# No SSDs? No problem.

When performing classroom tasks on two pairs of Windows 11 Pro laptops, PT performance engineers saw comparable performance on devices with SSDs and devices with UFS

When schools and districts are purchasing devices for their students and staff, they inevitably must balance budget and performance. Configuring devices with universal flash storage (UFS) instead of solid-state drives (SSDs) can save money, but some buyers may worry about performance. Is this concern warranted? In head-to-head storage performance, a device with an SSD might win out against one with UFS—but with the way students and teachers use their devices, storage performance isn't necessarily a key concern.

To assess what performance differences, if any, your users might see by choosing devices with UFS rather than SSDs, the performance engineers here at Principled Technologies (PT) timed how long it took to perform several everyday tasks on two pairs of laptops running Windows 11 Pro. In each pair, one had UFS and one had an SSD; otherwise, the two systems were identical. Our engineers found that the systems we tested with UFS and those with SSDs offered comparable performance, taking approximately the same amount of time to complete a variety of general productivity and app-based classroom tasks.
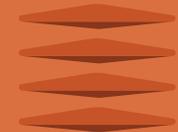
Consistent experience
across everyday productivity tasks

Keep up the pace
completing tasks in CoSpaces Edu, Blender, and Labster
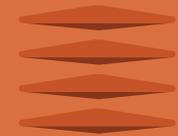
About the Lenovo 100w Gen 4 laptop

"Faster and easier to use than ever," according to Lenovo, "this affordable device keeps students connected, secure, and inspired within today's hybrid learning environment."[1] Weighing in at under 3 pounds, delivering all-day battery life, and equipped with a ruggedized design, the Lenovo 100w Gen 4 laptop can empower students in and out of the classroom.[2] To learn more, visit https://techtoday.lenovo.com/origind8/sites/default/files/2023-03/LenovoEDU-100w-Gen4-Datasheet.pdf.

About the Lenovo 300w Yoga Gen 4 laptop

Lenovo calls the 300w Yoga Gen 4 a "versatile learning laptop" that they built especially for students.[3] With a 360-degree hinge, up to two cameras, Dolby Audio™ speakers, and a Corning® Gorilla® Glass touchscreen, the Lenovo 300w Yoga Gen 4 can endure "a drop onto concrete from 76 cm [and] spills up to 360 ml," and the A-cover can withstand up to 60 kg.[4] To learn more, visit https://www.lenovo.com/il/en/laptops/lenovo/student-laptops/Lenovo-300w-Yoga-Gen-4-11-inch-Intel/p/LEN101L0035.

How we tested

PT performance engineers assessed the following devices:

- Lenovo® 100w Gen 4 laptop with an Intel® N100 processor
- Lenovo 300w Yoga Gen 4 laptop with an Intel N100 processor

We tested two configurations of each laptop: one with a 128GB UFS card and one with a 128GB NVMe SSD. Other than the change in storage, the configurations were identical. To ensure we're showing representative results, we ran our hands-on tests three times on three separate devices of each configuration—a total of 36 runs—and show the average test results for each device.

We hand-timed productivity tasks that students, teachers, and administrative staff encounter every day as they use their systems. We also hand-timed common scenarios in a variety of classroom apps. To learn more about how we tested, see the science behind the report.

Remain productive completing everyday tasks

Wherever students are—at desks in the classroom, working on homework at the kitchen table, or participating in a remote learning day from home—the sooner they can focus on their coursework, the better. The same is true for teachers and administrative staff as they plan lessons, complete paperwork, and discuss assignments in the classroom. If systems lag behind during day-to-day tasks, such as booting or launching a web browser, users may have a larger window for distractions.

PT performance engineers found that the systems with UFS and the systems with SSDs took approximately the same amount of time to complete these common system tasks (Figure 1). This means that whether their system has a UFS card or an SSD, users can carry out their daily routines with comparable ease.

Less than
0.5 sec
slower
100w: 15.6 vs 15.4
300w: 17.1 vs 16.6

Time to complete day-to-day tasks
Seconds | Lower is better

Figure 1: Time, in seconds, it took the laptops we tested to complete everyday tasks. Lower is better. Source: Principled Technologies.

Students and educators use Microsoft Word and Microsoft Excel—to write essays, read assignments, track data, perform calculations, and more—usually aren't just working with these apps once in a blue moon. Launching these programs might be a daily occurrence, and these users likely save files even more often. So, waiting for systems to complete these tasks could quickly add up to noticeable time lost.

As Figure 2 shows, PT performance engineers saw no significant time differences between the systems with UFS and the systems with SSDs in these Microsoft 365 tasks. With both desktop apps and web apps, the laptops with UFS kept up the pace.

Less than
0.3 sec
slower
100w: 7.7 vs 7.4
300w: 7.4 vs 7.2

Less than
0.2 sec
slower
100w: 1.9 vs 1.7
300w: 1.8 vs 2.0

Up to
3.8 sec
faster
100w: 73.2 vs 75.0
300w: 74.0 vs 77.8

Time to complete tasks in Microsoft 365 apps
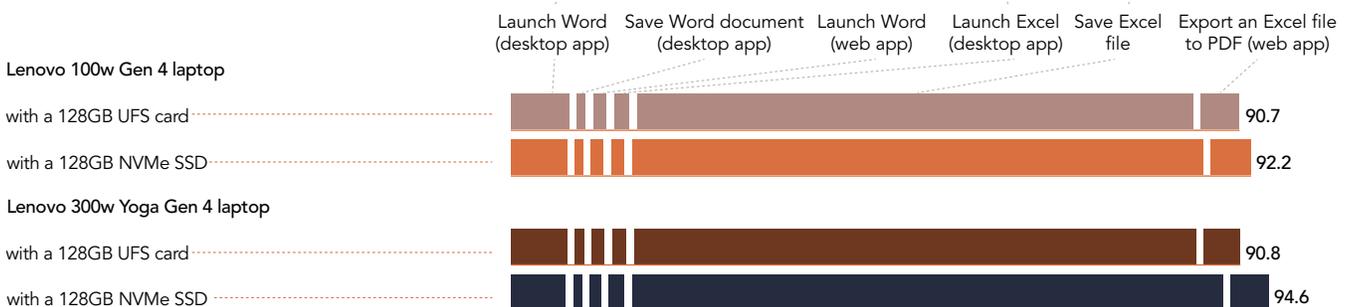*Seconds | Lower is better*

Figure 2: Time, in seconds, it took the laptops we tested to complete tasks in Microsoft 365 apps. Lower is better.
Source: Principled Technologies.

What about tasks that make a device work harder? Learners completing media projects and teachers or administrative staff using audio-visual support may find themselves editing videos or transferring large files to their laptops, while hybrid students and personnel likely use videoconferencing software to join virtual classrooms and staff meetings. As in our other comparisons, if these tasks take longer, users may lose focus and valuable time they could spend elsewhere.

Figure 3 shows the laptops with UFS and laptops with SSDs took a comparable amount of time to finish several system-taxing scenarios.

Up to
0.4 sec
faster
100w: 4.3 vs 4.3
300w: 3.6 vs 4.0

Time to complete resource-intensive tasks
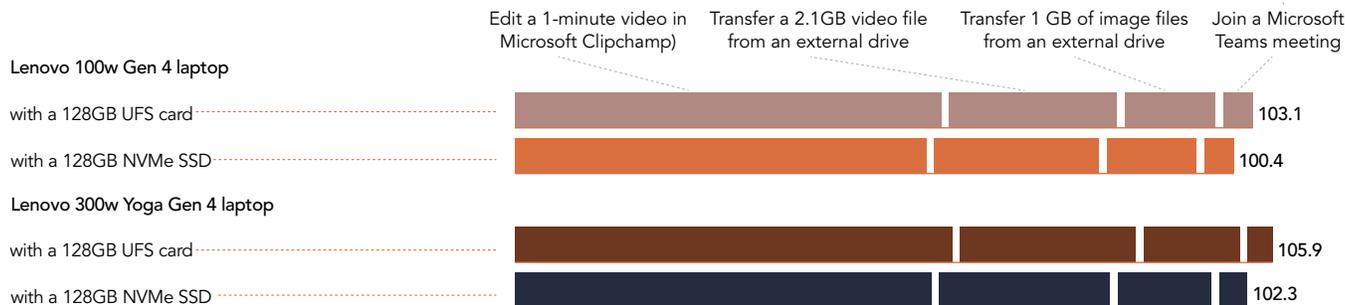*Seconds | Lower is better*

Figure 3: Time, in seconds, it took the laptops we tested to complete various resource-intensive tasks. Lower is better. Source: Principled Technologies.

Remain productive when using demanding apps

Designed specifically for young learners, CoSpaces Edu is a browser-based 3D animation app that allows students to create, code, and explore their own virtual projects. CoSpaces Edu aims to help children become future-ready with the "4 C's"—critical thinking, creativity, collaboration, and communication.[5]

Figure 4 shows that the systems with UFS and the systems with SSDs took similar amounts of time to load content in most of our hand-timed tests. In the Lenovo 300w Yoga Gen 4 comparison, the system with the UFS consistently saved time loading content, taking as much as 22 percent less time to load the Dinosaur Safari CoSpace.

Time to complete CoSpaces Edu tasks
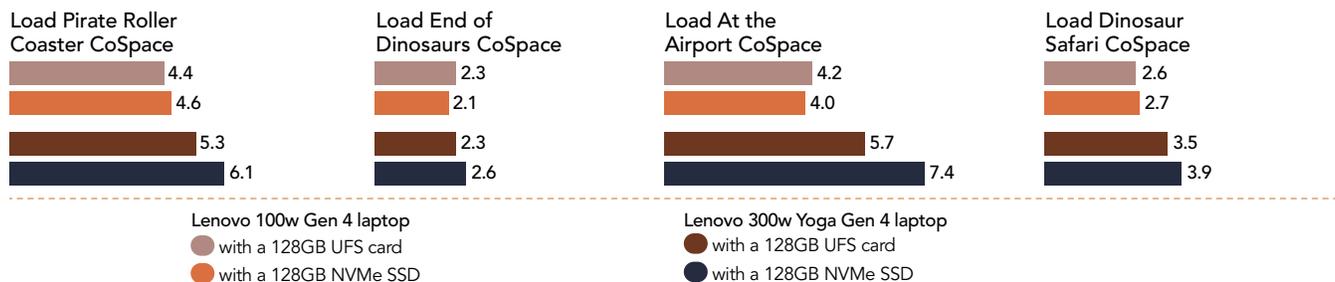*Seconds | Lower is better*

Figure 4: Time, in seconds, it took the laptops we tested to complete tasks in CoSpaces Edu. Lower is better. Source: Principled Technologies.

For computer graphics projects, Blender provides students and teachers the opportunity to work on modeling, animation, rendering, motion tracking, and more. The tasks we timed show how the systems can handle this resource-hungry work. Baking, for example, requires significant compute resources as the systems store or cache the results of a complex calculation.

When laptops take less time to complete these tasks, learners can enjoy more time to iterate on their designs—and teachers can concentrate on the art of teaching. As Figure 5 shows, the systems with UFS took roughly the same time as their counterparts with SSDs.

Time to complete Blender tasks
Seconds | Lower is better

Launch Blender
- 3.7
- 3.6
- 3.7
- 3.5

Bake data for a fire simulation
- 10.8
- 10.2
- 10.7
- 10.2

Bake data for a fluid simulation
- 30.6
- 30.3
- 27.0
- 27.8

Bake a mesh for a fluid simulation
- 40.1
- 41.1
- 37.3
- 39.0

Render a 2D animation
- 600.0
- 605.1
- 614.7
- 614.3

Render a 3D image
- 1,418.1
- 1,599.2
- 1,495.5
- 1,426.1

Lenovo 100w Gen 4 laptop
- with a 128GB UFS card
- with a 128GB NVMe SSD

Lenovo 300w Yoga Gen 4 laptop
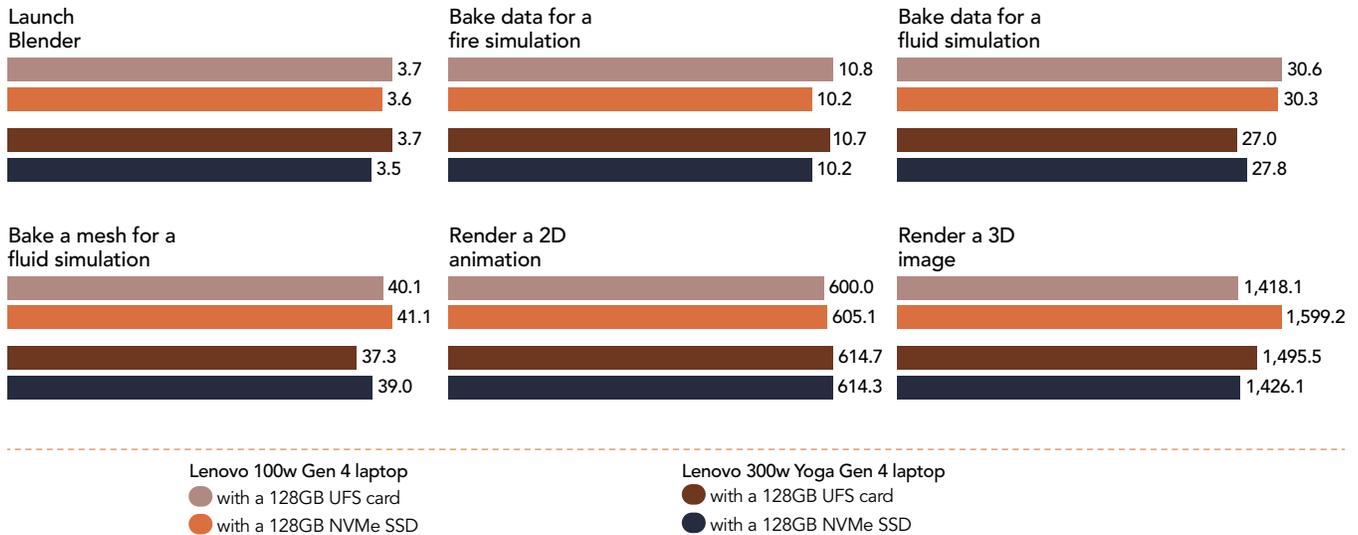- with a 128GB UFS card
- with a 128GB NVMe SSD

Figure 5: Time, in seconds, it took the laptops we tested to complete tasks in Blender. Lower is better. Source: Principled Technologies.

Labster provides STEM learners over 300 virtual science lab simulations. These immersive, 3D experiences cover topics ranging from basic laboratory skills to microbiology to physics to environmental sciences.[6]

Saving time loading Labster modules can lead to a smoother experience in the classroom or while completing homework. In our hands-on tests, we saw no significant performance differences between the systems with UFS and the systems with SSDs, as Figure 6 shows.

Time to complete Labster tasks
Seconds | Lower is better

Load Plate Tectonics module
- 34.0
- 36.6
- 39.3
- 36.9

Load Impact on Climate Change module
- 44.6
- 47.3
- 45.0
- 45.8

Load Cell Division module
- 32.5
- 34.0
- 32.6
- 35.7

Lenovo 100w Gen 4 laptop
- with a 128GB UFS card
- with a 128GB NVMe SSD

Lenovo 300w Yoga Gen 4 laptop
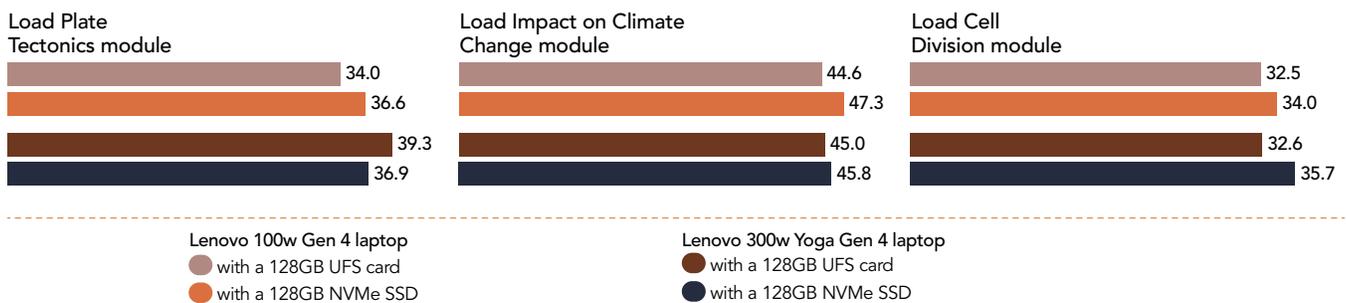- with a 128GB UFS card
- with a 128GB NVMe SSD

Figure 6: Time, in seconds, it took the laptops we tested to complete tasks in Labster. Lower is better. Source: Principled Technologies.

Conclusion

Striking a balance between budget and performance can be a difficult tightrope to walk. Fortunately, when it comes to selecting a laptop with UFS, education decisionmakers don't necessarily have to compromise on either. PT performance engineers hand-timed general productivity tasks—including boot times and Microsoft 365 app tasks—and tasks in CoSpaces Edu, Blender, and Labster. We saw that the Lenovo Gen 4 laptops with UFS storage delivered performance comparable to the same laptops with SSDs. Choosing UFS for education devices doesn't have to mean a downgrade in performance: Our results indicate a consistent experience for learners and education professionals in a variety of scenarios, regardless of storage choice.

1. Lenovo, "Lenovo 100w Gen 4," accessed February 20, 2024, https://techtoday.lenovo.com/origind8/sites/default/files/2023-03/LenovoEDU-100w-Gen4-Datasheet.pdf.

2. Lenovo, "Lenovo 100w Gen 4."

3. Lenovo, "Lenovo 300w Yoga Gen 4 (11" Intel)," accessed February 20, 2024, https://www.lenovo.com/il/en/laptops/lenovo/student-laptops/Lenovo-300w-Yoga-Gen-4-11-inch-Intel/p/LEN101L0035.

4. Lenovo, Lenovo 300w Yoga Gen 4 (11" Intel)."

5. CoSpaces Edu, "CoSpaces Edu for kid-friendly 3D creation and coding," accessed February 22, 2024, https://www.cospaces.io/.

6. Labster, "Explore our Growing Catalog of Virtual Labs," accessed February 22, 2024, https://www.labster.com/simulations.

Read the science behind this report at https://facts.pt/AuEu6iv ▶

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