The science behind the report:

Lenovo ThinkPad T14s Gen 4: Heightened productivity, lower cost

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Lenovo ThinkPad T14s Gen 4: Heightened productivity, lower cost.

We concluded our hands-on testing on October 26, 2023. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on September 20, 2023 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins.
Unless we state otherwise, we have followed the rules and principles we outline in that document.

Performance benchmark results

Table 1: The table below represents our benchmark results in detail. Higher benchmark scores are better. We report the median score of three runs for each test.

	Lenovo ThinkPad T14s Gen 4	14-inch Apple MacBook Pro (2023)
Cinebench R23 vR23.200 (score, higher is better)		
Single-core	1,911	1,656
WebXPRT 4 on Google Chrome v116.0.5845.140		
Overall score (higher is better)	286	264
Subscores (milliseconds, lower is better)		
Photo Enhancement	295	320
Organize Album Using AI	1,213	1,749
Stock Option Pricing	76	101
Encrypt Notes and OCR Scan using WASM	692	580
Sales Graphs	221	232
Online Homework	1,723	1,498

System and application responsiveness results

Table 2: The table below represents our hand-timed test findings in detail. Lower times are better. We report the median time of three runs for each test.

	Lenovo	Apple
Microsoft Office Word (seconds, lower is better)		
Time to launch	0.8	1.0
Time to open 90MB Word document	0.8	0.9
Microsoft Office Excel (seconds, lower is better)		
Time to open 92MB Excel spreadsheet containing macro	11.6	13.2
Time to open 650KB 10K row Excel spreadsheet	0.7	0.9
Time to insert 3-D 100% Stacked Column Chart	16.3	22.1
Microsoft Office PowerPoint (seconds, lower is better)		
Time to export 180MB PPTX to PDF	6.6	8.3

Zoom video conferencing

Table 3: The table below represents our CPU findings in detail. Lower percentages are better. We report the median percentage of three runs.

	Lenovo	Apple
System maximum CPU utilization while using Zoom (percent utilization, lower is better)		
Host, 1:1 meeting	6	17
Guest, 1:1 meeting	3	11
Host, 1:3 meeting	5	17

Audio testing

Table 4: The table below represents our audio findings in detail. Lower LUFS are better. We report the median score of three runs for each test.

	Lenovo	Apple
Microphone noise reduction		
Background fan volume (LUFS)	NA (did not register the fan noise)	Registered audible noise at -41.6 LUFS

System configuration information

Table 5: Detailed information on the systems we tested.

System configuration information	Lenovo ThinkCentre M90q Gen 4 Tiny 14"	Apple MacBook Pro 14"
Processor		
Vendor	Intel	Apple
Model number	Core i7-1365U	M2 Max
Core frequency	3.90-5.20 GHz	3.68 GHz
Number of cores	10	12
Logical processors	12	NA
Memory		
Amount	32 GB	32 GB
Type	LPDDR5	Unified
Graphics		
Vendor	Intel	Apple
Model number	Intel Iris Xe Graphics	M2 Max 38-core GPU
Storage		
Amount (TB)	1	1
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Intel Wi-Fi 6E AX211	Wi-Fi 6E (802.11ax)
Bluetooth	5.3	5.3
USB	1 x MicroSD card reader 2 x Thunderbolt 4 ports 2 x USB-A 3.2 1 x Kensington Nano Security Slot	1 x MagSafe3 port 1 x SDXC card 3 x Thunderbolt 4 ports
Battery		
Type	Integrated Lithium-polymer	Integrated Lithium-polymer
Rated capacity	57	70
Display		
Size	14	14
Resolution	2,880 x 1,800	3,024 x 1,964
Operating system		
Vendor	Microsoft	Apple
Name	Windows 11 Pro	macOS Ventura
Version	22H2 Build 22621.2134	13.5.1

System configuration information	Lenovo ThinkCentre M90q Gen 4 Tiny 14"	Apple MacBook Pro 14"
BIOS		
BIOS name and version	Lenovo N3PET16W (1.07)	8422.141.2
Dimensions		
Height (in)	0.66	0.61
Width (in)	12.50	12.31
Depth (in)	8.93	8.71
Weight (system) lbs.	2.80	3.58

How we tested

Setting up the system (Windows)

Setting up and updating the OEM image

1. Boot the system under test (SUT).
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set the Windows (plugged in) Power Mode to Best Performance.
4. Set Screen and Sleep options to Never:

    a. Right-click the desktop, and select Display settings.
    b. From the left column, select System.
    c. Click Power & Battery.
    d. For all power options listed under Screen and Sleep, select Never.

5. Disable User Account Control notifications:

    a. Select Windows Start, type `UAC`, and press Enter.
    b. Move the slider control to Never notify, and click OK.

6. Run Windows Update, and install all updates available.
7. Verify the date and time are correct, and synchronize the system clock with the time server.
8. Pause Automatic Windows Updates:

    a. Click the Windows Start button.

9. Type `Windows Update settings` and press Enter.

    a. From the Pause updates drop-down menu, select Pause for 5 weeks.

Setting up the system (macOS)

Setting up and updating the OEM image

1. Boot the SUT.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set Screen and Sleep options to Never:

    a. Select System Settings.
    b. Select Screensaver.
    c. Set Lock Screen Settings to Never.
    d. Return to System Settings, and select Battery.
    e. Set On power adapter setting to High Power.

4. Disable Automatically adjust brightness:

    a. Select System Settings.
    b. Select Display.
    c. Disable Automatically adjust brightness.

5. Run Software Update, and install all updates available.
6. Verify the date and time are correct.
7. Enable Automatic log in:

    a. Select System Settings.
    b. Click Users & Groups.
    c. Select the drop-down menu next to the Automatically log in as setting, and select the User account.

8. Disable Automatic Mac Updates:

    a. Select System Settings.
    b. Click General.
    c. Click Software Update.
    d. Click the information icon next to Automatic updates.
    e. Disable Check for updates.

Performance benchmark testing

Cinebench R23 benchmark testing

Setting up the Cinebench R23 test (Windows & macOS)

1. Download and install Cinebench from https://www.maxon.net/en/downloads/cinebench-r23-downloads.

Running the Cinebench R23 benchmark (Windows & macOS)

1. Launch Cinebench.
2. Select File→Advanced benchmark.
3. Set the Minimum Test Duration to Off.
4. Select either CPU (Multi Core) or CPU (Single Core), and click Start.
5. Record the result.
6. Wait 15 minutes before re-running.
7. Repeat steps 1 through 6 two more times.

WebXPRT 4 benchmark testing (Google Chrome)

Running the test (Windows & macOS)

1. Open the Web browser under test, and go to https://www.principledtechnologies.com/benchmarkxprt/webxprt/.
2. Click Run WebXPRT 4.
3. At the Ready to test your browser screen, click Continue.
4. Click Start.
5. When the test completes, record the results.
6. Click Run Again, and click Start to rerun WebXPRT. Record the results.
7. Repeat step 6 two more times.

Hand-timed custom workflow testing and multitasking scenarios

Time to complete the hand-timed Microsoft PowerPoint scenario

We recorded how long it took to launch PowerPoint, open a 180MB PowerPoint PPTX file, start a slideshow task, and export a PPTX to PDF. A stopwatch is required for this test.

We used the following application:

- Microsoft PowerPoint (Windows v16.0.16731.20194 & macOS v16.76.1.23082301)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch PowerPoint.
2. Stop the timer when PowerPoint has loaded.
3. Browse to where the test PowerPoint file is located.
4. Simultaneously start the timer and open the PowerPoint file.
5. Stop the timer when the PowerPoint file has loaded, as indicated by all 33 slides appearing in the side bar, and record the results.
6. Simultaneously start the timer and press F5 to start the slide show.
7. Stop the timer when the slide show starts to play.
8. Exit the slide show.
9. Click File→Export→Create PDF/XPS.
10. Simultaneously start the timer and click Publish.
11. Stop the timer when the PDF has been created, and record the results.
12. Repeat steps 1 through 11 two more times.

Time to complete the hand-timed Microsoft Excel scenario

We recorded how long it took to launch Excel, open a 92MB macro Excel XLSX file, open a 650KB 10K row Excel XLSX and insert a 3D 100% stacked column chart into the 10K row spreadsheet. A stopwatch is required for this test.

We used the following application:

- • Microsoft Excel (Windows v16.0.16731.20194 & macOS v16.76.23081101)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Excel.
2. Stop the timer when Excel has loaded.
3. Browse to where the test Excel macro file is located.
4. Simultaneously start the timer and open the Excel macro file.
5. Stop the timer when the Excel file has loaded.
6. Close the macro test file.
7. Browse to where the test Excel 10K row file is located.
8. Simultaneously start the timer and open the 10K row file.
9. Stop the timer when the Excel file has loaded.
10. Click Insert, and select the drop-down menu next to the Insert Column or Bar Chart icon.
11. At the bottom of the drop-down menu, select More Column Charts.
12. Under the Column section, choose 3-D 100% Stacked Column.
13. Simultaneously start the timer and click Ok.
14. Stop the timer when the 3-D 100% Stacked Column Chart appears.
15. Repeat steps 1 through 14 two more times.

Time to complete the hand-timed Microsoft Word scenario

We recorded how long it took to launch Word, open a 90MB Word DOCX file, perform a find/replace task, and export a DOCX file to PDF. A stopwatch is required for this test.

We used the following application:

- • Microsoft Word (Windows v16.0.16731.20194 & macOS v16.49.23082301)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Word.
2. Stop the timer when Word has loaded.
3. Locate the test Word file.
4. Simultaneously start the timer and open the Word file.
5. Stop the timer when the Word document has fully loaded.
6. Press CTRL + H/Control + H to bring up the Find/Replace dialog box.
7. In the Find What field, type I
8. In the Replace With field, type TEST
9. Simultaneously start the timer and select Replace All.
10. Stop the timer when Word has replaced every I.
11. Click File→Export→Create PDF/XPS.
12. Simultaneously start the timer and click Publish.
13. Stop the timer when the Word has exported the document to PDF.
14. Close the Word document. Do not save changes.
15. Repeat steps 1 through 14 two more times.

Video-conferencing testing

Preparing to install Zoom (Windows)

1. Open Edge.
2. Navigate to https://zoom.us/downloads.
3. Under Zoom Desktop Client, click Download.
4. When the file is done downloading, click Open File to begin the installation.

Installing Zoom (Windows)

1. In the Installer, click Continue.
2. Click Yes to allow Zoom to install on Allow this program to make changes to your device.
3. When the installation finishes, click Done.

Configuring Zoom (Windows)

1. Right-click the Zoom icon in the tray, and click Check for Updates.
2. Click Ok to download updates.
3. Click Install to install updates.
4. If there are no updates, click Close.
5. Right-click the Zoom icon in the tray, and click Settings.
6. Under General, enable Enter full screen when starting or joining a meeting.
7. Under Preferences, click Video.
8. Click OK to allow Zoom access to the Camera.
9. Click Audio.
10. Click OK to allow Zoom access to the microphone.
11. Enable Automatically join computer audio when joining.
12. Click Share Screen.

Preparing to install Zoom (macOS)

1. Open Safari.
2. Navigate to https://zoom.us/downloads.
3. Under Zoom Desktop Client, click Download.
4. When prompted to allow downloads from zoom.us, click Allow.
5. When the download is complete, click the download icon on the Mac taskbar, and select zoomusInstallerFull.pkg.

Installing Zoom (macOS)

1. In the Installer, click Continue.
2. Click Install.
3. If prompted to enter user password, do so, and press enter. Otherwise, click Install.
4. Click OK to allow Installer to access files.
5. When the installation completes, click Done.

Configuring Zoom (macOS)

1. Navigate to the menu at the top of the screen, and click Check for Updates.
2. Click Ok to download updates.
3. Click Install to install updates.
4. Under General, enable Enter full screen when starting or joining a meeting.
5. Under Preferences, click Video.
6. Click OK to allow Zoom access to the Camera.
7. Click Audio.
8. Click OK to allow Zoom access to the microphone.
9. Enable Automatically join computer audio when joining.
10. Click Share Screen.
11. Enable Side-by-Side Mode.

Configuring the Zoom account on the Zoom.com portal

1. Navigate to Zoom.us, and sign into the admin account you will use to host the Zoom calls.
2. Navigate to Settings, under Personal.
3. Click Meeting.
4. Scroll down and enable the following:

    • Start meetings with host video on.

    • Start meetings with participant video on. Participants can change this during the meeting.

Configuring the host for a Zoom call

1. Click Sign in to log into Zoom.
2. Enter Username.
3. Enter Password.
4. Check Keep me signed in.
5. Click Sign in.
6. Close out of the Zoom experience by pressing the X in the top right of the pop-up window.
7. On the Zoom landing page, click the down arrow under New Meeting, and check to enable Use my Personal Meeting ID (PMI).

Notes on testing

• Once in the call, we used screen share to display a PowerPoint.

• To simulate talking that all devices could hear, we played audio from a YouTube video in the background.

• We pointed all devices at an oscillating fan to simulate movement for the duration of the test.

• The call lasted 10 minutes, starting from the time all devices were in the call, all cameras were on, a user had turned on screenshare, and audio was playing .

Joining a Zoom call as a guest

1. Click Join a Meeting.
2. Enter the Personal Meeting ID of the host meeting.
3. Click Join.

Web-camera quality testing

1. Set each system brightness as close as possible to 200 nits without going below that level.
2. Using a Digital light meter (Dr.meter LX1330B), measure the room brightness.
3. For the Windows 11 system, open the Camera App. For macOS systems, open the Photo Booth App.
4. When positioned correctly, take a picture.

Audio quality testing

Note: We conducted testing in an audio room with an enclosed sound booth. In addition to the SUTs, we used one additional system, located in the audio room. We connected this system to the speaker in the sound booth.

Pre-test setup

1. Install Audacity on each SUT, and confirm that there are no issues with on-board mic recording.
2. Install VLC media player as a consistent media player on all SUTs.
3. Trim the sample song so that a roughly 20-second sample of the loudest part of the song remains.
4. Load the sample song file onto each SUT using a USB drive.

Microphone noise reduction

Setup

1. Place the Yamaha speaker in the sound booth, near the position where a laptop user would be speaking. Connect the speaker to the audio room computer, on which you have loaded a speaking sample representative of normal conversation. Use this same sample for each test for consistency.
2. Set the input volume of the onboard microphone to approximately 98%.
3. Place the SUT on the desk in the sound booth, and open Audacity. Measure the angle of screen tilt to maintain consistency across all SUTs. Press Record, and exit the sound booth.

4. On the audio room computer, press Play to play the speaking sample (roughly 20 seconds long).
5. Enter the sound booth, and stop recording in Audacity.
6. Transfer the recorded file to the audio room computer to analyze in Pro tools.
7. To match the stereo format of the Lenovo device recording, duplicate the Mac's mono audio file and combine the two mono duplicates into a single stereo track.
8. Use FabFilter Pro L2 in the Integrated setting in Loudness mode to measure the average loudness of both clips. Using clip gain as needed, level match clips to -21.1 LUFS. Note the volume difference of each system.
9. Add a fan in back corner of the sound booth, roughly 5 feet from the speaker. Keep the fan on and running at consistent speed during tests.

Testing

1. Place the SUT on the desk in the sound booth, and open Audacity. Measure the angle of screen tilt to maintain consistency across all SUTs. Press Record, and exit the sound booth.
2. Record at least 20 seconds of only fan noise.
3. Enter the sound booth, and stop recording in Audacity.
4. Transfer the recorded file to the audio room computer to analyze in Pro tools.
5. Level match recordings from both SUTs using the adjustment parameter from the "Setup" section.
6. Measure the volume level of fan noise using FabFilter Pro L2 using the Integrated setting in Loudness mode.

Read the report at https://facts.pt/z9w3QaC ▶

This project was commissioned by Lenovo.

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