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TECH ADVISOR

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INTEL ARC

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CONTENTS

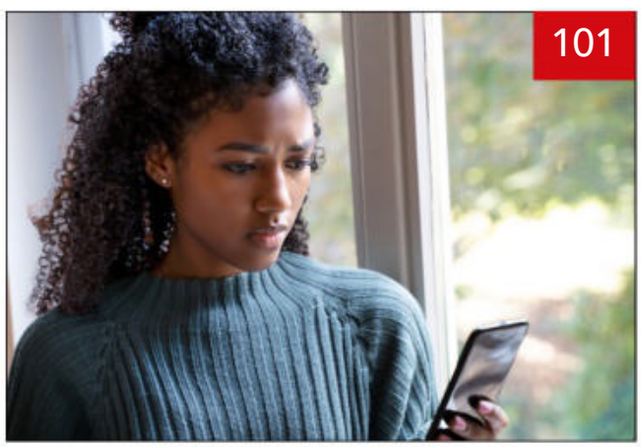
NEWS

INTEL ARC

WINDOWS 11

REVIEWS

FEATURES



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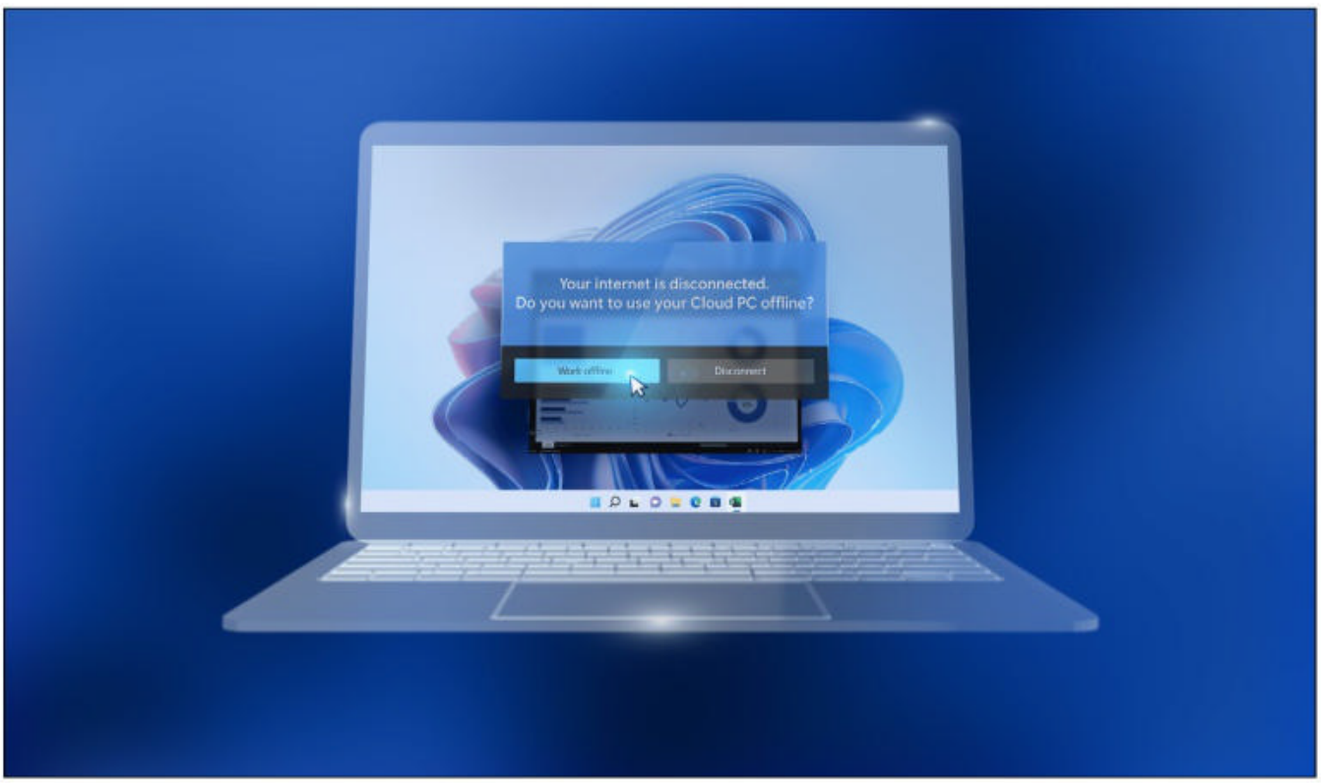


Windows Cloud PCs will soon be able to work offline

Windows 365 Switch will allow workers to go back and forth between a local PC and the cloud. MARK HACHMAN reports

Microsoft is beefing up its PC in the cloud, Windows 365, with some additional capabilities that recognize how workers will be moving back and forth from the office as they transition back to work, including an offline mode.

Microsoft launched Windows 365 in July 2021, offering businesses the option to use a PC in the cloud, rather than a physical device at their desk. Among the differences between Windows 365 and Windows 11 includes the option for a business to 'upgrade' their Cloud PC by

spending more to add additional virtual hardware. (Windows 365 is Microsoft's PC in the cloud; Microsoft 365 is the replacement for Office 365.)

"We see a future where Windows increasingly will take advantage of the capabilities of the hardware, the device it runs on, and the cloud," Jared Spataro, Microsoft's corporate vice president of modern work, said in a briefing before Microsoft's recent Future of Hybrid Work. Spataro added that he believes the future of Windows will see more and more of what makes a user's experience unique – settings, content, and even apps – to be put into the cloud and used on any device.

Three new features represent Microsoft's first steps down this path.

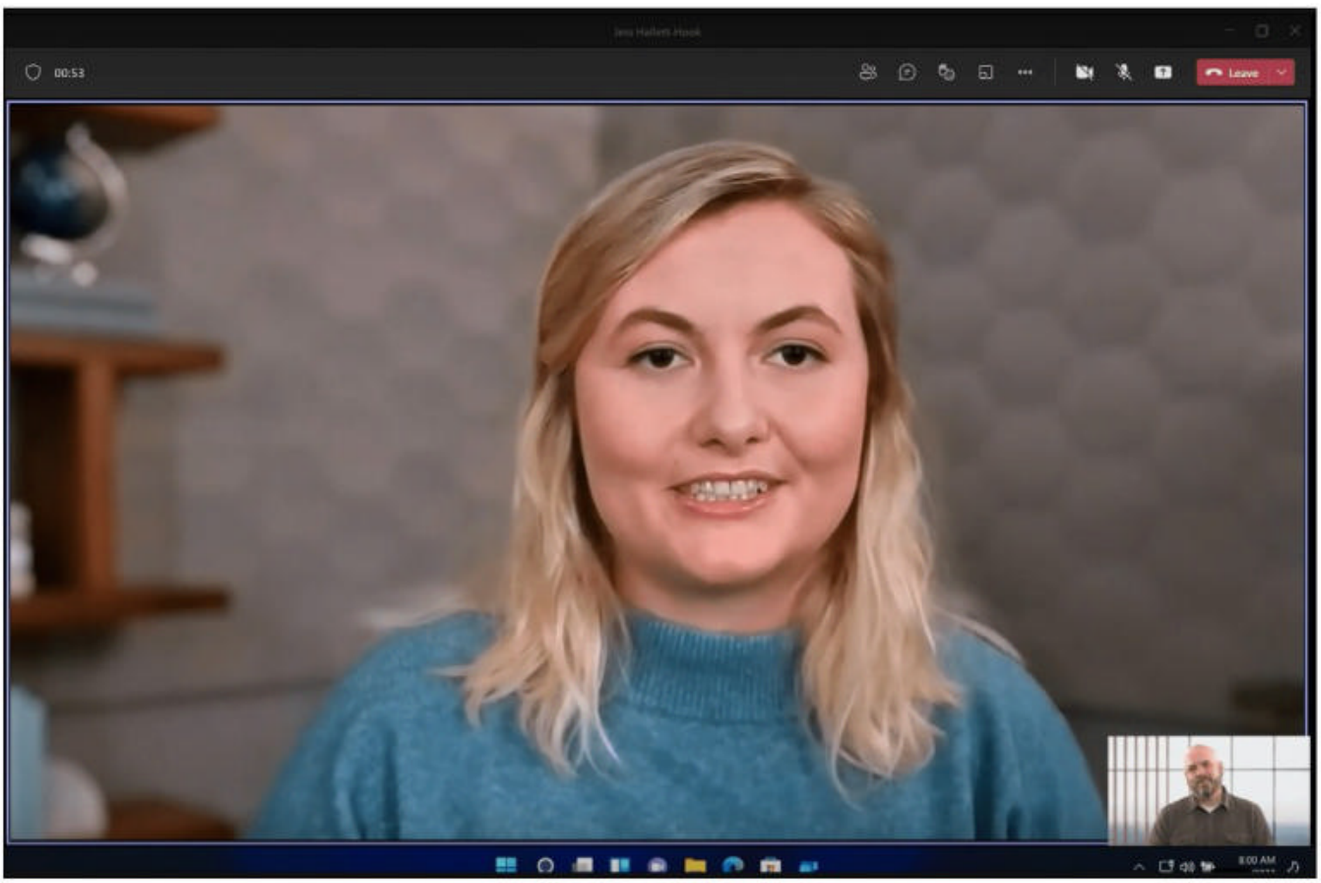
Windows 365 Boot will allow Windows 365 users to boot directly into the cloud – in other words, you won't boot a PC, then access the cloud. When the boot cycle completes, you'll simply be working within the Cloud PC.

People who boot into a local PC will have two options to move back and forth between it and the cloud. First, Microsoft says that you'll be able to swipe back and forth between virtual desktops, only that one of those desktops will be your cloud PC. Microsoft calls this Windows 365 Switch. The Microsoft 365 app in the taskbar will also toggle between the cloud and the local version of Windows.

"I can't overemphasize the importance of this," Spataro explained. "In other words, you can move between what's happening on your local device and what's happening on your Cloud PC."

Finally, Microsoft will introduce Windows 365 Offline, which, like the name suggests, will allow users to work within Windows 365, but offline. When a connection is restored, the offline and the online versions of Windows 365 will sync up. Microsoft hasn't said how the "Cloud PC" will be stored on the client PC.

"This will be an important part of the way we help people move to the cloud over time," Spataro said.



Microsoft taps AI to make you look your best in video meetings

New features make nifty use of AI on a PC. MARK HACHMAN reports

If you've ever been scared to look away for a second at your notes while in a Teams meeting, worry no longer. Microsoft is making AI-driven eye contact and a number of other productivity features part of the Windows platform, the company said in a press briefing accompanying its recent Future of Hybrid Work presentation.

The new features represent some nifty uses of artificial intelligence, on a PC platform that has struggled somewhat

to integrate them. On smartphones, AI is generally used to enhance photo-taking and minimize background noise. Microsoft is adapting these features to Windows 11 PCs, bringing improved background blur alongside a feature called voice clarity. Two other new features use machine learning more directly: an AI-driven Eye Contact feature, and an automatic framing of speakers as they move around.

To be clear, Microsoft has not said exactly when these features will roll out. The company also did not say whether these new features will be specific to Teams or system-wide, and didn't divulge whether they'll be a paid feature of Microsoft 365 or not.

Microsoft has signalled before that such features were coming. In July 2020, Microsoft rolled out the Eye Contact technology as one of the selling points of the Surface Pro X. Moreover, Microsoft made it part and parcel of Windows; the company claimed that the technology would work with any video chat app. (Several customers vociferously disagreed, claiming the technology didn't really work even after the device was updated.) Microsoft also offers noise-suppression options within Teams, where users can tell the app to eliminate all noise besides speech, or just let Teams decides what sounds should be cut out and which should be left in place.

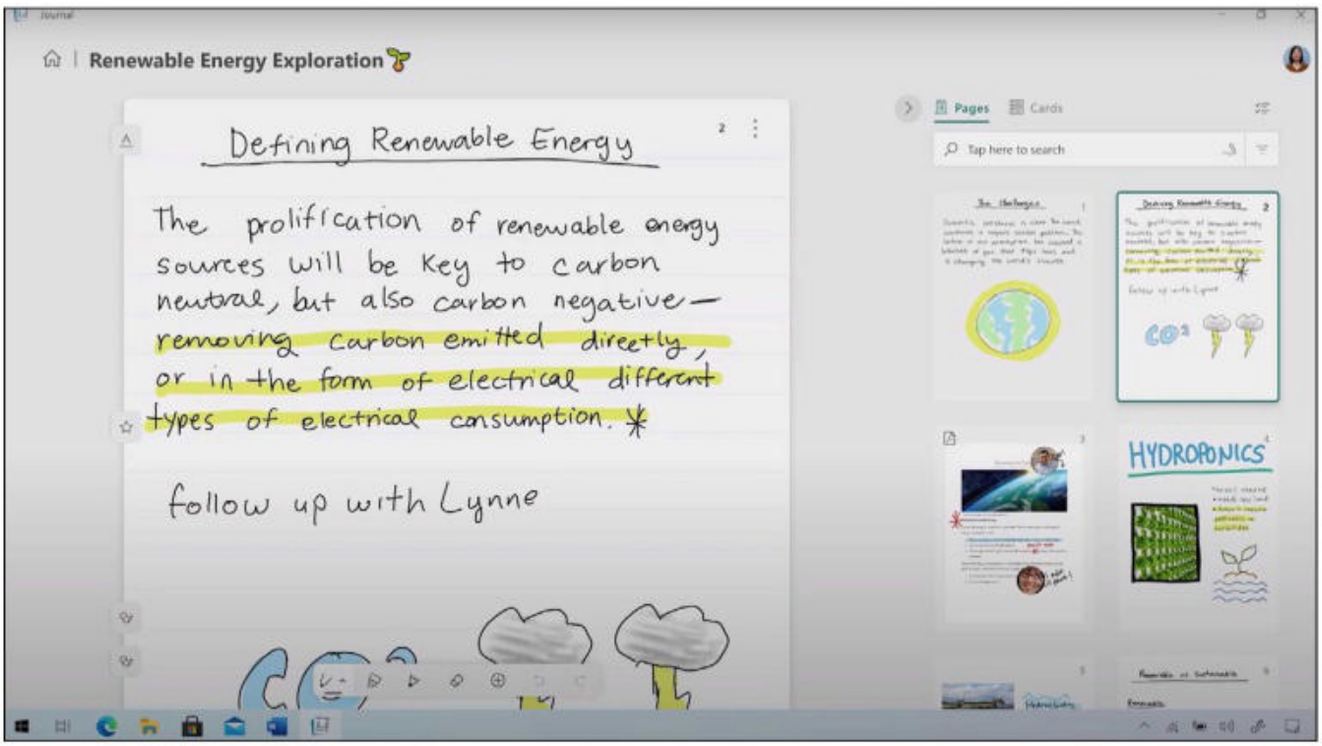
Teams, like other videoconferencing apps, now allows virtual backgrounds, which uses AI to sense the speaker and 'replace' what the camera sees with a mix of animated or static backgrounds. Zoom became the app of the pandemic with its easy videoconferencing and funny virtual backgrounds, but Microsoft also implemented virtual backgrounds in 2019. Now, Microsoft is implementing an improved 'portrait background mode', where it will look like your background was naturally blurred, rather than artificially.

Eye Contact works somewhat in the same manner. Portrait mode 'looks' for your silhouette. Eye Contact looks at your eyes. The difference here is that Eye Contact will actually 'replace' your eyes. As you move your gaze around the screen, Eye Contact is supposed to replace your eyes so that they appear to be staring directly at the screen. Given the trouble users have had with it before, we don't know whether the technology will actually work, or whether it will work so well as to be creepy.

Automatic framing applies the same techniques slightly differently. Dell's WB7022 4K UltraSharp webcam (£176 from fave.co/3jAhrGx) performs automatic framing to centre your face,

and now Windows will use the same approach. “[This] basically means that you will [be] right in the centre of focus, even as you move around or you stand up,” said Wangui McKelvey, general manager of Microsoft 365.

Users have already complained that Microsoft Teams performs automatic framing, but only for the host, and that it can be distracting. Again, we’ll have to see if this ability is configurable in some way. Still, CPU suppliers like AMD, Intel, and Qualcomm have talked about implementing AI on the PC for years now. It’s nice to see technologies starting to take advantage.



Meet Microsoft's new ink-first app, Journal

Microsoft tends to incorporate what works in apps like Journal into other parts of Windows. MARK HACHMAN reports

If you're a Surface tablet owner or someone who prefers inking over a keyboard, you may be searching for an app that prioritizes the pen. For that, there's a new Microsoft app: Journal (available from fave.co/3E6LqiY).

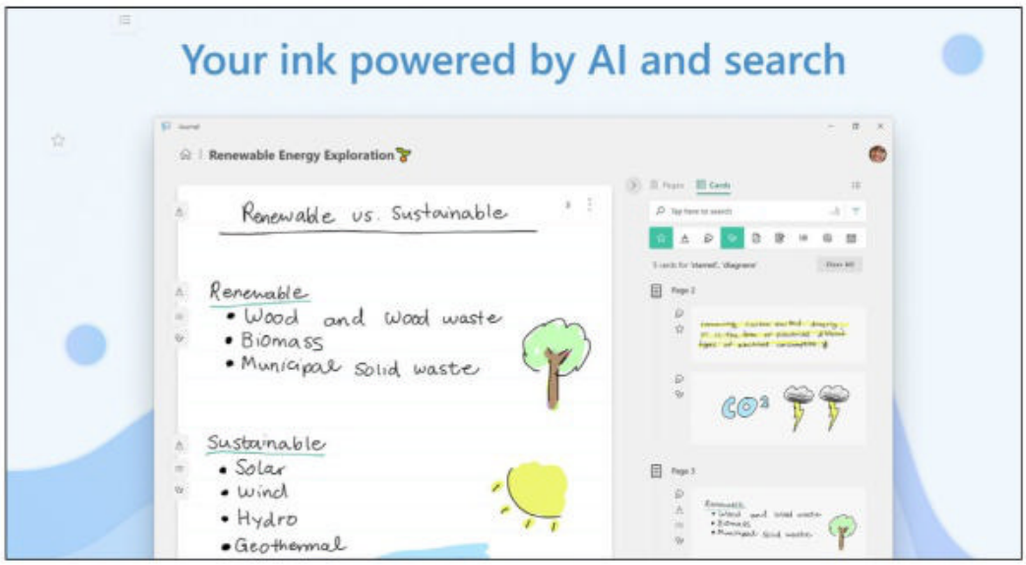
Journal matters for two reasons. One, Microsoft is trying to offer everything pen and paper does, plus more. And second, Microsoft tends to migrate features – or gestures in this case – it develops inside individual apps to the greater Windows and app environment. It's possible that Journal represents some future version of Windows.

Technically, Microsoft Journal is part of the Microsoft Garage, an app incubator that sometimes (but not always) produces a full-fledged application. Journal's noteworthy

because Microsoft designed it as an ink-first application. In reality, that means eliminating certain conventions: erasing e-ink by flipping the pen over or pressing a button, for example. Journal's UI is also page-based. Finally, Journal 'looks' at what you write, tries to figure out what it is you're inking, and offers suggestions to manipulate that text.

That's the difference between Journal and say, OneNote, which relies quite a bit on typed text and supplements that with inked notes and drawings. As you write, Journal recognizes what you write – just like the updated Microsoft Lens app that it recently introduced – and can translate it into text behind the scenes. Since Journal is connected to Microsoft 365, a text block can then be copied into Word. Journal is also integrated into the Calendar app, so you can scrawl notes during meetings.

Using Journal appears to be slightly



Journal is divided into a main inking page and a search panel to the right.

Text is 'erased' within Journal by scribbling it out.

different than Microsoft's other apps. For one, there's no panning and zooming – Journal provides you with a page, and you can only scroll up and down.

More important, however, are the new gestures. Circle or lasso a block of text, and Journal knows that you're selecting it. Mistakes are scribbled out, not erased, and Journal will then get rid of the eliminated characters. Put dots in front of a list, and Journal will know it's bulleted text. It also appears that Journal will also be able to import and mark up PDF files. That was a feature that the first Edge browser offered, but is slowly coming to speed inside the 'new' Edge.

For now, however, the Journal inking page takes up just one part of the page. The other can be reserved for a search panel, including stored Journals that you previously inked, as well as a search box (where characters can be inked in). Here, Microsoft is trying to move away from document names to get you to think about object types: a list, say, or a sketch. Microsoft is also replacing the term 'search' with 'filter' – as in 'to filter on' a sketch, rather than search for it. We'll have to see if that sticks.

Journal looks like one of those apps that may take off among a dedicated group of e-inkers…or not. Like many things within Windows, Journal is there if you choose to use it.

Intel's Arc GPUs arrive in laptops, loaded with enticing features

Let the battle begin. BRAD CHACOS reports

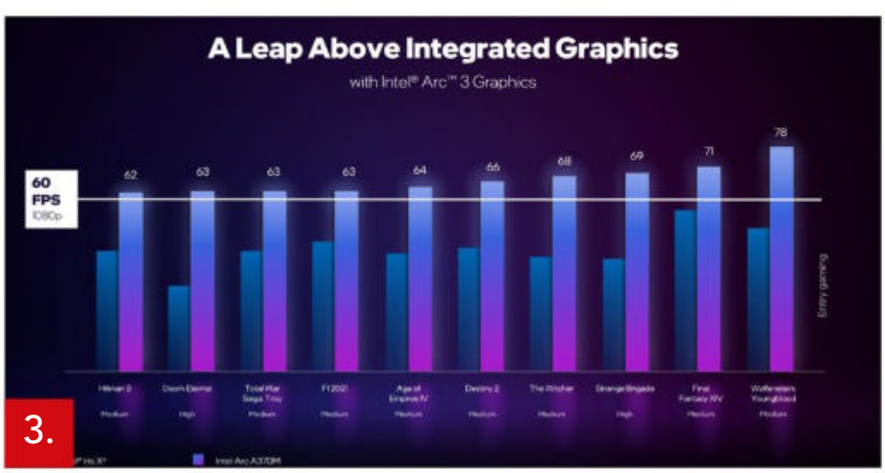
It's finally happening. After years of teases, promises and hype, a third heavy-hitting player enters the graphics card game, aiming to shake up the Nvidia/AMD duopoly. Intel's hotly anticipated Arc GPUs is here, though not in the way you might expect. Rather than debuting in desktop form, Arc's grand reveal comes via laptops, which can drive home some of the advantages Intel can provide in tuned systems revolving around its Core CPUs and Arc GPUs.

MEET INTEL ARC LAPTOPS

Intel has taken the wraps off its Arc A-series mobile GPUs, launching only the most humble variants – the affordable Arc 3 series. The A350M and A370M will

Intel says the Arc 3 laptops surpass 60 frames per second in triple-A games at 1080p resolution at high and medium settings, and 90fps in esports games, doubling the speeds available with its integrated graphics – but the company focused more heavily on the unique value and features Arc can provide (**2./3.**).

appear in laptops, with prices starting at $899 (£tbc). More powerful Arc 5 and Arc 7 notebooks are scheduled to hit the streets over the next few months. All Arc GPUs will be powered by Intel's new Xe HPG graphics architecture. We've split off the nitty-gritty Xe HPG architecture details into a separate article (see page 20), but you can see a high-level look at the mobile GPUs above (**1.**).



By focusing on affordable laptops rather than leaping straight into a battle for high-end desktop supremacy, Intel is playing to its strengths. Yes, Arc was designed for gaming first and foremost –

It starts with the media and display engines, which remain consistent across all Arc GPUs. Every Arc GPU can support up to four total HDMI 2.0b and DisplayPort 1.4a outputs (though configuration will vary by laptop). They're capable of outputting up to 360Hz at 1080p and 1440p resolution or powering a pair of 4K/120 or 8K/60 panels. That's impressive, especially in lower-cost Arc 3 laptops, but it's the media engine where the magic starts.

Arc GPUs sling all the high-end video you'd expect, from 8K 10-bit HDR encodes and HEVC, AVC and VP9. But Arc also offers something no other GPU maker provides: hardware-based AV1 encoding acceleration. The highly efficient next-generation video standard was created by a consortium of industry giants and is rapidly moving towards becoming the norm. Modern desktop GPUs support AV1 decoding that can help you watch 8K videos without your system catching fire, but until now you needed to use software alone to actually create AV1 videos.

Intel says the hardware-accelerated AV1 creation unlocked by Arc is 50 times faster than software encodes. In a short video showing off a stream of Elden Ring in X-Split, locked to 5Mb/s, an AV1 stream provided much better visual clarity than the standard H.264 encoder, displaying much clearer grass, bushes, walls, and other fine elements.

Being first to AV1 encoding is a major, major win for Intel. But it's far from the only one. Let's dig into the content creator enhancements Intel is highlighting with this release before circling back to gaming chores.

DEEP LINK

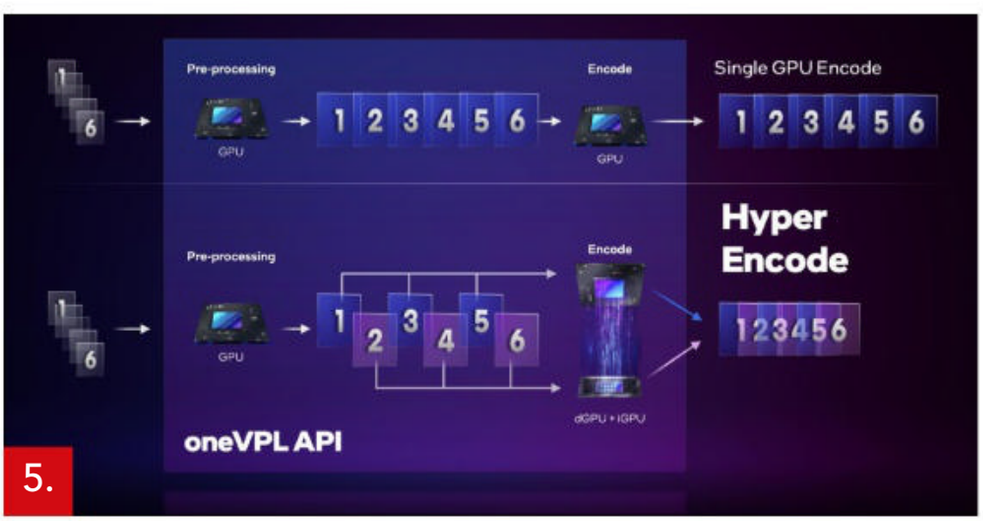
Arc presses its advantage in all-Intel systems with Deep Link, a series of features that can significantly improve performance when the GPU is paired with Intel's popular Core processor. Deep Link existed before, while the company used its Xe Max laptop GPUs to hone the technology, but it's been supercharged with the Arc launch. It revolves around three key features.

Dynamic Power Share (**4.**) intelligently shifts energy back and forth between the Intel CPU and GPU, giving more oomph to each when it's needed, similar to AMD's rival SmartShift technology or Nvidia's Dynamic Boost. It polls the system every 100 microseconds (or 10 times every second), checking to see how hard the Arc GPU is being stressed. (There's also a Low Activity mode that places less strain on battery life.) If things are running optimally, everything stays put. But if the Arc GPU is under heavy load, the laptop will shift more power its

way. And when the GPU isn't being used much, Dynamic Power Share tosses more juice towards the Intel Core processor to provide snappier desktop performance.

The remaining Deep Link features require software that supports it, though work on that is already underway. Hyper Encode (**5.**) lets software tap into all of the available Intel media engines in your laptop, rather than relying on just your CPU or GPU alone, as is typical when you're encoding video. Intel's OneVPL API splits media transcodes into batches of frames and dispatches them to the Arc GPU and the Core processor and its integrated graphics to process, round-robin style. That keeps all your available hardware churning at encoding as briskly as possible.

If the results we saw while batch processing videos in Hyper Encode's early days are any indication, this could be a game-changing feature for content creators, especially now that its power can be brought to bear on single video encodes. That goes doubly so in encoding software that supports Intel's sublime QuickSync technology. Hyper Encode, QuickSync, and AV1 encoding could be one hell of a power trio that Nvidia and AMD could struggle to match – assuming broad software support comes through.

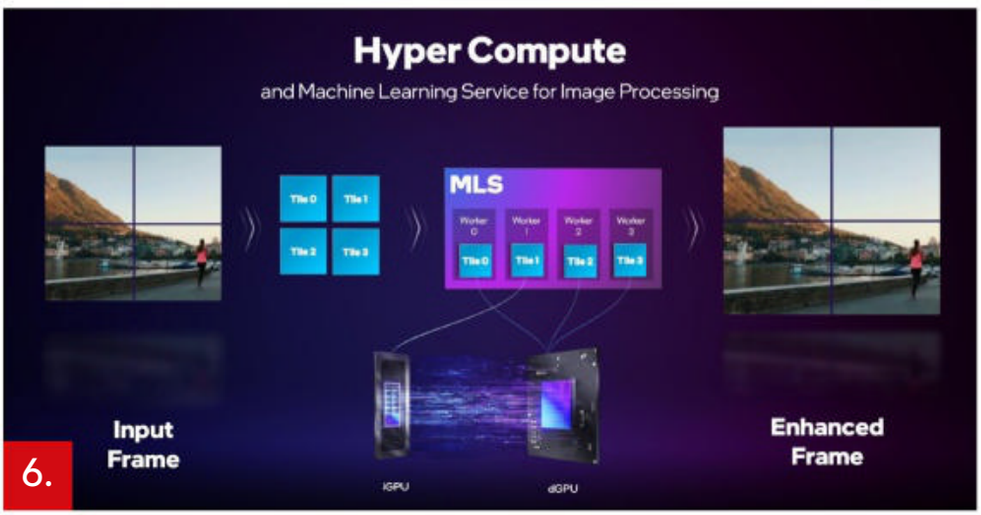


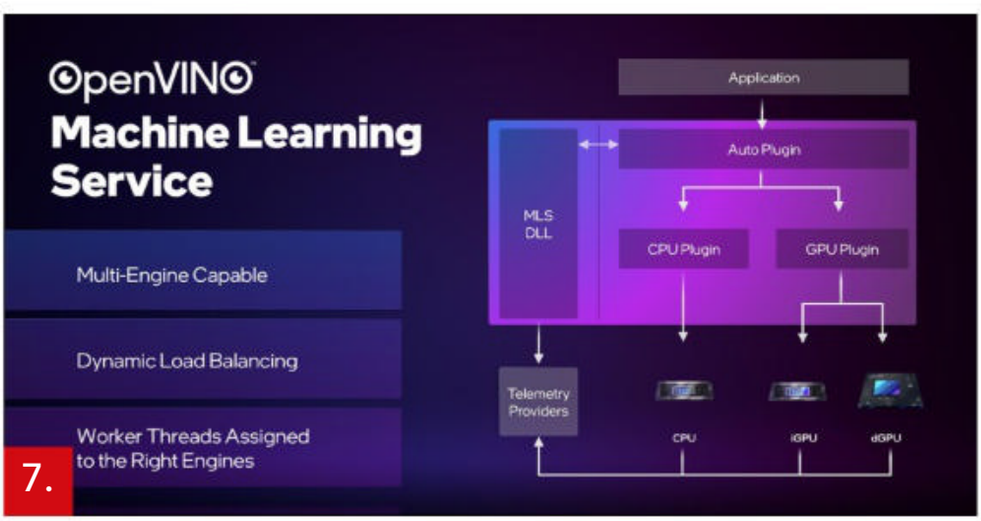
Intel says Hyper Encode can offer up to 60 per cent

better performance than Alder Lake's integrated Iris Xe graphics alone.

Finally, there's Hyper Compute (**6.**), a new Deep Link feature. Hyper Compute leverages all the 'XMX' cores Intel crammed into Arc GPUs to accelerate AI tasks, using a new 'Machine Learning Service' (**7.**) API for OpenVINO. There is a wild world of possible uses for this, but Intel showcased it with Topaz Labs' Video Enhance AI, upscaling and visually enhancing a 1080p video to 4K. Hyper Compute let the software split the input frames into several different tiles, dispatched those to both the Intel CPU's integrated graphics as well as the Arc GPU, then reassembled them to create final, enhanced frames at a much faster clip.

Intel claims Hyper Compute offers up to 24 per cent extra performance in the task – a good thing, as Topaz Labs' AI upscaling offers truly tangible visual differences when you're enhancing older pictures and video, but boy can it take a while.





INTEL XESS AND AI IN GAMES

Content creators aren't the only ones who can put those AI-infused XMX cores to work. At the initial reveal of its Arc GPUs last August, Intel also took the wraps off XeSS, which behaves an awful lot like Nvidia's vaunted DLSS. It taps into the XMX cores to use AI

8.

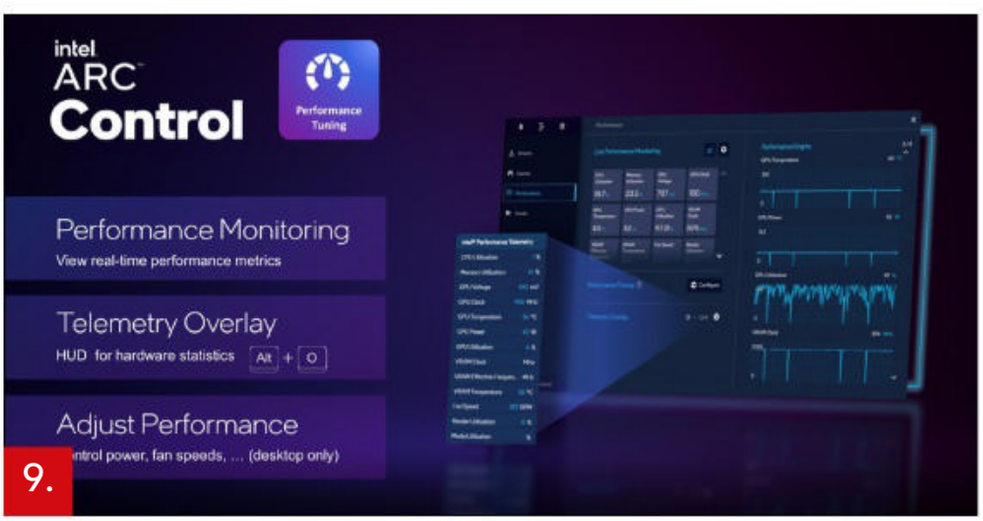
support into their games. For the Arc launch, Intel revealed a handful of games that will support XeSS by early summer, including Death Stranding, Ghostwire Tokyo, Hitman III, and Chivalry II (**8.**).

But XeSS isn't the only way Arc GPUs will tap into AI. Like Nvidia, Intel is rolling out AI-infused tools to supplement your gaming experience, via an all-new Arc Control interface (**9.**) that uses a modern overlay design.

Arc Control includes all the basics you'd expect from graphics software in 2022. You'll be able to monitor and tune your GPU performance, automatically update your drivers, manage global settings, keep tabs on your installed game library, and more. Better yet, Intel Fellow Tom Peterson told us that Intel will offer a new Control API that lets third-party software hook into Arc Control's capabilities, so programs like RivaTuner and MSI's Afterburner

to upscale an internal render running at a lower resolution, then clean up the resulting image, giving you drastically more performance with little to no visual impact (presumably depending on the settings used). Better yet, it uses a fallback technology on graphics cards that lack XMX cores, meaning XeSS will also work on Nvidia and AMD GPUs.

Like DLSS and AMD's upcoming FidelityFX Super Resolution 2.0, XeSS requires game makers to integrate



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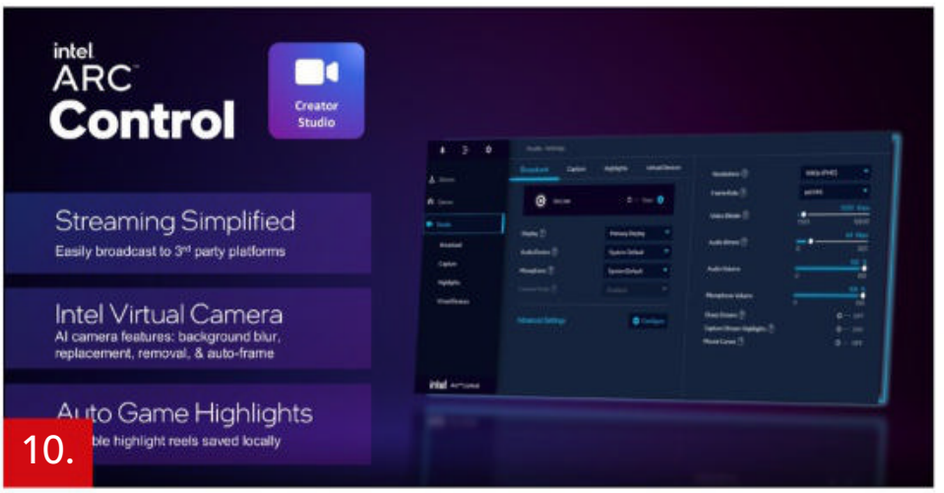


could offer all the same features if they chose to implement them.

The AI features are interesting though. Like AMD and Nvidia's graphics panels, Intel will offer a Creator Studio (**10.**) that makes it easy to broadcast to Twitch, YouTube, and other platforms (don't forget that AV1 encoding). Intel will tap into the XMX cores to power AI camera features like background blurring, replacement, and removal, as well as automatically framing you. It sounds similar to Nvidia's popular Broadcast suite.

But more intriguingly, Intel is also teasing Auto Game Highlights that save clips of your most dramatic gaming moments. Nvidia's ShadowPlay offers a similar tool but it's only available in a small handful of games. Intel says Arc Control's Auto Game Highlights don't require developer integration, and it's already working in 10 of the top esports games. The proof will be in the pudding but it could be a rad feature for the blue team.

ONWARD AND UPWARD

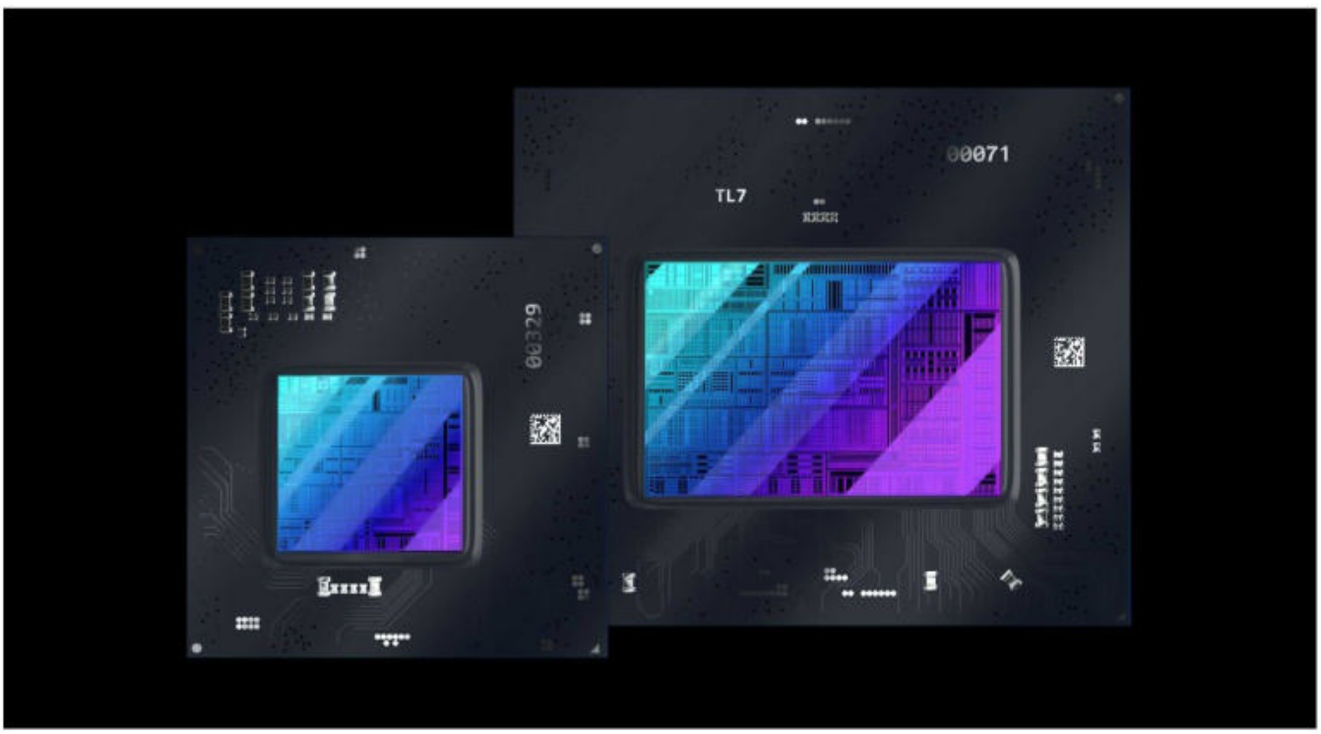
Intel's Arc 3 laptops launch is spearheaded by the thin and light Samsung Galaxy Book2 Pro. And once again, launching Arc in its most humble mobile iteration helps Intel drive home strategic wins. Intel's Devon Nekechuk told press that select Arc 3 laptops will be part of Intel's Evo programme. Evo dictates a wide array of technical details to ensure you have a portable, responsive, fast-charging laptop with all-day battery life, powered (of course) by various Intel technologies. Arc-enabled Evo laptops must abide by the same guidelines, but they'll offer twice the gaming performance of integrated graphics, AV1 encode, and support for Intel's compelling-on-paper XeSS and Deep Link features, with prices starting at $899 (£tbc).

It's a very Intel way of launching the Xe HPG architecture (see page 20) and its debut discrete consumer graphics cards, and one laser-focused on highlighting the features and

benefits possible with an all-Intel system now that Arc GPUs are here. Rather than getting into a frame rate war with Nvidia and AMD in their desktop strongholds, Intel is playing to its strengths: Its overwhelming ownership of the laptop space and deep software support. We'll have to see how Arc GPUs hold up once reviewers have them in hand, but the capabilities Intel revealed look very nifty indeed.

And make no mistake: That brawl is coming. More powerful Arc 5 and Arc 7 laptops are due by early summer, and Intel says Arc desktop graphics cards will make their debut sometime in the second quarter. Expect to see a fight from all sides. None of these companies enjoy losing, and when multibillion dollar megacorps are fighting it out for your attention, PC gamers and content creators could wind up being the big winners.

You know, if graphics card prices chill the heck out. Launching in laptop form helps Intel circumvent that headache, too.



Meet Xe HPG, the beating heart inside Intel's first graphics cards

Xe HPG is the architecture powering Intel's Arc graphics cards. BRAD CHACOS reports

It's the start of a new era of competition. As we've already seen, Intel has revealed its debut Arc GPUs, heralding its long-teased entry into discrete consumer graphics cards. Watch out, Nvidia and AMD. Chipzilla's here, fuelled by its new Xe HPG (High-performance gaming) GPU architecture.

Intel took an unusual (but strategically smart) approach to Arc's debut, rolling out Arc 3 graphics for modestly priced portable laptops. It lets the company leverage its substantial strengths in notebooks and software support rather than going blow-for-blow in gaming frame rates on the

desktop, where Nvidia and AMD stand firm. We've already looked at the Arc 3 laptop GPU reveal and Intel's killer features (page 12). There's some pretty compelling stuff, including key 'Deep Link' features that add eye-opening capabilities when you pair an Intel Arc GPU with an Intel Core processor.

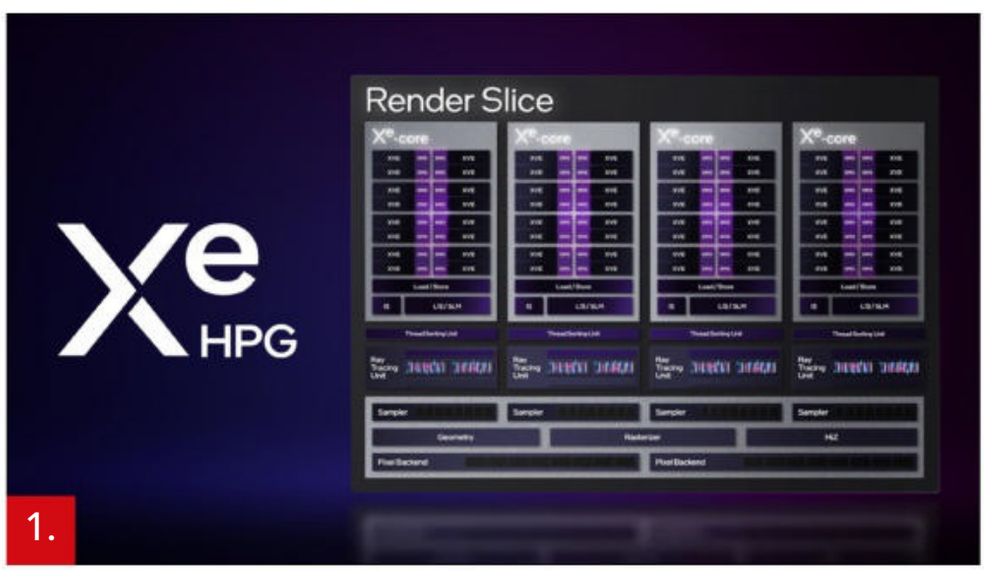
That's not the point of this article though. As part of the reveal, Intel Fellow Tom Peterson also provided the press with a high-level overview of the Xe HPG architecture underpinning these Arc 'Alchemist' graphics cards. It's our first glimpse at the nuts and bolts powering Intel's discrete graphics ambitions.

So, here's a brief technical explainer on the innards of Intel Arc's Xe HPG chips. Much the way Nvidia and AMD use different technologies and terminologies for their designs, Intel's Arc chips rely on some proprietary concepts (including a new take on clock speeds that needs some explaining). That makes it difficult to compare Arc against rival GPU architectures – Intel doesn't even use common terms like ROPs and TMUs – but by the time we're done here, you'll have a solid high-level understanding of what makes Xe HPG tick. Let's dig in.

MEET XE HPG

For Intel, Xe HPG 'render slices' (1.) comprise the backbone of every Arc GPU. Intel's laptop and desktop Arc offerings can be scaled up or down as needed to fit different market needs, but these render slices are at their heart, containing dedicated ray tracing units, rasterizers, geometry blocks, and the fundamental building block for Arc, the Xe Cores themselves. Xe XPG can scale all the way up to eight render slices in Arc mobile GPUs, represented by the flagship Arc A770M GPU in laptop form.

Each render slice contains four Xe cores and four ray tracing units, along with all the other bits necessary for running a modern GPU. These render

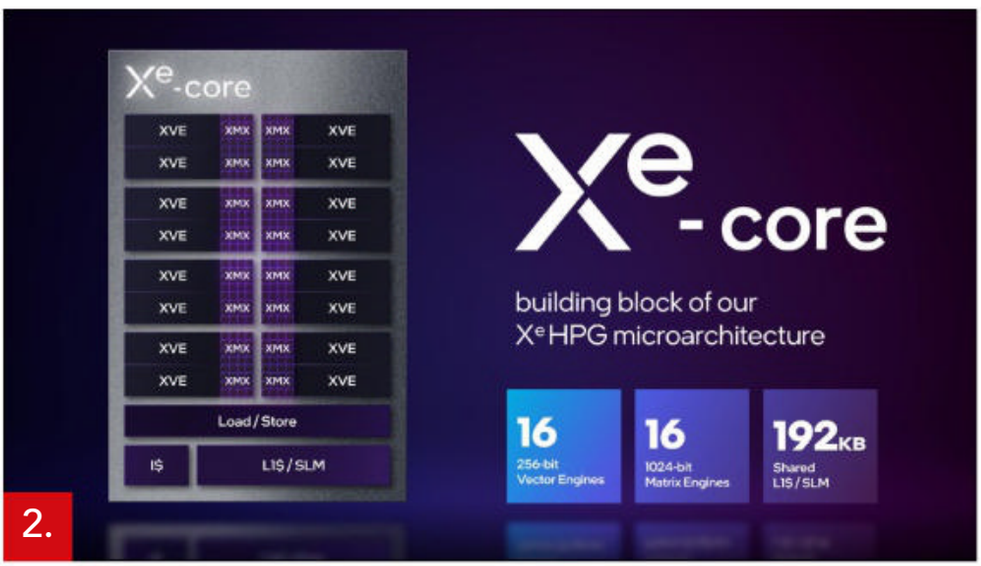


1.

slices are fully DirectX 12 Ultimate compliant, meaning Intel's Arc GPUs can handle ray tracing, Variable Rate Shading, Mesh Shading, and all the other features associated with that standard.

Let's go deeper and take a peek at the Xe cores themselves. Each Xe core (again, there are four per render slice) is comprised of three key bits: 16 256-bit 'XVE' vector engines that handle more traditional rasterization tasks, 16 1024-bit 'XMX' matrix engines that handle machine learning tasks (like the tensor cores in Nvidia's rival RTX GPUs), and 192KB of shared L1/SLM cache (**2.**). That cache can be used to hold tasks during compute workloads, or shaders and textures while gaming.

The biggest companies in PC gaming may be betting big on ray tracing being the future of graphics, but traditional rendering remains king for now. Each Xe Vector Engine (**3.**) includes a dedicated floating point (FP) execution port to handle traditional shading tasks, along with a shared INT/EM port that can tackle integer-based tasks at the same time.



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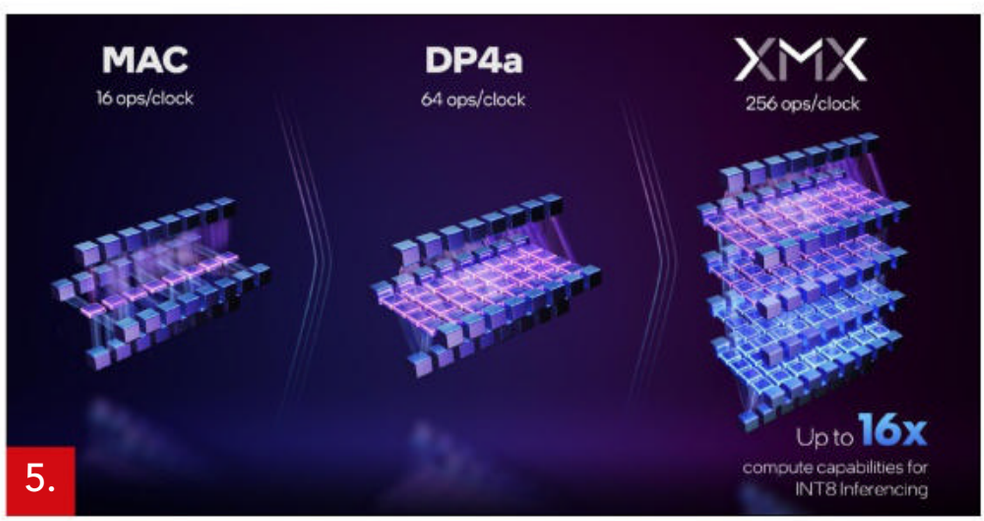
Nvidia introduced concurrent FP/INT pipelines with its RTX 20-series 'Turing' architecture to keep integer tasks from clogging up the FP32 pipeline, and it's become

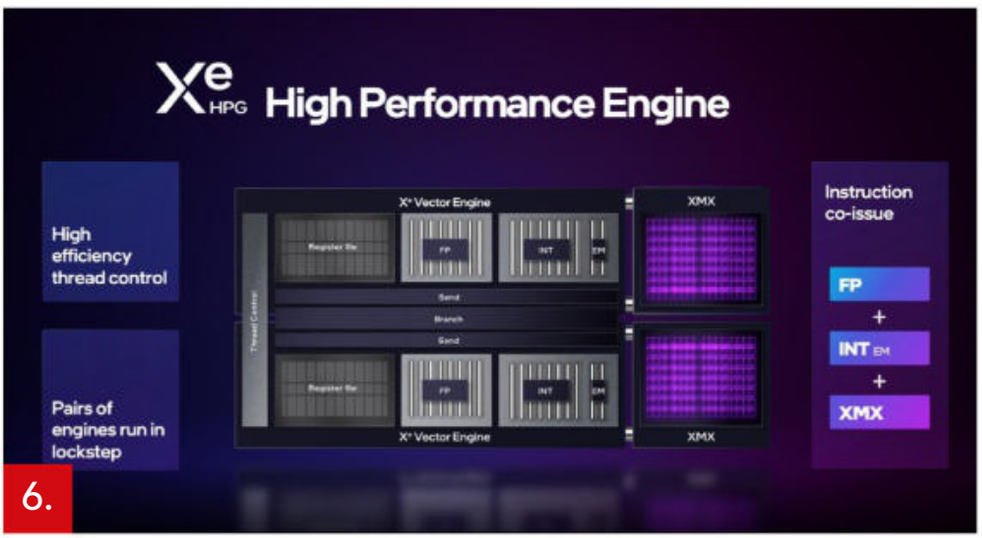
designed to greatly accelerate machine learning tasks. These are the bits that unlock the potential of XeSS, Intel's rival to Nvidia's vaunted DLSS upsampling, as well as other special sauce features like Hyper Compute and the virtual camera feature in Intel's new Arc Control command centre. (Again, read our Arc laptop GPU reveal coverage for deeper insight into those consumer-level features.)

the norm since. "When Nvidia examined how real-world games behaved, it found that for every 100 floating point instructions performed, an average of 36 and as many as 50 non-floating point instructions were also processed, jamming things up," we wrote in 2018. "The new integer pipeline handles those extra instructions separately from and concurrently with the FP32 pipeline. Executing the two tasks at the same time results in a big speed boost."

Intel's dedicated 'XMX' matrix engines (**4.**) hook into the vector engines in each Xe Core. They're broadly similar to Nvidia's RTX tensor cores,

When tapped by compatible software (such as a game with XeSS or an app that supports Hyper Compute), the XMX core's 4-deep systolic array can calculate up to 256 multiply accumulate (MAC) operations per





6.

clock for INT8 inferencing, a massive increase over the 64 ops/clock offered by modern GPUs with DP4a hardware on board and the 16 ops/clock supported by older GPUs (**5.**).

Intel's XeSS supports a fallback mode to run on rival Nvidia and AMD graphics cards that lack XMX cores, defaulting to DP4a hardware instead. This picture illustrates very well why Intel expects XeSS to run much, much faster on Arc GPUs with XMX hardware inside.

Each Xe Core features 16 total Vector and Matrix engines, with pairs of each running in lockstep, able to run FP, INT and XMX tasks all at the same time (**6.**). Arc GPUs can be kept very, very busy indeed.

XE HPG MEDIA ENGINE AND AV1 ENCODING

Intel has always been proud of its media engines, spearheaded by the lightning-fast QuickSync technology, and the Xe XPG's media engine (**7.**) is no different. It includes all the modern capabilities you'd expect in a graphics chip – various 8K HDR encode and decode support, HEVC, VP9, you name it – but also one big inclusion that no other chip (CPU or GPU) offers: hardware-accelerated AV1 encoding.

7.

The highly efficient next-generation video standard was created by a consortium of industry giants and is rapidly moving towards becoming the norm, and modern desktop GPUs support AV1 decoding that can help you watch 8K videos without your system setting itself on fire, but until now you needed to use software alone to actually create AV1 videos. Intel says that the hardware-accelerated AV1 creation unlocked by Arc is 50 times faster than software encodes, or it's capable of delivering much clearer streaming visuals at the same bitrate as other encoders.

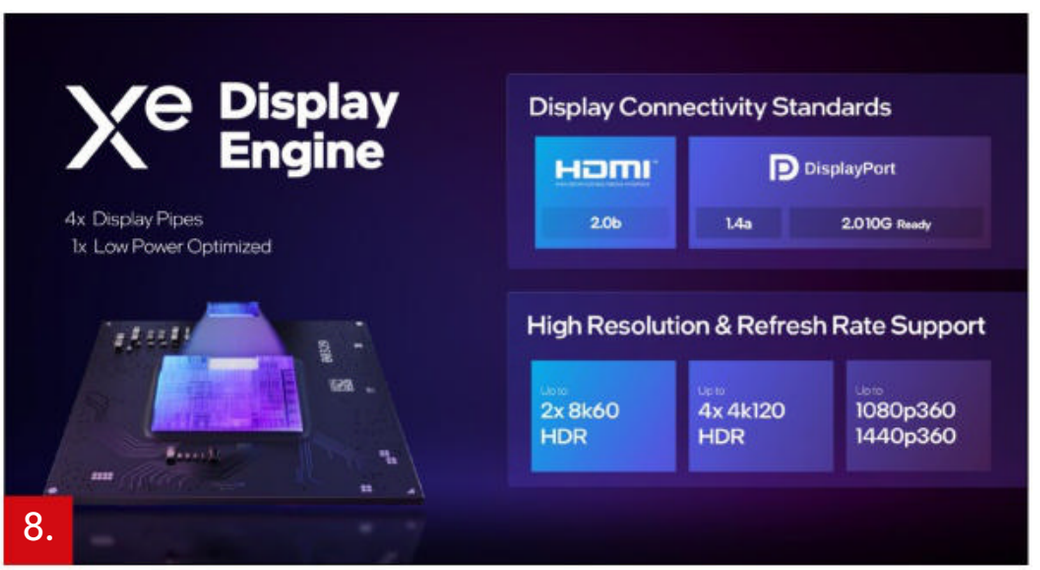
Paired with the Hyper Encode feature offered in all-Intel laptops as part of the company's Deep Link suite, which leverages the media engines in both the CPU and GPU rather than one or the other, Arc-based systems could prove terribly compelling for video creators (if gaming performance is up to snuff, of course).

XE HPG DISPLAY ENGINE

The Xe HPG display engine (8.) remains consistent across the Arc GPU stack, meaning every Arc graphics card offers the same video output capabilities (though the exact port configuration will vary by model). Don't expect good frame rates if you actually try gaming on a pair of 8K screens, but it's good to know Arc will support it if you want all the pixels for your productivity tasks.

REAL-WORLD ARC A-SERIES LAPTOP GPUS

Let's take a moment to bring all this technical talk back to the practical realm. Intel cobbled together a bunch of Xe cores and render slices into a pair of dedicated Arc 'Alchemist' GPUs for the mobile market: the higher-end ACM-G10, and the more modest ACM-G11, which will appear in the debut Arc 3 laptops (9.).



8.

From there, those GPUs can

9.

10.

their ultra-low clock speeds. In an era where Nvidia's GPUs push 2GHz and some AMD GPUs clear 2.5GHz, seeing Intel's Arc topping out at 1650MHz and going as low as 900MHz is a tad eye-raising. Clock speeds between rival graphics brands aren't as clear cut as they seem, however.

AMD's 'Game Clock' for Radeon GPUs isn't the same as Nvidia's 'Boost Clock', as I've explained before. Intel is using yet another metric for its Arc GPUs, dubbed 'Graphics Clock'. Petersen defined Intel's Graphics Clock as the average clock speed for a typical workload that particular GPU was intended for (so gaming for He XPG and likely compute tasks for workstation cards, for example). If you look at the laptop GPU charts above (**11.**), you'll also see a range of TDPs defined for each; the Graphics Clock is based

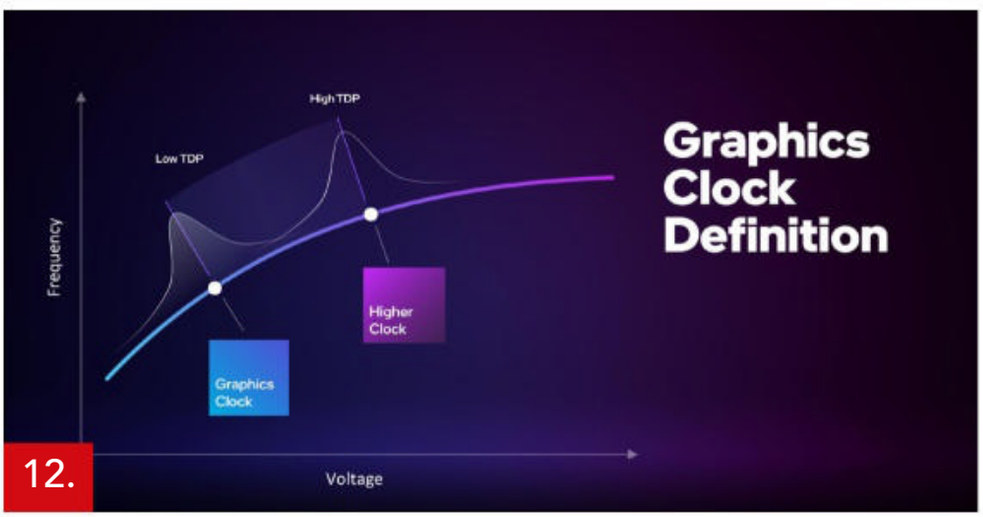
be sliced and diced to meet different market needs. Here's how the first generation of Arc graphics for laptops shakes out: Arc 3 laptops is available now, with Arc 5 and 7 laptops expected to launch sometime this summer (**10.**).

XE HPG GRAPHICS CLOCK SPEEDS

Something might have jumped out at you in those laptop GPU spec charts:

off the lowest available TDP. In other words, Intel's Graphics Clock essentially represents almost a worst case scenario for Arc GPUs.

All that said, graphics cores can run at different speeds depending on how hard they're being pushed (**12.**) – they'll hit much higher speed in 2D retro games and much lower speeds in complex modern games that hit every part of the Xe Core and Render Slice, for example.



And wattage can make a massive difference to performance as well; as we've seen with Nvidia's mobile GeForce offerings, pumping more juice into a GPU can help propel a lower-tier GPU past a low-watt version of an ostensibly more potent sibling.

It's also worth noting that clock speed isn't everything. In the same company's architecture, faster is generally better – a 2GHz GeForce GPU will be faster than a 1.5GHz one, say. But AMD's desktop Radeon RX 6500 XT lags behind its siblings despite packing a ludicrously fast 2.8GHz clock speed. Raw clock speed gains are far from the only way to drive faster performance, as AMD's Robert Hallock recently explained on our Full Nerd podcast. That company's Ryzen 7 5800X3D processor actually saw big gaming performance gains by dropping clock

speeds and plopping a huge slab of cache atop the chip.

It's complicated, is what I'm saying. Don't look too deeply into the clock speeds for Intel's Arc GPUs until laptops and desktop graphics cards wind up in the hands of reviewers.

BUT WAIT, THERE'S MORE

And that about does it for our tour of Intel's Xe HPG architecture. The company kept things pretty high level for the mobile-centric reveal, but we'd expect to see a white paper with more details released the closer we get to the arrival of Arc 5 and 7 laptops in early summer, and Arc desktop graphics cards sometime in the second quarter.

After 6 months, Windows 11 is still playing catch-up to Windows 10

There just aren't enough new, worthy features to justify upgrading from Windows 10 to 11. MARK HACHMAN reports

Last year, we wrote that Windows 11 was, in a word, unnecessary. Have six months changed our opinion? No, though there are signs that Microsoft is fixing some of Windows 11's most obvious flaws.

Because virtually all of Microsoft's development work now takes place on Windows 11, by necessity most of my work is done on its latest operating system. I've left most of my family's PCs running Windows 10, however, in part because they're simply used to the familiar Windows 10 environment. I still think that's the right decision for most people.

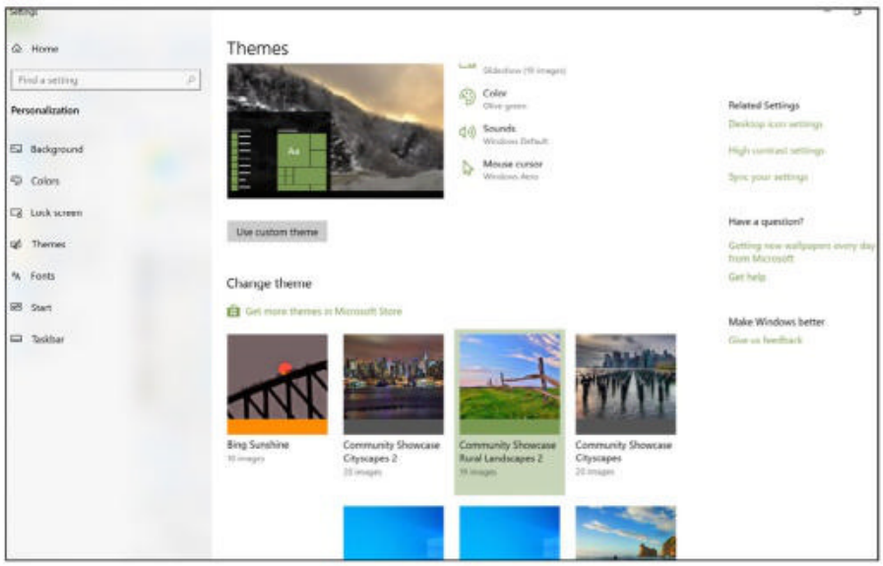
What follows isn't a re-review of Windows 11. But it's a good opportunity to think about whether the original review was influenced by first impressions, and what, if anything, Microsoft has accomplished in the intervening months.

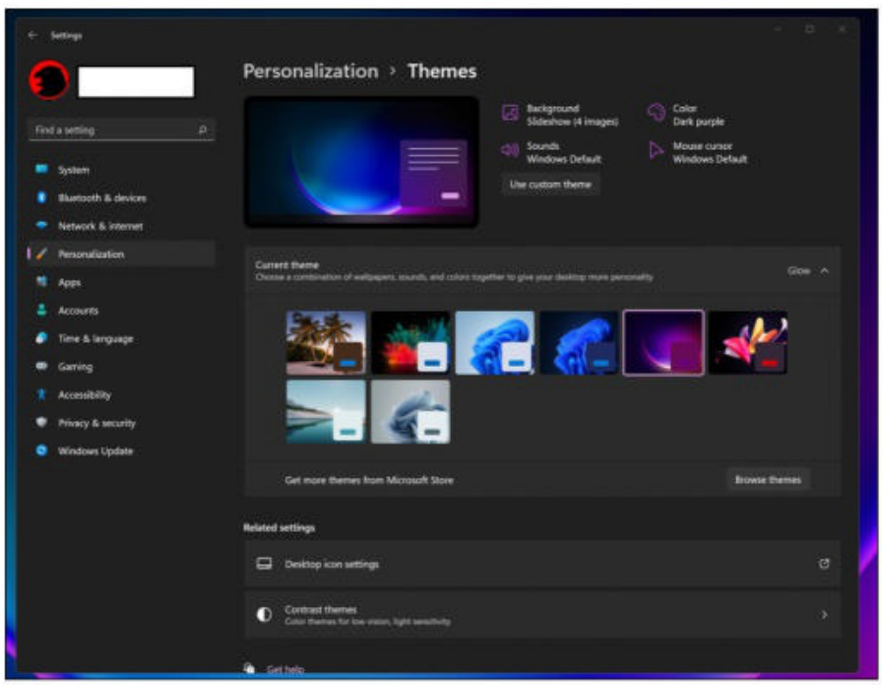
START, TASKBAR, THEMES AND MORE: STILL NO FUN

At release, Windows 11's most significant flaw was that it feels both less fun and less functional. That's still the case, months later.

Case in point: In Windows 10, navigating to Personalization > Themes brings up large, vibrant icons telling you what themes you have installed, tacitly encouraging you to use them. Technically, the same options are available within Windows 11, but everything is far more subdued. Your PC feels less like an extension of your personality than a condominium with a few paint schemes that have been pre-approved by an HOA.

Personalization matters, which is why we wrote a 'How to personalize your

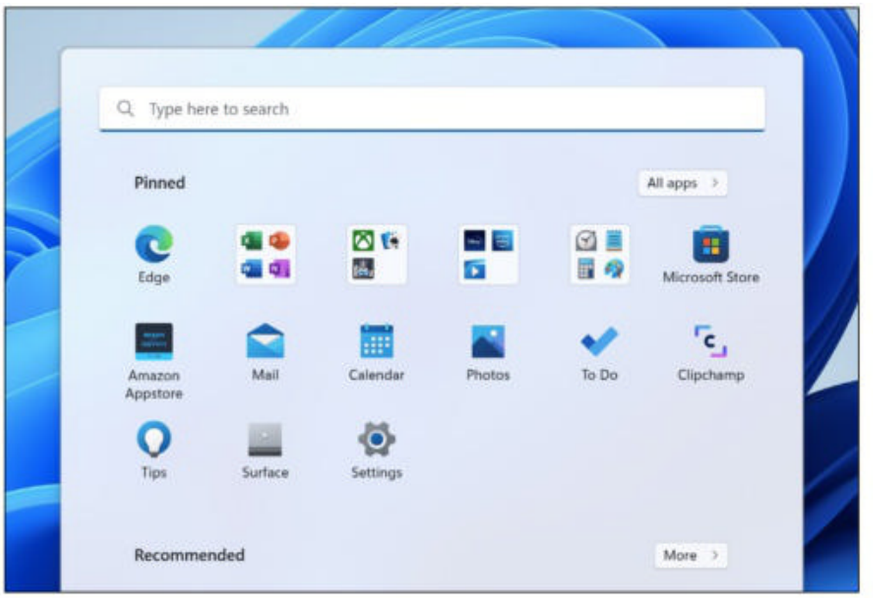




Windows 11's Settings menu is nicely organized, and a real strength of the OS. But there's a price to be paid for its efficiency, and that's its sense of fun. Windows 10 above, Windows 11 below.

PC' story for Windows 10 (fave.co/3M4alki). But that story includes a section that's hardly applicable to Windows 11: the Start menu.

To be fair, I use the Start menu as a 'Start' about half the time. Windows has a variety of ways to launch apps within Windows. You can also type Win + R to 'run' programs, or simply 'search' for them by hitting the Windows key, typing the name of the app and hitting Enter. I usually launch apps using the latter method.



Even in a blown-up screenshot, I struggle to make out the Disney app in the third folder within this Windows 11 Start menu, which shows the Start folders which have appeared in Microsoft's Insider releases. This is not a step forward.

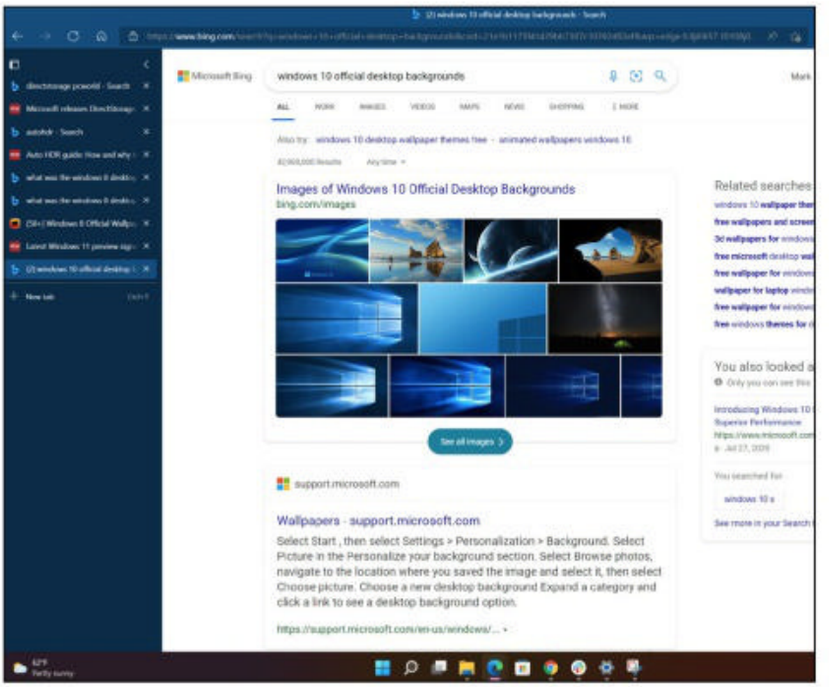
When I do need to use the Start menu, though, I really loathe doing so in Windows 11. It feels so horribly institutional, a sea of icons with no rhyme or reason. Yes, I know that Start folders appear to be scheduled for release during the autumn, but let's face it: They've already botched those too. One of the key visual elements of Windows 10 was the ability to visually weigh specific apps and folders by resizing them. Now, you can group Windows 11 apps together in a folder and make the icons smaller as a consequence. Doesn't this contravene the idea of making Windows more accessible?

At this point, I simply can't see why Microsoft enforces such ridiculous limitations on the ability of users to resize the Start menu as a whole. Those of us who prioritize aesthetics can leave everything primly centred. Otherwise, why not offer people the freedom of choice to expand their workspace?

Choice matters, too. I can understand Microsoft placing the most commonly used apps front and centre within Start. But they're clogged with Microsoft's insistence that I include, say, the Instagram app, which I've literally never used. In Windows 10, you can see both the preferred app tiles alongside the alphabetical list of apps. Windows 11

secrets the list of alphabetical apps behind the 'All apps' button, and I… simply forget about them.

Basically, I simply refuse to engage with the Start menu if I can avoid it. It's frustrating and futile, and I haven't even mentioned the wasted space that is the 'Recommended' files at the bottom of it. At least you can turn those off. (Go to Settings, then Personalization > Start > Show recently opened items in Start, Jump Lists, and File Explorer and toggle the button 'off'.)



Arranging your tabs vertically along the left edge of the screen is a choice Microsoft affords Edge users, but not those who use Windows 11.

The same argument holds for the taskbar. I honestly have no issue if Microsoft wants to move all the way away from the Fisher-Price tiled layout of Windows 8 into an ultra-efficient, clean layout, with an aesthetic that collects icons into the centre of screen with minimal badging. But again, it's about flexibility. I wouldn't dream of putting my Favourites bar within Edge onto the left-hand nav bar…but Edge does allow you that choice. So why not Windows?

Fortunately, third-party tools like Start11 and StartAllBack fix many (but not all) of the most annoying issues with Windows 11's Start menu and taskbar. It would be nice if Microsoft did the same officially.

WIDGETS, TEAMS CHAT, AND SEARCH: THE FORGOTTEN FUNCTIONS

I can say only one thing about Teams Chat: I went to the Settings menu (Personalization > Taskbar) and toggled it off months ago. I have Google Meet, I have the 'real' Microsoft Teams, and I have Zoom. I don't need anything else.

As a journalist, I'm technically in favour of Widgets, Microsoft's collection of news and information. But I usually don't bother hovering over the weather

icon in the taskbar to trigger Widgets. It's just not in my muscle memory. On the other hand, I chronically read an article or two in Edge every time I open a new tab in the 'Informational' view. Microsoft/Edge/Bing benefits either way, I suppose.

That's probably the same way I view Windows' built-in Search icon – it's simply not programmed into my daily use. As I've noted above, I 'search' to launch apps, but most of my Internet searches are conducted via a browser or file searches within File Explorer, or I simply open the most recent document within a specific app. My gut tells me that I could probably be more efficient by using the Search app, and it might be worth forcing myself into the habit to see if that's a more effective method. Maybe I've become acclimated to using a search bar, which is what I tended to use in Windows 10.

I do miss Cortana, somewhat. But I honestly don't care what service I use for general queries, such as the exchange rate of the Euro or when Halo was first released. Cortana doesn't seem like it's worth installing just for quickly setting up reminders, which is one reason I used it fairly heavily in Windows 10.

For whatever reason I don't find myself using Widgets, or the search box within it or the Windows 11 search icon. But I'm willing to believe most people find a way to find what they want, however that is, and settle on it.

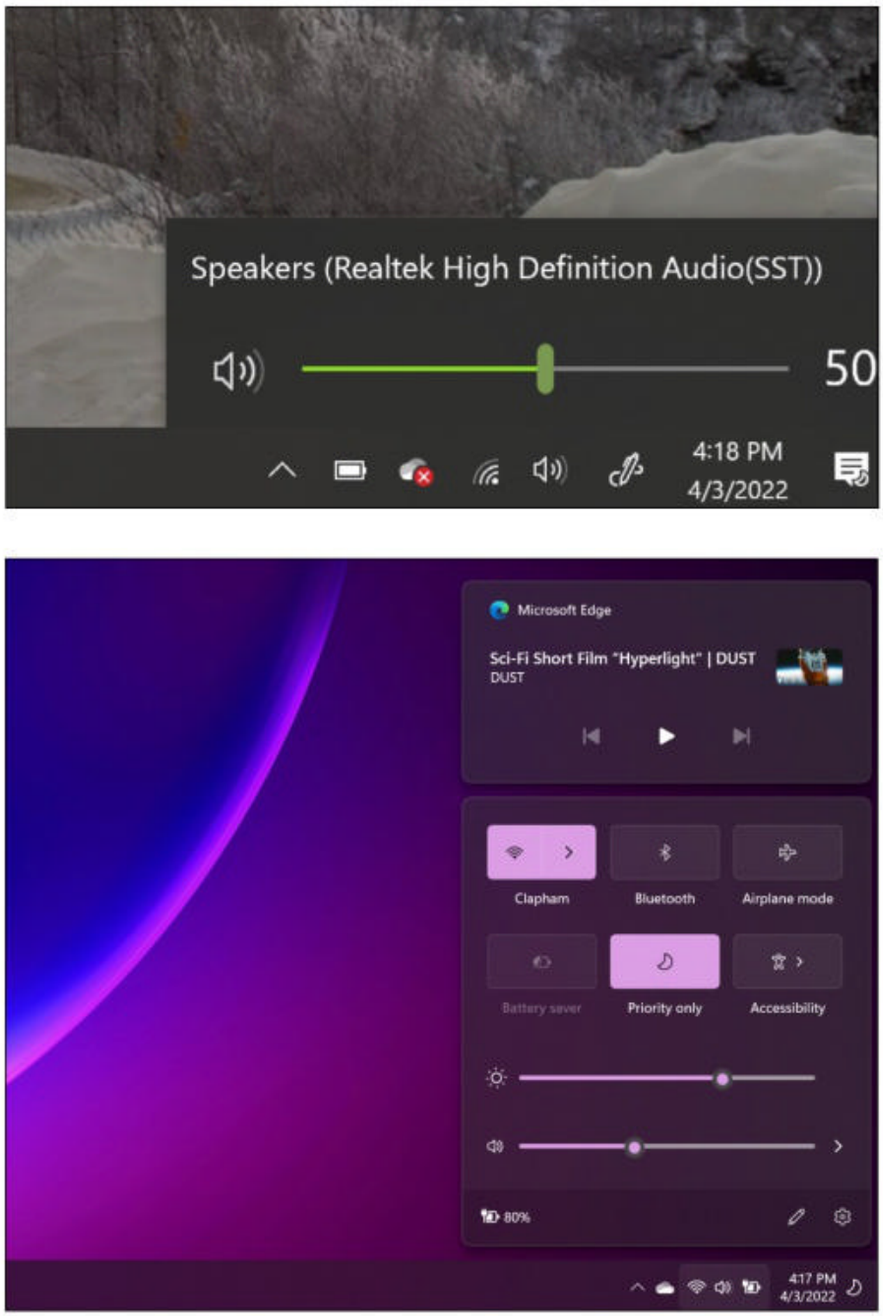
ACTION CENTRE AND NOTIFICATIONS: A STEP FORWARD

My opinion has changed on the Action Centre, which occupies the lower right-hand corner within Windows 11. After a few months, I've come to like how everything is clustered together, rather than being scattered across multiple taskbar icons on Windows 10. But it's not perfect; in Windows 10, the various icons present

more opportunities to communicate information, such as which audio device is being controlled by the volume slider. I also find I look at the notifications less than I used to.

The real glaring issue with the Action Centre is the lack of a fully-functional calendar, which just seems too weird. What's the point of a calendar if I can't add appointments to it, review holidays, or simply do anything with it? With Cortana being pushed aside, there's no real simple way to schedule a quick reminder. (Microsoft To Do volunteers, as the first thing it does is ask to be pinned to the Taskbar. Shouldn't this be part of the operating system, though? You need to manually install it via the Microsoft Store.)

Windows 11 also presents this weird UI interface in that the OneDrive cloud storage icon is a functional yet hidden button; yet so are the cluster of the networking icon, the volume icon, and the battery icon. Click anywhere in the latter group and the Action Centre opens. Where I often get confused is



Windows 11's Action Centre is more neatly organized, but excludes some information that Windows 10 provided up front. Windows 10 above; Windows 11 below.

after I turn on Focus Assist, the icon that indicates it's on and working (the crescent moon icon, in the screenshot above) appears to the far right, next to the time and date. Clicking on that opens the notifications, instead…with the Focus Assist settings all the way at the top. It's like a treasure map.

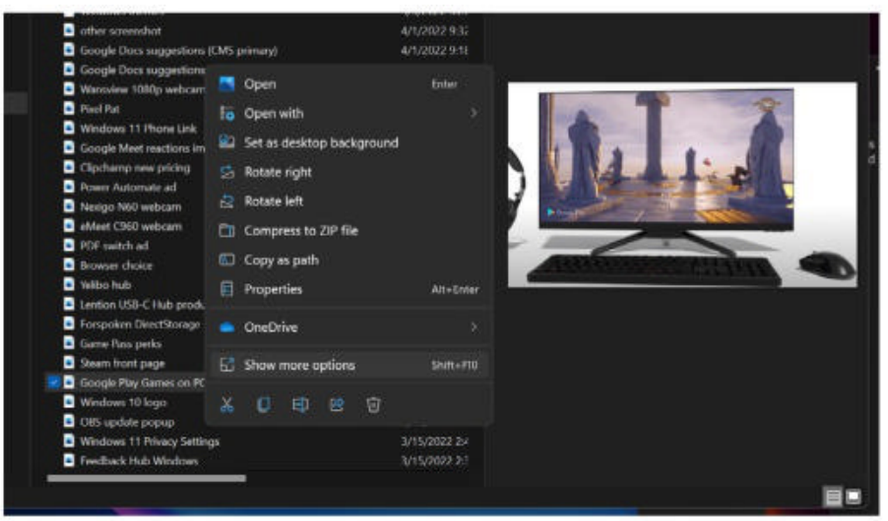
At least they finally restored the clock to multi-monitor set-ups.

THE WINDOWS SHELL: STILL SOME BASIC PROBLEMS

My colleague Alaina Yee detests the Windows shell, and she's absolutely right. The menu system that appears when you right-click a file, and then cascades over to a secondary menu requiring a second click, is unforgivable. Couldn't this all live on a single menu? Why should 'approved' Windows apps like PowerToys place their PowerResize capabilities on a secondary menu, especially ones that users like me use frequently? I've finally learned which of the shortcut icons (like 'cut' and 'rename') represent which functions, but the right-click menu options still feel sloppy. They're a big step backwards in efficiency.

I still think Snap View is a success, though, and a marked improvement over Windows 10. Yes, you can still use PowerToys and its fantastic Fancy Zones utility in either Windows 10 or Windows 11, but Snap View's ability to partition part of your screen is really handy, and the default alignments usually satisfy my requirements.

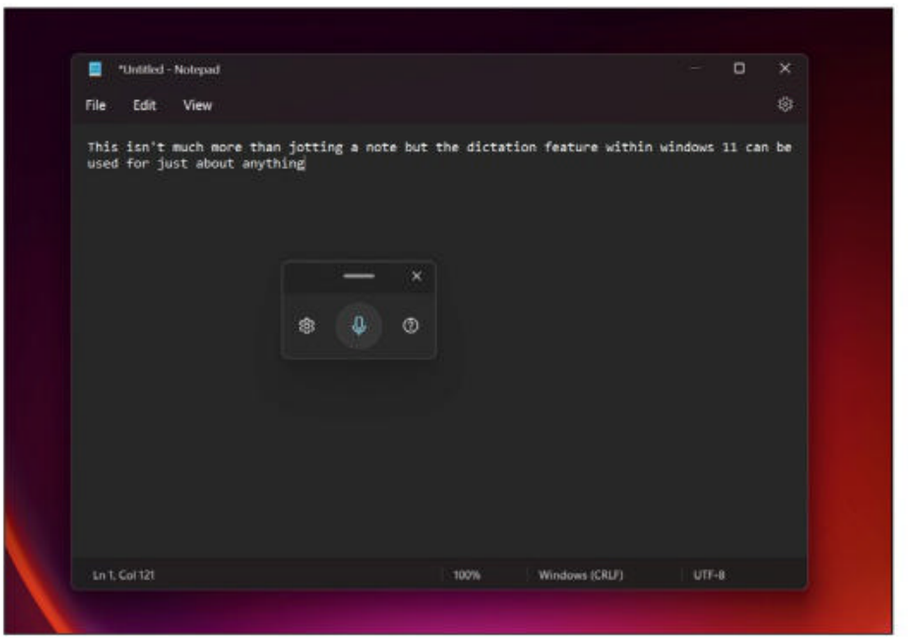
I'm still a fan of dictation, too. For whatever reason, I don't have to be in the mood to type a long phrase, and a quick tap of Win + H opens up the dictation widget almost instantly. I say the phrase, tap Win + H again, and move on. You don't have to write everything in dictation. It's especially handy for locked PDF files you want to copy a paragraph or two from, but are prevented from doing so.



Presenting one Windows 11 context menu, then hiding others inside a 'legacy' menu ('show more options' is just silly.

It feels, though, like Microsoft's designers

have never quite found the right way to manage files. I don't love File Explorer in either Windows 10 or Windows 11, and no matter what I do it feels like I expend far too much effort looking for what I'm searching for. Using the File Explorer's search bar feels unnecessarily slow. I don't instinctively click the Search button, though, nor do I search for documents by name. I tend to simply 'search' for files using the respective apps, or folders such as Photos. I've always felt that searching for files is where I, as well as Windows, flail.



I admittedly don't use Windows 11's dictation that much. But I don't use touch that often either…but when I want to, it's there.

Bur there's a bigger problem, and, frankly, I'm not even sure that Windows is the answer. As more and more collaboration moves online, 'files' are increasingly being stored or shared or collaborated on within apps like Google Workplace, Zoom, Teams, and more. But it's more than that. 'Knowledge', whether it's a to-do list or a shared insight with a colleague, simply isn't a 'file'. Can I use Windows' built-in Search to search Teams? Maybe eventually, but not now. Zoom? Google Meet? Not at all. If Windows can't even understand what I'm looking for, as well as where it's found, what good is a search function or file explorer, anyway?

MICROSOFT EDGE: FINALLY, YOU CAN EASILY SWITCH

Microsoft finally seems to have resolved its serious issue of a lack of browser choice in Windows 11, via an optional update that will almost certainly pushed to the general Windows 11 user base as part of an upcoming Patch Tuesday. It still feels a bit sleazy – the 'one-click' option to make a browser like Chrome your default browser still sets Edge as your default browser for opening PDF files, for example – but it at least gives consumers back the choice that

should have never been taken away in the first place.

MICROSOFT STORE AND WINDOWS APPS: IT ALL LOOKS NICE

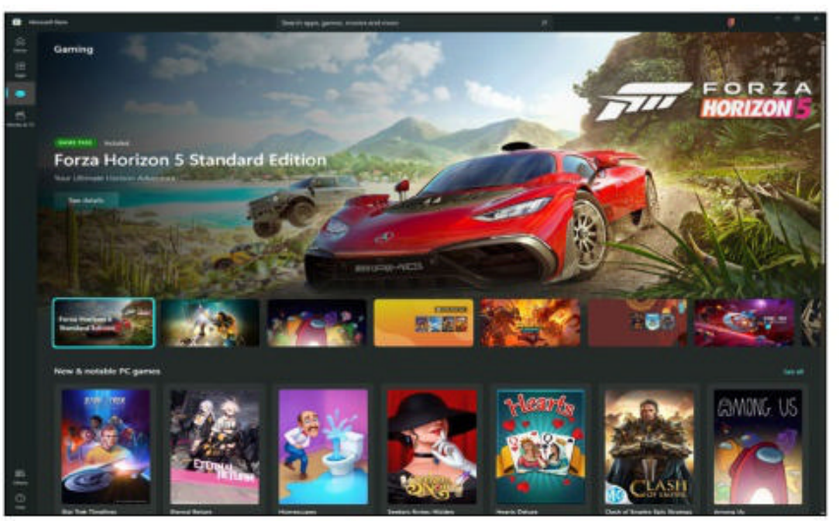
On balance, Microsoft's changes to Windows apps have been positive, though not profound. Say what you want about the Microsoft Store's utility – you can hardly argue that it doesn't look more professional and feels more useful, at least on the app pages. The front page of the Store, though, still feels sparse.

Microsoft revamped the Photos app, making it far worse – then fixed it, somewhat, largely accomplishing its original goals. You're still not going to convince me that the app wholly improved, though, with the elimination of the 'spot fix' tool as well as separating the profoundly useful Magic Select tool in Paint 3D. Microsoft also unnecessarily reorganized Paint, the app that Microsoft has tried to kill before. Again, redesigning for the sake of a redesign simply messes with muscle memory and makes people less productive.

I enjoy using the Windows 11's new Terminal and PowerShell apps, though I hardly ever have a need to.

UNDER THE HOOD: PC MAKERS ARE PUSHING THE HARDEST

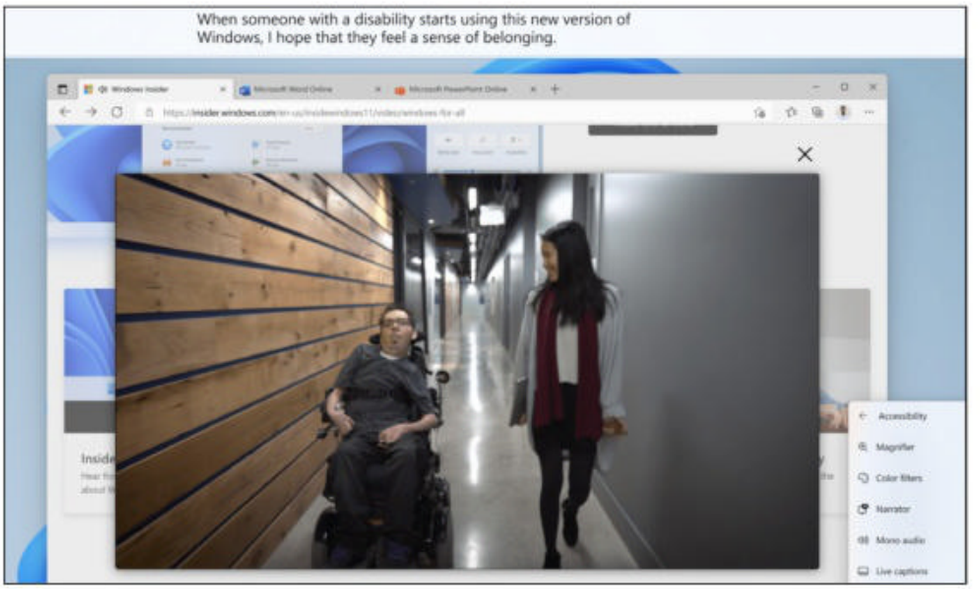
Really, the strongest argument for Windows 11 currently isn't the operating system, but what's inside the chassis. Virtually all new PCs now ship with Windows 11, so the most advanced laptops in my office now run Microsoft's latest operating system. In part, that's likely because of Intel and the Thread Director technology it made synonymous with its 12th-gen Alder Lake Core chips. But it's also due to Microsoft's goal to push PCs into the modern era of security, ruling out most older PCs with strict hardware requirements (that it later relented). To be fair, we haven't seen Windows 11, and its Virtualization Based



The revamped Microsoft Store is both aesthetically and functionally improved.

Security (VBS) cause any drastic hits to performance save for on much older, unsupported hardware.

Microsoft also integrated three other fundamental technologies as selling points for Windows 11: DirectStorage, Dynamic Refresh Rate and AutoHDR.



Windows 11's Live Captions provides captioning that appears at the very top of the screen.

Of these, DirectStorage appears like it could provide a profound advantage to Windows 11 gaming. After releasing DirectStorage in March, Microsoft showed how it could cut game loading times down to about a second. We still don't know how many games the technology will end up in, though, or when those games will even be released.

Otherwise, I haven't seen Dynamic Refresh Rate or AutoHDR present a significant upgrade. It's nice to use DRR to run a laptop display at 120Hz, especially for inking, but how often do I do that? On the other hand, 120Hz displays do make a difference, even just moving an interface around.

Matt Smith performed a direct evaluation of AutoHDR on PCs, which adds HDR detail to games that don't natively support it. It's noticeable, yes, but not that much of a selling point unless you have a top-grade HDR monitor. You'll want one with a minimum of at least 1,000 nits of peak brightness to fully bask in its abilities, and those are rare indeed.

WHAT'S BEING FIXED

The recent release of a new build into Microsoft's Beta Channel of its Insider program signals what Microsoft probably has planned for the autumn: Start folders, the ability to drag-and-drop files into Taskbar shortcuts, and Live Captions, among others.

Start folders, as I explained earlier, don't seem like they add that much

to the Windows 11 experience. Being able to drag and drop a file onto the appropriate Taskbar shortcut and open that file is a nice feature that a small but vocal group of users demanded, and that's fine – that shows, essentially, how the process of adding new features should work. And I really think that Live Captions are a useful feature that shows off Microsoft's AI capabilities – but, more and more, content is being streamed via Netflix, YouTube, Amazon and others (even Teams), which have closed-captioning services already.

VERDICT

I'm asked to review laptops periodically, and there are aspects of a laptop review I'll suffer through. I'll write the review using its keyboard, for example, to discover if it's truly a black mark or if I just haven't become used to it. Aside from the Start menu, I don't really detest anything about Windows 11 – and with Start, I simply avoid using it by 'searching' for an app, just like I might avoid a likely traffic jam by driving on surface streets instead.

But there's little I still particularly recommend about Windows 11. I truly do like Snap View (again, which can be configured using Fancy Zones) and flipping on dictation from time to time. My general sense is that Microsoft is still trying to reconcile the changes it made with what users truly want, or at least complain about. In the future, a feature like DirectStorage could be what sells Windows 11 to gamers, and the more mainstream audience that leans on the enthusiast community for advice. Dictation works, and features like the Xbox app and its cloud gaming service certainly add value to Windows 11 and 10.

I'm willing to believe that, over time, I'll warm to Windows 11. Maybe in six years or so, when Microsoft launches Windows 12, I'll feel a pull of nostalgia. But, six months in, there's still a genuine sense that Microsoft is playing catch-up to where Windows 10 is now, and without a critical mass of features it needs to justify Windows 11 as a genuine improvement.

Windows 11 preview signals its final new features for the autumn

Start folders, Live Captions and a drag-and-drop taskbar appear to be confirmed features. MARK HACHMAN reports

Microsoft has begun overlapping preview builds of Windows 11 in its Insider Dev and Beta Channels, essentially signalling to users that it's begun finalizing the features that will appear in the next release of Windows 11. The tech giant releases beta builds of Windows 11 in three separate channels: Dev, Beta and Release Preview. The Dev Channel is a laboratory for Microsoft concepts that may never ship, and Microsoft said in

February that the Beta Channel and the Dev Channel are on "parallel tracks". "The Beta Channel will be previewing experiences that are closer to what we will ship to our general customers," wrote Amanda Langowski, who oversees the Windows Insider programme.

Microsoft has since announced Windows 11 Build 22581, and the company is releasing it on both the Dev Channel and Beta Channel, simultaneously. This means two things: first, if you've been trying out Windows 11 builds on the Dev Channel, you can safely switch to the Beta Channel without the need to reformat your PC. But it's also a signal that Build 22581 represents something much closer to the final feature set of the upcoming autumn feature release of Windows 11, also known as 22H2 or Sun Valley 2.

Until Microsoft actually releases Build 22581, we can't say for certain what the build includes and excludes. And, even then, we can't be absolutely certain that those will be the features that emerge in the autumn release. Still, we can probably be assured that several will appear in 22H2, given they were highlighted in the blog post that accompanied the announcement. Most of these were part of Microsoft's Insider Build 22557, the massive release of new features Microsoft added in February.

Live Captions: This interesting new feature auto-generates captions on videos that you've archived to your PC, either for those who have difficulty hearing or for simply watching in a quiet environment.

Start folders: One of the complaints about Windows 11 was the lack of Start menu folders, a feature in Windows 10. The new feature allows you to group them, and a more recent addition allows you to name them, too.

Redesigned Task Manager: The redesign of the traditional Task Manager app brings it in line with Windows 11 design principles, but also adds an efficiency mode to try and limit the resources a particular app consumes. This won't be a feature that most users will use, but enthusiasts might use it to limit background applications.

Tablet-optimized taskbar: In February's Build 22563, Microsoft issued a change that shrinks the Windows 11 taskbar when used on a tablet, to allow more working space. Swiping up from the bottom expands it, so that you can interact with the icons.

Drag-and-drop apps in the taskbar: Microsoft didn't explicitly identify this

as a confirmed feature, but one of the 'fixes' the company made was to adjust the way dragging and dropping apps on the taskbar works. This was another feature of Windows 10 that was excluded from Windows 11, but added back in via an Insider build.

If your PC is in the Dev Channel and you want to switch it to the Beta Channel, you can go to Settings > Windows Update > Windows Insider Program and manually switch to the Beta Channel. There will be an undisclosed window of time before Microsoft pushes new Dev builds, and once that window closes you won't be able to switch channels without a clean Windows installation.

Microsoft hasn't said when the autumn release of Windows 11 22H2 will take place, but historically it has been released around September and October after a lengthy period of tweaking existing features and fixing bugs.

Credit: Getty Images/solarseven

Is your Windows 11 PC encrypted? The answer is surprisingly complex

Microsoft buries the fine print on this question. ALAINA YEE reports

You would think that Windows 11 PCs are all encrypted. Security is such a big focus for Microsoft's latest operating system that automatically keeping stored data scrambled unless the computer is unlocked seems sensible.

In fact, the mechanisms to do exactly that are already in place. Windows 11 Home and Windows 11 Pro both support automatic device encryption, with the Home version a more streamlined experience. You just have to sign into the machine with a Microsoft account, which

nearly all people do during set-up.

What trips up the process (and makes Windows 11 encryption so complicated) is your hardware. If a PC doesn't meet the required standards, device encryption doesn't automatically kick on, even if your laptop or desktop system is brand new. That doesn't mean your computer can't be encrypted, but you may have to do some work or pony up more cash to make it happen.

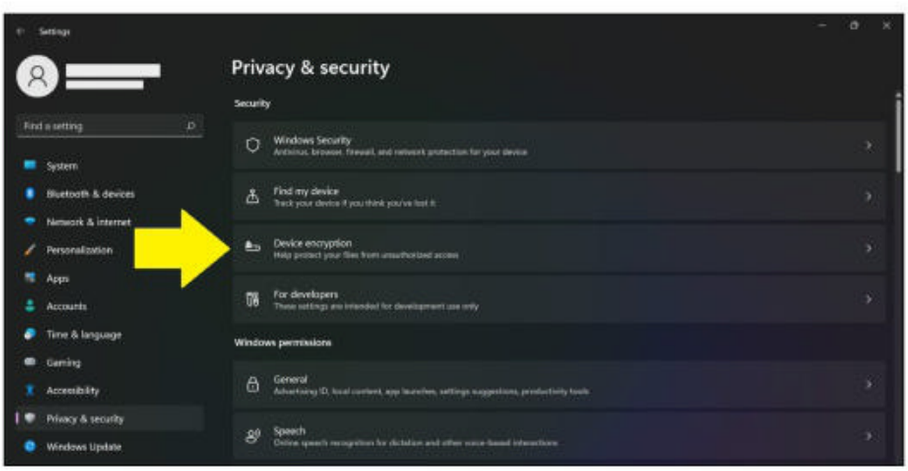
Note about "device encryption" vs "Device Encryption": In this article, we use "device encryption" (lower case) as a general reference to secured data in both Windows Home and Pro. The official name for the feature in Windows 11 Home is Device Encryption; in Windows 11 Pro it's called BitLocker Device Encryption.

HOW TO CHECK IF YOUR WINDOWS 11 PC IS ENCRYPTED

Open the Settings app. In the left-hand menu, choose Privacy & Security. On PCs that don't support device encryption, you won't see anything related to the feature in the menu. (Why Microsoft doesn't show a greyed-out option is anyone's guess.)

On PCs that support device encryption, it appears as the third option from the top. Click on the menu item. The next screen will show your encryption status. By default, it should be

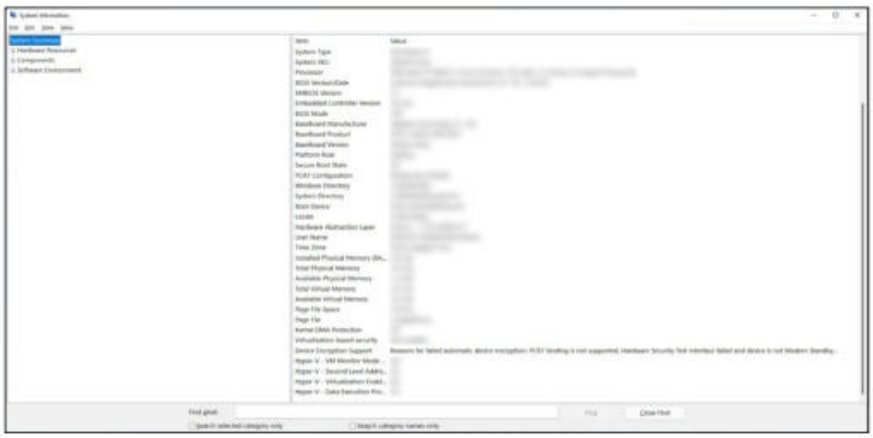
If device encryption isn't available on your PC, you just won't see an entry for it under Security.



If your PC supports device encryption, this setting will be visible.

on. If off, click the toggle to encrypt your PC.

Curious where your recovery key is? For Windows 11 Home users (and many Windows 11 Pro users), the key is saved to your Microsoft account. Windows 11 Pro users can also hop into their BitLocker settings via the Control Panel (Control Panel > BitLocker Drive Encryption) to manually save the key – which is a must if you log into your PC with a local account.



To read the full description of the problem, hover your cursor over the text in the 'Value' column.

MY WINDOWS 11 PC IS NOT ENCRYPTED. WHAT NOW?

Presumably, you're reading this section because you can't encrypt your PC – that is, Device Encryption settings are invisible to you in Windows 11 Home – and you'd like to. So first, you need a general idea of why your system didn't automatically enable encryption. Then you can decide to troubleshoot further, spend some money, or call it a wash.

Head to the System Information app. (Open the Start Menu, type **`system information`**, then right-click on the search result and choose Run as administrator.) When the app opens, scroll down to the bottom of the screen and look for Device Encryption Support. You should see a description that begins with 'Reasons for failed automatic encryption'. Hover your cursor over that text to read the full rundown.

Depending on the reasons given, you may be able to fix the problem(s). A common one is a lack of support for Modern Standby – it's a low-power state that allows a computer to run updates and other processes while asleep, as well as wake up instantly like a smartphone. Most current laptops support this feature, while many desktops don't. Of those that do, a handful of PCs don't have modern standby enabled by default, but you should be able to find tips online to help you flip it on.

Device encryption still won't work after troubleshooting your roadblocks? You can upgrade to Windows 11 Pro. Shelling out £99 opens up access to

BitLocker, which will work on systems without Modern Standby or even a TPM.

If you don't want to spend any money, you can of course choose to go sans device encryption. (We don't recommend it for security reasons, but it is an option.) You can also instead try a third-party encryption solution like VeraCrypt, which isn't as seamless but costs nothing.

WHY IS ENCRYPTION SO COMPLICATED?

Given that modern smartphones pull off automatic device encryption seamlessly, Microsoft does surprise with this inconsistent application of the feature. But in fairness to Microsoft, PCs have a wider spread of possible configurations that Windows 11 could be installed on.

The fact of the matter is, if encryption is important to you (and for laptop owners, it should be), be prepared to check on your system's status. You unfortunately can't yet assume this area of security is covered out the gate.

Opinion: When will Windows 11 stop screwing up the little things?

Microsoft seems to be oblivious to the importance of efficiency. ALAINA YEE reports

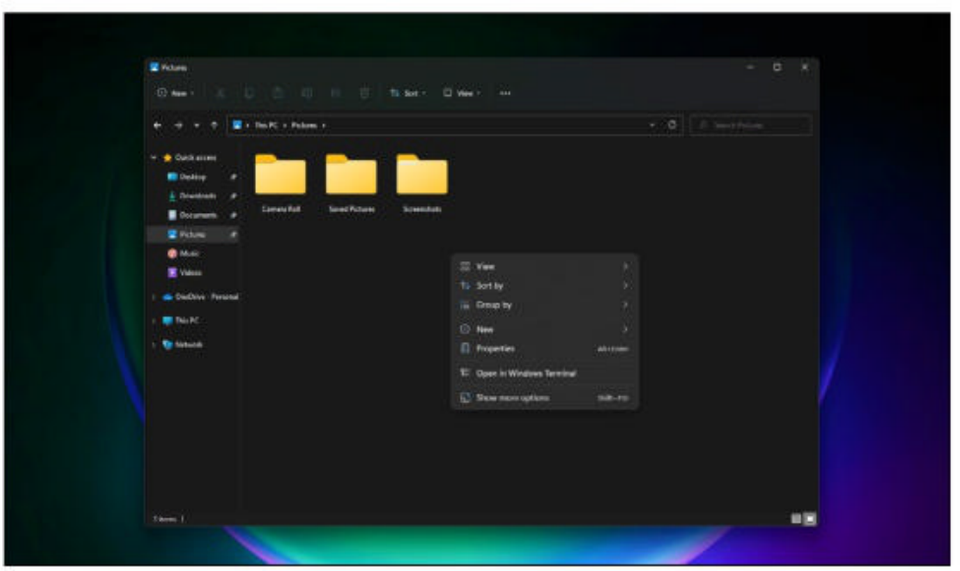
I know people who love Windows 11. I am not one of them. Before anyone tells me why I'm wrong – or that it's ludicrous for a tech journalist to be against new technology – let me draw your attention to the exact problem first. I want you to right-click on the desktop in Windows 11 and tell me what you see.

Does the menu have the Refresh option? Or are you forced to choose Show more options to get to a secondary right-click menu with the desired feature?

If you have it, congratulations. It means you keep your system up to date. (If you don't, I suggest you finally run Windows Update.)

But now repeat these same steps within a File Explorer window – arguably, the more common place you'd want to refresh the view. (For example, you've copied over or deleted files and aren't seeing the changes reflected onscreen.) Can't find a Refresh option in the right-click menu? It's not your eyes playing tricks on you. You have to go into Show more options to see it done. Oh, and pressing F5 on a keyboard doesn't work, either.

For decades, you only had to only make two clicks of a mouse to perform this task. Now that goes up to three, and it's not even consistent within the OS.



Seriously, why no option for Refresh in this menu? It was present in so many previous versions of Windows.

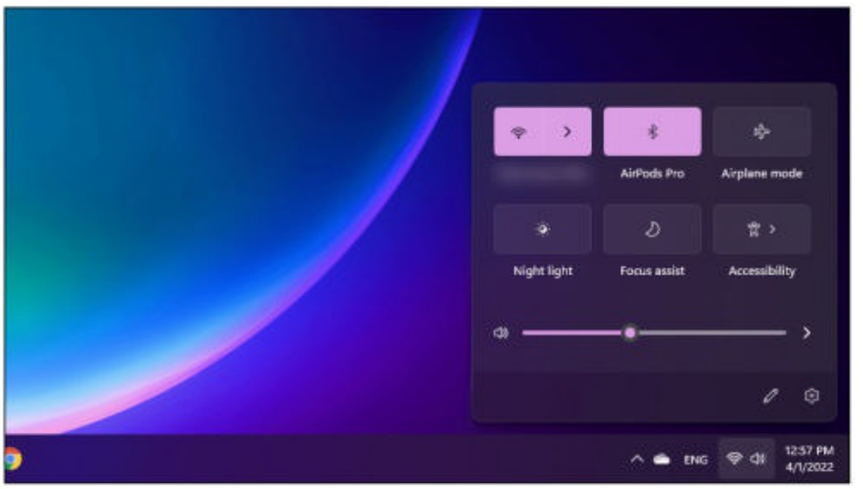
The desktop got a fix that put things back to the way they were, but not File Explorer? What?

This 'one gigantic step backward, tiny half-step forward' approach isn't efficient and makes trusting this operating system difficult. You know the reason why businesses still cling to Windows XP and Windows 7? Because to work efficiently, you develop a process that relies on certain key functions and features, and optimize accordingly. Change means that you disrupt all that and slow yourself down.

Now, change can be worthwhile when the new system offers tangible benefits. It improves your workflow's efficiency overall, or at least smooths over the rough patches that make your soul wither whenever you have to deal with them.

But switching to a less-reliable, less-efficient system isn't progress. And though I could retrain myself to use the refresh button, my counter to that is: Why am I being forced to? I might not be a corporation with shareholders and multimillion-dollar profits, but my

time is still valuable. Why a user interface team would overlook that and instead purposely bury things in sub-menus is beyond me. The whole point of a right-click menu is to have immediate access to commands you'd want to execute on the spot. The menu wasn't even cluttered to begin with – why remove elements from it?



In Windows 10, you can easily see your active audio device. Not in Windows 11. (That mention of AirPods Pro is related to connected Bluetooth devices.)

And this philosophy is littered throughout Windows 11. Don't believe me? Start by taking a stroll through the Settings app. Or have a look at your sound controls in the taskbar. With one click, tell me what your active audio device is. Can't do it, can you? In Windows 10, you just have to click on the volume icon to see that info. Not Windows 11. You have to click twice. First on the volume icon, then on the arrow to the right of the volume slider. Who thought that would be more efficient? Does the interface really become that much more beautiful with the omission of that useful information?

(And don't tell me few people use multiple audio devices with a PC. Even laptops owners pair their system with headsets, earbuds and external speakers.)

A line exists between a lack of clutter in an interface and design decisions that impede user ability to do things efficiently. It's not even a fine line. And yet, Windows 11 crosses it without any rhyme or reason. Don't even get me started on the taskbar.

At this point, using Windows 11 feels like signing up for death by a thousand paper cuts. I like to get through my to-do list without added headache. I have no reason to leave Windows 10, which works extremely well. Our official Windows 11 six-month report card reached a similar conclusion. In fact, I feel sorry for new PC owners saddled with what feels like a half-baked operating system. (Incidentally, if you want an escape, we have a guide that explains how to downgrade to Windows 10.)

Microsoft is continually pushing updates to Windows 11, but we can't predict when useful changes will arrive. And unlike with Apple products, most of us have no real loyalty to the idea of the brand or its vision, where the sense of community outweighs the downsides of being a glorified beta tester. I'm a working adult with responsibilities and often a full schedule, and I need my gear to serve me, not the other way around. I upgrade to newer products when they reduce hassle and improve my life. So I'm not against change. I'm against dumb stuff that progresses backward and wastes my time.

Asus ROG Flow Z13

Price: £1,899 from fave.co/3v86qBO ★★★★☆

While gaming laptops are nothing new, there's a theme among the top performers: they're still all bulky and heavy. Asus is one of few companies trying to change that, with experimental devices like 2021's ROG Flow X13 and now, the tablet-form ROG Flow Z13.

The idea is appealing – it's a 2-in-1 not dissimilar in design to Microsoft's Surface Pro line, but with a dedicated GPU and other top-end specs that put it in line with full-on gaming laptops.

There's also compatibility with the company's XG Mobile eGPU to spice things up, which has the potential to turn the Flow Z13 into a desktop gaming powerhouse – but it all comes at a very high premium compared to competing gaming laptops.

Has Asus done enough to tempt users from traditional gaming laptops?

DESIGN

The Asus ROG Flow Z13 is, simply put, a marvel of engineering. The 2-in-1

tablet barely measures any larger than Microsoft's Surface Pro 8, yet manages to pack in enough tech to qualify as a fully-fledged gaming laptop with a 12th-gen Intel CPU and an Nvidia GPU at its heart.

Take one look at the Flow Z13 and it's clear that portability was a huge focus for Asus. Despite the laptop-level tech on offer from the convertible, it measures in at 1.18kg and 11.9mm thick – making it much easier to carry around than a traditional gaming laptop, and it's the ideal size to slip into small rucksacks too.

For reference, the Alienware M15 R5 measures in at 2.5kg and 23mm thick.

It's worth noting that while the Flow Z13 is lightweight and portable compared to gaming laptops, it's much larger and heavier than standard tablets like the 680g iPad Pro, making it hard to use as an actual tablet. You'll likely be using the Flow Z13 on a table (and likely plugged in) the majority of the time.

The front of the Flow Z13 looks fairly standard with small, but still noticeable bezels, that surround the 13.4in panel but it more than makes up for it on the rear. Flip the 2-in-1 over and you'll find the signature Asus ROG branding, complete with stylized vents and angular patterns that make it clear it's a gaming device.

If that wasn't obvious enough, then maybe the small RGB-emblazoned window that gives you a look into the internals of the tablet might give it away. Though only a small design feature, it's one that gamers – including this writer – really appreciate.

You'll also find a small 8Mp camera on the rear of the tablet, a bonus compared to standard gaming laptops, accompanied by a 720p camera on the front. These aren't industry-leading cameras by any means, but they'll suffice for a quick snap and a video call.

Ventilation is incredibly important on a gaming device where temperatures can rise very quickly.

Take one look at the Flow Z13 and it's clear that portability was a huge focus for Asus.

Ventilation is incredibly important on a gaming device where temperatures can rise very quickly.

It's a particular pain point for gaming laptop users with intake fans usually on the bottom restricting where the laptop can be used.

The 2-in-1 design of the Flow Z13 means the intake vents are on the rear rather than the bottom, allowing you to use it on a bed without overheating issues while vents on the top expel heat without you or your hands getting hot. That translates to better gaming performance, but more on that later.

KEYBOARD

The lightweight keyboard offers a surprisingly high-end typing experience with great travel, a satisfying click and even backlit keys. It's not quite mechanical keyboard levels, but for a keyboard that thin, it's great to see. That trend continues with the trackpad that, while a little on the small side compared to some laptops, felt extremely responsive in use.

The 2-in-1 nature of the Flow Z13 means you can detach the keyboard whenever you like, opting instead for a true tablet form factor. It's great for gaming with a controller, especially if you're short on desk space, with the 160-degree kickstand providing great angles.

The lightweight keyboard offers a high-end typing experience.

There are downsides to the 2-in-1 form factor though. For instance, the kickstand design means it won't stay still when sat on your lap, and there's a lack of ports compared to the laptop competition too.

You'll find a single USB-C Thunderbolt 4 port on the left side, accompanied by Asus' proprietary port for its XG Mobile eGPU (more on that in a bit), as well as a USB-A port and a headphone jack on the right. There's also a microSD card slot beneath the kickstand if you want to add any extra storage.

The power button, housed on the right, doubles up as a fingerprint reader. It's not a new concept, available on smartphones, tablets and laptops for some time, but it works as well as you'd expect, reading your fingerprint for authentication as you turn it on. It works the first time most of the time, but you do have to be mindful about finger placement.

DISPLAY

At the heart of the ROG Flow Z13 is the 13.4in Mini-LED display with full touchscreen support – to be expected from a tablet, after all. The 16:10 aspect ratio may look a little bit odd for a tablet when rivals are usually much squarer in shape, but the wider aspect ratio does lend itself well to gaming and entertainment.

Importantly, the Flow Z13 is available in two flavours of Mini-LED display; 1080p/120Hz and 4K/60Hz, with the former provided for review. While you may be tempted to go for the 4K model, I'd argue that at just 13.4in, the Full HD resolution is sharp enough for an enjoyable gaming experience, and the buttery-smooth 120Hz refresh rate is crucial for gamers.

I'd only really recommend the high-resolution model to

At the heart of the ROG Flow Z13 is the 13.4in Mini-LED display with full touchscreen support.

video editors and content creators that work in 4K video.

Resolution and refresh rate aside, the Flow Z13 display is gorgeous with vibrant colour, plenty of detail and a level of brightness that puts most rivals to shame at an impressive 483nits in tests. The 99 per cent sRGB and 76 per cent AdobeRGB colour gamut may put some colour-correcting creatives off, but it's great for gaming and of better quality than most gaming laptop rivals.

The XG Mobile turns the Flow Z13 into a desktop PC set-up.

When it comes to audio, the Flow Z13 sports two side-mounted speakers that are more than enough for watching YouTube videos and casual gameplay, but the lack of bass means most dedicated gamers will opt for a gaming headset.

ASUS XG MOBILE

If you want more gaming prowess than the RTX 3050 Ti from the Flow Z13, you can opt to buy a bundle including Asus' XG Mobile. It's Asus's spin on the eGPU using proprietary tech, offering an upgraded Nvidia RTX 3080 mobile GPU.

That's not bad for a black box that measures in at 208x155x29.6mm and 1kg, taking up very little space on a desk or in a rucksack.

The XG Mobile connects to the Flow Z13 via a proprietary port on its left side, locked into place via a small switch on the back of the connector. Asus claims that there are over 67 wires within the cable that allow PCIe 3.0 data transfer speeds of around 63Gbps, almost double the 32Gbps on offer from competing Thunderbolt 4 eGPUs.

I'll go into more detail about how it performs a little later.

It's not just an eGPU though; the XG Mobile massively expands connectivity, featuring an HDMI 2.0 port, DisplayPort 1.4, four USB 3.2 Gen 1 ports, an RJ-45 Ethernet jack and an SD card reader for good measure.

The XG Mobile essentially turns the Flow Z13 into a desktop PC set-up,

allowing for a hybrid experience with full connectivity, desktop-level power and a multi-display set-up at home, and a portable 2-in-1 form factor when you're on the go. It won't fit everybody's needs, but it'll scratch the itch for some.

The only catch to the system? Unlike a standard eGPU, the RTX 3080 within the XG Mobile can't be swapped out in the future. That's fine for now, with the RTX 3080 being one of the most powerful GPUs around, but games will continue to get more demanding and at some point, it just won't be enough.

When that time comes, you'll have no choice but to get an entirely new XG Mobile – if Asus is making them for the next-gen cards, anyway. For now, it remains one of the best ways to get a desktop-level gaming experience from either the ROG Flow Z13 or last year's X13 – albeit at a premium.

The XG Mobile connects to the Flow Z13 via a proprietary port on its left side.

PERFORMANCE

The Asus ROG Flow Z13 comes in two core configurations: a variant with a powerful Intel Core i9-12900H and an AMD-flavoured variant available sporting the Ryzen 9-5900HS, but this only comes with the Full HD display.

Regardless of the model you opt for, you'll get the Nvidia RTX 3050 Ti with 4GB of GDDR6 memory, 1TB of SSD storage, 16GB of LPDDR5 RAM and full Windows 11 to play with. For reference, I've reviewed the Intel model here.

When it comes to performance, it largely depends on how you're using the Flow Z13; connected to power, connected to the XG Mobile eGPU or on battery, with no surprise that the latter provides the least amount of grunt when gaming.

Most gamers will likely use the Flow Z13 connected to power, so let's start there. Utilising the 12th-gen Intel CPU and Nvidia's RTX 3050 Ti, it should come as no surprise that the convertible is capable of powering a decent gaming experience.

When it comes to performance, it largely depends on how you're using the Flow Z13.

While you won't be able to play the likes of Cyberpunk 2077 at RTX Ultra graphics settings – it hit just 22fps during testing – you can achieve a steady 60fps in most games at a medium preset. The Flow Z13 comfortably surpassed the 60fps mark in Wolfenstein: Youngblood at medium quality, and it's a similar story in Far Cry: New Dawn, but cranking it up to ultra brought it down to 54fps.

That's fairly standard for the spec on offer, but if you want more power – be it for gaming or content creation – then you'll want to hook it up to the XG Mobile eGPU for a more desktop-level experience. Aside from the extra connectivity on offer, the eGPU provides RTX 3080 power that can really give the tablet a boost in performance.

When connected to the eGPU, we saw significant jumps in benchmark results across the board. Far Cry: New Dawn at Ultra jumped from 54- to 102fps, and even Cyberpunk 2077 was playable at its RTX Ultra quality settings with an average of 57fps in tests.

Considering the small dimensions of the convertible and eGPU compared to a standard desktop, it's impressive, although it's worth noting that the XG Mobile fans are much louder than the almost inaudible fans on the tablet itself when gaming, pumping out plenty of hot air to keep the GPU running smoothly.

While the tablet form factor would suggest great mobile performance, gaming laptops tell us otherwise – and it's no different with the Flow Z13. In a bid to keep battery consumption down when unplugged from the mains, the hardware doesn't perform at top speed and there's a slight dip in performance, even with the ROG Armoury preset set to performance mode.

When connected to the eGPU, we saw significant jumps in benchmark results across the board.

Though not as dramatic as you might expect, I saw dips across the board in testing, with Far Cry: New Dawn at Ultra dropping from 54- to 41fps. The only game to truly suffer was Cyberpunk 2077, which only managed 12fps at RTX Ultra on battery. Again, this is commonplace among gaming laptops, but it's worth pointing out for those that had dreams of playing AAA games on long car journeys.

While GPU performance can vary depending on the set-up you've got, CPU-based tasks like web browsing, video calling and running multiple apps at once perform at a similar level regardless of its set-up.

Our Geekbench 5 benchmarks saw a multi-core score of 11, 685 connected to the XG Mobile, 11,249 on battery power and 8405 on battery, making it a very capable machine for work as well as play.

You can see how the ROG Flow Z13 compares to the gaming laptop competition in all three forms below. For reference, the competition is benchmarked on plugged-in performance.

Geekbench 5 (multi-core)

Asus ROG Flow Z13: 11,686
Asus ROG Flow Z13 (XG Mobile): 11,249
Asus ROG Flow Z13 (battery): 8,405
Asus ROG Strix G15: 7,086
Alienware m15 R5: 7,362
HP Omen 15 (2020): 7,151

Asus ROG Zephyrus G14: 7,693
Dell G5 15 Gaming: 6,377

PCMark 10

Asus ROG Flow Z13: 7,074
Asus ROG Flow Z13 (XG Mobile): 7,299
Asus ROG Flow Z13 (battery): 6,481
Asus ROG Strix G15: 6,406
Alienware m15 R5: 6,535
HP Omen 15 (2020): 5,471
Asus ROG Zephyrus G14: 5,682
Dell G5 15 Gaming: 5,341

3DMark Night Raid

Asus ROG Flow Z13: 31,164
Asus ROG Flow Z13 (XG Mobile): 42,983
Asus ROG Flow Z13 (battery): 23,673
Asus ROG Strix G15: 39,874
Alienware m15 R5: 39,897

Far Cry: New Dawn (Medium 1080p)

Asus ROG Flow Z13: 63fps
Asus ROG Flow Z13 (XG Mobile): 118fps
Asus ROG Flow Z13 (battery): 48fps
Asus ROG Strix G15: 87fps
Alienware m15 R5: 86fps
HP Omen 15 (2020): 79fps
Dell G5 15 Gaming: 87fps

Far Cry: New Dawn (Ultra 1080p)

Asus ROG Flow Z13: 54fps
Asus ROG Flow Z13 (XG Mobile): 102fps
Asus ROG Flow Z13 (battery): 41fps
Asus ROG Strix G15: 81fps
Alienware m15 R5: 76fps
HP Omen 15 (2020): 68fps
Dell G5 15 Gaming: 79fps

Battery life

Asus ROG Flow Z13: 5 hours, 15 minutes
Asus ROG Flow Z13 (XG Mobile): 5 hours, 15 minutes
Asus ROG Flow Z13 (battery): 5 hours, 15 minutes
Asus ROG Strix G15: 9 hours, 38 minutes
Alienware m15 R5: 6 hours, 21 minutes
HP Omen 15 (2020): 5 hours, 7 minutes
Asus ROG Zephyrus G14: 11 hours, 33 minutes
Dell G5 15 Gaming: 8 hours, 13 minutes

Performance aside, the rest of the specification is unsurprisingly high-end with connectivity options including the latest Wi-Fi 6E AX211 and Bluetooth 5.2.

BATTERY LIFE

Battery life is another area to consider; while the dream of playing AAA games untethered from the wall is possible, you'll only get around 60 to 90 minutes of playtime before the 56Wh battery runs flat. It's then that you'll need to reach for the mid-sized 100-watt USB-C charger.

Thankfully, that's not indicative of general battery life; less performance-

intense tasks like web browsing, watching movies and video calling all fare slightly better on the battery. In our usual video loop test, the Flow Z13 stretched to five hours and 15 minutes.

While that'll be ok for some, it's at the low end of the scale and will likely put off those that want to use the Flow Z13 for work purposes – especially those away from the office.

VERDICT

If you like the idea of Microsoft's Surface Pro 8 but are put off by the integrated graphics on offer, the Asus ROG Flow Z13 may appeal to you.

The impressive internals – including a top-end 12th-gen Core i9 processor and Nvidia's RTX 3050 Ti – offer a decent gaming experience in a form factor closer to a standard tablet than a traditional gaming laptop, offering a more lightweight, portable design that's easy to throw into a rucksack. The 13.4in Mini-LED display is much brighter than rivals, the design is intuitive and the form factor means it's versatile in use too.

However, whether the RTX 3050 Ti performance will be good enough in a few years' time is yet to be seen, and unlike some gaming laptops, the components can't be upgraded.

You do have the option to pick up the XG Mobile dock which brings not only RTX 380 power but more USB ports, display connectors and Ethernet connectivity for a more desktop-esque experience, but it's a sizeable added cost on what is already a premium gaming device.

In all likelihood, the ROG Flow Z13 will be a niche product much like last year's X13, but it's refreshing for Asus to try something different to a traditional laptop with advantages not only to size and weight but elements like ventilation, which the Flow Z13 nails. Lewis Painter

The Asus ROG Flow Z13 offers a decent gaming experience in a form factor closer to a standard tablet than a traditional gaming laptop.

SPECIFICATIONS

- 13.4in (1,920x1,200) touchscreen display
- Windows 11 Home
- Intel Core i7-12700H processor
- Nvidia GeForce RTX 3050 Laptop GPU
- 8GB LPDDR5 RAM
- 512GB M.2 2230 NVMe PCIe 4.0 SSD
- 1x ROG XG Mobile Interface
- 1x USB 2.0 Type-A
- 1x USB 3.2 Gen 2 Type-C / power delivery
- 1x Thunderbolt 4 support DisplayPort / power delivery
- 3.5mm headphone jack
- MicroSD card reader
- Wi-Fi 6E: 802.11ax compatible
- Bluetooth 5.2
- 8Mp camera and 720P HD camera
- 2-speaker system with Smart Amplifiers
- Built-in 3-microphone array
- 56Wh battery
- 302x204x12mm
- 1.18kg

Samsung Galaxy Book Pro 5G

Price: £1,349 from fave.co/3rnDLrl ★★★★☆

Samsung's Galaxy Book Pro 360 5G shouldn't be considered by those looking for a general-purpose PC. But for someone who lives at a coffee shop, tapping out email, sneaking in a Netflix video, and shuttling back and forth? Keep reading.

This device is a tablet in laptop's clothing, with a 5G connection and fabulous battery life that many of its

competitors lack. Performance lags in places, though you'll probably forget all about that while viewing the gorgeous OLED screen.

Keep in mind that this particular device is nearly a generation old. It's still worth considering, as really only the 11th-gen processor lags behind the state-of-the-art 12th-gen Core hardware found within the Galaxy Book2 laptops Samsung recently announced. Still, view this device with a predator's eye (aka watch for retailers who may be clearing out older inventory). If you're the specific sort of customer who finds this review appealing, then snap it up.

BASIC FEATURES

We're reviewing the Galaxy Pro 360 5G, a specialized 360-degree convertible that ships only with a 13.3-inch display option, the Mystic Silver colour scheme, and the integrated 5G radio. It ships in one of two configurations: one with a Core i5-1130G7 for £1,349 or a more expensive £1,499 version with a Core i7-1160G7. (The Core i7 model also offers more memory (16GB RAM) as well as a larger SSD option (up to 512GB).

Both models ship with Samsung's include S Pen for inking, which saves some money, though there's no built-in holster. Otherwise, the unit we're reviewing requires purchasing a USB-C hub to connect to devices with a legacy USB-A connector.

Samsung has numerous other options within its Galaxy Book line-up from which to choose, though the differences may be confusing.

Forgoing the 5G option opens up more choices. Samsung's Galaxy Book Pro 360 (without 5G) is available in either a 13.3- or a 15.6in form factor, and we reviewed one of the models last year with a Core i7 chip inside of it. This review unit has a slower Core i5, which allows us to provide a detailed

As a 360-degree convertible, the Samsung Galaxy Book Pro 360 5G can fold up into tent mode.

On the right-hand side of the Samsung Galaxy Book Pro 360 5G is the SIM card slot, a standard USB-C port, and the headphone jack.

comparison of the two in terms of performance and general usability.

Finally, remember that this laptop is a 360-degree convertible, rotating from a clamshell all the way around to a tablet mode. Otherwise, consider the similar Samsung Galaxy Book Pro, a traditional clamshell notebook that lacks both the S Pen as well as a touch display. The Book Pro also includes a USB Type A port.

My initial impression of the Galaxy Book Pro 360 5G was of just another silver laptop stamped with a small black Samsung logo on the rear of the display. While the Mystic Blue of the larger Pro 360 we reviewed last year sometimes felt like it was indistinguishable from black, it did offer a splash of colour in the right light. Most silver 13in laptops in this category are actually Chromebooks and this slightly soured my initial impression.

Not entirely, however. One of the strengths of a 360-degree convertible Chromebook is its ability to swivel back on itself and create a 'tablet' for Android apps. Now, Windows 11 can do the same. Add the laptop's pen capabilities to that and a 360-degree Windows 11 convertible and the Book Pro 360 5G is more valuable than ever. The hinge rotated firmly and stably without flopping around, and the overall build quality feels solid if a bit heavy for a 13in notebook. There's a tiny bit of flex with the display, but nothing worrisome.

Air is pulled in by a fine grille of holes underneath the chassis and pushed out back through then hinge vents. Four rubber pads hold the laptop slightly off the desk or table. The Pro 360 5G does get warm (though not hot) in the default 'Optimized' setting, which adjusts fan

There's a faint 'Thunderbolt' logo to the right of the right-hand USB-C port, signifying the faster I/O. Either squint or memorize where it is.

speed and performance. The fan turned on noticeably with Whiteboard and Microsoft Edge running with just a hint of coil whine. Four fan modes are available (High Performance, No fan, Silent, and Optimized). The 'Silent' mode, unfortunately, isn't.

Different display types offer their own distinct advantages. Most high-refresh-rate laptops use IPS technology. Samsung's OLED displays are a visual treat, with profoundly deep blacks and vibrant colours that help make this laptop a joy to watch videos on. There are a number of display modes to chose from, which slightly differ both in the standard Windows 11 settings as well as Samsung's Settings app. The display puts out 281 nits, just above the 250- to 260 nits or so that we consider a suitable brightness.

As noted above, the laptop contains both a Thunderbolt 4-equipped USB-C port as well as two other 'generic' USB ports. The I/O throughput difference is profound, so thankfully Samsung etched a tiny lightning bolt logo next to the high-speed port. The entire laptop is powered by a compact 65-watt USB-C charger that brought the laptop up to about 50 per cent in a little more than an hour. You probably won't be flipping back and forth between the charger and battery power that often, but when you do, there's an annoying half-second or two when the display goes black before switching over to the new power mode.

TYPING EXPERIENCE, AUDIO, AND WEBCAM

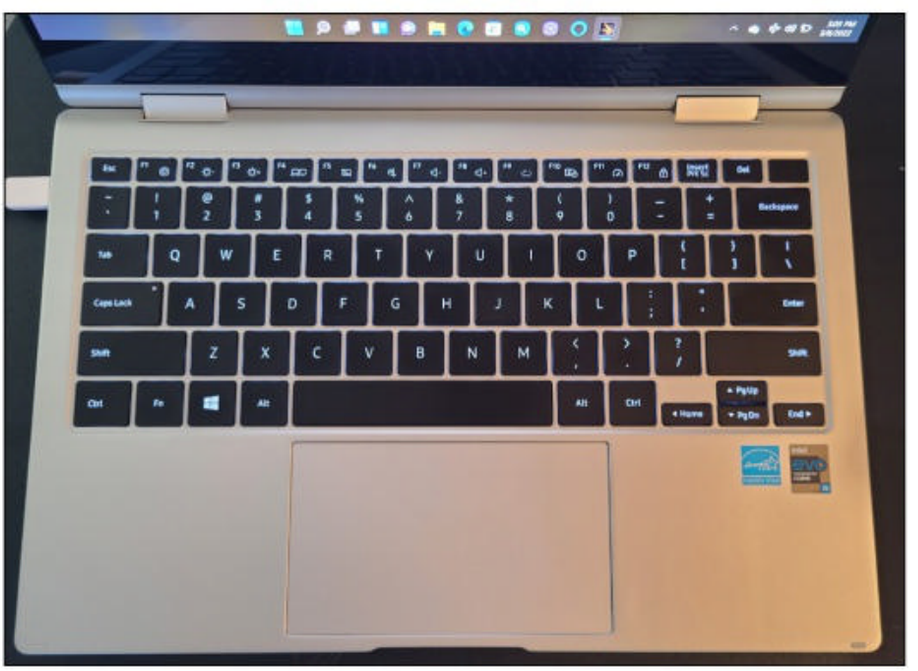
Samsung rates the key travel on its Galaxy Book Pro 360 keyboard at 1mm,

less than the key travel on comparable devices. That's the distance in which your fingers can depress the key before it 'bottoms out'. Personally, I prefer a travel distance of about 1.5mm. But Samsung softens the blow with a series of springy scissor switches mounted under rubbery keypad domes, which helps your fingers land more comfortably. The individual keys are also comfortably sized.

I also prefer the way Samsung laid out its 15in keyboard – but again, the compromises are smart. The tiny cross of directional keys in the lower right-hand corner isn't feasible for prolonged use and the top row of function keys are small enough that they should be used only occasionally. The choices laptop manufacturers make in selecting function-key shortcuts is oddly fascinating.

The top row is especially noteworthy. The F11 key triggers performance mode and pressing Function + F10 turns your camera and mic on and off. The poor F11 key, on the other hand, does triple duty. It serves as a shortcut for both full-screen and performance mode (Function + F11), and it can also be used to launch Samsung's 'secret screen capability' (Win + F11).

Keep in mind that Samsung tucks its Windows Hello fingerprint reader under the power switch to the upper right-hand-corner of the keyboard. Samsung's sensor still earns a mediocre grade, often failing to identify my finger until I tapped it several times. Make sure you have a PIN set within Windows. (You can't log in using the user-facing camera, unfortunately, as it's not Windows Hello certified).



The keyboard is comfortable to type on.

As far as the camera is concerned, I still favour a higher-resolution 1080p camera than the 720p user-facing camera Samsung included instead. The camera should capture your

While the webcam's colour seems acceptable, there are some odd lines running down my nose that aren't there in real life. It's all very splotchy.

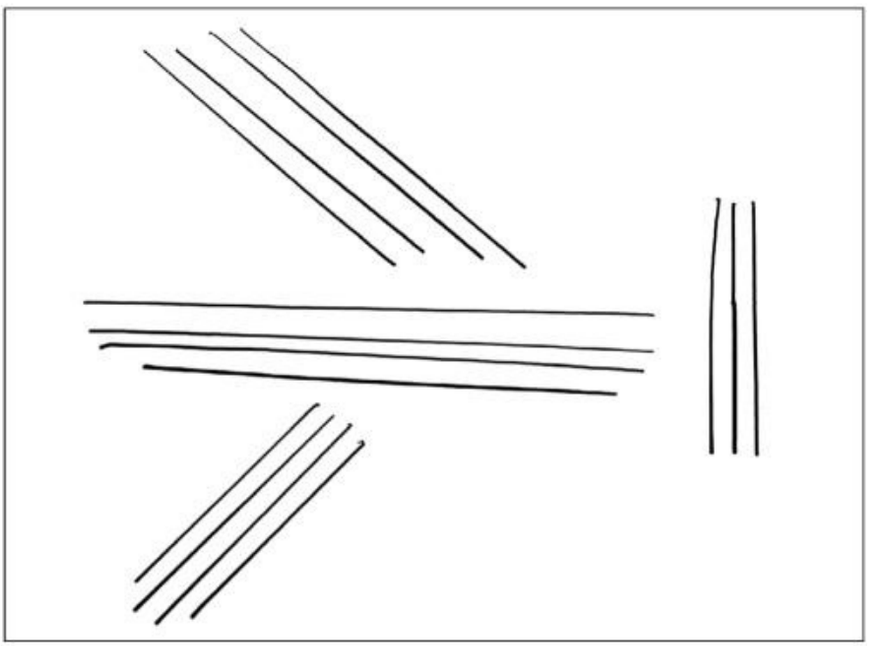
face well with accurate colour and lighting, but the low-res camera simply won't do you any favours on Microsoft Teams or Zoom. Samsung's F10 shortcut, mentioned above, serves as the only shortcut to turn off your mic and camera, as there's no privacy shutter.

On the other hand, the included 'beauty settings' that accompany the camera have less work to do – about the only noticeable change they offered were to erase circles from under my eyes and slightly slim my chin.

The Galaxy Book Pro 360 5G delivers crisp sound of moderate volume from a pair of speakers, tuned by AKG. Really, they offer about as much as you'd hope they would. Music and movies sound great at both the high end as well as the midrange. The low-end tones aren't as robust as you might like, but a thin laptop doesn't offer all that much to work with. I couldn't find an audio equalizer in the included Realtek audio app, though the upcoming revamp to the Windows Media Player should supply one. My only complaint is that I'd like the two speakers to deliver a bit more power.

AN EXCELLENT INKING EXPERIENCE

As with the 15in model of the Galaxy Book Pro 360, the smaller 5G model doesn't provide any place to store the included S Pen, which can be used for either drawing or as a control mechanism via its single button. You can magnetically attach the Pen to the back of the laptop's screen (weakly near the bottom or more strongly near the top), though you should expect it to immediately lose it in the bottom of a backpack.



Inking with the Samsung Galaxy Book Pro 360 5G is excellent. There's hardly any ink jitter, no matter the line alignment.

Fortunately, the S Pen doesn't require charging or pairing, as it uses a Wacom technology called EMR to ink on the screen's digitizer. Samsung has demonstrated impressive inking capabilities, both on our first look at an early Galaxy Tab S8, and now here on the Galaxy Book Pro 360 5G as well. Three factors usually determine the inking experience: the time it takes for the ink to 'flow' from the pen, any ink offset from the nib, and any jitter that occurs while the pen is inking.

The first metric is simply any lag that occurs as you quickly move the pen across the screen and with the Samsung S Pen it was noticeable but minimal. The S Pen's interaction with the digitizer is flawless when inking horizontally, as the ink emerges directly under the nib. It's slightly offset when inking vertically.

Normally, when slowly inking a diagonal line with a ruler, there's still some jitter, resulting in an unintentionally wavy line. There's hardly any at all with the Galaxy Book Pro 360 5G, making it one of the best inking experiences around.

5G MOBILE EXPERIENCE

Naturally, one reason to buy this laptop the optional 5G WWAN option. Samsung provided us a test SIM to facilitate testing. Keep in mind that a true mobile laptop experience is one part battery, one part SIM, and one part display – Samsung seems to have nailed this.

Though the display isn't overly bright, it was perfectly fine for working outside my local coffee shop as well as indoors – just keep to the shade. Even right by the bay, the Verizon SIM provided 40Mbit/s down, though less than a megabit upstream. It was far better elsewhere. At the coffee shop, for example, the laptop received 80Mb/s downstream and 8Mb/s up.

That's perfectly fine as an alternative to a suspicious or crowded Wi-Fi access point. (The laptop's Wi-Fi 6E is the most advanced on the market today).

Samsung is notorious for including many of its own branded apps. You'll find some tucked within the Start menu under the 'Galaxy' name (the Galaxy Book Experience and the Galaxy Book Smart Switch, which helps migrate files from another Samsung PC) as well as 'Samsung'. The latter includes apps that replicate what Windows does such as Samsung Studio Plus, which serves as a media editor.

Pay closer attention to Samsung Security, which offers a custom privacy folder, a 'security cam' that emails you when someone sits down at your PC, and a 'secret screen' that uses transparency effects to confuse prying eyes. Samsung Settings also offers a number of configuration options which you may find useful including a screen mode to set your PC with vivid colours and a battery protection option that can prevent your PC from charging itself fully. The latter isn't a bug but a feature, in that it prolongs your laptop's battery by doing so.

PERFORMANCE

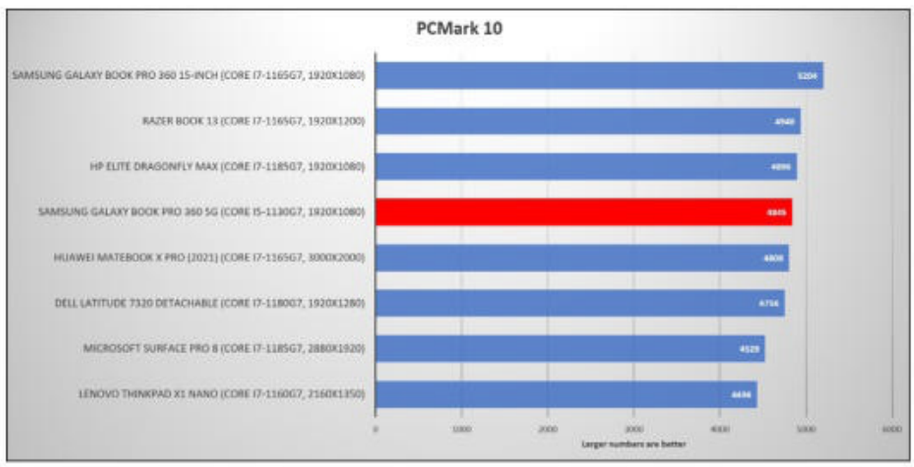
I wasn't particularly impressed with the performance, especially with how laggy the SSD can be. While unzipping files, the process would halt for a few seconds, making me wonder if there was something wrong with the system. These issues have been endemic to Windows 11, but they should have been fixed by now.

So, I checked it. We usually let our standard performance tests speak for themselves, but the SSD issue was worth spotlighting. Overleaf, we've compared CrystalDiskMark 4.0.3 results between the Microsoft Surface Laptop Studio and the Book Pro 5G. Are they direct competitors? No. But even if you don't understand which tests govern what, you can see that the read and write performance of the Surface Laptop Studio are generally much higher than the Samsung laptop. It's a hidden weak point.

In other tasks, however, the laptop performed more impressively. YouTube playback of a 4K/60 stream streamed without a single frame being dropped on the native 1080p display and just 17 out of 10,000 on an external 4K display. That's excellent and you won't notice any jitter playing back videos. Modern browsers also accommodate systems with low memory well, so you should be able to open numerous tabs without any slowdown. Still, our synthetic benchmark results weren't impressive.

We've chosen to compare the Samsung Galaxy Book Pro 360 5G to the 15in Samsung Galaxy Book Pro 360 as well as other similar devices such as the 13in Surface Pro 8 and the Dell Latitude 7320 Detachable tablets, the HP Elite DragonFly Max and Lenovo ThinkPad X1 Nano business notebooks, plus the Razer Book 13. Ideally, the Samsung convertible would deliver competitive performance and outstanding battery life, but it falls well short in several areas.

There's a reason for why it falls short and it's hidden in the PCU's model number. The Galaxy Book Pro 360 5G is powered by a Core i5-1130G7, one of Intel's 'UP4' class of Tiger Lake processors. That's code for a tablet-class processor, signalled by the '0' at the end of the number. More powerful 'UP3' processors for mainstream notebooks have a '5' at the end of the model number. Those processors demand more power (15- to 28 watts) versus the 7- to 15 watts UP4 chips like



The Samsung Galaxy Book Pro 360 5G offers middling performance in the PCMark 10 test, but it'll get the job done.

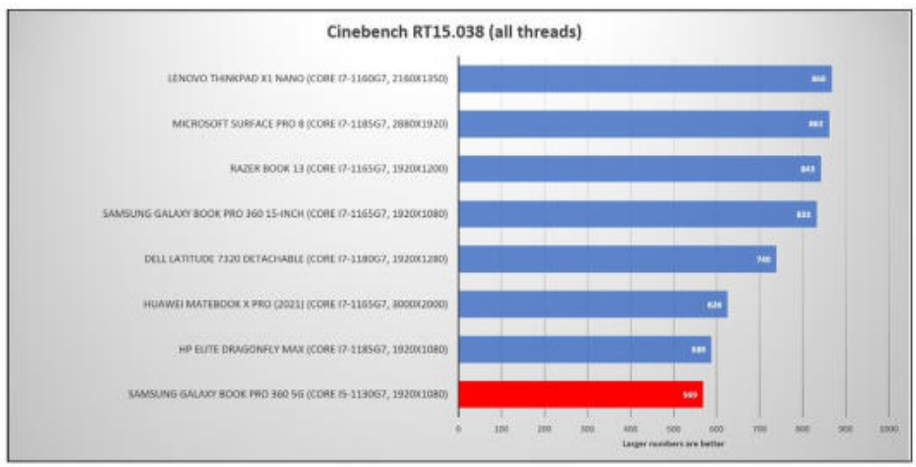
what's inside our review unit. Here's the upshot. Performance will suffer, though battery life should improve. We see this in the results below.

Our benchmark suite begins with UL's PCMark 10, a general-purpose test that evaluates a PC on several fronts like web browsing, video calls, CAD work, and more. The benchmark is designed as a comprehensive evaluation of all of a laptop's merits, though we've obviously added to it with our other tests. Remember, we're testing a Core i5-powered tablet-class laptop against a number of Core i7-powered machines. Most of them perform quite similarly in this test.

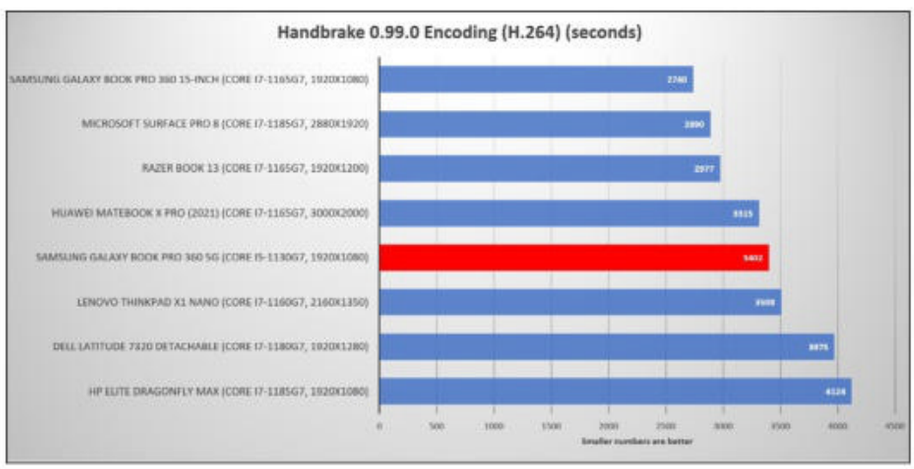
We've maintained the use of Cinebench R15, though modern laptops complete this bursty test quite quickly. Cinebench is designed to show how well a laptop responds to a generic CPU-driven task that falls outside of the chores put to it within the PCMark test.

The Galaxy Book Pro 360 5G performs surprisingly poorly here, even though the processor is a tablet-class chip. The ThinkPad X1 Nano and the Dell Latitude 7320 outperform it fairly handily. Even running the laptop in its 'maximum performance' mode didn't move the needle at all.

Handbrake is a real-world application used for transcoding video, which can



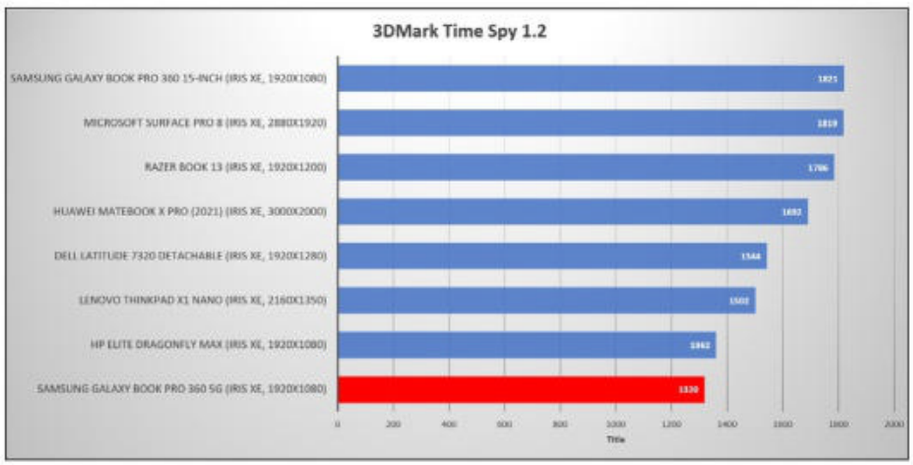
Not an impressive performance for the Samsung Galaxy Book Pro 360 5G in this synthesized CPU test.



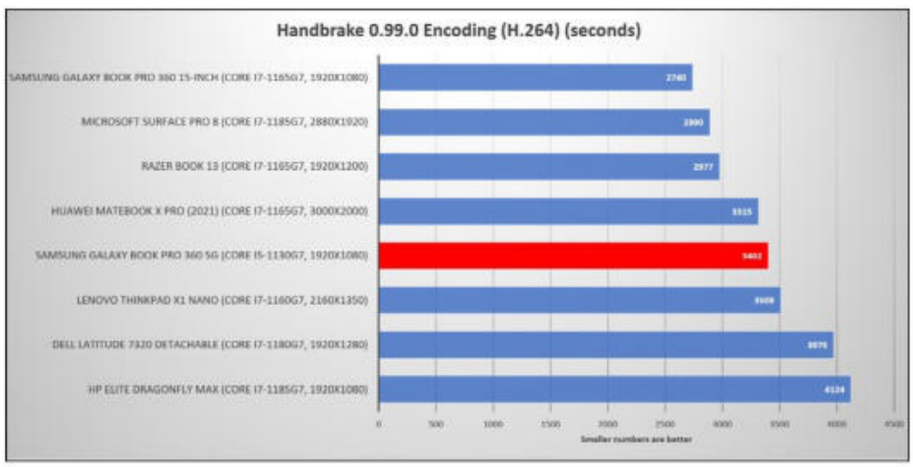
The Samsung Galaxy Book Pro 360 5G performs decently in video transcoding.

take an hour or more to transcode a full-length movie into a format that's appropriate for toting along on an Android tablet. We use this test to measure how well the Galaxy Book Pro 360 5G performs under prolonged load. Of all the tablet-class processors, it performs the best.

We're not expecting you to use the Galaxy Book Pro 360 5G to play games on and our 3DMark test bears that out. We use the modern "Time Spy" benchmark here and the results aren't anything to speak of. Instead, you could use the device like a Chromebook to play games on it from Xbox Game Pass or another service. The key here is that you'll want to play most modern games in the cloud, not on the local PC.



Let's just ignore the Samsung Galaxy Book Pro 360 5G's 3D performance.



Why should you buy the Samsung Galaxy Book Pro 360 5G? This is why.

Battery life, though, is where we'd expect this thin laptop to shine and it does. In our round-up, the only laptop that outperforms it is its bigger brother. Incidentally, almost 16 hours of battery life pushes into the range of laptops that use Qualcomm's battery-sipping Snapdragon chips, as evidenced by the battery-life chart that accompanies our HP Elite Folio review.

VERDICT

The Galaxy Book Pro 360 5G is less like a traditional laptop and more like a convertible, connected tablet. Sure, it's not as light as or as thin as a traditional

tablet like the Surface Pro 8 nor is it as powerful as a more traditional clamshell. But if you like it offers, you might consider the 15in Galaxy Book Pro.

In fact, you might consider this review as a jumping-off point for what you'd really like in a laptop. More performance? Well, inevitable discounts might spur you to buy the Core i7 version of this machine. However, performance should only increase rather marginally. Other business notebooks offer competitive features and they're worth a look.

Our review, though, probably underscores what makes this laptop a must buy for a certain niche. At a £1,349 and with the possibility of discounts to come, this convertible is both lightweight and connected. Samsung's OLED screens are simply lovely for watching videos upon and the 360-convertible form factor does allow for a tablet-like experience in this new era of Android apps on Windows. Finally, this laptop delivers marvellous battery life and a 5G connection to boot. From that perspective, the Galaxy Book Pro 360 5G has a lot to offer. Mark Hachman

SPECIFICATIONS

- 13.3in (1,920x1,080) Super AMOLED touchscreen display
- Windows 11 Home
- Intel Core i5-1130G7 processor
- Intel Iris Xe GPU
- 8GB LPDDR4x RAM
- 256GB SSD
- 1x Thunderbolt 4
- 2x USB Type-C
- 3.5mm headphone jack
- MicroSD card reader
- Wi-Fi 6: 802.11 ax 2x2
- Bluetooth 5.1
- 720p HD Camera
- AKG Stereo Speakers
- Dolby Atmos technology
- Internal Dual Array Digital Mic
- Fingerprint reader
- 63Wh battery
- 302.5x202x11.5mm
- 1.04kg

OnePlus 10 Pro

Price: £799 from fave.co/35YrCBA ★★★★☆

OnePlus has undergone a lot of change since we first met the brand as a plucky upstart all those years ago. Having been partially folded into sister company Oppo over the past 18 months or so, the phones that OnePlus is now releasing exist in a very different context to the company's early handsets and the new OnePlus 10 Pro embodies this shift perfectly.

While an initial January release in China gave us our first taste of what a OnePlus flagship in 2022 looks like, the phone's more recent expansion into new markets globally highlights the influence of the brand's passionate fandom, while reflecting the change that the company is going through internally, all at once.

With no standard OnePlus 10 (and only rumours of a OnePlus 10 Ultra), the 10 Pro is currently the only top-tier OnePlus purpose-built to take on rivals from Samsung, Apple and beyond. But does it deliver?

DESIGN

For all the technical prowess, performance and innovation last year's OnePlus 9 Pro touted, it came packaged in an uncharacteristically bland design for the brand. This year, OnePlus's design team has veered in a different direction, with the 10 Pro's form punctuated by a bold new camera housing that's impossible to miss and unlike anything the company's served up to date.

In a design that takes inspiration from entries like Samsung's Galaxy S21 Ultra, the 10 Pro's camera system is the first thing your eyes are drawn to; a sizeable, bold arrangement that curves in from the phone's edge and extends past the mid-point of its back, housing four spaced out circular elements (consisting of three camera sensors and a dual-LED ring-shaped flash).

The sensors (and flash) are set within an expansive mirror-polished metal surround that, although blending geometrically, offers up a contrasting appearance that's (perhaps intentionally) at odds with the rest of the phone's finish and colour palette. It's a design choice that helps the 10 Pro stand out against the competition while also implying the significance of the phone's upgraded Hasselblad-branded camera system.

Beyond this statement piece, the phone serves up a textured glass back that's great at repelling fingerprints, surrounded by a thin, colour-matched metal frame whose polished finish offers a nice contrast both in feel and appearance.

While Chinese fans also have access to an 'Extreme Edition' that offers an exclusive Ceramic White finish, elsewhere in the world you'll likely encounter the 10 Pro in one of two colourways: Volcanic Black (which feels like a visual nod to the original OnePlus One's Sandstone finish) or Emerald Forest (green).

While not true everywhere, your choice of colour also affects the RAM and storage options you can expect under the hood (for example, in the UK, the higher RAM model is exclusively available in Emerald Forest). Something we've seen from OnePlus before.

The rounded Gorilla Glass 5 back and (slightly less) curved edges of the Gorilla Glass Victus front make for a comfortable hand feel, in a design that's thin at 8.55mm and deceptively light (despite technically weighing 200.5g); considering the sizeable battery on board.

The glass meets at that aforementioned aluminium frame, which incorporates a USB-C port along its bottom edge, as well as a power key, volume keys and the company's signature knurled three-stage physical alert slider; practically unseen outside of

select OnePlus's mid-rangers and flagships and a nice extra tactile detail.

While OnePlus paid for its last two generations of flagships to undergo IP68-certification against dust and water ingress, the 10 Pro looks as though it's forgone that particular testing and as such, doesn't come with the same lab-tested assurances.

The 10 Pro offers a great general viewing experience.

Even, so there are signs that the phone is still built to withstand the same challenges, with a familiar red rubber gasket around the SIM tray and (as confirmed by independent teardowns) similar treatments around the physical buttons and other elements.

As such, don't go throwing your 10 Pro in the sink but know that if you do, it likely won't result in instant death.

DISPLAY

At first glance, the display offered up by the 10 Pro seems identical to its predecessor – a 6.7in 120Hz Quad HD+ AMOLED panel with support for 10-bit colour depth, HDR10+ and a cited 1,300 nit peak brightness, but the ante has, in fact, been upped.

The 10 Pro's panel actually shares more in common with Realme's recent GT 2 Pro flagship, namely in the use of LTPO 2.0 display technology, which means the panel's variable refresh rate can actually rapidly scale right down to 1Hz, resulting in greater power efficiency.

As well as offering a great general viewing experience – with pleasing colours, deep blacks and respectable outdoor visibility – OnePlus has also gone above and beyond with colour calibration, ensuring the 10 Pro's panel is designed to show accurate colours at two discreet brightnesses (100 nits and 500 nits), while most rivals only adhere to calibration at a single brightness level.

Speaking of brightness, the phone's AI-supported auto-brightness can be trained to your specific tastes by

adjusting the slider closer to your preferred values; based on factors like the app in use and the time of day. Generally, it adjusts to a comfortable value for the scenario but I did spend time training it to go dimmer in low light environments, which it started to grasp during the review period.

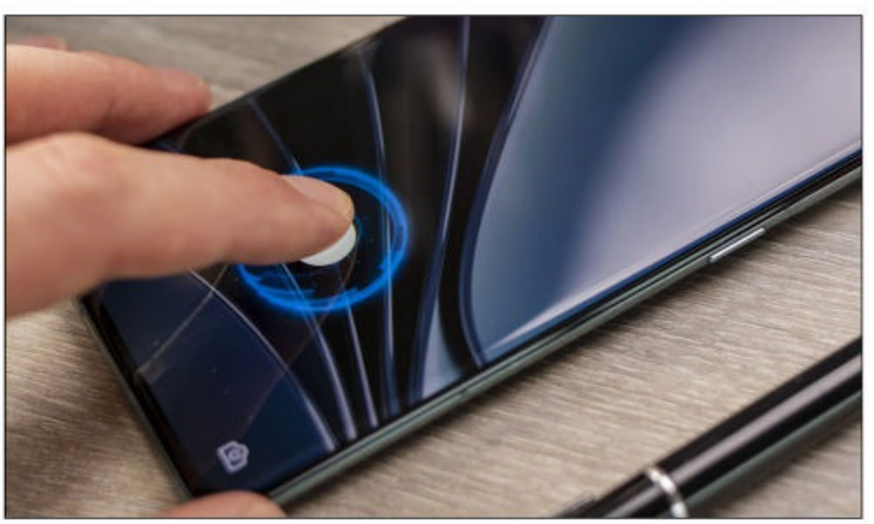
There are a host of customization options tied to the viewing experience too, with different colour space profiles (including a Pro mode), screen temperature control, natural tone functionality (which adjusts colour temperature relative to ambient light), an eye comfort mode, image and video enhancers, and the option to change both resolution and refresh rate.

The display defaults to Full HD+ resolution but can be set to Quad HD+ or dynamic, while refresh rate can either be fixed to 60Hz or set to dynamic mode, with that 120Hz maximum.

Those familiar with the OnePlus 9 Pro's oddly low-slung in-display fingerprint sensor will appreciate its migration northwards on the 10 Pro; sitting much more naturally in the bottom third of the display area, allowing for more comfortable use.

This optical sensor (as well as the RGB-based face unlock) is impressively snappy, however, by shifting the fingerprint reader area up, OnePlus has seemingly had to move the PIN/pattern input to the upper half of the display too; making for an ergonomically awkward experience.

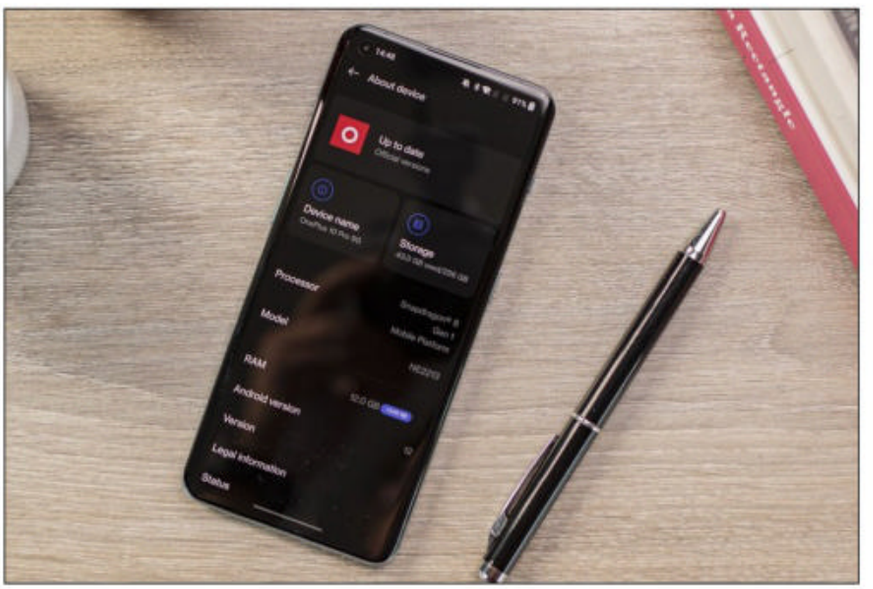
Numerous other phones, like Google's Pixel 6 line, don't seem to suffer from this issue, meaning PIN input and fingerprint sensor can occupy the same area of pixels for better comfort and convenience.



Those familiar with the OnePlus 9 Pro's oddly low-slung in-display fingerprint sensor will appreciate its migration northwards on the 10 Pro.

Dolby Atmos-certified speakers offer audible stereo separation, but the respective treble/bass bias between the earpiece speaker and the down-firing grille makes for an unbalanced headphone-

free sonic experience. OnePlus introduced a new Radiant Silver colourway of OnePlus Buds Pro alongside the 10 Pro's global launch, clearly hoping to push prospective buyers towards picking up the new Buds as their go-to audio solution, especially as there's no headphone jack on-device and no 3.5mm USB-C adapter in-box to speak of.



OxygenOS 12.1 as it appears on the 10 Pro (running atop Android 12) is, as expected, clean and characterful.

SOFTWARE

OnePlus's OxygenOS user experience has been one of the company's product's greatest strengths and standout features; an Android skin offering fluidity and simplicity in a way that really seems to resonate with users.

With this in mind, when the company suggested that OxygenOS would be fusing with Oppo's ColorOS as part of its OnePlus 2.0 initiative last September, fans were understandably uneasy about the move. Community feedback, however, pushed OnePlus to walk back this decision, resulting in ColorOS and OxygenOS still running on a newly-unified codebase (making for an easier update roadmap across both platforms), while still retaining each one's individuality on their respective brand's devices.

OxygenOS 12.1 as it appears on the 10 Pro (running atop Android 12) is, as expected, clean and characterful.

Whenever a '1' appears in the clock widget, it's rendered in the brand's signature red, you have control over quick settings and app icon shapes, the UI colour palette, the fingerprint sensor animation and more. You also have the option to use OnePlus Sans in place of Android's native Roboto font, which helps give the user experience a refreshingly unique look and feel, system-wide. Haptics have been improved too, with an x-axis motor that's reportedly 40 per cent stronger than previous entries, making for more precise

and tactile interaction.

Enduring extras like the Insight lock screen and The Shelf (a home for your widgets that keeps the home screens clear), have been joined by new inclusions like Work Life Balance, letting you filter notifications based on schedule, app and even account.

The one caveat to the experience offered up by The Shelf is that it's only accessible by way of a swipe down from the top right corner of the screen, an area I'm used to interacting with in order to access the notifications and quick settings shade. Its original home – to the side of the primary home screen – was abandoned in 2020, but if you're like me this small tweak comes with a bigger learning curve than expected.

The Shelf, a feature that helps keep your home screen clear, is accessible by way of a swipe down from the top right corner of the screen.

The OnePlus 10 Pro also benefits from the same commitment to software updates that the company made in mid-2021, meaning three years of OS updates and four years of security patches. By no means industry-leading but likely enough to last most users through to their next upgrade.

PERFORMANCE

OnePlus flagships always aim to offer the best hardware in the business and the OnePlus 10 Pro is no exception, with the phone powered by the latest Snapdragon 8 Gen 1 chipset and sporting a baseline 8GB of LPDDR5 RAM (with a maximum 12GB RAM also available), paired to either 128GB or 256GB of fast UFS 3.1 storage globally and up to 512GB on the China-exclusive Extreme Edition.

The 10 Pro is, as expected, a great real-world performer, with OxygenOS and that 120Hz refresh rate working in concert to offer up a smooth, snappy, responsive user experience, as well as fast app load times.

Geekbench 5 (multi-core)

OnePlus 10 Pro: 3,429
Oppo Find X5 Pro: 3,361
Samsung Galaxy S22+: 3,418
Google Pixel 6 Pro: 2,875
OnePlus 9 Pro: 3,611
Vivo X70 Pro+: 3,586

GFX Manhattan 3.1

OnePlus 10 Pro: 60fps
Oppo Find X5 Pro: 59fps
Samsung Galaxy S22+: 77fps
Google Pixel 6 Pro: 45fps
OnePlus 9 Pro: 36fps
Vivo X70 Pro+: 50fps

Battery life

OnePlus 10 Pro: 11 hours, 20 minutes
Oppo Find X5 Pro: 10 hours, 33 minutes
Samsung Galaxy S22+: 9 hours, 38 minutes
Google Pixel 6 Pro: 9 hours, 15 minutes
Vivo X70 Pro+: 9 hours, 30 minutes

Charge in 30 minutes

OnePlus 10 Pro: 94%
Oppo Find X5 Pro: 94%
Samsung Galaxy S22+: 37%
Google Pixel 6 Pro: 39%
OnePlus 9 Pro: 96%
Vivo X70 Pro+: 83%

Artificial benchmarks highlight the relative consistency in CPU performance seen time again when comparing the 8 Gen 1 to last year's Snapdragon 888, while GPU performance pulls ahead; only really falling behind the AMD RDNA 2-capable GPU inside Samsung's Exynos 2200 (powering this year's Galaxy S22 series, in select markets).

If you're feeling that performance is still somehow lacking, OnePlus has also implemented a dedicated high-performance mode (hidden away in the advanced battery settings menu) that offers even more grunt at the expense of battery life (I only used this during benchmarking to achieve the highest scores the phone was capable of), while a RAM Boost feature is also on-hand to leverage the phone's speedy storage as additional virtual memory, designed to help with multitasking and the like.

The phone handled demanding games comfortably, supported by a '3D passive cooling system' that resulted in negligible heat build-up, even after extended sessions. The caveat to the gaming experience is that – similarly to the Realme GT 2 Pro – even games that are known to support 120fps gameplay remained capped at 60fps on the OnePlus 10 Pro, even when manually selecting higher refresh rates and enabling High Performance Mode in the battery settings.

There's also a Pro Gaming launcher

that offers an in-game overlay to manage things like notifications and brightness independently of the phone's wider settings, as well as allowing for real-time performance monitoring of RAM, GPU load and even system temperature. Select games also support real-time game filters that change the game's visual output for aesthetic or functional advantage (depending on the game).

In the move to a new included 80-watt power adapter, Warp Charge has been scrapped in place of Oppo's SuperVOOC tech.

OnePlus has confirmed that the 10 Pro will benefit from Oppo's HyperBoost Gaming Engine (featuring a branded toolset, consisting of the GPA Frame Stabilizer, O-Sync and GPU Load Control) set to be issued in a forthcoming update that will hit devices sometime after the phone's global launch.

BATTERY LIFE

At first blush, it might seem that there's been no visible improvement to the fast charging when comparing the OnePlus 10 Pro to last year's 9 Pro.

Both phones reach approximately 95 per cent charge in just 30 minutes, which is a wholly impressive feat in its own right, but in the case of OnePlus's latest flagship, the company has actually bumped battery capacity up from 4,500- to 5,000mAh too, making that consistent recharge rate more of an achievement.

To facilitate this, the OnePlus 10 Pro matches Oppo's latest Find X5 Pro by pairing its 5,000mAh cell to faster 80-watt fast charging (up from 65-watt on the 9 Pro), resulting in over 50 per cent charge in just 15 minutes and a full charge in less than 35.

OnePlus fans might notice that in the move to a new included 80-watt power adapter, Warp Charge has been scrapped in place of Oppo's SuperVOOC tech. You still get an iconic OnePlus red charging cable but it's reverted back to USB-A on one end, a strange side effect of mixing and matching charging standards and

technologies between the brands. Hopefully, Oppo will catch up to OnePlus soon enough and start releasing VOOC chargers that are USB-C to USB-C.

To round out the charging experience, the phone also supports 50-watt wireless charging (and reverse wireless charging) matching the Xiaomi 12 Pro, that's also been rebranded to fall in line with Oppo's AirVOOC charging standard. While this wasn't tested as the compatible wireless charger is sold separately, OnePlus quotes a full charge in 47 minutes.

As for actual longevity, the bump to a 5,000mAh battery has paid off in spades. Even when the display is set to its maximum refresh rate and resolution, it offers up a day and a half os use comfortably and will facilitate two days of use in the hands of casual users; doling out an impressive PCMark Work 3.0 battery test score of 11 hours 20 minutes, alongside real-world screen-on time of nine hours.

PHOTOGRAPHY

Despite the bombastic new camera housing, the hardware at play is actually almost identical to that of the 9 Pro, albeit with one key exception.

The phone leads with the same optically-stabilized Sony IMX789 primary sensor (which is exclusive to OnePlus, Oppo and the like), featuring what is technically a 52Mp functional area, but comes tied to an unusual 16:11 aspect ratio. The result is that conventional 4:3 stills are captured at 48Mp (with pixel-binning bringing them down to 12Mp by default), however, more of the sensor remains available for video capture than would usually be the case.

The OIS-laden 8Mp telephoto is also lifted from last year's 9 Pro, with the same 3.3x magnification, but things take a turn where the ultra-wide is concerned, with a new 50Mp Samsung ISOCELL JN1 sensor that – as first seen on the Realme GT 2 Pro – offers a super-wide 150-degree field of view.

Ultra-wide shots are usually captured at around 110 degrees, but through two additional dedicated shooting modes, the 10 Pro can snap stills at the full 150 degrees with surprisingly little distortion, as well as featuring a fully circular fish-eye mode; allowing for more creative photographic options.

A closer look at that rear camera arrangement also reveals a Hasselblad logo and an unassuming set of letters and numbers in 'P2D 50T' which, according to the company, translates as follows: P = 'Phone', 2D = 'Second-generation Hasselblad camera for mobile' and 50T = '50-megapixel triple-lens rear camera set-up'.

A closer look at that rear camera arrangement reveals a Hasselblad logo.

It's a pretty contrived way to get people talking about the Hasselblad partnership but among fans and tech enthusiasts, it seems to have worked.

The Hasselblad partnership struck last year between the camera maker and OnePlus for $150 million manifests in a number of ways on the 10 Pro, although how tangible the benefits are to the phone's photographic capabilities really falls to personal preference.

Beyond the signature orange shutter button, the phone features a characterful XPan camera mode (which captures in the historical format's unusual panoramic 65:24 aspect ratio), while a trio of 'Master Styles' (named 'Serenity', 'Radiance' and 'Emerald') serve as bespoke filters tuned by Hasselblad Ambassador Yin Chao and Hasselblad Masters winners Ben Thomas and David Peskens, respectively.

As for more concrete technical improvements, the ability to shoot stills in RAW (and videos in LOG) has been extended with RAW+, which pairs a RAW image with OnePlus's post-processing; granting you the ability to share instantaneously or fine-tune the uncompressed image data, without quality loss. You also have the option to capture with 10-bit colour depth (up from 8-bit on most modern phones).

Practically speaking, output from the OnePlus 10 Pro's camera system makes for an odd mix. It's one of the more confident cameras we've seen in a OnePlus flagship in a few years but it suffers from unusual quirks, mainly around colour science and exposure.

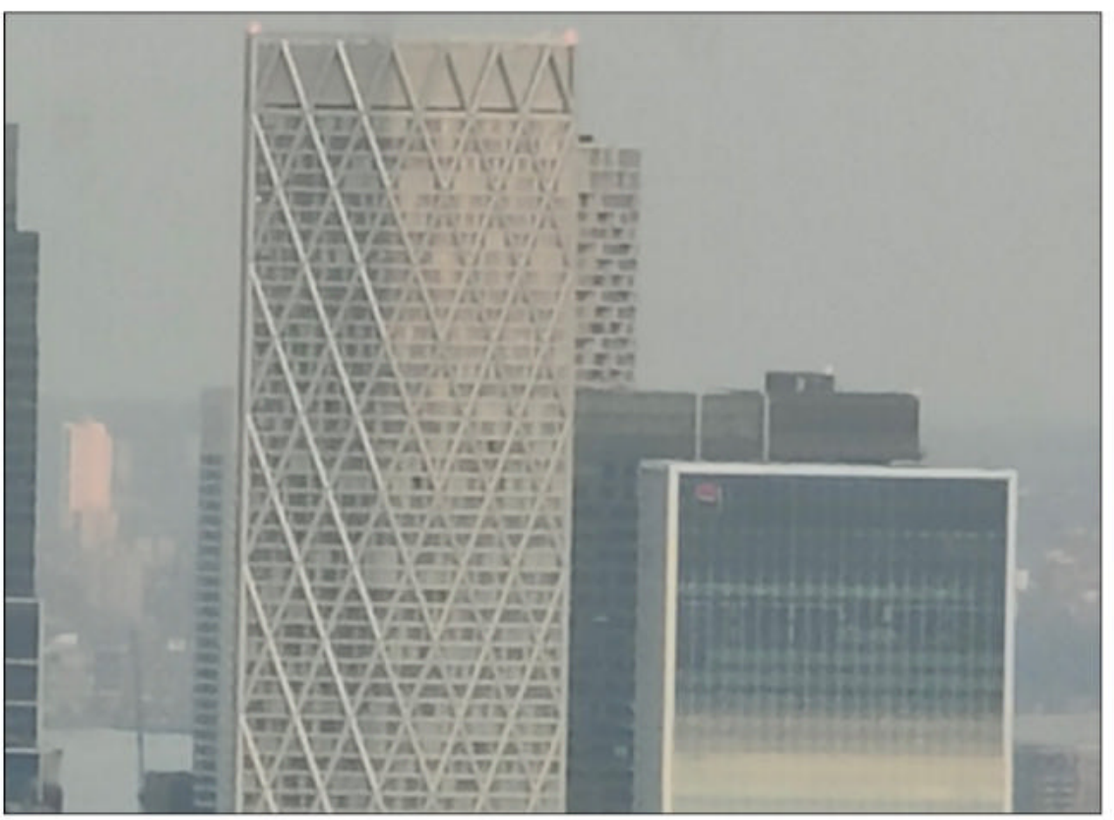
Shots taken on the primary snapper usually offer up pleasing colours (with a warmer bias than most) and are wholly suited to going straight onto social media, with the professional features that OnePlus is touting, however, you'd expect a better photographic baseline from the 10 Pro's camera.

Even in well-lit scenarios, the 10 Pro's camera has a tendency to underexpose,

Our first series of test shots were taken using the main camera…

…the ultra-wide lens…

…the 3x zoom…



…and finally the 30x zoom.

Next up, we have a low light shot…

…and on taken using the phone's Night Mode.

We'll finish up with a couple of examples of selfies. This image was taken with the front camera…

…while this shot used the rear camera.

suggesting limited dynamic range compared to its flagship rivals, or at the very least the need for more tuning by OnePlus's camera engineers.

Post-processing also leads to fine detail breaking down under scrutiny, while inconsistencies with that new 50Mp ultra-wide in comparison to the main and telephoto snappers highlight an even greater dynamic range difference in high contrast scenarios (look at the cactus photos for a good example).

The OnePlus 10 Pro delivers top-tier performance.

Selfies too are inconsistent, with that familiar under-exposure and a real struggle with accurate skin tones, something portrait mode using the main camera handles far better. The front 32Mp snapper seems to capture the blues of my shirt without issue, edge detection is good and bokeh looks quite natural, but my natural skin tone and the red brick of the buildings in the background appear hugely desaturated.

The silver lining is that almost all of the 10 Pro's camera issues can be addressed through software updates, it's just a shame the phone has made it to market with the camera in the state that it is.

VERDICT

Despite the obvious influence Oppo's presence has had over the OnePlus 10 Pro's development, the phone retains its individuality; feeling different enough from bedfellows like the Find X5 Pro and Realme's GT 2 Pro. Where Oppo has exerted its influence, however, the changes are more strange than definitively good or bad.

The OnePlus 10 Pro offers up one of the best displays on the market right now, delivers great top-tier performance, exceptional battery life, a slick user experience and a standout albeit somewhat divisive design.

The phone's biggest weakness is, as ever, its camera, which like so many OnePlus flagships before it, will likely require numerous post-launch patches

to bring it in line with competitors. Alex Walker-Todd

SPECIFICATIONS

- 6.7in (3,216x1,440; 525ppi) LTPO2 Fluid AMOLED 120Hz, HDR10+ display
- Android 12, OxygenOS 12.1
- Qualcomm SM8450 Snapdragon 8 Gen 1 (4nm) processor
- Octa-core (1x 3GHz Cortex-X2, 3x 2.5GHz Cortex-A710, 4x 1.8GHz Cortex-A510) CPU
- Adreno 730 GPU
- 8GB/12GB RAM
- 128GB/256GB/512GB storage
- Three rear-facing cameras: 48Mp, f/1.8, 23mm (wide), 1/1.43in, 1.12µm, multi-directional PDAF, Laser AF, OIS; 8Mp, f/2.4, 77mm (telephoto), 1.0µm, PDAF, OIS, 3.3x optical zoom; 50Mp, f/2.2, 14mm, 150-degree (ultra-wide), 1/2.76in, 0.64µm, AF
- Selfie camera: 32Mp, f/2.2, (wide), 1/2.74in, 0.8µm
- Wi-Fi 802.11 a/b/g/n/ac/6, dual-band, Wi-Fi Direct, hotspot
- Bluetooth 5.2, A2DP, LE, aptX HD
- GPS with dual-band A-GPS, GLONASS, BDS, GALILEO
- NFC
- USB Type-C 3.1, USB On-The-Go
- Fingerprint scanner (under display, optical)
- Non-removable 5,000mAh lithium-polymer battery
- 163x73.9x8.6mm
- 201g

Xiaomi 12 Pro

Price: £1,049 from fave.co/37Db9TN ★★★★☆

Forget the name: the Xiaomi 12 Pro is really the direct successor to last year's Xiaomi Mi 11. A re-shuffle in Xiaomi's flagship line-up has introduced the smaller Xiaomi 12, now giving the Chinese company a pair of high-end phones in different sizes to directly rival Samsung's Galaxy S22 and S22+ – with a 12 Ultra rumoured to arrive later this year to take on Samsung's own Ultra handset.

Being pitted directly against the S22+ (not to mention the likes of the Oppo Find X5 Pro and OnePlus 10 Pro, see page 74) gives the Xiaomi 12 Pro a lot to live up to. For the most part the hardware here is clearly up to the task, matching its rivals in most of the places it counts, though the battery life lets the side down.

Software issues hinder the experience further, with both bugs and awkward interfaces, and the result is a phone that impresses a lot but still feels like it's lagging behind the pack.

DESIGN

If there's a design philosophy to the Xiaomi 12 Pro, it seems to be 'attractive but conservative'. In a year where Oppo is further exploring moulded glass camera modules, OnePlus shifted to a wrap-around design and Samsung offered two separate designs within the same S22 series, Xiaomi has played it safe.

The camera module is restrained by modern standards.

That's not necessarily a bad thing though. Available in grey, purple or blue (China's green leather model doesn't seem to have made it to the international launch, sadly), the 12 Pro is sleek and simple, with only a slight glitter to the finish that helps catch the eye.

The camera module is especially restrained by modern standards, but I love it. The over-sized main lens naturally draws the attention, but subtler touches appeal more: the fact that the other two lens are flush with the module, the offset weighting, the just-barely-there dividing lines that carve the whole thing up into a grid.

It's not just how the phone looks – Xiaomi has nailed how the 12 Pro feels. Curved edges to both the body and display keep the phone comfortable to hold despite the relatively large 6.73in display (look to the Xiaomi 12 for a smaller alternative) and at 205g it isn't too heavy either. Throw in an almost satiny finish to the glass and the phone is a joy to fidget with.

Durability is a bit of a concern though. The 12 Pro has no official IP rating guaranteeing protection from water or dust, and while it uses tough Gorilla Glass Victus on the display, it's the weaker Gorilla Glass 5 found on the rear. After only a couple of weeks, the grey finish of my review unit has already picked up a few micro-scratches that seem to be removing the paint.

DISPLAY

The Xiaomi 12 Pro has an excellent display, up there with the best you'll find in a phone right now.

The 6.73in AMOLED panel boasts a high WQHD+ resolution, excellent peak brightness of 1,500 nits (which

helps drive Dolby Vision and HDR 10+ content), and uses LTPO tech so that it can scale the refresh rate from 1- to 120Hz – giving you benefits to the battery on static screens, and smooth scrolling and animations when appropriate.

The Xiaomi 12 Pro's 6.73in AMOLED display is excellent.

As display quality improves it's become harder and harder to pull phones apart from it – the equivalent Oppo and OnePlus flagships both feature panels that are just as good, though this does have the S22+ beat – that phone sticks to a lower FHD+ resolution and can't drop its refresh rate as low when needed.

Audio is a little harder to call. On paper the 12 Pro should impress thanks to quad speakers tuned by Harman Kardon, though in practice I was a little disappointed. There's a muddiness to the sound profile, especially at higher volumes, that sees instruments run together in the mix. It's actually most noticeable in regular speech, with a lack of crispness to podcasts or audio language lessons in Duolingo.

PERFORMANCE

It's certainly difficult to fault the 12 Pro's specs or performance. Powered by the latest Snapdragon 8 Gen 1 chipset, the phone also offers either 8 or 12GB of RAM and a fixed 256GB of non-expandable storage.

The phone is fast and smooth in daily use and will be more than capable of any standard phone tasks up to and including serious mobile gaming. Unlike some similarly specced phones, I haven't found it liable to overheat during demanding work, which can be a performance limiter in other devices.

Geekbench 5 (multi-core)

Xiaomi 12 Pro: 3,438
Xiaomi Mi 11: 3,684

Xiaomi 12: 3,754
Oppo Find X5 Pro: 3,361
Samsung Galaxy S22+: 3,418
Google Pixel 6 Pro: 2,875

GFX Manhattan 3.1

Xiaomi 12 Pro: 68fps
Xiaomi Mi 11: 54fps
Xiaomi 12: 114fps
Oppo Find X5 Pro: 59fps
Samsung Galaxy S22+: 77fps
Google Pixel 6 Pro: 45fps

Battery life

Xiaomi 12 Pro: 7 hours, 29 minutes
Xiaomi 12: 9 hours, 32 minutes
Oppo Find X5 Pro: 10 hours, 33 minutes
Samsung Galaxy S22+: 9 hours, 38 minutes
Google Pixel 6 Pro: 9 hours, 15 minutes

Charge in 30 minutes

Xiaomi 12 Pro: 100%
Xiaomi Mi 11: 79%
Xiaomi 12: 90%
Oppo Find X5 Pro: 94%
Samsung Galaxy S22+: 37%
Google Pixel 6 Pro: 39%

That performance is reflected in the benchmarks, which show that the 12 Pro is clearly on a par with its rivals – though as we've seen with other phones this year, on the CPU-focussed Geekbench 5 test it's actually slipped behind last year's Mi 11, while showing clear year-on-year improvement in the graphics-based GFXBench tests.

Performance is almost identical to the similar Oppo Find X5 Pro, and while the likes of the Realme GT 2 Pro and Exynos-powered Galaxy S22+ outpace the Xiaomi on graphical benchmarks, this is only because their chips are driving lower resolution displays.

Naturally, the 12 Pro also offers 5G connectivity, with dual-SIM support, and this is joined by Bluetooth 5.2, NFC, and Wi-Fi 6 or 6E – though Xiaomi warns that the exact Wi-Fi version varies by region.

BATTERY LIFE

When it comes to power management, the 12 Pro is the definition of a mixed bag. Battery life is, to be blunt, poor – both in our PCMark battery test, and in day-to-day use. Even with relatively light use, I found that the phone only barely makes it to bedtime, despite what should be a sufficient 4,600mAh cell.

That's with both refresh rate and resolution set to vary dynamically – which should help conserve power – and the phone's 'Balanced' power profile enabled.

The phone hasn't yet died on me before the end of the day, but I'd be hesitant about relying on the battery if

my routine involved more gaming, GPS navigation, video recording, or other power-intensive tasks.

Strangely, the phone's battery monitor blames Wi-Fi as the biggest battery drain, which sounds like either a software error or an optimization problem. With a bit of luck, that means this is an issue that Xiaomi can patch up and improve.

To compensate for the battery problems, the 12 Pro does excel at charging. Xiaomi ships the phone with an astonishing 120-watt wired charger, which it says can deliver a full charge in 18 minutes, though in my testing it didn't quite hit those speeds – it reached 70 per cent charge in 15 minutes. The small print is that to get at that full speed you have to manually enable the 'Boost' charging mode, which is likely to accelerate battery degradation.

You might then prefer to leave it off. Even without it, in my test the 12 Pro topped up to 66 per cent battery in just 15 minutes, and was at a full charge before the half-hour mark.

The phone also supports wireless charging, and reverse wireless charging for other devices. When charging itself, the phone can charge at up to 50-watt using Xiaomi's official wireless charger, though it'll hit much lower speeds on typical third-party Qi wireless chargers.

PHOTOGRAPHY

Xiaomi has proven itself an industry leader in camera stakes over the last few years, and unsurprisingly the 12 Pro impresses here.

That huge main rear camera lens is at the heart of things, powered by Sony's 50Mp, 1/1.28in IMX707 sensor – in fact, the 12 Pro is the only phone to use the component so far.

In good lighting, detail is excellent from this lens. Colours are punchy and vibrant, though the tones are slightly on

The huge main rear camera lens is powered by Sony's 50Mp , 1/1.28in IMX707 sensor.

We'll begin our test shots with a low light image…

…and a photo taken using Night Mode.

Our next set of shots were taken using the main camera…

…the ultra-wide lens…

…and finally the 2x telephoto zoom.

We'll finish off with a selfie.

the exaggerated side of natural. At times the dynamic range feels a little limited, with details lost in darker spots and some direct light blown out, but not so much as to be a critical failing.

Main lens results impress at night too. Using the dedicated Night Mode preserves a fraction more detail and dynamic range, but hardly enough to be worth digging through menus for it – the auto mode is perfectly sufficient. This isn't quite the best low light camera around (the Vivo X70 Pro+ still wears that crown), but it's quick, reliable and impressive for the price.

That main lens is joined by two smaller shooters, though don't write them off. Both the ultra-wide and the 2x telephoto zoom lens use 50Mp, though they use smaller Samsung sensors.

Despite that, their strengths and weaknesses are similar, albeit exaggerated. Detail is excellent, but dynamic range can be lacking and they struggle more than most when faced with bright, direct light. Even without optical image stabilization the telephoto holds its own surprisingly well at night, preserving detail and exposing light almost as well as the main sensor, though the ultra-wide has a sharper quality drop in low light.

On the front of the phone, the 32Mp selfie camera produces beautiful results in the right lighting (albeit with the same caveats around dynamic range), though struggles seriously at night, producing soft, murky images that look like they should come from a much cheaper device.

As for video, you can shoot at 4K at 60fps across all three rear lenses, with an 8K at 24fps option restricted to the main camera. The selfie lens caps out at 1080p at 60fps. Video recording is supported by some new focus tracking tech, which will help when filming pets, kids, or other fast-moving subjects – though they do have to stay central and large in the frame for the tracking to work.

SOFTWARE

The Xiaomi 12 Pro ships with Android 12, running Xiaomi's MIUI 13 on top.
I've long said that Xiaomi phones have been let down by the company's take on Android, and unfortunately, nothing has changed in that respect.

MIUI is unintuitive and frustrating by modern Android standards. The settings menu is cluttered and complex, with controls laid out in sections you'd never expect to find them. Some UI choices – like a split control centre and notification tray, each accessed by swiping from a different side of the screen – are shamelessly cribbed from Apple, but ill-suited to Android.

The 12 Pro ships with Android 12, running Xiaomi's MIUI 13 on top.

To top it all off, the phone comes pre-installed with apps like Facebook, TikTok, and Joom, with ads included for more.

While Xiaomi has included all of the key privacy and security features of Android 12 into its latest MIUI version, it's omitted one of the OS update's most appealing features, Material You. There's no sign of this option to tweak the phone's colour palette based on your chosen wallpaper, even though it's perhaps the main user-facing feature of Android 12.

It doesn't help that I've encountered a few bugs in my time with the 12 Pro, too. Dark Mode occasionally generates visual artifacting in the settings menu; once the alarm went off but was impossible to find to deactivate; and some interaction with the Android 12 privacy features prevents the microphone from activating at all for speech lessons in Duolingo. I've had none of these issues on other Android 12 devices.

Xiaomi's current policy is to issue its flagships with three years of Android updates and a fourth of security patches, which should see this phone get Android 13, 14, and 15. That's roughly typical for high-end Android phones, though lags behind Samsung's promise of four years of updates for its phones, or Apple's market-leading approach to long-term support.

VERDICT

The Xiaomi 12 Pro has an awful lot going for it, but that's coupled with a pair of major flaws.

I love the sleek, understated design. I love the beautiful display and the impressive performance. And I (mostly) love the camera, which is a solid performer, if not quite best-in-class.

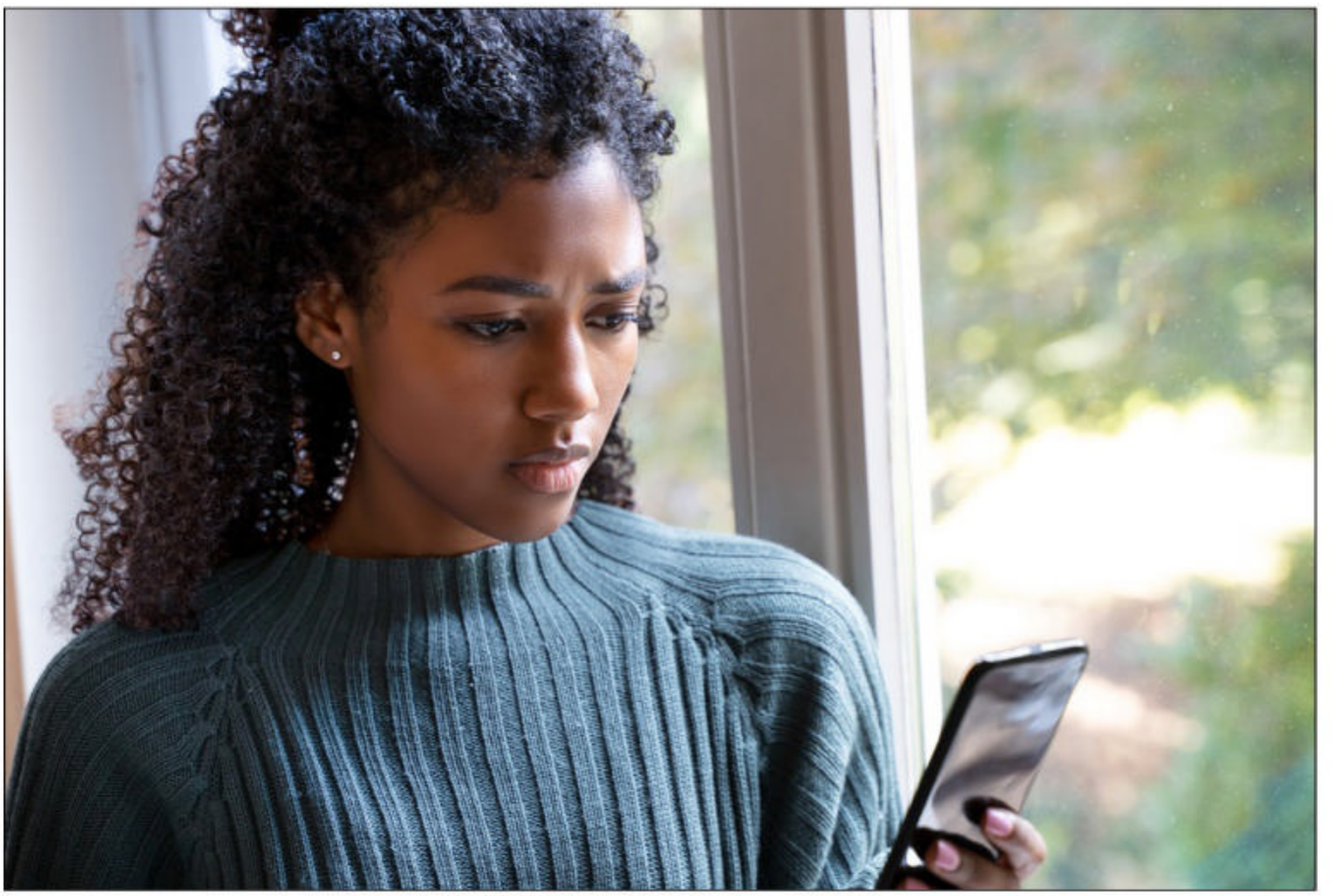
Unfortunately, the battery life is a clear failing, and the software suffers too – both from accidental bugs and intentional design choices. Some of these failings could well be fixed

with updates, but for the moment they frustrate.

That's not enough to stop me from recommending the Xiaomi 12 Pro, but it is enough to make me encourage you to take a close look at the phone's rivals before you commit. Dominic Preston

SPECIFICATIONS

- 6.73in (3,200x1,440; 521ppi) LTPO AMOLED, 120Hz, HDR10+ display
- Android 12, MIUI 13
- Qualcomm SM8450 Snapdragon 8 Gen 1 (4nm) processor
- Octa-core (1x 3GHz Cortex-X2, 3 2.5GHz Cortex-A710, 4x 1.8GHz Cortex-A510) CPU
- Adreno 730 GPU
- 8GB/12GB RAM
- 128GB/256GB storage
- Three rear-facing cameras: 50Mp, f/1.9, 24mm (wide), 1/1.28in, 1.22µm, Dual Pixel PDAF, OIS; 50Mp f/1.9, 48mm (telephoto), PDAF, 2x optical zoom; 50Mp, f/2.2, 115-degree (ultra-wide)
- Selfie camera: 32Mp, f/2.5, 26mm (wide), 0.7µm
- Wi-Fi 802.11 a/b/g/n/ac/6 or 6e (market dependent), dual-band, Wi-Fi Direct, hotspot
- Bluetooth 5.2, A2DP, LE
- GPS with A-GPS. Up to tri-band: GLONASS (1), BDS (3), GALILEO (2), QZSS (2), NavIC
- NFC
- USB Type-C 2.0, USB On-The-Go
- Fingerprint scanner (under display, optical)
- Non-removable 4,600mAh lithium-polymer battery
- 163.6x74.6x8.2mm
- 205g



Credit: Getty Images/tommaso79

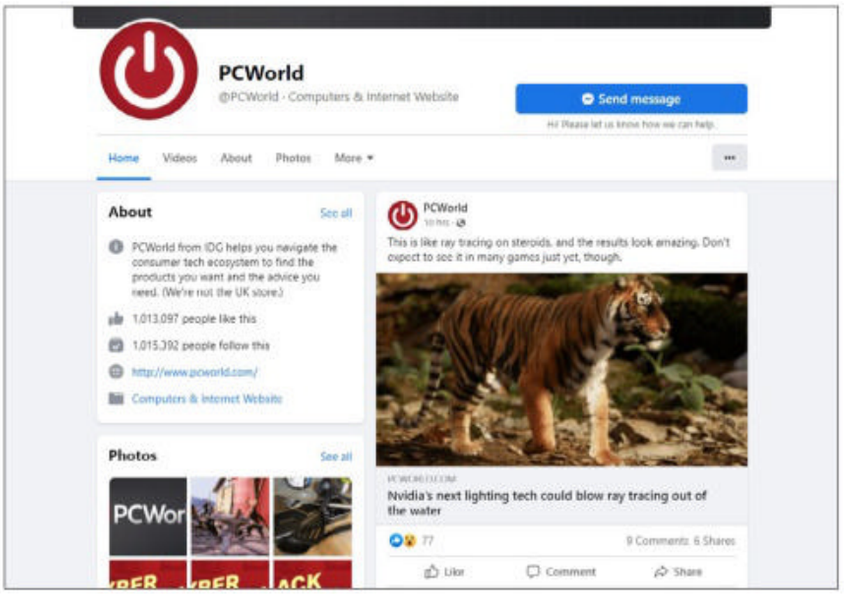
How to protect yourself from digital stalking

If you need more help, don't be afraid to reach out to agencies that are ready to assist. TECH ADVISOR STAFF report

The conveniences of modern life also come with downsides. One drawback that can have an outsized impact on a person is digital stalking – the use of your digital footprint to keep tabs on you online and in the real world. But you can take steps to minimize that risk. You don't need to go to extreme lengths to maintain your privacy, either. Basic precautions will set you up well for the future, like turning off public sharing for social-media posts.

But you can go even further to increase your security measures to

prevent cyberstalking – and most people concerned about digital stalkers will want to do so. Vulnerabilities can overlap. For example, social media can reveal facts that can make stalking you digitally and physically easier. And having the same user name across all apps and services could make finding you on the web and discovering one of your long-forgotten accounts with a weak password much simpler. (Both can lead to further intrusion into your life.)



Your public posts on social media are viewable by anyone. They don't need an account to see what you've shared.

This article breaks everything down for you, with bold text that highlights key action items. Use it as a checklist to shore up your defences.

WAYS PEOPLE CAN MONITOR YOUR ONLINE ACTIVITY

Your social media accounts or other apps and services may be broadcasting all of your posts or information for anyone to view. **Remove the information or set your privacy level to friends-only (at minimum)** to keep those details away from prying eyes. Unfortunately, you can't always predict which companies will do this, so you may have to comb through a lot of apps and web sites for a thorough lockdown. Also, when you're tagged or otherwise named in other people's public posts, someone can see into your life. You can **change your settings to block others' ability to tag you**.

Your user name

Many people use the same user ID across all services. **To avoid someone following you around the Internet, mix it up**. Use a unique login name for some services, if not all of them. If you use a password manager, you'll be able to easily keep track of your user IDs.

Through your friends

Not only can other people's public posts divulge specifics about your life, but your 'friends' on websites or apps can also

become a vulnerability. You won't always know who they know, and what ends up getting shared indirectly.

You can **minimize this risk by limiting your posts' reach** to trusted individuals, **removing people you don't know well** from your friends list, **and/or simply not sharing as much** online.

Account infiltration

Another person can access your account if you have a weak, leaked or shared password, or through any linked third-party services that have been compromised. Let's say that you use Facebook to log into other websites. If someone gains access to your Facebook account, that could open up access to a ton of other sites as well.

At its most benign, you might find yourself with a freeloader on your Netflix account. But even in that case, that person can still see your viewing habits and some of your billing details, as well as your email address and possibly phone number, too. Such data can allow deeper digging into your life and snooping on personal messages or email if your security is weak overall. Your financial information, intimate conversations, and private photos could end up exposed.

To root out a spy, **check your account activity**. Many major services (Gmail, Facebook, and so on) show a list of IP addresses and the devices associated with them, as well as the time and date of the access. You can **figure out your IP address by typing `what's my ip` into Google** or another search engine. (Your phone may have a different IP address than your PC if you use its cellular data connection.)

If you see any unknown IP addresses, log out that device or end its session. Also **change your password** as well to something strong and random. A password manager (even a good free one) will make that simple. **Enable two-factor authentication** to raise your security level even further, and **limit third-party access** to your accounts. Even if you don't see any suspicious activity, you can still go through these steps to ensure you (and only you) have account access.

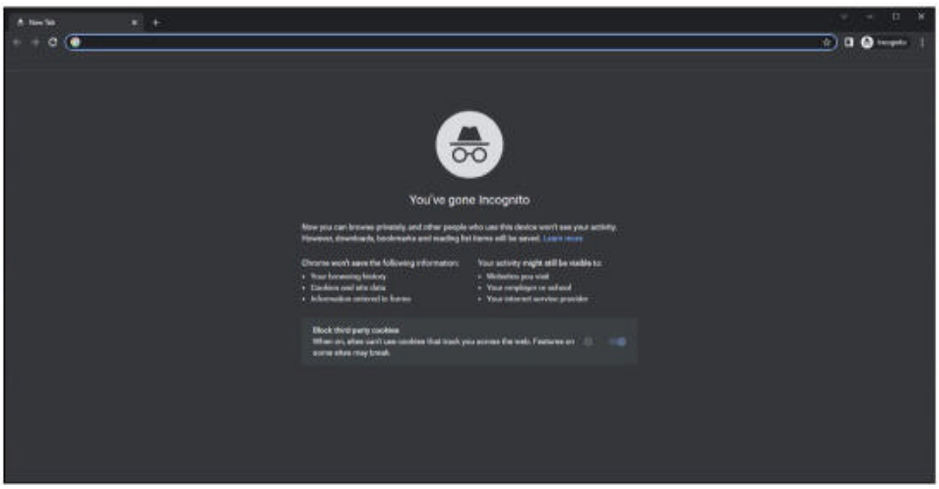
Physical access to your device(s)

Checking IP addresses in your account activity will tell you when people outside your home are monitoring you, but not necessarily when someone inside your home is doing the watching. You might catch them that way on their own devices, but not when they use yours.

Maybe you don't have a screen lock on your phone or an account password on your PC. Or perhaps you've shared that info in the past with a housemate,

friend, or family member and never changed it. They can then have a look at any website or app you're logged into. No need for the passwords to those accounts.

Keep people out by adding an authentication method to the device – **or changing your existing credentials**. If that's not an option, **log out of websites and applications** when you're not using them. For web browsing, **you can also use an incognito window in Chrome**, InPrivate window in Edge, or a private window in Firefox to avoid leaving a history of what sites you visit.



Incognito windows in Chrome are a way to keep people with access to your device from knowing your browsing history. The same mode exists in other browsers too but are named differently.

A private browsing session won't prevent someone on your home network from being able to see your traffic requests, though. To cover that completely, you'll need to use a VPN. Alternatively, you can use your phone's cellular data connection.

Remote access to your PC

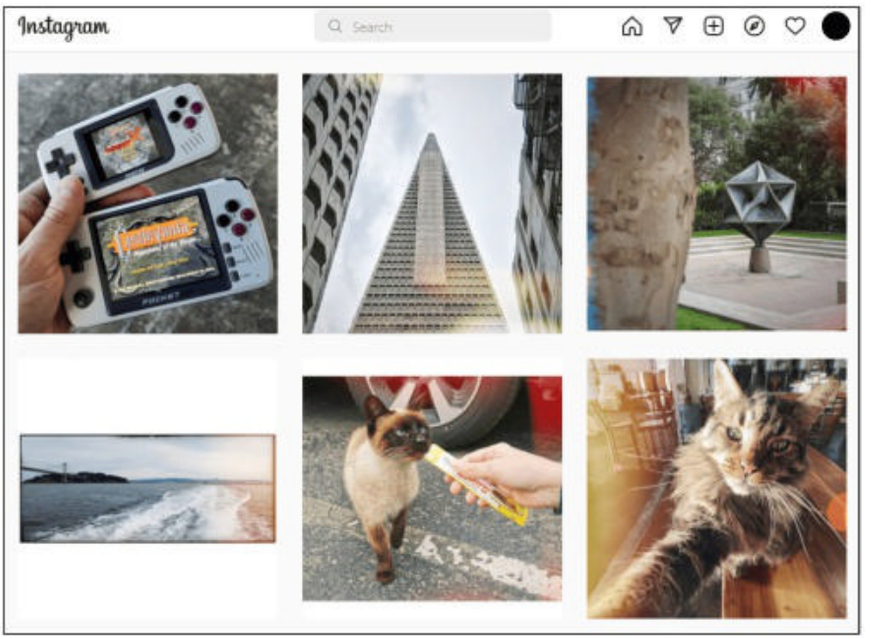
Checking account activity logs also won't reveal if someone is monitoring you via remote access to your PC. It not only allows them to see everything you do in real time, but also control your computer.

If someone doesn't have physical access to your devices, you'll usually have to click a malicious link for them to gain remote access. So **don't click on any links you don't recognize**. Also **run regular, thorough antivirus and antimalware scans on your PC**. If you use Chrome, **check your Chrome Remote Desktop settings as well** to make sure no one has unauthorized access your PC. (And be sure that the Google account you use to sign into Chrome is secure.)

Someone with physical access to your devices may surreptitiously set up remote access software without your knowledge. One easy way to do this is turning on Remote Desktop, a feature

built into Windows 10 Pro and Windows 11 Pro, or Apple Remote Desktop, the equivalent for macOS. Go into your settings to **revoke access to unrecognized accounts or turn off the feature completely**.

Third-party software alternatives for Remote Desktop and Apple Remote Desktop also exist. You can look for these by scanning through the installed apps on your PC. In Windows, type **Apps & features** into the Start menu or search bar, then start looking at the list of apps. On a Mac, open the Applications Folder. (Check both the one tied to the system and the one tied to your user account.) Obvious remote-access software includes TeamViewer, but you can Google the name of any program you don't recognize. **Uninstall any monitoring apps that don't belong on your system**.



Even if you don't share a lot of written information, check-ins that identify your location can reveal more than you intend. Same for photos, which we cover in the next section.

WAYS PEOPLE CAN MONITOR YOUR PHYSICAL LOCATION

You can leak information on your current physical location or even usual haunts through what you share online. Here's how to plug that.

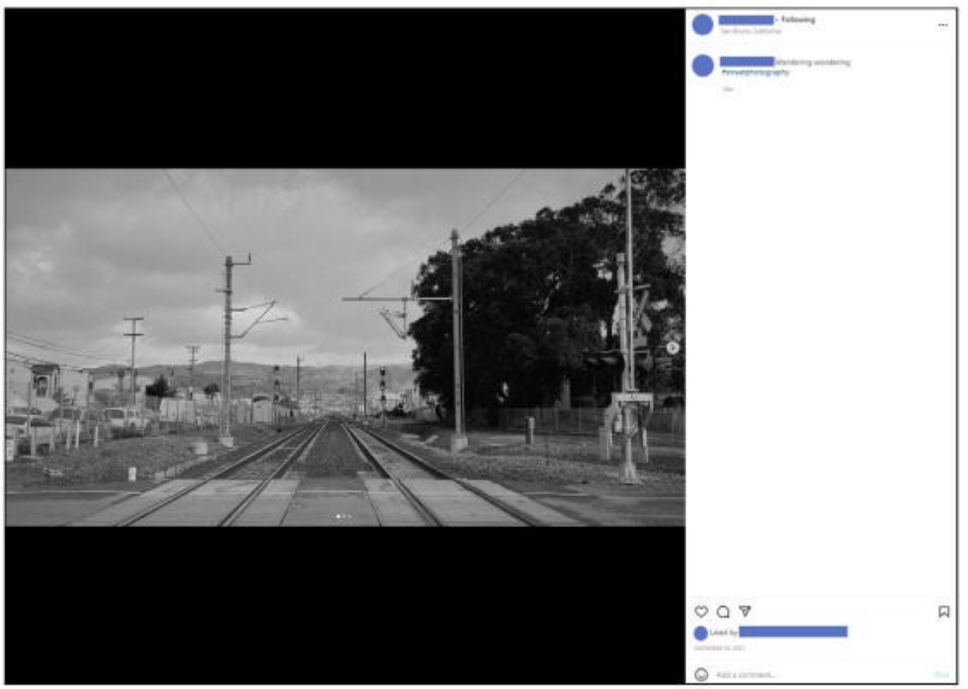
Social media

Public posts on Facebook, Twitter, and Instagram that tag or mention a location are a dead giveaway of where you're at or where you like to visit. You can also give away your locale through sharing photos with landmarks or details recognizable to whomever is viewing the photo.

To solve this problem, **lock down your posts**. You can make your account private on Instagram and Twitter, and on Facebook, you can choose to limit who you share posts with. Make them Friends-only at minimum, or even more restricted if you're connected to people you don't know well. (You don't know

who they know, much less who may try to use them to get to you.)

Alternatively, you can just **stop tagging or mentioning where you're at**. If you must, wait until after you've departed – and limit the habit to places you're only visiting once, rather than spots you frequent. You can also **change your settings to block others from tagging you** in photos or locations by default.



This picture on Instagram not only advertises the general location, but also has clear landmarks that help pin-point an exact spot.

Also be mindful of what you share. You're not required to disclose your home address, workplace, education, or other identifying details. (You may need to share a phone number for two-factor authentication, but you can use a Google Voice number that can't be easily traced to you.) Only reveal information when absolutely necessary and keep it as general as possible.

PHOTOS

Photos shared online can betray your location in two ways. You have geotagging enabled for photos you take on your phone, or you've taken a photo with enough background details to reveal where you are. (Or both.)

You can either **turn off geotagging entirely** for your photos, or before posting a photo, **run it through an app that strips its metadata** (including location and the device used to take the snap). If you only need to remove location data, try Adobe Photoshop Express on Android; on iOS, try Snapseed. (Don't reverse these recommendations, even though the apps exist for both platforms.) You'll open your existing file, then save/export it. In your Photos app, you can look at the info of the copied photo to verify the GPS data is gone.

As for what you take shots of, be mindful of what's in the background behind you before you post a photo. You may not be able to eliminate all clues to where you are, though, **so being careful about whom you share the photo with is also a strategy**.

OTHER APPS AND SERVICES

Similar to social media, your settings in some apps and services can broadcast your usual haunts or habits. For example, fitness apps that track your route when running or biking may make that public information by default. A travel app that blasts your itinerary to the wide Internet. A calendar that's set to public. Websites that allow anyone to see your wish lists and favourites. Take the time to **go through the settings of your apps and services**. Verify that your details aren't public at minimum, and **consider locking down any extraneous information**. Share only the minimum with friends as necessary (they probably don't, for example, need to know your exact run route for fitness challenges, only that you did eight miles). To really go private, **don't neglect old accounts you use rarely or have abandoned**.

DOMAIN REGISTRATION

Do you have a website with your own domain? If your domain registrar doesn't offer private registration (or you didn't turn on the feature), your name, address, phone number, and email address can be found by anyone.

The fix is simple. **If your registrar offers private registration, turn it on**. Your registrar will substitute their own contact info for yours, and forward you any incoming messages from people trying to get in touch about your domain.

If your registrar doesn't offer private registration, move to one that does.

APPLE AIRTAGS (AND OTHER BLUETOOTH TRACKERS)

A Bluetooth tracker is a small physical object that can be placed on items to ensure they don't go lost. That's their intent, at least – but they can be used for stalking, too. Because the person would need to have access to your car, bike, bag, or other belonging, this form of monitoring your movements relies on at least an initial moment of close proximity.

Apple AirTags are the most potentially dangerous of the trackers, due to how many Apple devices are available for a tracker to ping off of and thus establish your location and route of movement. But Tile, Chipolo, and other trackers work in a similar fashion.

If you have reason to believe someone might place a tracker on you, in your stuff, or on your car, you may want

to **begin regularly checking your stuff for anything that doesn't belong**.

Phone location

Your phone may be betraying your location to your friends and family – or anyone deemed as such in your settings.

If you have location settings on (this allows your cell phone to share your GPS location with apps, which is necessary when using a map app, ride sharing, or allowing an app to check into a place), it's possible for select contacts to track you in real time if you allow it. In theory, only you should have control over this, but if someone has had physical access to your phone, they can grant permission to themselves or others too.

It's a sword that cuts two ways: Useful if you need to keep track of your aging relative who sometimes gets lost going home on public transit, but dangerous if it's a person who shouldn't have that info.

On iPhone, **you can check to see who has this level of access in your Find My app. On Android, sharing is done through Google Maps –** click on your profile icon, then go to Settings > Location Sharing.

5 reasons why you should buy a desktop PC instead of a laptop

Before you buy a new laptop, take a moment to consider the benefits of a dedicated desktop computer. JARED NEWMAN reports

About a year ago, I bought a Mac for the first time in my life. It's not that I'm anti-Apple – I switch freely between iOS and Android, and I'm currently wearing an Apple Watch – but my preference for working in Windows has started to feel like a blind spot in my tech coverage. Even when I can borrow my wife's MacBook to try the occasional app or MacOS trick, it's not the same as living inside MacOS full-time.

But unlike the average Mac buyer, I

didn't end up with a MacBook. Instead, I went with Apple's diminutive Mac Mini, which is now sitting on my desk beneath my main monitor. Whether it's Windows or MacOS, one thing I know for sure is that I'm an enthusiastic desktop PC user.

While the laptop's portability benefits are obvious, here's why I still appreciate the desktop computer – whether it's running Windows or macOS.

1. DESKTOPS CAN BE CHEAPER

Apple's Mac Mini starts at £699, which is £300 cheaper than a MacBook Air with nearly identical tech specs. Essentially, you're not paying for the display, trackpad, battery, and webcam, which means you can put that savings toward better desktop accessories or use what you've already got.

The maths gets a little trickier on the Windows side, where pricing can be all over the place. Still, you can generally find decent desktops in the £500 range (one example), whereas the quality of laptops in that price range can be iffy in terms of keyboard, trackpad, and build quality.

2. THEY'RE BETTER FOR CERTAIN APPLICATIONS

The always-on nature of desktop computers also opens up some use cases that aren't practical with a laptop. If you want to use Plex or Channels DVR to record over-the-air TV or stream your personal media collection, you'll need a computer that's plugged in and running around the clock. Same goes if you're rolling your own home automation service or sideloading apps on your iPhone. With a laptop, you'd lose access to these services whenever you put it to sleep.

3. THEY AFFORD MORE POWER

Intel and AMD ship different sets of processors for laptops and desktops, with the latter being more powerful. After all, they don't have to worry about keeping your lap cool or burning through too much battery life, and they can use bigger fans to dissipate heat. Apple, meanwhile, is clearly leaning into the strength of desktop computing with its Mac Studio, whose optional M1 Ultra chip outperforms any MacBook.

Of course, desktops also leave room for bigger, more powerful graphics cards for PC gaming – at least when you can find them.

4. DESKTOPS ARE EASIER TO EXPAND

To add more storage to a desktop PC, you merely need to throw in an extra internal hard drive or plug in an external one. That means you can keep costs

It's easier to add more storage to a desktop PC.

down on the initial purchase and expand as you go.

Adding more storage to a laptop creates a whole new set of complications. Only some Windows laptops let you install more internal storage, and Apple's recent MacBooks aren't expandable at all. While you can always plug an external drive into a laptop, you'll need to avoid loading it with any important files or programs unless you always plan to take the extra drive with you.

5. AND THEY'RE SIMPLER TO SIT DOWN AND USE

The ease of adding storage to a desktop ties into a broader point, which is that desktops can feel less cumbersome than laptops, especially when you're bringing in external monitors, webcams, speakers, mice, and keyboards. You don't have to deal with finding your laptop and plugging in power cords and peripherals before you can get comfy at your desk.

That might sound sort of silly – it's not that hard to plug in a few cables, after all – but sometimes removing tiny bits of friction can make a big difference. Even using a fancy laptop docking station isn't the same as being able to sit down at your desk and immediately start computing.

Whether those upsides are worth sacrificing the portability of a laptop is something I can't answer for you. But they're worth keeping in mind next time you're in the market for a new computer.

Credit: Getty Images/Lacheev

How to set up Android parental controls to limit screen time

This quick and easy enhancement will change how you interact with your Pixel's notifications – for the better. JIM MARTIN reports

As a parent, one of the biggest struggles of modern times is managing what your child can do on their phone (or tablet) and restricting the amount of screen time they can have each day. It seems like an impossible task, and it's certainly far from easy. Even if you manage to block one device, they'll probably find another or turn on the TV and watch Netflix.

There is no magic bullet and you'll still have to do some supervision (as well

as hiding the TV remote) to ensure your child isn't seeing stuff they shouldn't.

Plus, you should sit down with them and talk about the dangers of unrestricted use and explain why you're about to install an app that will let them control how much their use their precious device.

We're not saying there won't be arguments and tantrums, but since asking a child to turn off their phone and do something else is largely ineffective, here's how to use apps and settings to control their screen time on Android phones and tablets (and Chromebooks, too).

We'll focus mainly on the Google Family Link app here, but if your child has access to other devices, such as iPads, iPhones, Windows laptops and Macs, you may want investigate parental control software that works across all of them and can enforce the time limits you set regardless of which device they use.

HOW TO USE GOOGLE FAMILY LINK

Family Link (fave.co/3venmGT) – at the time of writing – was being advertised on TV. It has been around for a few years now and was widely criticized when it launched for being a truly awful app.

In 2022, things are much better, and in our experience, Family Link does what we want it to. Here's a summary of its features:

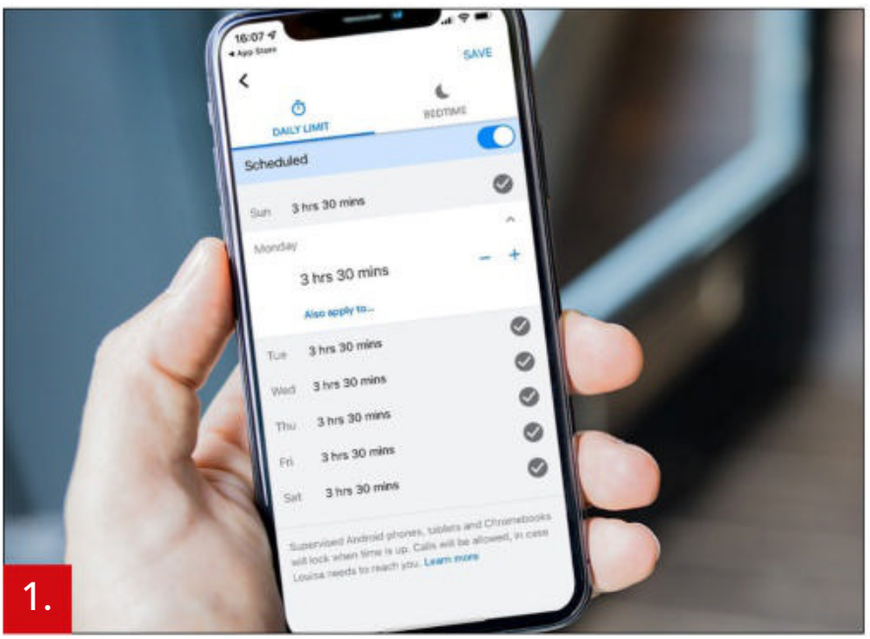
- It provides an overall screen time limit, which can be different every day.
- It lets you set a bedtime: hours between which the device cannot be used.
- For any given app (including games and social media) you can set a time limit, block it or always allow it, regardless of whether the daily screen time has been used up.
- It lets you approve or deny requests to install specific apps from Google Play.
- It lets you see a child's current location on a map (requires mobile data).
- Parents can install it on iPhone or Android to monitor and change settings on the child's Android device.

Many paid-for parental control apps fail to do all of the above, so Family Link is a good way to control screen time, all for free.

Family Link is designed to be used with child Google accounts (in other words, accounts for children under 13). However, it also works with pre-existing Google accounts of children any age, so you can continue to restrict screen time for kids older than 12.

Do note that Family Link does not block offensive content; it is up to you which apps you allow your child to use.

Also, bear in mind that Always Allowed apps will work even if the child's screen time is used up for the day, but only until Bedtime comes into effect. This is in contrast to Apple's Screen Time where apps that are always allowed work regardless of any screen time limits and bedtime restrictions.



1.

To set up and use the app, you will need both your phone and your child's phone. The steps may vary slightly, but here's the basic process:

1. Go to the app store on your phone – Android or iPhone – and search for Google Family Link (fave.co/3venmGT).
2. Follow the instructions to sign into your Google account.
3. If you're not already a Family Manager, follow the steps to set up a Google Family and make yourself the manager (or one of the managers).
4. Choose an existing Google account you want to manage, or create a new child account.
5. Install the Google Family Link app on the child's phone.
6. Follow the prompts on the parent's phone to link the child's device (this requires the two devices to be within Bluetooth range).
7. Choose from the list of apps already installed on the child's device whether to allow or block them.

Once this first stage of the process is complete, you can then use the Family Link app on the parent's phone to:

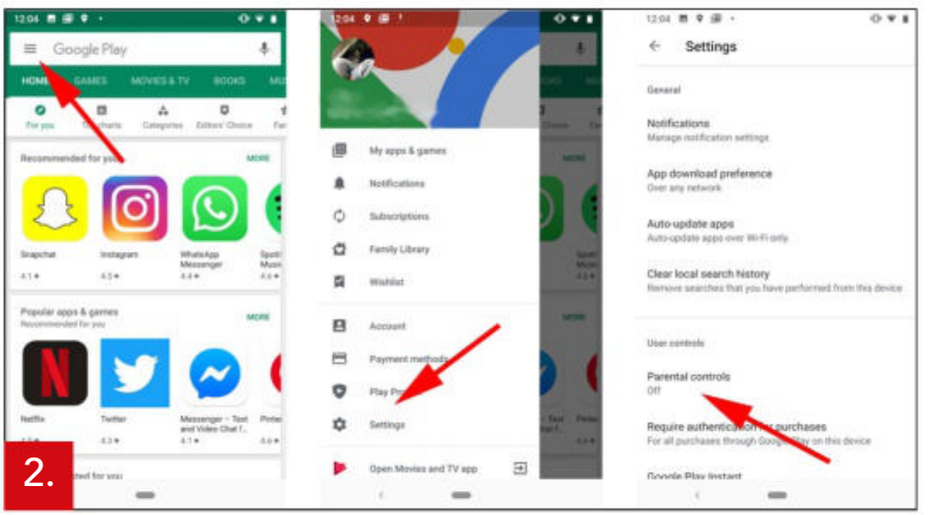
- Manage settings such as purchase and download approvals.
- Choose age restrictions for apps and games, films, TV and books.
- Configure (or edit) limits, including Daily Limits (total screen time) and Bedtime (**1.**).
- Use App Controls to set a specific time limit for each app.
- See the current location of the phone.

• See the total amount of screen time used today (and historically).
• Lock the child's phone to temporarily prevent them from using it.
• 'Ring' the child's phone to locate it when it has been misplaced.

Like other Google apps, Family Link uses a series of 'cards', so you need to scroll up and down to get to the section you want. It should list other devices besides the one you've just installed Family Link on which the child has been signed into. You'll need to install the app and link those devices before time limits will be enforced across them. Until you've done that, they'll have unlimited use on those devices.

HOW TO RESTRICT CONTENT IN THE GOOGLE PLAY STORE

If you're not going to use Family Link, you can set similar restrictions about the apps, games, films, TV and books your child can download from the Play Store.



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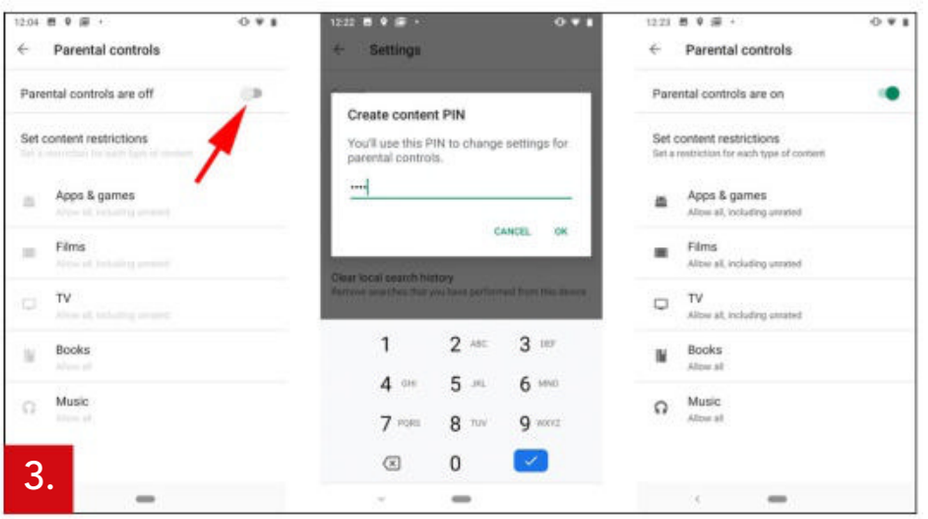
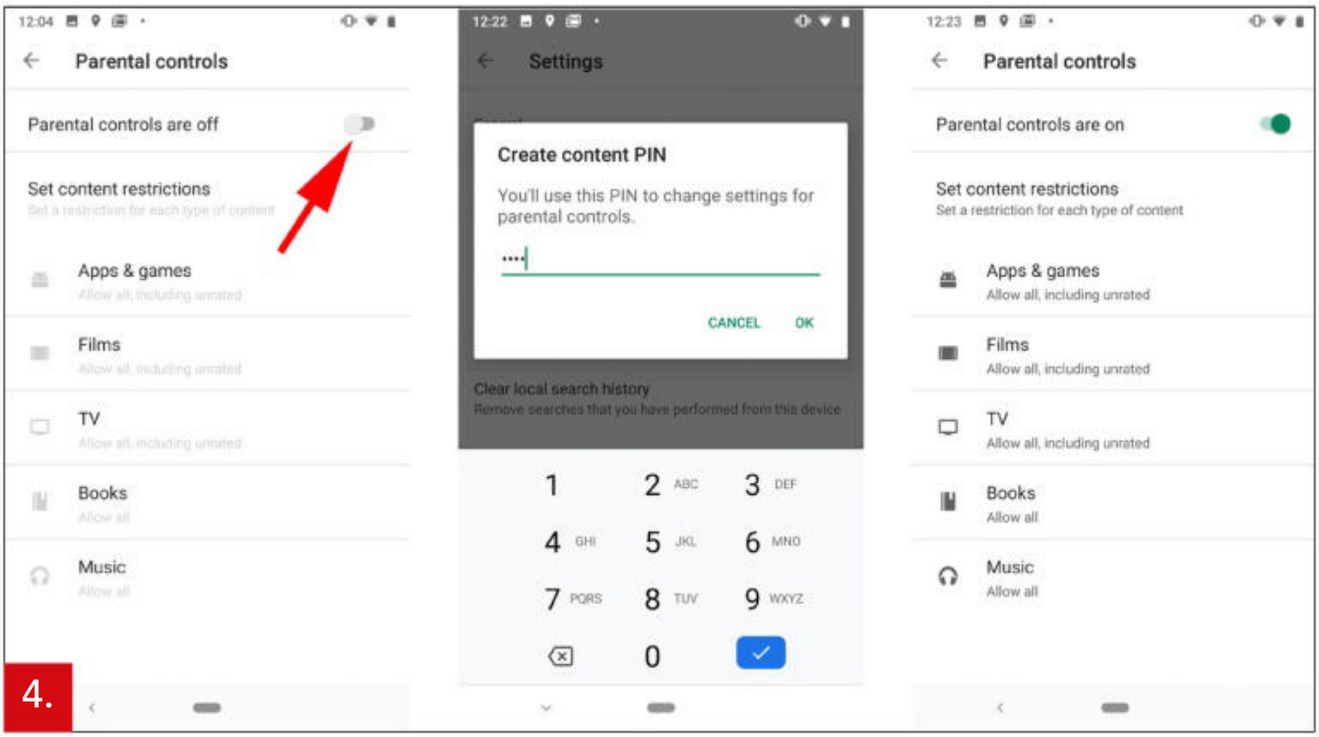


3.

To do this, launch the Play Store app on their device and tap the profile picture to the right-hand side of the search bar. If necessary, scroll down and tap Settings, then tap Family. Tap Parental controls and tap the toggle to enable them – enter a PIN so that the settings cannot be changed by the child (2.).

Confirm the PIN, then you'll be able to go into each section and set the restrictions you want in place. The



different sections are Apps & games, Films, TV and Books. Unfortunately, Music is no longer one of the categories. Tap on one and you'll see the various age categories available. Simply tap the highest age you want the child to have access to and then tap Save (**3.**).

Now, whenever your young one is in the store they won't be able to download any content that is rated above the setting you've put in place. Books is slightly different, in that the settings cordon off content that is marked as explicit rather than by age (**4.**).

If you want to prevent children from buying content freely, go back to the Settings menu and tap on the Authentication heading. Now tap Require authentication for purchases. Make sure 'For all purchased through Google Play on this device' is selected. They will now need your password to install any apps or make in-app purchases.

Credit: Getty Images/izusek

5 Pixel features for smarter calling

Let your Pixel phone make your life easier with these exceptionally effective annoyance-eliminating options. JR RAPHAEL reports

Pixel phones are filled with efficiency-enhancing features, and one area that's all too easy to overlook is the way the devices can improve the act of actually talking on your mobile phone.

Talking on your phone, you say? What is this, 1987? Believe me, I get it. We're all perpetually busy creatures these days, and the timeless art of speaking to another human on your mobile device can seem both archaic and annoying.

But hear me out. Here in the real world, placing or accepting (or maybe even just avoiding) a good old-fashioned phone call is occasionally inescapable.

That's especially true in the world of business, but it's also apparent in our everyday lives. Whatever the case may be, your trusty Pixel can make the process of dealing with a call easier, more efficient and much less annoying.

1. THE FAST FINDER

We'll start with some time-saving tricks specific to the act of placing a call – because if you're already dialling and preparing to speak to someone, the last thing you want to do is make the process any more painful than it has to be.

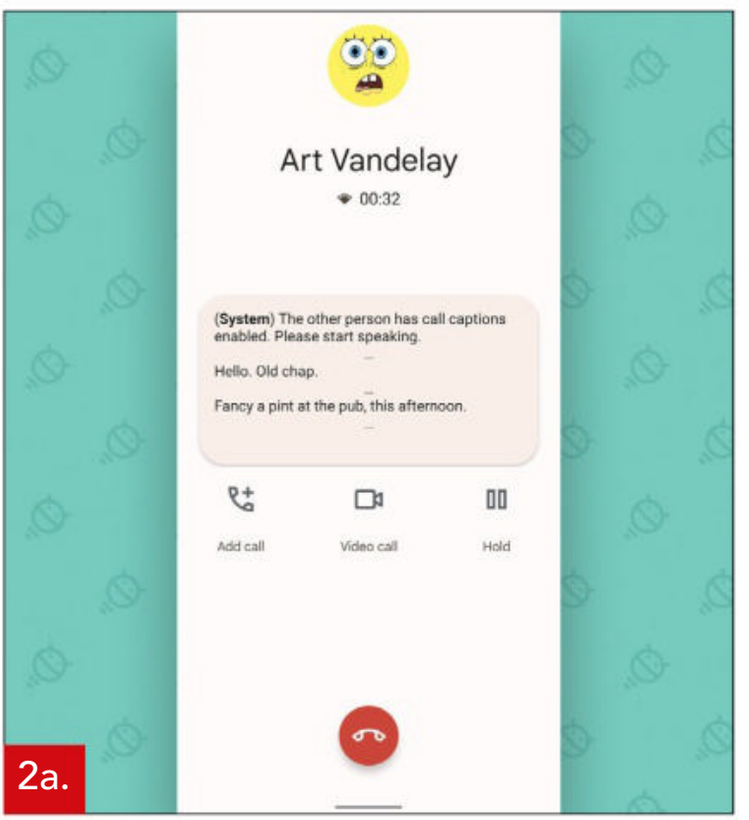
One common calling annoyance is the need to find the number of a business you're planning to ring for one reason or another – a medieval-feeling hassle that typically requires you to search for the business in one app, then either copy its number or follow a link to bring it over into your Phone app for the actual call.

You might not ever realize it, but your Pixel Phone app is standing by and waiting to act as your personal virtual phone book. Simply type in the name of any business near you, and the app will automatically pop up relevant results in your area. From there, placing a call is just one more tap away. (If for some reason results don't show up right away for you, tap the three-dot menu icon in the Phone app's upper-right corner, select 'Settings', then select 'Nearby places' and make sure the toggles in that area are on and active.)

2. THE CALL TRANSCRIBER

Our next buried Pixel calling treasure is technically an accessibility feature. But while it provides some pretty obvious (and pretty incredible) benefits for people who have hearing issues, it can also be useful for just about anyone in the right sort of situation.

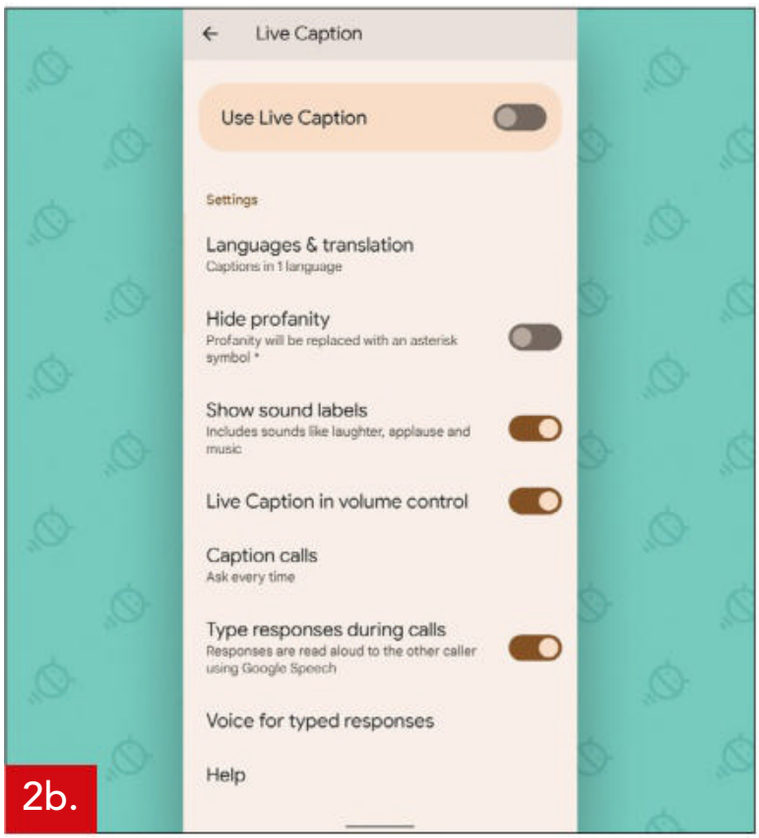
It's part of the Pixel's Live Caption system, and it has a couple of interesting ways it could make your life a little easier.



2a.

The system itself is available in English on the Pixel 2 and later, and English, French, German, Italian, Japanese and Spanish on the Pixel 6 and 6 Pro.

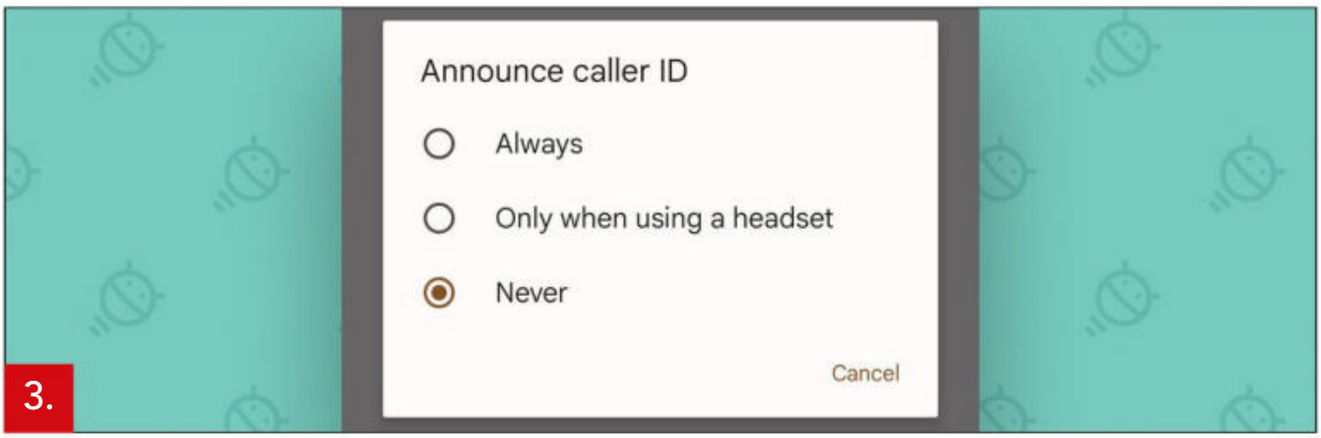
To use it, press either of your phone's physical volume buttons while you're in the midst of a call – then look for the little rectangle-with-a-line-through-it icon at the bottom of the volume control panel that pops up on your screen. Tap that icon, confirm that you want to turn on the Live Caption for calls system, and then just wait for the magic to begin (**2a.**).



Everything the other person says will be transcribed into text and put on your screen in real-time all throughout the call.

If you've got the Pixel 6 or Pixel 6 Pro, you can even have your phone translate a call into a different language on the fly. And as of the March 2022 Pixel feature drop, those latest Pixel phones can also allow you to type out responses back and then have your Assistant voice read your words aloud to the other person on your behalf – a fine way to have an actual spoken conversation without making a single peep, for times when both silence and voice-based communication are required.

To activate that option and also configure the other Live Caption possibilities, head into the Sound section of your system settings and tap the 'Live Caption' line. There, you can enable the ability to 'Type responses during calls' and also tell your Pixel to caption your calls always or never – or to prompt you every time to check (**2b.**). Just be sure to hit your volume button again once the call is done and turn the Live Caption system back off via that same volume-panel icon. Otherwise, the system will stay on and continue to caption stuff indefinitely (and also consume needless battery power while it's doing it).



3. THE OUT-LOUD CALL ANNOUNCER

Provided you work in a place where occasional noises aren't a problem, another interesting way to stay on top of incoming calls is to tell your Pixel phone to read caller ID info out loud to you anytime a call comes in. That way, you can know who's calling as soon as you hear the ringtone, without even having to find your phone or look.

This one's easy to set up. Open the Phone app, tap that three-dot menu icon and select 'Settings', then look for the 'Caller ID announcement' line right down at the bottom of the screen.

Tap it, and you'll be able to choose to have incoming call announcements made always, never, or only when you've got a headset connected.

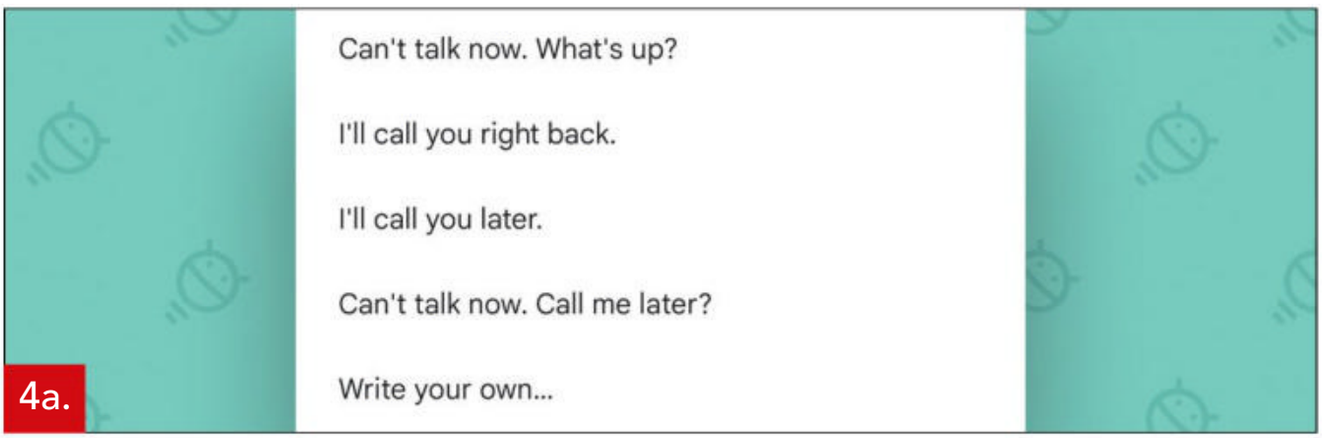
And here's an extra little bonus to go along with that. If you've got a Pixel 6 or Pixel 6 Pro and use English, Japanese or German as your system language, you can even accept or reject a call via Assistant solely by speaking a command out loud.

You only have to configure it once: Provided you have one of those devices, fire up Assistant, say "Assistant settings", and tap the line labelled 'Quick phrases'. Turn the toggle next to 'Incoming calls' into the on position – and the next time a call comes through, simply say "Answer" or "Decline" to have Assistant do your bidding without ever lifting a finger.

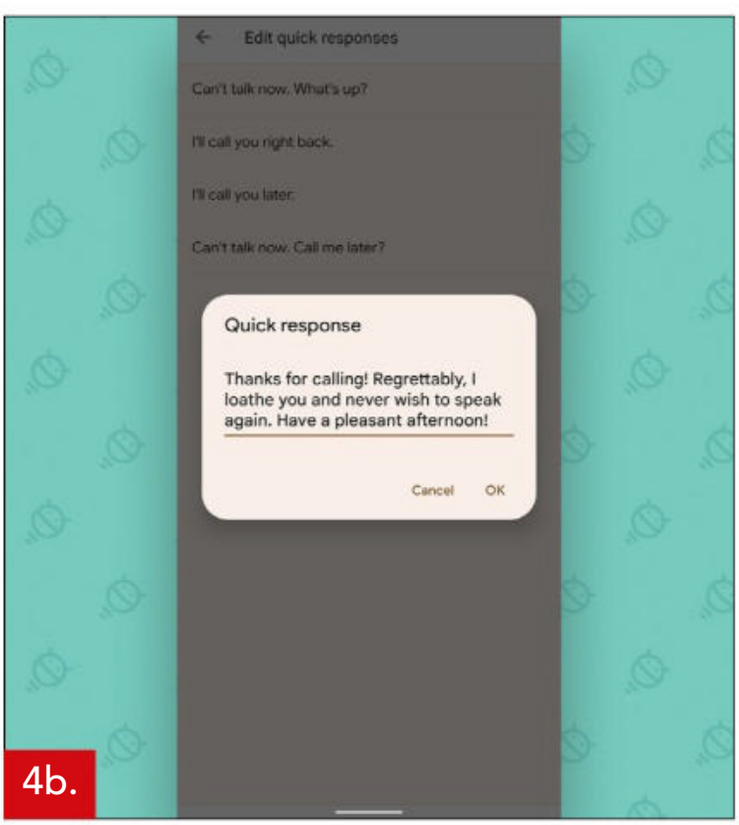
4. THE POLITE REJECTER

What if you get a call you want to avoid, but in a polite way that prevents you from having to respond to a voicemail later? Luckily, Pixel has a fantastic feature for that very purpose.

The next time such a call comes in, look for the 'Reply' button on the incoming call screen, right next to that 'Screen call' command. (And if your



Pixel's screen was on when the call started and you're seeing the small incoming call panel instead of the full-screen interface, press your phone's power button once. That'll take you back out to the standard full-screen set-up, where you'll see the button you need.)



Tap Reply, and you'll be able to decline the call while simultaneously sending the person a message explaining the reason for your rejection (**4a.**).

You can pick from a handful of pre-written texts or even opt to write your own message on the spot. You can also customize the default responses to make them more personalized and appropriate. Just go back into the 'Settings' area of your Pixel Phone app and look in the 'Quick responses' section there to get started (**4b.**).

5. THE SIMPLE SILENCER

Let's be honest, no matter which ringtone you pick out for your phone there's something about the sound of a phone ringing always manages to raise one's hackles.

Well, two things: First, on the Pixel 2 or higher, you can configure

your phone to vibrate only when calls first come in – and then to slowly bring in the ring sound and increase its volume as the seconds move on. That way, the actual ringing remains as minimally annoying as possible and only comes in (and only gets loud) when it's actually needed. To activate that option, look in the Sound section of your system settings, tap either 'Vibrate for calls' or 'Vibration & haptics' and then 'Vibrate for calls', and make sure that's set to the 'Vibrate first and then ring gradually' option.

Alternatively, the next time your Pixel rings and you want to make it stop – whether you're planning to answer the call or not – just press either of the phone's physical volume buttons. It's easy to do even with the phone in your pocket, and the second you do it, all sounds and vibrations will stop. You'll still be able to answer the call, ignore it, send a rejection message or whatever feels right in that moment. But the hackle-raising sound will be silenced, and your sanity will be saved.

INSIDE: APPLE'S PEEK PERFORMANCE EVENT

Macworld

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