



Finish everyday tasks faster

Higher CrossMark and WebXPRT benchmark overall scores



Boost productivity

Faster Microsoft 365 task completion



Get a better user experience

Good mic noise reduction and louder speaker volume with less CPU usage during Zoom meetings

Lenovo ThinkPad X1 Carbon Gen 11: Get more for less

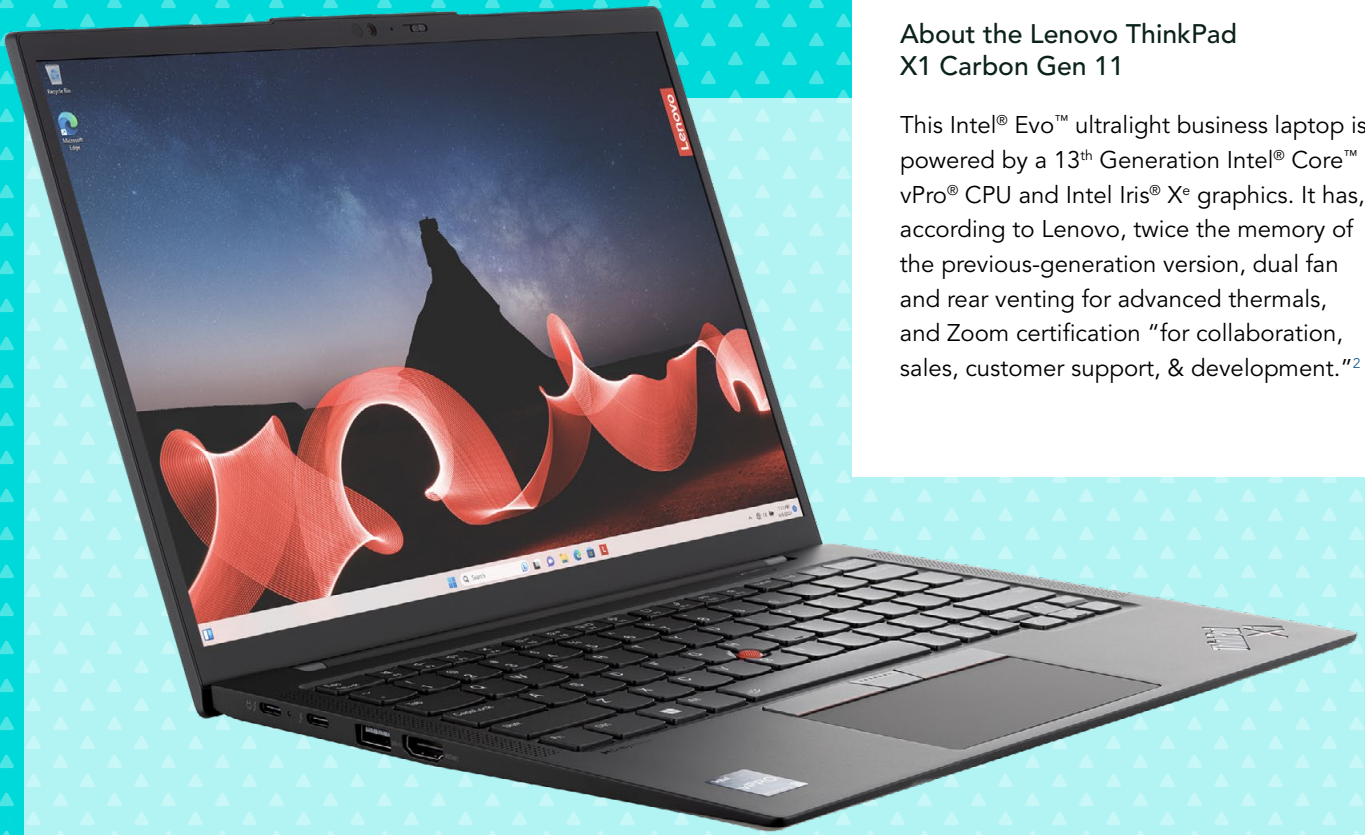
The new ThinkPad X1 Carbon Gen 11 cost substantially less and delivered better performance benchmark scores and end-user experiences than a 14-inch Apple MacBook Pro (2023)

You're likely used to working in either Microsoft Windows or Apple® macOS®. If you typically use macOS, you may not be aware of what new Windows 11 devices from Lenovo® are bringing to the table. Let's look at the 14-inch Lenovo ThinkPad® X1 Carbon Gen 11, which was \$2,047.50 less expensive and almost a pound lighter than a comparable 14-inch Apple MacBook Pro® (2023) when we ordered them for this evaluation.

Anyone who uses resource-intensive productivity or content creation tools and keeps in touch with teammates through Zoom may be interested to know that, in our hands-on tests, the Lenovo ThinkPad X1 Carbon Gen 11 received higher performance benchmark scores, completed Microsoft 365 tasks in less time, and hogged fewer CPU resources during Zoom meetings than a 14-inch Apple MacBook Pro (2023). Additionally, this Lenovo laptop has a touchscreen for more direct interactions and can be set to Best performance power mode to prioritize performance. At the time of testing, the 14-inch Apple MacBook Pro only offered Automatic (balanced) or Low Power Mode (best battery life) power settings.¹

While each user has to decide for themselves if superior system responsiveness with a touchscreen is enough to switch operating systems, we're here to help both Windows 11 and macOS devotees with real-world performance and user experience evaluations of both systems.





About the Lenovo ThinkPad X1 Carbon Gen 11

This Intel® Evo™ ultralight business laptop is powered by a 13th Generation Intel® Core™ vPro® CPU and Intel Iris® X^e graphics. It has, according to Lenovo, twice the memory of the previous-generation version, dual fan and rear venting for advanced thermals, and Zoom certification “for collaboration, sales, customer support, & development.”²

Lenovo ThinkPad X1 Carbon Gen 11 vs 14-inch Apple MacBook Pro (2023)

Greater tactile interaction

Built-in touchscreen vs. none

29% lighter

2.74 lbs. vs. 3.56 lbs.

Built-in remote manageability³

Intel vPro with Intel Active Management Technology vs. none

Meets strict Intel processor-based laptop criteria⁴

Intel EVO certified vs. not

Modern wireless connectivity

Wi-Fi 6E and Bluetooth 5.3*

Connects with Android or iOS phones

Intel Unison™ connects PCs to Android and/or iOS phones⁵
Apple Continuity only connects macOS devices to iOS phones⁶

More business-focused connections

2x Thunderbolt™ 4 ports
2x USB-A 3.2 ports**
1x HDMI® port
1x headphone/mic combo
1x Kensington Nano Security slot

vs.

3x Thunderbolt 4 ports
1x SDXC card slot
1x HDMI port
1x headphone jack
No security slots
No USB-A ports**

*Both systems had these features.

**USB-A is a common connection type for wired and wireless connections to office essentials such as printers, scanners, mice, and external hard drives.⁷ Instead, the 14-inch Apple MacBook Pro (2023) has an SDXC card slot that allows users to store information on an external drive or import images from a digital camera.⁸

About the Intel Core i7-1370P processor

Intel designed the new 13th Generation Intel Core P-series mobile processors to “power the latest enthusiast, thin-and-light laptop designs and Internet of Things (IoT) devices.”⁹ The Intel Core i7-1370P processor we tested has a 24MB cache, a max turbo frequency of 5.2 GHz, 14 cores (6 Performance-cores and 8 Efficient-cores), 20 threads, and enhanced Intel Thread Director controller.¹⁰

ThinkPad X1 Carbon Gen 11 sustainability

A 2020 study shows that consumers care about sustainability and are willing to pay more for products that have sustainable packaging.¹¹ One of the ways Lenovo is committed to reaching net-zero emissions by 2050 is through providing environmentally conscious products that arrive in minimal recycled or biodegradable packaging materials.¹² To this end, Lenovo says that the Lenovo ThinkPad X1 Carbon Gen 11 is ENERGY STAR® certified and designed with these sustainability specs:

- The display cover contains 90 percent recycled magnesium
- The speaker enclosure contains 98 percent post-consumer content (PCC) recycled plastic
- The 57 WHr battery enclosure contains 25-30 percent PCC recycled plastic
- The 65W adapter contains 90 percent PCC recycled plastic
- Components are attached with low-temperature solder
- The laptop ships in plastic-free packaging with 90 percent recycled and/or sustainable content.¹³

Real-world ThinkPad X1 Carbon Gen 11 packaging

We took pictures during our unboxing process so you could see the sustainable packaging for yourself.



Note: The interior bamboo and sugarcane gift box in this center photo is home-compostable.



Figure 1: Lenovo ThinkPad X1 Carbon Gen 11 packaging.
Source: Principled Technologies.

How we tested

Before we started our hands-on evaluation, we set the Windows power mode on the Lenovo ThinkPad X1 Carbon Gen 11 to “Best performance.” Because the 14-inch MacBook Pro (2023) has no such performance-boosting setting, we left it as-is. Other than making and verifying that single change, we used out-of-box OEM performance settings for both laptops:

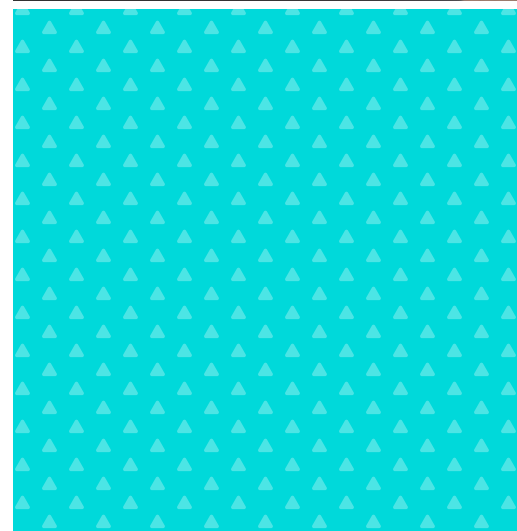
- **Lenovo ThinkPad X1 Carbon Gen 11** running Windows 11 Pro, with a 13th Generation Intel Core i7-1370P processor (3.9 – 5.2 GHz), 14 cores, Intel Iris Xe graphics, 64 GB of memory, and 1 TB of SSD storage. Cost on July 12, 2023: \$1,651.50.
- **14-inch Apple MacBook Pro (2023)** running macOS Ventura, powered by an Apple M2 Max processor (3.68 GHz), 12 cores, M2 Max 38-core GPU, 64 GB of memory, and 1 TB of SSD storage. Cost on July 12, 2023: \$3,699.00.

We ran four benchmarks to assess performance on the two devices:

- **Cinebench R23** is a benchmark that evaluates CPU and GPU capabilities using Redshift, a Cinema 4D rendering engine, and reports system performance under a heavy load.¹⁴
- **CrossMark** is a benchmark that evaluates how well devices handle diverse tasks such as application and file launches; web browsing; document, photo, and video editing; scientific simulation forecast modeling within a spreadsheet application; and multitasking.¹⁵
- **WebXPRT 4** is a browser benchmark that runs a series of tests that include HTML and JavaScript handling as well as online homework, photo manipulation, and face detection tasks.¹⁶
- We used **Speedtest by Ookla** to measure the upload and download speeds between each laptop and a test server, through the Google Chrome™ browser.

For a more complete look at the end-user experience, we also hand-timed how long it took to complete common Microsoft 365 tasks, compared CPU usage during Zoom meetings, and conducted specialized microphone and speaker comparisons on both systems.

All of the results we report reflect the specific configurations we tested. Any difference in the configurations you test, as well as browsers, screen brightness, network traffic, or software additions, can affect these results. For more information on these 14-inch laptops, as well as our testing parameters and procedures, see the [science behind the report](#).





System responsiveness results

While physical features such as display quality, ports for all your accessories, and portability are important, responding to requests and completing tasks quickly is still a laptop's primary function—but not everyone uses their laptop in the same way. That's why we conducted many different performance benchmark tests: Each one stresses the systems in different ways. We also completed a cross-section of Microsoft 365 tasks to get a look at how both systems handled common productivity tasks. Those hand-timed results are in the next section. A reminder as you dive into the heart of our report: the Lenovo ThinkPad X1 Carbon Gen 11 delivered better performance at a dramatically lower cost than the 14-inch MacBook Pro (2023).

Benchmark scores

CrossMark uses models of real-world applications to measure responsiveness and performance, so higher overall scores here give insight into how a system might perform day to day.

Many laptop users browse the web and use web-based applications every day. Regardless of job titles and descriptions, a higher WebXPRT 4 score could indicate an improved online experience.

CrossMark

Overall score | Higher is better

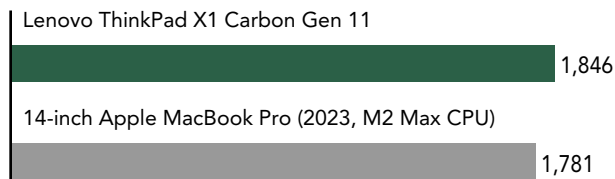


Figure 2: CrossMark overall scores. Higher is better. Source: Principled Technologies.

WebXPRT 4

Overall score | Higher is better

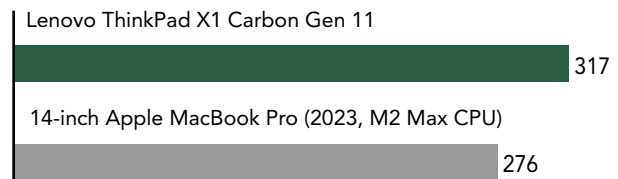


Figure 3: WebXPRT 4 with Chrome overall scores. Higher is better. Source: Principled Technologies.

While not everyone works on resource-intensive tasks for days at a time, most of us have times when we are doing computationally intensive tasks. Higher Cinebench R23 scores reveal systems that have the power to better handle working with computer-aided design (CAD) programs, complex spreadsheets, and scientific simulations. To gauge system performance under a sustained load, we also ran the default Cinebench R23 10-minute workload five times back-to-back.

Cinebench R23 single-core

Overall score | Higher is better

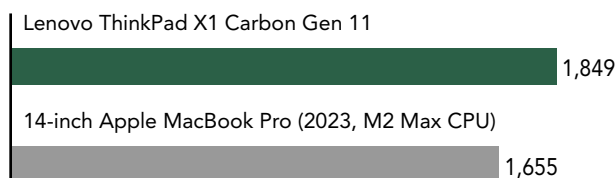


Figure 4: Cinebench R23 single-core scores. Higher is better. Source: Principled Technologies.

Cinebench R23 sustained single-core

Overall score | Higher is better

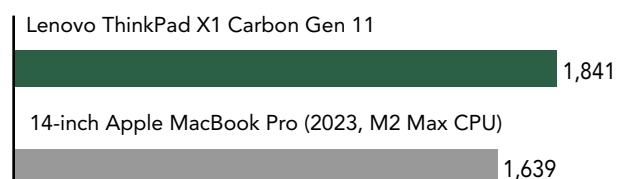


Figure 5: Cinebench R23 sustained single-core scores. Higher is better. Source: Principled Technologies.

Using a fire hose to fill a swimming pool takes less time than filling it with a garden hose. It's the same with bandwidth, which is measured in megabits per second (Mbps). The more data a laptop transfers per second, the smoother the web browsing experience.

Speedtest by Ookla

Speed scores (Mbps) | Higher is better

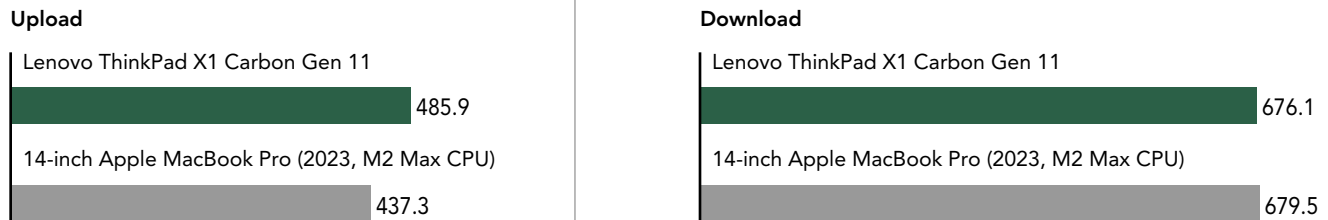


Figure 6: Speedtest by Ookla upload and download speed scores on Chrome. Higher is better. Source: Principled Technologies.

About Intel Unison

Intel Unison enables users to sync their Evo-certified laptops with Android- or iOS-based phones. With Intel Unison, users can take photos and videos on their phones before transferring them to their laptops for storage and editing. Users have access to their phone's full contact list and can receive and manage phone notifications on their laptop screen. They can also use their laptop mouse or keyboard to receive or initiate voice calls and text messages.¹⁷

We tried out this feature and found the ThinkPad X1 Carbon Gen 11, which is a non-macOS device, paired successfully with an iPhone®. We were also able to easily share iPhone files to the PC and access those files.

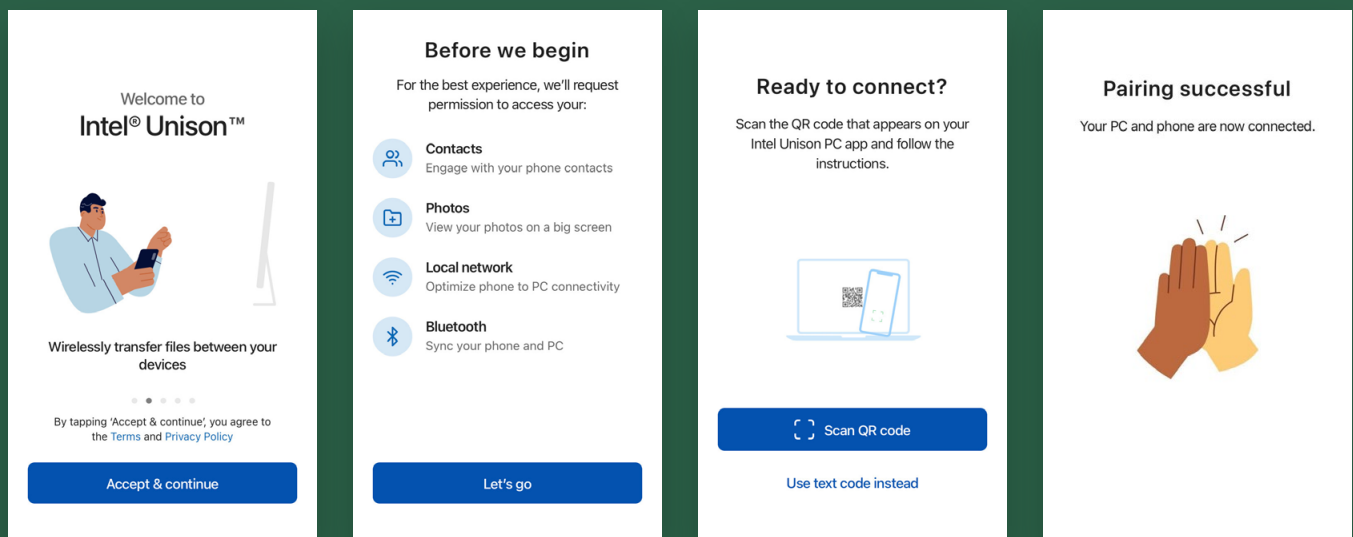


Figure 11: Screenshots of successful pairing of an Apple iPhone and a Lenovo ThinkPad X1 Carbon Gen 11 using Intel Unison. Source: Principled Technologies.

Hand-timed Microsoft 365 tasks

For this hand-timed task comparison, we completed common Microsoft 365 tasks of the type many office users might do every day. The Lenovo ThinkPad X1 Carbon Gen 11 finished the tasks faster than the Apple MacBook Pro—and while differences in seconds and fractions of seconds may seem paltry, they can make for a substantial difference in experience. When you factor in the number of times users toggle between applications during a single day and add up those micro-frustrations over a week or a month, the faster system really has the potential to boost both your mood and your productivity.

Time to complete tasks in Microsoft 365

Seconds | Less time is better

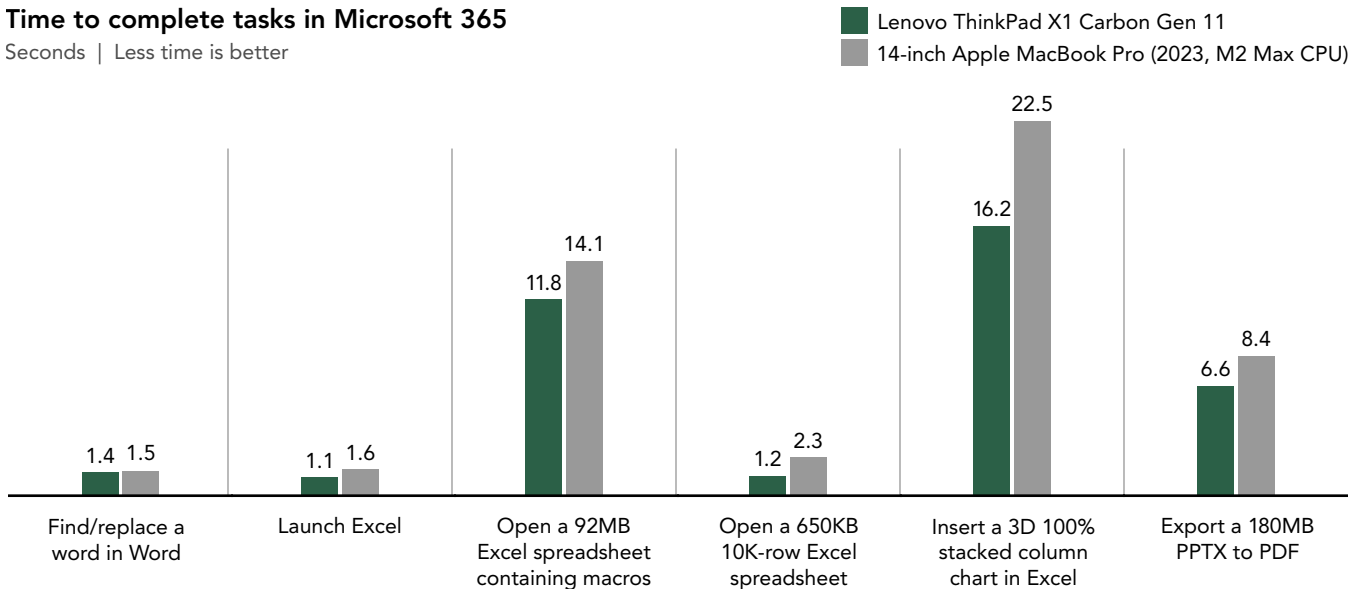


Figure 7: Time to perform various tasks in Microsoft 365. Less time is better. Source: Principled Technologies.

Security from supply chain trust through end of life

According to Help Net Security, supply chain attacks in 2022 caused more data compromises than malware—and impacted more than 10 million people.¹⁸ Lenovo and Intel have partnered to provide deeper and broader protections from the point of manufacture through transport and until the end user has the device in their hands. The first step in this secure supply chain is Intel Trusted Device Setup and Intel Transparent Supply Chain. These services fall under the Lenovo ThinkShield umbrella, which provides end-to-end protection of sensitive data with secure hardware, software, and services. With Lenovo ThinkShield and the Intel vPro platform, companies can fortify their business and protect their assets from manufacturing floor to final disposal.¹⁹

Zoom video conferencing results

CPU usage

For this comparison, we evaluated CPU usage in one-on-one and group meetings on the Lenovo ThinkPad X1 Carbon Gen 11 and 14-inch Apple MacBook Pro (2023) using Zoom. For this test, we configured Zoom to enter full-screen automatically when starting or joining a meeting; chose the audio and video on options when joining a meeting; and chose side-by-side mode when screen-sharing. This last choice was to ensure the cameras were always on-screen along with the screenshare. For repeatable audio measurements, we played a YouTube video on the host device.

System maximum CPU utilization while using Zoom

Percent utilization | Lower is better

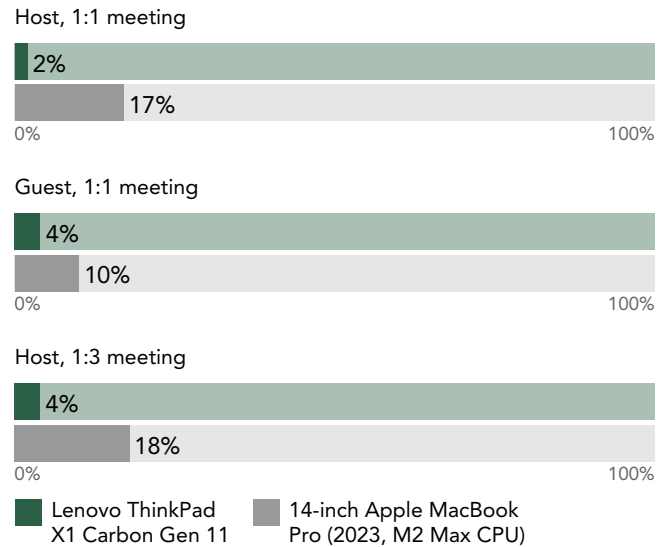
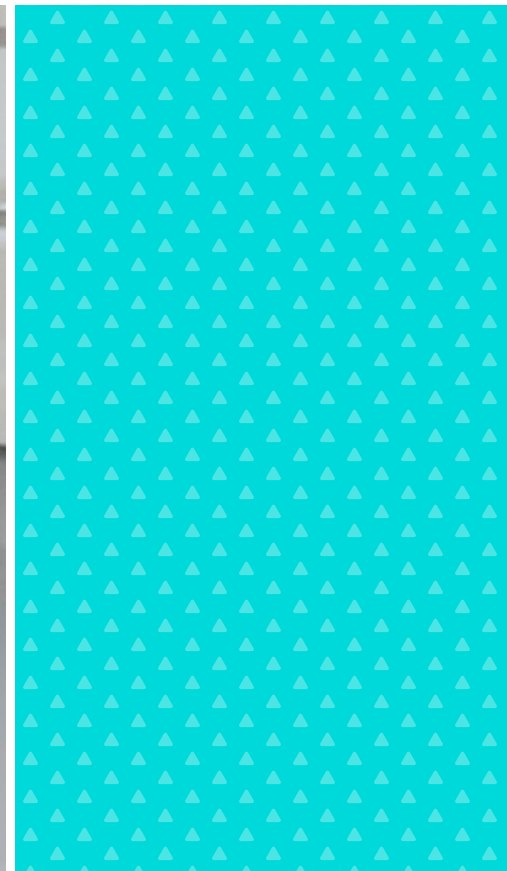


Figure 8: Zoom CPU usage, as reported by Zoom. Lower usage is better. Source: Principled Technologies.



Audio experience results

With many companies opting to embrace remote and hybrid work environments, the components we rely on to keep far-flung team members and clients connected are more important than ever.

Microphone noise reduction

We found that the Lenovo ThinkPad X1 Carbon Gen 11, with its four 360-degree mics with integrated AI-based noise cancellation and Dolby Voice®, was better at reducing background noise when compared to the 14-inch MacBook Pro (2023), with its three-mic array with high signal-to-noise ratio and directional beamforming.^{20,21} With better background noise reduction and fewer audio distractions, it's easier for your colleagues to hear what you're saying, focus on the discussion at hand, and even relax into the conversation.

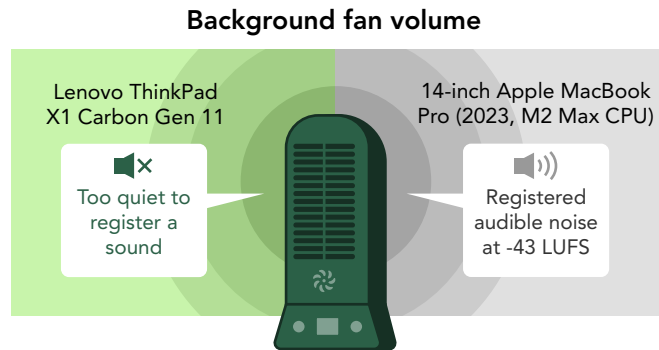


Figure 9: Microphone test background fan volume results. Lower LUFS, which is a standard loudness measurement, are better. Source: Principled Technologies.

Speaker volume output

We found that the Lenovo ThinkPad X1 Carbon Gen 11, with its stereo speakers and Dolby® Atmos® surround sound technology, delivered louder speaker volume output than the 14-inch MacBook Pro (2023) with its high-fidelity six-speaker sound system.^{22,23} For context, 60 dB is the volume of normal conversation.²⁴ To mimic the variances in human conversation, we set the target dB to 64. While speaker volume output may not be top-of-list for features you prioritize, think about how frustrating a quiet speaker might be when you want to step away from your laptop to grab a drink or snack during a long video conferencing meeting you're just there to learn from. The louder the speaker volume output, the longer your proverbial leash.

Maximum audio output needed to reach target dB

Percent of maximum system volume | Lower is better

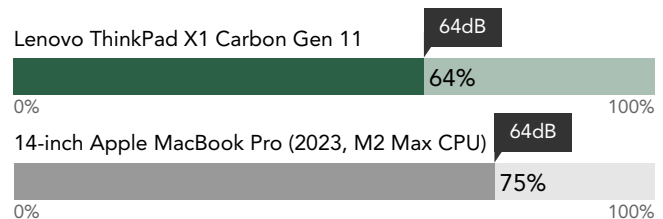


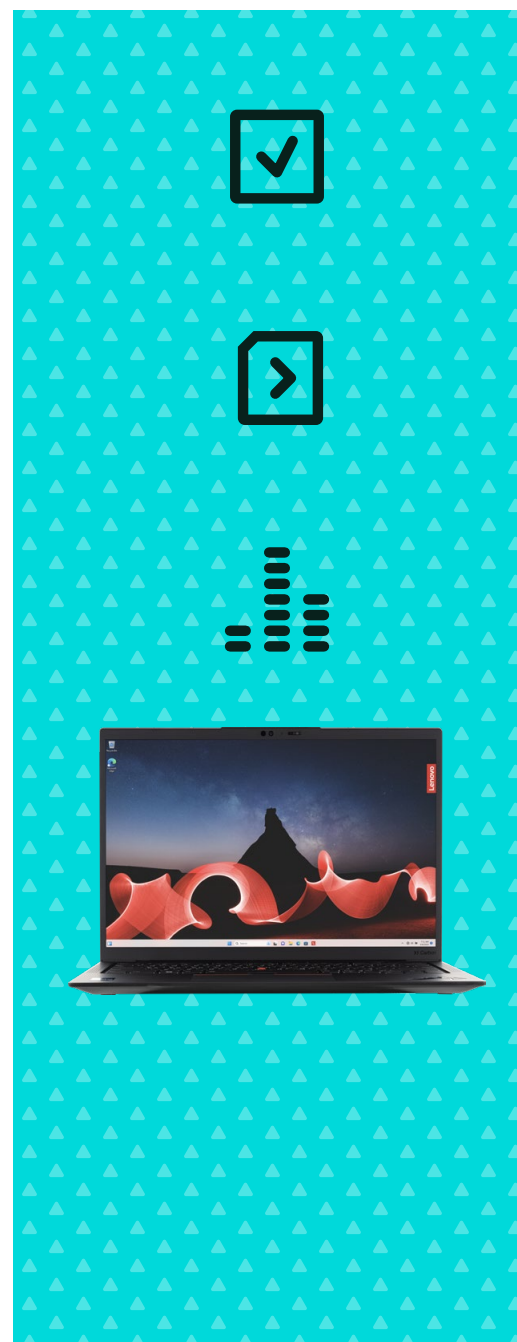
Figure 10: Speaker volume output level results. Lower is better. Source: Principled Technologies.



Conclusion

In our tests, the touch-capable ThinkPad X1 Carbon Gen 11 received higher performance benchmark scores (aside from an almost equivalent Ookla download score) and was \$2,047.50 less expensive than a 14-inch Apple MacBook Pro (2023). The 13th Generation ThinkPad X1 Carbon also provided better end-user experiences with good mic noise reduction, louder speaker volume output, and considerably less CPU usage during Zoom meetings versus its 14-inch MacBook Pro counterpart.

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