signal65

The Samsung Galaxy Book4 Edge PC powered by Snapdragon X Elite

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In partnership with:

Qualcomm

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Introduction

Galaxy AI meets the Copilot+ PC.

A Flagship Copilot+ PC

When Microsoft announced the creation of a new category of PC that would be defined by advancements in not only deep AI functionality and integration, but with new levels of performance and power efficiency, we knew that the PC market would never be the same. Samsung has been preparing a device ecosystem for this moment maybe more than any other PC device OEM. With its own ecosystem of Galaxy devices across laptops, smartphones, and even wearables, Samsung has the potential to be one of the best integrations of consumer-friendly AI.

The new Galaxy Book4 Edge is the first Copilot+ PC from Samsung and brings with it an impressive combination of form factor, performance, new AI capabilities, battery life, and cross-device integrations. This is a laptop that shows great promise for productivity workhorses, content creators, and technology enthusiasts.

The First Copilot+ PCs

The Samsung Galaxy Book4 Edge is one of the first Copilot+ PCs that meets strict new requirements from Microsoft. These requirements include a processor that offers a dedicated NPU (neural processing unit) with more than 40 TOPS of performance, 16GB of system memory, and a dedicated button on the keyboard for easy access to Copilot features.

Being a Copilot+ PC means that the Samsung Galaxy Book4 Edge provides consumers with a bevy of new AI-based features that come directly from Microsoft Windows, including efficient studio effects for your integrated webcam, live captions and translations, and the upcoming Recall feature that helps you search and find content that you've seen or engaged with in a way that was never possible before.

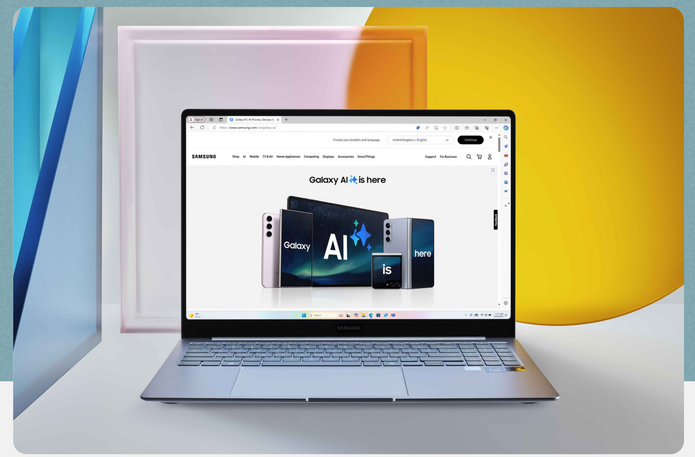
But being a Copilot+ PC also means that you can have confidence that your laptop is ready for the latest and most innovative AI applications from other developers, thanks to the inclusion of the 45 TOPS NPU and the battery life to sustain usage for longer than previous Windows laptops.

What We Cover

This paper will provide an overview of the Samsung Galaxy Book4 Edge design, features, capabilities, and performance. It will compare to other modern laptop designs as well as show generational improvements. We'll cover standard performance metrics, AI performance and feature analysis, battery life and more.

The Samsung Galaxy Book4 Edge

Samsung has made waves in the thin and light laptop market with its combination of innovative features, modern and sophisticated designs, high performance, and technology integrations across the rest of its consumer products lineup.



Hardware Specs

- Qualcomm Snapdragon X Elite X1E-84-100 processor
- 12 CPU Cores
- 45 TOPS NPU
- 16GB Memory
- Up to 1TB eUFS
- Up to Wi-Fi 7 and Bluetooth 5.3
- 2MP FHD Camera
- 3.4 lbs

The design of the new Samsung Galaxy Book4 Edge with the Snapdragon X series of processors borrows a lot from Samsung's previous products, and that's a good thing. Galaxy laptops have been known for their thin and light designs, without sacrificing performance. The Copilot+ PC sports a 16" display with a 2880x1800 resolution and comes in at just under 3.5 pounds. This is an amazingly portable machine that still offers a sizeable display in a small frame.

At the heart of the Galaxy Book4 Edge is the Snapdragon X Elite X1E-84-100 processor built with 12 Oryon CPU cores, running at a peak of 3.8 GHz for all 12 cores, or 4.2 GHz for a pair of cores when the applications need it most. The highest end Adreno GPU offers plenty of capability for mainstream gaming and content creation workloads with a peak performance rating of 4.6 TFLOPS. And of course, you have the new Hexagon NPU and its 45 TOPS of AI acceleration capability that makes this one of the premier AI PCs on the market.

Our tested configuration includes 16GB of LPDDR5X memory running at 8448 MT/s and a 1TB eUFS to provide plenty of storage for applications and content.

Powered by:

Snapdragon X Elite

High Level System Description

Design

The Samsung Galaxy Book4 Edge offers a thin and light aluminum chassis that feels premium in the hand, but the sheer scale of the 16" screen does mean it's going to be wider than many other machines on the market. (There is a 14" version of this laptop as well, not tested today.) The Sapphire Blue color scheme is a blue/silver mix and offers a clean and professional look.

Screen

The 16" 2880x1800 AMOLED 2x display with a 120Hz refresh rate offers amazing picture quality and the touchscreen is responsive; this is a clamshell design in the purest sense and doesn't fold over like a convertible device. The screen gets very bright (maximum 470 nits in our testing) and Samsung says it offers 120% of the DCI-P3 color gamut and it has an anti-reflective coating on it despite it not being a matte finish, making it one of the most impressive displays we've seen on a Copilot+ machine yet.

Connectivity

The Galaxy Book4 Edge is among the first laptops from Samsung to support WiFi 7. The ports on the laptop include a full-size USB-A 3.2 connection (which is great for users with traditional thumb drives and accessories in use), a headphone jack, microSD, full size HDMI, and two USB-C 4.0 ports.

Keyboard/Touchpad

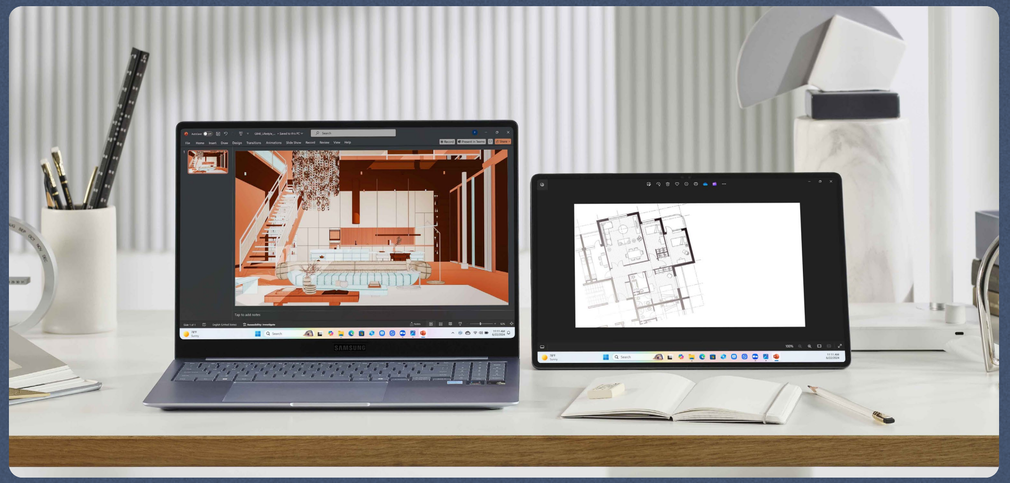
The keyboard on the Galaxy Book4 Edge is quiet without a lot of key travel due to this thinness of the system. In my time using it, the keyboard provided a solid input experience and provided more than enough responsiveness for long term usage. There is an integrated fingerprint sensor under the power button, giving users more options for fast and easy login. The 16" model also has enough space to include a small number pad – great for those working in spreadsheets frequently. The touchpad is enormous, taking up more than half of the horizontal space on the bottom surface of the device. Accidental input rejection worked well and the only caveat is that you'll need to get used to the trackpad being slightly left-offset.

Price & Value

While pricing of laptops is always changing and shifting as sales and promotions happen, the Samsung Galaxy Book4 Edge with the Snapdragon X Elite offers an impressive combination of performance and features, with the added appeal of being one of the first Copilot+ PCs on the market, for only $1749 in our tested configuration (as of this publication). This gives the Samsung device an advantageous start in the performance and testing comparisons to come, and considering a 15" MacBook Air with 16GB of memory and 1TB of storage starts at $1899, puts this laptop in a great spot to compete against Apple.

Competitive Landscape for Comparisons

To best understand the performance landscape that the new Snapdragon X Elite processor and the Samsung Galaxy Book4 Edge are competing in, we selected a handful of other devices to measure and compare.



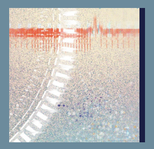
One of the comparisons we wanted to evaluate for the Samsung laptop using the Snapdragon X Elite was another X Elite laptop on the market from Surface. The Galaxy Book4 Edge uses the X1E-84-100 chip while the Surface Laptop 15" we have uses the slightly lower end X1E-80-100 model. How the Galaxy Book4 Edge compares here will give us an indicator for how well Samsung was able to engineer this design.

From a generational uplift comparison, we tossed in the Surface Pro 9 5G that uses the SQ3 chip, also known as the Snapdragon 8cx Gen 3. This allows us to see how the Windows on Arm ecosystem has improved in terms of performance and capability.

We wanted to include modern competitive options using the Intel Core Ultra 7 155H like the MSI Prestige 16 EVO AI, one of the higher performing Meteor Lake machines. This laptop also has a larger form factor including a 16" screen but is thicker and a bit bulkier but should provide a good comparison for in-market systems.

Finally, the Apple MacBook Air 15" powered by the M3 processor is often considered one of, if not the, best and most premium laptop on the market.

Given that status and that the M3 chip is based on a similar Arm architecture as the Snapdragon X Elite, this gives us a great comparative data set. (Obviously there are going to be some applications and workloads that are not available cross-OS, so we'll point out those areas where they occur.)



Competitive Landscape

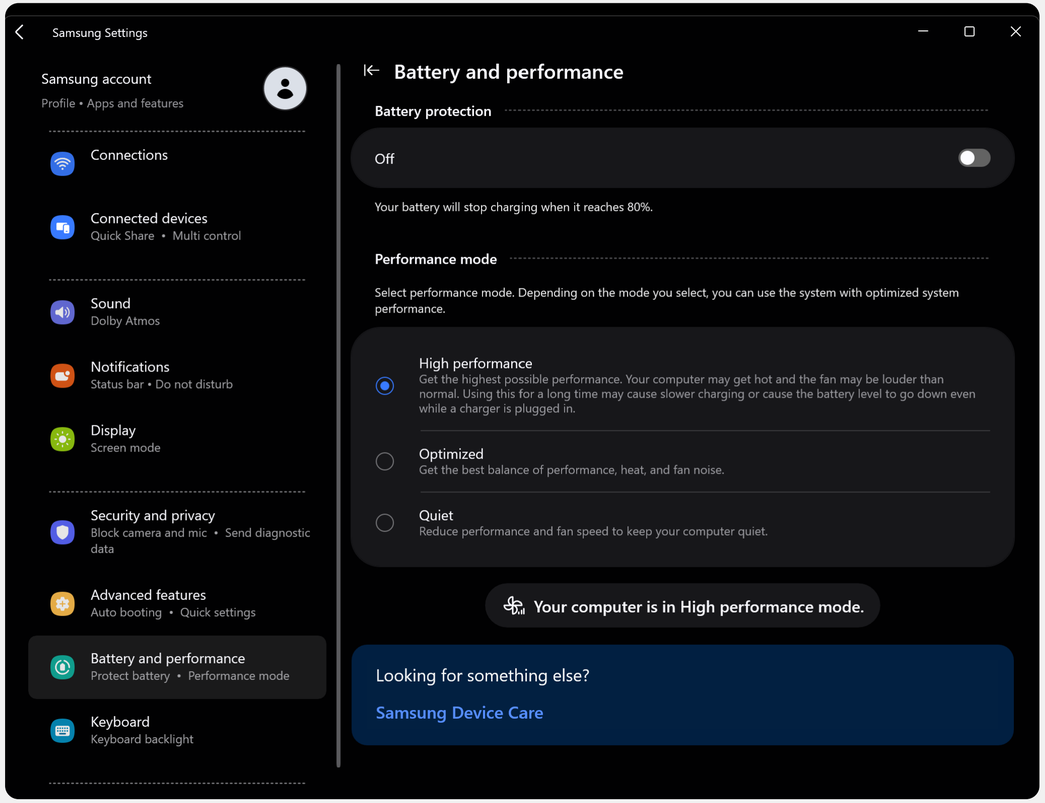
One of the strengths of the new Samsung Galaxy Book4 Edge is its price. As tested, with 1TB storage and 16GB of memory, with the Snapdragon X1E-84-100 processor, is priced at $1749. The equivalent configuration (16GB/1TB) of the MacBook Air 15” from Apple is $1899. Obviously, there is a wide range of system options in the PC space and prices vary widely based on design, but it’s fair to assume that you can find and configure comparable Core Ultra systems at about the $1300-1800 price range.

Full system specifications and testing details are included at the end of this report in the appendix.

The new Samsung Galaxy Book4 Edge is $150 cheaper than a comparable MacBook Air*

Samsung Performance Mode Flexibility

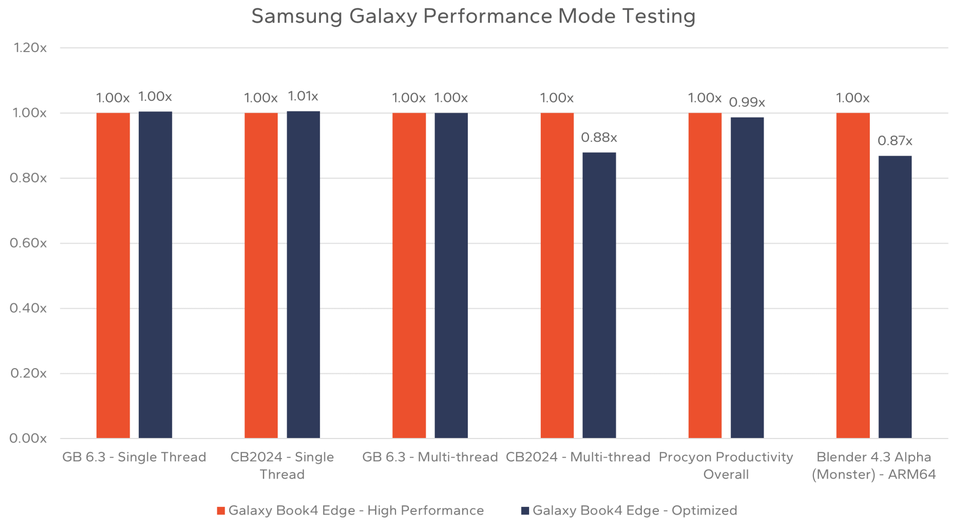
Many laptop OEMs will include software on their systems that enables more fine-tuned controls over the fans, thermals, and performance. Samsung has the aptly named “Samsung Settings” application on the Galaxy Book4 Edge that exposes a setting called “Performance Mode” with options for High Performance, Optimized, and Quiet.

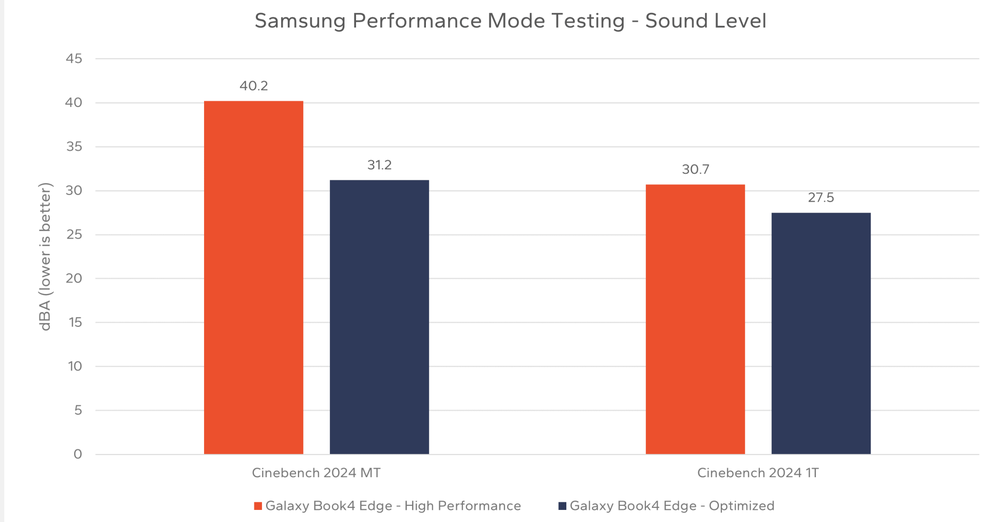


In the high performance state, the system will draw the most power and run at its highest performance, at the expense of elevated sound levels and surface temperatures. In Quiet, the system will lower clock speeds and performance to run in a basically silent manner. Optimized is somewhere in the middle, though from a practical sense, this is the mode that most users should be operating in the majority of the time.

Samsung Performance Mode Flexibility

What does this translate into when it comes to performance?





In general, the performance delta between the two modes is rather small. In all our single and lightly threaded testing, the difference is +/- 1%. Even results from the Geekbench multi-threaded score show no discernible change. Both Cinebench 2024 and Blender 4.3 testing are the outliers, showing an 11-13% performance advantage in the high performance mode. Both of these tests are pegging all the cores for an extended period of time; multiple minutes at least. In those instances where the thermal system begins to get saturated, you'll see the fans spin up and the performance come down as shown here.

The high performance does come with added noise levels in those same kind of extended, sustained benchmarks. You can see in our sound level testing with the Samsung Galaxy Book4 Edge in Optimized mode goes from a nearly silent 31.2 dBA under a full run of Cinebench 2024 to just over 40 dBA when put into high performance.

Samsung Performance Mode Flexibility

Optimized Performance Mode

High Performance Mode

That added power does come with the tradeoff of additional heat. In the High Performance mode the surface temperature of the laptop hits a moderate 45.3C while in the Optimized performance state it only got up to 41.9C.

In general, this is a very common and expected behavior for modern laptops that are looking to push the boundaries of performance and scalability. By utilizing both Windows OS settings and OEM software like the Samsung Settings tool, users have the ability to customize the system state for their purposes – highest possible performance when you need it for something like video creation on the go, or a more moderate setting for everyday use and battery life.

At Signal65 our standard operating procedure has been to measure performance of laptop platforms in their highest performance state when utilizing pre-installed OEM software and/or OS settings. Full details of these settings and configurations can be found in the backup for this report.

System Thermal Analysis

Physical and technical characteristics analysis.

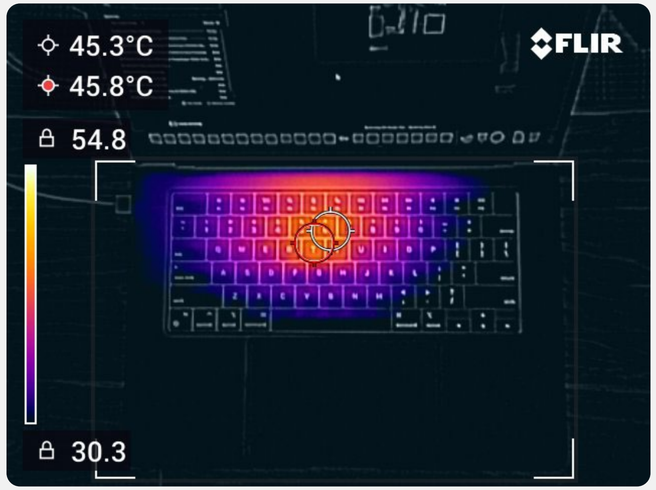
Thermal Performance Under Load

Thermal performance testing for this report was conducted using the FLIR C5 Thermal Imaging Camera. Temperatures were measured in a 72°F ambient room using a 10-minute run of Cinebench 2024 to saturate the cooling solutions.

Thermal Performance (Cinebench 2024 Multi-thread)

Samsung Galaxy Book4 Edge (Snapdragon X Elite)

Surface Laptop 15" (7th Edition)



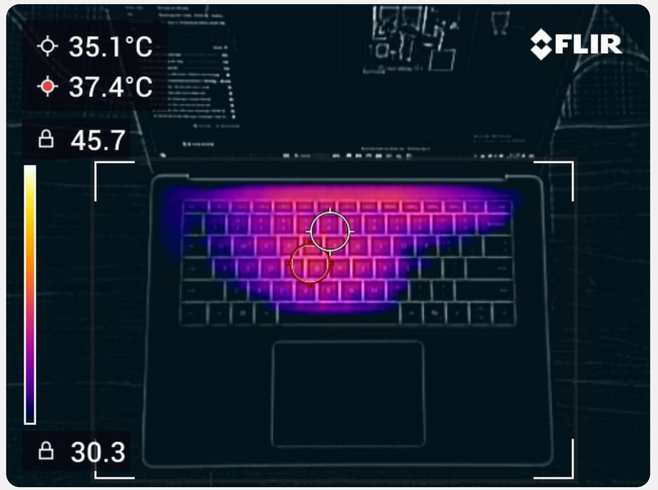
Apple MacBook Air (Apple M3)

MSI Prestige 16 EVO AI (Intel Core Ultra 7 155H)

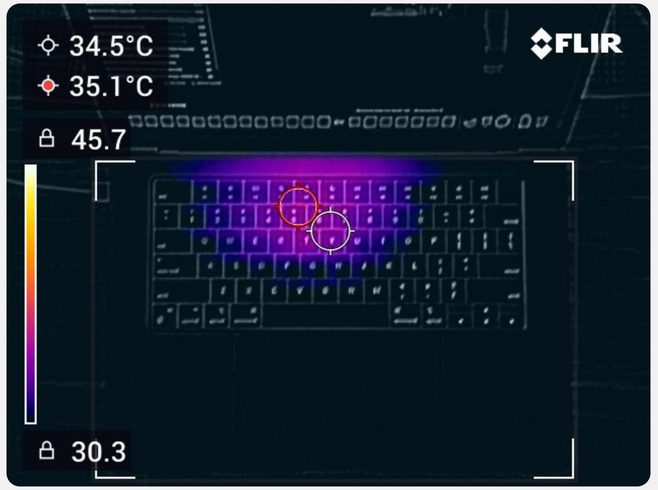
In what we can generally consider a worst-case scenario, under a fully loaded system for 10 minutes to saturate the cooling solution, the Samsung Galaxy Book4 Edge does very well comparatively. Coming in at a peak surface temp of 45.3C, it is noticeably lower than the Surface Laptop with the Snapdragon X Elite and the MSI Prestige with the Core Ultra 7 155H. The MacBook Air actually gets slightly hotter to the touch too, by half a degree. This is in the high performance state on the Galaxy device.

Thermal Performance (Cinebench 2024 Single Thread)

Samsung Galaxy Book4 Edge (Snapdragon X Elite)



Surface Laptop 15" (7th Edition)



Apple MacBook Air (Apple M3)

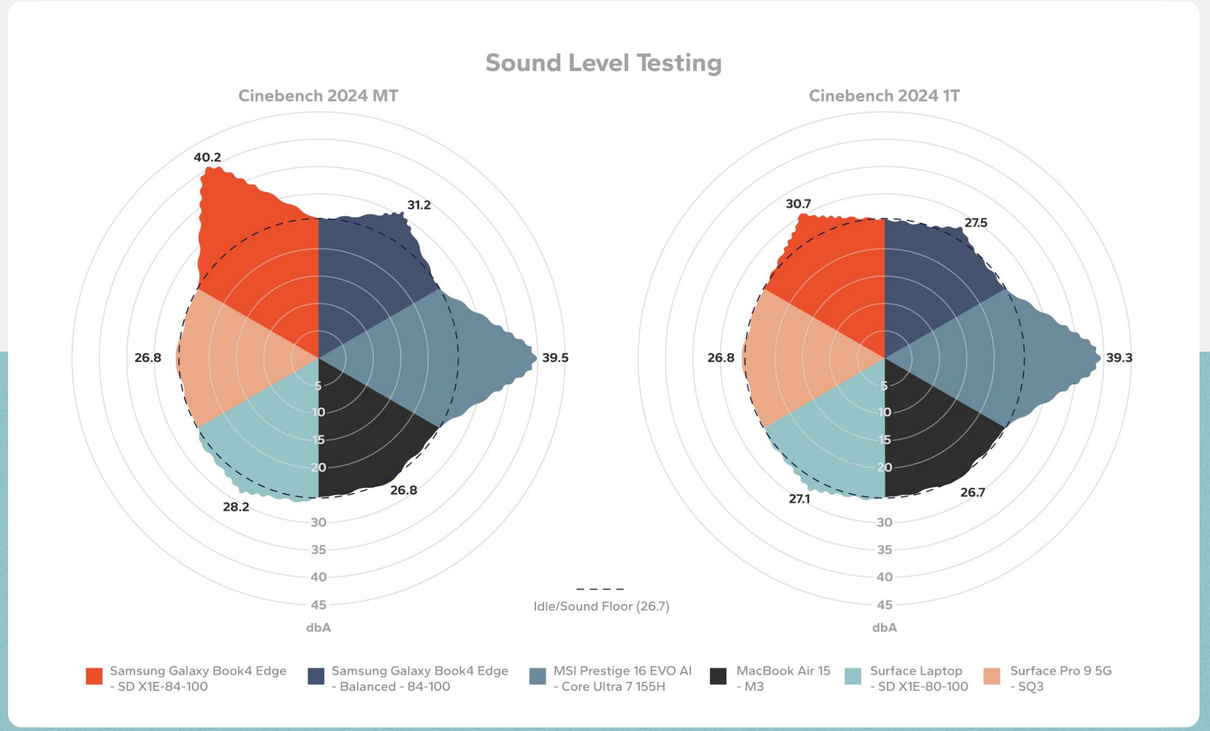
MSI Prestige 16 EVO AI (Intel Core Ultra 7 155H)

The thermal results on the single threaded testing also show us that the Galaxy Book4 Edge is managing the power output well. It hits 38.5C after 10 minutes of running Cinebench 2024 in the 1T mode, just slightly higher than the new Surface Laptop and almost 3 degrees lower than the MSI Prestige 16 with the Core Ultra 7. The MacBook Air 15" just barely breaks the 35C level, making in the coolest of the platforms tested.

System Thermal Analysis

Sound and Fan Noise

Secondary to the thermal performance of any notebook design is the resulting fan speeds and noise that can be traded off for temperature. We measured noise of these laptops in a quiet, but standard working environment from a distance of 18 inches.



In this chart we are including the results from the Samsung Galaxy Book4 Edge in both its high performance mode and the balanced/optimized mode, just so the reader has a bit of additional context. The sound produced by the Galaxy device under an extended, all-core workload is definitely higher than other Snapdragon devices we have tested. This is likely caused by it integrating the absolute highest performing SoC (the 84-100 SKU) and Samsung's push to design an incredibly thin and light laptop form factor. The sound levels aren't "harsh" or piercing in any way.

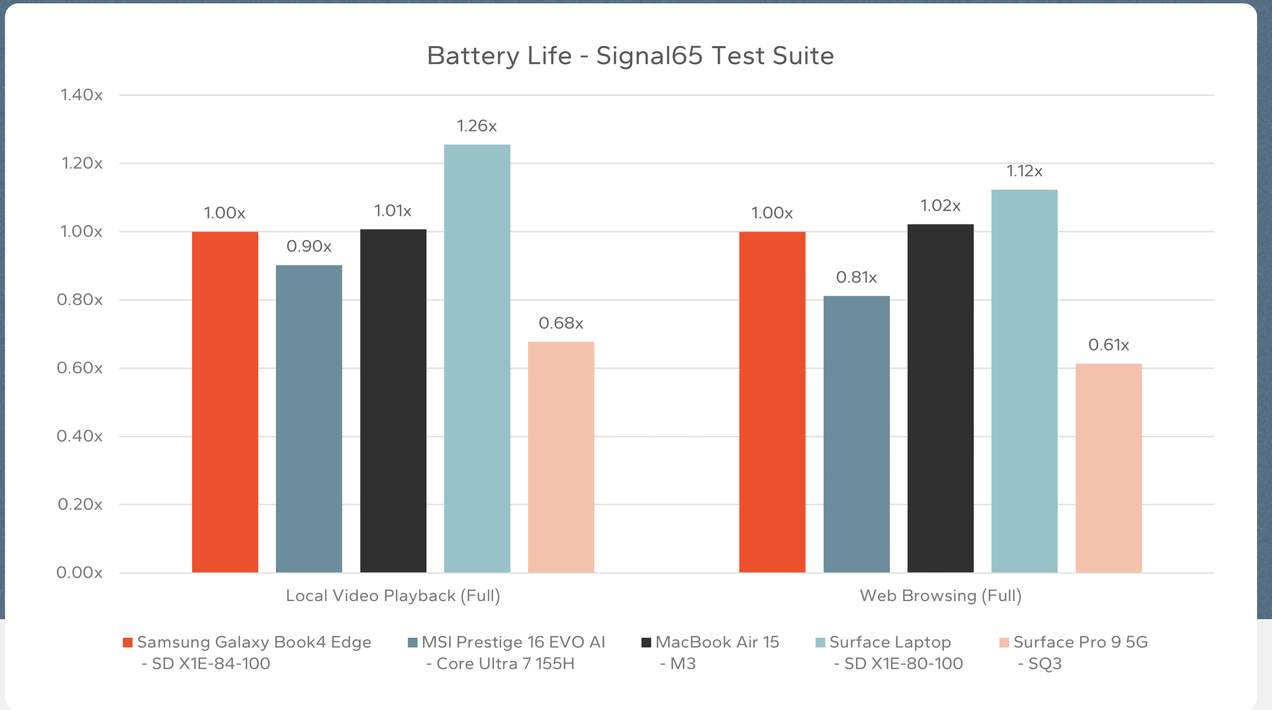
But you can see here another one of the advantages of users running in that Optimized state: sound levels are basically at the same level as the Surface Laptop 15" in both single and multi-threaded testing.

Battery Life

Understanding real-world battery life scenarios.

Signal65 Battery Tests

Our in-house custom battery tests look at usage scenarios that are common to both industry battery testing and things that users are typically doing every day on their laptops. The video rundown test uses a looped local file for offline playback with Wi-Fi disabled and represents battery consumption on a long-haul flight or maybe on a road trip. For our browsing test, a script opens Chrome, a bunch of tabs, scrolls, plays videos, etc. to simulate a standard web browsing experience, with Wi-Fi on of course, connected to a common AP. In both tests, screen brightness is set to 150 nits.



The Samsung Galaxy Book4 Edge offers similar battery life for web browsing and video playback to the MacBook Air 15” with a smaller battery

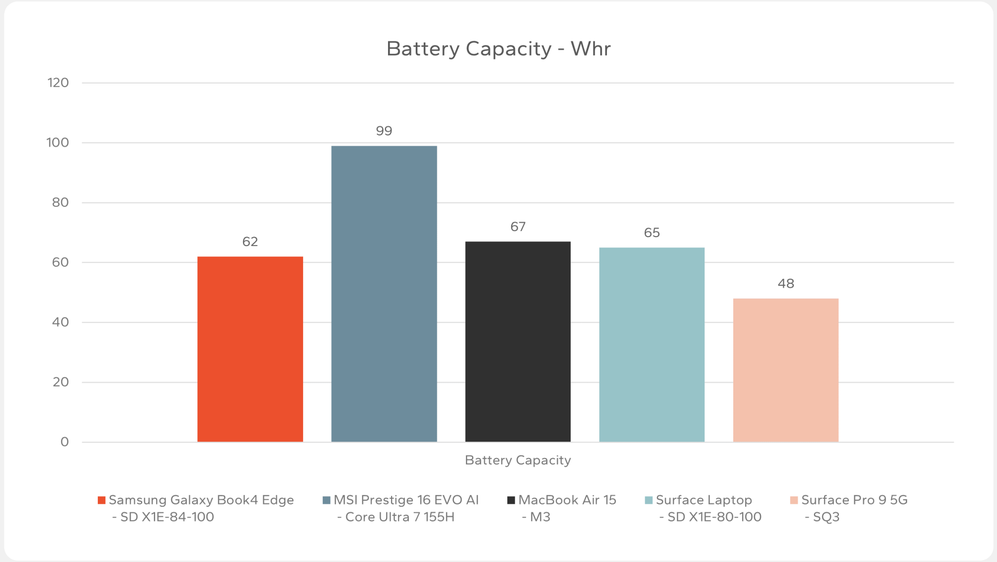
In the local video playback battery life testing, the Galaxy Book4 Edge does well, matching the MacBook Air 15” and beating out the Core Ultra 7 155H laptop (with a much larger battery) by 10%. The Surface Laptop with its X Elite platform is still the king of the hill here, by a significant 25%! The Samsung device lasts over 17.5 hours, a great result!

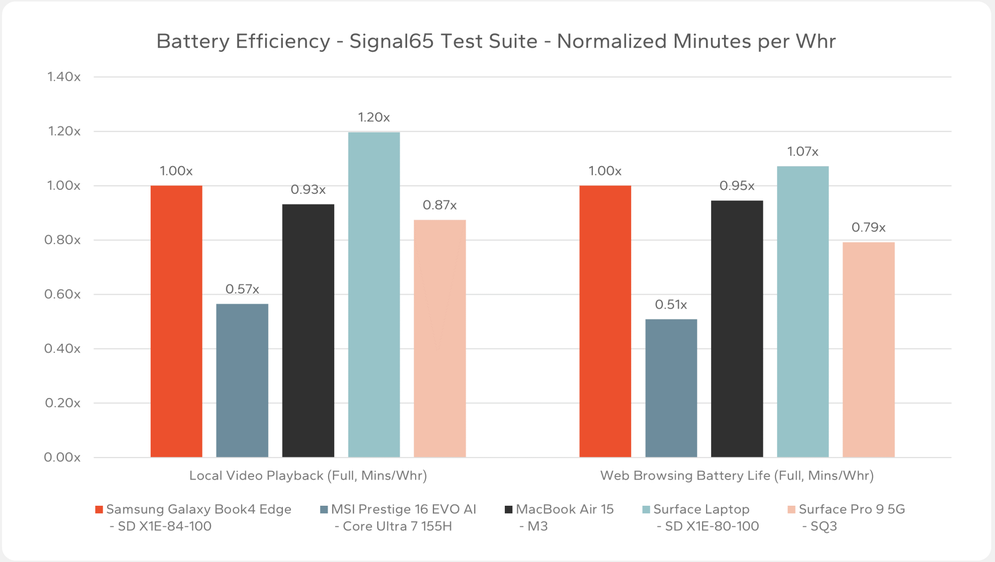
In our web browsing results we see that again the Samsung device and the MacBook Air are essentially offering the same results, while the Surface Laptop lead has dropped to 12%. The Intel Core Ultra 7 machine from MSI falls a bit further behind too, resulting in 20% less usable battery life than the Galaxy Book4 Edge.

Battery Life

Battery Life Efficiency

Because the battery sizes change for each of these laptops, it's worth looking at the battery life efficiency as well as absolute battery life. Below are the measured capacities of the batteries of the tested laptops as of the time of our benchmarking.





The Samsung Galaxy Book4 Edge has the smallest battery of the modern systems we've tested, coming in at just 62 Whr. The MacBook Air and the Surface Laptop are a bit higher at 67 Whr and 65 Whr respectively, and the MSI Core Ultra 7 155H device mashes a full 99 Whr into that chassis.

As expected, both systems using the Snapdragon X Elite platform look strong in our battery efficiency results. The Samsung Galaxy Book4 Edge provides double the efficiency of the Intel Core Ultra platform in our browsing battery life testing, and is better than even the MacBook Air 15".

Performance Bounding

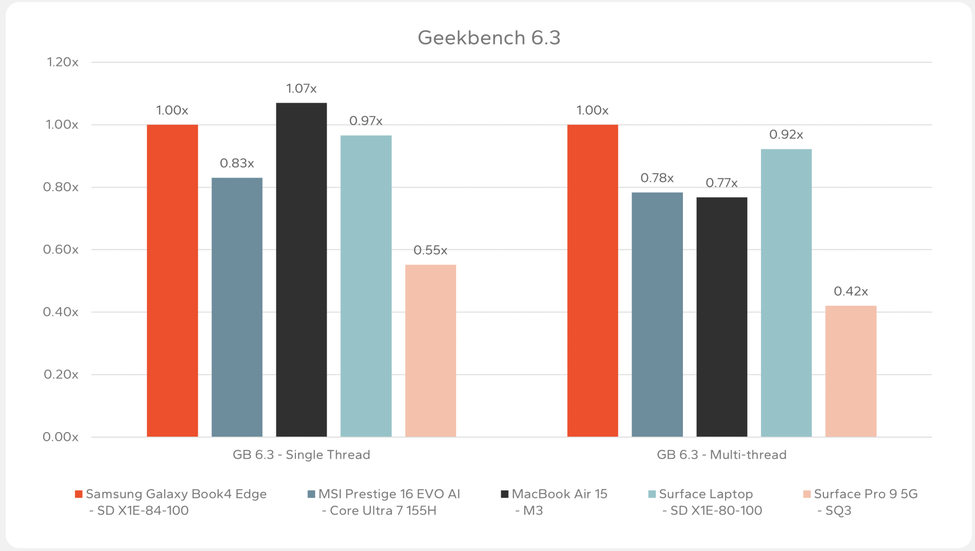
Peak and sustained synthetic performance comparisons.

The Samsung Galaxy Book4 Edge offers the highest performance Snapdragon X Elite platform tested to date

Geekbench 6.3

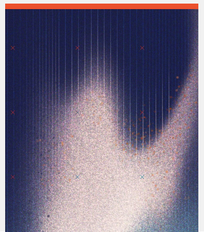
Geekbench 6 is self-described as a benchmark that measures a “system’s performance with the press of a button” and allows for device comparisons between everything from mobile to desktop. It is comprised of a collection of workloads that stress the CPU and GPU, through tests that the developer considers “real world” in that they represent workloads from augmented reality to object detection to file compression and much more.

While Geekbench isn’t an exact measurement of a specific real world application, Signal65 likes to use Geekbench as a general purpose performance indicator for bursty, broad-coverage workloads.



The first set of performance results for the Samsung Galaxy Book4 Edge start to show off the capability of the Snapdragon X Elite X1E-84-100. It is not only faster than the Surface Laptop by a few percent in our single threaded scores in Geekbench but is 17% faster than the Intel Core Ultra 7 155H. The Apple M3 is still winning in the ST results by a modest 7%.

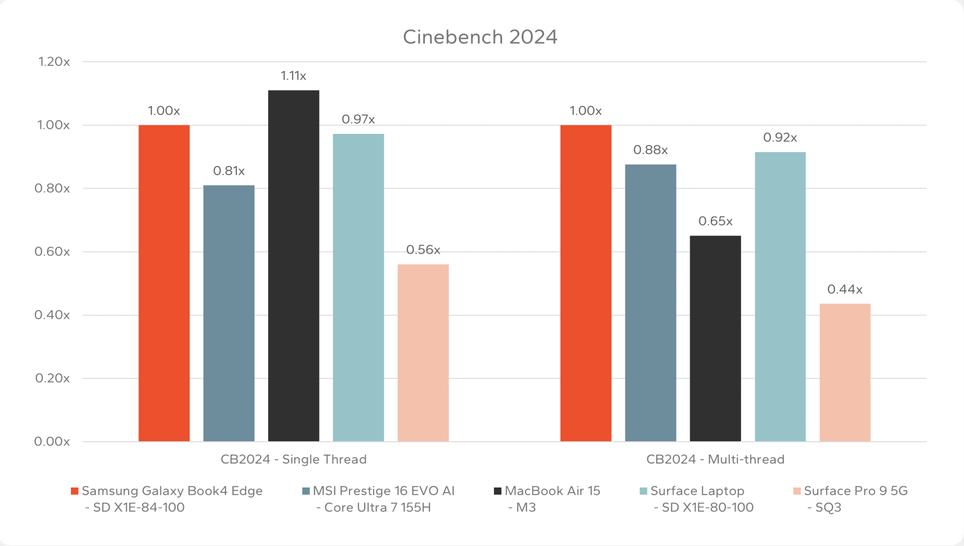
The multi-threaded scores are even more impressive for the Galaxy Book4 Edge as it surpasses both the Core Ultra and MacBook Air by 20%+. That added frequency and headroom of the 84-100 part also means that the Samsung lead over the Surface Laptop with the X Elite grows to 8% in these tests.



Performance Bounding

Cinebench 2024

Cinebench has been a consistent benchmark used in engineering analysis and reviews across the industry for years. It is based on the Maxon Cinema 4D rendering engine and runs in both single threaded and multi-threaded configurations in an attempt to measure maximum, sustained performance of a processor. We use the phrase “sustained performance” since it can be run for 10-30 minute intervals and will saturate the cooling capability of a laptop or desktop machine to measure performance that a system can maintain over a longer period of time.



Results in our Cinebench testing look similar to the Geekbench results, but there are some minor differences based on the more extended run time for this test. The M3 is still about 10% faster in single threaded score, but the Galaxy Book4 Edge is almost 20% faster than the Core Ultra 7 155H and close to double the performance of the previous Windows on Arm solution, the Surface Pro 9 5G.

In the multi-threaded test, where we start to see thermal limitations of any systems if they exist, the Samsung laptop is still the fastest of the group, edging past the Surface Laptop with the X Elite by 8% and the Intel-based MSI machine by 12%. The MacBook Air 15” machine and the M3 processor is 35% slower.

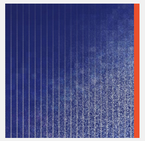
Samsung Galaxy Book4 Edge is up to 34% faster in sustained, all-core performance than the Apple MacBook Air

Performance Bounding

We call this section “performance bounding” because both test suites included are meant to represent the peak or sustained performance of the platform and architectures. The collection of Geekbench sub-tests might each be representative of some application, but the collective result and score is more of a “best case” or representative situation to a power user across a range of workloads. And while most users might not be using the Cinema 4D engine for 3D rendering, the single and multi-threaded results help to demonstrate the performance capabilities of the devices in question should you have a workload similarly demanding.

The results show us that the Samsung Galaxy Book4 Edge is an impressive performer in both single thread and multi-thread workloads, which is a good indicator for how it should look in the rest of our testing and in your real-world scenarios. In terms of the Windows PC market, the Surface Book4 Edge, like other Snapdragon X Elite laptops, offers best-in-class multi-threaded performance and offers performance upside in single threaded apps even compared to the latest Intel Core Ultra x86 platform. The aging Snapdragon 8cx Gen3 / SQ3 that was used in the Surface Laptop 9 5G is basically half the performance of the new Snapdragon X Elite, and that means that users that have been waiting for this Windows on Arm initiative to really take off should be happy with an upgrade.

The Apple M3 is still a very fast CPU for the MacBook line of laptops, and it trades off benchmark wins against the Snapdragon machines between the single and multi-threaded results. That ST performance will probably lead to advantages in things like straight line browser results for the Mac but means heavier applications like content creation could see benefits for the new Samsung Galaxy Book4 Edge.



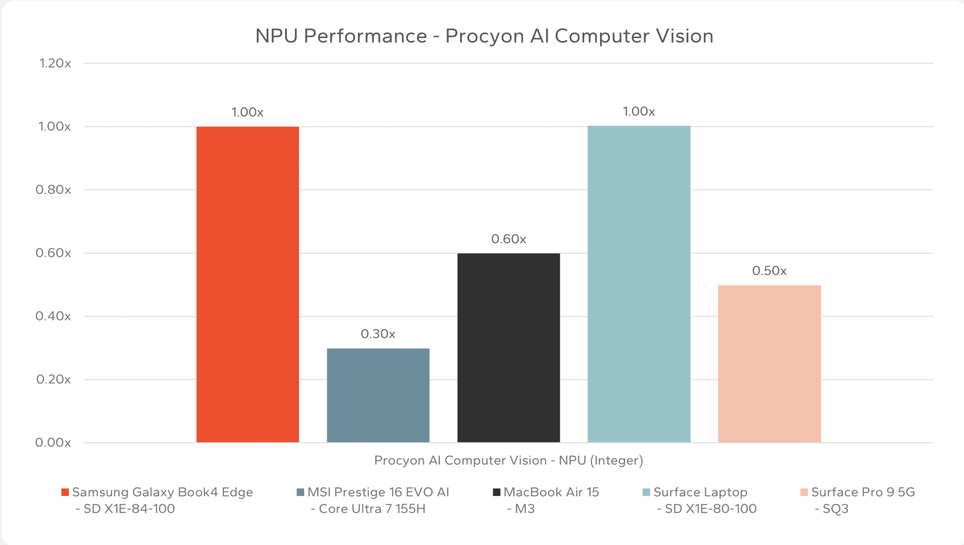
Modern AI Performance

AI throughput and performance using benchmarks and applications.

Procyon AI Computer Vision

From UL, “Procyon AI Computer Vision Benchmark gives insights into how AI inference engines perform on your Windows PC or Apple Mac. The benchmark features several AI inference engines from different vendors, with benchmark scores reflecting the performance of on-device inferencing operations.”

This test includes testing of models MobileNet V3, Inception V4, YOLO V3, DeepLab V3, Real-ESRGAN, and ResNet 50. These models achieve a range of image recognition, classification, and upscaling functions and it supports both integer and floating-point precisions, where supported by the hardware and development stacks per platform.



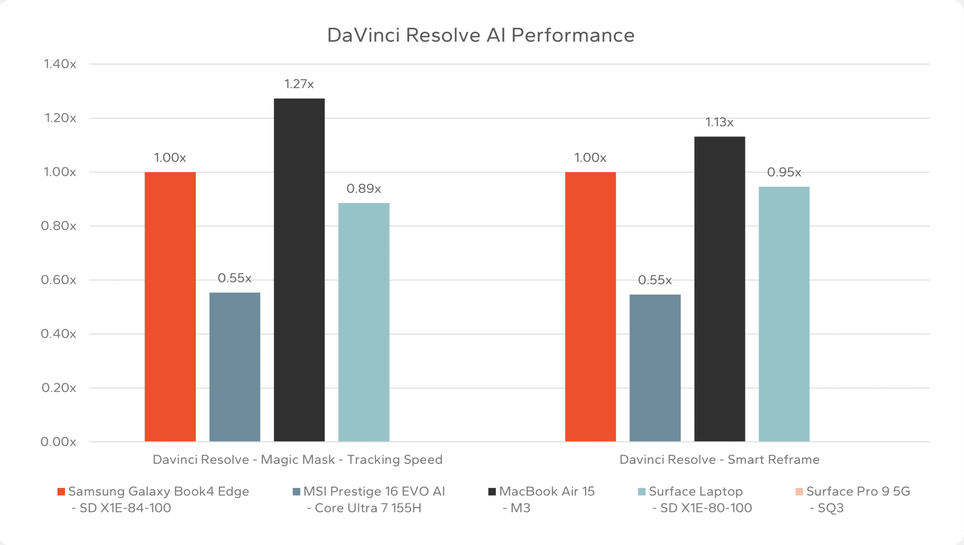
A big hurdle for AI performance analysis today is finding ways to compare architectures and platforms where support for different precisions and software APIs varies widely. The Procyon AI benchmark shows us that when we can compare across the common integer precision data on these systems, the NPU on the Snapdragon X Elite is completely unrivaled by other platforms. Rated at 45 TOPS, it is more than 3x faster than the NPU on the Intel Core Ultra 7 155H and twice the speed of the neural processor on the Apple M3 chip. There are other platforms coming this year but until those are available broadly and enabled in key tests like this one, the X Elite is the NPU performance leader.

The Samsung Galaxy Book4 Edge has nearly 2x the NPU performance compared to the Apple M3

Modern AI Performance

DaVinci Resolve AI Functions

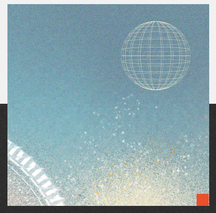
Blackmagic Design has been a leading developer in the content creation field and is integrating various AI functions throughout its software. In DaVinci Resolve, the Magic Mask feature uses AI inference to identify and track an object through a video clip using only very rough indicators from the content creator. This speeds of development of new creative that must remove, overlay, or adjust complex, fast moving masked content. Smart Reframe uses AI inference to edit video to track a subject automatically.



These two new AI-enabled features of the latest version of DaVinci Resolve showcase the benefits of the integrated NPU in the Snapdragon X Elite and clearly paint a picture of how content creation tools will likely evolve as the Copilot+ PC era begins. The Samsung Galaxy Book4 Edge is about 10% faster than the Surface Laptop in the Magic Mask feature thanks to the faster CPU (which handles a portion of the processing) and is nearly 2x the performance of the Core Ultra 7 155H.

On the Smart Reframe feature the advantage of the Samsung device is about 5% versus the Surface Laptop with a similar X Elite platform and is still almost 2x faster than the Intel-based MSI laptop. Without a doubt the best experience for emerging AI workloads with DaVinci Resolve is on the Snapdragon-powered systems.

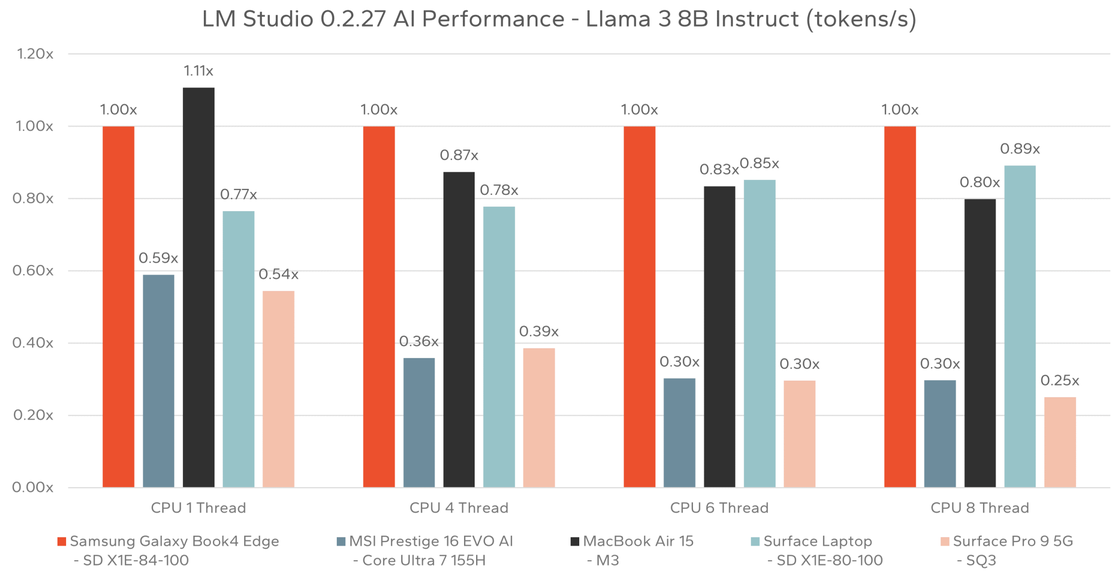
It is worth noting that in both use cases, the MacBook Air and its M3 processor leads the group, by 27% and 13% respectively. Creation and video editing is one of the key consumer bases that flock to MacOS, and Blackmagic (the app ISV) has clearly focused on it for some time.



Modern AI Performance

LM Studio 0.2.27

LM Studio is a fairly new tool on the PC that allows users to more easily run LLMs (large language models), entirely offline. You can download and import models from HuggingFace or other repositories and you can interact with them through an in-app Chat UI. There is still some customization and optimization that has to occur between the models and the silicon vendors to support different IP, but our testing here today is looking at CPU performance with Llama 3 8B Instruct at different CPU thread counts.



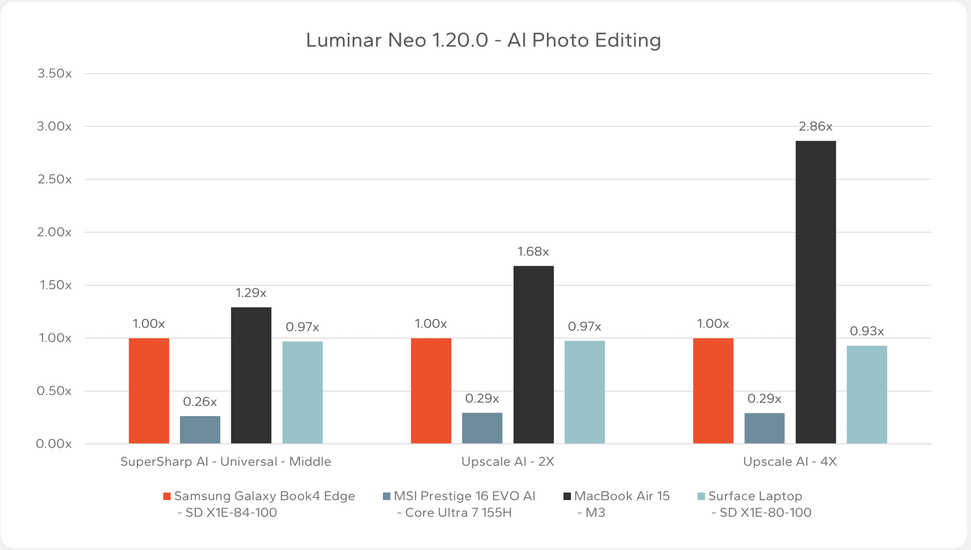
Our testing is looking at relative performance in tokens/second, one of the key metrics to evaluate performance of an LLM. In the single threaded results, the Samsung Galaxy Book4 Edge does very well, outpacing every laptop other than the M3-based MacBook Air 15". The benefit of that 84-100 SKU of the Snapdragon X Elite emerges here when you see it is 20% faster than the Surface Laptop using the X Elite 80-100 SKU.

As we pump up the thread count, the gap between the Samsung and the Surface laptops with the X Elite compresses some, but even at 8-threads the Galaxy Book4 Edge is 10% faster. Higher thread counts also mean the Samsung laptop increases its lead versus the Intel Core Ultra 7 system (to more than 3x!) and passes the MacBook Air for a solid lead of 20% faster inference at 8-threads.

Modern AI Performance

Luminar Neo 1.20.0 – AI Photo Editing

Luminar Neo from Skylum is software for photo editing that is pushing the boundaries of technology with different kinds of AI, including generative. It bills itself as easy to use, cross-platform, and continuously updated and improved with fixed and fresh features (many of which are using AI). The features we are testing in our analysis today run in the NPU of the Snapdragon X Elite and the Apple M3, but run on the GPU or CPU for the Intel platform.



The SuperSharp AI feature attempts to take photos with blur or areas out of focus and use local AI to improve them. In our testing the Samsung Galaxy Book4 Edge is more than 4x faster than the Core Ultra 7 but finds itself about 25% behind the MacBook Air. The Upscale AI feature, with the 2x resolution setting, shows a similar story, with the Snapdragon X Elite devices completely dominating the Intel x86 counterpart in Windows but falling behind the clearly optimized integration on the MacOS.

Luminar Neo is another example of a developer quickly adapting and taking advantage of the new capabilities of AI PCs to enhance the usability and experiences of things consumers are doing every day.

Section Takeaway

While our testable and measurable workloads in the AI PC space continue to grow, it's clear that this first set of Copilot+ PCs like the Samsung Galaxy Book4 Edge, powered by the Snapdragon X Elite, offer more in terms of AI performance and potential than any other platforms on the market today. The Procyon AI benchmark is more of a peak theoretical maximum differentiation, but that viewpoint is valuable precisely BECAUSE we are in the early stages of software enablement, and it gives us a peek into what the AI PC future might look like. Offering 3x more performance in that test than the next best x86 option, followed then by results in DaVinci Resolve that are 2x faster on the Snapdragon than the Core Ultra, demonstrates the capabilities and potential to us clearly.

AI Usage Observations

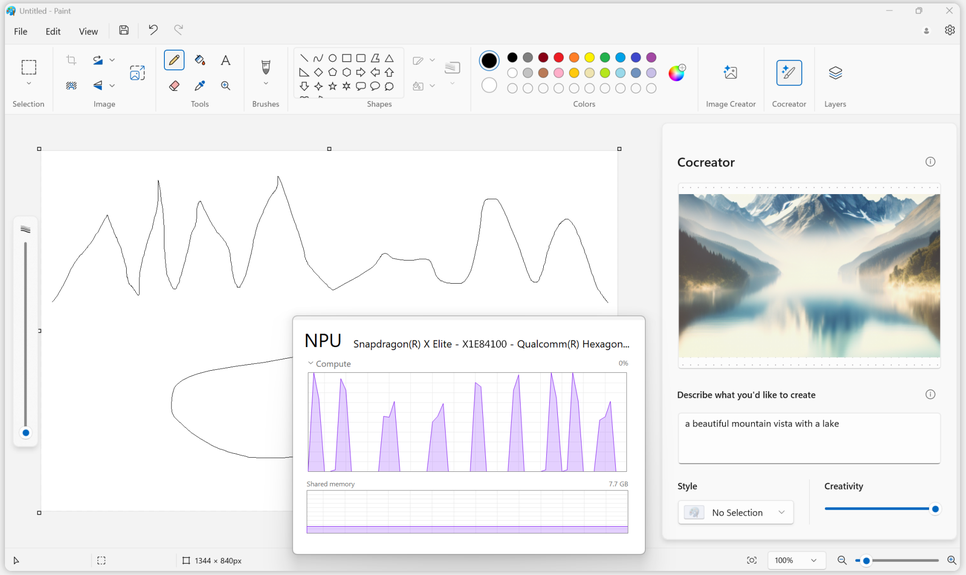
Looking at Copilot+ and other AI tools for today's AI PC

We are in the early stages of really understanding what an AI-enabled PC will be, what a Copilot+ PC will really be, and offer, to consumers willing to buy in. We already showed you some performance results, both in the form of benchmarks and real-world applications, where we were able to quantify speed and capabilities between devices.

But because we are in this ecosystem shift, and because the application landscape continues to change day after day, it's worth exploring some other use cases and workloads that we have been testing and experimenting with on the Samsung Galaxy Book4 Edge. These aren't easily comparable across devices, or may be in early stages of development, or could be just a fun, experiential toy.

Image Cocreator

Inside the latest version of Paint on Windows 11, when run on a Copilot+ PC like the Samsung Galaxy Book4 Edge, is a new capability called the Cocreator. This feature combines both a text-based input field and a drawing pad input field where you use your finger, mouse or cursor to roughly outline an idea, to create an AI-generated image.



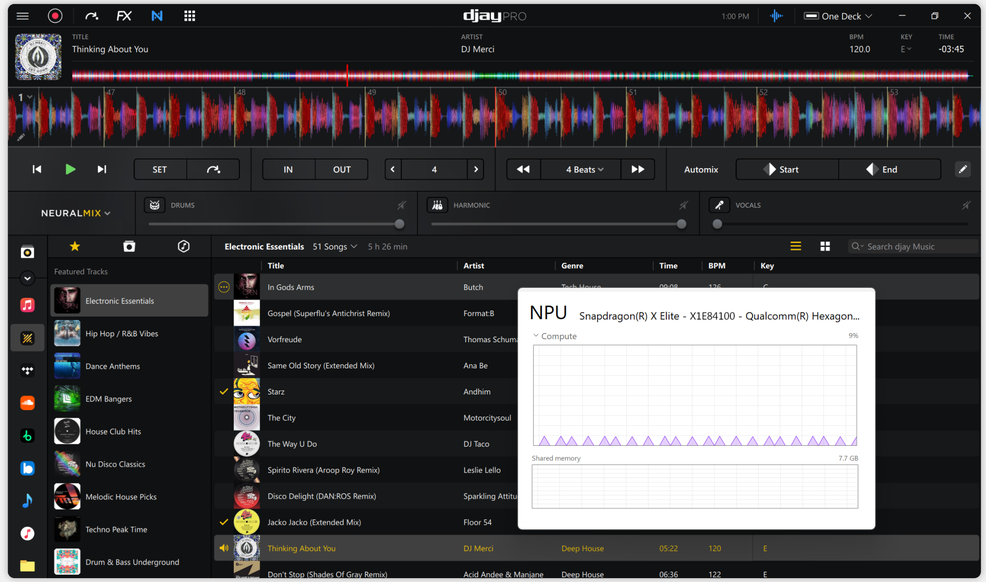
There is a slider that allows you adjust the level of 'creativity' – basically how much you want it to adhere to your original sketch or not – and some additional style options like 8-bit or watercolor, to add a specific tone.

This feature feels more like a toy than anything that a professional creator would use today, and that's fine for the audience its targeting. This function utilizes the 45 TOPS Hexagon NPU on the Snapdragon X series chips and you can see in the image above the activity running on that NPU when you move the slider position, change the text prompt, or change the drawing pad.

Cocreator was on the list of key features and highlights from Microsoft during the Copilot+ PC launch, so I expect it to get updates and improvements as the AI PC push continues.

Djay Pro

I first saw a demo of this software in Seattle during the Microsoft launch event at Qualcomm's booth. Djay Pro (https://www.algoriddim.com/djay-pro-windows) allows users to mix music from their laptop with professional-grade tools. The Neural Mix tech enables users to remix individual elements from multiple tracks by separating the music into its components in real-time. You can isolate drums, instruments, and vocals of any song based on cutting-edge AI; that of course runs on the NPU in Snapdragon X Elite and Samsung Galaxy Book4 Edge.

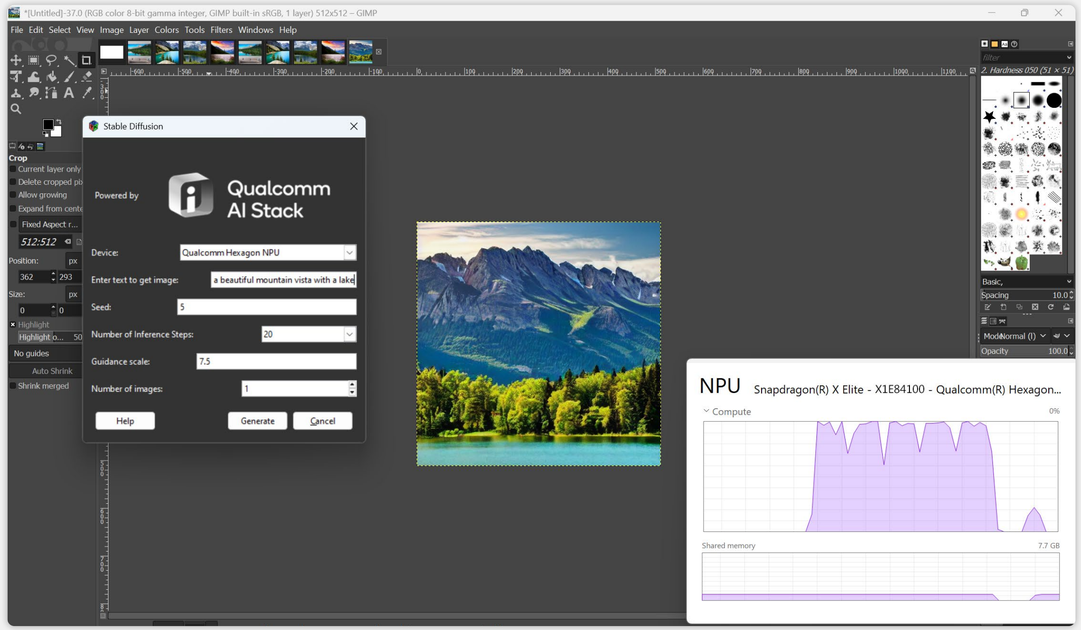


This is one of those tools that even if you aren't a professional or aspiring DJ, is just fun to use and play with! I do not accel in the musical arts, but it is clear just in playing with the capabilities that this kind of tool can be an incredibly powerful enabler for those learning the craft or experts that just want to move and work faster.

The developer, Algoriddim (itself just a kick-ass name) has said that by increasing the neural networks size, it enables more accurate and higher quality music separation, required more processing power and thus is only enabled on Copilot+ PCs with the higher performance integrated NPUs.

GIMP with Stable Diffusion Plugin

GIMP is an open-source image and photo editing software tool that tries to offer powerful functionality and features. It is known for its extensibility as well through plugins, and it's that feature that has allowed silicon vendors to custom make stable diffusion generative AI capabilities for it.



As part of its Snapdragon X Series rollout and demo spree, Qualcomm engineering created a plugin specifically for GIMP (https://github.com/quic/wos-ai-plugins/tree/main/plugins/gimp/stable-diffusion) that integrates text-based image generation, currently integrating SD v1.5. It's available on GitHub freely for anyone with a Copilot+ PC like the Samsung Galaxy Book4 Edge to install and experiment with.

The process is simple, and the results are impressive, even if they might seem a bit dated for those in the industry following the GenAI segment for some months. In the screenshot above you can see that the plugin is utilizing the 45 TOPS Hexagon NPU for the image generation, and our prompt of a "beautiful mountain vista" results in exactly that. There are a handful of options for the number of inference steps (affecting quality), setting the seed value (that randomizes the AI output), or adjusting the guidance scale (how much the model sticks to your prompt vs being creative).

Performance is excellent and the experience will feel like magic to those that haven't utilized generative AI capabilities previously. Its value for real work is clear; if you are comfortable with the quality of results that come from the SD v1.5 model.

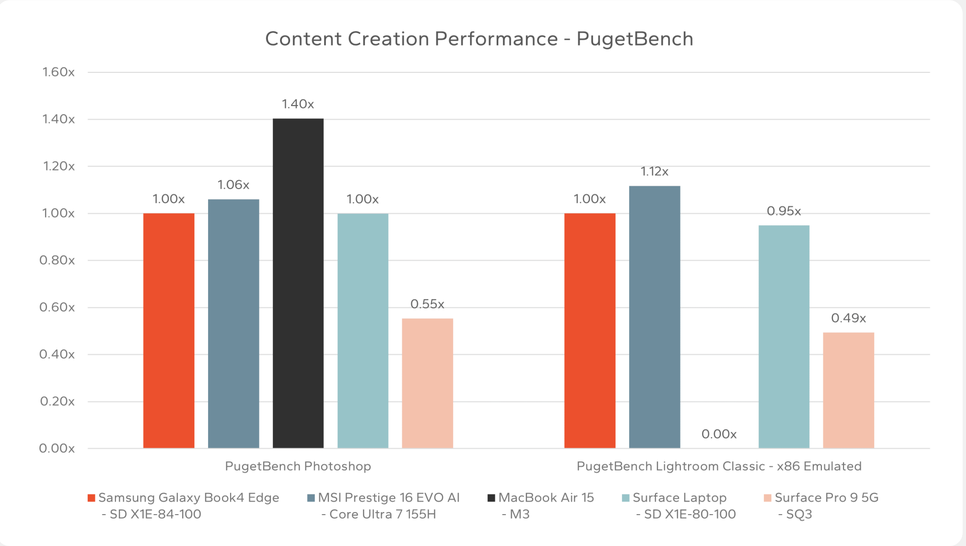
Content Creation and Creativity

Content creation application performance across photo editing, video editing, and 3D rendering.

Content creation and creativity applications have a wide range of functions and features, and scale from lightweight to extremely heavy workloads. In this section we are looking at the performance of a handful of different benchmarks and use cases across Adobe Photoshop, Lightroom Classic, and Blender.

PugetBench Photoshop and Lightroom Classic

Adobe Photoshop and Lightroom Classic are staples of media and content creation enthusiasts and professionals as long-time tools that are trusted by the industry, while also being on the leading edge of AI and innovative features. The PugetBench tests runs a series of tests on workloads to measure performance and usability.



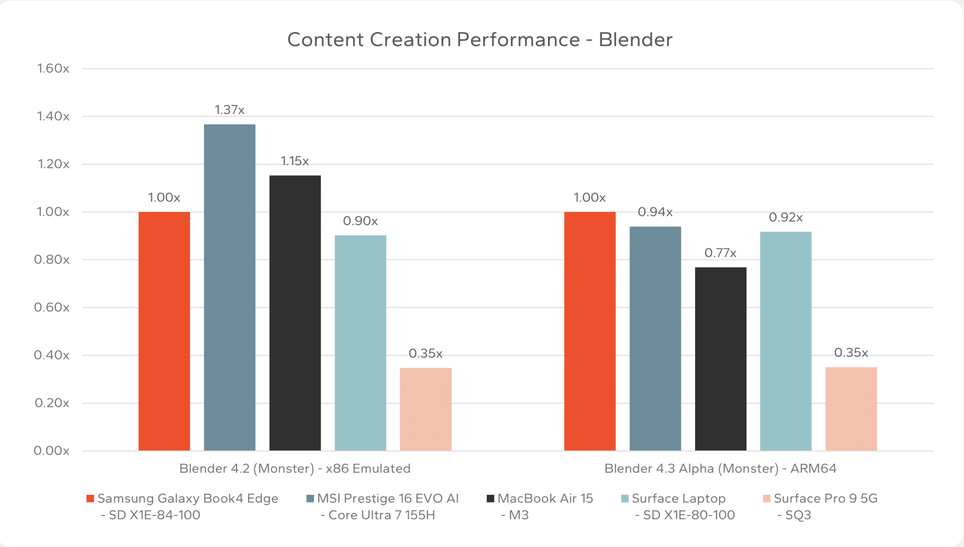
Getting the suite of Adobe applications to run natively on Arm CPUs on Windows has been a painstaking process for those of us monitoring it from the outside. The results from our testing show that even if the new Snapdragon X Elite isn't the fastest platform for this creation tool, it is no longer burdened by emulation and performance issues.

The Samsung Galaxy Book4 Edge performance with the Snapdragon X Elite is comparable to the results previously seen with the Surface Laptop in our Photoshop results, but the x86 platform still has a 6-12% performance lead over both Copilot+ PCs. And the MacBook Air is strong here too, with a significant performance advantage of about 40%.

Content Creation and Creativity

Blender Rendering

Blender is one of the most popular 3D modeling tools used by professional and personal users for rigging, animation, rendering, compositing, and much more. It is utilized in film and animation, game development, architecture and design, as well as art and product design. It has a large and active community and is overseen by a non-profit organization.



For our Blender testing we are showing two different versions of the application. 4.2 is the latest full release but runs as an emulated app on the Snapdragon X Elite platforms, while the 4.3 release is the most recent alpha that includes a native Arm64 implementation. The results don't just demonstrate the capability of the X Elite as a creative platform, but also the advantages when tools like Blender make the effort to develop and target the Arm architecture directly within Windows.

In the emulated version of the app, the Intel laptop completes the tested render workload 37% faster than the Samsung device. That advantage goes away completely when we move all the systems to the latest 4.3 alpha version where the Samsung device is 6% ahead of the Core Ultra 7 155H and is 8% faster than the Surface Laptop.

Maybe more interesting to readers is that the move from an emulated to a native version of Blender also means the Galaxy Book4 Edge moves from being 15% SLOWER than the MacBook Air to 20% FASTER. There are wins and losses throughout this testing, but seeing a 3D rendering application show this kind of performance for the Snapdragon chip compared to the Apple M3 is impressive.

Section Takeaway

From a creator perspective, the Samsung Galaxy Book4 Edge and the Snapdragon X Elite platform look like they are doing well, even if they aren't leading the pack in every benchmark result. In previous generation Snapdragon and Windows on Arm laptops, this was a significant sore spot for users, with application compatibility gaps and big performance deltas to the x86 and Mac competitors. This update, inclusive of both the new Window Prism emulation layer, the much faster Snapdragon X Elite, and the efforts to improve native Arm64 application compatibility, tells a much better story.

Image editing and manipulation tools like Photoshop and Lightroom are within spitting distance of the top x86 Windows laptops as we have tested them here, and in Blender, once we moved to the new 4.3 native version of the app, the Galaxy Book4 Edge is faster than the MacBook Air.

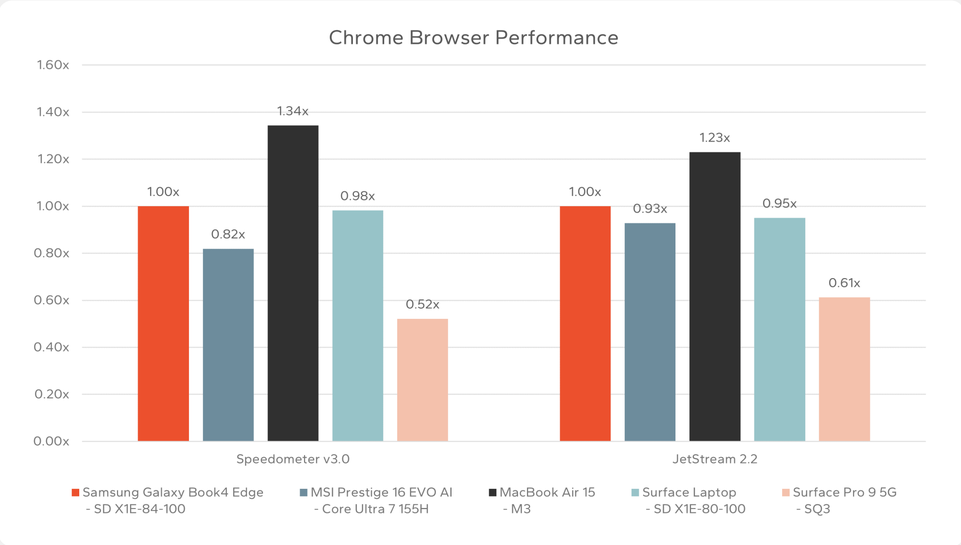
The Samsung Galaxy Book4 Edge offers up to 20% faster rendering than the MacBook Air 15" in Blender.

Modern Web Performance

Everyday performance in modern web applications and browsers.

Google Chrome

Using the latest version of the Chrome browser, now available natively for Windows on Arm, we are running each platform through standard browser performance tests like Speedometer v3 and JetStream v2.2. These tests look at a range of capabilities from JavaScript to Web Assembly and workloads like rendering charts and editing rich text.



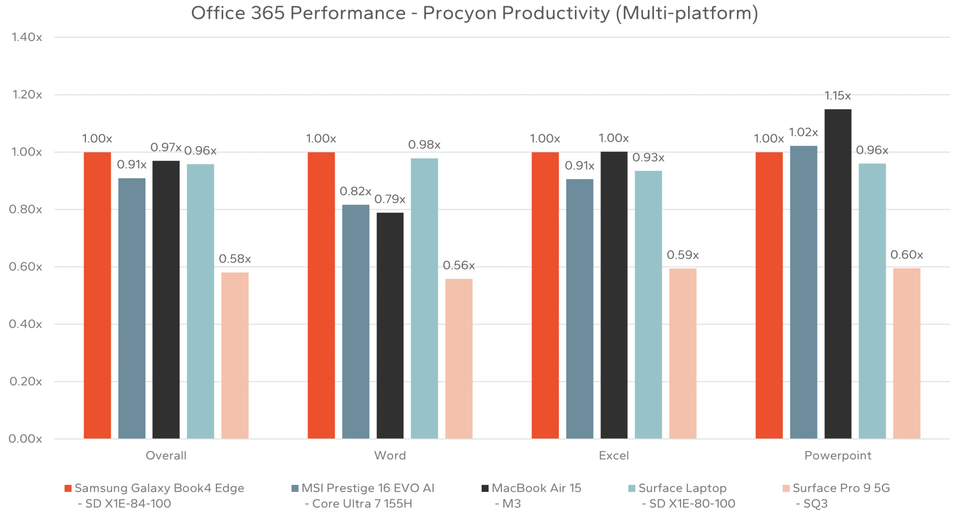
Clearly the efficiency and speed of Chrome on the MacBook Air is excellent based on these scores. But from a Windows perspective, the Galaxy Book4 Edge with the Snapdragon X Elite is faster than the x86 competitor. Thanks to the release of the native version of Chrome for the Arm64 architecture, the most popular web browser now is a first-class citizen in the app ecosystem, and the performance results speak for themselves.

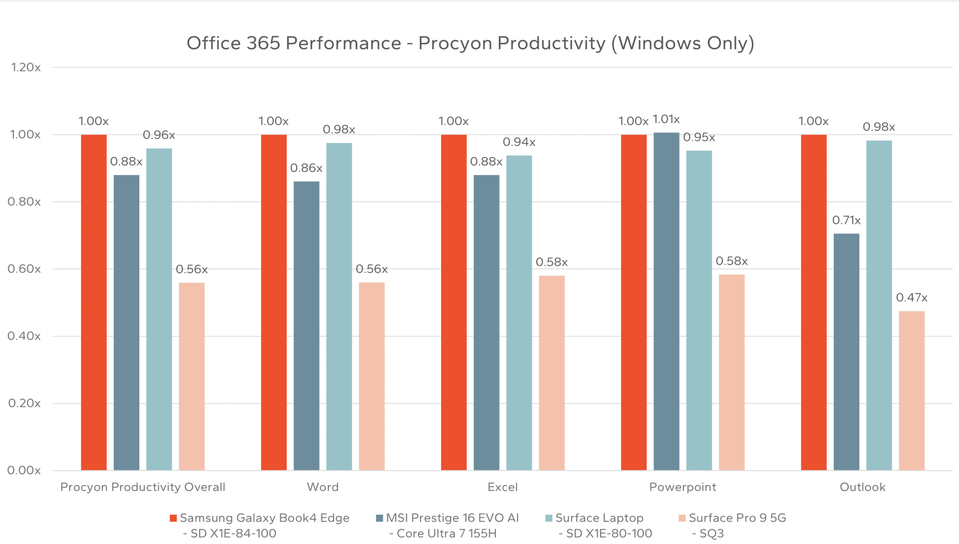
There is no sacrifice in performance or efficiency if you depend on Chrome as your primary interface to the web.

Productivity

Office and advanced productivity performance testing.

The Procyon Productivity test uses Microsoft Office 365 applications to evaluate performance using real-world workloads and scenarios. There are two versions of this test, one that is multi-platform that can be run on Windows and Mac devices, and one that is Windows only (due to a difference of Microsoft Outlook integration). Scores for both versions are different and reported separately.





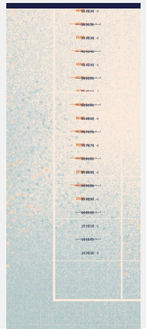
Performance with Office 365 across this set of tests is fairly uniform ranging from the Intel Core Ultra to the new Samsung Galaxy Book4 Edge powered by the Snapdragon X Elite. Only the Surface Pro 9 5G with the 8cx Gen3 stands out but offers a supporting data point to the narrative that moving to a system powered by the X Elite is not going to sacrifice your ability to be productive.

This second version of the test only compares Windows laptops but adds performance analysis in the Outlook email and calendar application. The Samsung Galaxy Book4 Edge and the Snapdragon X Elite perform exceptionally well here and it leads both the Surface Laptop and the MSI machine with the Core Ultra 7 155H. Offering a 12% overall faster result than the x86 competitor is a great outcome for Qualcomm and Samsung and ensures that no one should have to worry about your ability to get work done on these devices!

Productivity Thoughts

Productivity performance is an area that many would consider to be a “solved problem” in the world of computing. Applications like Word and PowerPoint aren’t typically thought of as performance drains on your machine, though Excel can be bottlenecked by single threaded throughput if you have a lot of complex macros or formulas.

But in previous generations of Windows on Arm systems there have been concerns about baseline performance and the need to emulate some of these applications on slower CPUs. That is no longer the case. Office 365 runs natively on Arm-based processors now and the results on the Snapdragon X Elite demonstrate that not only is it “fine” performance but that it is competitive with Intel’s latest offerings.

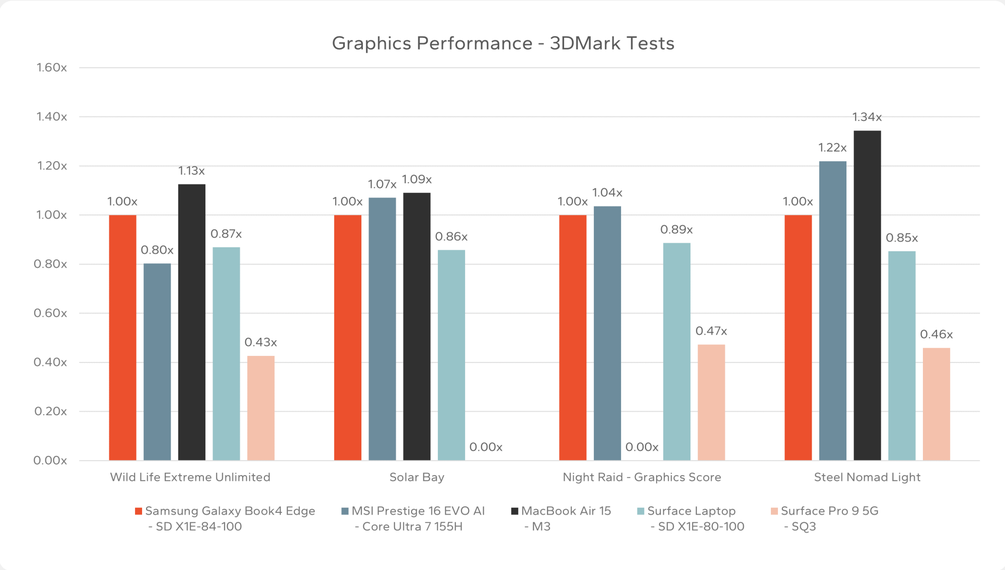


Graphics Performance

GPU performance analysis in synthetic and real-world testing.

3DMark

UL Benchmark's 3DMark family of tests is one of the longest tenured set of benchmarks in the world and the developers have continued to innovate and build leading-edge tests to evaluate performance appropriately across a range of hardware, APIs, and graphics features.



Because of the different supported features and platforms on all of these 3DMark tests, understanding the results can be a bit confusing. In the Wild Life Extreme test, which is the oldest here but still supports modern APIs like DX12 and Metal, the Snapdragon X Elite on the Samsung Galaxy Book4 Edge is roughly 2.2x the performance of the Surface Pro 9 5G and the aging 8cx Gen3. It is 20% ahead of the latest Intel Core Ultra processor with integrated Arc graphics. The GPU on the Apple M3 is showing some muscle here, resulting in a 13% performance lead.

Solar Bay is a mobile-focused test that integrated hardware ray tracing support. It's an advanced feature for this class of product for sure, but the results show the Samsung laptop with the X Elite is within 10% of both the MacBook Air and the Intel Core Ultra 7.

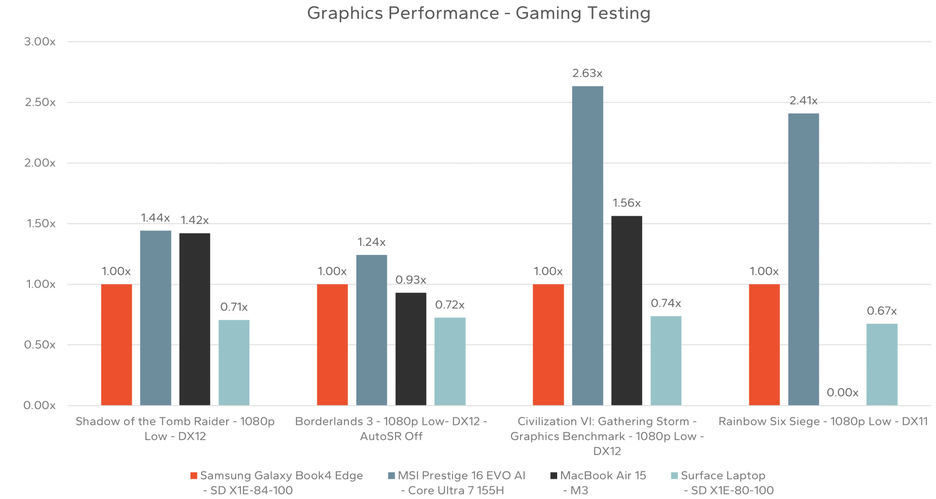
3DMark Night Raid is a DirectX 12 benchmark for laptops, notebooks, tablets and other mobile computing devices with integrated graphics. The Night Raid result has the Galaxy Book4 Edge competing well and within 5% of the Intel platforms.

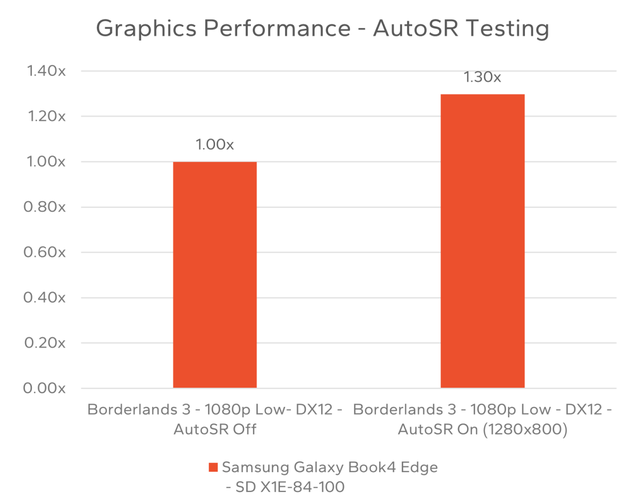
Finally, a new test that was released in the last few months, the Steel Nomad benchmark is meant specifically to look at integrated graphics performance on Windows and Windows on Arm platforms, but also runs on iOS. The results look quite different than Wild Life Extreme, with the Intel platform providing a 22% performance lead, but the Samsung Galaxy Book4 Edge is able to use that faster GPU to a ~15% lead in these tests over the Surface Laptop.

Graphics Performance

Early Game Testing and Performance

Though we are early in the life of the Snapdragon X Elite platform and we expect the gaming compatibility and performance landscape to change for the better over time, it is worth taking a look at some of our early testing results on the Samsung Galaxy Book4 Edge.





In the four games we spent time testing and playing, all of them fall into the average frame rate of 30-60 FPS. Solid, but not earth shattering. In all four instances, the Intel Core Ultra 7 based laptop is providing a better gaming experience, and in both Civ 6 and Rainbow Six Siege, framerates are more than 2x higher. The key takeaway though is that these games are running, playable, and provide a decent enough gaming experience that we can say users that want to try out mainstream gaming on a Snapdragon X Elite platform should have no fear doing so.

Another interesting point that might be lost in the data here is how much faster the Samsung Galaxy Book4 Edge is in these gaming results than the Surface Laptop. The X Elite 84-100 is rated at a much higher peak performance compared to the 80-100 used in the Surface, and as a result we saw scores that are ~30% higher with the Samsung implementation. In a game like Rainbow Six, that pushes you from 33 FPS to 47 FPS; a significant difference for mainstream gamers!

One more interesting feature to call out is AutoSR – a Microsoft specific gaming capability that is part of the Copilot+ PC lineup. It uses the dedicated NPU on the Snapdragon X Elite to implement super resolution technology directly at the OS level. This means the game itself can render an image at a lower resolution (and do so faster) and AutoSR will upscale it to improve image quality while providing a higher frame rate.

A quick test with Borderlands 3 shows that the feature can increase performance by 30% without significant impact on image quality, compared to native rendering. In this example, the frame rate jumps from 47 FPS to 61 FPS!

Section Takeaway

This section of our analysis of the Samsung Galaxy Book4 Edge might be the most complicated and one that pushes us to revisit our testing every few months. It's clear from the synthetic 3DMark test results that the Adreno GPU that Qualcomm has built into the Snapdragon X Elite is powerful enough to stand within range of the integrated graphics leaders in the market today including those from Intel and even the Apple M3. And it offers modern features like ray tracing and image upscaling.

And we spent hours looking at different gaming titles that work on the new Samsung Galaxy Book4 Edge, and to be clear there are many (and plenty that Qualcomm has been demoing during its press tours over the last 6 months). We were able to play Shadow of the Tomb Raider, Borderlands 3, and others at a 1080p resolution and image quality settings generally on low.

Some of the biggest game titles that require kernel-level anticheat platforms won't run today, like Fortnite, and that's a significant miss for a mainstream gaming option.

PC gaming is a complicated and long-term investment that both Microsoft and Qualcomm will have to make, improving the software and driver stack for gamers to grow confidence in Adreno as even a mainstream gaming option.

Conclusions

Even though we are just in the early stages of this shift to an AI enabled PC ecosystem, it's clear that we will see significant changes in our usages and our devices because of it. Microsoft has laid out its plans for the Copilot+ PC future and is investing billions of dollars in the marketing, but most importantly the engineering, to get this right and do it in a way that is effective and impactful while also recognizing the need for safety and privacy.

This new PC category promises consumers and businesses a drastic improvement and shift in how we get work done and how our computers will help us create. Much of that vision is something we'll be analyzing and testing over the rest of this year. But make no mistake, the industry is betting on the NPU and general performance capability of the Snapdragon X Elite processor to bring that vision to life.

The Samsung Galaxy Book4 Edge is an amazing example of what this kind of PC innovation can create. Utilizing the new Qualcomm Snapdragon X Elite chip means that this laptop can be thinner, lighter, and faster, and do it all while offering battery life that exceeds anything previously available in the Windows ecosystem. Samsung has managed to create a balance of technology implementations, style, and peak performance, to present a Copilot+ PC option that should garner a lot of attention.

Summarizing our performance observations from the testing in this report, there are a few critical takeaways. First, the use of the Snapdragon X1E-84-100 processor, the highest performing SKU of the X lineup, makes it the fastest Windows on Arm machine we have tested to date. Compared to the Surface Laptop 15" that uses the X1E-80-100, our benchmarks show that in some instances this Samsung laptop is more than 10% faster. That includes benchmarks like Cinebench 2024 but also real-world usages like DaVinci Resolve and Blender.

Even the GPU performance on the Galaxy Book4 Edge scales exceptionally well with Samsung's implementation of the Snapdragon X Elite. All of the 3DMark test results are least 10% faster on it compared to the Surface Laptop, and in the real-world gaming testing, that advantage actually hits 20%+!

Compared to the Intel Core Ultra 7 155H system in our testing, the Galaxy Book4 Edge does exceptionally well, matching or beating it in nearly all results. A couple of the graphics and gaming tests do find that the Intel Core Ultra still outperforms, but in all of our AI software and capability benchmarks, the X Elite is the clear winner. The MacBook Air 15" powered by the M3 is a formidable competitor, but the Samsung laptop holds its own, outpacing it in multi-threaded workloads, and providing one of the first real Mac-compete options for the Windows market.

The Samsung Galaxy Book4 Edge powered by the Snapdragon X Elite platform is an amazing example of how combining brand-new technologies and innovations, with the expertise of a mobile-first company and engineering organization that has perfected consumer and commercial devices over decades, can create compelling and market shifting products.

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Signal65 exists to be a source of data in a world where technology markets and product landscapes create complex and distorted views of product truth. We strive to provide honest and comprehensive feedback and analysis for our clients in order for them to better understand their own competitive positioning and create optimal opportunities to market and message their devices and services.

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System Configurations

	SAMSUNG GALAXY BOOK4 EDGE	MSI PRESTIGE 16 EVO AI - CORE ULTRA 7 155H	MICROSOFT SURFACE LAPTOP (7TH EDITION)	APPLE MACBOOK AIR 15	SURFACE PRO 9 5G - SQ3
CPU	Qualcomm Snapdragon X Elite X1E-84-100	Intel Core Ultra 7 155H	Qualcomm Snapdragon X Elite X1E-80-100	Apple M3	Microsoft SQ3
RAM	16GB LPDDRX-8448	32GB LPDDR5X-6400	16GB LPDDRX-8448	16GB LPDDR5X-6400	16GB LPDDR4X-2092
Storage	1TB Samsung KLUGGARHHD-B0G1 UFS 3.1	1TB Western Digital SN560	512GB Samsung MZ9L4512HBLU-00BMV	256GB SSD	512GB KIOXIA KBG40ZNS512G
GPU	Qualcomm Adreno X1-85	Intel Arc Graphics	Qualcomm Adreno X1-85	Integrated	Qualcomm Adreno GPU
NPU	Qualcomm Hexagon NPU	Intel AI Boost	Qualcomm Hexagon NPU	Apple Neural Engine	Qualcomm Hexagon NPU
Display	16” 2880x1800	16” 3840x2400	15” 2496x1644	15” 2880x1864	13” 2880x1920
OS	Windows 11 26100.1150	Windows 11 26100.1150	Windows 11 26100.1150	MacOS Sonoma 14.6	Windows 11 26100.1150
Windows Power Mode (Performance)	Best Performance	Best Performance	Best Performance	N/A	Best Performance
Windows Power Mode (Battery Tests)	Best Power Efficiency	Best Power Efficiency	Recommended	N/A	Recommended
OEM Power Settings (Performance)	High Performance	Extreme Performance	N/A	N/A	N/A
OEM Power Settings (Battery Tests)	Quiet	Battery Saver	N/A	N/A	N/A
Firmware Version	P00AKX.044.240615.WY.0940	E15A1IMS.10A	144.18.235	N/A	18.13.251
Virtualization Based Security	Enabled	Enabled	Enabled	N/A	Enabled

Applications Used

Geekbench 6.3.0

Cinebench 2024.0.1

Google Chrome version 126

3DMark 2.29.8282

UL Procyon 2.8.1251

LM Studio 0.2.27

Microsoft Office 365 2407

Adobe Photoshop 25.9.1

Adobe Lightroom Classic 13.3

Blender 4.2.0 Alpha

Blender 4.3.0 Alpha

Davinci Resolve 19 Beta 5

Luminar Neo 1.20.0


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