responsive device that can better handle creative and everyday workflows

A comparison of the [Lenovo ThinkPad X1 Carbon Gen 12](#) and the older [Lenovo ThinkPad X1 Carbon Gen 9](#)

When upgrading to a new laptop, many of us have had the sudden revelation where we discover just how much we'd been missing out on. Whether it's improved features, faster performance, or longer battery life, newer technology can have a lot to offer. If it's been several years since your last upgrade, your current device might be lagging behind the times. With the rise of AI, you may be unprepared to handle the workloads of today and tomorrow.

The right new system can support all the work you do with ease, including everyday tasks, resource-intensive creative workflows, and even demanding AI work. To determine the type of performance improvements a user might expect from upgrading, we tested a [Lenovo® ThinkPad® X1 Carbon Gen 12](#), featuring an [Intel® Core™ Ultra 7 processor 165U](#), and a three-year-old [ThinkPad X1 Carbon Gen 9](#). We found that the newer system outperformed its older counterpart when it came to AI workloads, saved time on creative and productivity tasks, and provided longer battery life. In the changing technology landscape, the [ThinkPad X1 Carbon Gen 12](#) could help you reach new heights.



Explore new AI possibilities

Up to 57% higher Procyon AI Computer Vision Benchmark score*



Render 3D graphics faster

Up to 5.3x the Blender score*



Maintain focus on day-to-day tasks

30% higher SYSmark 30 score*



Work unplugged for longer stretches

Over 6.5 hours of battery life during a virtual meeting

*with the [Lenovo ThinkPad X1 Carbon Gen 12](#) vs. the [Lenovo ThinkPad X1 Carbon Gen 9](#)

Features of the Lenovo ThinkPad X1 Carbon Gen 12



This 14-inch, ultraportable, and Intel Evo™-certified business laptop is powered by Intel Core Ultra processors with integrated AI.¹ It includes a redesigned keyboard, a larger trackpad, an optional 2.8K OLED display, and “razor-thin bevels.”² As a sustainability bonus, its chassis includes recycled post-consumer content and its packaging is plastic-free, with some elements utilizing rapid-renewable materials.³

- ▶ Learn more about the ThinkPad X1 Carbon Gen 12 at [https://www.lenovo.com/us/en/p/laptops/thinkpad/thinkpadx1/thinkpad-x1-carbon-gen-12-\(14-inch-intel\)/len101t0083/](https://www.lenovo.com/us/en/p/laptops/thinkpad/thinkpadx1/thinkpad-x1-carbon-gen-12-(14-inch-intel)/len101t0083/).

Table 1: Feature comparison of the laptops we tested.

	Lenovo ThinkPad X1 Carbon Gen 12 Intel Core Ultra 7 processor 165U	Lenovo ThinkPad X1 Carbon Gen 9 Intel Core i7-1185G7 processor
Graphics	Integrated Intel Arc™ graphics and AI Boost	Intel Iris® Xe graphics
Operating system	Windows 11 Pro	Windows 10 Pro
Display touchscreen	Yes	Yes
Ports	2x Thunderbolt™ 4 2x USB-A 3.2 1x HDMI 2.1 1x headphone/mic combo 1x Kensington Nano Security Slot™	1x USB-C Thunderbolt 4/power in 1x USB-C Thunderbolt 4 2x USB-A 3.2 1x HDMI 2.1 1x headphone/mic combo 1x Kensington Nano Security Slot
Intel vPro®	Yes	Yes
Intel Evo	Yes	Yes
Intel Unison™	Yes	No
Wi-Fi and Bluetooth	Intel Wi-Fi 6E (802.11ax) with Bluetooth 5.3	Intel Wi-Fi 6 AX 201 (802.11ax) with Bluetooth 5.2

About the Intel Core Ultra 7 processor 165U

The Lenovo ThinkPad X1 Carbon Gen 12 we tested features an Intel Core Ultra 7 processor 165U, which incorporates three separate engines: a central processing unit (CPU), a graphics processing unit (GPU), and a neural processing unit (NPU). This architectural shift, according to Intel, makes Intel Core Ultra processors “the most AI-capable and power-efficient client processor in Intel’s history.”⁴ The Intel Core Ultra 7 processor 165U has 12 cores, 12MB Intel Smart Cache, a Max Turbo Frequency of 4.9 GHz, and support for the OpenVINO, WindowsML, and ONNX RT AI software frameworks.⁵

- ▶ To learn more about the Intel Core Ultra 7 processor 165U, visit <https://www.intel.com/content/www/us/en/products/sku/237329/intel-core-ultra-7-processor-165u-12m-cache-up-to-4-90-ghz/specifications.html>.

How we tested

We tested a Lenovo ThinkPad Carbon X1 Gen 12, featuring an Intel Core Ultra 7 processor 165U, against an older Lenovo ThinkPad X1 Carbon Gen 9, featuring an Intel Core i7-1185G7 processor. Both systems had 1TB SSDs, while newer laptop had 32 GB of memory and the older one had 16 GB, reflecting typical configurations for both systems.

We utilized a wide range of tools and benchmarks to explore the advantages of the new ThinkPad Carbon Gen 12, covering performance for multiple types of workloads as well as battery life and other elements of user experience.

AI performance benchmarks and tools

AI isn't just for large enterprises—growing numbers of users are already using AI in small and large ways in everyday workflows. Whether you're exploring AI development or taking advantage of the latest AI tools in Windows 11 Pro and beyond, you'll need a laptop that can handle AI load. These two benchmarks help illustrate the kind of AI performance you can expect.

- ◆ Procyon® AI Computer Vision Benchmark (p4)
- ◆ Topaz Video AI (p4)

General performance benchmarks

Almost everyone who works on a laptop spends time web browsing and working in documents or spreadsheets. This set of benchmarks can quantify general performance for the kinds of tasks many workers handle every day.

- ◆ PassMark PerformanceTest 11 (p8)
- ◆ Procyon Office Productivity Benchmark (p8)
- ◆ SYSmark® 30 (p9)
- ◆ WebXPRT 4 (p9)

Graphics-intensive performance benchmarks and tools

Working with photos, videos, and 3D renders means you need a great deal of compute power. For users who work with these kinds of files every day, this set of tools and benchmarks offers multiple angles on measuring a device's performance for graphics-intensive work.

- ◆ 3DMark® (p5)
- ◆ Blender (p5)
- ◆ Cinebench 2024 (p6)
- ◆ HandBrake (p6)
- ◆ Procyon Photo Editing Benchmark (p7)
- ◆ Procyon Video Editing Benchmark (p7)
- ◆ PugetBench for Creators (p7)

Battery life, workflow, and user experience tests

To go beyond standard benchmark testing, we also timed how long it took to do several real-world tasks and looked at user experience from multiple angles. These tests included:

- ◆ Everyday productivity tasks (p10)
- ◆ Content creation tasks (p11)
- ◆ Real-world workflow (p11)
- ◆ Battery life (p12)
- ◆ Microphone experience (p13)
- ◆ Camera quality (p13)
- ◆ Thermal performance (p14)



Dive into AI with confidence

AI technology and its exciting uses are growing at an explosive rate. In fact, some studies project the AI market to grow to \$407 billion by 2027—a significant increase from the already impressive \$86.9 billion in 2022.⁶ Whether it's for the AI-powered tools we leverage every day, such as background blurring during virtual meetings or autocorrect text suggestions, or for the tools of the future, such as ChatGPT and Copilot, our devices must be well-equipped to handle this AI landscape.

Windows Studio Effects, a new feature set from Microsoft, “leverages AI models built by Microsoft and compiled/optimized for devices with a Neural Processing Unit (NPU) to deliver high-fidelity, battery-friendly AI effects.”⁷ The effects include auto framing, background blurring, light adjustments, and fun filters. We enabled Windows Studio Effects on the Lenovo ThinkPad X1 Carbon Gen 12 to evaluate its functionality, and we found that it ran as we anticipated. On the other hand, because the ThinkPad X1 Carbon Gen 9 does not have an NPU, it is not compatible with Windows Studio Effects.

- ▶ To learn more about these effects and how to enable them, visit <https://support.microsoft.com/en-us/windows/windows-studio-effects-273c1fa8-2b3f-41b1-a587-7cc7a24b62d8>.

To test the AI capabilities of the Lenovo ThinkPad X1 Carbon Gen 12 laptop and its older counterpart, we used a number of tools. First, we ran the Procyon[®] AI Computer Vision Benchmark with the Intel OpenVINO[™] toolkit. This benchmark uses multiple AI inference engines and neural network models, including MobileNet v3 and ResNet-50, to “[help] you decide which engines to support to achieve the best performance.”⁸ The benchmark ran three precision levels—float32, float16, and int8—which determine how precisely a model completes its work. Some levels require more time to run than others.

Figure 1 shows that the Lenovo ThinkPad X1 Carbon Gen 12 laptop, powered by the Intel Core Ultra 7 processor 165U, delivered up to 57.7 percent higher inference performance than the ThinkPad X1 Carbon Gen 9. Even if you're not using your laptop to run inference operations on gigantic datasets, you may see better performance as you develop an AI model or work on refinement parameters.

Procyon AI Computer Vision Benchmark Intel OpenVINO

Lenovo ThinkPad X1 Carbon
■ Gen 12 ■ Gen 9

Overall rating | Higher is better

float32



float16



int8



Figure 1: Procyon AI Computer Vision Benchmark Intel OpenVINO overall scores. Higher is better. Source: Principled Technologies.

Next, we used the Topaz Video AI benchmark to assess performance for the Topaz Labs[™] Video AI application, which uses AI to enhance video by upscaling resolution, steadying camera movement, and more.⁹ The new Lenovo ThinkPad X1 Carbon Gen 12 performed well on multiple Topaz Video AI tests, as the [science behind the report](#) shows. However, the older Lenovo ThinkPad X1 Carbon Gen 9 could not support the workload. This makes the choice clear: Selecting the newer Intel Core Ultra 7 processor-powered device for AI-powered video editing is the wiser decision.

Speed the pace of creativity

Whether your organization has historically relied on graphics-intensive apps—such as for creating scientific models or editing marketing collateral—or you’ve more recently dived into content creation for social media, you need a device that can handle the demands of today. We used a variety of tests to assess how the Lenovo ThinkPad X1 Carbon Gen systems tackled some of the intensive workloads that creatives and technical workers rely on every day.



We first used the 3DMark Time Spy test, which measures DirectX graphics performance.¹⁰ While 3DMark targets the benchmark toward gamers, Time Spy can also provide an idea of how a system performs while running resource-hungry video and multimedia workloads. As Figure 2 shows, the Intel Core Ultra 7 processor-powered Lenovo ThinkPad X1 Carbon Gen 12 achieved a 31.5 percent higher 3DMark Time Spy score. This boost means that if you regularly need to perform high-intensity graphics work, such as modeling 3D scenes or characters, the ThinkPad X1 Carbon Gen 12 could deliver a better experience.

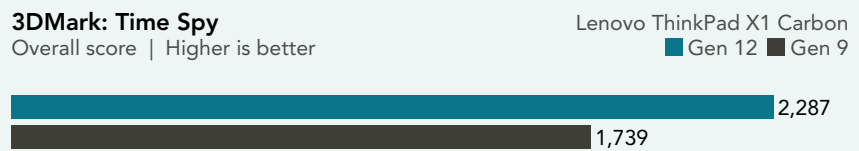


Figure 2: 3DMark overall scores. Higher is better. Source: Principled Technologies.

As a dynamic lighting technique for 3D renders, path tracing helps graphics look more realistic—and it requires considerable system resources. Using 3D rendering workloads, the Blender benchmark calculates how many path tracing samples a system can render per minute.¹¹ Our tests used three different workloads for a broader perspective on path tracing performance. For each workload, the Lenovo ThinkPad X1 Carbon Gen 12 with its Intel Core Ultra 7 processor 165U delivered more than twice the performance of the older ThinkPad Carbon Gen 9, achieving more than 5 times the score on the Monster workload (Figure 3). This significantly higher performance means the ThinkPad X1 Carbon Gen 12 could save time on 3D renders or help users tackle more complex projects.

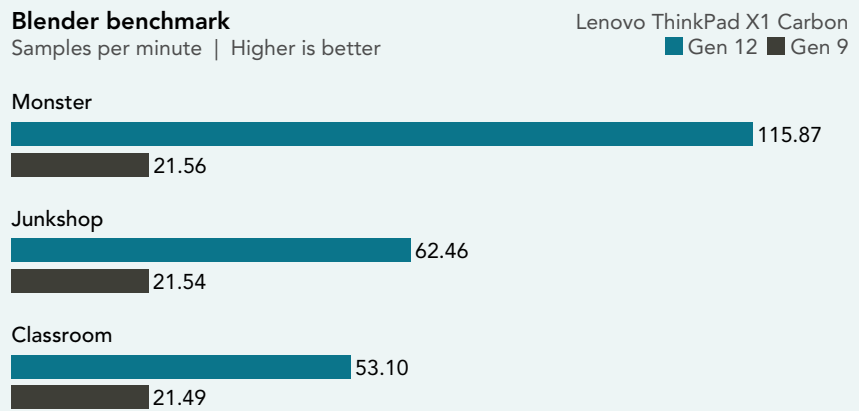


Figure 3: Blender benchmark samples per minute. Higher is better. Source: Principled Technologies.

Achieve end-to-end security

Today's security concerns can be complex and manifold. Intel and Lenovo bring key security features to the Lenovo ThinkPad X1 Carbon Gen 12 with an Intel Core Ultra 7 processor 165U. These include Intel Transparent Supply Chain (Intel TSC), which protects hardware components and software during every step of the supply chain process with "a set of tools, policies, and procedures implemented on the factory floor at PC and server manufacturers that help enable enterprises to verify the authenticity and firmware version of systems and their components."¹²

The Intel Core Ultra processor-powered devices we tested are also protected by Lenovo ThinkShield, "a comprehensive portfolio of end-to-end security tools that encompasses hardware, software, services, and processes."¹³ Lenovo ThinkShield incorporates built-in platform security, security management solutions, and more—including AI-powered endpoint protection.¹⁴

We also tested the systems with Cinebench 2024, a benchmark that uses the Redshift render engine to quantify CPU and GPU capabilities.¹⁵ For both single-threaded and multi-threaded tests, higher Cinebench scores can translate to increased responsiveness on graphics-heavy video games, scientific simulations, and product development software. As Figure 4 shows, the Lenovo ThinkPad X1 Carbon Gen 12 outperformed the ThinkPad X1 Carbon Gen 9, achieving up to twice the score.

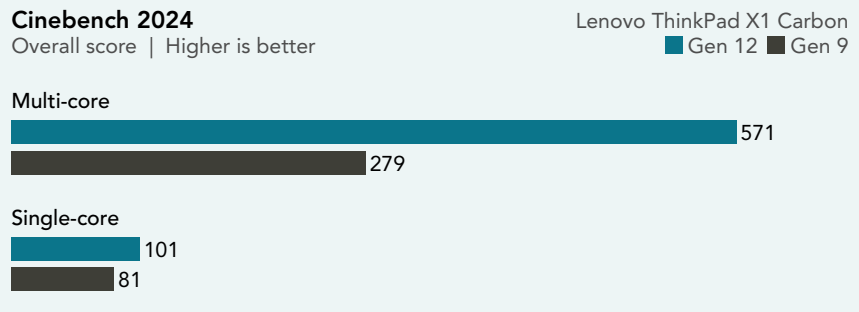


Figure 4: Cinebench 2024 scores. Higher is better. Source: Principled Technologies.

Next, we examined the laptops' performance on two video encoding workloads. Encoding a video—the process of compressing raw files into a viewable format for video players—is compute-intensive work. Using two presets from HandBrake, an open-source encoding tool, we measured the amount of time the systems required to encode a video and the amount of frames per second (FPS) they could process. We found that the Lenovo ThinkPad X1 Carbon Gen 12 once again significantly improved performance over the older ThinkPad X1 Carbon Gen 9 (Figures 5 and 6). On the Fast1080p preset, the Intel Core Ultra 7 processor-powered ThinkPad X1 Carbon Gen 12 handled twice the FPS while taking less than half the time to complete the encoding process. For video and media teams, the newer ThinkPad X1 Carbon Gen 12 could offer compelling time savings.

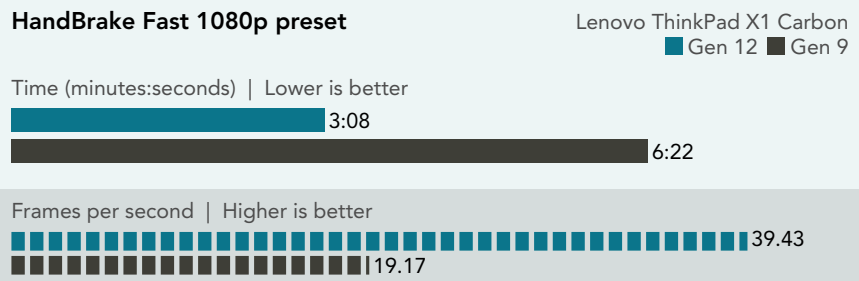


Figure 5: HandBrake Fast 1080p preset test results. Less time is better, and more FPS is better. Source: Principled Technologies.

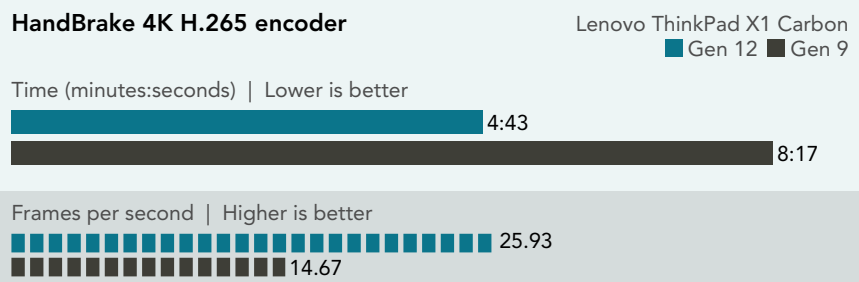


Figure 6: HandBrake Hardware 4K H.265 encoder test results. Less time is better, and more FPS is better. Source: Principled Technologies.

Adobe Creative Cloud includes key applications for creative professionals. To measure performance here, we selected benchmarks that test systems using these apps. The Procyon Photo Editing Benchmark leverages a real-world photo editing workflow in Adobe Photoshop® and Adobe Lightroom® Classic, while the Procyon Video Editing Benchmark reflects a video workflow in Adobe Premiere® Pro.^{16,17} As Figures 7 and 8 show, the Lenovo ThinkPad X1 Carbon Gen 12 scored higher on both benchmarks, more than tripling the score of the ThinkPad X1 Carbon Gen 9 in video editing performance. For creatives who work with compute-intensive Creative Cloud apps each day, these scores indicate they could save time editing and exporting projects by choosing the newer device.

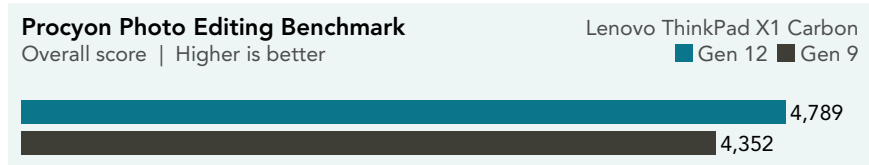


Figure 7: Procyon Photo Editing Benchmark overall scores. Higher is better.
Source: Principled Technologies.

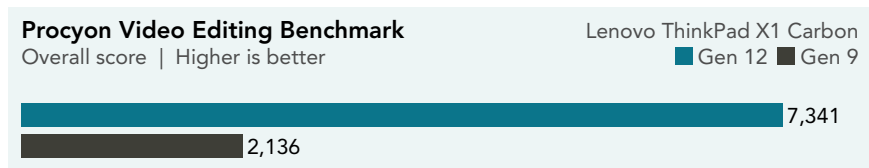


Figure 8: Procyon Video Editing Benchmark overall scores. Higher is better.
Source: Principled Technologies.

To gain a fuller understanding of the performance users could expect when using Adobe Creative Cloud apps, we also tested the systems with the PugetBench for Creators benchmarks. These tools are “focused on the most popular and common workflows used by professionals”¹⁸—in this case, Photoshop and Premiere Pro. The Intel Core Ultra 7 processor-powered Lenovo ThinkPad X1 Carbon Gen 12 again proved itself the winner, with up to 76.9 percent higher performance in these tests (Figure 9). Users who work regularly in these apps could expect to save time completing workflows, making the most of their workday.

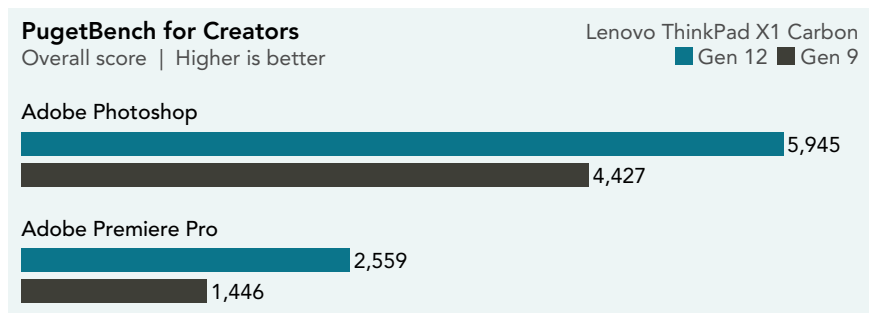


Figure 9: PugetBench for Creators overall scores. Higher is better.
Source: Principled Technologies.





Complete everyday work faster, regardless of your role

When you think of a productive workday, what do you envision? Maybe you're crafting the perfect Microsoft PowerPoint presentation, multitasking efficiently across apps, or quickly finding answers from your internet research. One thing that you probably don't imagine: waiting on your device to load pages or complete operations. Because delays can open the door to distraction or frustration, especially for actions you repeat dozens of times each day, it's important to understand how quickly a device can accomplish tasks. To see the kind of performance the Lenovo ThinkPad X1 Carbon Gen 12 and ThinkPad X1 Carbon Gen 9 could offer for everyday workflows, we tested them with general productivity benchmarks.

We tested the two laptops' performance with PassMark PerformanceTest 11, which measures CPU, 2D and 3D graphics, disk, and memory performance with 28 speed tests.¹⁹ Higher scores here indicate a smoother, more responsive experience when you complete everyday work. As Figure 10 shows, Lenovo ThinkPad X1 Carbon Gen 12 scored 17.1 percent higher than the Gen 9 device.

PassMark PerformanceTest 11

Overall rating | Higher is better

Lenovo ThinkPad X1 Carbon
■ Gen 12 ■ Gen 9



Figure 10: PassMark PerformanceTest 11 results. Higher is better. Source: Principled Technologies.

Whatever their job title, many professionals rely on Microsoft 365 apps such as Word, Excel, PowerPoint, and Outlook. The Procyon Office Productivity Benchmark quantifies performance on these apps by simulating a variety of common tasks as users switch between multiple windows.²⁰ The Lenovo ThinkPad X1 Carbon Gen 12 scored 9.3 percent higher than its older counterpart, as Figure 11 shows, which indicates it could streamline users' experience in these essential apps.

Procyon Office Productivity Benchmark

Overall scores | Higher is better

Lenovo ThinkPad X1 Carbon
■ Gen 12 ■ Gen 9



Figure 11: Procyon Office Productivity Benchmark overall scores. Higher is better. Source: Principled Technologies.

We also ran the SYSmark 30 benchmark, which “measures and compares system performance using real-world applications and workloads,” such as multitasking.²¹ Figure 12 shows that the Lenovo ThinkPad X1 Carbon Gen 12 performed 30 percent better overall on SYSmark 30. This means that compared to the older ThinkPad X1 Carbon Gen 9, the newer Intel Core Ultra 7 processor-powered device could deliver a smoother experience for users completing typical to-do lists, even if they’re multitasking their way through the day.



Figure 12: SYSmark 30 overall ratings. Higher is better. Source: Principled Technologies.



Finally, we tested the systems’ web browsing performance using WebXPRT 4. An industry-standard browser benchmark, WebXPRT 4 uses HTML5, JavaScript, and WebAssembly-based scenarios to simulate a range of real-world activities.²² Web browsing is an integral part of jobs from project manager to teacher to stock broker, and it’s critical to understand how your system will handle this everyday task. As Figure 13 shows, the Intel Core Ultra 7 processor-powered Lenovo ThinkPad X1 Carbon Gen 12 was able to sustain better web-browsing performance than its older-generation counterpart in our testing, with an 18.1 percent higher overall WebXPRT score.

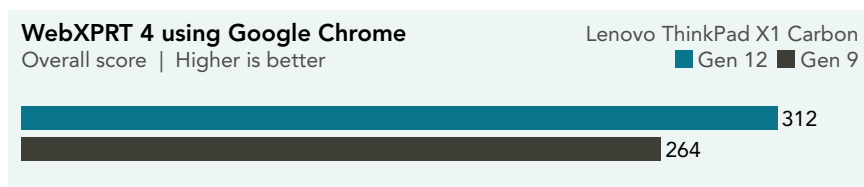


Figure 13: WebXPRT 4 overall scores with the Google Chrome browser. Higher is better. Source: Principled Technologies.

Choose a more sustainable laptop

Lenovo maintains that the ThinkPad X1 Carbon Gen 12 is TCO 9, ENERGY STAR®, and EPEAT® Gold certified, with these sustainability specs:²³

- ▶ The packaging is Forest Stewardship Council® (FSC) certified plastic-free, made with bamboo and sugar cane
- ▶ The top cover contains 3 percent recycled carbon fiber
- ▶ The keyboard frame contains 90 percent recycled magnesium
- ▶ The bottom cover contains 55 percent recycled aluminum and 45 percent hydro-aluminum
- ▶ The speaker enclosure, battery enclosure, and power adapter contain 90 percent post-consumer content (PCC) recycled plastic
- ▶ The cable holders contain 30 percent PCC recycled plastic
- ▶ The keycaps contain 85 percent PCC recycled plastic
- ▶ Memory modules, SSD boards, and fingerprint modules are attached with low-temperature solder

The Lenovo 2023/24 Environmental, Social, and Governance report outlines approaches to and goals for sustainability, including targeting net-zero greenhouse gas emissions by 2050. The report highlights the Lenovo commitment to utilize post-consumer recycled content in its products, improve its products’ energy efficiency, and utilize renewable and bio-based materials in its packaging, among other practices.²⁴

- ▶ Learn more at <https://investor.lenovo.com/en/sustainability/reports/FY2024-lenovo-sustainability-report.pdf>.



Minimize wait times with streamlined performance

Microsoft 365 applications such as Word, Excel, and PowerPoint are foundational for many users: Some of us can't go a single day without editing a document or updating data in a spreadsheet. Experiencing delays accomplishing daily tasks, especially when you have innumerable interactions with these apps, can add up to frustrating wait times. When a system can speed the time to complete tasks in Microsoft 365 apps, users can spare themselves productivity losses and aggravating holdups.

In our workflow testing, we performed 10 tasks in Microsoft 365 apps with the two devices. These tasks included quick jobs, such as launching the apps, and more resource-intensive tasks, such as opening a large spreadsheet containing a macro. Figure 14 highlights that the Lenovo ThinkPad X1 Carbon Gen 12 saved time on each of these tasks compared to the ThinkPad X1 Carbon Gen 9. While seconds or fractions of seconds may seem like insignificant differences, a more responsive device can deliver a smoother user experience.

Time to complete tasks in Microsoft 365

Seconds | Lower is better

Lenovo ThinkPad X1 Carbon
■ Gen 12 ■ Gen 9

Microsoft Word

Launch Word



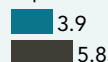
Open 90MB document



Perform find/replace



Export PDF



Microsoft Excel

Launch Excel



Open 650KB 10k-row spreadsheet



Open 92MB spreadsheet containing macro

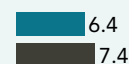


Microsoft PowerPoint

Launch PowerPoint



Export 180MB .PPTX to PDF



Start slide show



Figure 14: Time to perform various tasks in Microsoft 365. Less time is better. Source: Principled Technologies

Integrate Android and iOS devices with Intel Unison

The Intel® Unison™ app promises to be a game changer for Windows PC users who use their iPhone® devices every day.²⁵ While Apple Continuity connects only devices in the Apple ecosystem,²⁶ Intel Unison “seamlessly connects your PC, phone, and tablet for a universal, easy-to-use experience,” according to Intel.²⁷ For Intel Evo-certified Windows PCs and Android or iOS phones and tablets, Intel Unison can enable you to:

- ▶ Fully access Android or iOS mobile photo galleries from your PC
- ▶ Transfer files between your PC and Android or iOS phones and tablets
- ▶ Make and receive Android or iOS phone calls on your PC
- ▶ Send and receive Android or iOS text messages on your PC
- ▶ Manage, filter, and customize Android or iOS device notifications through your PC²⁸

Users who work with Adobe Creative Cloud applications—video editors, marketing professionals, photographers, and others—regularly use these programs to create and edit large media files. These types of assets can become unwieldy or problematic on less powerful devices, causing lengthy loading times or even crashes. But with a capable, high performing system, creative professionals can rely on a faster experience to help them maintain focus and meet deadlines.

We measured the length of time each laptop required to complete three tasks in Adobe Photoshop and Lightroom Classic. The Intel Core Ultra 7 processor-powered Lenovo ThinkPad X1 Carbon Gen 12 saved time in this workflow, as well, taking 12 seconds less to create a photomerge panorama compared to the ThinkPad X1 Carbon Gen 9 (Figure 15). When you’re in a creative flow, losing even a few seconds may be enough to break concentration. With the ThinkPad X1 Carbon Gen 12, you could shrink the window for distraction.

Time to complete tasks in Adobe Creative Cloud

Seconds | Lower is better

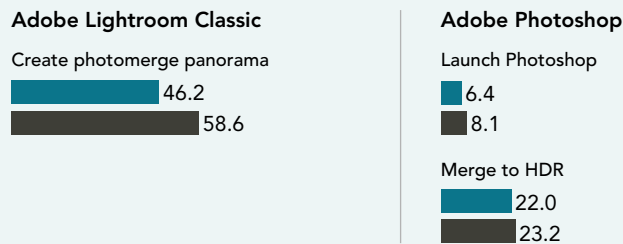


Figure 15: Time to perform various tasks in Adobe Lightroom Classic and Photoshop. Less time is better. Source: Principled Technologies.

3D modeling software offers a plethora of use cases across industries. Professionals can utilize tools such as Agisoft Metashape to create models for city planning, mining, forensic work, and agricultural practices.²⁹ 3D modeling software is a resource-intensive task, which means finding the right device to handle these needs is essential. Our Agisoft Metashape workflow tasked the laptops with building a realistic 3D shape by opening and aligning 148 photos, building textures, and more.

As we expected, due to the demanding nature of 3D modeling, both systems took much longer to complete this task than any others in our testing. However, as Figure 16 shows, the Lenovo ThinkPad X1 Carbon Gen 12 saved over 3 hours completing the workflow. Taking just over 7 hours, the system completed the work within a typical workday. If you were completing this workflow with the ThinkPad X1 Carbon Gen 9, which took over 10 hours, you might be stuck at the office late into the evening.

3D modeling workflow with Agisoft Metashape

Time (hh:mm:ss) | Lower is better

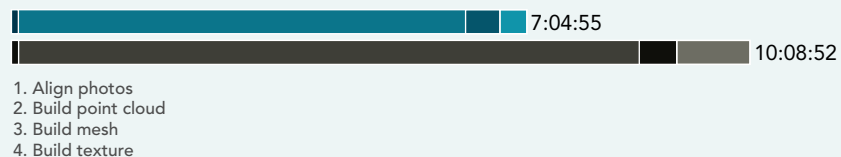


Figure 16: Time to perform a 3D modeling workflow using Agisoft Metashape. Less time is better. Source: Principled Technologies.



Extend battery life to extend productivity

These days, many users work entirely remotely, while some split time between the office and their homes, and others take their systems along for offsite presentations and meetings. For those who work beyond their desks, battery life is an essential consideration. While you might find that relocating helps boost your focus or creativity, nothing shatters that focus quite like the panic of seeing a low battery warning when there are no outlets nearby—or, worse, allowing the battery to die without having saved your work. Long battery life can be essential to getting more done.

We measured the laptops' battery life by having them join a Zoom video call connected to several other systems. We set the devices' screen brightness to as close as 250 nits as possible, reflecting a user keeping their screen bright, and modified settings to ensure that the devices never went to sleep or reduced their brightness.

This test revealed that the Lenovo ThinkPad X1 Carbon Gen 12, powered by an Intel Core Ultra 7 processor 165U, ran for nearly 3 hours longer than the older device, as Figure 17 shows. While you probably don't find yourself in 6-hour-long virtual meetings, these results indicate that when you're working on resource-intensive workloads on the go, the Lenovo ThinkPad X1 Carbon Gen 12 could deliver the battery life you need to finish your projects.

Battery life during a Zoom video call

Time (hh:mm) | Longer is better

Lenovo ThinkPad X1 Carbon

■ Gen 12 ■ Gen 9



Figure 17: Battery life, in hours and minutes, that the devices sustained while attending a virtual meeting. Higher is better. Source: Principled Technologies.

Experience better video calls

It's a cliché for a reason: Collaboration is key. Whether we're answering questions in a client meeting, outlining a plan for colleagues, or asking a project manager for clarification, most of us can't do our work in a vacuum. If collaboration at your organization means meeting virtually, a device with high-quality audio and video capabilities can make a positive difference. The Lenovo ThinkPad X1 Carbon Gen 12 is Zoom Certified, meaning it has "undergone comprehensive testing and review to ensure a seamless communication experience."³⁰ To understand the impact this certification and other features might have, we performed user experience tests.

If you work in a space with varying amounts of background noise—whether that means chatty coworkers or a neighbor who's a little too enthusiastic about mowing their lawn—your microphone's noise-reduction capabilities might come in handy. Lenovo notes that the ThinkPad X1 Carbon Gen 12 offers "two 360-degree mics with AI-based noise cancellation, combined with Dolby Voice and Dolby Atmos."³¹ To assess the effectiveness of those noise cancellation abilities, we measured how well both systems could reduce the noise of a fan. Figure 18 highlights our results: The new Lenovo ThinkPad X1 Carbon Gen 12 handled noise reduction substantially better than the older ThinkPad X1 Carbon Gen 9.

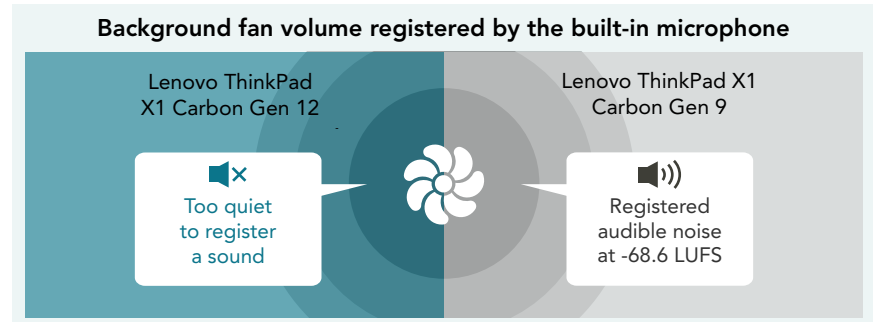


Figure 18: Results of our microphone noise reduction test. Lower LUFS, which are a standard loudness measurement, are better. Source: Principled Technologies.

Virtual meetings are more than digital phone calls: with cameras turned on, your team might feel more connected, or you could pick up important cues from a client's body language. A high-quality webcam can also help you maintain a professional appearance during video calls. Take a look at the selfies we took in a dimly lit and well-lit room in Figures 19 and 20. Which device would you select for future meetings?

Selfies in a dimly lit room

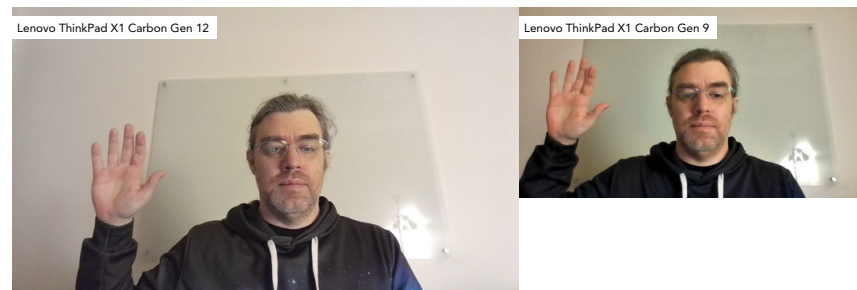


Figure 19: Unedited photos from the ThinkPad X1 Carbon Gen 12 (left) and the ThinkPad X1 Carbon Gen 9 (right) in a ~38 lux room with screen brightness set to ~200 nits. The image on the left is larger because the ThinkPad X1 Carbon Gen 12 has a higher resolution. Source: Principled Technologies.

Selfies in a well-lit room

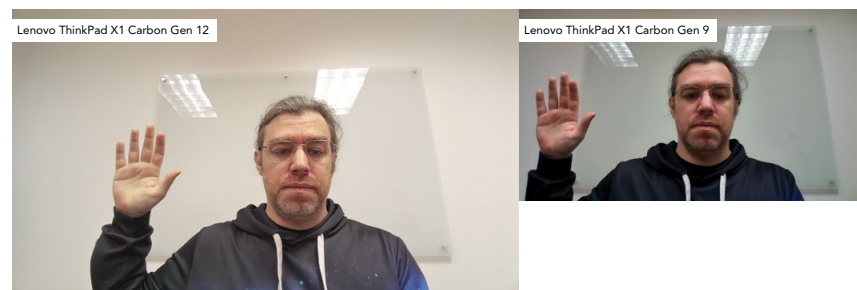


Figure 20: Unedited photos from the ThinkPad X1 Carbon Gen 12 (left) and the ThinkPad X1 Carbon Gen 9 (right) in a ~622 lux room with screen brightness set to ~200 nits. The image on the left is larger because the ThinkPad X1 Carbon Gen 12 has a higher resolution. Source: Principled Technologies.



Stay cool under pressure

As your laptop tackles compute-intensive work, it may heat up. If your device is up to the task, that heat remains manageable—you may barely even notice the temperature on your lap as you work during a commute or from your couch. But if the system isn't equipped to take on everything you need it to, it could overheat, causing an unwelcome distraction as you try to finish out your day.

Running an intensive Cinebench 2024 workload on the two laptops for 90 minutes, we took temperatures on their keyboard decks and chassis undersides. These spots are where your wrists might touch the device as you type or where you might feel it resting on your lap. In both locations, the newer Lenovo ThinkPad X1 Carbon Gen 12 ran considerably cooler than its older counterpart. As Figure 21 shows, the Intel Core Ultra 7 processor-powered laptop could be better fit to go the distance for your demanding workloads.

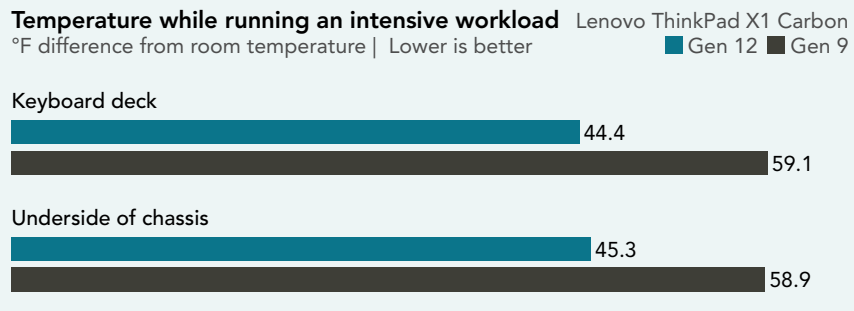


Figure 21: Thermal testing results while running a sustained Cinebench 2024 multi-core workload. Lower temperatures are better. Source: Principled Technologies.



Conclusion

For users who open their laptops to edit media files, work on AI models, compose documents, or research on the web, one thing is clear: A system that saves time and offers long battery life can be an important piece of the productivity puzzle. In our tests, the Lenovo ThinkPad X1 Carbon Gen 12 with an Intel Core Ultra 7 processor 165U achieved higher benchmark scores, time savings, longer battery life, and cooler surface temperatures compared to the older ThinkPad X1 Carbon Gen 9. It also offered other user experience improvements that could make your virtual meetings run more smoothly. If it's time to upgrade—especially to meet the demands of the AI revolution—the ThinkPad X1 Carbon Gen 12 could be a great choice.

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