The science behind the report:

Lenovo ThinkPad X1 Extreme Gen 4: Empower productivity with better portability, performance, and online collaboration capabilities

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 X1 Extreme Gen 4: Empower productivity with better portability, performance, and online collaboration capabilities.

We concluded our hands-on testing on August 10, 2022. 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 June 2, 2022 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.

Table 1: Results of our testing.

	Lenovo® ThinkPad® X1 Extreme Gen 4	Apple® MacBook Pro®16-inch
Hand-timed performance		
Multi-tasking scenario		
Launching browser and loading 20 tabs (sec.)	30.8	30.9
5K RED render in Adobe Premiere® Pro	47.4	59.5
Benchmark performance		
Cinebench R23		
Initial performance single-core scores	1,589	1,532
Initial performance multi-core scores	12,745	12,393
Sustained performance single-core scores	1,568	1,532
Geekbench 5		
GPU initial performance scores	117,565	63,103
GPU sustained performance scores	121,967	62,193

	Lenovo® ThinkPad® X1 Extreme Gen 4	Apple® MacBook Pro® 16-inch
Maxon Redshift 3D project		
Time to render a project (seconds)	382.0	614.0
Blender		
Time to run a 3D monster workload (samples per minute)	1482.0	351.0
Time to run a 3D junkshop workload (samples per minute)	851.5	179.4
Time to run a 3D classroom workload (samples per minute)	735.1	164.4
Onshape online performance check		
Performance check (lines per second)	638.1	618.2
Performance check (triangles per second)	819.9	821.8
In-game performance		
Shadow of the Tomb Raider		
Frames rendered	15993	12913
Frame rate (frames per second)	102	83
Online collaboration		
Speedtest® by Ookla®		
Download speed score (Mbps)	164.1	144.9
Upload speed score (Mbps)	150.8	137.8

System configuration information

Table 2: Detailed information on the systems we tested.

System configuration information	Lenovo ThinkPad X1 Extreme Gen 4	Apple MacBook Pro 16"
Price	$3,753.60	$4,299.00
Processor		
Vendor	Intel®	Apple
Model number	Core™ i9-11950H	M1 Max
Core frequency (GHz)	2.6 – 5.0	3.2
Number of cores	8	10
Memory		
Amount (GB)	32	64
Type	LPDDR4	Unified
Graphics #1		
Vendor	Intel	Apple
Model number	Intel Iris® Xe Graphics	M1 Max 32-core GPU
Graphics #2		
Vendor	NVIDIA®	NA
Model number	Geforce® RTX 3080	NA
Local storage		
Amount	512 GB	2 TB
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Intel Wi-Fi 6E AX210	802.11ax Wi-Fi 6
Bluetooth	5.2	5.0
USB	1 x SD 4-in-1 card reader 1 x USB-A 3.2 Gen 1 (always on) 1 x USB-A 3.2 Gen 1 2 x Thunderbolt 4 ports	1 x SDXC card 3 x Thunderbolt 4 ports
Battery		
Type	Integrated Lithium-polymer	Integrated Lithium-polymer
Rated capacity (Whr)	96	100
Display		
Size (in.)	16.0	16.2
Resolution	3,840 x 2,400	3,456 x 2,234

System configuration information	Lenovo ThinkPad X1 Extreme Gen 4	Apple MacBook Pro 16"
Operating system		
Vendor	Microsoft	Apple
Name	Windows 11 Pro	macOS® Monterey
Version	21H2 Build 22000.795	12.4
BIOS		
BIOS name and version	Lenovo N40ET34W 1.16	N/A
Dimensions		
Imperial dimensions		
Height (in.)	0.90	0.70
Width (in.)	14.20	14.00
Depth (in.)	10.00	9.76
System weight (lbs.)	4.31	4.74
System weight with power adapters (lbs.)	6.22	5.48
Metric dimensions		
Height (cm)	2.28	1.77
Width (cm)	36.06	35.56
Depth (cm)	25.4	24.79
System weight (kg)	1.95	2.15
System weight with power adapters (kg)	2.82	2.48

How we tested

Setting up the systems

Setting up the Windows system for the test

Setting up and updating the OEM image

1. Boot the system.
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.

   • In the bottom right-hand corner click the battery icon, and move the slider to Best Performance.

4. Unplug the system, and set the Windows (unplugged) Power Mode to Best Power Efficiency.

   • In the bottom right-hand corner click the battery icon, and move the slider to Best Power Efficiency.
   • Click the Battery Saver drop down menu, and turn off Lower screen brightness when using battery saver.

5. Set Screen and Sleep options to Never.

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

6. Disable User Account Control notifications.

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

7. Run Windows Update, and install all updates available.
8. Launch the Lenovo Commercial Vantage app, and install all system updates.
9. Verify the date and time are correct, and synchronize the system clock with the time server.
10. Pause Automatic Windows Updates.

    • Click the Windows Start button.
    • Type Windows Update settings, and click Enter.
    • From the Pause updates drop-down menu, select Pause for 5 weeks.

Capturing hand-timed test results

We recorded how long it took to launch Firefox, load the Lenovo web page, and load 20 duplicate tabs. A stopwatch is required for this test.

Running the test

1. Simultaneously start the timer and launch Mozilla Firefox.
2. Browse to https://www.lenovo.com/us/en/pc/.
3. When the web page fully loads, press CTRL/command and click the refresh button to duplicate the web page in a new tab.
4. Once the web page fully loads in a new tab, press CTRL/command and click the refresh button to duplicate the web page again in a new tab.
5. Repeat step 4 until there are 20 tabs open.
6. Stop the timer when the web page on the 20th tab fully loads.
7. Repeat steps 1 through 6 twice more.

Adobe Premiere Pro

We recorded how long it took to export a 8K ProRes and 5K RED video file to H.264. A stopwatch is required for this test. We used the following application:

   • Adobe Premiere Pro v22.4.0

Running the test

1. Launch Adobe Premiere Pro.
2. Select New Project, Name the project, and select the test media to import.
3. Click Create.
4. To bring up the Export Media dialog, press Ctrl + M.
5. From the Format drop-down menu, choose .MP4 and H.264.
6. Simultaneously start the timer and click Export.
7. Stop the timer when the file has exported.
8. Repeat steps 1 through 7 twice more.

Capturing benchmark performance metrics

Cinebench R23 benchmark

Setting up the test

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

Running the test (Initial CPU performance)

1. Verify that the system is running on AC Power.
2. Launch Geekbench.
3. Click Run CPU Benchmark.
4. Record the result.
5. Wait 5 minutes before re-running.
6. Repeat steps 1 through 5 twice more.

Running the test (Sustained CPU performance)

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. To verify how sustained performance is impacted, record the results for 30 iterations.

Geekbench 5 Pro benchmark

Setting up the test

1. Download, and install Geekbench 5 from https://www.geekbench.com/download/.

Running the test (Initial GPU OpenCL performance)

1. Launch Geekbench.
2. Click Run Compute Benchmark.
3. Record the result.
4. Wait 5 minutes before re-running.
5. Repeat steps 1 through 4 twice more.

Running the test (Sustained GPU OpenCL performance)

1. Launch Geekbench.
2. Click Run Compute Benchmark.
3. To verify how sustained performance is impacted, record the results for 30 iterations.

Maxon Redshift 3D Renderer benchmark

Setting up the test

1. Download and install the Maxon App from https://www.maxon.net/en/try.
2. Click the Maxon One 14-day trial, download, and install the RedShift application.

Running the test

1. On the bottom left of your desktop, open a command prompt by clicking the Windows icon, and type `cmd`
2. Click Enter.
3. Inside the command prompt type cd C:\ProgramData\Redshift\bin
4. Click Enter.
5. Type RunBenchmark.bat
6. To start the benchmark, click Enter.
7. Record the results.
8. Wait 5 minutes before performing the next run.
9. Repeat steps 1 through 7 twice more.

Blender benchmark

Setting up the test

1. Download the Blender Benchmark from https://opendata.blender.org/.

Running the test

1. Launch the Blender Benchmark.
2. At the Welcome screen, click Next.
3. Select Blender version 3.1.0 and click Next.
4. At the Benchmark Scenes screen, click Next.
5. At the Benchmark Device screen, select the GPU option, and click Start Benchmark.
6. Record the results.
7. Wait 15 minutes before performing the next run.
8. Repeat steps 1 through 7 four more times.

Onshape online performance check benchmark

Setting up the test

1. On systems with dual graphic capabilities, verify that the discrete GPU is being used by the Chrome web browser:

   - In the Windows Search Box, type Graphics Settings and click Enter.
   - Under the Custom options for apps heading, click Browse, and add C:\Program Files\Google\Chrome\Application\Chrome.exe.
   - Click the newly added Chrome application, and click Options.
   - Select discrete graphics option, and click Save.

Running the High Content Quality test

1. Go to https://cad.onshape.com/check.
2. Record the Performance Check results.
3. Repeat steps 1 through 2 four more times.

Measuring in-game performance

Shadow of the Tomb Raider

Setting up the test

1. Purchase, download, and install Shadow of the Tomb Raider from https://store.steampowered.com/.
2. Click Play.
3. To change settings, click Options➔Display and Graphics. We used the following identical settings both systems supported:

   - DirectX 12: On (Note: MacOS does not offer this setting)
   - Fullscreen: On
   - Resolution: 1,920x1,200
   - Refresh Rate: 60Hz
   - Anti-Aliasing: TAA
   - VSYNC: Off

Under the Graphics Tab:

- Select Preset: Highest
- Ambient Occlusion: BTAO

4. Click Apply Changes, and click the Back button.
5. Exit the game.

Running the test

1. Launch Shadow of the Tomb Raider.
2. Click Options.
3. Click Display and Graphics.
4. Click Run Benchmark.
5. Record the benchmark result.
6. Wait 5 minutes before re-running.
7. Repeat steps 1 through 6 twice more.

Capturing online collaboration metrics

Speedtest by Ookla

Setting up the test

1. Download and install the Chrome web browser from https://www.google.com/chrome/downloads/.

Running the test

1. Open the Chrome web browser, and go to https://www.speedtest.net/.
2. Verify that the same server is used on systems under test.
3. Click Go to start the benchmark.
4. Record the result.
5. Repeat steps 1 through 3 twice more.

Capturing images using built-in camera apps

1. Set each system brightness as close to 200 nits as possible 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 system, open the Photo Booth App.
4. When your subject is positioned correctly, take a picture.

Read the report at https://facts.pt/8F2sSWo ▶

This project was commissioned by Lenovo.

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