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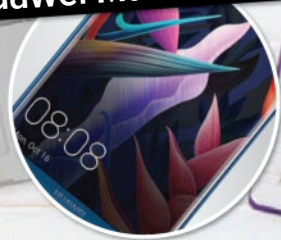
Microsoft Surface

Book 2:

The ultimate laptop



+ Huawei Mate 10 Pro



IDG FEBRUARY 2018

OnePlus 5T

FULL REVIEW

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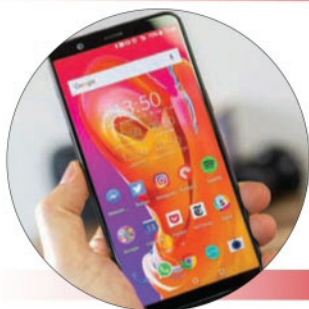
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Microsoft Surface Book 2

13in: £1,499 inc VAT from fave.co/2A0rw84

15in: £2,499 inc VAT (available early 2018) ★★★★★



The Surface Book 2 solves a big problem for Microsoft: how do you market the Surface Book as a performance notebook when it's two years out of date? As our review shows, by making it bigger and faster, with longer battery life.

Microsoft brings 8th-generation Intel Core processors and powerful, discrete Nvidia GPUs with enough horsepower to start thinking of the Surface Book 2 as a graphics workstation. But Microsoft's big October surprise was the debut of not one, but two Surface Book 2 devices: a 13.5in and a new 15in model (we reviewed the latter). Neither is a simple clamshell notebook, though calling them convertible 2-in-1s instead seems like we're selling them short.

As our review shows, however, the new generation isn't perfect. An ambitious decision to use a USB-C port has ripple effects for expansion capabilities. And then there's the price: up to £3,299.

Display and chassis

Microsoft's Surface Book has always reminded me of an answer to Lenovo's classic ThinkPad, replacing the classic black Bento box with a nearly uniform silver slab. Unlike the Surface Pro and the Surface Laptop, there are no colour options, and the only adornment is the Windows logo on the outer casing. Raise the display into a laptop configuration, and the keyboard's backlighting is the only visual cue that the Surface Book 2 is awake and active.

Your eyes are sucked toward the big, bright, vibrant screen. Our Surface Book 2's display pumped out 412 nits, more than enough. And while a 3.2K IPS display might not quite reach that magic 4K milestone, the superb visual quality lives up to the Surface brand. More pixels would have negatively affected performance and battery life. It's a good trade-off.

Though Microsoft doesn't tout the Surface Book 2 as a content-creation machine as it does the Surface Studio, the Book 2 does include both of its colour profiles: standard RGB, and its 'enhanced' profile, which makes colours a bit more vivid. If you'd like, you can also use the Surface Dial peripheral on the ten-point touchscreen. Unfortunately, the Surface Book 2 reclines to about the same 50-degree angle as the original Book, not nearly flat enough to let the Dial rest without sliding to the ground.

Though the Surface Book's weight climbs to 1,905g, the incredibly long battery life means you can leave your charger at home. (If you're an acolyte of the Microsoft ecosystem, you probably already own a Surface Dock for expansion and charging, anyway.) Still, it's no wonder why Microsoft's device chief Panos Panay refers to the Surface Book 2 as a desktop, as the device is big and bulky, though not especially heavy.

The Surface Book 2 is a 2-in-1 convertible. Though it lacks the 360-degree hinge of most such models, the display can be flipped over and reattached into a tent mode for viewing videos, or detached to function as a conventional tablet. Press a button on the keyboard, and after a second or two the 'muscle wire' retracts, and the tablet disconnects from the base.

Microsoft claims the tablet disconnects more quickly than in the previous Surface Book, though in testing both, I couldn't see any difference. After a second or two, the Surface Book 2 releases the tablet, and you can lift it free. This is no Amazon Kindle, though: Undocked, the 15in tablet is almost ludicrously huge, and unless you're in the NBA, I doubt one hand will have enough breadth to hold it comfortably. By itself, the tablet weighs around 800g, surprisingly light for something so big, but it's still awkward. Once detached, it feels like it needs a Surface Pro-like kickstand. The tablet is multi-touch, with the standard ten points of contact.

(Undocked, you'll discover that a Surface connector provides the data interface between the base and tablet. Though you can connect a charger or Surface Dock to this port, there's very little point in doing so.)



The silvery metallic exterior of the Surface Book and Surface Book 2 both exude an almost military-like solidity. In a year or so of using the original Surface Book as a daily driver, it became slightly dented in places from normal wear and tear within a sometimes crowded backpack, and suffered a larger divot from a Kinect that plunged from the top of my roll-top desk as it lay, closed, on my desk. Neither affected its performance. That's a good indicator that the Surface Book 2 will be equally durable.

Piling an additional notebook or two on top of the Book never damaged its iconic, accordion 'dynamic fulcrum' hinge, which remains within the Surface Book 2. When the Book 2 is closed – now with a more authoritative click – a small gap remains near the hinge. While that space may still be oddly frustrating to some, it doesn't affect performance and seems as structurally rigid as before. The tablet does wobble when you jiggle the base, though not as much as with the original Surface Book. It's a reminder, though, that this isn't a true notebook.

Perhaps the most surprising thing about the Surface Book 2, though, is simply how quiet it is. Microsoft uses a passive cooling system to cool the

clipboard or tablet portion of the Surface Book 2, forgoing the fan entirely. Yes, it's a fanless Core i7.

The keyboard, and the port debacle

The Surface Book 2 didn't mess too much with one good thing: Its keyboard feels essentially unchanged from the first iteration. Note, however, that it follows the Surface Laptop's layout, rather than the original Book's: Microsoft eliminated the 'Insert' key, and added a separate key for toggling through various backlight controls. Otherwise, a wider bezel surrounds the keyboard on the 15in model, really emphasizing how vast the available space is.

I've always found the Surface Book's keyboard quite comfortable to type upon, with a firm response and good key travel. The Surface Book 2 keyboard felt ever so slightly stiffer, with response that felt a tad shallower. The trackpad feels identical: slick, smooth, and responsive.

Microsoft did mess with the port allotment, however, and it's one area where I feel the Surface Book 2 takes a step back. The left side of the base should look familiar to Surface Book owners: with two USB 3.0 Type A connectors, plus a UHS-II SDXC card reader. Microsoft even preserved the 3.5mm headphone jack. Along the right side, though, things change: Alongside the expected Surface connector, there's a USB-C connector – and that's it.

Previously, Surface Books included a mini-DisplayPort connector, a simple way to connect to a single monitor by way of a miniDP-to-HDMI cable. To connect to multiple monitors, you used the Surface

Dock, a £189 (from fave.co/2zVKjRT) hub with two additional miniDP connections.

With the Surface Book 2, the miniDP connector is gone. Instead, you'll need to invest in new infrastructure, beginning with a new adaptor – a USB-C to HDMI cable, perhaps – that will cost you about £20. Theoretically, the USB-C connector also anticipates a future where you'll be able to connect the Surface Book 2 to an ecosystem of external hard drives and other devices. But Microsoft's implementation also lacks the Thunderbolt I/O implementation, part and parcel of Apple's MacBook Pro and an easy way to connect multiple displays to a device that supports it.



That means connections to external monitors are somewhat limited. Officially, the Surface Book 2 can drive two 4K monitors at 30Hz either via the USB-C port or the Surface Dock. Alternatively, either the Dock or the USB-C port can power a single 4K monitor at 60Hz. (If you try simultaneously to connect a monitor via USB-C and a second monitor over the Dock, only the Dock-connected monitor will light up, Microsoft says.) We successfully connected the Book 2 to a conventional 1080p monitor at full frame rate, but managed only 30fps on a 120Hz 4K HDTV.

Microsoft's traditional solution for multi-monitor setup has been the Surface Dock, which allows you to connect up to two external displays via a pair of mini-DisplayPort connectors. But that has a problem, too: The 144W Dock doesn't supply as much power as the Surface Book 2's 180W native charger. Microsoft says that, under load, a Surface Book 2 powered by the Dock may use up so much power that it will drain the battery and enter sleep mode.

During testing, I played a few 3D-intensive games for nearly an hour, while using the Dock, as well as an additional 15 minutes or so while completely undocked. During that time, the battery decreased to about 65 percent overall. During ordinary use – web browsing, office work, and so on – the Dock supplied sufficient power without issue. And if the Surface Book 2 is connected to its charger, as well as to a single monitor via a USB-C to HDMI cable, the Book 2 should operate normally.

Microsoft claims that the Book 2 will charge from any USB-C PD3.0 compliant charger from 7.5- to



Surface Dock

95W, with a 60- to 95W USB-C charger powering the Surface Book 2 to 80 percent charged in 1.5 hours time. I didn't have enough time to confirm the latter claim, but as for the former, our Surface Book 2's USB-C port didn't accept power from a few random external chargers or battery packs. (And no, you can't charge the Surface Book 2 from the USB-C and Surface ports, simultaneously – we asked.)

Confused? Well, so were we. Microsoft had a pricey but effective solution in the Surface Dock, but complicated the matter unnecessarily.

All of this talk of ports and power sparked a somewhat lively debate between myself and a colleague, Gordon Ung. His take: how many people actually connect more than one monitor to a laptop? My response was to point to all of our coworkers with two or more displays. It may be somewhat of a niche case, but it's a niche that lines up neatly with the power users that make the most likely candidates for Surface Book 2 purchases. One fix would simply be to release an upgraded Surface Dock that could accommodate the power needs of the Surface Book 2.

Otherwise, the Surface Book 2 also includes 802.11ac for wireless connectivity, which connected

satisfactorily as I roamed around my home and office. Bluetooth 4.1 Low Energy is also built in, which avoids collisions with the Wi-Fi signal. Finally, there's a bonus for gamers: Xbox Wireless is built into the 15in version, meaning you can connect your wireless Xbox One controller for gaming on the go.

Speakers, cameras, the Pen and the Precision Mouse

Like the original Surface Book, the Book 2 sports both front (5Mp, 1080-capable) and rear (8Mp autofocus, 1080p-capable) cameras that take serviceable pictures and enable Windows Hello's biometric logins. Normally, few people would care about a tablet camera. But the Windows 10 Fall Creators Update that's rolling out now includes such fun utilities as the Mixed Reality Viewer, where you can snap a photo with the rear camera and drop in a computer-generated dinosaur, giant taco, or bug right into the scene. Our review unit shipped with the older Creators Update, however.



The Surface Book 2 continues the Surface Book tradition of decent audio, accompanied by Dolby Audio processing. Though it supplies an adequate range of sound, you'd still be better off routing Spotify through headphones or an accompanying Invoke speaker for better bass response. The speakers are mounted inside the tablet, unlike the Surface Laptop's base-mounted speakers.

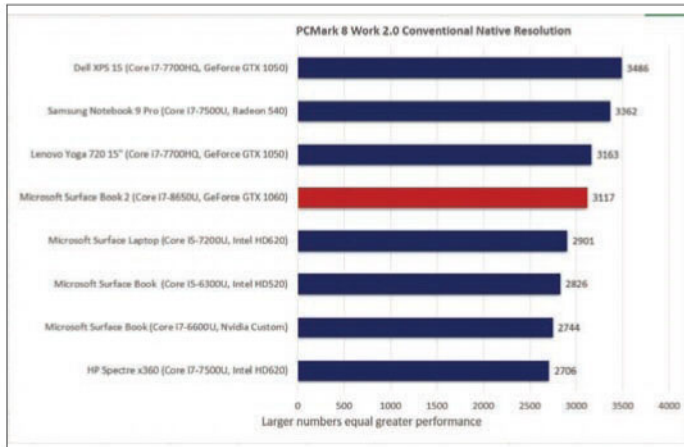
Microsoft also provided what it calls a "next-generation" Surface Pen for review (£99 from [fave.co/2j8q9MI](https://www.fave.co/2j8q9MI)). To be honest, the increasing levels of sensitivity – 4,096 in this version – have moved beyond our ability to test. Microsoft's new Pen looks nice, writes smoothly, and is powered by a replaceable AAAA battery. That's enough.

We didn't receive Microsoft's new Precision Mouse in time for review, but we were quite impressed in the short hands-on time we had earlier.

Performance

We expect an Nvidia GTX 1060-powered system such as the Surface Book 2 to perform well. Microsoft created extra pressure, however, by claiming the Surface Book 2 would perform three to four times better than the original Surface Books. In our performance charts below, you'll see us compare the Surface Book 2 to its predecessor, as well as some recent laptops we've reviewed that have discrete graphics: Dell's XPS 15, Lenovo's Yoga 720, and Samsung's Notebook 9 Pro.

We threw both mainstream and gaming benchmarks at the Surface Book 2. Somewhat surprisingly, the

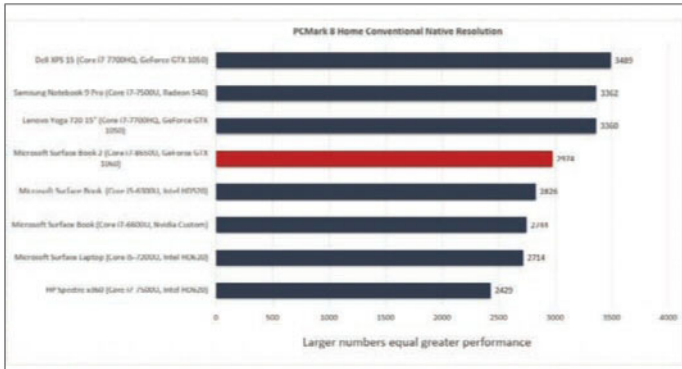


Microsoft's Surface Book 2 landed in the middle during PCMark Work 8 Conventional. It was faster than its predecessors but slower than other laptops we've tested with discrete GPUs

Surface Book 2 doesn't necessarily top the heap in general productivity performance, but as a graphics workstation it's among the very best.

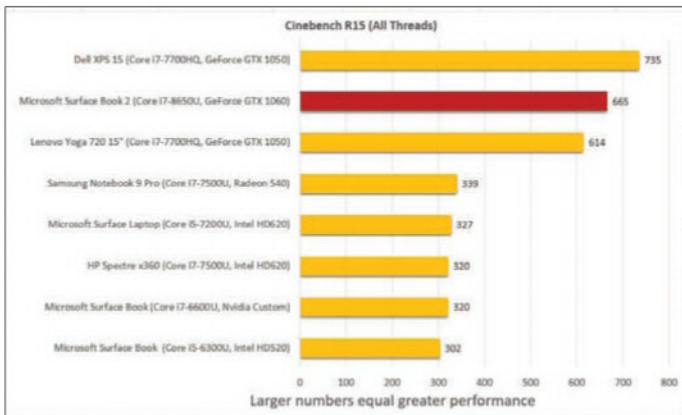
Our first test is PCMark Work 8 Conventional, which simulates everyday activities like web browsing and document editing. It's a good test for isolating the CPU's role in everyday use. Any machine scoring 2,000 or above will sail along smoothly during these low-intensity tasks. The Surface Book 2 lands square in the middle: a little faster than its predecessors, but a little slower than the trio of recent competitors.

The Home and Creative broaden the scope somewhat, adding light gaming, photo editing, and finally some image and video processing. In general, how the Surface Book 2 compares against the Surface



The PCMark Home test offers a richer mix of photo editing and light gaming. Any of these machines will perform well in these tasks

Book most likely ties into the base processor clocks of both chips: 2.6GHz for the original Book, 1.9GHz

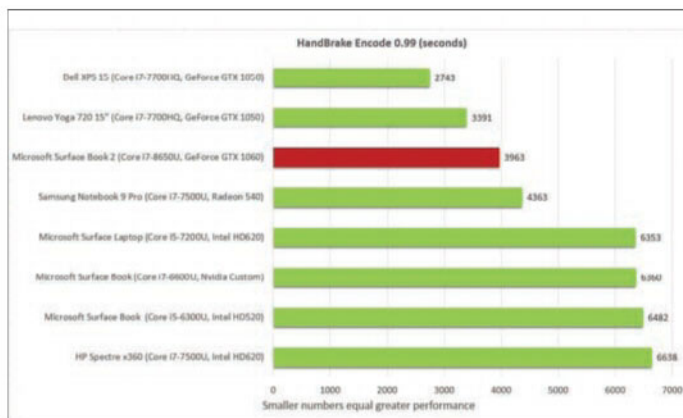


Cinebench R15 offers a useful counterpoint to PCMark Work 8 Conventional. It's a free 3D rendering test based on Maxon's professional Cinema4D engine. It's almost entirely CPU-bound and scales well with the number of cores and threads

for the Surface Book 2. When needed, the Book 2 can boost up to 4.2GHz – but in these tests, it doesn't need to. As with the Work Conventional test, it scores below similar laptops with discrete GPU.

Remember, the eighth-generation Core chips use four cores and eight processing threads. Applications that take advantage of all of them perform better than the earlier dual-core Core chips. Maxon's Cinebench benchmark takes advantage of this, with benchmarks that exercise all available cores. Here, the Surface Book 2 is in the middle of the quad-core leading edge, while all the dual-core systems fall into place behind them.

We ran HandBrake, a prolonged test that converts a Hollywood movie into a format suitable for an Android tablet. One of the advantages of Windows 10 and the new Core chips is that they're optimized for

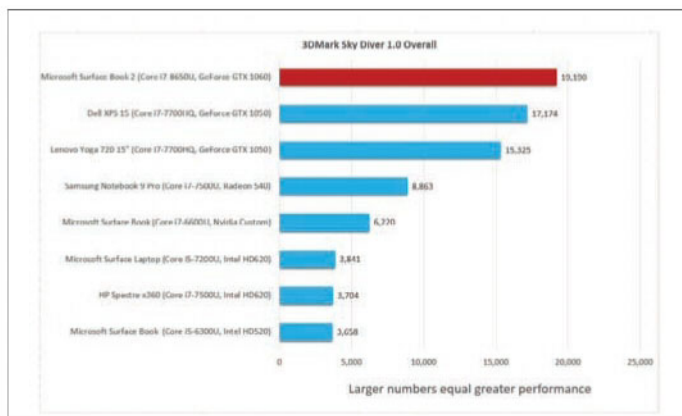


Editing and converting videos offers another good test of dual-core versus quad-core, because more cores make a big difference. We used the popular and free HandBrake encoder to convert a 30GB 1080p video using the built-in Android tablet preset

video playback. Still, the test is both a good workout as well as a real-world application, especially if you're preparing some in-flight entertainment for your kids. Here, Microsoft's Surface Book 2 is the slowest of the quad-cores, possibly because it throttles its fanless Core i7 chip under prolonged load.

The Surface Book 2 differs slightly from gaming machines in that it's more of a general-purpose performance notebook. If you'd like, you can download an Play Anywhere title for the Xbox, like Gears of War 4, and fire it up. Conversely, Microsoft also offers a complimentary three months of Adobe Creative Cloud as encouragement to use it for more traditional creative pursuits. Either way, it's hard to go wrong.

Here, we tested using the 3DMark Sky Diver benchmark, where the Surface Book 2 really begins

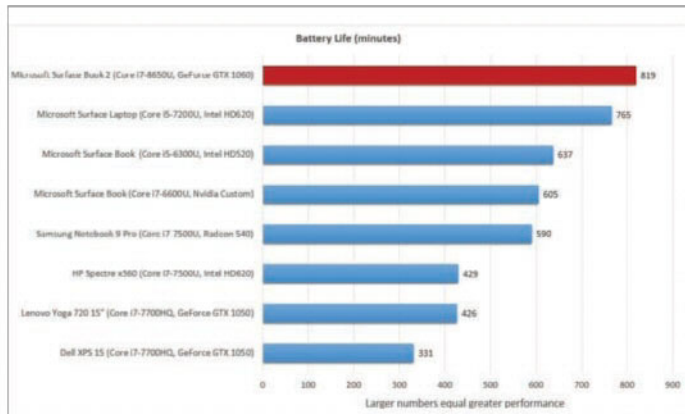


Futuremark's 3DMark Sky Diver is a synthetic test that measures the graphics performance of a PC. Although it doesn't use an actual video game engine, it's still well respected and clearly shows what you get if you opt for a discrete GPU

to strut its stuff, outpacing all comers. Compared to the prior-generation Surface Book with discrete GPU, Microsoft’s claim of a 3X to 4X performance difference is proven out.

I also played around with performance-hungry games from yesteryear, like *Crysis 2*, and maxed it out on my 1080p monitor at Ultimate performance levels. Modern games, such as *Watch Dogs 2*, also rendered smoothly at High and Very High settings. Just for fun, I tried *Far Cry 3* on the Surface Book 2’s native tablet settings. It didn’t quite deliver playable frame rates, though the detail, naturally, was amazing.

Finally, there’s battery life – a traditional strength of the Surface Book, and one that carries over here. We gauge a laptop’s stamina with our video rundown test. We first charge the laptop to 100 percent, then set its screen between 250 and 260 nits to simulate the



The Surface Book 2 tops the charts in our video rundown test, coming fairly close to Microsoft’s claim of “all-day battery life”

brightness level you'd use in an office. With a pair of earbuds plugged in and the volume set to 50 percent, we run a 4K video file (the open-source Tears of Steel) on continuous loop in Windows 10's Movies & TV app until the laptop shuts itself off.

Over time, we've expanded the notion of 'all-day battery life' from a generous six hours to more than eight hours and above. The Surface Book 2 carves out new territory at the high end, pushing past a whopping thirteen hours with ease. Microsoft's Surface Book 2 includes two different batteries: a 23.2 Watt-hour battery in the tablet, and a separate 62.2Wh battery in the base. (Interestingly, those are the design capacities, as measured by Windows; the batteries actually charged to 23.6- and 65.6Wh, respectively.)

Sure, 13 hours is far less than the 17 hours at which Microsoft rates the Surface Book 2. But Microsoft typically dials down the brightness to below the levels at which we test. On the other hand, our tests didn't take advantage of the Windows 10 Fall Creators Update's ability to prolong battery life by playing back video at a lower resolution, or running entirely in battery-saver mode. As our previous tests showed, aggressively managing battery life can tack on as much as 30 percent more runtime – enough to match up with Microsoft's own numbers.

Verdict

Reports of the PC's death have ushered in a renaissance of sorts, producing marvellous designs from Microsoft, HP, Lenovo, and others. I used the original Surface Book as a daily driver for months, if not years, and

I'm an unabashed fan of that original – and now, the Surface Book 2.

The trap that Microsoft sets, though, is not unlike Apple's: the company tacitly encourages you to think within its ecosystem and only its ecosystem, rather than its competition. Once you begin looking elsewhere, options like the Lenovo Yoga 720 begin to look more attractive, and at possibly cheaper prices, too. Other alternatives include the Dell XPS 15, which tops the performance charts, above – save for battery life, where it finishes at the bottom. Otherwise, what's a few thousand pounds between friends?

There's one question we can't answer: stability. One of the unfortunate legacies of the Surface products is a shakedown period of a few months where some early models suffered anything from 'hot bag' refusals to enter a sleep state, to screen flickering. Our Surface Book 2 exhibited a strange buzzing noise almost immediately, which persisted for about an hour or



other glitches. The bottom line? If you can afford a Surface Book 2, we'd recommend it. So many of its attributes are simply fantastic, including its graphics performance and stellar battery life. If Microsoft had avoided all of the complications associated with its decision to incorporate USB-C (omitting Thunderbolt, upgrading the Dock), we'd be hard-pressed to find anything wrong with the Surface Book 2 at all. Microsoft has made its 'ultimate laptop' even better, in many ways. Just not all of them. Mark Hachman

Specifications

13.5in Surface 2

- 13.5in (3,000x2,000, 260ppi) PixelSense display
- Windows 10 Pro Creators Update 64-bit
- 8GB or 16GB RAM 1,866MHz LPDDR3
- 256GB, 512GB, or 1TB PCIe SSD
- 7th Gen Intel Core i5-7300U dual-core processor, 3.5GHz Max Turbo
- 8th Gen Intel Core i7-8650U quad-core processor, 4.2GHz Max Turbo
- Intel HD Graphics 620 integrated GPU (on Intel i5-7300U model)
- Nvidia GeForce GTX 1050 discrete GPU with 2GB GDDR5 graphics memory (on Intel i7-8650U models)
- 2x USB Type-A
- 1x USB Type-C
- 3.5mm headphone jack
- 2x Surface Connect ports
- Full-size SD card reader
- 802.11ac Wi-Fi
- Bluetooth 4.1



- Windows Hello face authentication camera (front-facing)
- 5Mp front-facing camera with 1080p HD video
- 8Mp rear-facing autofocus camera with 1080p HD video
- Dual microphones
- Front-facing stereo speakers with Dolby Audio Premium
- Support for Windows Sonic for Headphones
- Up to 17 hours video playback
- 45W USB-C power adaptor
- 312x232x3-23mm
- Core i5 1,534g; Core i7 1,642g

15in Surface 2

- 15in (3,240x2,160, 260ppi) PixelSense display
- Windows 10 Pro Creators Update 64-bit
- 16GB RAM 1866MHz LPDDR3
- 256GB, 512GB, or 1TB PCIe SSD
- 8th Gen Intel Core i7-8650U quad-core processor, 4.2GHz Max Turbo
- Nvidia GeForce GTX 1060 discrete GPU with 6GB GDDR5 graphics memory
- 2x USB Type-A
- 1x USB Type-C
- 3.5mm headphone jack
- 2x Surface Connect ports
- Full-size SD card reader
- 802.11ac Wi-Fi
- Bluetooth 4.1
- Xbox Wireless built in
- Windows Hello face authentication camera (front-facing)
- 5Mp front-facing camera with 1080p HD video
- 8Mp rear-facing autofocus camera with 1080p HD video
- Dual microphones
- Front-facing stereo speakers with Dolby Audio Premium
- Support for Windows Sonic for Headphones
- Up to 17 hours video playback
- 45W USB-C power adaptor
- 343x251x15-23mm
- 1,905g

OnePlus 5T

£449 inc VAT from fave.co/2jclVDD



Making a mark on the smartphone market is hard enough. Muscling in to compete in the same arena – if not at the top step – doesn't happen often. OnePlus has bucked this trend over the last three years with its phones of high specs and low prices.

Times change though. You may have needed an invitation to buy the OnePlus One in 2014, but the clamour was justified when the phone cost just £229 at a time when the then-flagship iPhone 5s sold for £549 and could compete on specs.

The £449 OnePlus 5T is an upgrade on the five-month-old OnePlus 5 in the same way the 3T was to the 3 a year ago. In eighteen months, there have been four flagship devices from a company that had previously only made two (the mid-range OnePlus X being its other device).

The new phone is excellent – a huge, crisp screen and screaming performance – but it's coming from a company that is dangerously close to annoying its fans and appearing like it has run out of ideas, even though it hasn't. It's an impressive refinement of the company's fast progression in smartphones. It's very similar to the OnePlus 5, but the new screen size and face unlock feature make it feel surprisingly fresh.

Design

Let's not pretend here, the OnePlus 5T naturally looks like the OnePlus 5. The front is more attractive with the lack of bezels and fingerprint sensor but the phone itself is largely unchanged aside from the new 18:9 display. It's only available in midnight black at launch and yes, it looks a lot like the Oppo R11S.

It's a tiny bit taller than the OnePlus 5 to accommodate the new screen, measuring 156x75x7.3mm. It won't fit properly in an old case, but you wouldn't want it to now that the fingerprint sensor is on the back. Luckily, it's really fast, easy to use and is circular. The rear otherwise looks the same, with dual cameras and a OnePlus logo. It charges via USB-C (and its excellent but proprietary Dash Charge charger) and retains a headphone jack, but ships with no headphones.



There is no waterproofing of any kind, nor any form of wireless charging. We don't care about the latter too much, but the former is something the 5T lacks in comparison to nearly every other Android flagship this year. So there are some sacrifices to achieve the price.

It's a phone we find to be ridiculously slippery. It's so thin, and the back isn't easy to grip so snapping it into a case almost a must. This is a shame, as the cases don't show off the excellent premium build underneath. This isn't a problem unique to OnePlus, though.

It's also definitely a two-handed phone. The lack of bezels looks lovely, but makes a phone harder to hold. Only the massive-handed will be able to reach their thumb to the top of the display, and for us texting with one hand is impossible.

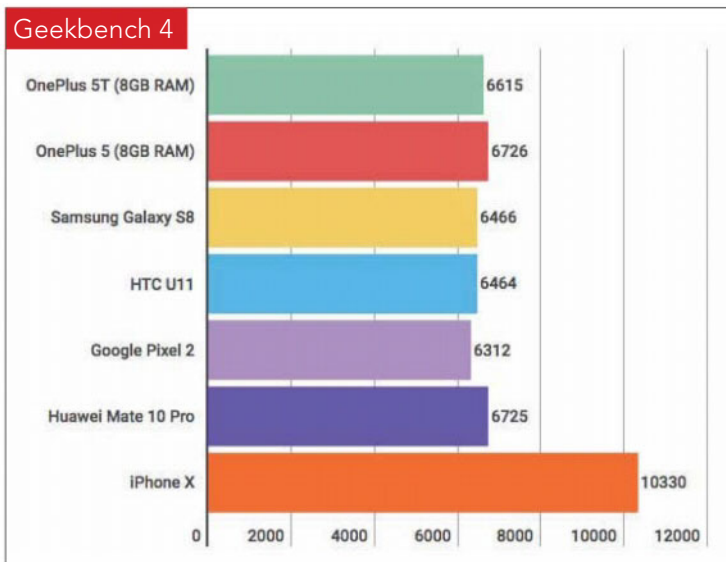
But for £449, wow, what a looker. It is a more attractive and pleasing phone to use than the OnePlus

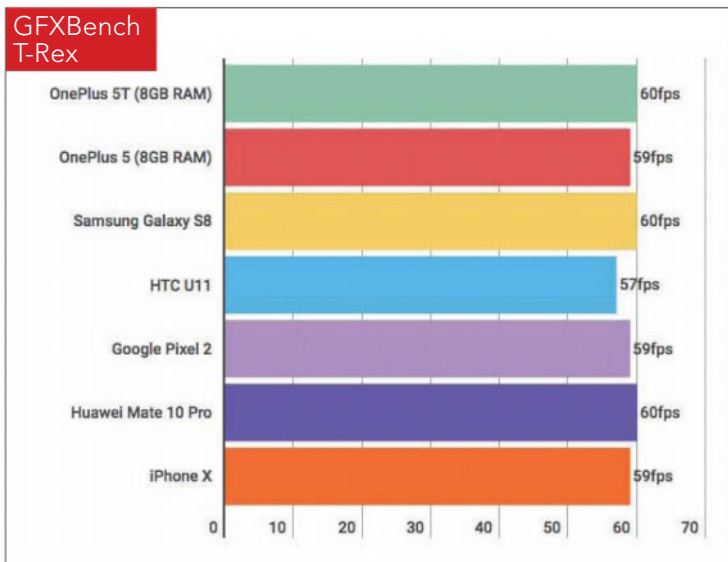
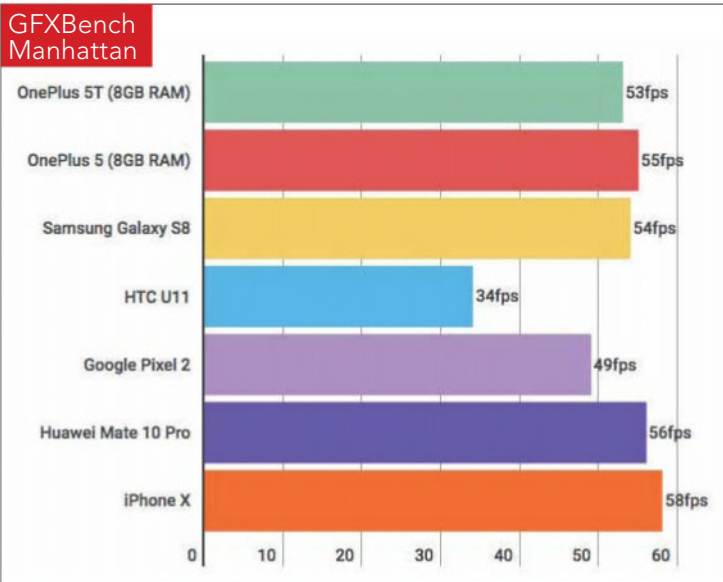
5, whose bezels now look antiquated in comparison. And though the specs haven't changed much, they remain credibly high-end.

Performance

Unlike the OnePlus 3T, the 5T does not get a notable bump over the previous generation in terms of core specs. But with a Snapdragon 835 and 8GB RAM in the £499 version we tested (and a perfectly adequate 6GB in the cheaper model) that won't prove a problem for all your smartphone needs.

A benchmark of the handset against phones with similar specs shows that the field is pretty well balanced. It's worth mentioning that the benchmark speeds of the iPhone X (reviewed on page 53) will beat anything Android for this year and probably the next





couple, but that the OnePlus 5T feels as fluid as an Android phone can feel other than the Pixel 2.

The OnePlus 5 scores higher than the 5T on a couple of tests, but it is a tiny difference. OnePlus was also accused of boosting the 5 for tests, so they may have stopped that when everyone noticed.

The 5T is the fastest phone we have ever used besides the Pixel 2 this year. Away from Android, this year's iPhones are also ridiculously quick with Apple's new A11 Bionic chip.

Display

The display is altered with a 6.01in Optic AMOLED panel that uses a 2160x1080 resolution to create the 18:9 aspect ratio. It takes up a whopping 80.5 percent of the front of the device.

It's a bright, colourful panel that is a smidge under Samsung-quality, but as is usually the case with OnePlus, it's a belter of a screen for the price. We found though that the auto-brightness setting is too aggressive and makes the screen too dim much of the time. The only changes are the display, fingerprint placement, camera sensors and new face unlock feature. The latter works stupidly fast but is less secure than Apple's Face ID, and akin to the same feature on the Galaxy S8 in that it records a 2D image that can potentially be fooled by a decent quality print out of your face. Apple's uses 3D mapping, which can't be tricked this way.

It's also great that the 5T does not suffer from the jelly scroll effect that plagues the OnePlus 5 still. The display size and quality is the best upgrade here.

Cameras

The camera set up is now two Sony sensors. The main is 16Mp with f/1.7 aperture while the secondary is a 20Mp with f/1.7 aperture. This is an upgrade from the OnePlus 5, whose secondary camera was an f/2.6 telephoto lens.

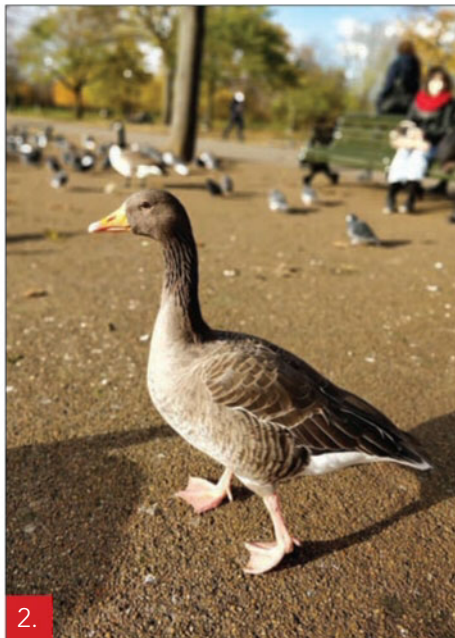
With improved aperture, OnePlus claims the 5T is its best ever phone for low light photography (photo 1), and this appears to hold true.

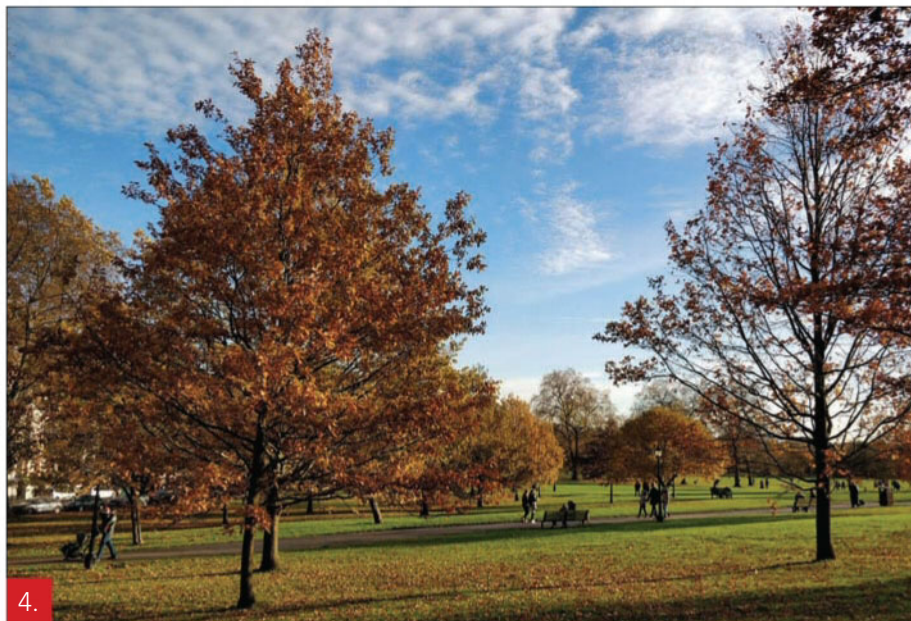
We noticed that it takes a lot for the second sensor to even kick in though, and it feels a bit redundant as an inclusion. It's not needed at all for zoom, and is best reserved for portrait mode. This, like on the OnePlus 5, performs with mixed results.



Below is a shot of a goose (2), where the bokeh effect worked pretty well, but zoomed into the head you can see that the phone struggles to identify exactly where bird ends and background ends, with blurred patches. There were better results of human subjects (3), and the cameras did well in the below shot to well define the position of the camera, with the person blended better into the background.

It doesn't perform as well as the Pixel 2 (which only has one lens) and is less consistent than the iPhone 8 Plus and iPhone X. The camera best performs in bright daylight, where landscapes look excellent (4), but it doesn't achieve the same standard as the best cameras in phones from Apple, Google and Samsung.





The front-facing camera is a 16Mp sensor with f/2.0 aperture and is pretty decent in daylight and for video calling. The 5T isn't the high-end phone to pick if you want the ultimate smartphone camera, despite its relentless 'Shot on OnePlus' social media campaigning. You'll find better results in phones that are admittedly more expensive.

Connectivity and audio

Call quality has been solid, and it's good to see OnePlus plough on with the dual-SIM slot as standard, but there's still no expandable storage. It gets Bluetooth 5.0 which paired the phone flawlessly with a Samsung Gear Fit2 Pro for the duration of our testing.

Full LTE compatibility, 802.11ac Wi-Fi and NFC round up all the inclusions you'd expect.

Battery life

The battery life is about the same as the 5, and the 5T shares the same capacity. Dash Charge remains an excellent charging technology even if it only works with the supplied cable and brick. We also saw the 5T achieve four hours of screen on time under fairly heavy usage until it was reaching empty.

It's not as much of a two-day powerhouse like the BlackBerry KeyOne (£399 from tinyurl.com/y99qxp6), but for a phone with the best specifications out there and an OLED display, the OnePlus 5T holds its own.

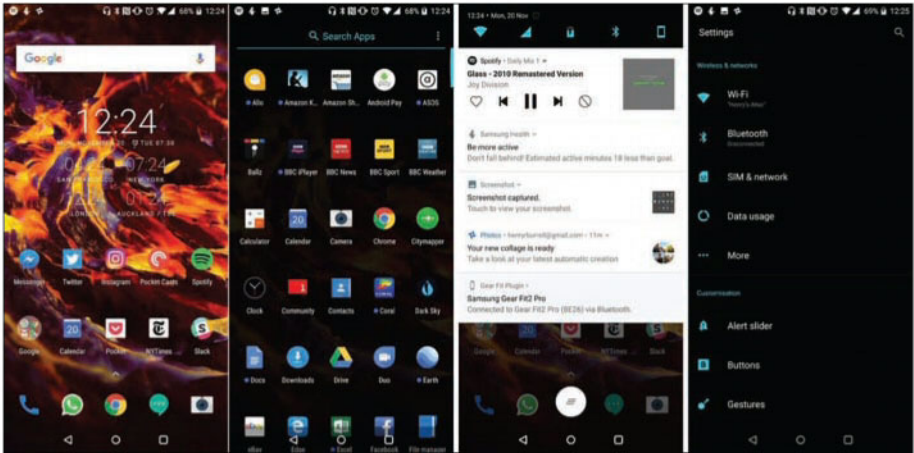
Software

It's a disappointment that the 5T doesn't ship with Android Oreo. It's on Nougat 7.1.1, but we're hopeful for 8.0 Oreo in the coming months.

Oxygen OS, the firm's interface, continues to improve. OnePlus pushes you on set up to use its new font 'OnePlus Slate' which is toying with a comic sans vibe at times. We still prefer the other option, 'Roboto', Google's preferred font.

We used the 5T with the Dark theme, a nice touch that changes the whole UI to a slicker black hue with the ability to change the accent colour of icons and menus.

The changes to stock Android are thoughtful and unobtrusive. Swipe up for apps is better than an app tray, while the notification shade is familiar but excellently customizable.



The home screen, app drawer, notification shade and settings menu on OxygenOS (customized)

Unlike previous OnePlus phones, the navigation buttons are now exclusively software features as the bottom bezel can no longer accommodate capacitive buttons either side of a fingerprint sensor. They can of course be remapped, and there are little features like swiping down anywhere on the home screen or on the fingerprint sensor to pull down the notification shade.

The top bezel still has room for a camera, and that's how you can set up face unlock. It's less secure than the fingerprint sensor or a simple PIN, but it is the fastest face unlock we've ever seen on a phone.

Tap the power button while looking at the device and it's so fast you don't even see the lock screen. It's odd at first, but is the fastest on any Android device we've used by a country mile. OnePlus also says that it won't integrate it to be used in sensitive apps such

as for banking, acknowledging its security pitfalls compared to fingerprint or PIN.

Along with Google, Nokia and Motorola, OnePlus ships a clean, uncomplicated version of Android that's all the better for it. If you like a bit of Samsung style flash on your phone though it might not be for you – the 5T is blindingly fast but partly because of its lack of animations. Everything is very austere and clean cut in order to get a process done as fast as possible, but it's a phone that encourages you to tinker to get a truly unique look and feel – which we love.

The customization is now key to the OnePlus experience. People (including us) buy iPhones and Samsung phones and never tweak anything. Using the 5T implores you to dig into the UI and change things for the better, and we welcome that wholeheartedly.

OnePlus confirmed at the phone's launch event that it will be getting Oreo in 'early 2018', which will bring better notifications, security, handy features like password autofill, and visual tweaks.

Verdict

The OnePlus 5T isn't a surprise, both in its existence and the fact it's very similar to the OnePlus 5. It stands as a reminder that 2017 was the year every company quickly produced a phone with an 18:9 display to make sure its bezels didn't look outdated on the store shelf.

But OnePlus isn't on many store shelves given its online retail approach, and its many vocal core fans who bought the 5 will be annoyed by the 5T. OnePlus needed to update its design language quickly to keep up with the wider market where it is yet to make a dent,

and the 5T is overall a better device than the 5. And let's not forget that for £449, the 5T is an exceptionally well-rounded smartphone. It is at least £100 cheaper than similar handsets, and sometimes close to £300 less. If you buy into the design (without waterproofing and wireless charging) and price but can accept that the camera isn't top draw and it'll probably be superseded in six months, then it's a great choice. Henry Burrell

Specifications

- 6.01in full-HD (2160x1080, 401ppi) display
- Android 7.1.1 Nougat
- Qualcomm MSM8998 Snapdragon 835 processor
- Octa-core (4x 2.45GHz Kryo and 4x 1.9GHz Kryo) CPU
- Adreno 540 GPU
- 6/8GB RAM
- 64/128GB storage, no microSD support
- Fingerprint scanner
- Dual 20Mp and 16Mp, f/1.7, 27mm, EIS (gyro), phase detection autofocus, dual-LED flash
- 16Mp, f/2.0, 20mm, EIS (gyro), 1µm pixel size, 1080p, Auto HDR
- 3.5mm headphone jack
- 4G FDD-LTE UK bands B3/B7/B20
- 802.11ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO
- NFC
- USB 2.0
- Non-removable lithium-polymer 3,300mAh battery
- 156.1x75x7.3mm
- 162g

Huawei Mate 10 Pro

£699 inc VAT from fave.co/2jc1FSy



Huawei is the biggest telecoms company on the planet, but the brand is still relatively unknown in the UK. Although other phone makers such as Samsung and Apple only very recently launched bezel-less phones, Huawei has quietly been doing this since 2014. Its Mate series has always had practically zero side bezels so although some will think that Huawei is just copying the big boys with the Mate 10, it's actually the other way around.

The past few Mates have all looked pretty much the same, but Huawei has shaken things up for 2017 and it's

no overstatement to say this is one of the best-looking phones around. It's also one of the most powerful and longest-lasting, attributes which should ensure its place on your upgrade shortlist alongside the Galaxy S8, Note8 and – maybe – iPhone 8 Plus.

Design

The Mate 10 Pro – the only model from the range that will be sold in the UK later in November – is a gorgeous-looking phone that's taller and slimmer than its predecessors thanks to the switch to an 18:9 screen and smaller top and bottom bezels than on the Mate 9. It's a bit smaller than the iPhone 8 Plus, but has a 6in screen rather than 5.5in.

A glass back is the main change from previous Mate designs. Unlike the iPhone 8 which also adopts the glass sandwich, the Mate 10 Pro doesn't support wireless charging. Instead, the Gorilla Glass 5 is there purely for aesthetics.

And it looks stunning. The glass curves on all four edges and reflects the light beautifully (see opposite). It joins the alloy frame almost invisibly and feels silky smooth in the hand.

The problem with this is that – hardened or not – glass is still glass. Huawei provides a plastic case in the box, and a screen protector is fitted at the factory, but the case hides that glorious finish so it'll always be tempting to go case-less and run the risk of the drop-smash.

At least it will continue to work if it falls in the bath: the Mate 10 is Huawei's first phone to have proper waterproofing. And since the cameras protrude by a



millimetre or so and aren't part of that rear glass, they should continue working even if it does get cracked.

The Mate 10 Pro comes in four colours: Midnight Blue, Titanium Grey, Pink Gold, Mocha Brown. In my eyes, the blue version looks best, but plenty of people are taken with the bronze-like Mocha Brown.

Just be sure to have a lens cloth handy at all times to clean the glass of those inevitable fingerprints.

Another departure from previous Mate designs is the stripe which highlights the dual cameras. These are still aligned vertically but are separated instead of having a single cover as on the Mate 9.

The arrangement is essentially the same, though, with 12- and 20Mp sensors, the former colour and the latter mono. Both lenses have a faster $f/1.6$ aperture to

let in more light than before, but only the 12Mp camera benefits from optical stabilisation.

The fingerprint scanner sits below the cameras and is a bit larger than the Mate 9's. Having used enough phones with a rear scanner, it's just as good – if not better – than a front-mounted sensor as your finger falls naturally on it when you pick up the phone.

But therein lies the rub: you have to pick it up to access the scanner. That, or press the power button and enter your PIN or swipe pattern to unlock.

There's another slight niggle: you won't find a 3.5mm headphone jack on the Mate 10 Pro, though there is one on the standard Mate 10 (a model you can't buy in the UK).

The top edge of the phone has what looks like a headphone jack, but it's actually an IR blaster next to a microphone. This lets you control your TV or set-top box, should you want to.



Another oddity is that the Pro doesn't offer expandable storage via microSD whereas the standard Mate 10 does. Fortunately, the Pro packs 128GB as standard, but you'll have to be sure that's all you'll need for the lifetime of the phone.

It is a dual-SIM phone, though, and it supports 4G for both nano SIMs. The modem supports Cat 18 LTE so it's one of the first phones which can download at 1.2Gb/s. Unfortunately, you're not going to experience this in the UK for a long while as the fastest download speed to date (offered by EE) is 150Mb/s.

Huawei is calling it 4.5G, but while it's interesting, ultimately it isn't a reason to buy the Mate 10 Pro (or any other phone with similar tech.)

Display and audio

We never got the Mate 9 Pro in the UK, but that model had an OLED screen as opposed to the IPS LCD screen in the standard Mate 9. Things are the same in 2017 and it means the Mate 10 Pro should be compatible with Google's Daydream VR headsets (it isn't yet certified, but is expected to be shortly).

It has a resolution of 2160x1080 which is lower than its rivals, but in the flesh it looks great and, at 480ppi, everything looks nice and sharp. The OLED tech means contrast is fantastic and colours are also great: it has a wide colour gamut (112 percent of the NTSC standard) which allows it to display HDR10 content.

Colours pop as they do on the Galaxy S8 Plus and viewing angles are nice and wide with no noticeable colour shifting.

The 18:9 aspect ratio screen is becoming more common, which is a good thing for the Mate 10 Pro as more apps will be optimized to run in full-screen mode. The phone lets you force any app to do this, but doesn't guarantee it'll work properly.

Unlike the Pixel 2 XL which has two front-firing stereo speakers, Huawei opts for an Apple-like approach with the top one facing the front and the bottom-firing speaker used as the second.

They're loud enough, but not particularly well balanced with the front speaker noticeably quieter.

Cameras

The lenses may have f/1.6 apertures, but the cameras are not the Mate 10 Pro's strong suit. At least, certainly not when compared to the amazing snappers on the Pixel 2 XL.

Put simply, the Mate 10 Pro cannot resolve the same level of detail. When you look close up, photos don't look sharp and there's evidence of noise reduction, even in good light. This makes textures look a bit smeary, and it's worse in low light.

We've also reason to quibble about video quality. Everything looks a little soft at 1080p but while 4K is decent enough, there's no stabilisation on offer (despite the OIS).

Annoyingly, the same restriction is imposed if you choose to shoot at 1080p60, so you either live without stabilisation or put with less detail and half the number of frames per second to get smoother video.

Audio quality on videos is pretty good, with none of the noise reduction you get on other phones



that makes it sound as though the recordings were made under water. It's a stereo soundtrack, too. You can see a 1080p30 clip with stabilisation enabled at tinyurl.com/y7hgbr7q.

Plus, while it's easy to be critical of the quality when really scrutinising photos at 100 percent, they look good when viewed normally. The lack of sharpness isn't noticeable: focus is actually very good.

You can snap a shot in a hurry and still get good results thanks to the array of focusing techniques (and depth perception) at the rear which mean there's no perceptible delay between tapping the shutter button and the photo being taken.



There are lots of modes to play with including slo-mo video (which works a lot like the iPhone's and lets you adjust which portion is slowed down), a pro mode for photo and video that gives enthusiasts access to shutter speed, ISO, metering, EV correction, focus and white balance. You can even lock the last three while you make other changes.

You can also use the monochrome camera to take 20Mp photos and they're clean even in low light:

Huawei's signature light painting mode is great fun at night, and long exposures can be used to get light trails or other effects.

On top of all that, there's the option to enable Motion photos (basically the same as Apple's Live

Photos) and both portrait mode and 'wide aperture' mode. The latter is usable with the standard field of view which means you can take photos of several people and still get a nice blurry background.

In portrait mode, results can look great, but it doesn't always correctly detect hair. Again, though, this is only something you'd notice if you zoom in and look closely.

Around the front the 8Mp selfie camera is decent enough and you can play with the beauty settings in the portrait mode and even toggle on the 'artistic bokeh effect' which uses the power of the Kirin 970 to figure out what's in the background and blur it. And it works surprisingly well.

The stock camera app has the same interface as before, but the AI certainly appears to help with scene recognition. A symbol appears at the bottom-left corner to indicate what it has recognized.

For example, there's almost no delay switching to foliage mode when pointing the camera at a plant. Similarly, face recognition (and tracking) worked really well when taking photos of a ballerina – despite the relatively dim lighting.

Even when it's very dark, the cameras are still able to focus quickly and take sharp-looking photos with good skin tones.

Each camera has its own ISP (image signal processor) and these are used in conjunction with the AI engine to process images according to the type of scene detected. The processing power is also used to enable software zoom up to 2x, and the results can be better than the telephoto lens on the iPhone 7 Plus.

Performance

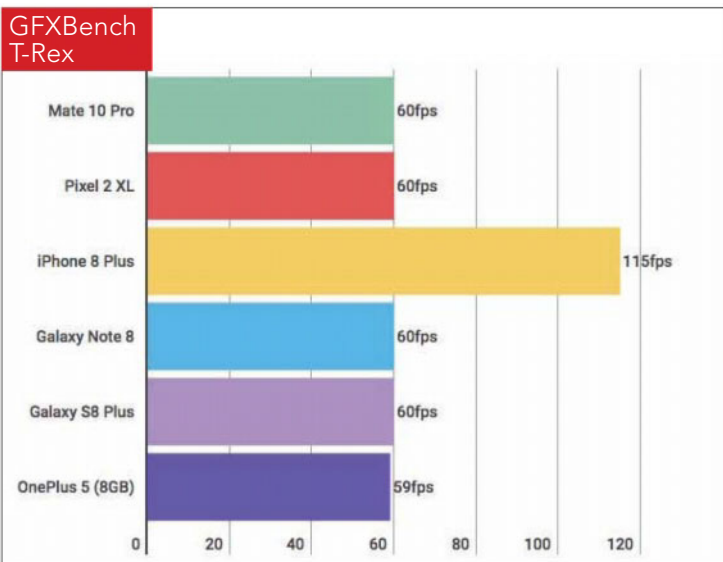
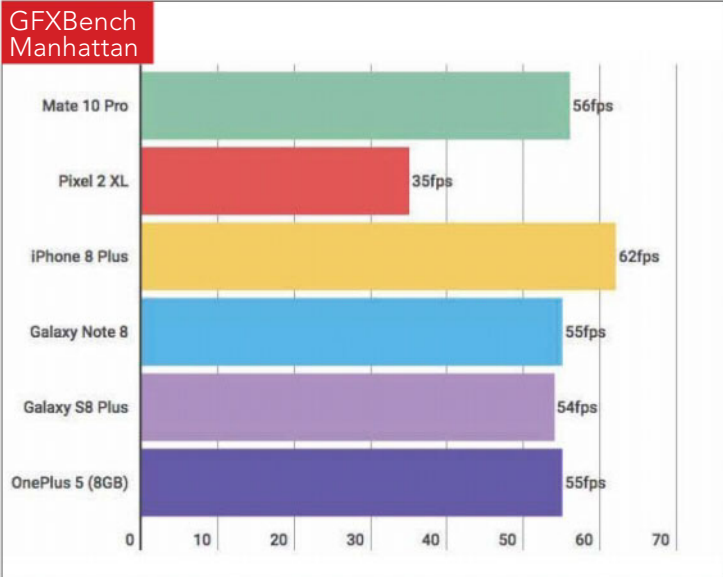
Huawei uses its own-design processors in its phones and the latest is the Kirin 970. It's an eight-core chip and, like Apple's A11 Bionic, it has dedicated neural network hardware which allows it to handle tasks such as language translation and image classification on the phone instead of requiring it to call home to servers on the Internet.

Huawei says the performance of this so-called NPU (Neural Processing Unit) is 25 times better than the main CPU, and 50 times more efficient.

Overall the Kirin 970 is 20 percent more efficient than the Mate 9's Kirin 960 and the new Mali G72-MP12 GPU is 50 percent more efficient.

All of this means the Mate 10 Pro has excellent battery life. With a 4,000mAh capacity, it easily lasts





a day even with heavy use. And if you're not playing games, taking videos or constantly using the screen to browse the web, watch videos or send messages, it'll (almost) last two days.

When it's empty, the included SuperCharge power supply will charge the Mate 10 Pro to almost 60 percent in only 15 minutes.

As for the processor's performance, it's fantastic. It comfortably sits with Snapdragon 835-powered phones and thanks to the lower resolution than some of those phones, the GPU doesn't have such a hard time rendering all those pixels so it can deliver as many, if not more frames per second.

Only the A11 goes noticeably quicker in benchmarks, but this doesn't include image recognition. Huawei says the Mate 10 Pro can identify scenes in photos at a rate of 2000 per minute, while the iPhone 7 Plus can manage only about 500.

And in real-world use, the Mate 10 Pro feels as fast and responsive as you'd expect from a top-end flagship phone.

The real question is whether developers will use Huawei's APIs to create apps that take advantage of the NPU. If not, you're not going to see a huge benefit beyond translation and image and scene recognition or other apps Huawei itself releases.

Translation needs to improve before you can rely on it. Once you've downloaded the respective language packs, you can use the app offline

It works pretty well, but in the (admittedly hard) test above, it completely fails to translate the Spanish for department stores and calls them "large surfaces".

Software

As you'd hope from a brand new Android phone, the Mate 10 Pro comes with Android 8.0 Oreo and this is overlaid with Huawei's EMUI interface.

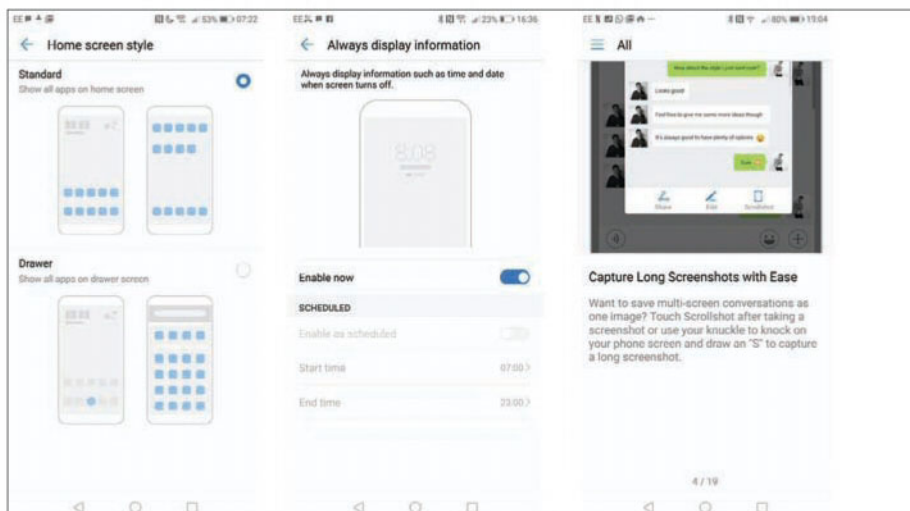
EMUI is one of the most iOS-like Android interfaces out there and this makes it ideal if you're jumping ship from an iPhone. The default layout is to show all apps in a grid, but you can change this for the traditional app drawer in the settings.

From the home screen you can drag down to get a search bar to find apps, music or other media.

The previous version was EMUI 6, but in order to match Android, this has now been bumped up to EMUI 8.0 for the Mate 10. You won't notice too many major changes, since these are lurking behind the scenes.

EMUI 8 is great to use, although it does take a bit of adjusting if you're used to plain Android. What's nice





is that you have a choice of whether to use the usual Android soft navigation keys or EMUI's floating button.

You'll have to learn the gestures for the button, but because you can position it anywhere on the screen, it could be a quicker way to operate the phone with one hand. Disabled by default is the always-on display. This shows the time, date and notifications just like the Pixel 2 XL and Galaxy S8. You can schedule this, too, so it doesn't use power at night.

Like Motorola, Huawei adds quite a few handy features to Android, such as double-pressing the power button to launch the camera when the phone is off, and letting you quickly call someone by holding the volume down button and speaking their name.

Thanks to the wider screen, the Mate 10 Pro has a feature called Smart Split-screen. This automatically displays some apps in two columns in landscape

mode and means you can keep watching a video while replying to an email, for example.

And as with previous versions, you can use your knuckle to knock on the screen to achieve certain things. For example, a double knock takes a screenshot and you can draw letters with your knuckle to launch certain apps. You can also draw a line across the screen to enter split-screen mode – getting the knack just takes a little practice.

A potentially useful feature for some is the ability to connect a big screen using just a USB-C to HDMI adaptor cable. When you do this, you get a Windows-style desktop for running apps and the phone screen becomes a virtual touchpad for the on-screen cursor. A keyboard also pops up when relevant for text entry.

The desktop environment is fairly rudimentary, but if Huawei develops it, this could be a reason to get the Mate 10 over one of your other shortlisted phones.

Verdict

The Mate 10 Pro is the best phone from Huawei yet and although the cameras aren't as good as the Pixel 2 XL's, it has a better screen, better battery life and just as much processing power. In fact, with the AI processor there's arguably more on board, but there's no guarantee that apps will appear to make use of it. Even if they don't, this is still an outstanding phone. Jim Martin

Specifications

- 6in (2160x1080, 402ppi) IPS display
- EMUI 8.0 (Android 8.0 Oreo)

- Hisilicon Kirin 970 processor
- Octa-core (4x 2.4GHz Cortex-A73, 4x 1.8GHz Cortex-A53) CPU
- Mali-G72 MP12 GPU
- 4/6GB RAM
- 64/128GB storage
- Fingerprint scanner
- Dual 20Mp and 12Mp, f/1.6, OIS, 2x lossless zoom, Leica optics, phase detection and laser autofocus, dual-LED (dual tone) flash
- 8Mp, f/2.0 front camera
- Bluetooth 4.2
- GPS, A-GPS, GLONASS, BDS
- USB-C 3.1
- 4,000mAh lithium-polymer battery
- 154.2x74.5x7.9mm
- 178g



Apple iPhone X

64GB: £999 inc VAT from fave.co/2iyEGRo

256GB: £1,149 from fave.co/2iywdhe ★★★★★



It's 10 years since Steve Jobs unveiled the first iPhone and Apple has marked the occasion with a new handset that doesn't just jump one generation, it jumps several. The firm has leaped from iPhone 7 (via

the iPhone 8) all the way to iPhone X, bypassing the iPhone 7s and leapfrogging the iPhone 9 altogether.

Despite rumours of limited stock, thousands of people queued around blocks the world over to pick up the new handset, in scenes we haven't seen for a few years. All Apple had to do to get so much attention was redesign the iPhone. That sounds easy, but the redesign involved the removal of the Home button, and to make that possible Apple had to rethink the way you interact with the phone.

Face ID

The iPhone X feature that's received the most attention is Face ID, Apple's technology for unlocking the iPhone X and authenticating your ID. It replaces Touch ID, Apple's fingerprint technology that served the same purpose.

Setting it up is easy. In a process similar to Touch ID, where the Home button records several impressions of your fingerprints, the you'll need to move your head in different angles as the TrueDepth camera system records different spots on your face. It takes a few minutes, and then it's ready to go. Face ID only allows a single

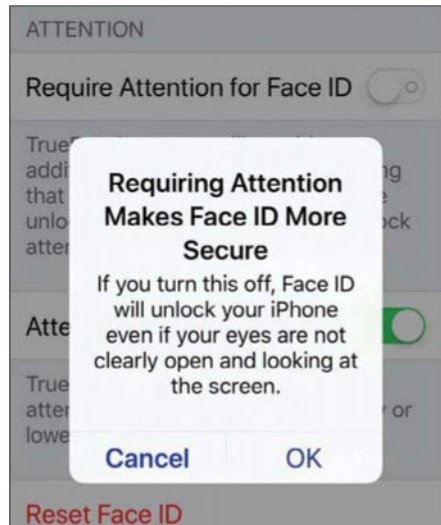


person to register their face. Touch ID lets you register different fingers; you can use this capacity to register the fingerprints of other people who you want to have access to your device. This is handy if you're okay with, say, your other half having access to your iPhone. Maybe Face ID's one-face limitation will change if Apple decides to use Face ID on the iPad, a device that's more likely to have multiple users.

By default, Face ID requires your eyes to be open in order for it to work, But if you go into Settings > Face ID & Passcode and turn off the Require Attention for Face ID setting, Face ID will work when you have your eyes closed.

I had some concerns about Face ID because I've got so used to Touch ID, which feels like it has seamlessly integrated with how I use my iPhone. But for me, there was actually nothing to really be concerned about. Face ID is much closer to the idea of seamless integration than I imagined with Touch ID.

By default, Face ID requires your eyes to be open in order for it to work, But if you go into Settings > Face ID & Passcode and turn off the Require Attention for Face ID setting, Face ID will work when you have your eyes closed



When it works, Face ID works really well. To access your iPhone X after it's been sitting in your pocket, purse, bag, desk, and so on, you need to unlock it using Face ID. At first, I had a tendency to wait for the lock icon on the screen to unlock. But the key is to not wait. You should swipe up to get to the Home screen as you're looking at the iPhone X. It takes some practice, but before too long, unlocking your phone will feel effortless.

I've had some conversations with Android users who have tried the iPhone X, and their main beef with Face ID is that it's too slow compared to a fingerprint scanner. In their limited time with the iPhone X, they're not accessing the Home screen in the manner I described above – and since they're not invested in the iPhone, they're not willing to learn, either. It's still true that access to the Home screen using Face ID isn't as fast as using a fingerprint scanner, but it's maybe a second slower. If that one second is all the difference to you, then I hope you're using that time wisely.

Using Face ID with some third-party apps is done in a manner similar to that of Touch ID. For example, with the app for my bank and with



Third-party apps such as Dropbox have updated its apps with Face ID support

Dropbox, the login screen appears, and then a Face ID icon appears, and then the app unlocks. It's really no different than how Touch ID was implemented in those two apps, this, it's no more convenient.

Face ID has a certain viewing angle you need to be within to work, which is where I have a very minor issue with the technology. I try to keep my personal correspondence on my iPhone when I'm using my work laptop, and the iPhone X lays on my desk to the side. When I get a text, I can see it on the iPhone's lock screen. On the iPhone 6s Plus, I use Touch ID to unlock my handset while it's still at my side. But with the iPhone X, my face is out of range of the TrueDepth Camera. The solution to this minor issue: move the iPhone X in a new location so it's within range of my face. I have also found that Face ID works when the iPhone X is in my car mount, which is attached to an air vent to the right of the steering wheel.

Apple is very confident in Face ID's security, stating that it's much more secure than Touch ID. Many other publications have tried to see if they can trick Face ID, with their results matching what Apple has said, that twins can get by Face ID. Since I don't have access to twins, I didn't test this, but Face ID wasn't fooled when I tried to have my two sons access the iPhone X.

Apple has said a lot about how it believes augmented reality is going to be a big deal, and we've seen AR apps, like Ikea, The Machines, and AR MeasureKit. There are even rumours of Apple working on an AR wearable. The TrueDepth camera will have a big role in AR, and Apple demonstrated

how it can be used with its recent release of Clips 2.0. Clips uses the TrueDepth camera so it can filter out background objects for its Selfie Scene feature, and the app can use you in the foreground for a virtual scene. Other than some issues with clipping your foreground image, the Selfie Scene implementation works quite well. Expect to see a lot of fun and innovative apps that use the TrueDepth camera coming soon in the App Store.

Display

The other feature that demands your attention is the iPhone X's screen. It's the first iPhone with an organic light-emitting diode (OLED) display. It's also the biggest iPhone display, measuring 5.8 inches diagonal.

I can't emphasize enough how much I love the iPhone X's screen. I can say it's gorgeous, but that feels like an understatement. The colours are rich and pop, text looks clean and sharp, and the black is so deep that I actually find it mesmerizing. I've seen lots of screens that don't look black – more like a 98 percent grey – and as stupid as it sounds, I like to



gaze at the black gap on the second page of my Home screen. This is the best screen I've seen on an iPhone.

OLEDs are currently susceptible to burn-in, the effect where you can see a shadow of an image when something else is on screen. This was evident in Google's Pixel 2 phone, which also uses an OLED. Apple has even stated in a knowledge base article that burn-in on the iPhone X's display is 'expected behaviour' and that the company has done what it can to minimize burn-in. I haven't noticed it in the nearly two weeks since I've had the iPhone X, but it is something I'll keep an eye on and will update this review accordingly should anything change.

When first using the iPhone X, I had to get over the false impression that the iPhone X's screen is smaller than what I'm used to on the iPhone 6s Plus. Based on diagonal measurement, the iPhone X is bigger (5.8 inches) than the iPhone 6s Plus (5.5 inches, the same as the iPhone 7s Plus and the iPhone 8 Plus). The iPhone X's screen is a slightly narrower, though, and noticeably taller. Overall, it's a bigger screen.

But it's not the screen that gave me the impression that the iPhone X's is smaller. It's the bezel on the Plus iPhones. The black border on the Plus iPhones, even though they aren't part of the screen, unconsciously became part of the screen in my head. It took me a few days to clear this psychological hurdle (or optical illusion, if you will). While showing the iPhone X to other people, some of them also were fooled into thinking that the iPhone X's screen is smaller, so I think this could be a phenomenon experienced by many new iPhone X owners.



The notch does get in the way when watching a full-screen video. You have the option of resizing the video so that the picture avoids the notch

What didn't take me long to get over was the notch. Yes, the notorious notch, the one that houses the TrueDepth camera system. I found it a distraction at first, but it was yet another head game I played on myself – what really bugged me wasn't the actual notch, but that I feel like the notch goes against Apple's design aesthetic. But I was able to realize that in typical use, I don't notice the notch at all. Even with full-screen videos, the notch doesn't bother me. (There is an option to resize videos so that they avoid the notch, but that means video is smaller than full-screen.)



To use the Flashlight or Camera from the lock screen, you perform a hard press on each button, similar to a 3D Touch

Gestures

Apple had to come up with a new set of gestures to make up for the lack of a Home button on the iPhone X. I learned these new gestures quickly – you use them a lot, so if you need ‘practice’ for the muscle memory to kick it, you’ll get it.

We have a complete list of the new gestures you’ll need to learn. Most of them are simple, like swipe up from the bottom to get to the Home screen, or swipe down from the top of the display’s right side to get to Control Centre.

Speaking of the Control Centre swipe, it’s the one new gesture I don’t like – you really need to reach to

the top of the screen area next to the notch, and this requires more effort than the previous Control Centre gesture (swipe up from the bottom of the screen, which works on the iPhone 8 and older iPhones).

The iPhone X's lock screen has two quick access buttons, one for the flashlight, and another for the camera. They're easy to get to at the bottom of the screen, but simply tapping each button doesn't activate it. You need to do a hard press, like you do for 3D Touch. A hard press is necessary, because you don't want these buttons activating while in your pocket, and these lock screen functions don't require Face ID verification to work. But there's nothing in the included documentation that tells you how to use these buttons.

People's tolerances for UI vary, and I can see how someone would absolutely hate not having a Home button. If you're one of those people, then the iPhone X is not for you. But keep in mind, the Home button is probably not in the iPhone's long-term plans. It could be five or six years before we see Apple completely abandon the Home button, but it will happen eventually.

The cameras

The iPhone X's rear camera has a 12Mp dual lens camera with a $f/1.8$ wide-angle aperture, $f/2.4$ telephoto aperture, optical zoom, 10x digital zoom, and optical image stabilization on both lenses.

The pictures from the iPhone X are excellent, with vibrant colours and great sharpness. The iPhone X seems better at handling a wide array of lighting



Shot with no flash at 1x zoom

situations compared to other iPhones I've used in the past. As someone who has no skill at adjusting camera settings and prefers to rely on automatic settings, the iPhone X produces results that make me very happy.

The camera feature that I really want is the optical image stabilization on both lenses. My lack of a steady hand (or my heavy-handedness with pushing the shutter) often results in jitter that creates blur, and I found that with the iPhone X, I had more good pictures than blurry, unacceptable ones.



Landscape shot at night, no flash, 1x zoom

The iPhone X comes with the new Portrait Lighting mode, a special camera mode that applies different lighting effects to portraits. (On the iPhone X, this feature is available on both the front and rear cameras.) The results you'll get with Portrait Lighting are mixed. I found that the Natural Light setting worked the best, producing even results and nice bokeh. Contour Light and Studio Light seemed to create hot spots depending on the angle of your subject, but emphasized different detail elements to change the emotion of a picture.



Portrait Lighting mode on the iPhone X can be hit or miss

Two of the Portrait Lighting modes, Stage Light and Stage Light Mono, are just...well, I'll say that I'm not going to use them. The pictures I took using these settings – as well as a vast majority of the pictures I've seen from other people – look cheesy, and they'd be used as examples of bad image editing. Apple decided to label Portrait Lighting mode as beta, seemingly as

an excuse for the mixed results, so let's hope we see improvements in the near future.

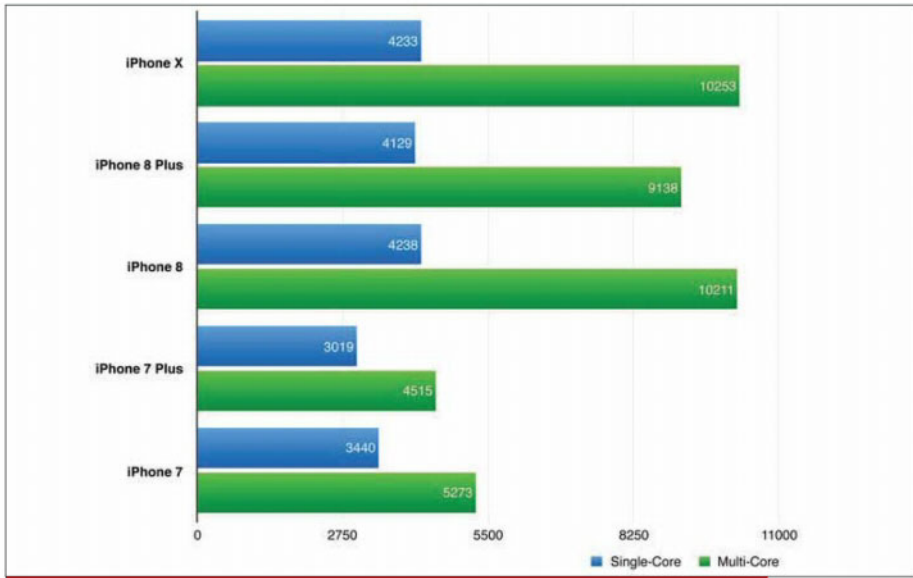
The rear camera is capable of shooting 4K video at 24 frames per second, 30- or 60fps. Shooting 4K video at 60fps feels overindulgent, and if you have only 64GB of storage, it's probably a setting you will seldom use. But gosh, it looks so buttery smooth and the detail is amazing. If you have a 4K TV and love shooting your own videos, 4K at 60 fps is the reason why you need to get 256GB of storage. If you don't want to shoot any kind of 4K video, you'll be happy with the 1080p and 720p video from the iPhone X.

My favourite new feature of the video camera is the Super Slo-mo mode, which captures video at 240fps at 1080p resolution. It's another space-hogging camera mode, but it's a lot of fun.

Speaking of fun, I have to mention the new Animoji, since they're exclusive to the iPhone X (for now). Animoji uses the TrueDepth camera to sync your head and facial movements to an animated emoji. You've surely seen them all over the Internet, and it's guaranteed to make you laugh.

Performance

The iPhone X has Apple's new A11 Bionic processor, a 64-bit six-core beast. It has a pair of performance cores that Apple says are 25 percent faster than its predecessor, the A10 Fusion. And Apple says the A11 Bionic's four efficiency cores are 70 percent faster. We used the Geekbench 4 app to get an idea of the speed of the A11 Bionic in the iPhone X. Obviously, the A11 Bionic is faster than the A10 Fusion, but what's of



Geekbench 4 CPU test. Longer bars/higher scores are better

note here – and not surprising – is that the iPhone X essentially performs the same as the iPhone 8. These two phones have the same processor, so if all you want in a new iPhone is faster performance and you could not care less about new features like Face ID or the cameras, get an iPhone 8 and save some serious cash.

Overall, the iPhone X feels like a snappy phone when launching apps, unlocking the phone, playing videos (streaming and stored on the iPhone), and other tasks. When I tried doing simple video edits in iMovie, or when I created a short video in Clips, the iPhone X rolled along smoothly, though the higher the resolution of the video, the more performance was hit, but never to a point where I was left frustrated.

Battery life

Apple states the following stats for battery life:

- Up to 21 hours talk time
- Up to 12 hours Internet use
- Up to 13 hours wireless video playback
- Up to 60 hours wireless audio playback

No one performs only a single task on their phone. When was the last time you spent a day using your iPhone just for phone calls? What's important is whether or not you can get through a day on a single battery charge, using your phone for different tasks. And the more power you have left on your phone at the end of the day, the better.

The day I decided to keep a close eye on battery life was a particularly busy day for the iPhone X. I used the phone for email, texts, and a phone call of five minutes. I looked up a recipe on the Internet, tracked my fantasy football team throughout the day, and got driving directions for a 30-minute trip. I shot 129 photos and nine short videos, and uploaded them via Wi-Fi to my Dropbox account. I watched a couple of steaming YouTube videos (one over Wi-Fi, the other over LTE) for a total of about 30 minutes. And at the end of the day, I took my dog for a walk for over an hour, during with time I played Pokémon Go (which is a battery killer).

After all that, the iPhone X's battery life was at 52 percent – before I went on my Pokémon Go dog walk, the battery was at 68 percent. Typically, I'm not this busy with my phone, so I can get through a working

day without worrying about charging the iPhone X. Of course, your mileage may vary.

Mostly glass design

With the 2017 iPhones, Apple decided to go back to a glass front and back. The main reason is so the phone can support wireless charging. The iPhone X works with wireless chargers that adhere to the Qi standard.

I don't have a wireless charger to work with the iPhone X, and frankly, I think wireless charging is overrated. Sure, it's convenient; just place the iPhone X on the charging pad (if it's in a non-metal case, you can keep it on), and that's it, the pad does all the work and charges the phone. Of course, you have to place the iPhone X properly; if it's slightly off to the side, it won't charge. To me, it's not that much of an effort to plug a Lightning cable into the iPhone X. And you



The back of the iPhone X uses glass to allow for wireless charging

have to pay extra for a wireless charger, whereas the iPhone X comes with a 5W adaptor and a Lightning cable. Finally, there's no speed advantage (as of yet) to using a wireless charger. But hey, just because it's not something I'm interested in doesn't mean it's not right for you. I just don't see wireless charging as something you need to think about when deciding if you want to buy an iPhone X or not.

The glass construction feels nice in the hand, and on the silver iPhone X that I have, the silver steel frame between the two pieces of glass sparkles and dazzles – it looks so good that it's a shame that I keep my iPhone X in a case. Because after all, glass, even as strong as the glass on the iPhone, still isn't as strong as metal and can shatter after a fall.

The back of the iPhone X, like other iPhones, is still saddled with a camera bump. As I mentioned earlier, I often use my iPhone by my side when I'm on my work computer, and the phone can't lay flat on its back, rocking in a tottering motion when I tap on the screen. Fortunately, the case I use provides enough thickness to compensate for the camera bump and let the iPhone X lie flat. But it sure would be nice if the bump went away, either by advancements in camera technology, or by making the iPhone thicker (maybe add more battery?).

Verdict

As I mentioned in the introduction, 2017 marks the tenth anniversary of the iPhone. What I remember most about the first iPhone was the sense of astonishment. Sure, it had its flaws, but I felt like I was holding the future of computing in the palm of my hand.



However, with each new generation of iPhones introduced, I started to feel less and less like the iPhone was a harbinger of what's to come. The new features felt more like incremental steps that helped solve a current problem than giant leaps that made you wonder what incomprehensible thing will be unleashed. That's not to say that those iPhones were bad products; on the contrary, they were great. But they weren't inspirational.

And now we have the iPhone X, and that sense of astonishment and inspiration is back, for me. That's mostly because of the TrueDepth camera and the A11 Bionic – AR development could really take off, and it's going to be fun to see what comes of it. Other features, like the spectacular quality of the OLED screen, the bigger screen in a smaller footprint, and the cameras, complete the package.

All of this comes at a price – the iPhone X is Apple's most expensive phone. Is it worth it? If you simple want

a great tool for the job, you'll probably be fine with the iPhone 8. But if you are a true iPhone fan, or you like the idea that the future is in your hand, you need the iPhone X. Roman Loyola

Specifications

- 5.8in (2436x1125, 458ppi) Super AMOLED display
- iOS 11.0
- Apple A11 Bionic processor
- Hexa-core (2x Monsoon, 4x Mistral)
- Apple GPU
- 3GB RAM
- 64/256GB storage
- Dual 12Mp, f/1.8 and f/2.4, phase detection autofocus, OIS, 2x optical zoom, quad-LED (dual tone) flash
- 7Mp, f/2.2, 1080p at 30fps, 720p at 240fps, face detection, HDR, panorama
- A-GPS, GLONASS, GALILEO, QZSS
- Wi-Fi 802.11ac
- Bluetooth 5.0
- NFC
- Lightning Connector
- IP67 certified
- 2,716mAh non-removable lithium-ion battery
- 143.6x70.9x7.7mm
- 174g

Motorola Moto X4

£349 inc VAT from fave.co/2j8Kphb



Motorola's mid-range X series of smartphones is back with the new Moto X4, which follows 2015's Moto X Play, X Style and X Force line-up. This time, Motorola has opted to go back to just the one model to keep things simpler, and it's certainly a compelling offering with plenty of interesting and impressive features. But it has stiff competition from Honor and OnePlus.

Design

In a bit of a departure from the rest of its phones, Motorola has gone for glass on the front and back

(like many of 2017's phones) mated to an anodized aluminium frame. This results in a premium-look and feel that's lovely at first glance but little too shiny and smudge-prone. It's available in Sterling Blue or Super Black.

The back is described as a 3D contour, which essentially means that it's slightly curved to feel comfortable in the hand. That's aided by its 5.2in screen, which keeps the X4 at a manageable size that's easy to use one-handed.

The X4 is 7.99mm thick for the most part, aside from the 9.45mm circular portion that houses the camera. It weighs 163g. While those measurements aren't particularly outstanding, they're good for a phone of this price.

Impressively, the X4 has an IP68 water resistance rating, which we tested by dropping the phone into a shallow pool of water and can confirm that it still worked perfectly when we took it back out. That's



actually better than the flagship Z2, which is simply described as “splashproof”, and the Honor 9, which isn’t waterproof.

Like the Honor 9 you’ll find a standard headphone jack alongside a USB-C port on the bottom edge, but the X4 has just one speaker, which doubles as the ear piece for phone calls. It’s fairly loud, and pretty much on a par with the Honor’s single bottom-firing speaker.

Display

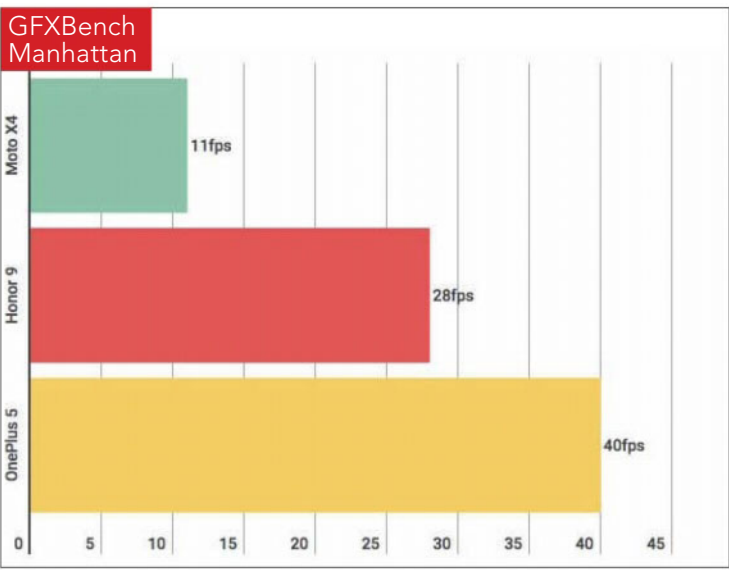
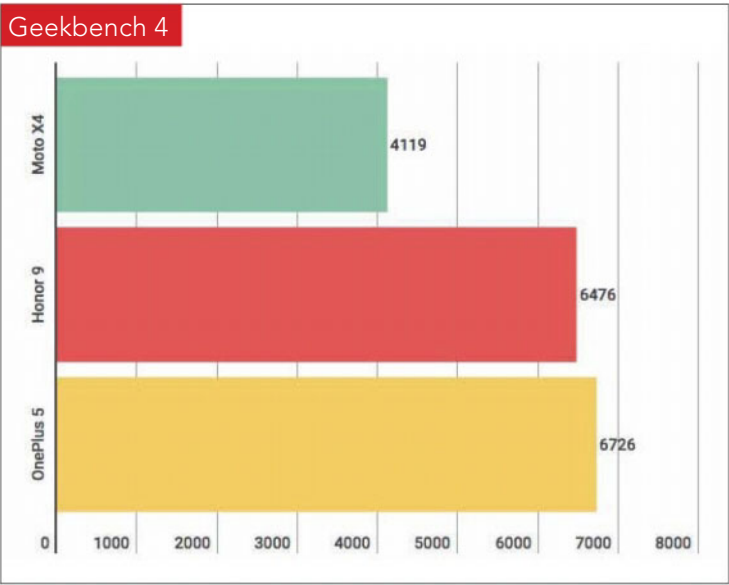
The X4’s 5.2in screen is Full HD, which means a resolution of 1920x1080 pixels. During our testing, we found the screen to be bright, colourful and crisp. It doesn’t live up to the standards of flagships from the likes of Samsung and LG, and its bezels prevent it from being as immersive as an edge-to-edge would, but for the price it’s very good. In fact, the colours are so bold in vivid mode that you’d be forgiven for thinking it was an OLED panel. In fact, it’s a top-tier LCD screen with great viewing angles.

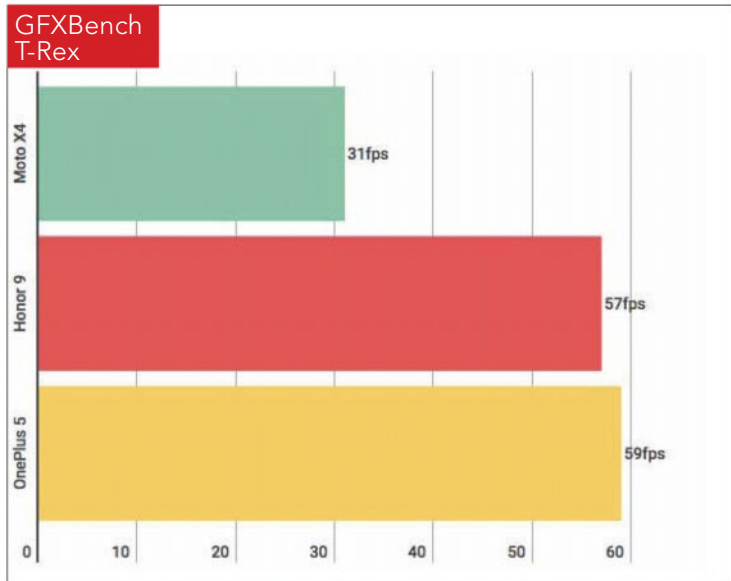
Performance

Inside the X4 is arguably its biggest weakness: Qualcomm’s mid-range processor, the Snapdragon 630, paired with 3GB RAM.

In itself, that’s a fine combo for a mid-range phone. The problem comes from the competition, namely the Honor 9 which is a lot faster for only £30 more.

You can see the difference in the graphs below. But in the real world, with real use, the phone is suitably speedy, launching and running apps without a problem and allowing us to switch between them without delay.





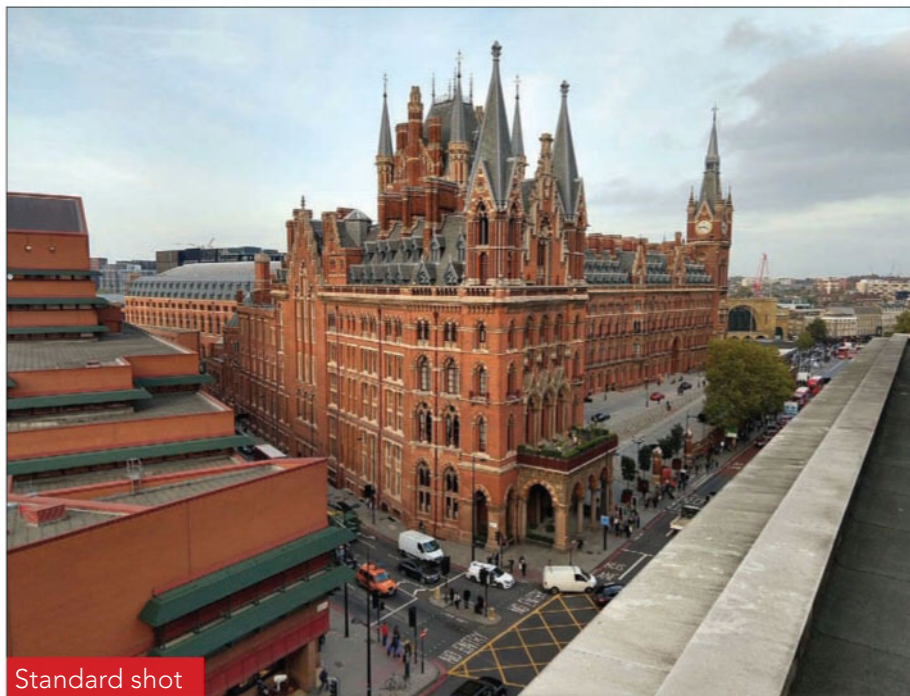
The worry is that although adequate for now, you'll probably hanker after the Honor 9's extra performance in a year or two's time when the X4 could well feel slower than it does when you get it out of the box.

Storage-wise you get 32GB storage built-in, but there's support for a microSD card up to 2TB. This fits into the tray above the nano SIM card, which can be ejected from the top of the phone.

Cameras

One of the Moto X4's key features is its dual camera. Like the LG G6 and Asus ZenFone 4 it has standard and wide-angle lenses rather than telephoto.

And like the ZenFone, it has 12Mp and 8Mp sensors respectively, so your wide-angle shots aren't going to



Standard shot

have as much detail as photos from the main camera. However, unlike the Asus and LG, the X4 supports depth effect so you can get nice blurry backgrounds for your portrait photos. And there's a handy slider at the bottom so you can adjust how much blur you want.

Dual Autofocus Pixel technology means focusing is quick, and auto HDR is enabled by default. There's a very slight delay after taking some photos for processing, but in most situations there's no perceptible lag.

In good light, the main 12Mp camera takes great photos which look nice and sharp. They're a tad



oversharpener, but we'd rather this than be too soft. Colours aren't always the best: they tend to be a little dark and drab but this is all easily sorted in Snapseed or your favourite Android photo editor.

As you can see above, there is noticeable distortion when using the wide-angle camera. With enough natural light, it's perfectly possible to get lovely, sharp shots. In dim light there's a bit of noise, but colours and detail are still good. However, in very low light, the X4 simply can't cope and managed this dismal attempt of our standard low-light scene (see the image overleaf).

Around the front is a 16Mp front-facing camera for selfies which offers an adaptive low light mode as well as a Panoramic Selfie feature to capture bigger groups or the environment behind you.

In terms of video, it can shoot 4K up to 30fps, and 1080p at 60fps. Unfortunately, like even certain flagship phone (such as the Mate 10 Pro) stabilisation is only possible at 1080p30 or lower. That's frustrating as the stabilisation is pretty good. But as it's done in software, it seems there's not enough processing grunt to work at higher frame rates or resolutions. The camera app also includes a 3D Detector, which scans an object in front of the camera, attempts to identify it and then give you relevant information. We tried it on an iPhone X and it successfully recognized it and brought up Apple's web page for the phone. You'll also find an AR feature for both the rear camera and selfies. It allows you to add animations to photos and videos, like Snapchat, but this isn't going to appeal to everyone.

Battery

The 3,000mAh battery is a non-removable and Motorola says it's capable of providing power "all day".



It charges via USB-C and supports TurboPower fast charging with the bundled adaptor, which means six hours of power is achievable with just 15 minutes of charging time. And it certainly does last all day, even with pretty heavy use. Obviously, if you play games for hours on end you'll need that charger before the day is out, but with mixed use you can usually make it through to the following morning.

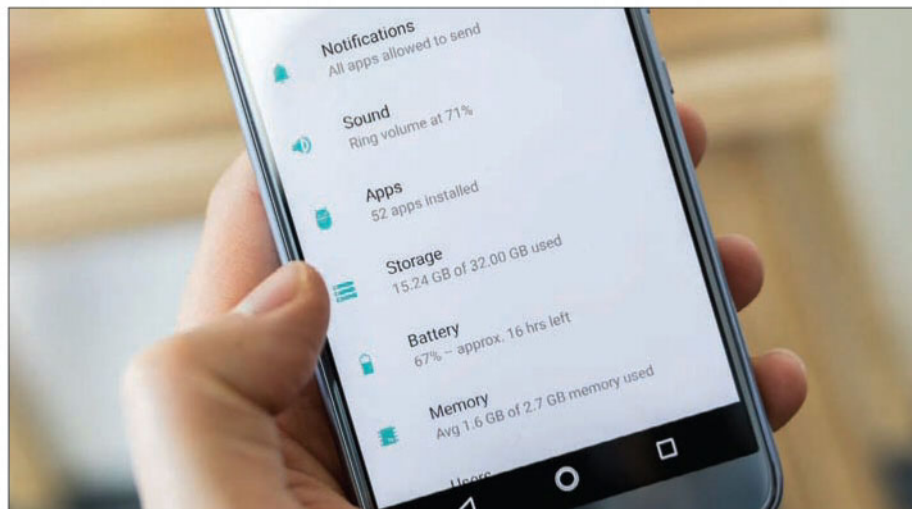
Software

The Moto X4 runs Android 7.1 Nougat (not Oreo, sadly) out of the box. As with all Moto phones, it's almost plain Android with no annoying overlays or heavily modified menus and settings. Even the icons are the default Android ones.

And, as any Motorola owner will know, you also get Motorola's Moto app which includes a variety of features such as Moto Display and Moto Actions. With Moto Display you can get notifications to fade in and out when the screen is off, and the 'one-button nav' feature lets you use taps and swipes on the fingerprint sensor instead of the on-screen navigation keys.

There's the usual 'karate chop' to turn on the torch and double-twist to launch the camera. Moto Key means you can access password-secured websites using your fingerprint rather than having to type your password every time.

Built into the US version of the Moto X4 is Amazon's Alexa voice assistant, which is a first for Motorola and it can be used hands-free. Google Assistant is still available, so you'll be able to take your pick. As of yet, there's no support for Alexa in the UK model.



Verdict

We're pleased to see that Motorola has revived the Moto X. For the most part, we like the new glass design and the specs and features are good for the £350 price – it looks like a more expensive phone.

Waterproofing and the dual-lens camera sets this apart from rivals, and we like the 5.2in screen size for comfort and practicality.

It's slower than the Honor 9, and has half the storage as standard, but if you'd prefer the water-resistance over the extra speed, the Moto X4 is a great choice for anyone that can't afford the hefty price tags of the current flagships. Ashleigh Macro

Specifications

- 5.2in (1920x1080, 424ppi) IPS display
- Android 7.1 Nougat

- Qualcomm Snapdragon 630 processor
- Octa-core 2.2GHz Cortex-A53 CPU
- Adreno 508 GPU
- 3GB RAM
- 32GB built-in storage, up to 2TB microSD card slot
- Dual-lens 12Mp and 8Mp rear camera with Dual-LED flash
- 16Mp front-facing camera
- 4G LTE
- 802.11ac Wi-Fi
- Bluetooth 5.0 LE
- Fingerprint sensor
- A-GPS, GLONASS, GALILEO
- NFC
- Water Resistant IP68
- 3,000mAh battery with Turbo Charging
- 148.4x73.4x8mm
- 163g

Best antivirus software

Keep your Windows PC safe from spyware, Trojans, malware, and more. IAN PAUL shows how



Antivirus software ranks nearly as crucial as a PC's operating system. No matter how careful you are, some threats can't be prevented without the additional help of an antivirus program – or a full antivirus suite. You could visit your favourite website when it's unintentionally displaying malicious ads. You may accidentally click on a phishing email. You could also get caught by a zero-day threat, where an undisclosed bug in Windows, your browser, or

an installed program allows hackers to install other malware on your machine.

Sure, PC security software isn't fool-proof. Antivirus software often can't do much to stop zero-day exploits, for example, but it can detect when the undisclosed vulnerability is used to install other nasty bits on your machine like ransomware. In general, the average user actively using email, clicking on links, and downloading programs will benefit from an antivirus suite.

So what should you pick? Our recommended suggestions strike a balance between excellent protection, a worthwhile selection of features, and minimal impact on your PC's performance.

What to look for

Here are three requirements an antivirus suite needs:

- High detection rate for malware and other threats
- Low impact on system resources
- An easy-to-use interface

That's not all to consider, however. These days, many security suites come with extras such as a backup service for your most essential files, Android apps for mobile security, a more advanced firewall, family protection (read: child restriction) features, and the right to use the program on multiple PCs. Whether you need those extras depends on your personal situation.

How we test

First, we take a look at the interface to determine how easy or complicated it is. Does the interface

make it easy to get at essential tools like PC scans and password managers, for example, or is everything buried under multiple clicks? Are there elements that look like they should be clickable but aren't? Are alerts interactive or purely informational, and does that make sense in context?

We also examine the features on offer. Every good antivirus suite should have the basics like scanning and real-time protection, but many vendors offer elements that go beyond basic security like password managers or firewalls. We try to discern whether any of these extra features are particularly useful, or just frills that look nice but don't serve a practical purpose.

To test the suite's demand on system resources, we run two benchmarks. The first is PCMark 8's Work Conventional test, which simulates a variety of workloads including editing spreadsheets, browsing the web, and running video chat.

We run the benchmark before the security suite is installed. Then we install the software, have it run a full scan on our Windows 10 test machine, and start a second run of the benchmark at the same time. Then we compare the overall scores to see if the decline between the two benchmarks is significant.

As a harsher stress test, we also use Handbrake to transcode a video before and after installing the A/V. On most home PCs, this encoding task utilizes 100 percent of the CPU. We then compare transcoding times to see if there's any significant decline.

Our test machine is an Acer Aspire E 15 (pictured opposite) with an Intel Core i3-7100U, 4GB RAM, and a 1TB hard drive. Each security suite is tested on a

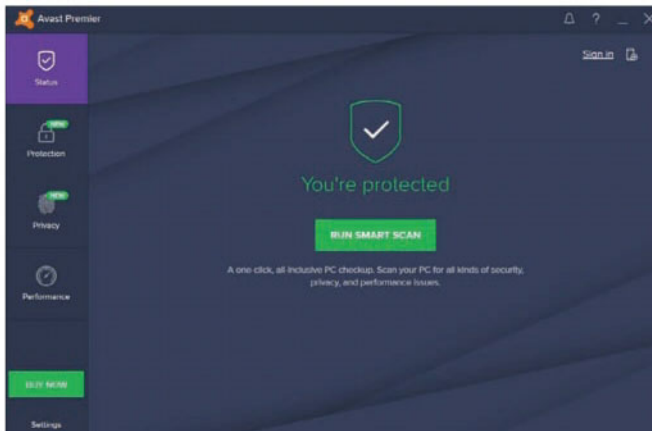
clean install of Windows 10 Home. As for the antivirus suite's detection capabilities, we'll rely on the opinions of security researchers dedicated to this task. We'll take into consideration reports from outlets such as A-V Comparatives, A-V Test and SE Labs.

We'll also take pricing into account and what you get for it. Whenever possible we'll review security suites using a free trial to get a sense of what consumers see when they first try out a new product.

Avast Premier

Price: £59.99 from fave.co/2jaNI7A

Avast is one of the more popular free, third-party antivirus programs. For anyone willing to pay for more advanced features, however, Avast's premium products also have a lot to offer. At the top of the company's line-up is Avast Premier for £59.99, which comes filled



Avast's 'Protection' options

with features. Though it only offers two additional extras compared to Avast's £49.99 Internet Security product (fave.co/2jb09QJ), those particular features are potentially useful for those who want them.

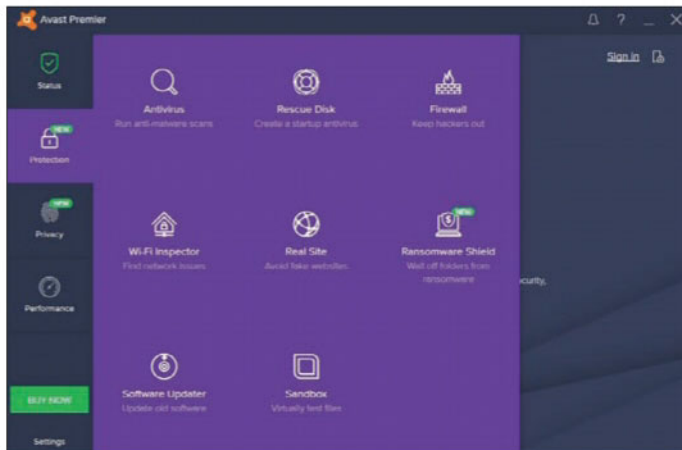
The first is Data Shredder, which deletes files by immediately overwriting them so they are not recoverable. The second is Software Updater, which automatically updates third-party programs, plug-ins, and utilities on your PC. Both are nice features, however, you can use free programs to perform the same functions – like FileHippo App Manager (fave.co/2jd9BTF), which monitors and automatically updates your programs.

Despite being packed with features, Avast manages to not overwhelm the user with a messy interface. The program uses a fairly standard design that includes a left rail with a pop-out menu, and a main screen that displays the settings and primary interface for each feature.

The program also uses colour effectively to help convey important information. The program's primary background is a bluish grey, with the active section in the left rail highlighted in purple.

Avast Premier features four main categories: Status, Protection, Privacy, and Performance. The Status section is pretty simple with a basic green check mark when all is well. The main interface has one button to run a quick scan for viruses. This is also the section where you can get direct links to Avast's catalogue of Android and iOS apps.

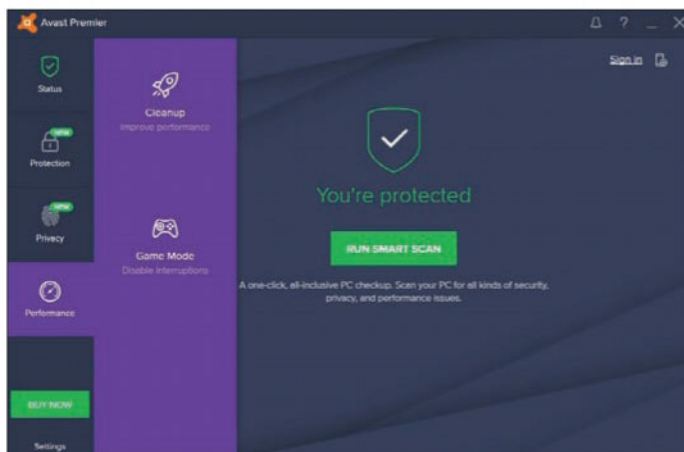
Protection is where you can run antivirus scans, as well as get access to a roster of other security features.



Avast's 'Protection' options

There's Rescue Disk, which puts a version of Avast Antivirus on a CD or USB stick to more effectively scan and remove stubborn malware. You'll also find Avast's firewall settings, a Wi-Fi inspector, Real Site phishing protection, Ransomware Shield (which monitors specific folders for ransomware threats), the aforementioned software updater, and a sandbox to wall off suspect files from the rest of your PC.

The Privacy section includes Avast's built-in password manager, Data Shredder, and Sensitive Data Shield. The latter probes your machine for important documents, and then it adds extra monitoring and protection to those files to guard against malware. It also acts as a quick access list of your important files. There's also a link to SecureLine VPN, but VPN service is not part of the Avast subscription. Instead, you're prompted to pay extra for the VPN.



Here's the 'Performance' section

Finally, there's the Performance section with only two features. The first is Cleanup, which is similar to programs like CCleaner that scan your system for extra files, temporary folders, and caches that can be cleared. Although it looks like it's included, Cleanup only scans your PC for free. To actually clean up your PC, you need to shell out cash for Cleanup Premium.

Performance also houses the settings for Avast's gaming mode. This feature automatically detects when you're playing a game and forces Avast and Windows to reduce its resource footprint – allowing you to play your game unencumbered.

Installing Avast Premier is very easy and using the free trial does not require you to register with the company. Ironically, Avast tries to install extra software at installation – something a security suite should guard against. In the case of our test PC,

it was Google Chrome. On a system with Chrome already installed, Avast offered to install its own secure browser, SafeZone. Later on, I noticed that Avast installed two Chrome extensions: Avast Online Security and Avast SafePrice. I don't recall explicitly agreeing to install either of them.

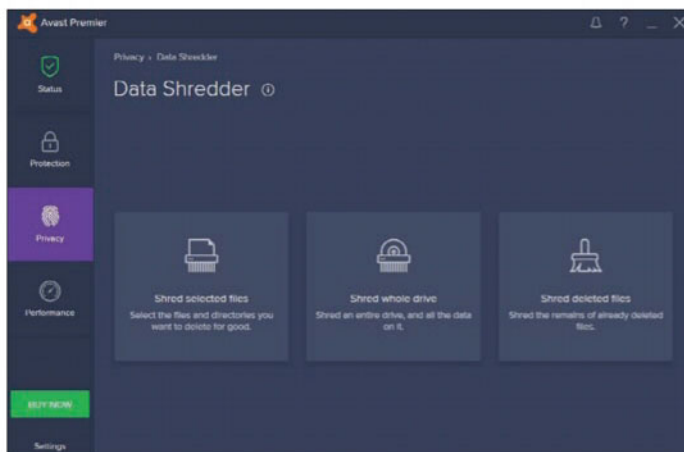
Avast makes it easy to opt-out of this download, but it's also easy for users to get a surprise Chrome install if they're not paying close attention.

Performance

As one of the top security firms, Avast performs very well. In A-V Test's June test of zero days, web, and email threats, Avast scored a perfect 100 percent. Regular malware scans also did well, scoring 100 percent against more than 10,000 samples.

Avast performed similarly high during A-V Comparatives' evaluation. It scored 100 percent in the organization's malicious URL test and 99.8 percent against nearly 38,000 malware samples. In A-V Comparatives' offline test, that detection number dropped slightly to 98.8 percent. SE Labs gave Avast a AAA rating, noting that it and AVG were the most effective free products. Avast and AVG did fail to stop five targeted attacks in SE Labs' tests.

During our benchmarks, Avast had no drop in performance. When we ran PCMark 8's Work Conventional test – a simulation of web browsing, video chat, word processing, and spreadsheet editing – without Avast running, our test PC netted a score of 2517. With Avast running, it got 2515, which is well within the standard margin of error.



Avast Internet Security's Data Shredder feature

In our more-punishing Handbrake test, our test PC typically takes one hour, 15 minutes, and 30 seconds to transcode a 3.8GB MKV file using the Android Tablet preset. With Avast installed the file took one hour, fifteen minutes, and five seconds.

We also looked at how Avast's Sensitive Data Shield performed, since that feature is likely to be intriguing to most users. It did a good job, though there were a high number of false positives. For example, it included many Word documents in the 'Employee documents' section likely because they were my old articles with company names in the title. Avast also inspected folders that weren't even on my PC via the Keybase.io desktop program for Windows. That is admittedly an edge case as Keybase is a niche program. Nevertheless, if you are a Keybase user, turn off the program before scanning for sensitive documents.

Verdict

Avast Premier is a very well-designed program with all kinds of extra features that will appeal to security conscious users looking for more than just antivirus protection. But if you don't mind the inconvenience, you can get an alternative that is almost equally as good for £10 less – Avast's £49.99 Internet Security product is easily supplemented with free software to replace Avast Premier's Data Shredder and Software Updater features.

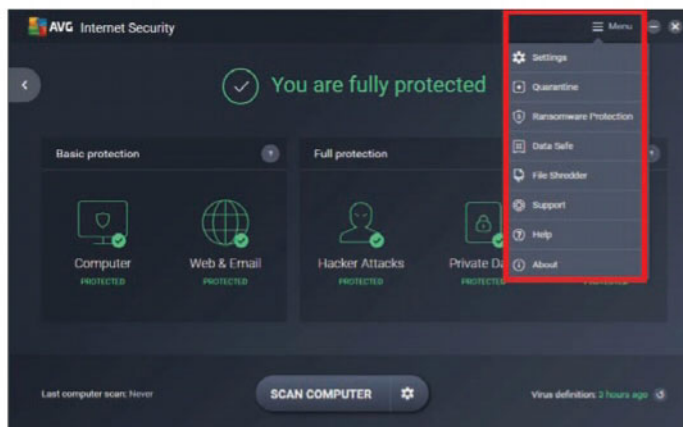
AVG Internet Security

Price: £49.99 from fave.co/2zZJEin

AVG has a big advantage in the free antivirus space since it owns both Avast and its homegrown product, AVG Free. The hope is you'll love the free stuff so much that you'll upgrade to one of its paid products.

In the case of AVG, most people go with its Internet Security program. Priced at £49.99, it's one step down from the company's flagship product, AVG Ultimate (£69.99 from fave.co/2zZJEin), and lacks a number of Ultimate's less crucial features. For example, you don't get AVG's PC tune up package or third-party desktop software updater. That's hardly a loss, though, as you can find free programs to dump cached folders taking up too much space or monitor software updates. The important security features are all included in the security suite, however, including antivirus, firewall, and phishing protection.

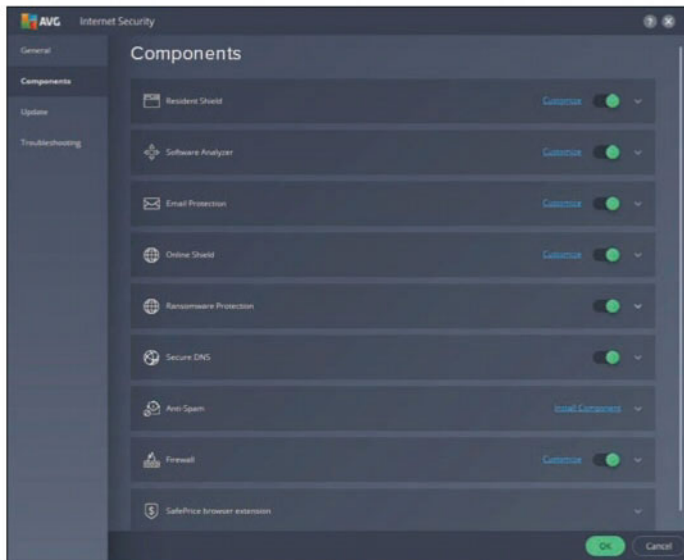
Unlike Avast, AVG opted not to include a password manager as part of its various security packages.



AVG Internet Security's primary dashboard and menu

Instead, you have to fork over an extra £10 per year to make that a part of your security set-up. That's not a bad price, though for a few pounds more you can get an annual subscription to LastPass.

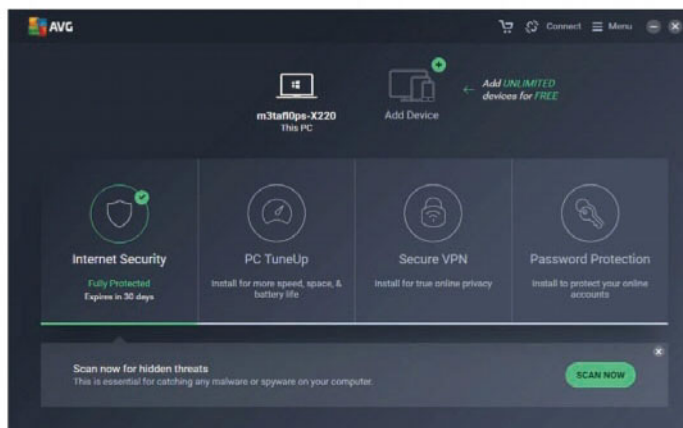
When you first open up AVG, it offers a similar aesthetic to its corporate counterpart Avast. The app largely has a grey background with bright green to highlight important information. You'll first see a status dashboard that lets you know which AVG security features are active. This dashboard is not intuitive, though. Almost nothing is clickable in the main part of the screen. To tweak most options, you have to click on the Menu hamburger icon at the top right of the window. There you can get into the nitty-gritty of the application's settings, including general options, controls for ransomware protection, a data safe (encrypted folders), and a file shredder feature that overwrites deleted data to make it harder to recover.



The Components settings

Overall, the settings could be better organized and made clearer. Most of the key settings you'll want to access, for example, are under Menu > Settings > Components. From there you can tweak your firewall and play with the spam scanning settings.

Reinforcing my point about organization is how the options are laid out. Each part of the component settings is hidden under a downward facing arrow. Click that arrow and you reveal each section's panel, but all you'll see is an explanation of the feature and an option to uninstall individual parts of the security suite. To actually get deeper into those firewall settings, you have to click the Customize link in each tile, which is never hidden.



AVG Internet Security's secondary dashboard

To access other options, you'll have to go back to the main dashboard. In the upper left hand corner is an arrow – when you click on it, it opens another window where you can add another device to your subscription, as well as download and subscribe to other AVG products such as PC TuneUp, Secure VPN, and Password Protection. This window is reminiscent of Norton Security.

AVG's overall interface is not a deal breaker, and once you get used to the logic of the application, it's not hard to navigate. However, during testing I often kept thinking about its Avast counterpart, which I found to be far more intuitive with items more readily accessible and not buried under a mountain of clicks.

One thing that AVG Internet Security does make very easy is the ability to scan your PC, as the Scan Computer button is the most prominent item on the primary dashboard.

Performance

Like many of the mainstream security programs, AVG got very high marks for antivirus and malware protection. A-V Test's August tests gave AVG 100 percent detection in its 0-day and malware tests. In A-V Comparatives' real-world protection test, meanwhile, AVG scored 100 percent as well with three false positives out of 329 samples.

When pitted against A-V Comparatives' malware protection test, AVG scored 99.8 percent in an online scan against nearly 38,000 samples and 98.8 percent offline.

SE Labs gave AVG an AAA rating, saying that both it and Avast were the most effective free software in its tests, but AVG did fail to detect five targeted attacks. All three organizations used the free versions of AVG's antivirus, which doesn't have the ransomware, firewall, or phishing protection.

AVG also did well in our performance benchmarks. When we ran PCMark 8's Work Conventional test (a simulation of everyday tasks like word processing, web browsing, and video chat), our initial score was 2521. With AVG running in the background, that score was 2524 – a tiny enough difference that the improvement could be chalked up to margin of error.

Our Handbrake test, which puts much more stress on a system, showed no significant performance dip. Our Windows 10 PC takes an average of one hour, 15 minutes, and 30 seconds to transcode a 3.8GB MKV file using the Android Tablet preset. With AVG installed, Handbrake transcoded the same file in one hour, 15 minutes, and 25 seconds.

Verdict

AVG Internet Security leaves a lot to be desired when it comes to app design, especially compared to Avast. Given that the same company owns both development teams, we hope to see some improvement. Nevertheless, AVG gets high marks for security, has enough features to satisfy most users, and doesn't drag on your performance.

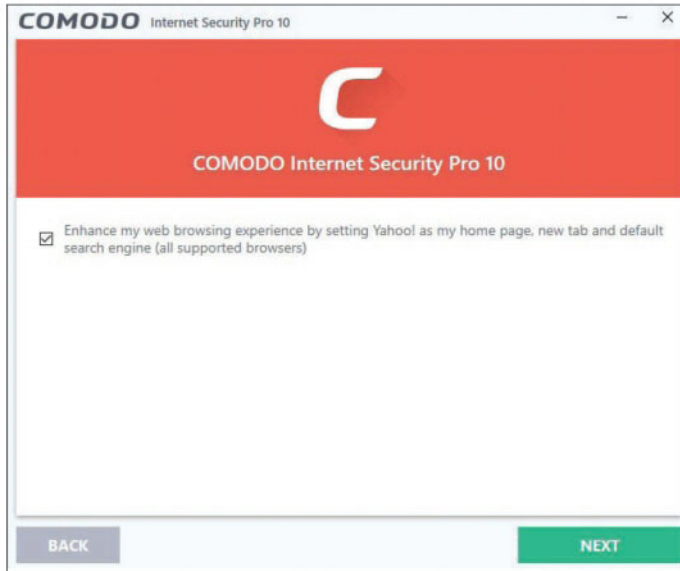
Comodo Internet Security Pro 10

Price: £39.99 from fave.co/2zZQepg

When we previously looked at Comodo's Internet Security Pro, the company had a habit of bundling software with its security suite – and that trend hasn't changed with Internet Security Pro 10. Underneath the hassle of warding off extra installs, however, is a security suite that does a good job of detecting threats.

When you install Internet Security Pro 10, you have to read every screen very carefully. If you don't, the program will attempt to set your browser's home page and search engine to Yahoo, change your DNS provider to Comodo (fave.co/2jcORvV), set Comodo Dragon (fave.co/2jaVXR6) as your default browser, and import all the data from your current default browser.

Certainly, some might like all that. Comodo Secure DNS is a popular choice among security enthusiasts who don't want to use their ISP's default service. Other security suites also route your DNS through their services. As for the browser, Comodo Dragon is a Chromium-based browser that some users might enjoy.



Comodo wants to change your default home page and search engine

But here's the thing: most people will click through the install screens without reading them, and software companies count on that. It's just unseemly. Plus, the attempt to switch your search engine and home page makes all the other extra software look hostile. This approach is just not a good idea, even when acknowledging that companies are trying to make a buck. There has to be a better way.

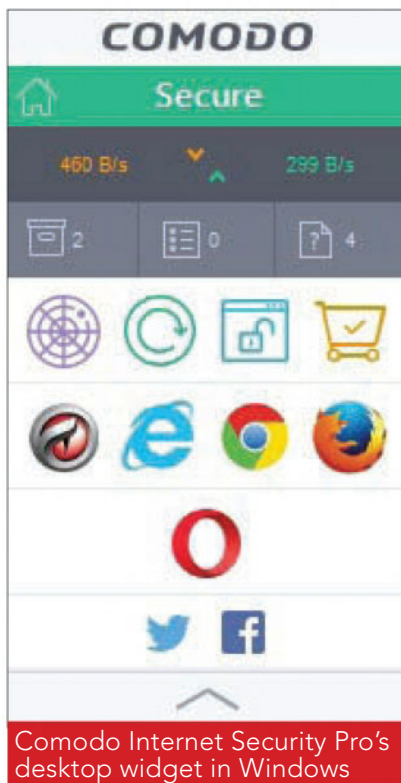
As for the app itself, Comodo Internet Security Pro has some nice features. Comodo's interface comes in three parts: the main application window, a widget that sits in the upper right corner of your desktop, and the system tray icon.

That's a lot, but you can close the main window and get rid of the widget quite easily, leaving only the system tray icon. The widget, though, might be appreciated by some users as it has easy access to Comodo's primary features.

At the very top there's a status icon telling you the state of your PC. (Before running your first scan, it's yellow.) Below that is a counter informing you of your current bandwidth usage for both up and down streams.

Then there's a mini-dashboard shows the status of Comodo's containment tasks (a feature that lets you run untrusted apps as well as browsers in a virtualized space); the number of tasks the security software is currently running; and a listing of suspect files. That last feature isn't particularly great, given that Comodo treated the EXE files for two common and popular services – CrashPlan and Slack – as suspect.

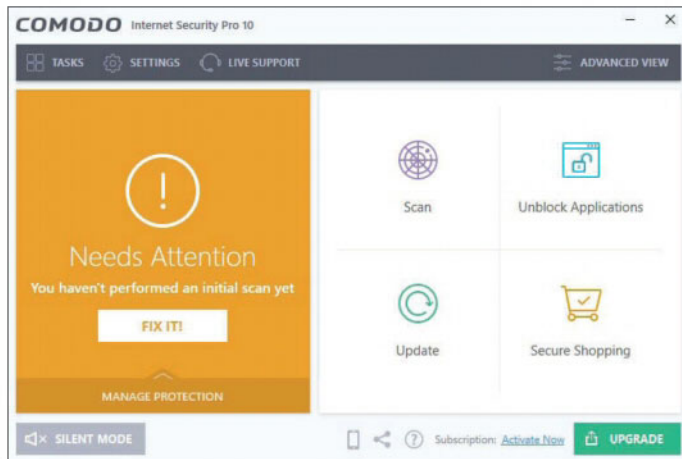
The widget also has quick access to Comodo's four basic operations: scan, unblock applications, update, and secure shopping. Finally, you'll see the symbols for all of your installed browsers if you're using any of



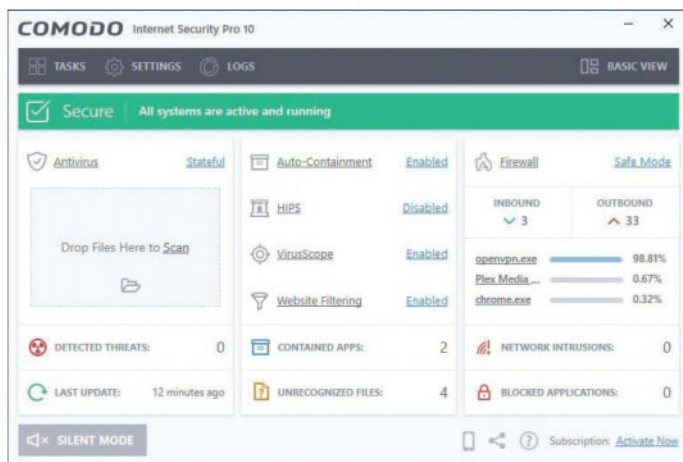
the big four: Internet Explorer, Chrome, Firefox, and Opera, plus Comodo Dragon. There isn't an icon for Edge on Windows 10 PCs.

If you open any of these browsers from the widget, they launch in a security container – one of those virtualized environments that are sandboxed from the rest of the PC. When you run a browser in one of these containers, the entire window will be outlined in green. Oddly, Edge has a tab inside the Internet Explorer container that is supposed to launch the newer browser. It doesn't work, however. As for other, lesser known browsers like Vivaldi, Comodo ignores them.

This containers feature is supposed to keep you more secure, and it does seem to be a fine feature. However, during one test, my PC became unusable after enabling Internet Explorer in a secure container. Comodo's secure shopping feature also inexplicably



Here's the basic view after first launch



Comodo Internet Security Pro 10's advanced view

ate up 25 percent of my CPU resources even though I hadn't activated it, and I had to restart my PC.

Comodo's main application is just a bigger version of the widget. It has the same four main options: scan, unblock applications, update, and secure shopping.

Scan opens a second window where you can choose carry out a full scan, quick scan, a 'rating scan' for commonly infected areas, or a customized scan. Unblock Applications is where you can re-enable any desktop programs that Comodo may have prevented from running. Update lets you manually check for new virus definitions. Secure Shopping, meanwhile, is a virtualized, sandboxed desktop environment where you can only access Windows File Explorer and a select number of installed browsers that launch in incognito mode. The idea is to create a secure space where you can do online shopping.

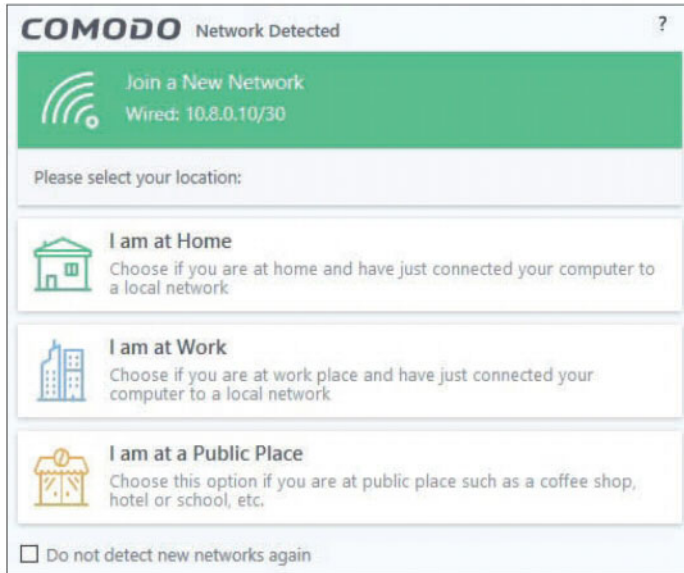
Overall, the basic look of Comodo Internet Security Pro is clean and easy to understand. If it's too basic, however, there's also an advanced view that provides a lot more at-a-glance data. It includes firewall details, a list of enabled services, blocked applications or network intrusions, and other information. Personally, I prefer the advanced view since it behaves like a security dashboard for your system. It also has a nice drag-and-drop area to scan files for viruses.

Performance

Comodo has a reputation for being something of a resource hog. That perception is less deserved these days, but we still found some truth to it.

During our first performance test, which checks how an antivirus program affects system resources during lighter tasks, Comodo held its own against the competition. When we fired up PCMark 8's Work Conventional benchmark, the synthetic simulation of word processing, spreadsheet editing, web browsing, and video chat churned out a score of 2507. After starting an antivirus scan, the second score for PCMark 8 was 2535 – ever so slightly within Comodo's favour, though not significant because the number falls within normal margin of error.

However, when we moved on to our more strenuous Handbrake benchmark, Comodo caused a notable drop in performance. On our test PC, Handbrake v0.9.9 typically takes an hour, 15 minutes, and 30 seconds to transcode a 3.8GB MKV file to MP4 using the Android Tablet preset. With Comodo running, that same file conversion took one hour, 41 minutes, and 31



Comodo's Wi-Fi connection assistant

seconds. That 34.4 percent increase in time is the worst Handbrake result of the suites we've tested so far.

As for virus detection, A-V Test rated Comodo's Internet Security Premium quite high, with 100 percent detection against real-world threats like malware attacks and web and email threats. Virus detection, meanwhile, was equally high at 99.9 percent. A-V Comparatives did not test Comodo's performance – the organization only tests security suites that are submitted to it by the vendor – nor did SE Labs.

Verdict

Comodo's antivirus and malware detection is fine, but it has some of the lowest-scoring benchmark performance

results we've seen so far. However, this program does have a very nice price of £39.99 per year for three devices. If you don't mind the slip in performance for resource-intensive operations, then Comodo is a fine choice. For those with mid-range PCs, however, you'd do well to look elsewhere.

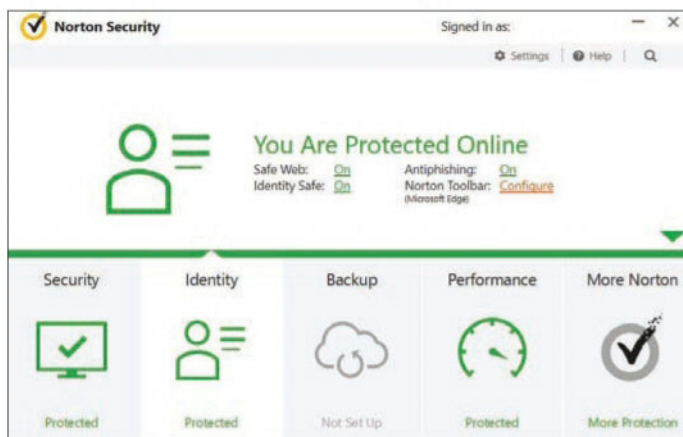
Norton Security Premium

Price: £39.99 from fave.co/2A0OEDw

Norton is one of the oldest names in PC security – and despite some ups and downs, it's still one of the best. Currently, Symantec offers several versions of its long-lived antivirus software: the current flagship product is Norton Security Premium, which costs £39.99 per year. Following that are Norton Deluxe (£24.99 per year from fave.co/2zZOLiC), Norton Security Standard (£19.99 per year from fave.co/2jbcODi), and Norton Antivirus Basic (£24.99 from fave.co/2jaZVsV).

This review covers the top dog among the set, Norton Security Premium. Downloading and installing it is simple enough, and the program doesn't try to add a lot to your system outside of the program itself. It does, however, encourage you to enable its own browser-based password manager once you're up and running.

One of its standout aspects is its unobtrusiveness. Outside of a small cluster of notifications when you first install it, the program doesn't inundate you with pop-ups. The interface is also clean and easy to use, though the settings for each category aren't immediately obvious. (You'll have to click on a downward-facing arrow on the far right side of the screen.)



The interface is clean and organized

Norton Premium's dashboard is divided into four main categories: Security, Identity, Backup, and Performance. There's also a fifth section that houses account management, access to extra features, and ads for more Norton services and apps. Like many antivirus programs, Norton Security uses a colour-coded scheme where green means you're protected, yellow means caution, and red means you're not protected.

The Security section is the most important section for PC users, as it houses the settings for regular PC scans. By default Norton will do a quick scan, but there are also options for full and customized scans. There's also a feature called Power Eraser that is supposed to eliminate 'difficult-to-detect threats'.

The Identity section, meanwhile is about protecting you. You'll find the anti-phishing settings here, as well as Norton's 'Identity Safe', which is the desktop version of the built-in password manager. Like other

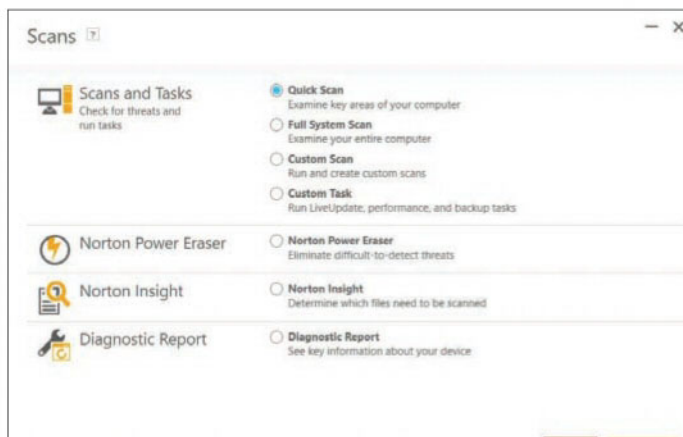
services, the safe can house your username, passwords, addresses, credit card information, and secure notes. Norton does have a nice tags feature to help you better organize your data, which you won't always find in all password managers.

Backup is where Norton lets you setup and manage the 25GB of free cloud storage that comes with the suite. You can use it to upload files or folders to Norton's servers via encrypted incremental backups. When you activate the feature, Norton monitors your documents, pictures, contacts, and other items by default. It will not, however, backup your videos by default or any email databases you may have.

Performance is the least useful of the categories, since its features are mostly redundant. You'll find options like a file cleanup utility, disk defragmenter, and a tool for restricting startup programs – all tools that come built into Windows. If you want to stop programs from starting up at boot, for example, the Task Manager in Windows 8.1 will work just fine. The Backup section does have a graph that details the current processor usage of Norton and Windows, as well as recent security events and alerts from Norton.

Performance

Norton Premium 22.9 received high marks from both A-V Test and A-V Comparatives for malware detection. In June, A-V Test threw 10,252 samples of malware at Norton and the software came back with a 99.9 percent detection rate. A-V Test also put Norton up against 202 samples of zero-day, web, and email threats for which Norton came back with a 100 percent rating.



Norton's security scans settings

A-V Comparatives got a similar result of 99.8 percent in March using nearly 38,000 samples. However, that was with an active Internet connection: offline, that detection rate fell to 86.8 percent. SE Labs, meanwhile, gave Norton a AAA rating.

Those are all great results. The only concerning aspect would perhaps be the offline detection rate, though you could ameliorate it with other tools such as Windows Defender periodic scanning or Malwarebytes.

Norton did not have an appreciable drain on resources. When we ran PCMark 8's Work Conventional benchmark, which simulates basic tasks like spreadsheet editing, web browsing, and video chat, our test PC scored 2538 without Norton installed. When we installed Norton Security Premium, started a full scan, and then ran PCMark 8 again, the second score was 2526. That's a drop of less than one percent and within the PCMark 8 benchmark's typical margin of error.



The built-in report card feature

We also didn't see any real difference in performance during our Handbrake test, which puts far more stress on a system. It took our test PC one hour, 15 minutes, and 30 seconds to transcode a 3.8GB MKV file. With Norton installed, the time was 22 seconds faster at 1:15:08.

Verdict

Norton is extremely user friendly and well organized, and it doesn't interfere too much with users' day-to-day activities. That last part is key since security applications work best when they stay out of your way. The software also has some handy extras, like the online backup and password manager that make it an all-in-one security suite.

You certainly have to pay for the privilege, however. Symantec will give you a really nice discount for your first year – 45 percent off – but don't be fooled, as

you'll ultimately be paying £39.99 for the privilege of running Norton Security Premium.

Windows Defender Security Centre

Price: Free with Windows 10

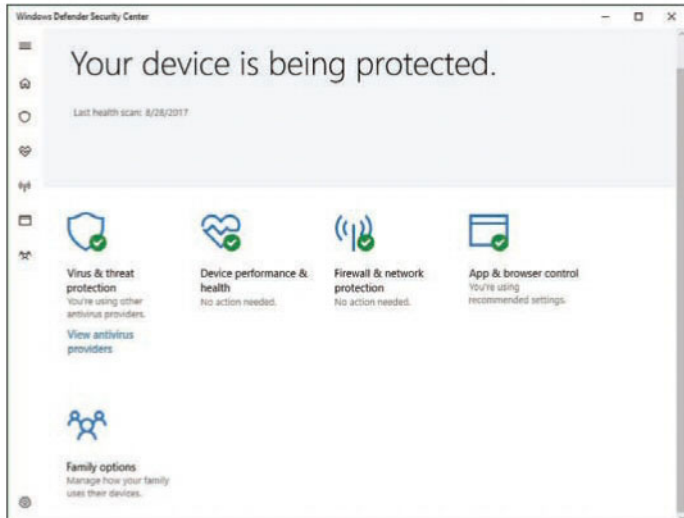
In 2006, Microsoft added built-in security software to Windows for the first time. Since then, it's appeared under various names, but currently it's known as Windows Defender Security Centre (WDSC). What started out as a basic antivirus detection feature has slowly grown into something that resembles a security suite. It doesn't have anything close to the features you'd see in a third-party suite, but it does a fair job at antivirus and malware scanning.

Briefly, however, WDSC has five sections: Virus & threat protection, Device performance & health, Firewall & network protection, App & browser control, and Family options.

The crucial section is Virus & threat protection. This is where you can manually start a full scan, enable real-time protection, or carry out an offline scan for removing particularly nasty bits of malware.

Device performance & health, meanwhile, just gives your PC a general health report card including Windows Update status, driver status, and so on. It does not report on any potential security weaknesses, short of lagging updates.

Firewall and network protection is fairly self-explanatory, while App & browser control houses all of your PC's SmartScreen settings for Edge, downloads, and the Windows Store.



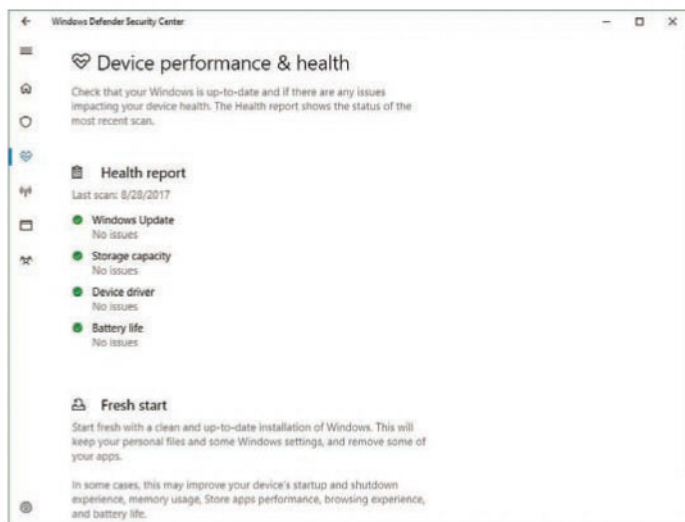
Windows Defender's primary dashboard

You can dive a little deeper into WDSC beyond this, but not by much. If I had to guess, Microsoft plans to expand its functionality over time, and right now we're just seeing the basic scaffolding being built. That's just speculation, however.

Performance

Windows Defender stacks up alright in anti-virus detection. A-V Test gave Defender a 99 percent detection rate for real-world testing against 0-day, web, and email threats. For run-of-the-mill malware, meanwhile, Defender scored very highly against more than 10,000 samples at 99.7 percent detection.

A-V Comparatives found a similarly high performance level for real-world protection, with about



Windows Defender's device performance and health report

nine false positives out of 329 test samples. SE Labs, for its part, gave Defender a AA overall rating in the period of April through June. (The highest that an antivirus can score with SE Labs is a AAA rating.) During its testing, Defender failed to protect against six targeted attacks and four web-based attacks.

As for the drain on your PC's resources, that's a little harder to measure than with third-party software. WDSC is built right into the operating system and starts up automatically. To counteract that, we turned off the entirety of Windows Defender (both the scanning tool and the overall program) using the registry. Then we fired up our first benchmark: PCMark 8's Work Conventional benchmark, which simulates everyday

tasks like video chatting, web browsing, and word processing, and recorded the score. Afterward, we switched WDSC back on and started a full system scan before running PCMark 8 again.

The results fell in line with the best third-party options: Windows Defender had no real effect on performance. Running Windows 10 with Defender off garnered a PCMark score of 2498. Once it was back on, the score went up to 2516 – right within the margin of error for PCMark 8 results.

That story also held true in our Handbrake performance benchmark, which puts far more strain on system resources. With Windows Defender turned off, we were able to transcode a 3.8GB MKV file on the Android Tablet preset in one hour, 14 minutes, and 21 seconds. With Windows Defender turned on, it took one hour, 15 minutes, and 30 seconds. That difference is so small it's insignificant.

Verdict

Windows Defender is a fine basic security solution. For advanced users who are hyper-aware about all the various threats out there, this free option might be enough if they also periodically scan their systems with something like the free version of Malwarebytes (fave.co/2zZIV1Z). The average user, however, should look for a more feature-rich third-party solution.

Best overall antivirus suite: **Norton Security Premium**

Norton Security Premium is an old name in security, but it has an easy-to-use interface, highly-rated protection,



and a number of helpful extra features. It's on the higher end of the price spectrum at £39.99 per year, but you can install it on up to 10 devices.

Best budget antivirus suite: **AVG Internet Security**

AVG Internet Security does an excellent job of protecting your PC, but its interface could be a lot better. Nevertheless, with unlimited installs for £49.99 per year, it's hard to beat this popular security solution.

How To: Play PC games on a TV

The Steam Link bridges the gulf between gaming on your computer and gaming on your couch. **SAMUEL AXON** reports



Windows may have the most robust library of games in the world, but many people enjoy playing games in the living room – yes, even PC gamers. Valve, the company behind Steam, helps its users cross the bridge between computers and couches with the Steam Link (£29.92 from fave.co/2zYlnth),

a diminutive set-top box that streams games from your gaming PC straight to your TV.

We'll go over how to set it up, but first, let's take note of a few key considerations.

Input devices and controller support

The Steam Link supports a number of input devices. They include USB-based or wireless-with-a-USB-dongle keyboards or mice, Xbox 360 or Xbox One controllers connected via USB (wireless dongles are technically possible but require a lot of workarounds and hassle), a PlayStation 4 controller connected via USB, or Valve's own wireless Steam Controller.

All the USB devices are very easy – just plug them in, and they should work right away. If you're using a Steam Controller, you'll have to sync it. To do this:

- First turn on your Steam Link
- While holding down the X button on the Steam Controller, press the Steam button to put it into discovery and pairing mode
- It should work straight from there

Wired versus wireless

Valve recommends connecting both your Steam Link and your host machine with a wired ethernet connection. Why? Well, streaming high-resolution games at 60 frames per second is one of the most taxing things you can do on a network connection. And since the games are interactive, you could very easily encounter game death-ensuing stutters or other issues with the slightest hiccup.



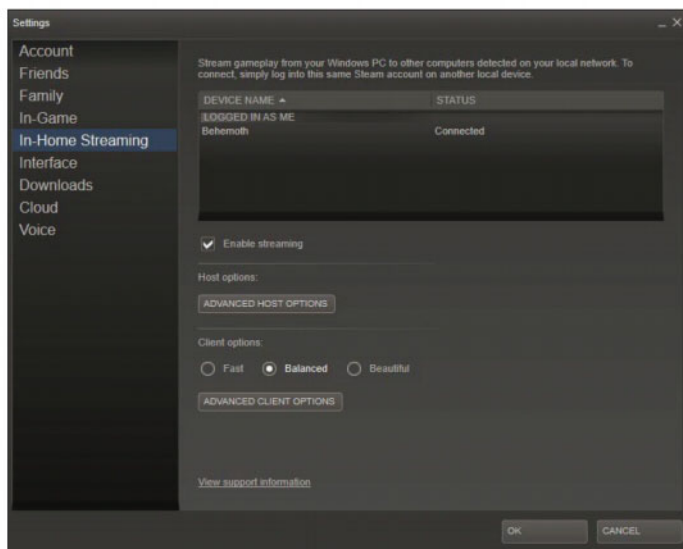
The Steam Link's physical connections include an ethernet port

Wireless connections are better than they've ever been, but they're still subject to interference from other wireless signals, as well as signal degradation over long distances or going through walls and furniture. If you have an ideal scenario, Wi-Fi will be fine for the Steam Link – but most of us don't.

Use a wired connection if you can. But if it's not possible, troubleshoot your network and you might be able to improve your circumstances well enough to play. It helps to use a 5GHz network, too. Just note that your Internet connection speed is irrelevant since Steam Link only streams games from PCs on your local network.

Set up your PC

Chances are, your PC is good to go right off the bat. Just make sure it's on, connected with a stable local



The in-home streaming interface inside the Steam PC client

network connection, and running Steam. But if you have any issues, go to Steam preferences and verify that Enable streaming is checked in the In-Home Streaming section. You'll see some other settings here too, but we'll tweak most of those on the Steam Link itself.

Set up the Steam Link on your TV

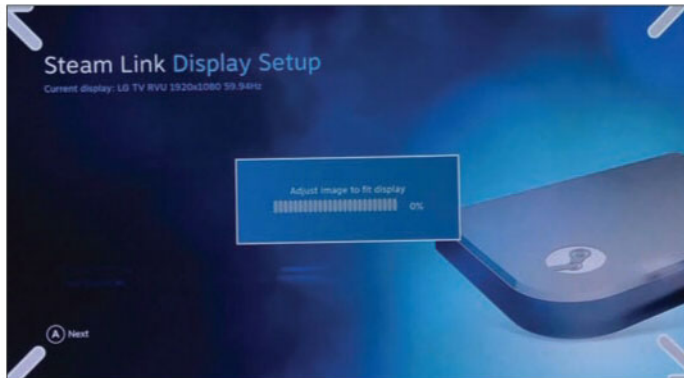
This part's really easy. The Steam Link comes with a power cable, an ethernet network cable, and an HDMI cable. Plug the power cable into the wall, the HDMI cable into your TV, and if possible, the ethernet cable into your network router. You can also connect it to the network with Wi-Fi, as previously discussed. When you've plugged everything in and powered up your

Steam Link, you'll be taken through an easy, step-by-step process for configuring it. If you're connected over ethernet, it may automatically download an update first, though – let it, if so. After that, you may be prompted to pick your language. Easy enough; pick the language of your choice.

Set up the display

The Steam Link will now run you through two screens where you'll have to configure your display settings.

In one, you'll be asked to set the screen scaling to make sure the entirety of the image is visible on your TV. If you've connected a controller, you can use left and right on the directional pad to set this.



In another screen, you'll be presented with some basic settings: scaling, resolution, and CEC. Leave scaling at 0 percent in most cases, and pick the resolution and Hz refresh that best matches your TV. Sometimes you'll even see this automatically recognized at the top of the screen, as seen in the

below screenshot. But other times, you just have to know what your TV can support. Chances are it's the highest setting listed in the menu.



CEC is a feature on some TVs that lets you to control multiple devices connected to your TV with the same controller. If you don't need this, leave it off. But if you have thought through how to set up a whole CEC scenario, keep it enabled.

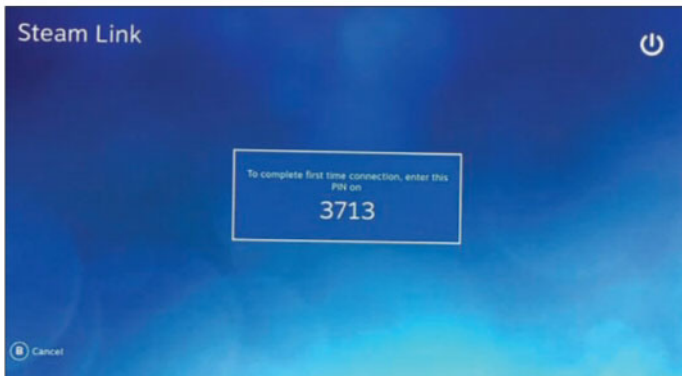
Pick and connect your host PC

Your Steam Link will now try to automatically detect available PCs that are running Steam. If everything's set up on your PC, it should appear on the menu and you just have to hit a button ('A' on most controllers) to proceed. If it's not listed, you'll have to search for it ('Y' on most controllers). If you search, you'll be prompted for information that will help the Steam Link find your PC, like its host name or IP address.

Once you've selected your host, the Steam Link will show a four-digit PIN number that you need to



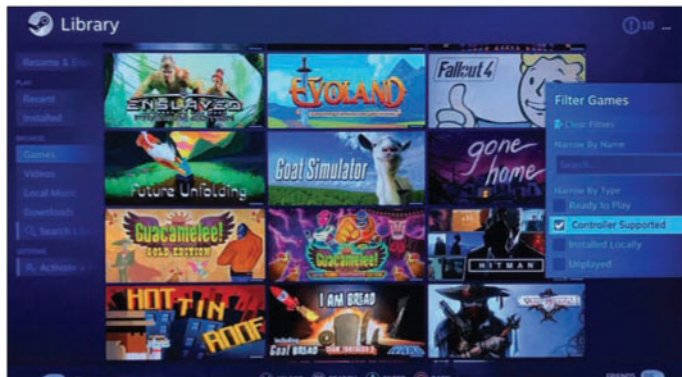
enter on the host PC to confirm the connection. Look at your host PC, and you should see that a prompt has appeared asking for the code. Type it in and you're set. From here, you'll be taken to the main menu.



Stream games from your PC to Steam Link

From this point, you're home free. Just load up your 'Library' and look at the list of games. You can remotely install games to your PC from your purchased games library here. If you're using a gamepad, you can press

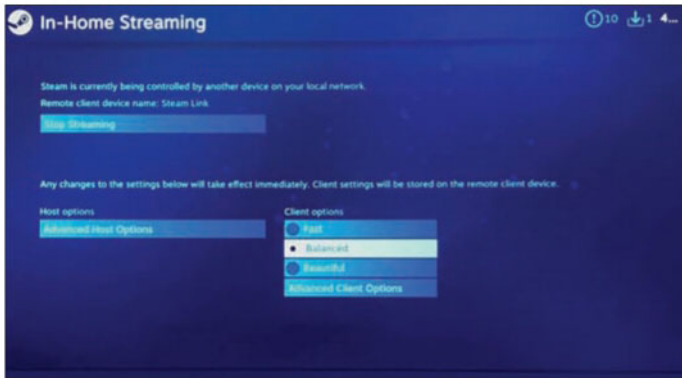
a designated button to apply a filter ('Y' on the Xbox controllers, triangle on the PlayStation 4 controller, and so on – it's listed at the bottom of the screen). This is helpful for identifying which games support the gamepad and thus are easily playable on your TV.



There are a few settings you should know about, too. In In-Home Streaming on your Steam Link, you can pick from three quality presets – Fast, Balanced, and Beautiful – or you can more finely tweak the settings that affect quality and consistency of the image. If you're on an ethernet connection, the maximum settings will probably work. If you're on Wi-Fi, you may spend some time adjusting these options.

The process should be pretty straightforward, but be sure to check out Valve's guides to Steam Link network settings and network troubleshooting if you run into any trouble.

Remember that the Steam Link only streams actual gameplay from your PC, so you may need to upgrade your graphics card if you want to crank up graphics



quality without sacrificing frame rate. If your gaming PC can't play a game at Ultra settings, your Steam Link won't either. Steam Link won't magically make your games any smoother.

That's it. It might take some tweaking, depending on your network conditions, but you should be playing Steam games on your TV before long.

