Improve productivity with the Lenovo ThinkCentre M90a Pro Gen 4 all-in-one desktop PC

Compared to the Apple iMac, the ThinkCentre M90a Pro Gen 4 offered stronger performance in benchmarks and hand-timed tasks

All-in-one (AIO) desktop computers offer several advantages over laptops that make them attractive to certain business users. AIO systems often contain more powerful hardware components, making them better for demanding tasks. They may also have room for additional storage, so they are easier to upgrade, they typically have more ports and support multiple types of connections, and they take up no more room than the monitor since the processing unit is attached to the back of the screen.

When choosing an AIO, consider how you'll use it. If you're a business user who multitasks, look for a system that delivers a good experience and offers strong performance on such common business applications as Microsoft 365, Zoom, and Microsoft Teams. We compared two AIO desktop systems to see how well they meet the needs of business users:

- **24-inch Lenovo® ThinkCentre™ M90a Pro Gen 4** powered by a 13th Gen Intel® Core™ i9-13900 processor
- **24-inch Apple® iMac®** powered by an Apple M1 processor

Across a range of benchmark tests and hand-timed workflows, the Lenovo ThinkCentre M90a Pro Gen 4 achieved higher scores and completed scenarios faster than the iMac. Our audio tests showed that the ThinkCentre M90a Pro Gen 4 offered louder speaker output and reduced background noise with its on-board microphone better than the iMac, making it more suitable for videoconferencing needs.

Multitask without delay

Up to 265.2% higher Cinebench R23 multi-core scores

Boost your browsing

50.6% higher WebXPRT 4 score

Get to work faster

Launch Microsoft 365 applications in up to 74.6% less time

About the Lenovo ThinkCentre M90a Pro Gen 4

This AIO business desktop computer features a 13th Gen Intel Core i9-13900 processor, Intel UHD graphics 770, Intel vPro® Enterprise, 16 GB of RAM, and 1 TB of SSD storage. According to Lenovo, the ThinkCentre M90a Pro Gen 4 can "address the needs of modern workplaces and content creators."[1] The system includes features such as:

- Energy Performance Optimizer, which uses machine learning to boost performance
- Thunderbolt 4 for ultra-fast file sharing
- Support for an additional 8K monitor or two additional 4K monitors
- Support for external GPUs and storage devices
- Flicker Free and Eyesafe certified display with Natural Low Blue Light technology
- Intelligence privacy features such as Human Presence Detection and zero-touch login and logout
- Built-in phone-docking bar and cord management base[2]

To learn more about the Lenovo ThinkCentre M90a Pro Gen 4, visit https://news.lenovo.com/pressroom/press-releases/thinkcentre-m90a-pro-gen-4-all-in-one-desktop-pc/.

System shown with optional Conference Call Base

Lenovo ThinkCentre M90a Pro Gen 4 *vs. 24-inch Apple iMac*

Built-in remote manageability[3]

Intel vPro™ technology
vs. none

Modern wireless connectivity

Wi-Fi 6E*

*Both systems had these features.

More efficient, stable connection with less interference[4]

Bluetooth 5.3
vs Bluetooth 5.0

Lessen your environmental footprint

Sustainable packaging
vs. non

Connects with Android or iOS phones[5]

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

More connectivity options

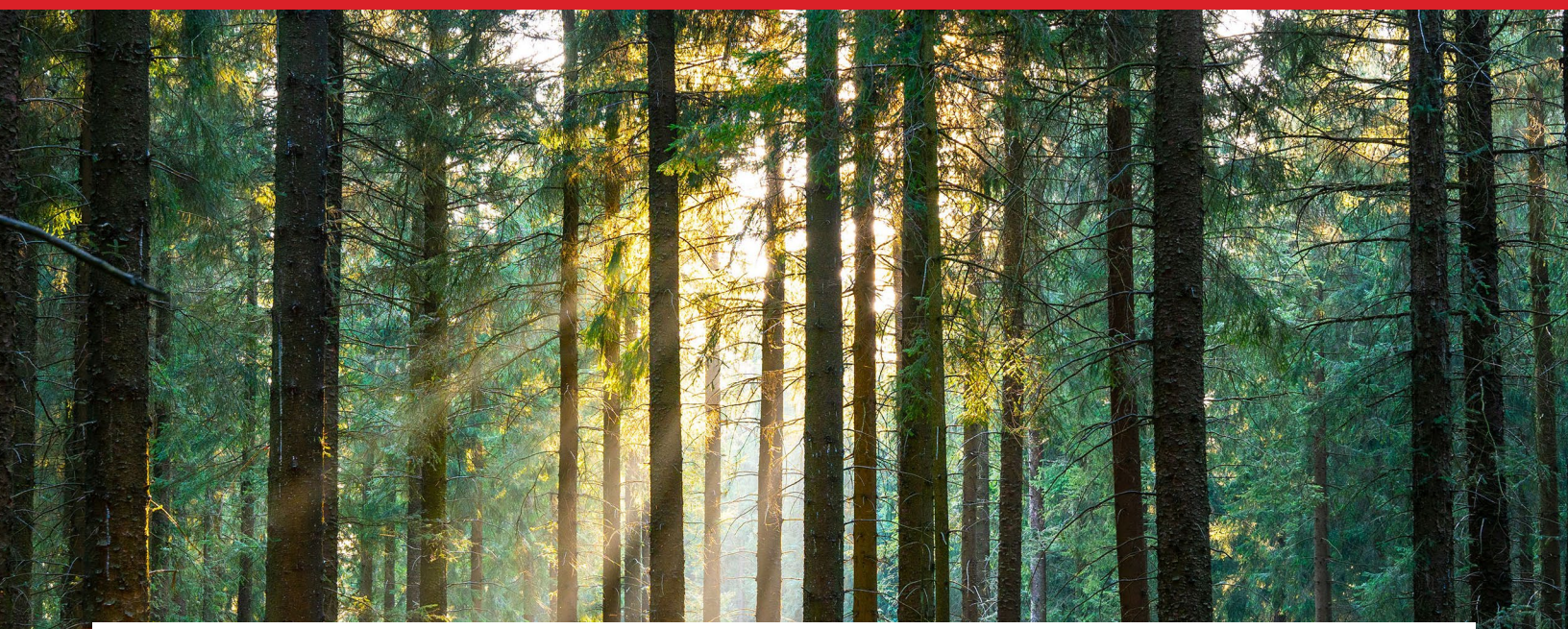
5x USB-A
3x USB-C
1x HDMI
1x DisplayPort
1x Gigabit Ethernet
1x headphone / mic combo x Smart card reader
1x Kensington Security slot
1x optical disk drive

vs.

2x Thunderbolt / USB 4 ports
2x USB 3 ports

About the Intel Core i9-13900 processor

According to Intel, 13th Gen Intel Core processors meet the needs of gamers, creators, and professionals who want "highly flexible architecture and industry-leading tools for the ultimate in performance customization."[6] The Intel Core i9-13900 processor features advanced performance hybrid architecture that includes Performance-cores (p-cores) for single and lightly threaded performance, and Efficient-cores (E-cores) for highly threaded workloads. The Intel Core i9-13900 processor we tested has a 36 MB Intel Smart Cache, a max turbo frequency of 5.6 GHz, 24 cores (8 Performance-cores and 16 Efficient-cores), 32 threads, and enhanced Intel Thread Director controller. To learn more about the Intel Core i9-13900 processor, visit https://ark.intel.com/content/www/us/en/ark/products/230499.html.



ThinkCentre M90a Pro Gen 4 sustainability

Many consumers are conscious of the effect their purchases have on the environment. In fact, studies show that consumers are willing to pay more for technology products that use sustainable packaging.[7] To work toward their stated goal of net-zero emissions by 2050, Lenovo ships many systems in recycled or biodegradable packaging materials.[8] With environmental concerns in mind, the Lenovo ThinkCentre M90a Gen 4 offers:

- ENERGY STAR® certification
- EPEAT® Gold certification
- TCO 9.0 certification and available CO2 Offset Service
- Sustainable packaging, including:
  - EPE cushioning, an environmentally safe, recyclable foaming material
  - System bags made with 30% ocean-bound plastic (OBP)
  - Forest Stewardship Council (FSC) certified paper packaging materials, which saves trees
  - Packaging made with 65% post-consumer content

Real-world ThinkCentre M90a Pro Gen 4 packaging

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

Figure 1: Lenovo ThinkCentre M90a Pro Gen 4 packaging.
Source: Principled Technologies.

How we tested

Before we started our hands-on evaluation, we set the Windows power mode on the Lenovo ThinkCentre M90a Pro Gen 4 to "Best performance." Because the 24-inch Apple iMac has no such setting, we left it as-is. Other than making and verifying that single change, we used out-of-box OEM performance settings for both devices:

- **Lenovo ThinkCentre M90a Pro Gen 4** running Windows 11 Pro, with a 13th Generation Intel Core i9-13900 vPro processor (4.2 – 5.6 GHz), 24 cores, Intel UHD graphics, 16 GB of memory, and 1 TB of SSD storage.
- **24-inch Apple iMac** running macOS Ventura, with an M1 processor (3.2 GHz), 8 cores, M1 8-core GPU, 16 GB of memory, and 1 TB of SSD storage.*

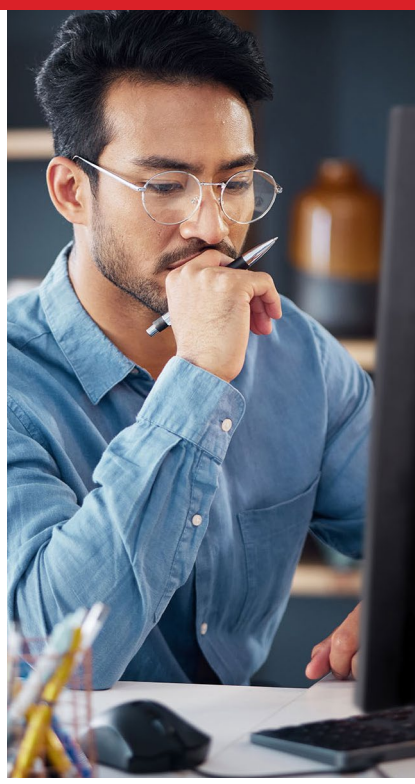
*We completed testing before the new iMac with M3 chip was available; this was the best available model at the time of testing.

To measure the performance of the devices, PT conducted six benchmark tests:

- **Cinebench R23** evaluates CPU and GPU capabilities using Redshift, a Cinema 4D rendering engine, and reports system performance under a heavy load.
- **WebXPRT 4** is an internet 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.
- **CrossMark** 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.
- **Procyon Office Productivity** measures performance with workloads that contain common tasks in Microsoft 365 applications.
- **Procyon Photo Editing** measures performance with workloads that feature common photo-editing tasks in Adobe® Lightroom® and Adobe Photoshop®.
- **Geekbench 6** measures system performance using everyday tasks in popular applications. The benchmark provides a score for both the CPU and the GPU.

To get a better understanding of the systems and their application responsiveness, we hand-timed a series of common tasks in Microsoft Word, PowerPoint, and Excel. We also measured how long it took the devices to complete custom multitasking workflows, compared Zoom video conferencing experiences, and conducted speaker and microphone tests.

All 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 24-inch AIO devices and our testing parameters and procedures, see the science behind the report.



System responsiveness (performance) results

One of the potential advantages of an AIO desktop system is that these systems are larger than laptop and mobile devices and can accommodate bigger, more powerful hardware components. To measure the system responsiveness of the two systems, we conducted a series of benchmark tests that stress the systems in different ways.

Benchmark scores

Cinebench R23

The Cinebench R23 benchmark stresses the GPU and CPU of the systems to see how the systems perform under constant heavy load. A high Cinebench R23 score indicates that a system can handle multi-threaded tasks, such as 3D rendering, video editing, and gaming.

Cinebench R23

Overall score | Higher is better

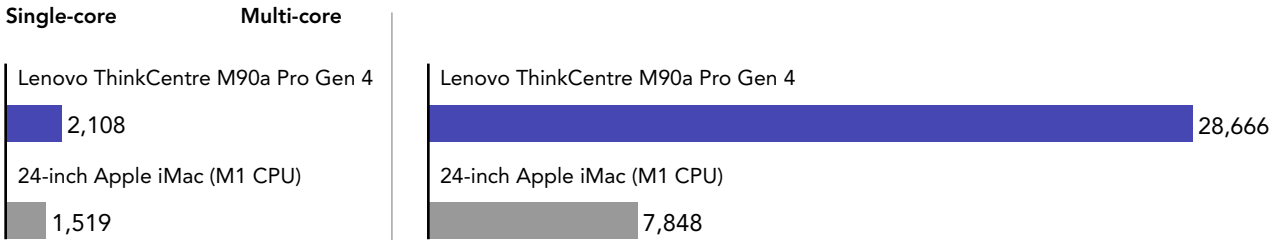


Figure 2: Cinebench R23 multi-core scores. Higher is better. Source: Principled Technologies.

WebXPRT 4

Many business workers use web-browsing and web-based applications frequently. A higher WebXPRT score indicates that a system can provide a better, more responsive web-browsing experience.

WebXPRT 4

Overall score | Higher is better

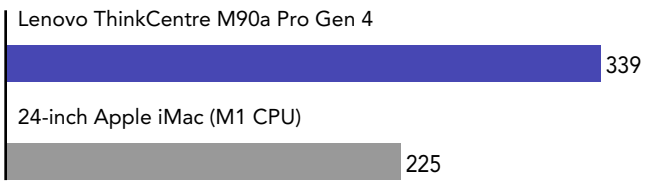


Figure 3: WebXPRT 4 overall scores using the Chrome browser. Higher is better. Source: Principled Technologies.

CrossMark

The CrossMark benchmark uses models of real-world applications to measure system responsiveness. A higher CrossMark score indicates better general system responsiveness.

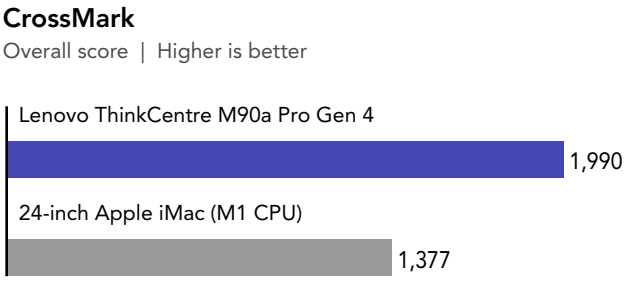


Figure 4: CrossMark overall scores. Higher is better. Source: Principled Technologies.

Connected computing with Intel Unison

Few of us can work on our laptops for very long without needing to check our phone or take a call. Fortunately for users of the Lenovo ThinkCentre M90a Pro Gen 4, this system comes with Intel Unison.[9] According to Intel, "Unison seamlessly connects your PC and devices for a universal, easy-to use experience."[10] Unison gives users the flexibility to make calls, send and receive test messages, transfer files, and manage notifications from their PC or their phone. To learn more about the features of Unison, visit https://www.intel.com/content/www/us/en/products/docs/unison/overview.html.

The Intel® Unison™ solution is currently available for approved configurations of Windows-based PCs and pairs with Android or iOS-based phones or tablets. Intel Unison also requires a companion mobile app that can be downloaded from the relevant app store and all devices must run a supported OS version. Results may vary.

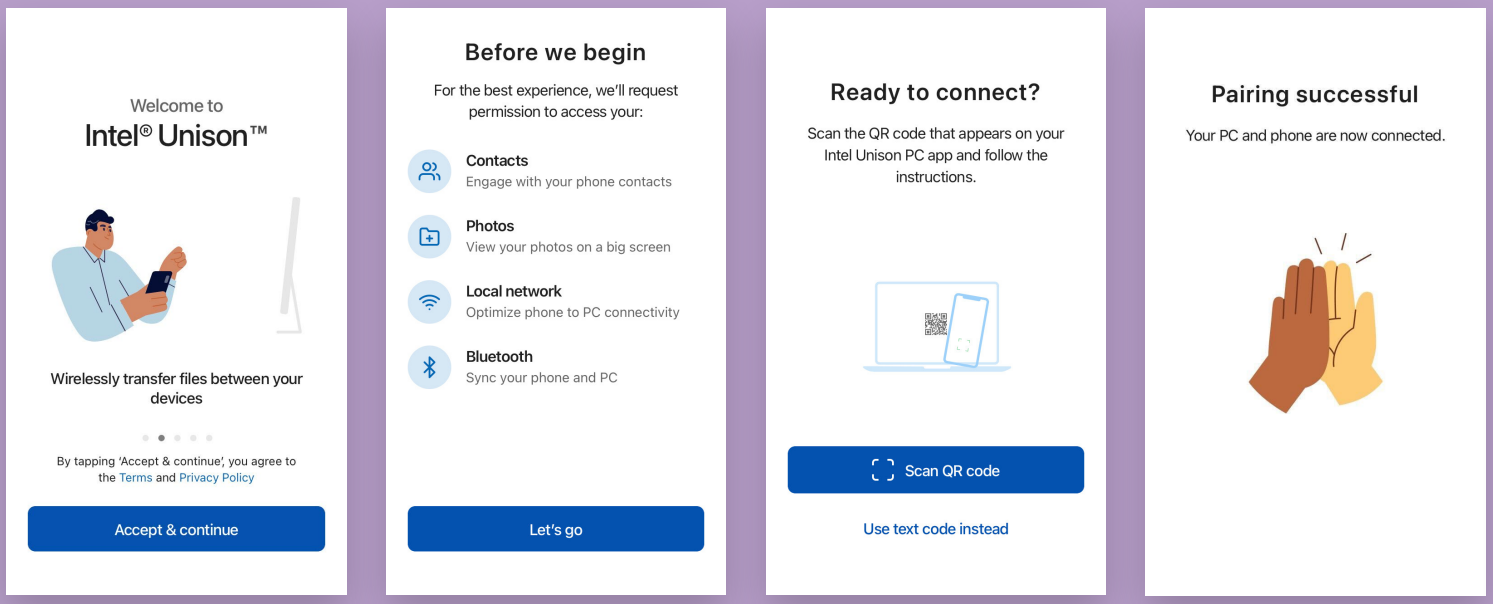


Figure 5: Screenshots of successful pairing of an Apple iPhone and a Lenovo ThinkCentre M90a Pro Gen 4 using Intel Unison. Source: Principled Technologies.

Procyon Office Productivity

The Procyon Office Productivity benchmark measures performance while completing office productivity tasks in the Microsoft 365 suite of applications. A higher Procyon Office Productivity score indicates that the system can provide better performance while using Microsoft 365 applications.

Procyon Office Productivity
Overall score | Higher is better

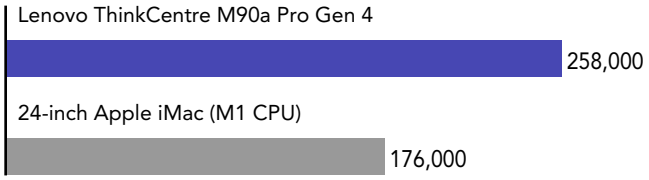


Figure 6: Procyon Office Productivity overall scores. Higher is better. Source: Principled Technologies.

Procyon Photo Editing

The Procyon Photo Editing benchmark uses workloads that simulate real-work photo-editing tasks in Adobe Lightroom and Adobe Photoshop. A higher Procyon Photo Editing score indicates a system can offer better performance while editing photos in these apps.

Procyon Photo Editing
Overall score | Higher is better

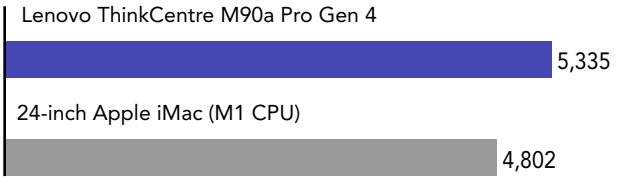


Figure 7: Procyon Photo Editing overall scores. Higher is better. Source: Principled Technologies.

Geekbench 6

Geekbench 6 evaluates a system's single-core and multi-core performance using everyday tasks and scenarios, such as checking email or playing music, or doing both at the same time. A higher Geekbench 6 single-core score indicates that the system could provide better performance while processing workloads that don't require multiple cores, such as web browsing and office productivity applications. A higher Geekbench 6 multi-core score indicates the system could provide better performance while processing multi-threaded workflows, such as data analysis, video editing, and 3D gaming.

Geekbench 6
Overall score | Higher is better

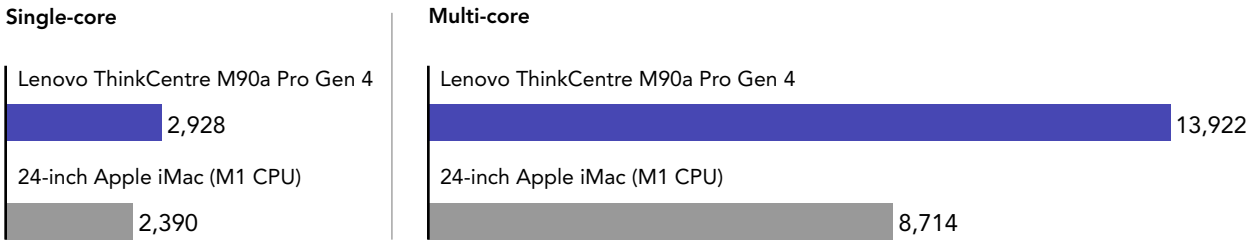
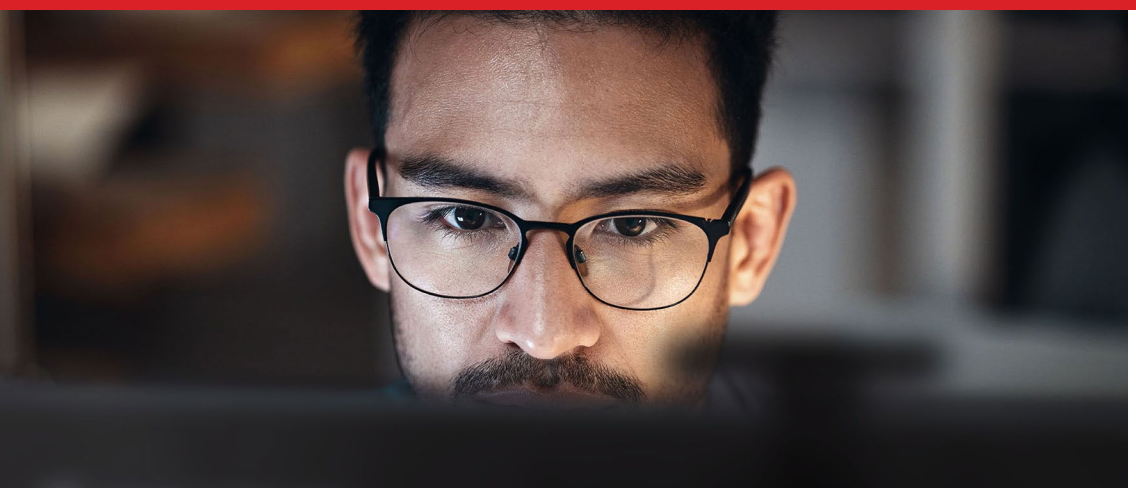


Figure 8: Geekbench 6 scores. Higher is better. Source: Princi`pled Technologies.

Full lifecycle security with Lenovo ThinkShield

Lenovo systems offer ThinkShield to deliver comprehensive security across the full lifecycle of your devices. According to Lenovo, "ThinkShield evolves with the modern threat landscape to protect your business and adapt to the needs of the workforce."[11] ThinkShield provides security features such as:

- Endpoint security and management
- Data defense and secure cloud backup
- Passwordless authentication
- BIOS firmware
- Firmware, hardware, and software security and verification
- Trusted Supplier program[12]



Everyday productivity results

A typical workday involves hundreds of tasks such as launching an application, opening an Excel spreadsheet, or exporting a PowerPoint presentation. While each of these tasks may take only a few seconds, over the course of weeks and months, these seconds can really add up. We hand-timed how long each system took to complete a series of common tasks in Microsoft 365 and found that the ThinkCentre M90a Pro Gen 4 completed the tasks in less time than the iMac.

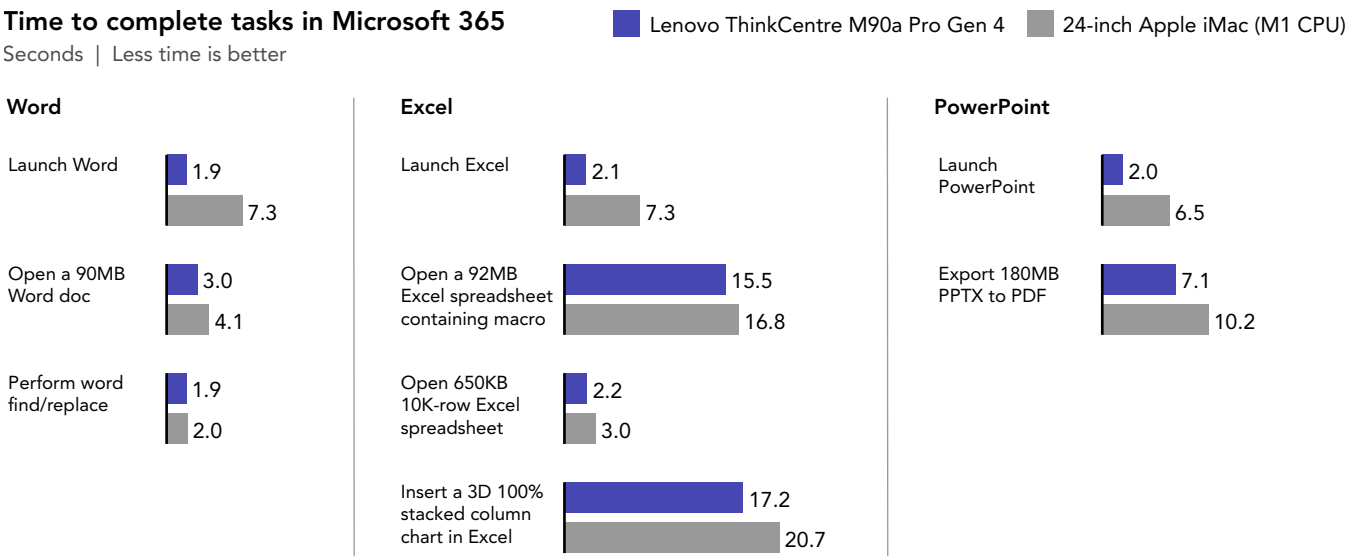


Figure 9: Time to perform various tasks in Microsoft 365. Less time is better. Source: Principled Technologies.

To measure how well the systems performed in a web-browsing scenario, we hand-timed how long it took the systems to launch the Mozilla Firefox browser and populate 20 tabs. The ThinkCentre M90a Pro Gen 4 was able to complete this workflow faster than the iMac.

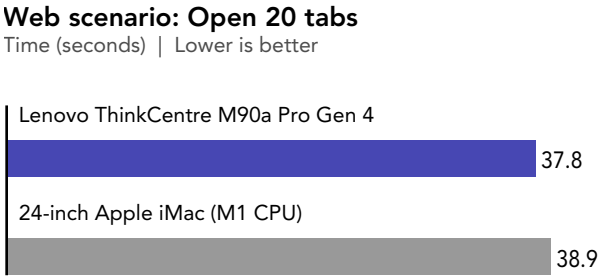


Figure 10: The time, in seconds, it took the systems to launch Firefox and open 20 tabs. Lower is better. Source: Principled Technologies.

Collaboration workflow using Zoom (Outlook, PowerPoint, Google Chrome, Excel)

To measure how well the systems performed in a collaboration scenario, we created a custom workflow using multiple tasks in Zoom, Outlook, PowerPoint, Google Chrome, and Excel. When we timed how long each system took to complete the workflow, the ThinkCentre M90a Pro Gen 4 completed it in 6.6 percent less time than the iMac. Speeding up multitasking in productivity and collaboration applications with the ThinkCentre M90a Pro Gen 4 could provide a better experience for end users.

Collaboration workflow using Zoom

Time (seconds) | Lower is better

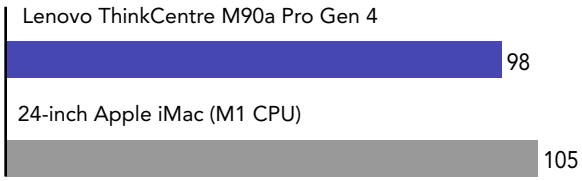


Figure 11: The time it took the systems to perform the collaboration workflow, in seconds. Lower is better. Source: Principled Technologies.

Zoom video conferencing results

CPU usage

We also measured CPU usage in group and one-on-one Zoom meetings on the Lenovo ThinkCentre M90a Pro Gen 4 and 24-inch Apple iMac. 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 utilzation | Lower is better

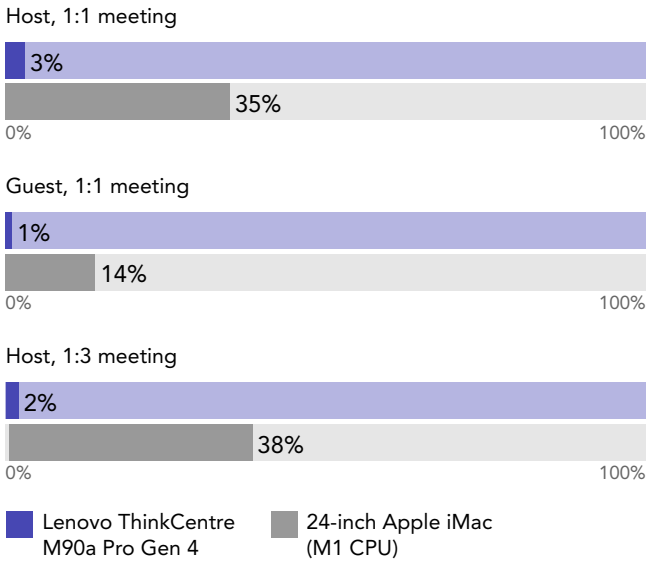


Figure 12: Zoom CPU usage, as reported by Zoom. Lower usage is better. Source: Principled Technologies.

Audio experience (microphone and speaker) results

The prevalence of videoconferencing means that audio experience, including background noise and speaker output, are more important than ever. We compared the quality of the audio experience on both devices and found that the Lenovo ThinkCentre M90a Pro Gen 4 reduced background noise and offered louder speaker output to help make remote meetings a success. (See the science behind the report for test details.)

Background noise reduction

Hard-working AIO systems can produce background noise that might distract from the message you're getting out to your team. We measured the background noise elimination capabilities of both devices and found that the ThinkCentre M90a Pro Gen 4 was more effective at reducing background noise, as the background fan was too quiet to register a sound.

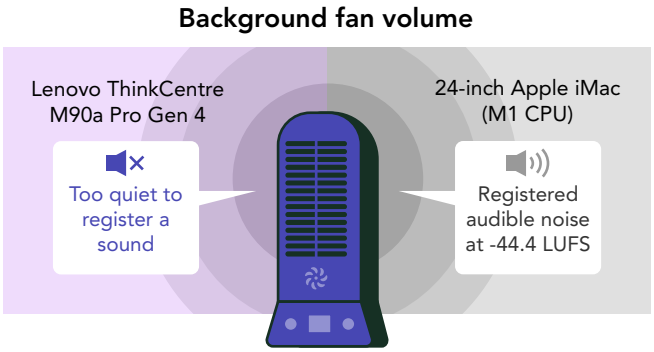


Figure 13: Microphone test background fan volume results. Lower LUFS, which is a standard loudness measurement, are better. Source: Principled Technologies.

Louder speaker output

We found that the Lenovo ThinkCentre M90a Pro Gen 4 offered louder speaker output than the Apple iMac. Strong speaker output gives you the flexibility to turn up the volume of your device to drown out distractions and keep you on task.

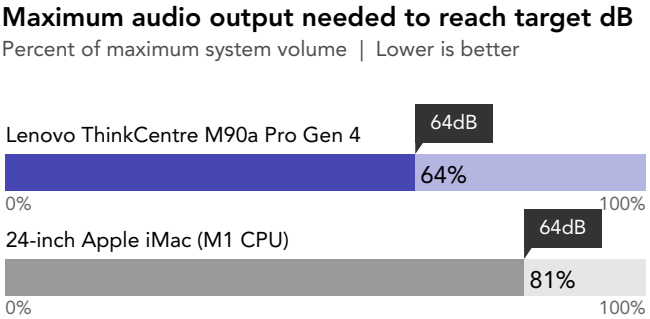
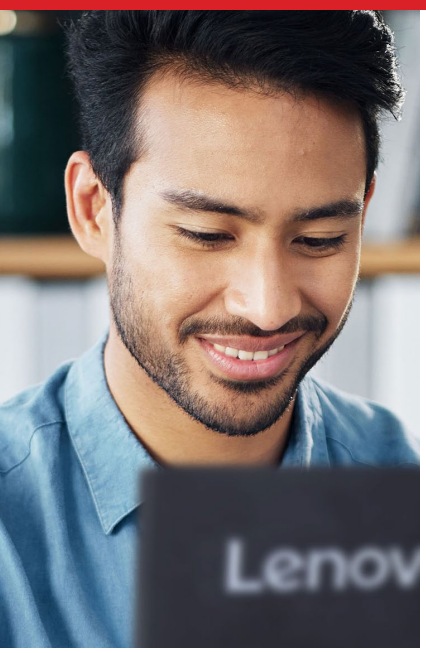


Figure 14: Speaker volume output level results. Lower is better. Source: Principled Technologies.



Conclusion

Before you invest in an all-in-one PC for yourself or your workforce, make sure it's up to the task. Our tests showed that the Lenovo ThinkCentre M90a Pro Gen 4 was a good multitasking system, consistently achieving higher scores on benchmark tests and completing hand-timed workflows faster than the iMac. Plus, the ThinkCentre M90a Pro Gen 4 offered strong speaker output and microphone quality for a positive videoconferencing experience and it arrives at the door in thoughtful, sustainable packing that lessens your environmental impact.

1. Lenovo, "Lenovo ThinkCentre M90a Pro Gen 4 Raises Standards for Flagshio All-in-One Desktop PCs," accessed October 15, 2023, https://news.lenovo.com/pressroom/press-releases/thinkcentre-m90a-pro-gen-4-all-in-one-desktop-pc/.
2. Lenovo, "Lenovo ThinkCentre M90a Pro Gen 4 Raises Standards for Flagshio All-in-One Desktop PCs," accessed October 15, 2023, https://news.lenovo.com/pressroom/press-releases/thinkcentre-m90a-pro-gen-4-all-in-one-desktop-pc/.
3. Intel, "What is the Intel vPro Platform?," accessed October 15, 2023, https://www.intel.com/content/www/us/en/architecture-and-technology/vpro/what-is-vpro.html.
4. Joe Svetlik, Becky Scarrott, "Bluetooth 5.0: everything you need to know," accessed October 16, 2023, https://www.whathifi.com/advice/bluetooth-5-everything-you-need-to-know.
5. Intel® Unison™ solution is currently available on Windows-based PCs to pair with Android- or iOS-based phones and tablets. Some premium features only available on eligible designs. All devices must run a supported OS version. See intel.com/performance-wireless for details.
6. Intel, "13th Gen Intel Core Processor Family," accessed October 15, 2023, https://www.intel.com/content/www/us/en/products/docs/processors/core/13th-gen-processors.html.
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8. Lenovo, "Environmental, Social and Governance Report," accessed November 2, 2023, https://investor.lenovo.com//en/sustainability/reports/FY2023-lenovo-sustainability-report.pdf.
9. Intel® Unison™ solution is currently available on Windows-based PCs to pair with Android- or iOS-based phones and tablets. Some premium features only available on eligible designs. All devices must run a supported OS version. See intel.com/performance-wireless for details.
10. Intel, "Put Your PC at the Center of All You Do," accessed October 13, 2023, https://www.intel.com/content/www/us/en/products/docs/unison/overview.html
11. Lenovo, "Lenovo ThinkShield," accessed October 13, 2023, https://techtoday.lenovo.com/us/en/solutions/thinkshield.
12. Lenovo, "Lenovo ThinkShield."

Read the science behind this report at https://facts.pt/LG8Hvd5 ▶

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This project was commissioned by Lenovo.