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REDESIGN ISSUE

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ISSUE 100 MARCH 2020 f TECHLIFER t TECHLIFER v APPLE NEWSSTAND & GOOGLE PLAY

EXPERT ADVICE

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& HOW TO REPAIR AN OLD ONE

MAKE A NEW PC RUN EVEN FASTER WITH OUR GUIDE TO TRIMMING PRE-INSTALLED BLOATWARE!

PLUS: HOW TO KEEP YOUR OLD PC RUNNING SMOOTH!

Reviewed
Beats Solo Pro headphones
Our new favourite set of cans!

Page 022
Australia's NBN: tech disaster of the century?

What - and who - broke our broadband network

Page 070
Is VR worth it yet?

The state of Virtual Reality in 2020

Page 076
Quantum computing

What is it, and what can it really do?

FUTURE

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Vigor2862Vac

32x
VPN

- VDSL2/ADSL2+, 1 x configurable GbE WAN/LAN port, dual USB ports for failover and load-balancing
- Two USB 2.0 ports for connection to two 3.5G/4G LTE USB mobiles, FTP server and network printer
- 4 x Gigabit LAN ports with multiple subnets and 50,000 NAT sessions
- Integrated IEEE 802.11ac (AC2000) wireless Access Point; dual band; up to 1.7Gbps throughput
- IPv6 & IPv4
- Increased IP addresses (1022) and IP subnets (8)

- VoIP (2 x FXS and 1 x FXO Line Port) for Vigor2862Vac
- Object-based SPI Firewall and CSM (Content Security Management) for network security
- 16 x VLANs for secure and efficient workgroup management
- 32 x VPN tunnels (including 16 x SSL VPN tunnels) with Load Balance and Redundancy
- Fast VPN throughput, VPN load-balancing and backup for site-to-site applications
- High Availability mode
- Embedded Central VPN Management for 8 remote Vigor routers
- Central AP Management for deployment of multiple wireless VigorAPs
- Works with Smart Monitor Network Traffic Analyzer (30-nodes)
- Works with VigorACS 2 Central Management for multi-site deployment

Vigor2762 Series

VDSL2/ADSL2+ router with 1 x configurable GbE WAN/LAN port, 3 x GbE LAN ports, SPI Firewall, 802.11ac Wi-Fi, and 2 x VPN tunnels including 2 x SSL-VPN



Vigor2762Vac

2x
VPN

- 1 x VDSL2/ADSL2+ WAN port
- 1 x configurable GbE WAN/LAN port
- 3 x GbE LAN ports with 50,000 NAT sessions
- 2 x USB ports for 3G/4G LTE mobile broadband access, USB printer and storage
- VDSL2 vectoring
- IPv6 & IPv4
- Object-based SPI Firewall, CSM (Content Security Management) and QoS for network security
- 2 x VPN tunnels including 2 x SSL-VPN tunnels
- Integrated IEEE 802.11ac (AC1200) wireless Access Point
- SIP VoIP (2 x FXS ports)
- Works with VigorACS 2 (Central Management System)

VigorNIC 132F

VDSL2/ADSL2+ PCI Express NIC with SPI Firewall and SFP secondary WAN port



- 1 x VDSL2/ADSL2+ WAN port
- 1 x SFP port for optic fibre or UTP interface module
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- VigorACS 2 management system

Vigor130

VDSL2/ADSL2+ modem/router



- 1 x VDSL2/ADSL2+ WAN port
- 1 x Gigabit Ethernet LAN port
- VDSL2 vectoring
- Bridging for VDSL2 and ADSL2+
- Object-oriented SPI Firewall
- IPv6 & IPv4
- Works with VigorACS 2 management system

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WELCOME

A few words from the boss...

New design...

Who dis?

Hitting the 100th issue of any magazine is always a big milestone, and it's a great chance to sit back and take stock of where we're at. Looking back at the last 100 issues, it feels like the right time to refresh the design and feel of the magazine, so that we can charge into the next 100 issues looking trim and feeling fit, as it were!

We're still very much the same *TechLife* you know, just looking a little sharper and, I hope, a little easier to read. As part of our redesign, we've paid close attention to legibility and readability, and I think we've ticked those boxes, too. On top of that, we've shuffled a few things around to try and improve the flow of content as you read it.

Speaking of content, though, it's also a good chance to call out to you, our loyal readers, to find out what sections really work for you or the ones that you skip over. We try to cover a broad range of technology topics each issue, from apps to games, smartphones to laptops, cameras and handy software, as well as helping you discover the best ways to use and take full advantage of the full range of tech toys that you can find around the modern home, or on the modern individual. So please, get in touch david.hollingworth@futurenet.com and tell me what you want to see more of in *TechLife* in the coming issues.

David Hollingworth, Editor

“
Get in touch –
tell me what you
want to see more
of in *TechLife* in
the coming
issues.”



CONTENTS

Inside this issue of TechLife

54



EXPERT ADVICE

WHAT TO DO WITH A NEW PC

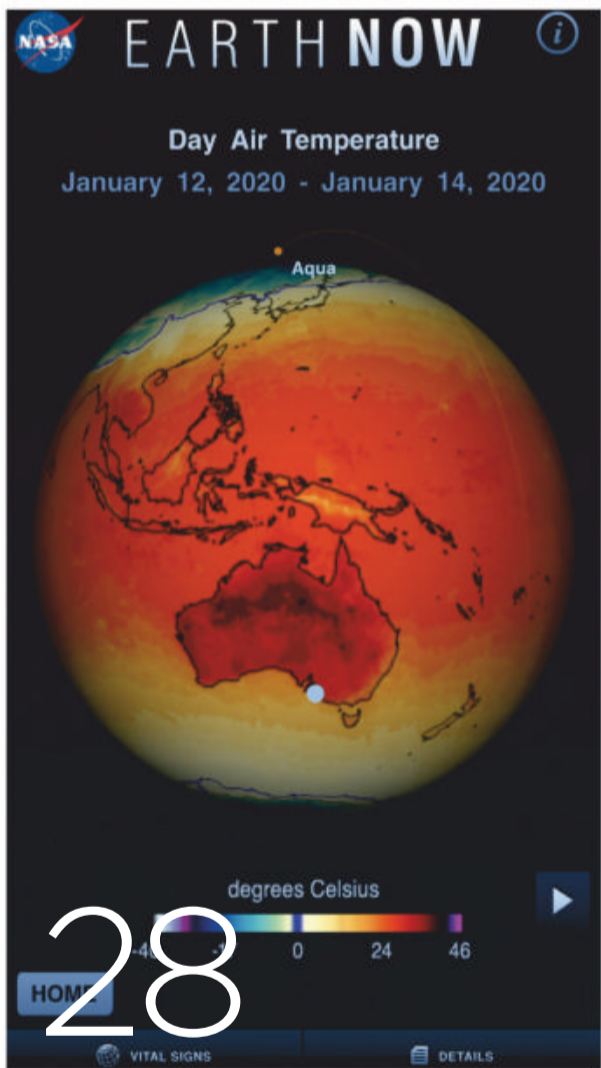
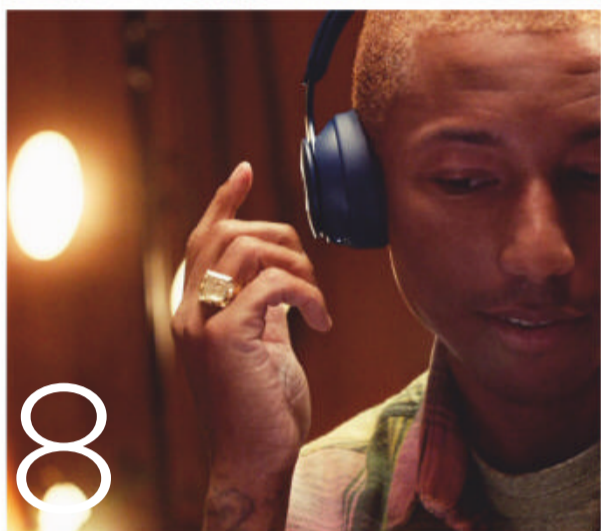
& HOW TO REPAIR AN OLD ONE

MAKE A NEW PC RUN EVEN FASTER WITH OUR GUIDE TO TRIMMING PRE-INSTALLED BLOATWARE! **PLUS:** HOW TO KEEP YOUR OLD PC RUNNING SMOOTH!

76

Quantum computers

A new generation of number-crunchers are harnessing the power of particles: how will these super-fast computers change our world?



- Intro
- 003** Editorial
- Hotspot
- 008** Beats Solo Pro
- 010** Essential tech news
- 012** Report: The best of CES
- 014** Pop science
- 016** Razer Viper Ultimate
- 017** Everybody's talking 'bout...
- 018** News in Numbers
- 020** Samsung Q950R 8K
- Discover
- 026** Emerging Tech
- 028** New apps for every platform
- 030** Game News
- 032** PC & console game reviews
- 034** Mobile game reviews
- 038** CES 2020 for gamers
- Test Bench
- 042** Dell Inspiron 13 7000
- 044** Philips Hue Play HDMI Sync Box
- 046** Nvidia Shield (2019)
- 047** Amazfit GTR
- 048** Black Eye Pro Kit G4
- 049** F-Secure Sense
- 050** Samsung RU8000
- 051** Bowers & Wilkins PX7
- 051** Rode VideoMic NTG
- Bargain Hunter
- 052** Best free text-to-speech software
- Features
- 022** Who killed the NBN?
- 070** The state of VR
- 076** Quantum computers
- Help Station
- 084** Your questions answered
- 088** Make the most of File Explorer
- 092** Print an amazing photo book
- 094** Tame Siri and Search
- 096** Understanding port forwarding
- 098** Run your own game server
- 100** Build a website with Wordpress
- 104** Shoot studio-style pet portraits
- 106** Add drama with monochrome
- Buyer's Guide
- 109** The best tech products
- The back page
- 114** Ridiculous tech

DOWNLOADS

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makes it easy to
install, test and
uninstall
applications.”



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clear the
download list,
remove all
cookies, clear the
cache, clear saved
form data, and
forget saved
passwords.”

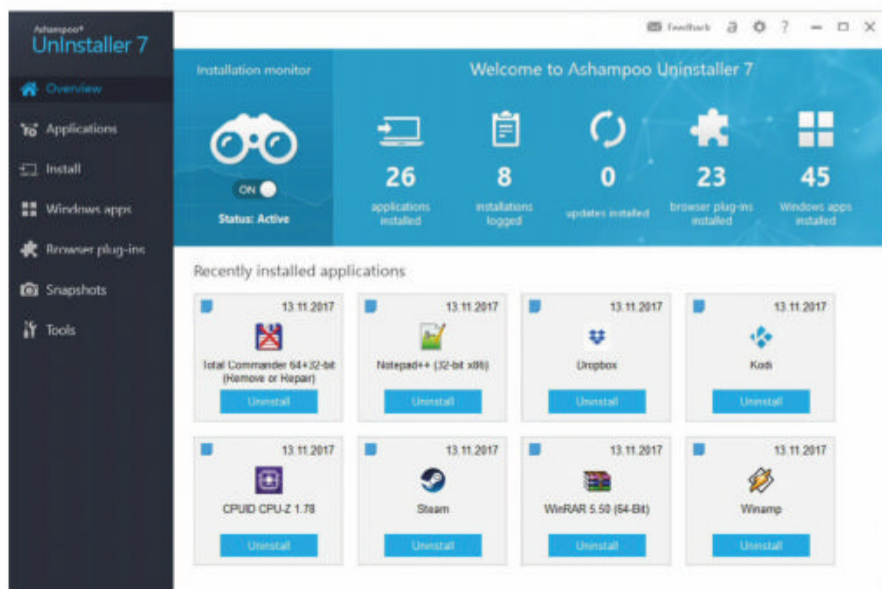
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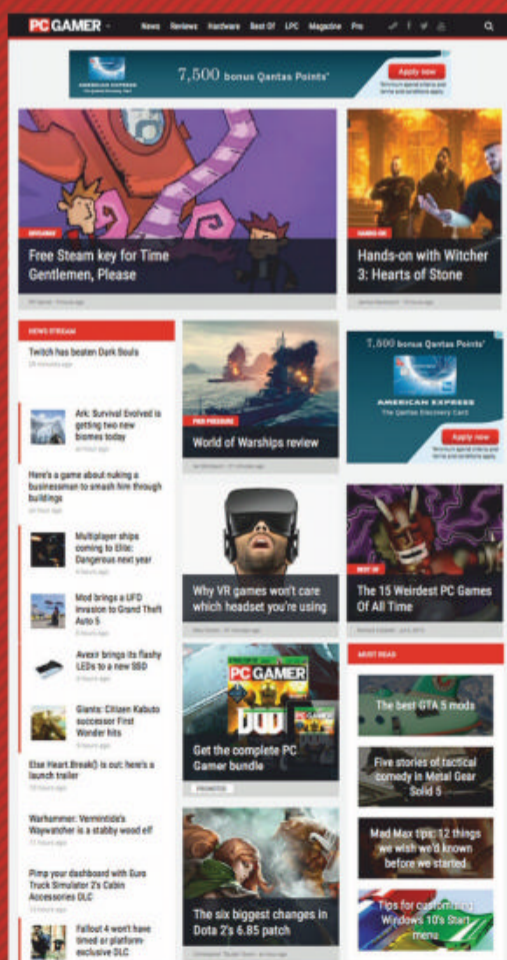
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HOTSPOT

Your guide to hot new tech



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When it comes to sound and build quality, many audiophiles have been quick to dismiss Beats products

Beats Solo Pro

Beats' on-ear Solo line gets a 'Pure ANC' upgrade.

The Beats Solo Pro could well be a turning point in the Apple-owned headphone company's journey. While these are still unmistakably Beats headphones, the designers of these new over-ear cans have made some surprising tweaks to the brand's normally bass-heavy sound profile, and the hardware has incorporated some notable improvements in terms of build quality.

Beats iconic and instantly recognisable designs long ago turned it into the world's most

fashionable headphone brand, with a huge variety of colors and styles making it easy for anyone to find a set of cans that suits their own personal style. To borrow a quote from Eminem in the magnificent Dr. Dre and Jimmy Iovine-themed series *The Defiant Ones*, Beats really are "the Jordans of headphones."

Of course, there's obviously much more to headphones than how they look. When it comes to sound and build quality, many audiophiles have been quick to

dismiss Beats products – this despite the fact that the audio company has made significant strides in both areas since being purchased by Apple back in 2014.

Beats Solo 3 Wireless were the first headphones the company released after the acquisition. While those incorporated many technological improvements over the previous Beats Solo 2 Wireless on-ear cans – particularly, some top-notch

wireless connectivity via Apple's W1 chip – their questionable durability and focus on heavy bass at the expense of the mid range still turned many people off.

Design

The first thing you're likely to notice about the Beats Solo Pro is how striking and sophisticated they look, with hidden seams, a matte finish and a single color motif bringing the cans a distinctly minimalist design aesthetic. In terms of colors, Beats Solo Pro are available in Black, Ivory, Gray, Dark Blue, Light Blue and a very striking Red, which is what we reviewed.

The Solo Pro's strong anodised aluminum side arms also slide out of the headband in a much more discrete way now, avoiding the exposed metal sections that appeared mid-band when extending previous Beats 'bands.

Apart from bringing a slight flimsiness to earlier models, the old extendable arm method was also responsible for breaking up the headband's sleek silhouette and 'one piece' illusion. Of course, there are still hinges in the headband, allowing you to fold and stow the Solo Pro's in their accompanying faux felt pouch (which is actually made almost entirely of recycled plastic).

Apple's done a great job when it comes to comfort, with the Solo Pro's redesigned ear cups offering more density in their cushioning (35%, according to Apple) for a more comfortable fit. A tighter seal on your ear also provides a decent amount of passive noise isolation, while helping reduce sound leakage.

The headband itself is still quite firm and can apply a fair bit of pressure on your head after an extended period of use. Those who wear glasses should definitely try these in store before committing – one glasses-wearing *TechLife* staffer who tested these found their ears getting sore around the one-hour usage mark.

Sound quality and connectivity

Beats headphones are often criticised for heavily skewing towards fans of bass-heavy music (like hip-hop and EDM) while leaving mids and highs sounding a little flat and muddled in the process.

Apple's said its taken those criticisms to heart, and has deliberately re-engineered the Solo Pro's acoustics from the ground up to provide a more balanced audio profile.

That famous punchy bass is still there, but it's now accompanied by exceptionally warm mids and clean highs, meaning that vocals sound more emotive and instrumentals offer more resonance.

Not all of that comes from changes to drivers or EQ tuning either. Some of that improvement comes from the redesigned ear cups we mentioned earlier, with their greater density said to help significantly reduce total harmonic distortion (THD) across the frequency curve, making Beats Solo Pro more suited to all genres of music.

Battery life and noise cancelling

While Jabra's Elite 85h headphones currently hold the battery life crown for wireless headphones with ANC (36 hours with ANC, 41 hours without), Beats' Solo Pro aren't far behind, offering an impressive 40 hours of listening time from a full charge with noise cancelling and transparency switched off. Turn both of those features on, however, and battery life drops by half to around 22 hours of listening time.

In terms of noise cancelling performance, Beats Solo Pro

handles itself remarkably well for a pair of on-ear headphones. While the cushioning on each cup is unlikely to cover your entire ear, it does achieve a fairly decent seal over your ear canals, significantly reducing the amount of outside noise that gets in while also ensuring that sound leakage is

kept to a minimum.

While impressive for on-ear cans, Beats Solo Pro's ANC performance doesn't quite reach the heights of Sony's class-leading WH-1000XM3 headphones, as they're unable to completely drown out some of annoyingly loud voices that you'll regularly hear on public transport (or, if you're unlucky, the office). Also, we've found that the Solo Pro's noise cancelling was unable to successfully filter out the whistling noise that can occur on particularly windy days.

Verdict

As with their forebears, when it comes to style and design the Beats Solo Pro remain unrivalled in the headphones space. We love the choice of available colors (some of which were handpicked by none other than music superstar Pharrell Williams) and the headphones' classy matte finish.

Adding new features like Pure ANC on top of that easily makes this the most well-rounded and capable set of Beats on- or over-ear headphones in years – and ones that are, without doubt, an important turning point for the audio company.

★★★★★

Bright, colourful, and with a sound quality and feature-set that – quite simply – cannot be beat.

Stephen Lambrechts



“

The first thing you're likely to notice about the Beats Solo Pro is how striking and sophisticated they look.

HOT SPOT

What you need to know

Saudi Arabia reportedly hacked Jeff Bezos' phone

Amazon's CEO and founder reportedly had his phone hacked back in 2018 after receiving a WhatsApp message sent from the personal account of the crown prince of Saudi Arabia. Following digital forensic analysis, it is believed the encrypted message, sent from Mohammed bin Salman's phone number, included a malicious file that was able to infiltrate Bezos' smartphone. It is "highly probable" that the hack was triggered by an infected video file sent from the crown prince to Bezos.

German government paying thousands to keep using Windows 7

The German government isn't the only one paying a large sum to have its remaining Windows 7 machines covered by the ESU program as a report has revealed that Ireland's Health Service Executive will pay 1.1m Euro in 2020 and 2021 for security updates for 46,000 computers. The German government began the process of migrating to Windows 10 in 2018, according to a report from the German newspaper *Handelsblatt*.

WhatsApp dark mode is finally available for beta testing

It's been an extremely long time coming, but WhatsApp dark mode is finally available for beta testing on Android. The new option, discovered by WABetaInfo, is available to all users (not just those running Android 10, as we'd initially feared) and replaces the app's usual white and teal design with shades of dark gray.

Microsoft customer support database exposed online

Exposure was the result of misconfigured Azure security rules.

Microsoft has disclosed a security breach where an internal customer support database was exposed online in the last month of 2019.

The software giant provided further details on the security breach in a blog post in which it said that the database was storing anonymised user analytics and was accidentally exposed online between December 5 and December 31.

Security researcher at Security Discovery, Bob Diachenko first discovered the database and reported it to Microsoft. The company quickly secured the exposed database on the

same day he reported the issue, despite the fact that he did so on New Year's Eve.

According to Diachenko, the customer support database contained a cluster of five Elasticsearch servers that are used to help simplify search operations. All five servers stored the same data as they appear to be mirrors of each other.

According to the company, the accidental server exposure was the result of misconfigured Azure security rules it deployed on December 5 which have now been fixed.



The Witcher is officially getting an anime movie on Netflix

The Witcher: Nightmare of the Wolf is confirmed.

The movie is real, and it's coming from The *Legend of Korra* creators at Studio Mir. The timing of the film's release hasn't been disclosed, though.

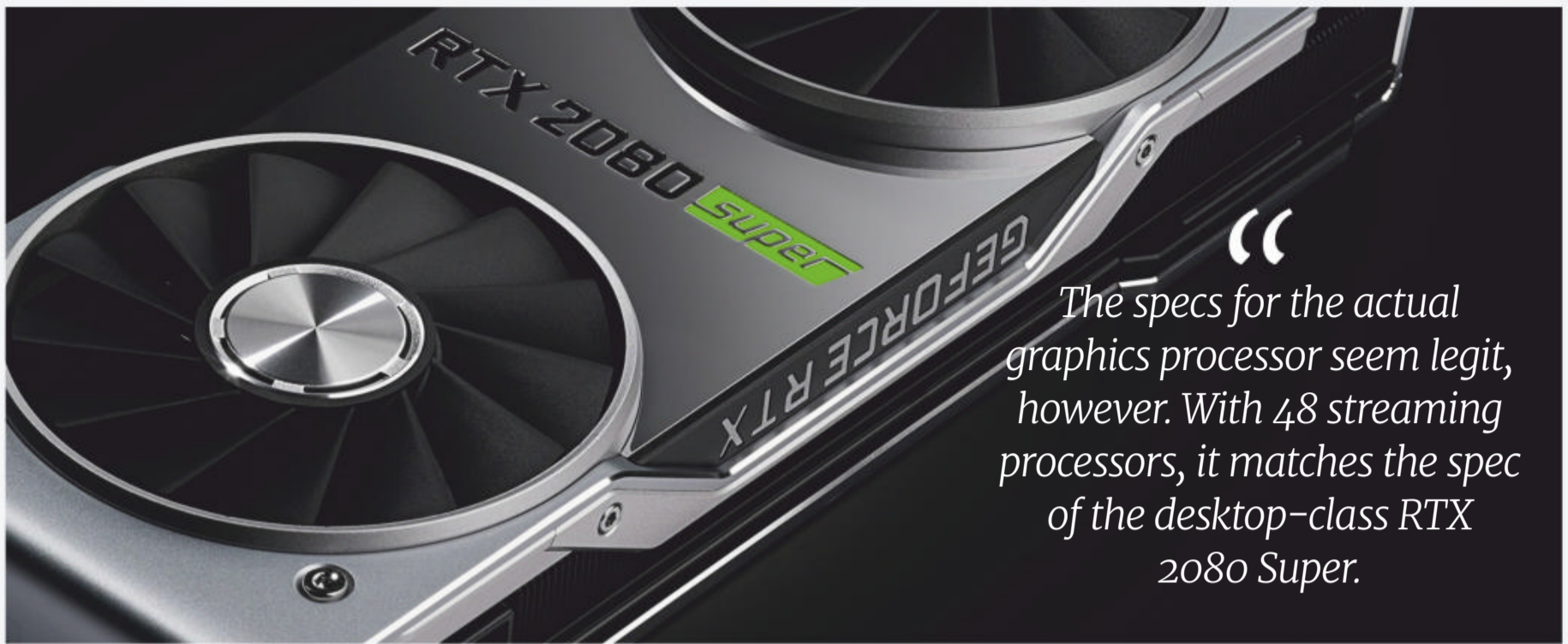
A film title called *The Witcher: Nightmare of the Wolf* was listed on the WGA site on January 10, with a writing credit for Beau DeMayo: a writer on the Netflix show who scripted the third episode on the series.

That was the extent of the details, until Netflix released a confirmation.

"The rumors are true, a new Witcher story is in the works! The anime film, *The Witcher:*

Nightmare of the Wolf, will take us back to a new threat facing the Continent. Brought to you by the Witcher team @LHissrich and @BeauDeMayo, and Studio Mir the studio behind *Legend of Korra*."

That's the extent of the details, other than the fact it's based on *The Witcher* books by Andrzej Sapkowski, but it gets more interesting when you consider that rumors of a *Witcher* animated project – to tide fans over between seasons of the live-action show – have been circulating since September.



“
The specs for the actual graphics processor seem legit, however. With 48 streaming processors, it matches the spec of the desktop-class RTX 2080 Super.”

Nvidia could be striking back at AMD with rumored RTX 2080 Super-equipped laptops

Get ready for some Super gaming laptops.

At CES 2020, AMD came out swinging with a group of GPUs, like the Radeon RX 5700M, for laptops that should see it compete in the portable market for the first time in years. However, Nvidia's not going to take that lying down.

We've seen a leaked Geekbench result (which you can have a look at here, if you're interested – browser.geekbench.com/v4/compute/4704729), spotted by renowned leaker Tum Apisak, that suggests that we'll be getting a Max-Q Nvidia GeForce RTX 2080 Super in the near future – however there are some details that are suspect.

The specs reported in the Geekbench leak are a little fishy, which we'll get into later, but it could just be due to early drivers and misreported system information. This isn't the first time we've heard rumors suggesting that Nvidia could be working on a GeForce RTX Super mobility lineup, so this just helps paint a picture of what the lineup could look like.

At the end of the day, we won't know whether or not these leaks are accurate until Nvidia deems it

necessary to actually announce its Super Mobility lineup – if it ever does. Until then, all we can do is take these leaks and tear them apart to see what we can potentially learn.

Getting our hands dirty
The Nvidia GeForce RTX 2080 Super Max-Q appears in a laptop equipped with an Intel Core i9-10980HK. But, the 10980HK in this Geekbench result only has a maximum frequency of 4.92GHz, short of the 5GHz promised at CES 2020. We did see a leak from Tum Apisak earlier that suggested that the maximum frequency is 4.8GHz, so the sample in this leak is the slowest one we've seen – which suggests it may not be real.

The specs for the actual graphics processor seem legit, however. With 48 streaming processors, it matches the spec of the desktop-class RTX 2080 Super. Clock speeds see a massive dip, however, which is to be expected: down to 1.23GHz boost from the 1.815GHz that the desktop card features.

That's only to be expected – because of the power constraints of the thin-and-light gaming

laptops that Max-Q graphics are found in, GPUs simply cannot reach the same clock speeds, and thus result in lower performance overall.

If this mobile GPU is actually real, it should lead to improved performance over the vanilla RTX 2080, though if it mirrors the bump seen when we moved from the RTX 2080 to the RTX 2080 Super on the desktop side, it'll be a very minor upgrade.

Until Nvidia actually details what the RTX 2080 Super Max-Q can do (if it actually exists), we're just going to have to keep digging into these leaks. As it stands, because today's information features hardware that's either unannounced or is announced with no specific specs, it's hard to actually trust these leaks.

Either way, because the RTX 2080 Super was such a slight upgrade over the original card when it launched back in July 2019, if you're looking to buy a high-end gaming laptop, we'd just jump on it now. If real, the RTX 2080 Super will be faster, but it likely won't be so much faster that waiting a few months will be worth it. **TL**

HOTSPOT

CES 2020 Report

CES 2020 Top Five

Our favourite and weirdest pieces of ultra-new tech - straight from the show floor!

As many counted down to the beginning of the new decade, for some of us the countdown continued until the 5th of January – when CES 2020 would begin. CES signifies the beginning of a new year with over 4,000 companies converging on Las Vegas to wow the world with their new products and services. While during prior years IoT represented the Internet of Things, in 2020 and beyond it will be – apparently – all about the Intelligence of Things. We're expecting more from our devices and it's time they think a little for themselves. Here are the highlights from the show floor.



LG Washing Machine and Dryer

It's certainly taken a while, but the laundry is finally receiving a tech update. LG has learned that we're all using the standard wash function on our machines, regardless of the fabrics we're cleaning. And that we are also using too much detergent in general. To fix this the new washer and dryer from LG will detect the fabrics you place into the machine, weigh the total mass and use a large detergent storage bin to dispense the appropriate amount. This means that our clothes will likely last longer, look better and cost us less to clean. When the load is ready, you'll be notified on your smartphone or TV, and the dryer will already be set appropriately for what's to come.

Appliances now talk to one another and provide real intelligence in their thinking.



Samsung Ballie

Perhaps inspired by BB-8, the Ballie from Samsung is your new rolling companion. A smart speaker on wheels that follows you around when you're at home, ready to carry out your commands and control your smart home. When you've left home, Ballie will patrol the home and can be connected to remotely – the onboard camera becomes your eye into your home.

Ballie will also play with your pets, chase your dog and nestling up to your cat. During play time, if the Ballie detects your pets have made a mess it can summon the robot vacuum to come clean the area.

A very impressive pet, surveillance device, and butler for the smart home.



Hyundai S-A1

When Uber announced that it'll be taking transport to the skies, the company needed a partner to provide the hardware. Now Hyundai has signed an agreement to produce electric-powered flying taxis for Uber. Under the Uber Air name, passengers will be able to be flown from Melbourne CBD to the airport in minutes. The Hyundai S-A1 will seat four passengers with carry-on luggage, and a pilot. The S-A1 can manoeuvre like a drone, with eight rotors and can cruise at speeds up to 290km/h. Uber Air will operate between 1,000 to 3,000 feet so higher-flying commercial aircraft will not be impacted, and the noise of the electric motors won't disturb the neighbours too much either. While initially launching with a pilot, the plan is to make these fully autonomous, which would allow for more trips servicing more passengers.

02

Moen Faucet

The kitchen is one of the most common areas of the house for a smart speaker or hub. It only makes sense then that we

should be using that speaker to command apparatus in the kitchen. The faucet above the sink is now ready! With the Moen Faucet, you'll be able to ask Google or Alexa for "200ml of water" – when an item is placed under the faucet, you'll receive 200ml of water.

Take it one step further and ask for "300ml of water at 90 degrees" and it'll provide the correct amount and temperature too. If it's a regular request you can save these commands, such as filling the gym bottle, baby bottle, or a cup of green tea.

The measuring jug and the kettle are both looking a little nervous.



“
You’ll be able to ask
Google or Alexa for
“200ml of water” – when
an item is placed under
the faucet, you’ll receive
200ml of water.



01

Sony Vision S

When Sony shows up to CES with a car, it piques attention. The Vision S is an insight into what Sony thinks the car of the future could look like. What it's been creative about however is utilising the vast catalogue of Sony technology in displays and home entertainment to bring together a masterpiece.

The attending car manufacturers at CES were bound to be paying attention to this, as it provides a conversation piece for those who appreciate brands such as BMW, while Ford and others could partner with Sony for their future vehicles.

The Vision S featured 360-degree audio capabilities with speakers even in the head rests to provide a personal listening experience to any passenger without the need for headphones. Loaded with displays and touch-sensitive surfaces the Vision S was as interesting to look at inside as it was outside.

If Sony were taking pre-orders for the Vision S, there would be a long queue by now.

“
Loaded with displays and
touch-sensitive surfaces
the Vision S was as
interesting to look at
inside as it was outside.



Tesla Cybertruck's revolutionary retro look

The truck of the future, today?

No, you haven't been sucked into a low-res video game – the new Tesla Cybertruck just looks like an animated armoured vehicle whose pixels are taking a while to render.

When Elon Musk rolled out the Cybertruck in November 2019, the truck's strikingly angular design certainly caught peoples' eyes, but auto experts say the look has as much to do with function as form.

Unlike many pickup trucks, the Cybertruck has a unibody design, meaning the vehicle is built around a metal scaffolding. In standard pickup trucks, the vehicle's body rests atop a metal frame that both supports the engine and absorbs physical

stresses. The Cybertruck boasts a maximum towing capacity of 6,350 kilograms and a payload of 1,580 kilograms, according to *Outside* magazine. Although powerful, the truck body remains lightweight thanks to its stainless-steel monocoque frame. The reduced weight enables the all-wheel-drive model to accelerate from 0 to 100 kilometres per hour in just 2.9 seconds, even though its battery alone weighs more than 450 kilograms.

The same stainless steel used for

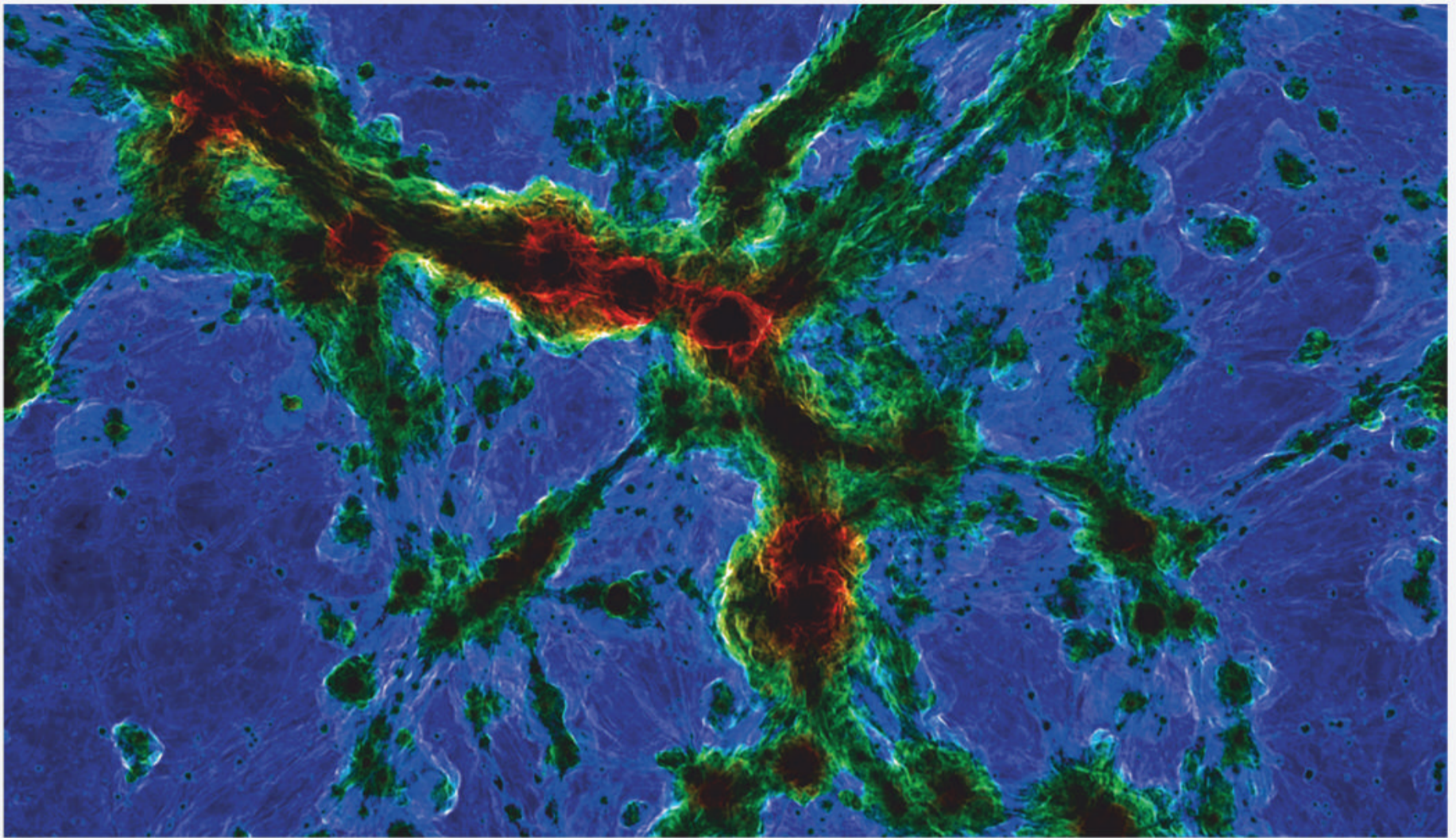
“
Unlike many pickup trucks, the Cybertruck has a unibody design, meaning the vehicle is built around a metal scaffolding

the Cybertruck encases SpaceX's Starship spacecraft, and Tesla claims the metal will resist dents,

corrosion and even bullets. The truck's 'armoured-glass' windows proved less impressive, though. Tesla's chief designer, Franz von Holzhausen, chucked a steel ball at not one, but two windows during the

unveiling event, shattering both. "It didn't go through, so that's a plus side," Musk said. "Room for improvement."

NICOLETTA LANESE



Physicists simulate the origins of the universe

The formation of galaxies is a complex dance between matter and energy, occurring on a stage of cosmic proportions and spanning billions of years.

How the diversity of structured and dynamic galaxies we observe today arose from the fiery chaos of the Big Bang remains one of the most difficult unsolved puzzles of cosmology.

In search of answers, an international team of scientists has created the most detailed large-scale model of the universe to date, a simulation they call TNG50. Their virtual universe, some 230 million light years wide, contains tens of thousands of evolving galaxies with levels of detail previously seen only in single-galaxy models. The simulation tracked more than 20 billion particles representing dark matter, gases, stars and supermassive black holes over a 13.8-billion-year period.

The unprecedented resolution and scale allowed the researchers to gather key insights into our own universe's past, revealing how various oddly shaped galaxies

morphed themselves into being and how stellar explosions and black holes triggered this galactic evolution.

TNG50 is the latest simulation created by the IllustrisTNG project, which aims to build a complete picture of how our universe evolved since the Big Bang by producing a large-scale universe without sacrificing the fine details of individual galaxies.

TNG50 has allowed researchers to see firsthand how galaxies may have emerged from the turbulent clouds of gas present shortly after the universe was born. They discovered that the disc-shaped galaxies common to our cosmic neighbourhood naturally emerged within their simulation and produced internal structures including spiral arms, bulges and bars extending from their central

supermassive black holes. When they compared their computer-generated universe to real-life observations, they found their population of galaxies was qualitatively consistent with reality.

As their galaxies continued to flatten into well-ordered rotating discs, another phenomenon began to emerge. Supernovae explosions and supermassive black holes at the heart of each galaxy created high-speed outflows of gas. These outflows morphed into fountains of gas rising thousands of light years above a galaxy. The tug of

gravity eventually brought much of this gas back into the galaxy's disc, redistributing it to its outer edge and creating a feedback loop of gas outflow and inflow. Apart from

recycling the ingredients for forming new stars, the outflows were also shown to change their galaxy's structure. The recycled gases accelerated the transformation of galaxies into thin rotating discs – despite these initial findings, however, the team is far from finished dissecting their model. **TIM CHILDERS TL**

“
*Galaxies we observe today
arose from the fiery chaos
of the Big Bang*”

HOTSPOT

Razer Viper Ultimate



\$249, www.razer.com

Razer Viper Ultimate

The cream of the crop of wireless gaming mice.

With gaming mice like the Razer Viper Ultimate, Razer continues to step up its game. There's a reason why both casual and hardcore gamers tend to gravitate toward the brand, after all, and it isn't just because of its attractive packaging or black and green motifs. This mouse marks a notable improvement to the brand, and may be one of the best gaming mice on the market.

However, with that step up in quality comes a major bump in price. The Razer Viper Ultimate will set you back a whole \$249 – that's a lot to ask for a mouse, no matter how svelte it is. To put it into perspective, it's going up against the \$169 SteelSeries Rival 650. Razer is hoping that its unique

technology and convenient charging stand makes up the difference, but does it?

Design

Razer has clearly outdone itself with the Viper Ultimate, serving up a slim yet sturdy ambidextrous mouse that feels nearly just as responsive as your go-to wired mouse. It's lightweight, yet somehow it still feels like a tank – albeit amazingly light. We honestly don't know how Razer was able to engineer such a product that feels like waving around nothing at all, especially on a plastic mouse mat.

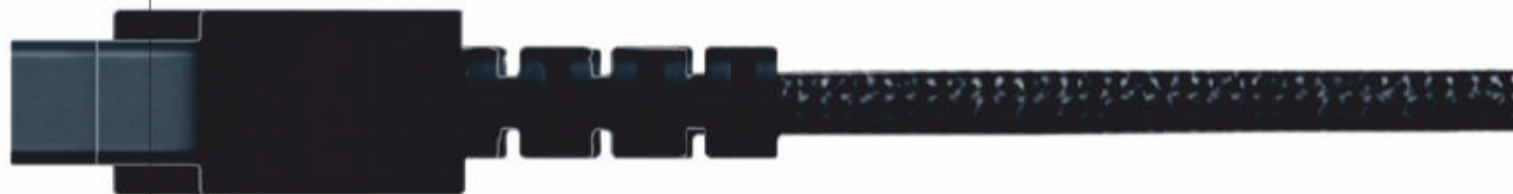
If you're not into a lighter mouse, the Viper Ultimate does not offer weights or any way to shift



Razer's latest works in both wired and wireless modes.

out the way its heft feels in your hand, but if that's not a dealbreaker, it's still a very solid choice, especially for how smooth and responsive it feels to use.

With a matte, brushed black exterior and the iconic Razer logo where your palm rests, it's a quietly unassuming peripheral that belies a powerful interior. It's made out of a slick yet grippy plastic on both exterior sides and a scroll wheel that offers a pleasing bit of resistance – not too fast, not too slow, though it does come on a bit stronger than most other models' wheels. It can take some effort to browse with, but this gives the mouse



and while flying through day-to-day work, we notice that it drains extremely slowly. It certainly outlasts our MacBook Pro's Magic Mouse, something we appreciated immensely, as charging peripherals is not something you want to have to do often.

Unfortunately, one area it does tend to fall short in are its amount of customisable buttons: you've

found that in music and rhythm games like *Osu!*, this was a boon – a mouse that finally felt as though I was using a stylus instead, with natural movements that felt natural and smooth.

Razer claims that its HyperSpeed Wireless tech provides markedly less latency than other mice available right now, and we can certainly attest to

got left and right-click buttons, the clicking scroll wheel and two programmable buttons on both sides. This doesn't make it ideal for anyone who spends a lot of time playing games that require macros or abilities beyond four of them being easily accessible, but it's perfectly serviceable for just about any other gamer.

Fortunately, actually clicking the buttons felt precise and satisfying.

They register every single time, even when tested in twitch shooters like *Call of Duty: Modern Warfare* or when aiming in *Red Dead Redemption II*.

But the high quality doesn't stem only from its aesthetic appeal. Sure, you can simply admire the mouse from afar, but most praise should be heaped upon its Razer Focus+ Optical Sensor, which can also be found in the bigger, more customisable Basilisk Ultimate. The sensor is capable of running up to 20,000 DPI/CPI, which is a seriously impressive number. It's more than just a number, too – you can see the performance from the moment you pick up the mouse from its cradle and start using it.

Its tracking speed comes boasting 650 inches per second, which is also lightning high so that the mouse can keep up with your movements on-screen. We

there being nearly zero. in our time with the peripheral. It tracked beautifully as well, even when we opted to put it on top of the blanket we'd wrapped ourselves in when trying out a round of *Overwatch* and switching between completing work-related tasks. We didn't expect it to perform so well

on a fleece throw, but it did, to our surprise.



Razer claims that its HyperSpeed Wireless tech provides markedly less latency than other mice available right now.

Verdict

While the Viper Ultimate is a strong performer in nearly every category, its one pitfall may see a wide variety of detractors: the price. Frankly, \$249

is a high price of entry. You are getting what you pay for here, though. While you could certainly find a serviceable and comparable mouse for less, the Viper Ultimate is an exemplary wireless mouse that excels in responsiveness, visual appeal, build quality, and battery power.

For Razer fans, it's a no-brainer. For everyone else, it might take a bit of enticing to convince them to pull the trigger.



Essential for fans of the Big Green Brand, and a fantastically well-specced gaming device. But you do pay for it...

Brittany Vincent

even more of a premium edge. Plus, its ergonomic shape is perfect for users who spend all day on the computer.

Whether you're left or right-handed, you can swap between user modes by heading into the Razer Synapse software. As usual, Razer's proprietary software is simple to use, offering simple ways to change the color of the typically-green Razer logo on the mouse as well as what hue your charging cradle glows when it's nearly finished juicing up. But you won't have to charge it very much.

Performance

Razer says it lasts up to 70 hours between charges, a claim that does shake out. After spending a week or so with the Viper Ultimate during heavy usage in both games



Everyone's talking about: Is the internet broken?

The founder of the web hits out against the state of the online world – but can it be fixed?

Sir Tim Berners-Lee, inventor of the world wide web, is worried about the state of the internet. “The forces taking the web in the wrong direction have always been very strong,” Berners-Lee told *The Guardian*. “Whether you’re a company or a government, controlling the web is a way to make huge profits, or a way of ensuring you remain in power.” In an effort to combat what he sees as the internet becoming a “digital dystopia,” Berners-Lee’s Web Foundation has launched a global action plan designed to prevent corruption and sinister manipulation online, and aiming to turn the web into a force for good. The Contract for the Web (**contractfortheweb.org**) is over a year in the making, worked on in conjunction with over 80 widespread institutions, and provides outlines for governments, companies and individuals to make the online world a better place. It’s a fight for equality, fairness, and the erasure of the web’s more sinister elements.

Were it coming from a less reputable source, this kind of manifesto structured around principles gleaned from previous

work on human rights and data protection might not have much impact, but the Contract for the Web has already seen endorsement from some of the largest online companies: Google, Twitter, Microsoft, Reddit and Facebook all count themselves as signatories. Perhaps, given (for example) Facebook’s frequent questioning over privacy violations, this may seem a little disingenuous, and there’s not yet any legal binding or consequences for violation. But the mere fact that it exists is an encouraging sign for our online future, and its founders are working to roll its principles into the UN and national governments worldwide.

The contract’s principles for individuals basically amount to the kind of behaviour we should all be showing in real life: creating and collaborating, building civil communities, and being active, supportive citizens. That’s something we can all get behind – and if you’d like to add your own name to its list of endorsers, you can sign up using the big red button on the top right of the website. **TL**

Wallpaper Engine <http://bit.ly/33IF4YV>

Want to do more with your Windows desktop? Wallpaper Engine allows you to add a whole new dimension, replacing boring static images with something far more interesting. While we’ll admit that Microsoft has thoroughly upped its wallpaper game in recent years, Wallpaper Engine – which uses your computer’s graphics card, so naturally runs a little better on PCs with a bit more power – gives you access to 3D scenes, interactive wallpapers, or even your favourite websites right there on your desktop, with tools included to create your own if you’re so inclined.

It costs US\$3.99 through Steam (**www.steampowered.com**), but it could be worth it, particularly given that the app’s dedicated community has created thousands of interesting wallpapers that you can download and personalise.

Next issue on sale
9th of March



The 60-Second Quiz
Pens at the ready, your time starts now!

- 01** On which platform did Microsoft Word first appear?
A ZX Spectrum
B Xenix
C Smart toaster
- 02** What was the original name of Microsoft’s word processor?
A Words
B Multi-tool Word
C Processing
- 03** Early on, Word was second fiddle to which DOS application?
A WordPlanet
B WordStar
C WordGalaxy
- 04** Word was released on Mac OS in 1985. When did it reach Windows?
A 1983
B 1989
C 1997
- 05** Which aspect of Word 1.1 did Byte magazine call a ‘farce’?
A The ribbon interface
B Its documentation
C Comic sans
- 06** What name did Word go by for its Atari ST release in 1988?
A Microsoft Docs
B Microsoft Write
C Microsoft CV and Cover Letter



Imagine a wallpaper this beautiful, but animated too. Credit: Wallpaper Engine Team

HOTSPOT

The news in numbers

The news in numbers

Here we reveal some mostly useless yet highly fascinating numerical facts...



1,482 days

Was the lifespan of Windows 10 Mobile, released to manufacturing in November 2015, and officially reaching end of support on December 10 2019. Available on Lumia phones and a few obscure devices from the likes of Wileyfox, Win 10 Mobile couldn't compete with Android or iOS, and Microsoft stopped active development in October 2017.

100KG

The weight of the space junk being targeted by the ESA's ClearSpace-1 mission to remove space junk from orbit around Earth. The object, the remains of a rocket's upper stage, is considered representative of much of the debris around our planet, and if successful the four-armed satellite could go on to capture more astro-rubbish.

64

The number of qubits in Google's Sycamore quantum computer, with which it has claimed quantum supremacy – carrying out a mathematical process in 200 seconds that would have taken a classical computer 10,000 years.

G3420

An ancient, in CPU terms, Pentium processor from the Haswell days seems to be back on the manufacturing block at Intel. The 22nm chip, which was originally released in Q3 2013, is most likely aimed at the embedded processor market after Intel recently apologised for not making enough of its contemporary chips available.

2004

Seems to be the number of the next version of Windows 10, the build previously known as 20H1, with both the fast and slow rings of the Insider programme currently testing it.

January 15

Was the big day for those remaining Windows 7 users out there: the venerable OS started showing fullscreen popups to hammer home the message that it is no longer supported by Microsoft. Support officially ended the day before, on the 14th.

HOTSPOT

Samsung Q950R 8K QLED TV



\$TBC, www.samsung.com

Samsung Q950R 8K QLED TV

Samsung's new flagship 8K offers state-of-the-art performance.

The Samsung Q950 represents the latest 8K TV from the manufacturer, combining all the benefits of last year's Samsung Q900 8K screen with innovations first introduced the 2019 flagship Samsung Q90 4K TV that hit shelves earlier this year.

Combined, the new Samsung Q950 offers an 8K panel and AI-enhanced image processing, plus wider viewing angles, an improved black filter and standard-setting HDR performance. If all that wasn't

enough, Samsung's smart platform is the most comprehensive on the market.

So if you're looking for a state-of-the-art TV - and don't mind paying top-dollar for it - the Q950 should be at the top of your short list.

The Samsung Q950R will be available in four different sizes: 65-inches, 75-inches, 82-inches and 98-inches. Samsung sent over the 75-inch version for review purposes, but the technology is largely the same in each screen size.

The Q950's prices have not been announced for Australia yet, but we're sure it's coming.

Design

The Samsung Q950 looks identical to last year's Q900 with a minimalist appearance that resembles a monolithic rectangular black slab. The screen is bezel-less, there's an eye-catching brushed metal trim around the outer edge, and the rear of the panel has textured grooves. The only



connection on the panel itself is a single proprietary input for the One Connect box.

The Q950 sits on a pair of sturdy feet that match the design simplicity of the panel itself. You can position the feet at either end, or closer together if you want to install the TV on a narrower surface. There are recesses at the rear of the panel where you can store the feet when not in use, making wall-mounting neat and tidy.

The One Connect box is quite large and surprisingly heavy, but it remains a clever idea. The first HDMI input is 2.1 (8K/60p) and the other three use 2.0b. There are also three USB ports (two 2.0 and one 3.0), twin terrestrial and satellite tuners, a CI slot, an optical digital

input and a LAN port for a wired connection (although there's also built-in WiFi and Apple AirPlay).

While three of the HDMI inputs are 2.0b they can, according to Samsung, still support 4K at up to 120Hz, dynamic metadata (HDR10+), variable refresh rate (VRR), and an auto low latency mode (ALLM). The Q950 doesn't currently support an enhanced audio return channel (eARC), but Samsung may add that via a future firmware update (as it did with its 2019 soundbars).

The included remote control is stylish and ergonomically designed, with an attractive all-metal construction. It's comfortable to hold, easy to use with one hand, and has a microphone for voice control. Samsung has also added direct access buttons for Netflix, Amazon and so on along the bottom.

Smart TV

The Samsung Q950 boasts the full Samsung smart experience, and is probably the most comprehensive system available, with a launcher bar along the bottom and a second layer that provides easy access to whatever content you happen to be watching. And there's a lot to watch, because no other smart platform offers as many video streaming services as Samsung.

The system includes Netflix, Amazon, YouTube, and all the usual TV catch-up services, but there are plenty of others available. A recent firmware update has now added Apple TV and this feature that is currently exclusive to Samsung, giving its TVs an edge over the competition.

Apple TV works well and is easy to setup and connect with your existing Apple account, providing access to TV shows and movies, as well as your own library. The picture and sound quality are excellent, and the app supports 4K and HDR10. However Apple also supports Dolby Vision which Samsung doesn't, and there's



Once you get used to ignoring the admittedly minor distraction of the legs, the new Samsung is almost a work of art...

currently no support for Dolby Atmos.

Given the amount of content available, it makes sense to collate a user's favourite shows into a single location, thus making things easier to find. Samsung has called this feature Universal Guide, and it can be tailored to a user's particular tastes. The Universal Guide also uses AI machine learning to analyse viewing habits and optimise recommendations.

Performance

The Samsung Q950 is a superior picture performer, delivering an impressive image with lower resolution and SDR content. The direct LED backlight, highly effective local dimming, and the new black filter produce exceptional levels of contrast. What's more, this is achieved without crushing shadow detail, and regardless of the ambient light in the room.

The colours are also excellent, appearing saturated but natural, while the screen uniformity is impressive thanks to a lack of banding or clouding. The wider viewing angles are nothing short of a revelation, with no visible contrast or colour degradation as you move off-axis.

The Samsung Q950 is easily the best HDR TV to date, capable of delivering a massive peak brightness of 3,800nits. That basically means this QLED TV can display 1,000nit content without tone mapping, and 4,000nit content with almost no tone mapping. What little tone mapping is required is spot on, and the HDR colour accuracy is exceptional with 100% of DCI-P3.

★★★★★

The sheer size of the panel and the AI-enhanced processing results in a superior sound performance, and the ability to output Dolby Atmos via HDMI-ARC is sure to please.

Stephen Withers



SPECIAL REPORT

Who killed the NBN?

Who killed the National Broadband Network?

How super-fast internet heralded a catastrophic change in Australian politics.

NICK ROSS



My name is Nick Ross. Some of you may remember me from being the ABC's Technology Editor who, "Championed the NBN on behalf of the ABC." If you've never heard of me, you might be interested in my story if you have a passing interest in the NBN, Australian politics, the sorry state of Australia's mainstream media, or are wondering how Australia has become the way it is. Indeed, the reasons for the downfall of the NBN mirror what simultaneously happened to Australia: the transition from fact to toxic politics and the move to a post-truth society.

The short story

My interest in the NBN first piqued in 2011 when Melbourne's Royal Alfred Hospital did a telehealth demonstration that showed how healthcare could be much-better served with reliable internet. Of particular note was that NBN-related cost savings to the health budget could dwarf the NBN's build costs on their own. At the time, the media narrative of

this nascent policy was following predictable, ignorant, political lines. I wanted to change that.

Over the next three years I'd talk to nearly every relevant party that was involved in the NBN, from the politicians, to the people on the ground building it, the NICTA and CSIRO innovation hubs that were doing trials for Telehealthcare, Smart Grids and other innovative applications, big and small businesses that were planning to use it, the Unions representing the builders, everyone covering it in the media, the telcos, overseas experts who'd overseen similar rollouts, the lot.

In the beginning of 2013, this culminated in me tying all of the information together and writing a colossal, 13,000 word article on the matter called, *The Vast*

Differences Between The NBN And The Coalition's Alternative. It was designed

to act as a one-stop resource for other journalists which supplied them with a full grounding in the subject and offered information that they could use to hold politicians to account.

This was a time when the Coalition's pre-election cry of, "We'll complete the NBN sooner and cheaper" was becoming the false, mainstream narrative. I found that:

"The Coalition's NBN alternative is different by almost every measure. It uses different technologies to connect the bulk of the country; it has different uses and applications; it affects Australia's health service differently; it provides different levels of support in emergencies and natural disasters; it requires a different amount of power to operate; the cost of maintenance is different; the overall cost, the return on investment and the re-sale value are different; the management, ownership, governance, competition and monopoly factors will be different; it has a different

life-span and upgradability issues; the effect on businesses (of all sizes) and GDP is different; the effects on television are different; the effect on senior citizens is different; the viability and potential for cost blowouts is different; the costs of buying broadband will be different; the reliability is different; the effect on property prices will be different; the timescale is different; the legacy is different. Ultimately, it has completely different aims.

In just about every case the Coalition's alternative compares unfavourably to the current plans - and usually in dramatic fashion. That's based upon the facts and the information currently available in the public domain."

A few days later it was used by the *7.30 Report* to grill Malcolm Turnbull on live TV. Up to that point Turnbull (who was in his 'Leather Jacket,' 'Darling of the Media' phase, had gone to every mainstream media outlet that would have him and slammed Labor's "wasteful" NBN, unchallenged. Now he was being held to account. He didn't like that.

The next day, on the front page of *The Australian* newspaper, an article appeared saying I'd been disciplined by the ABC. I hadn't. Every fact in the article was wrong. I'd been told not to talk to *The Australian* by the ABC's Head of Corporate Affairs, Sally Cray. She'd been recently hired by the ABC but I'd later find out that her previous role was Turnbull's Chief of Staff (a role she resumed straight after the 2013 election). A few days later *Media Watch* got involved. They did almost a whole episode about me without talking to me first. The entire episode involved them trying to pick holes in what I said, but when they failed, they took a quote I'd written in an entirely different article, in an entirely different context (years earlier), doctored it

“
In just about every case the Coalition's alternative compares unfavourably to the current plans - and usually in dramatic fashion.”



SPECIAL REPORT

Who killed the NBN?



Has Rupert Murdoch had a hand in the NBN's twisted history?



to mean the polar opposite of what was intended and used it to bury me. After that, all serious mainstream media NBN coverage ceased and the media mostly parroted whatever politicians (mostly Turnbull) said.

I continued to cover the NBN in the background but it was in a context where it was widely regarded that the Liberals were going to win the next election and nobody wanted to support a Labor government that was heading for defeat. I wasn't unaware of this but felt that people should at least know the truth about the NBN before the polls as it would be a tragedy if it got killed and replaced by an alternative that wouldn't work. I tried to publish another massive article called, *NBN alternative: Is Australia's copper network fit for purpose?* Years of research had made it clear that Telstra's copper had been so badly maintained that cost blowouts were assured and reliability would be disastrous if the MTM model manifested. But I was told by ABC management that despite there being, "Nothing wrong with [the article]" they 'Expected the

Liberals, to win the next election, that Malcolm Turnbull would be in charge of The ABC and that they didn't want to annoy him.' I published it two days after the election anyway but it was buried by ABC News. Ten years later, and I get reminded of it every single day on social media. So now I'm joined at the hip with the NBN and while I don't cover it any more, every delay, cost blowout and lie that gets exposed leads to people Tweeting that they should have listened to Nick Ross.

Recently I was forcibly moved over to the NBN and it's a) slower than what I had before and b) much less reliable. Consequently, I'm fulfilling a promise to write a 'final' article on the matter where I personally blame the (main) parties involved for ruining everything.

The Top 10 reasons the NBN failed, according To me...

10 Labor

Trailing in a distant last place is Labor – the people that many Australians probably think are at fault, but aren't. In hindsight,



Stephen Conroy's efforts to censor Australian internet access did not help the ALP at all.

Labor had (mostly) the right policy but didn't appear to have understood why. They utterly failed to sell it – wittering on about internet dishwashers – and didn't do a Cost Benefit Analysis. Even when we did one for them they ignored it. The "NBN was designed on the back of a napkin" jibe was always harsh (it went through an expert panel and was ultimately outlined by a \$25-million KPMG-McKinsey Implementation Plan). But, Labor also alienated many potential allies by simultaneously pushing an unworkable Internet Censorship Filter, which made it hard for tech enthusiasts to support them. Nonetheless, most serious accusations weren't/aren't true.

09 Tony Abbott

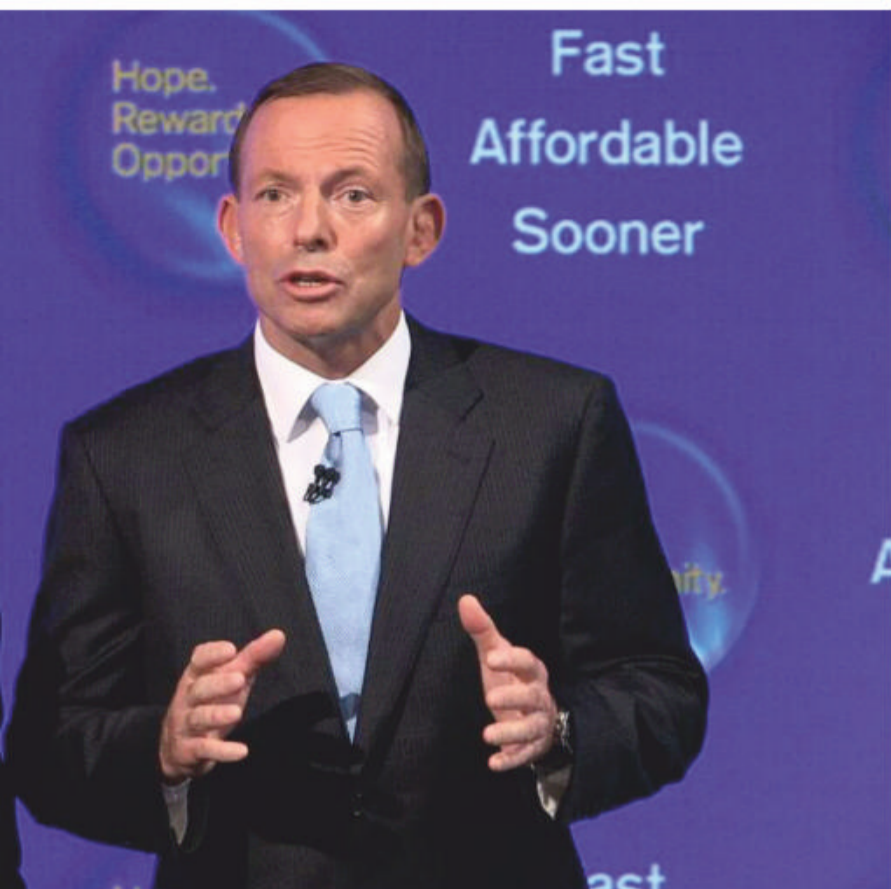
A long way ahead is the man who actually ordered the NBN's destruction. Why so low down the list? Blaming Tony Abbott is pointless. To this day he has no comprehension of what he did. You may as well get angry at a wasp for being a wasp.

08 Australian business

With the exception of Intel and (especially) Cisco (who would later pay the price of criticising Liberal policy by getting shunned from Government contracts) Aussie businesses, big and small, are part of the problem. I went to countless events where groups would



The answer to this question, many of us would now agree, is a resounding "No."



publicly praise Turnbull's policy, but as soon as the cameras were off, would inevitably say... "He won't change anything, he's just saying that to get elected."

07 Technology journalists

It breaks my heart but, if you think it was Australia's tech journos who gallantly stood up against Turnbull's lies, you'd be disappointed. At a time when we'd never be more important, we collectively fouled the sheets. While keeping a safe distance was understandable (considering the heat that was raining down on me), many didn't. As Renai Le May stated in his book, *The Frustrated State*, they'd "Meekly write down his every view for faithful reportage to their audience." At events where there was positive news about the fibre rollout, they'd complain about being given nothing to write about. Some even joined in with the pollies' taunts of calling proponents 'Fibre Zealots.' The worst offenders have all since left (or been booted from) the industry. However, others like Le May, simply shut up shop as there was simply no point in questioning the incessant lies anymore.

06 Media Watch

Two of the NBN's greatest wrecking balls.

“
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be disappointed.”

In the face of years of appalling journalism, *Media Watch's* one foray into the toxic NBN coverage saw them attack my efforts to tell the truth. They didn't contact me before focusing almost an entire episode on me. When Le May warned me of the impending beat-up I spoke to their producer, who eventually acknowledged, "You're right, but it's too late to change anything as we're going to air soon." They went to air knowing they were wrong. All serious mainstream NBN discussion stopped after this episode and I was left humiliated and suffering stress, anxiety and depression for the next few years.

05 The ABC

While all Australian mainstream media's NBN coverage was terrible, the ABC was the worst offender; whether it was the elections team parroting Turnbull's NBN claims verbatim because, as they told me, "It would cause less trouble," or Triplej's *Hack* ditching my questions and

replacing them with Turnbull's favourite tech journo, or Tony Jones' fawning over him, or the umpteen radio producers letting Turnbull rock up every day to pan Labor and the NBN unchallenged, or the top managers for holding back important news, or their internal whistle-blower service covering this up, or installing Turnbull's

Chief of Staff in a senior position, or them canning their dedicated Technology and Environment Editors after the election or one of many other instances that coincided with the ABC going downhill. Only Carol Duncan gave Turnbull a hard time and she lost her job soon afterwards.

04 Michael Vertigan and Henry Ergas

The people Turnbull commissioned to do a Cost Benefit Analysis on NBN implementation

somehow came to the conclusion that it would be better to implement Turnbull's MTM model than roll-out fibre. NBNco would use their findings as a basis to destroy the NBN.

03 David Thodey, CEO of Telstra

Telstra's share price was in the doldrums. It spent much of its efforts on maintaining its incumbent position rather than innovating. Then NBN came along and bought its customers. Suddenly the company started talking about innovative things it could do with the NBN. It was set to be the country's largest internet service provider. But Turnbull needed its rotten copper network to make his MTM NBN work. Knowing it was barely fit for purpose, Thodey told everyone, "The copper has been going well for a hundred years. I think it will keep going for another hundred." Despite holding the power to veto Turnbull, he didn't. The share price spiked and he promptly left with a massive bonus. *The Financial Review* later said, "Telstra's shareholders got a raw NBN deal by giving up a third of the company's earnings in return for... \$11 billion."

02 The Hidden Puppet Masters

Who told Abbot to kill the NBN? There are many theories but no smoking guns. We know Foxtel executives told employees that they'd lobbied against it. Was that enough to kill the whole project? Probably, yes.

01 Malcolm Turnbull

I used to say that if you heard Malcolm Turnbull say anything about broadband it was probably untrue. In hindsight, was anything true at all? Only his initial claims that the NBN would be, "A gigantic torching of taxpayers' money" and a "Colossal white elephant" were actually prophetic. **TL**

DISCOVER

Emerging tech

Bleeding edge: the best of emerging tech

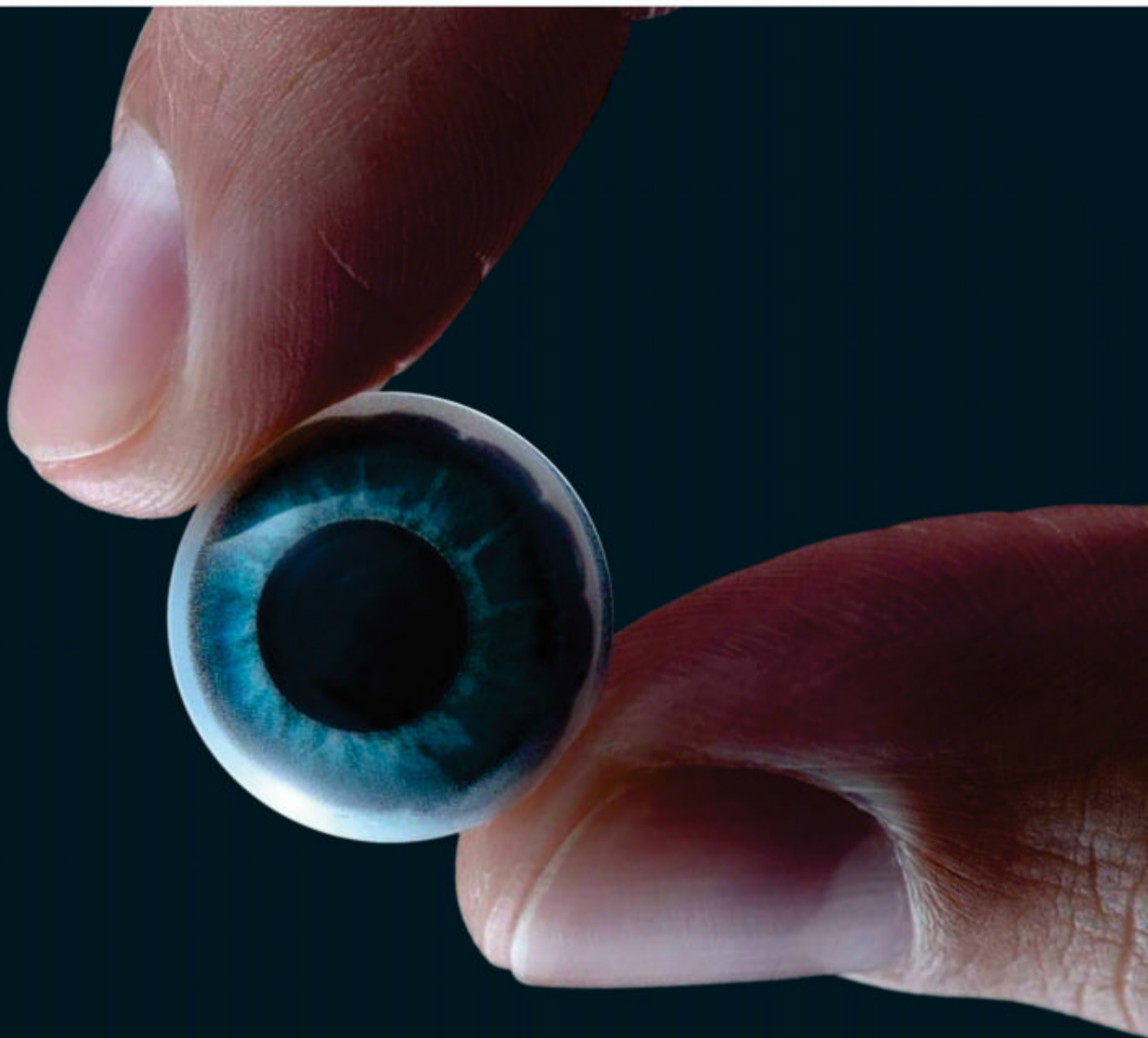
A roundup of emerging tech experiences, including all the latest virtual and augmented reality apps, alongside AI apps and other useful tools.

AR contact lenses have somehow, almost overnight, become a product that one US startup is hoping to bring to the medical device market soon. If that wasn't enough, some boss coder has managed to write AR software so you can collect digital powerups in real world go-karts. AI this month is helping us predict the weather at a microclimate level, 3D print environmentally sustainable housing and highlight potential issues in national power-line networks. While all this is great for humanity, it's hard to feel that anything other than Stanford's AI driven Delorean, which can be seen online performing millimetre-perfect drifts around a gymkhana track, is the most impressive achievement of AI this month. Joel Burgess



VR
Artec 3D Leo
US\$25,800, artec3d.com

While most of us won't have a spare 40-grand to drop on a VR scanner, this fully portable unit capable of making realistic avatars in minutes sure looks neat. The scanner has onboard processors that stitch the data into a polygon map directly on the device and the screen on the back allows you to see if you've missed any sections as you go. Combine this with a battery pack and the Artec 3D Leo is a fully portable 3D scanner that can render at 80fps.



AR
Mojo Vision - AR contact lenses
\$TBC, mojo.vision

AR contact lenses are generally considered to be the stuff of science fiction, but the start-up Mojo Vision has been surreptitiously working on a prototype for a couple of years now, and while it's still some way off from consumer models, it showed off tech at CES that it hopes to have in a medical industry prototype soon. While journos didn't actually get to put the contacts in their eyes, *Tech Crunch's* Brian Heater said that the lens he held in front of his eye was impressive.



VR
The Eye As Witness
Free, holocaust.org.uk/news/through-whose-eyes
The University of Nottingham and the National Holocaust Centre have collaborated to build an immersive 3D recreation of a Warsaw Ghetto from a photo taken in 1943. One of the first visitors, a physician who spent months in Theresienstadt, the Czechoslovakian transit camp in the photo was impressed by the VR experience and hopes it will engage younger generations. The scene is part of *The Eye As Witness: Recording the Holocaust* VR exhibition that is publically available in a number of British museums.

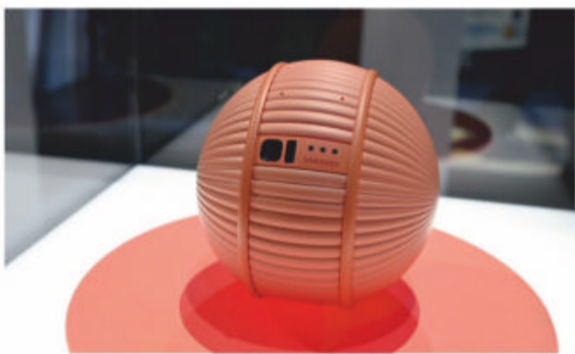


AI

AI Space Factory Tera

\$873 per weekend, aispacefactory.com/tera

AI Space Factory, the winner of NASA's 2019 3D-Printed Habitat Challenge, has tweaked its competition winning design to be suitable for construction as a hotel in a New York State pine forest. Following a successful Indiegogo campaign in August 2019, the AI Space Factory building, known as Tera, is expected to welcome its first guests sometime in March 2020. The futuristic living pod is created by an AI driven 3D printer that uses a corn syrup and sugar compound that hardens to a basalt like rock that is stronger than concrete, according to the company.

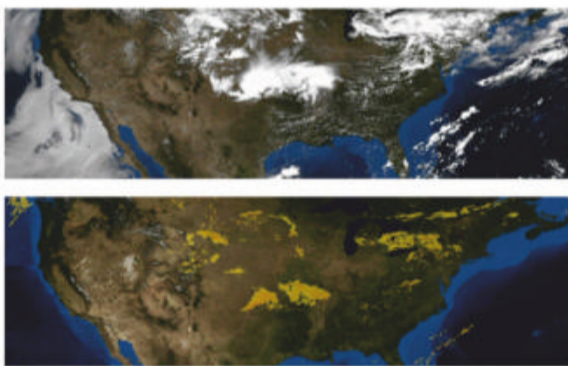


AI

Samsung Ballie

\$TBC, news.samsung.com

CES wouldn't be complete without some of the more quirky companion robots designed for select markets, but which get international write ups cause they're ... well... unique. Samsung's latest is an AI ball it calls Ballie. Other than using its inbuilt camera to autonomously track and follow you, the ball can also open your Samsung blinds, turn on your Samsung washing machine, show your yoga routine on your Samsung display and turn on your Samsung robovac. You can learn more about it in our special CES 2020 report starting on page 38.



AI

Google Nowcast

\$NA, ai.googleblog.com

Predicting the weather is a numbers game and while our general tools are pretty good at picking general weather systems you don't get suburb-scale weather predictions, primarily because it requires too much processing to work at such a granular level. Google is hoping to fix this by training machine learning systems on large precipitation data sets and then using the lightweight automated prediction models to spit out six-hour, 1km rain maps in under 15 minutes.

Xenobots

Scientists have created programmable biological cells that can be programmed to interact with biological systems. Using frog stem cells, University of Vermont researchers were able to assemble cells that can move through and interact with other biological matter to achieve predetermined outcomes. So far researchers have found ways to control the movement and shape of the cells, elements that would help it collect unwanted particles from biological systems. Because the cells contain DNA they are able to repair themselves if damaged and only require food (protein) to perpetuate.

Stanford designs drifting AI driven DeLorean

Researchers at Stanford's Dynamic Design lab are attempting to make autonomous driving software safer by developing an AI driving agent that will drift around a gymkhana track. This AI stunt driver is named Martykhana - a combination of references to the driving obstacle course it navigates and the converted, all-electric 1981 DeLorean it uses, similar to the one 'Marty McFly' drives in *Back to the Future*. While the high speed burnout machine looks anything but safe, the team hope the testing it'll do will give self-driving cars the capabilities to handle better in extreme out-of-control circumstances.

Researchers discover living, growable bricks

University of Colorado researchers have discovered a bacteria that turns sand, gelatin and salt water into a tough calcium carbonate substance that can be used as an alternative to traditional building materials. These self-actualising bricks not only offer an alternative to traditional building materials like cement that require considerable emissions to create, but the bacteria that cause the chemical transformation actually absorb CO2 to form the calcium carbonate structure.


DISCOVER

Best new apps

Best new apps

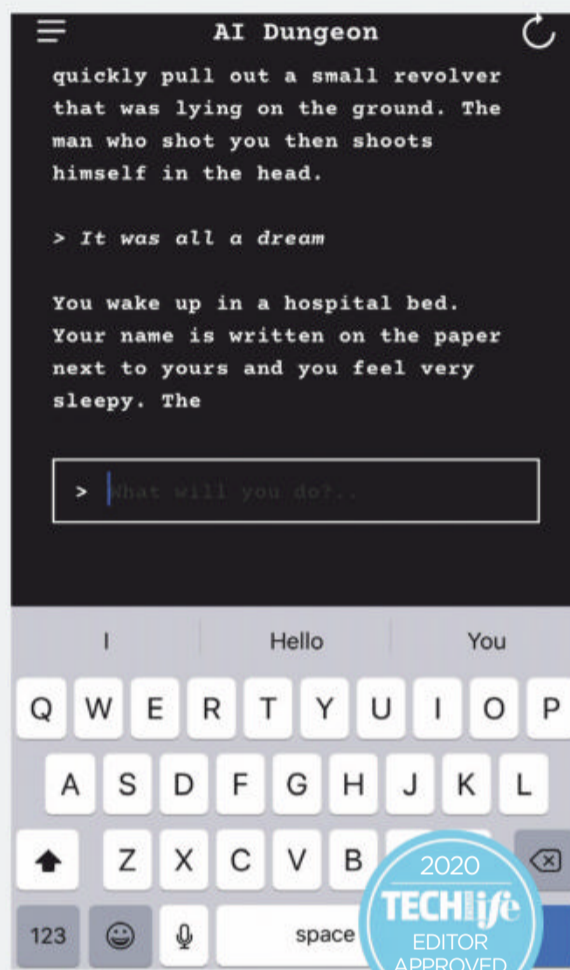
James O'Connor reviews the most interesting new apps for iOS and Android.




 Free
air-matters.com/
iOS, Android

Air Matters

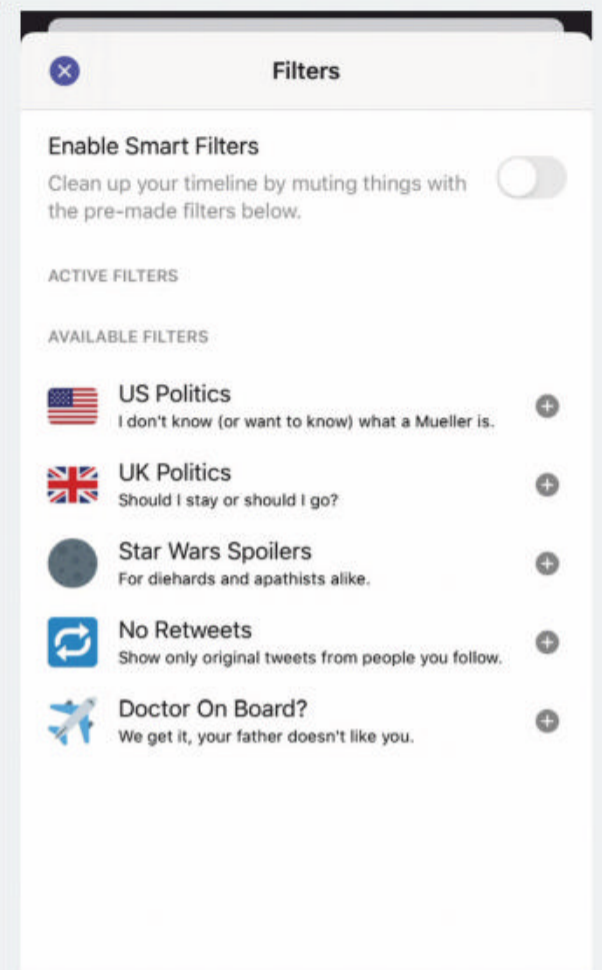
If you live in Australia in 2020, it's suddenly become very important to have an app that lets you know how breathable the air outside is. I know, right? Technology has, of course, contributed to the world we're now all living in, for both better and worse, but at least with an app like Airmatters we can keep on top of what we need to do to protect ourselves, especially as there have been several days in major cities lately where leaving the house without a mask has not been advised. I tested out a few different apps, and Air Matters was the one that most clearly communicated exactly what I needed to know. It gives you the numbers and figures you'd expect, but also makes very direct recommendations on whether you should leave the house, whether an air purifier might be a good idea, and what sort of ventilation is recommended. It provides extensive data history and charts your surrounding areas easily. Grab it now and hope you won't need it for a while. ★★★★★




 Free
www.aidungeon.io/start
iOS, Android

AI Dungeon

While *AI Dungeon* markets itself as a "game," I think it belongs on these pages – it's a narrative generator, and it's going to appeal to audiences who avoid the "game" tab on the App Store. In *AI Dungeon*, you're dropped into an AI-generated narrative after a few prompts and left to work your way through it, resolve it, or see it through. AI-generated text appears, and you can give simple commands or dialog to drive it forward. I started up a detective story and after being shot decided to declare that it had all been a dream – which, shockingly, the story went along with, and things continued in the waking world. While it often feels like the stories are trying to bend back to normalcy when you try to drive them too far off the rails, it's still fascinating how genuinely reactive the system feels to your words choices. *AI Dungeon* is a lot of fun to mess around with – you're not going to tell the next iconic story, but you might find yourself surprisingly engaged. ★★★★★



 \$5.99
N/A
iOS, Android

Nighthawk for Twitter

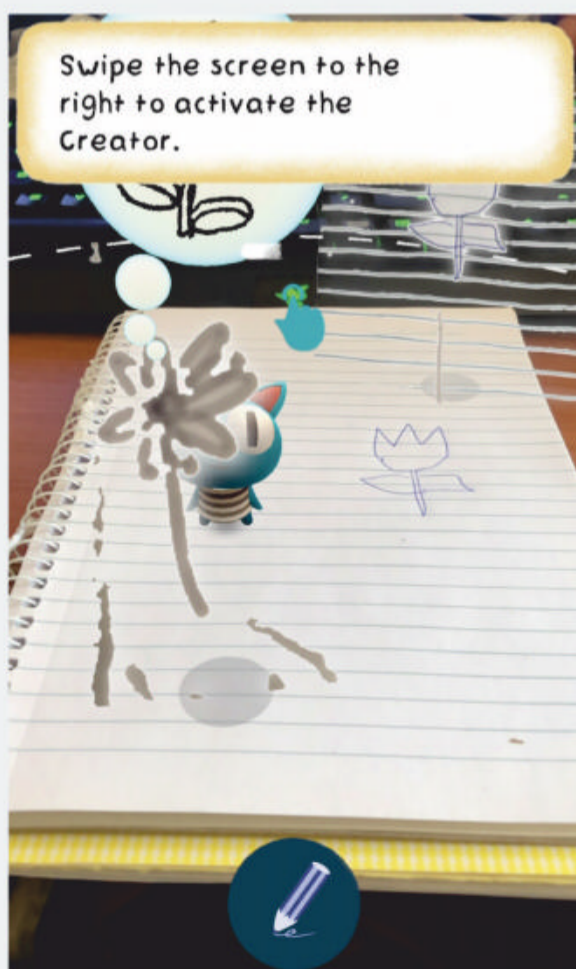
Twitter is important, but not very good, and is at least partly responsible for the terrible shape of the world. Nighthawk poses an important question – what if Twitter was, for some reason, worse? Nighthawk's big thing is that it allows you to filter out certain topics, but, weirdly, the list of filters is extremely short and specific right now. Is it worth paying \$5.99 for a version of Twitter that does not let you track threads or add images to your tweets if, in exchange, you can disable all mentions of US politics, *Star Wars* spoilers, and, uh, jokes about doctors being on planes? Is it comforting knowing that you can cut out all retweets from your feed, but also won't be able to access your DMs? Nighthawk for Twitter is an extremely limited app, one that charges you \$6 for a less convenient experience. You can also add a 'Close Friends' feed, which is theoretically a nice idea – but then, that's what Twitter's in-built "list" function is for. There's no benefit to using Nighthawk for your tweeting. ★★★★★



\$4.49
tokotoko.io/
iOS, Android

TokoToko

TokoToko is an AR app clearly made with kids in mind, but which still holds a certain appeal as an adult. It tells simple little stories with a variety of cute beings that you interact with through drawings – you might be asked to draw a door through which action can happen or draw a flower and hand it to a character. You need to play on a large flat surface, and when everything is going well it’s a lovely, cute experience. But actually getting everything to work properly can be a challenge, I found – early on – I had a very hard time handing the flower I had drawn to the little dude on my screen, and this issue persisted. This will no doubt frustrate the kids who are the game’s target audience, and the app sometimes translated my drawings into weird AR objects that didn’t quite look right. On the other hand, drawing a door and then seeing a little critter climbing up a ladder on the other side of it is a delight. ★★★★★



Free
davidsdisposable.app
iOS

David’s Disposable

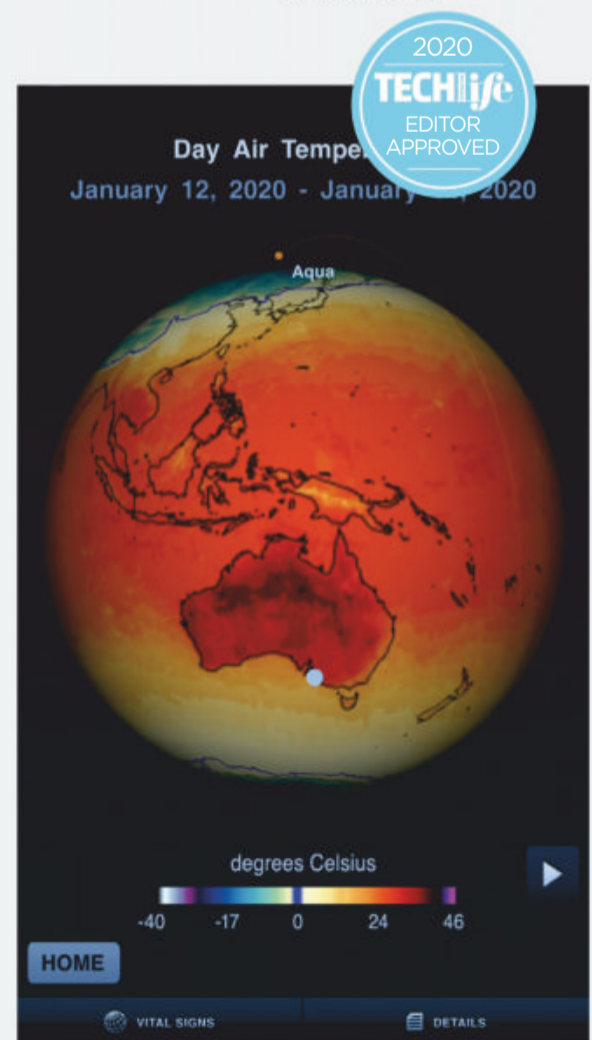
Nostalgia can be a powerful tool. This app – created by a 23-year-old YouTuber I’ve never heard of, who is, I think, too young to be as nostalgic for disposable cameras as I am at 32 – absolutely nails its brief. It catapults you right back to the late 90s/early 2000s, when you’d carry around a limited-shot disposable camera, lining up shots with the tiny viewfinder and excitedly wondering what they’d look like when they’re ready. The real genius of this app is that you need to wait for the photos, and they’ll only become available to you at 9am the day after you shoot them, as though you had to take the film in to be developed. Is that a bit of a silly gimmick? Yes. Did it charm me, absolutely and completely? Also yes. The app is free with some mild ad support, which you can get rid of by spending \$1.49. This app is exactly what it should be – fun, silly, and ultimately disposable. ★★★★★



Free
N/A
iOS, Android

Earth Now

Earth Now is not a new app – it’s a few years since it even received an update – but it sure is an app for 2020. This NASA app tracks weather and events around earth in real-time, letting you track disasters, heat waves, sea level changes, ozone effects, and more. Turning on the air temperature chart and seeing Australia turn an angry red, or tracking the fires that are happening in the country (and in other parts of the world, as it turns out) might be stressful, but it’s important too. You can also track the paths of satellites moving around the earth, which is a bit more fun, or just marvel at changing cloud patterns. Of course, keeping on top of world events generally means keeping up with the news and current affairs, but it’s hard not to be a bit enchanted by interacting with a live, ever-changing globe. After a few uses, I felt a bit more connected to what’s happening not just in Australia, but around the world. ★★★★★



DISCOVER

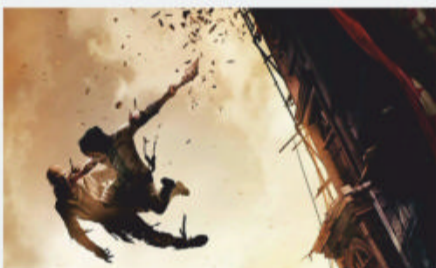
Games news



***Doom Eternal* will be about twice as long as *Doom 2016*, according to Id**

“THAT POWER FANTASY, YOU’RE GOING TO EARN THAT”

Creative director Hugo Martin confirmed that *Doom Eternal* “is a 22-plus hour game” in an interview with *GameSpot*. Raw game length isn’t worth much if the game feels padded or otherwise unnecessarily stretched out, but Martin said the studio is “hell-bent on engaging you from beginning to end.” The first two or three levels of *Doom Eternal* have more variety on display than the whole first game, Martin says.



***Dying Light 2* has been delayed indefinitely**

DYING LIGHT 2 BECOMES THE NEXT MAJOR TITLE TO MOVE OUT OF THE AUTUMN RELEASE SEASON AT THE LAST MINUTE.

In a statement announcing the news, CEO Paweł Marchewka said: “We were initially aiming for a Spring 2020 release with *Dying Light 2*, but unfortunately, we need more development time to fulfill our vision. We will have more details to share in the coming months, and will get back to you as soon as we have more information.



These *Cyberpunk 2077* Keanu Reeves Funko Pops are... hot?

I’m not sure how I’m supposed to feel about all of this.

Cyberpunk 2077 may be delayed to September, but Funko Pop Keanu Reeves is here to boost your spirits.

The first set of *Cyberpunk 2077* Funko Pops were revealed at this year’s London Toy Fair. They’ll include two (count ‘em, two) versions of Reeves’ Johnny Silverhand, as well as both a male and female version of V. You can either get Sunglasses Keanu Reeves dual-wielding pistols (decidedly more menacing) or Relaxed Keanu Reeves kneeling down, eyes as molder (decidedly

more intoxicating). Both versions of Johnny Silverhand feature a cocked eyebrow and show off his muscles and, well, his silver hand. It’s... disconcertingly cool.

The male and female versions of V are based on the character builds we’ve seen in trailers and promo artwork – female V has an asymmetrical bob, and male V is sporting the now-iconic jacket from the game’s cover art. It’s nice to see both V options, as the McFarlane *Cyberpunk 2077* action figures only offer up the male version.

All *Half-Life* games are free on Steam for the next two months

Here’s an easy way to catch up on the storied series.

Valve will release a new *Half-Life* collection ahead of the upcoming release of *Half-Life: Alyx*, according to Steam alerts archived on *ResetEra* and the Steam forums. Not only that, as an added way to ring in the long-awaited sequel, this new collection will apparently be free to play (not necessarily free to own) “until [the] launch of *Half-Life: Alyx*.”

The Steam alert in question was captured in English and Spanish by independent

users, and it certainly looks legitimate. It seems to have been sent prematurely on January 20 and almost immediately pulled, likely due to some sort of scheduling error. If it is legit, we can expect to see it again as we get closer to *Half-Life: Alyx*’s March 2020 release date. The alert says the collection will be free until the launch of *Alyx*, so the freebie window will likely start one or two weeks ahead of time.



Xbox Series X backwards compatibility: 'All our games will play up and down' for the first few years

That includes support for all Xbox One, 360 and original Xbox games via current backwards compatibility tech.

Xbox Series X backwards compatibility will go both ways, at least for the early years of the new console. Xbox Game Studios head Matt Booty confirmed Microsoft's commitment to making all new Xbox games playable within its current family of devices in a new interview. That means no console launch exclusives, at least not in the traditional sense.

"As our content comes out over the next year, two years, all of our games, sort of like PC, will play up and down that family of devices," Booty told *MCV*. "We want to make sure that if someone invests in Xbox between now and [Series X] that they feel that they made a good investment and that we're committed to them with content."

Booty said it's still important that *Halo* will be "there at the launch of the console, taking advantage of all the features". So even if you play through *Halo Infinite* on Xbox One first, you'll still have something to look forward to if you play it on an Xbox Series X later.

Both Phil Spencer and Xbox partner director of program management Jason Ronald

expanded upon the Xbox Series X backwards compatibility in an interview with *GameSpot*.

"We wanted to make sure we had that, day one, we could deliver on the compatibility promise, and so I've been playing quite a few [Xbox 360] games on my [Xbox Series X] and Xbox One games on the [Xbox Series X] and that's just to ensure that we can be there day one," Phil Spencer said.

"We have thousands of games that run on Xbox One today," Xbox partner director of program management Jason Ronald told *GameSpot*.

"We want those games to be able to come forward with you but we also want your services to come with you. We want your gaming legacy to come with you, whether that's your Gamerscore, whether that's your friends list, all your Achievements, your game saves, all of that should come forward so there are no barriers for you as you think about moving forward."



“

We want to make sure that if someone invests in Xbox between now and [Series X] that they feel that they made a good investment and that we're committed to them with content.

But making the Xbox Series X backwards compatible is no easy feat. It was such a difficult process in the past, Spencer points out that Microsoft "paused [their] backwards compatibility program for [Xbox 360] on Xbox One." The differences in hardware pose the

biggest problem even with making the newer Xbox One games playable on the next-gen console." One of the biggest challenges is console games are usually hyper-optimised to the unique hardware capabilities of the device, and this is a new generation of hardware," Ronald says. "It is a new chip architecture. At the same time, we did design the silicon with [backwards]

compatibility in mind, so we did make certain decisions to try to lessen that work, but I don't want to trivialise how much work the team's actually doing because there is a tremendous amount of work." **TL**

DISCOVER

PC & console games



\$14.99, PC, Switch, www.nintendo.com

Super Crush KO

A one-hit wonder.

It's a tale as old as time: girl meets alien warlord; alien warlord comes crashing through her bedroom wall; he steals her cat and maybe her heart. Then the girl grabs a laser rifle and heads out to get her cat back.

Functionally, as a setup for a videogame, this mightn't be all that different to 'your princess is in another castle', but paired with a bright art style that looks like it's been scrawled onto your monitor in pastels, it's exactly the kind of thing that makes me do the heart eyes.

So, yeah, it was pretty much love at first sight with Super Crush KO. But this was a surface-level attraction, based on appearance and assumption, the kind that quickly fades. Sorry to say, this isn't going to be a love story.

Peel back the impeccable presentation, and underneath you'll find a pretty straightforward 2D brawler. Armed with the aforementioned laser gun and a selection of

punches, kicks and dashes, you move left to right, clearing screen after screen of robotic nasties. And there's nothing wrong with that! Some of my best friends are straightforward 2D brawlers. But *Super Crush KO's* action lacks a certain zest. As gorgeous as the art is, in motion it's never quite as smooth as you'd hope. Your character feels a little like one of those paper dolls you made as a kid, putting split pins in the joints so you could jiggle its limbs.

There's no real sense of heft to the action. Enemies just kind of linger there, politely waiting to explode while you repeatedly hammer the punch button. You can stand harmlessly on top of one another, your sprite overlapping theirs, until an attack pattern causes them to flash red, knocking you backwards with all the force of an updraft catching a shopping bag. A misjudged uppercut will send you sailing past your intended target and into clear baby-blue



Bright and colourful graphics do not make up for repetitive gameplay.

sky, where a carefully cued follow-up punch leaves you fluttering in the breeze as your combo multiplier trickles away.

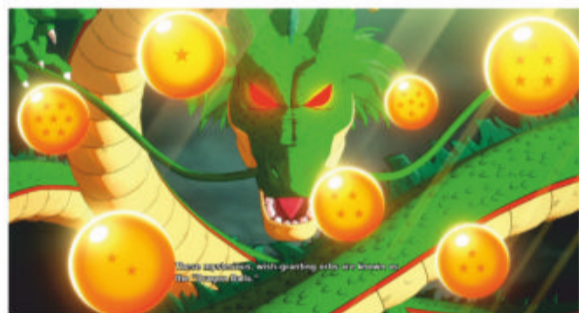
Super Crush KO is one of those action games that's always marking your performance. Its UI is dominated by a big fat letter grade that sits at the top the screen looking judgemental. And this is the aspect of the game I'm most torn about.

I'm not sure how well this actually fits with every other part of the game. Some of this, admittedly, might be personal bias – I'm the one who gives out scores around here, thank you very much, and that's the way I like it – but the constant reminder of your current grade means that every moment you're not landing a punch feels like a failure.

★★★★☆

Floaty combat and repetition mean this cartoon brawler is never more than a pretty face.

Alex Spencer



US\$59.99, PS4, Xbox, PC, www.bandainamcoent.com

Dragon Ball Z: Kakarot

An open world RPG that follows the anime closely.

In *Dragon Ball Z: Kakarot*, you're able to get through this first arc, including all the sub-stories, in about six hours. The year spent training is sped up, giving you snippets of Gohan's transformation and Goku's training in the afterlife without forcing you to defeat X number of creatures. *Kakarot* as a game understands what you're here for – larger than life, planet-destroying battles. It offers plenty of those, while integrating RPG elements to give you a sense of growth and progress.

Dragon Ball Z: Kakarot covers the four main arcs of the story – Saiyan, Frieza, Cell, and Buu – but manages to cut out even more of the fluff than *Kai* does. As a result, you still get all the main story beats, but you also don't need to watch battles that take multiple episodes to complete. Instead, you fight in the battles yourself.

Battles are similar to those in *Dragon Ball Xenoverse*, but simplified a bit. The system requires you to start with basic Ki strikes and punches. Then you launch powerful skills when the opportunity appears.

While the battles feel epic, they are

ultimately very simple. You get in close, land a basic combo, and follow up with a special attack. Sometimes you may need to use a healing item, but you can finish most battles without issue. The battles do make you feel like you're an amazingly strong Z fighter, but sometimes they lack tension.

There are skills to level up, but sometimes you need to train before you can spend Orbs on your skill tree. Meals give you both permanent and temporary effects, but you can also get Chi-Chi to make full course meals with even more benefit – if you can find the recipe first. You need to turn in Turtle School tasks by talking to Master Roshi, but you can't do that very often during the course of the story. Collecting the Dragon Balls later seems cool, and in theme with the show, but ultimately the rewards aren't worth the effort.

★★★★☆

A light and fun RPG that sometimes gets bogged down by its interweaving progression systems.

Liz Henges



US\$19.99, PS4, Xbox, PC
invectorgame.com

Avicii Invector

Avicii Invector isn't your average rhythm-action game. The project, that aimed to enhance Tim Bergling's brand of electronic dance and house music by combining it with interactive and mesmeric environments, began in 2015, but the Swedish club sensation passed away in April 2018. Hello There Games and Bergling's team subsequently finished the game, with a percentage of the proceeds going to the Tim Bergling Foundation, which supports those with mental health problems. It imbues the final experience with profound poignancy beneath the upbeat sheen of the Swedish DJ's party anthems.

That final experience is 25 of Avicii's biggest hits grouped into five distinct, but ravishing, worlds. Similar to *Amplitude* or *Thumper*, you match notes to a corresponding button on your pad – I prefer this to the keyboard controls, but they work just fine too – on three different lane types that ensure that no song becomes a chore.

Avicii Invector is an excellent, sometimes overwhelming experience. While it's impossible to know the state of the game when the DJ passed away, an infectious affection for Bergling's work now oozes from the rush of each break to every cathartic drop.

★★★★☆

A sumptuous fusion of sound, colour and love that everyone should try.

Harry Shepherd

DISCOVER

PC & console games



Free, PC
spoland.itch.io/the-last-resistance

The Last Resistance

Wilderness and robots make for an evocative combination. Playing out like a very, very small-scale *Far Cry*, you're dropped into a refreshingly Nordic open space that offers maybe ten minutes of exploration as you increase your arsenal enough to eliminate a robot threat.

You start the game with no weapons, but pretty soon you'll find an axe and then a shotgun, tools that make the smaller enemies at least rather trivial to deal with. The AI of those little spider bots is decidedly simplistic: they won't stop chasing you, ever, until you're dead. Or, more likely, until they're dead, as they're far slower and weaker than you are. The massive, *War of the Worlds*-style tripod enemies pose a deadlier threat, and remain an ominous presence even as you increase in killing power.

The Last Resistance, however, is a small game. Not just in terms of map size, but in its progression: you acquire the axe, and then the shotgun in a linear order. While you likely won't replay it, there's something to be said for a game where you can destroy a robot army during your coffee break.

★★★★☆

Short and not so sweet, with some unique enemies, even if replayability suffers.

Tom Sykes



\$29, PC, www.mosaiccorp.biz

Mosaic

Wallowing in day-to-day drudgery.

Mosaic's sales pitch: forget the straightforward thrills of action and/or adventure, here's a game that simulates the tedious grind of everyday life.

Using point-and-click controls, you drag your character – an anonymous office worker with a wonky tie, a smartphone and not much else in the way of a discernible personality – through this loop five times, a full working week of low-level misery. Which raises the question: why exactly would you want a second life that's just as rubbish as the first? If *Mosaic* was able to answer for itself, I suspect it'd be a mumble about art and mirrors and reflecting reality.

There are some sharply observed moments here, like the daily elevator ride you share with two strangers. Seemingly the only control you have over your character is which way he looks – so much as glance in a stranger's direction, and they'll do everything they can to avoid meeting your gaze. At which point, you realise there is a second thing you can do: look at your phone. This is the big message *Mosaic* has to impart: Modern life, eh? We're all scared of one

another and we're always looking at our screens.

There are no real puzzles to speak of, or gags and insights to be accessed by clicking on background details. For the most part, you just move through the story. There are exceptions, mind. Every day when you arrive at work, *Mosaic* switches to a very simple hex-based strategy game. It's half-baked, but possibly intentionally so – work isn't supposed to be fun, after all. Outside of the office, there's the occasional bright spot to be found along your commute: watching a butterfly or sinking into your own imagination.

You might consider that question, why you'd want to live someone else's tedious life and conclude that, frankly, you don't. And you wouldn't be wrong, exactly. But *Mosaic* is at least an occasionally fascinating way of boring yourself.

★★★★☆

A game about breaking free from monotony that gets, perhaps inevitably, a little monotonous.

Alex Spencer



\$12, PC, Xbox, lifeisstrange.square-enix-games.com

Life is Strange 2

Far too focussed on the finish line.

Life is Strange 2 begins in suburban Seattle, where a fatal misunderstanding forces Sean and Daniel to flee their home. In his panic, Sean takes his brother on the run, aiming for his father's family home in Puerto Lobos, Mexico, and the pair take the first steps on their year-long journey to the border.

His decision provides an impressive backdrop to their adventure – but also forces *Life is Strange 2* to immediately undermine its road-tripping *raison d'être*. Rather than directly portray a 2,500km journey, developer Dontnod sticks to its series' classic tropes. Exploration, dialogue, and character development are its strengths, but those are difficult to achieve within the confines of a Greyhound bus. Instead, the story moves from vignette to vignette, with each chapter set months after the one before, in a place where Sean and Daniel can stay in relative safety for a few days or weeks.

Here lies the game's most existential dilemma. These havens provide a place to live almost entirely off-grid, a rare opportunity to lay low and take stock. In one episode, whole chunks of dialogue

are given over to the idea of holding out for next month's paycheck, while another places the brothers firmly within the nuclear family they both so clearly crave. Those themes, of financial security and familial responsibility, are woven throughout the game, but their importance pales in comparison to Dontnod's desire for a classic roadtrip, and so Sean and Daniel are moved on, irrespective of the decisions made within the episode.

This problem is exacerbated by the fact that *Life is Strange 2*'s most powerful tool is not directly in your hands. While players control Sean, it's Daniel who boasts supernatural abilities. Its desire to stick to the series' tropes means you're forced into setpiece after setpiece on your inevitable road to Mexico, without any desire to cater to the player who just wants to be a good big brother.

★★★★☆

Promises a classic American roadtrip, but it fails to put you in the driving seat.

Alistair Jones



Free, PC

papercookies.itch.io/no-players-online

No players online

There's something eerie about a public space that is devoid of people, a fact that this first-person horror utilises to its advantage. It's set in an online FPS, but one where you're the only player.

Without revealing too much, the abandoned server you're playing on isn't quite as empty as the game initially suggests. A presence that makes itself known as you play a (seemingly futile) game of Capture the Flag. It's this steadily growing anticipation that makes *No Players Online* so wonderfully tense to play – you just know something will happen as you run from capture point to capture point. But what will that be, exactly?

As *NPO* comes to a close, and its cards are laid out on the table, it becomes clear that it owes something to the technological horror of the Ring series. If the final revelation is a bit preposterous, then it's hard to fault the general theme of the game: what are old servers but essentially graveyards haunted by the people that have abandoned them?

★★★★☆

A clever use of video game tropes comes together to present a singular horror gaming experience.

Tom Sykes

DISCOVER

Mobile games

Mobile games

James Pinnell reviews the latest games for android & iOS smartphones & tablets.



Black Desert Mobile

Free with IAP

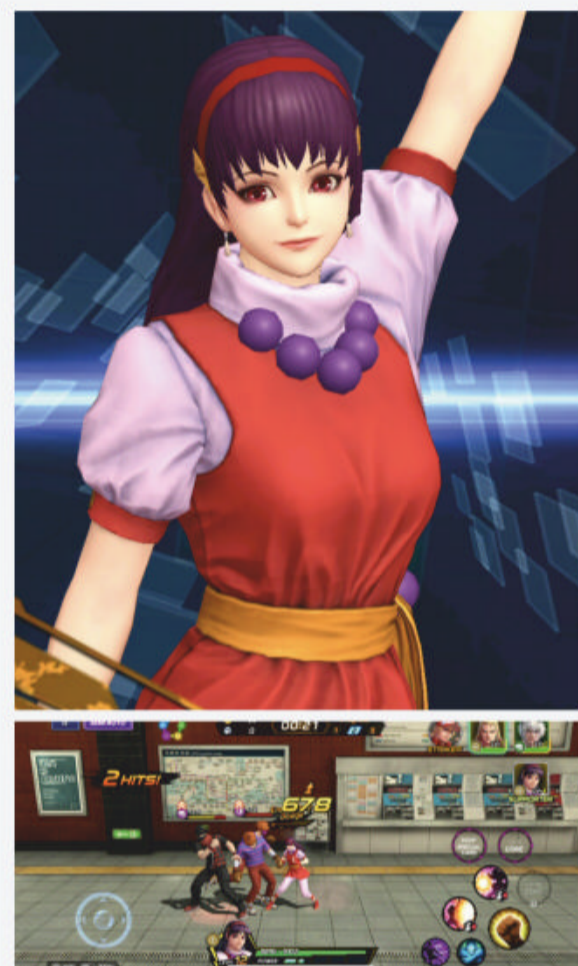
Black Desert Online, for better or for worse, is one of the most engaging MMO (Massive Multiplayer Online games) titles on PC and console. It's entirely open world, has an engaging crafting and combat system, deep character customisation, player housing, and trading. So, when the developer, Pearl Abyss, announced the development of a mobile version, I was intrigued to see if they could replicate the PC experience onto mobile.

I've spent about a month with the game so far and I'm impressed to see that for a launch title, it has gotten a lot of things right. First off, the graphics are stellar – both environments and character/beast models are incredibly detailed, spell effects are multi-staged and grand, while the framerate at max settings is tight, fast, and crisp. The combat is the same detailed move/dodge system, utilising combos and melee/ranged/AOE skill types across different bosses and enemies.

Outside of the standard quest/mission grind, (yes, there is still a grind, but it's negated by an offline "auto" mode) there's a base you can build that

generates resources and items. You can also go fishing, build Amity (relationships) with NPCs, find hidden bosses and quests, complete trade routes, farm "nodes" for rare items, and so forth. The game carefully unlocks new features and functions as you level, so you aren't bombarded with new things to do.

There's a lot – boss fights, group raids, PVP, Guild events, World events, so on and so forth. As with most mobile MMOs there is also an auto system – this allows you to grind missions and story quests easily (the story is decent through, so it's worth reading), but not PVP, initial boss encounters and Quest events. In many cases, playing the PC/Console version would likely be more "realistic", but for a mobile game, the dynamic battles are genuinely a lot of fun. Dodging works and is genuinely important – even if you auto run, you'll likely still die without it. Most importantly – you'll likely never need to spend a dime if you don't want to. ★★★★★



King of Fighters All Stars

Free with IAP

King of Fighters, a niche fighting franchise that is a hangover from the nineties, targets a hardcore fanbase. SNK, the developers of *KOF*, has been re-releasing early versions of the games on mobile to a mostly muted audience. *All Stars* takes the franchise in a new direction, pushing it into "gacha" territory via randomised summons of fighters that are placed into teams and fought via a never-ending run of side scrolling beat-em-up missions.

In an attempt to avoid repetitive drudgery, it mixes things up by introducing a bunch of fun plays on fighting game tropes – introducing random "challengers" into your missions, via real and AI players.

But at the end of the day, like most "gacha" games, things fail dramatically when it comes to summoning fighters you want. Most summons involve three to four star fighters, many of them duplicates, and things divulge into the standard grind to win drudgery. There is a great game in here, but unfortunately descends into farce. ★★★★★



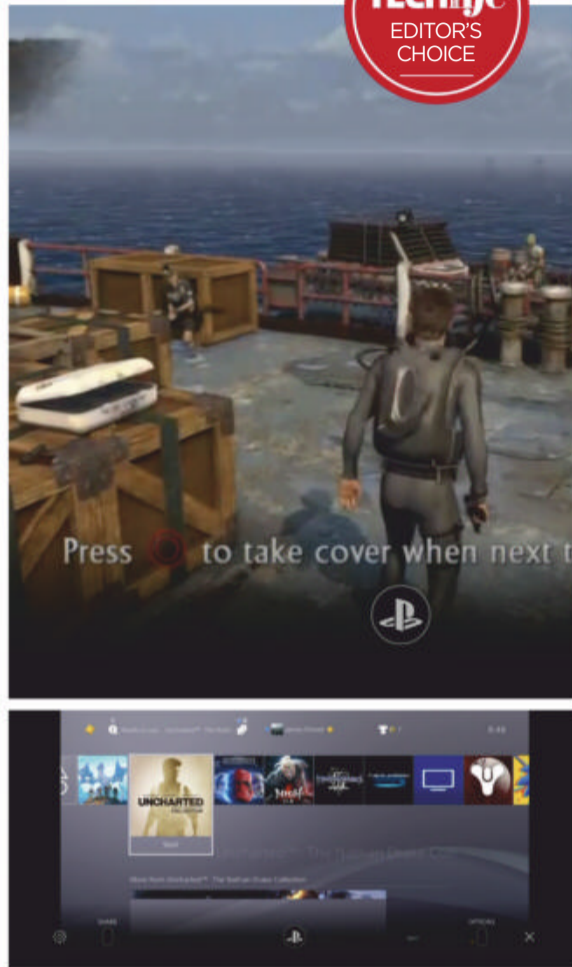
Raid: Shadow Legends

Free with IAP

For the first time ever, I received a request to review a game. A notorious game. In fact, if you've been on YouTube at almost any point in the last few years, you've probably heard of this obnoxious title that has been flooding both standard and native advertising on the platform with what must be an incredible marketing budget. Yes, good people, it's *Raid: Shadow Legends*.

The most interesting part of *Raid's* hype is simply how ordinary it is as a mobile game. It's not clever or original in its playstyle, its UI is chunky, dated and ugly, the sound is poor, and the storyline is awful. Its graphics are passable at best, and the gameplay is horribly repetitive. So much so, that the entire game, almost from start to finish, can be played on Auto, meaning you don't have to fight a single battle.

It's also probably the most over monetised game I've ever loaded up. I counted 10, popups for "offers" on start-up alone. This game is a boring, pointless, money grabbing mess and it's fairly staggering how it continues to get so many high ratings. Please stay far away. ★★★★★



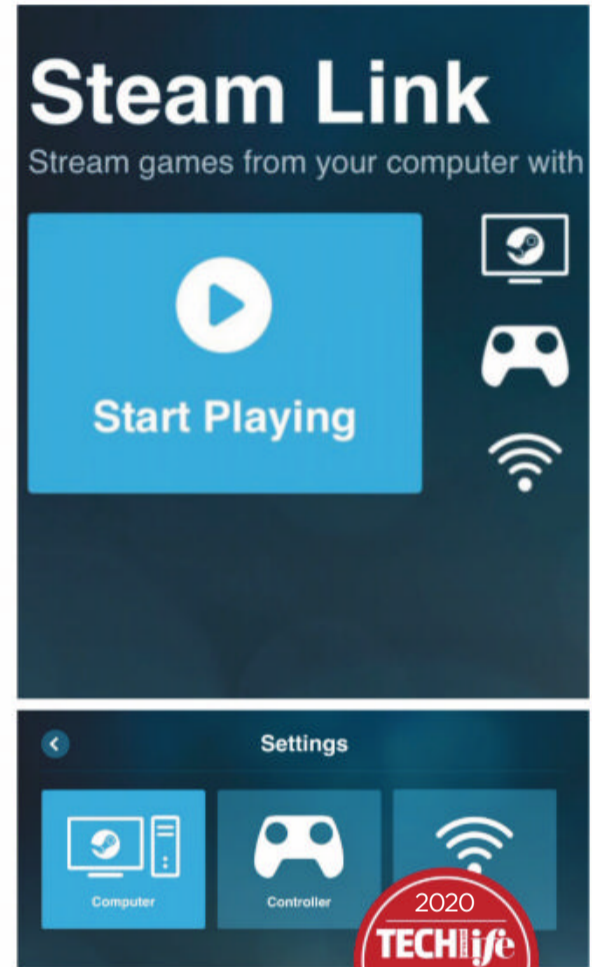
PS4 Remote Play

Free

While the PS4 Remote app is relatively old, with the last iOS update it became possible to Bluetooth-connect a PS4 controller directly to your phone or tablet, upgrading from the janky onscreen controls to a full mobile experience. With a plastic clip off eBay or Amazon you can easily connect the two together and have the full remote experience.

It runs at 720p if you have a standard PS4, and 1080p if you have a PS4 Pro. Unlike other similar apps, it works over both wireless and cellular networks, so if you have a decent upload at home, you can have a cheeky game of *Destiny 2* on your lunch break.

Recent updates have also dramatically improved framerate, latency and added support for iPad. In practise, it works extremely well. There is very little control lag, every game on the system is supported, and it doesn't require any additional services to run. Even the touch screen controls are quite good, although they do crowd the screen somewhat and using button combinations is like playing twister with your fingers. ★★★★★



Steam Link

Free

The updates to iOS's Bluetooth support don't just stop at the PS4. The Steam Link app is a relatively new addition to mobile devices, originally reserved for a small standalone device or certain smart TVs. Steam Link, like PS4 Remote, effectively mirrors your PC while running Steam, enabling you to play any game in your PC library on your phone or tablet.

Unlike PS4 remote, however, Steam Link requires a controller to operate, so there are no touchscreen controls available. However, Steam Link does run at 1080p by default, and is wholly dependant on the power of your PC in what games can run and at what resolution or framerate they display. When active, Steam Link turns Steam into "Big Picture" mode, which makes it easier to select games, install them, update them and so forth with the controller.

As video game streaming becomes more prevalent, it's likely a console or PC won't even be needed in the near future to play full game experiences on mobile. Both of these applications however are a great start if you are getting a little over the same sort of mobile game experience. ★★★★★ TL

SPECIAL REPORT

CES 2020 for gamers

More than 170,000 people filed through the doors at CES this year, which is roughly 170,000 more people than we can deal with in early January.

Ode to joy

In Las Vegas, CES yields little for watchers of the new generation, but pays plenty of homage to the current one.

Attending Las Vegas' Consumer Electronics Show has always seemed to require a special sort of madness. After all, who in their right mind spends the first week of January – a time, traditionally, of abstinence, or at least a bit of low-key living, after the excesses of Christmas and the New Year – in a city where the party never stops and the dinner buffets stretch off to the horizon? We would, if it's all the same to you, much prefer to stay in bed.

Nor has it typically yielded much of great significance to the videogame industry. It is the tech

sector's measuring contest, a place where fantasy becomes a passably prototyped sort of reality, where expensively developed and tenuously marketable solutions go in search of their respective problems. Each year Ed Zitron, a US PR (and, in a past life, disc editor for one of our sister titles) goes hunting for the very worst CES has to offer. Among his discoveries this year were a stove that monitors air quality; a toothbrush speaker system; an 'e-gardener'; countless helmets to aid sleep, mindfulness or brainpower; and



Alienware's Project UFO prototype is further evidence of the company's enduring prejudice against round edges.

'the world's first connected pen'. Right you are.

This year, of course, heralds the arrival of a new console generation, but you wouldn't necessarily have known it if you were at CES. Sony's livestreamed press conference featured PlayStation boss Jim Ryan touting sales figures and unveiling PS5's logo, but little else. AMD's equivalent event sent newsdesks into a brief frenzy when it seemed to reveal a rear view of Xbox Series X, but the company quickly copped to having used a fan-made render it found online; the console's array of ports must remain a beguiling, eternally fascinating mystery for now. That aside, pickings were slim. Indeed, the closest thing to Series X to be shown at CES was Razer's mini-PC, the Tomahawk, which boasts a similar form factor and has a tool-less design that simplifies the upgrade process: slide out an internal drawer, pop your new component into place, and away you go.

Razer is the sort of company that flourishes at CES, because it is prolific and weirdly experimental enough to ensure it stands out from the crowd. This year it showed off a custom racing setup with a 128-inch screen offering a 200-degree view, a hydraulic seat that mimics





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SPECIAL REPORT

CES 2020 for gamers



G-force and terrain and a steering wheel with pedals and manual paddle gearshift. Made by Razer using a mix of its own tech and that of other companies (including Fanatec and Vesaro), it's not intended for the home market, but instead is aimed at cornering (sorry) the apparently rapidly growing e-racing scene.

The Korean firm was also part of a broader trend at CES this year, which we suspect at least one marketing exec has suggested we all label Switchification. Leading the charge, if you can call it that, is Alienware's cheerily ludicrous Project UFO, a portable – and dockable – PC with a 1,600 x 900 screen and detachable controllers. Alienware's shtick is basing its industrial design somewhere in between '70s sci-fi and a '90s teenager's bedroom, and it continues the theme with a system that is not only imposingly large, but that looks even bulkier than it is, with more awkward angles than badly built Ikea furniture. The appeal of the concept – a Switch that plays your Steam library – is undeniable. The execution is rather less convincing, though it is, in fairness, to use the timeworn CES caveat, only a prototype.

Elsewhere, Chinese smartphone manufacturer Xiaomi was showing off its mobile-gaming mouthful the Blackshark Phone 2 Pro, and specifically what it calls the Portable Gaming Kit – though hats off to the thirdparty seller on Amazon who has listed it as the Switch Kit. Essentially the gamepad equivalent of an drop-leaf table, it can be pulled apart from either side to reveal a cradle for your phone, with Joy-Con-style removable controllers. Razer's Kishi, meanwhile, is the latest in its line of phone cradles, the deal this time around being compatibility with both iOS and Android, and a direct connection to your smartphone's charging port to minimise latency in a sector where Bluetooth is the accepted standard.

All that aside, the only real link to the new generation of consoles comes, predictably enough, from display manufacturers – though if Samsung's bezel-less 8K display, or the LG model that rolls down from the ceiling, set your pulse racing then we'd perhaps suggest getting out more (once

Razer's Kishi mobile-gaming cradle borrows the Xbox button layout and colour scheme, though only having a single set of triggers rather limits its purported use for cloud-streamed games.

we've asked if you could lend us a few quid until payday, anyway). Series X and PS5 will support, if likely only theoretically at first, 8K resolution, but on PC players tend to favour refresh rates. CES ensured that extreme framerate fans were every bit as well catered for as the pixel-counters: Asus unveiled the first 360Hz display, with backing from a *Counter-Strike* pro.

And that, really, is CES in a nutshell: it is a place where nothing is too extreme, where something being theoretically achievable is evidence enough that it should be made. It is a week-long celebration of robots that bring you toilet paper, of shower heads that double up as Bluetooth speakers; of smart litterboxes, pinball tables with LCD screens in place of traditional mechanical

innards, and wearable sub-woofers. And it's in Vegas. We stay at home, stuffed from the holidays, if anything relieved that the new generation of consoles has only a slight link to this desertbound tech hellscape.

“
A place where nothing is too extreme; a week-long celebration of robots that bring you toilet paper.”



Razer's extravagant e-racing set-up may not be intended for commercial release, but that's not to say we don't quite fancy one.



TOP: MSI's Aegis T5 is a desktop PC that looks like a robot's head, because it's CES and why the hell not.

ABOVE: Charmin's Rollbot will bring toilet paper to you if you find you've run out at the worst possible time. Daft as it is, it seems more useful than MSI's offering.



ABOVE: Xiaomi's Switch-like controller for its Blackshark Pro 2 smartphone.

BELOW: Hyundai and Uber linked up at CES to announce this flying taxi, which we're sure will end well.



Virtual sanity

NVIDIA ROLLS OUT A DRIVER UPDATE TO BOOST VR FIDELITY .

In recent years, CES's main mark of significance to the game industry was in virtual reality, whose big players saw enough of a crossover between tech and games to justify an appearance at the show. This was a quiet year by comparison - no surprise, given last year's release of Index and Quest. But there was a significant development from Nvidia, whose CES-timed GPU driver update added support for Variable Rate Supersampling, or VRSS. Exclusive to the RTX line of graphics cards, it supersamples the part of the frame the player is looking at, giving compatible VR games a low-cost boost in fidelity. **TL**

TEST BENCH

The hottest gear pressure-tested



\$1,999, www.dell.com

Dell Inspiron 13 7000 2-in-1

A step up for Inspiron.

Dell's Inspiron line of laptops may not be its most premium family, but that hasn't kept some of the best features and performance hardware from showing up here.

The Dell Inspiron 13 7000 2-in-1 Black Edition (or Dell Inspiron 7390) is a testament to that, with exclusively high-end internals, a premium design, a 4K display, and a clever stylus slot that makes us wonder whether they actually beat Microsoft to the idea.

The Dell Inspiron 13 7000 2-in-1 serves as a launching point for Dell's latest Inspiron 13 7000-series laptops. That's because Dell was quick to move on from this model. It was effectively the ultimate version of the Inspiron 13 7000-series just before Dell took the leap into 10th-Gen Intel Core processors.

Design and display

The Dell Inspiron 13 7000 2-in-1 certainly qualifies as a thin-and-light ultrabook, but it's not the thinnest, lightest, or most ultra. The 2-in-1 form factor often

comes with a tradeoff in weight and thickness, and that shows up here. The Dell Inspiron 13 7000 2-in-1 Black Edition measures 15.9mm at its thickest point and weighs 1.39kg). That's well above the XPS 13 and HP Envy 13t.

That said, the Dell Inspiron 13 7000 2-in-1 Black Edition is plenty easy to carry around. It fits well into the laptop slot in our backpack, and does little to weigh us down. We've definitely borne heavier laptops.

One thing likely contributing a bit to the weight is the metal chassis. While some laptops opt for a lighter magnesium, Dell has gone with stamped aluminum. It feels sturdy to the touch, with minimal flex when we apply pressure. That aluminum covers the bottom, display cover, keyboard deck and outside of the hinge, but the inside of the hinge is plastic.

There's a good excuse for the inside of the hinge being plastic: that's where the Dell Active Pen lives. It has a handy slot carved out for it, and is held firmly in place by magnets. The magnets are strong enough that we're able to roll the pen across the keyboard

and have the magnets pull it right into the slot. It's a clever solution that makes losing the pen difficult while also making it easy to access the pen in any position.

That's important because the laptop can be in several positions. It can fold open into a tablet, sit upright like a typical laptop, or flip over into a tent position.

In all of those orientations, the pen is readily available.

This design positions the barrel charging port on the left side along with an HDMI and USB-C port, making the ports nice and balanced. The right side houses a USB-A port, 3.5mm headphone

“
The Dell Inspiron 13 7000 2-in-1 Black Edition isn't a performance monster with the Intel Core i7-8565U processor and integrated graphics on offer.”



jack (something we firmly believe belongs on the left side of laptops but is more excusable in a 2-in-1 where the left and right side can flip), and a microSD card slot.

Dell has positioned large speaker grilles on the underside of the chassis, near the front, but they may not have very big speakers inside. The audio is wimpy, with the low-end almost absent, and higher volumes leading to an irritating buzzing.

The display helps make up for the speakers somewhat. It's impressively clear at 4K, though it could stand to be brighter. The maximum brightness is strong enough for a lot of situations, but the glossy display sets it up to fail against sunlight. The bezels on the sides and top are fairly thin, though the top bezel makes a bit more room for the 720p webcam. The lower bezel is easily an inch wide. It's not bad, but it's not winning any screen-to-body ratio competitions.

Performance

The Dell Inspiron 13 7000 2-in-1 Black Edition isn't a performance monster with the Intel Core i7-8565U processor and integrated graphics on offer, but it's perfectly

sufficient for the type of work it's expected to handle. The processor zips through simple tasks, booting, and program launches quickly.

In our Benchmarks, we see the processor running neck and neck with the same chip in more expensive laptops like the Dell XPS 13 and cheaper HP Envy 13t, and considering the 16GB of RAM, this is a multi-tasker worth looking at. We don't run into any issues working on projects with dozens of tabs open in Chrome, the occasional YouTube video, and Slack in the background all at the same time.

Through all of our work with the Dell Inspiron 13 7000 2-in-1 Black Edition, we haven't noticed it get very warm either. The fans kick up to a modest level when it's under load, but they're not obnoxiously loud.

While normally the use of integrated graphics might seem like a smart consideration for battery life, our benchmarks showed a different story here. The Dell Inspiron 13 7000 2-in-1 Black Edition earned a respectable PCMark 8 Battery Life score of 5 hours and 32 minutes, exceeding the Dell XPS 13's and nearly tying

A slight lack of grunt is made up for the Inspiron's sheer versatility.

the HP Envy 13t's scores.

That's good news for workers, as that test simulates working and browsing. In our experience using the Dell Inspiron 13 7000 2-in-1 Black Edition for work, it holds up well for most of a day when keeping the power settings lower and leaving the display at 50% brightness. A full 8-hour work day would be a bit of a stretch, but could likely be managed with further reduced brightness and battery-saver mode.

Verdict

A Full HD display option would likely improve the offering, but the introduction of new 10th-Gen Intel Core processors to the Dell Inspiron 13 7000 2-in-1 line might improve the battery shortcomings while offering more configurations.

★★★★☆

The Dell Inspiron 13 7000 2-in-1 Black Edition is a versatile machine that will make a reliable partner for workers of all types. The ability to multitask, take notes with the stylus, and enjoy sharp content on the display add up to a strong experience.

Mark Knapp



The hinge that makes the Inspiron 13 7000 also holds its handy stylus.

TEST BENCH

Reviews



Approx. \$335, www2.meethue.com

Philips Hue Play HDMI Sync Box

Amp up your movie nights with this HDMI-powered light show.

The Hue Play HDMI Sync Box from Philips leverages the company's Hue light technology to create an immersive entertainment experience by adding lighting effects to your favorite shows and movies.

If you weren't aware, Hue lights matching what's on a screen has been capable for a long time, just not for people's TVs. Hue Sync has been available for desktop computers for over a year and it was a bit confusing why this functionality wasn't available for the main place this would make sense.

But, if the time was needed to make sure the Hue Play Sync Box was stable and accommodated the various complexities in the TV arena, then the wait was worth it. It's a fantastic product for those who want it and will make those who don't think they need it reconsider once they've seen it in action.

Setup and design
Setting up the Hue Play Sync Box

is straightforward, but will likely require re-doing you TV's entertainment area in some form.

To get Hue lights to mimic whatever content is showing on your TV screen, you'll need to connect a source device, like an Apple TV, into the Sync Box. (It is essentially a fancy splitter that connects to Hue lights.)

The content passing through is analysed and translated to flashes of color on any connected Hue lights.

If you want your Hue lights to match what's on the screen from your cable box, Apple TV, and Xbox, then each of those has to be plugged into the Sync Box.

There are four HDMI inputs to accommodate an adequate number of sources, but be warned that may be a limiting factor for some people. While you don't need to plug everything into the Sync Box – just the items you want to match with the light colors –

having inputs flowing through various inputs may affect how you control your TV or attached devices.

The Sync Box uses the same power adapter that the Play Bar Lights use so, for example, if you have two Play Bar Lights and a Sync Box, they can all be plugged into the same power adapter.

Once the Sync Box is powered on and connected to the TV, the device uses a separate Hue app called Hue Sync, which uses the lights set up in the main app's

"Entertainment" area, to control the Sync Box and start and stop syncing.

The setup process went smoothly for us and only took about 15 minutes (including a firmware update to the Sync Box) to get everything functioning from start to finish. But if you're coming into this fresh without any prior experience, the setup

“
The Sync Box creates bursts of color during explosions and dramatic ambiance during tense scenes.”



and installation process will likely be more complicated needing to set up a bridge, lights, and then the Hue Play Sync Box.

Also, you should be aware that because TV areas can be a mess of wires, it may take some time to get everything unhooked and reconnected. People familiar with Hue and its apps shouldn't have much difficulty adding the Sync Box to their setups, but anyone else should plan to have some free time available.

Performance

The Hue Play Sync Box performs as advertised and the actual hardware performance has been rock solid. After a few weeks and dozens of movies we didn't see any hiccups or issues with the hardware box or effects it produced.

The Sync Box creates bursts of color during explosions and dramatic ambiance during tense scenes is unlike other things people do to enhance the movie watching experience. Adding pricey rear speakers, a sub, or other things to a TV area might not even be as worthwhile as adding a Sync Box would.

Marvel movies are good

examples of how color can add to the viewing experience. The best movie we found was *Into The Spider-verse*, which was a magical experience when synced to the Hue HDMI Box.

That said, the constant glow on every show, movie, or onscreen content could be distracting depending on if you keep the lighting effect on all the time.

There are settings in the Sync app to start syncing your lights on power-on or you can manually enable syncing when you're ready. We used both and this setting will be a personal preference. There were times we forgot to enable the lights if they didn't start automatically, and there were times the lights were more distracting than helpful – like an episode of *The Office* where there was less color and mundane backdrops.

The biggest downside to the Sync Box is some of its technical specs: It will output 4K, but is limited to 60Hz and HDR10. (Its HDMI spec is listed as 2.0b with HDCP 2.2.)

The double edge sword here is that for people most likely to invest in Hue Play Bar Lights and the Sync Box to enhance their

Bigger and flashier action movies really benefit from the Sync Box's Ilight show.



The unit itself is remarkably discreet.

entertainment area, are probably the same ones investing in the highest quality TVs and movie watching. The device's specs aren't embarrassing or even bad, but it should be a consideration. There's a chance you might not even notice the 60Hz refresh rate or the lack of Dolby Vision HDR.

Verdict

The effect the Hue Play Box creates is stunning and makes certain movies and shows really fun to watch. It will engage you in a way that should delight most people. The setup was simple enough for anyone who already owns Hue lights and feels comfortable unplugging an HDMI cable or two. This box draws no attention to itself and is all about the presentation it creates.

★★★★☆

Its hardware specs could become outdated and a limiting factor for some people, but the biggest dislike is simply the price: at \$335, the device is targeted at a narrow market segment and won't make it into as many homes as a result.

Tyler Hayes

TEST BENCH

Reviews

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Not only can you stream top-notch PC games from your own collection; you can also enjoy fast-loading 4K HDR content and ambitious AI upscaling for 1080p video.



US\$150, [nvidia.com](https://www.nvidia.com)

Nvidia Shield TV

The ultimate streaming player and gaming device in one.

The Nvidia Shield TV has always been something of an odd duck in the streaming-player crowd. The first-gen model had a clever idea – half game console, half streaming box – but a cumbersome design. The second-gen model corrected a lot of the lingering issues, but still cost an awful lot of money (up to \$300) in a market where 4K HDR streamers usually go for \$50.

With the new Nvidia Shield TV (US\$150, with no official Australian price announced yet), the company is trying something a little different. Not only can you stream top-notch PC games from your own collection; you can also enjoy fast-loading 4K HDR content and ambitious AI upscaling for 1080p video. Then there's the Android TV OS, which offers thousands of apps, in addition to smart-home and digital-assistant compatibility.

The Shield TV has one feature that most Android TV systems lack: Nvidia Games. Selecting this will bring you to a variety of

Android games, but also to GeForce Now. While GeForce Now has been through a few different iterations, it's now a free game-streaming service. There are a handful of games available absolutely free of charge, such as *Batman: Arkham City* and *Tomb Raider* (2013), but these are mostly holdovers from an earlier experiment.

For the most part, GeForce Now is a way to stream games that you've already purchased on Steam, UPlay and similar services. The way this works is actually quite clever. You sign into your Steam/UPlay account on a remote server, which then downloads the game and streams it right to your Shield TV. The Shield will let you know when you've picked an incompatible title.

Android TV has access to thousands of apps – although like most app stores, there's a lot more chaff than wheat. At the very least, you'll be able to get just about every major channel and just about every channel-specific

streaming app out there.

The Shield TV is a powerful device, sporting a Tegra X1+ processor, 2 GB RAM, 8 GB storage, and support for Dolby Vision and Atmos. As such, there's no reason to discuss video performance in great detail. The Shield TV loads and buffers 4K HDR content very quickly.

From its ambitious AI upscaling to its surprisingly solid game streaming, the Shield TV is definitely aiming for a gaming/streaming audience rather than the everyday binge-watcher. But I think it provides just about everything those gamers and streamers would need, at a much more approachable price than before.

★★★★☆

Seamless game-streaming, fast-loading 4K HDR content and ambitious AI upscaling for 1080p video. Yes please.

Marshall Honorof



US\$149, au.gearbest.com

Amazfit GTR

Amazing in some ways, less so in others.

The Amazfit GTR is the latest smartwatch from Huami, a company backed by Chinese tech giant Xiaomi which is continuing its near two-year tradition of churning out impressive budget smartwatches under its Amazfit brand, including the Stratos, the Verge, and the Bip.

The Amazfit GTR is another of Huami's affordable smartwatches that makes bold claims about its style, display and extended battery life. On the specs sheet, it certainly looks like good value for its pricetag: at around US\$140 – prices vary depending on the size and style you choose – you get GPS, a battery that can supposedly last up to two weeks with normal usage, tracking of 12 different activities, step counting, sleep monitoring, and an AMOLED display with 326 pixels per inch, the same resolution density found on an iPhone 11.

So how does it fare in practice? After spending more than a week with its 42mm and 47mm variants, we've come away

impressed by just how much the Amazfit GTR can do, particularly with its exercise tracking. Its battery life is also among the best you'll find at this price, even if it doesn't quite live up to the company's lofty promises.

There's a huge difference in the design of the two variants. The 42mm feels sleeker and sportier: it has a silicone strap and most of its designs are single color, giving it an understated look.

The 47mm Amazfit GTR feels more like a classic watch, with a titanium or aluminum alloy body and a traditional leather strap. The underside of the strap is silicone, which means you can wear it for exercise without worrying about damaging the leather – a thoughtful touch.

The face on the 47mm model is, naturally, bigger. We have relatively thin wrists, but it didn't look too large: it shouldn't be a problem unless you have



For its price, the GTR is a remarkably stylish device.

“

On the specs sheet, it certainly looks like good value for its pricetag

exceptionally thin wrists. The screen itself is one of the Amazfit GTR's best features. The 42mm version has a 390 x 390, 1.2-inch AMOLED display, while the 47mm has a 454 x 454, 1.39-inch AMOLED display. At this price point, you wouldn't expect any fancy app integrations, especially as the

Amazfit GTR runs proprietary software, rather than Wear OS, and indeed it offers few surprises.

But it looks the part, which is rarely the case in this price bracket.

Whether you go for the sportier 42mm or the more classic 47mm style, you'll be able to pair it with most outfits.

★★★★☆

There's nothing too exciting about Amazfit's latest effort, but it's relatively cheap and looks great on your wrist. If that's enough, it's an ideal smartwatch.

Samuel Horti

TEST BENCH

Reviews



“
While the camera arrays on modern flagship phones already offer a decent amount of versatility, they still can't quite match what dedicated DSLRs and mirrorless snappers can do.

\$369, <https://blackeyelens.com>

Black Eye Pro Kit G4

Change your smartphone camera's perspective.

Smartphone cameras have come a long way in the last few years. In that short span, we've gone from single-lens shooters that needed excellent lighting to multi-lens technology that produces superb results in most scenarios – even at night. But while the camera arrays on modern flagship phones already offer a decent amount of versatility, they still can't quite match what dedicated DSLRs and mirrorless snappers can do – and some of the latter's strength and versatility certainly stems from the wide variety of specialised lenses on offer.

That's (in theory) where clip-on lenses for phones, like the Black Eye Pro Kit G4, come in. They promise to add that extra dimension to smartphone photography, providing access to wider angles, longer zooms and some amount of creativity with special lenses, all within a portable package that you can easily pocket or drop into a bag. The sales pitch is that they're perfect for quick, impromptu and

creative shoots when you're out and about.

As the name suggests, the Pro Kit G4 is Black Eye's high-end lens pack, and has been designed with quality in mind. It includes three different glass lenses: a portrait telephoto model that gets you a 2.5x magnification, a fisheye lens for a hemispherical field of vision, and a wide-angle lens for 120-degree shots.

The optics of each is fitted within a well-made aluminum frame and these are screwed onto their own sturdy, clothes peg-like clip. Some thought has clearly gone into the design of the lenses, with a strip of yellow rubber on the side of the clips to prevent your phone's screen from getting scratched.

If you're unsure whether the kit is compatible with your phone, Black Eye offers a very useful list of smartphones that it's definitely compatible with – but that said, we also tried the lenses on a Nokia 8 Sirocco, which isn't listed, and they

worked just fine, although we weren't able to use them with a Huawei P30 Pro.

The three lenses in the Pro Kit G4 do exactly what it says on the tin – you get a decent zoom in addition to what your phone is capable of, a wider angle to frame a shot and a very different perspective with the fish-eye. And they're ready to be used straight out of the box. Unlike some of the newer Olloclip lenses, which require a companion app to use, the Pro Kit G4 has no such paraphernalia attached to it – just clip on and shoot.

★★★★☆

There is no doubt that clip-on lenses, like the ones in Black Eye's Pro Kit G4, can significantly expand a smartphone camera's potential. They add versatility and allow you to capture new types of images that your phone normally wouldn't be capable of.

Sharmishta Sarkar



\$TBC, www.f-secure.com/

F-Secure Sense

Protect your home network and all its connected devices with this security router.

F-Secure Sense is a one-stop wireless router which prevents access to malicious websites and other threats, blocks trackers, and includes a firewall to protect all your connected devices from incoming attacks.

Bundled apps help set up and manage the router, and provide further standalone protection when you're on the go: URL filtering, download scanning, behavior monitoring, banking protection, parental controls and more (features vary depending on your platform).

A stripped-back, minimalist design should allow F-Secure Sense to blend into most homes. Its ports, cables and buttons are tucked away at the back, leaving just a cream-colored box with a gently glowing LED clock.

Sense otherwise supports all the standards you need – 802.11a/b/g/n/ac Wi-Fi over 2.4GHz and 5GHz (AC1750) – while providing a Gigabit Ethernet WAN port and three LAN ports. There's a USB 3.0 port, too, but right now

that's only for powering other devices.

Unfortunately, there's no Wi-Fi Protected Setup (WPS) option to speedily connect new devices. You'll have to enter your wireless key each time.

As we write, the F-Secure Sense router is available for free as a part of F-Secure's Total internet security suite. Good news if you like a bargain, not so much if you're hoping to use another antivirus vendor. You can buy it separately, but only in limited countries – F-Secure is working on a wider global release as we write, so hopefully it will become available locally in the not too distant future.

F-Secure does a good job of simplifying the Sense setup process, and that's obvious from the moment you open the box.

A card points you to product and app URLs, for instance. A well-designed Quick Guide walks you through the first installation steps, and there's a sheet of technical specs.

The power adaptor supports both two and three pin connections out of the box, and there's an Ethernet cable if you need it.

Our testing broadly confirmed this, with speeds peaking at around 480Mbps.

Real-world Wi-Fi speeds will depend on your home construction and layout. Sense had no difficulty simultaneously streaming four 4K video streams to separate test devices, though, and we weren't able to spot any significant performance issues.

★★★★☆

F-Secure Sense doesn't lead the market in speed, or features, or protection, or indeed anything else, but it's a decent all-rounder, easy to set up, and offers a good level of home network protection for a great price.

Mike Williams

TEST BENCH

Reviews



\$1,295, www.samsung.com

Samsung RU8000

Samsung TVs don't always need QLED to impress.

While there's no doubt that Samsung's 'QLED' Quantum Dot technology delivers a premium experience, it also comes with a premium price tag attached.

So it's great to find that Samsung can also combine plenty of picture quality with a great smart system even when you step down to a non-QLED series like the RU8000. These use regular color filters, are illuminated by less aggressive backlight systems and, as a result, are far more affordable.

The RU8000 isn't particularly glamorous by Samsung standards - its screen frame looks and feels pretty plasticky, and it feels strikingly lightweight while you're setting it up. Its desktop feet are a flare-free zone, too. And because they attach towards the TV's bottom left and right corners, you'll also need a pretty wide table or TV stand to sit the TV on.

The good news is that, while it's not as thin round the back as some of today's LCD or, especially,

OLED TVs, it's certainly not a 'budget fatty'. And while its bezel might not be especially robustly built, it is at least pretty narrow, meaning it doesn't distract you much from the RU8000's all-important pictures.

The Samsung RU8000 gets the same Tizen-based Eden 2.0 smart platform sported by the brand's premium 2019 QLED models.

This gives you a simple, space-saving home screen comprising a tidy row of link icons along the bottom of the screen. An upper layer of direct content link sometimes pops up if the app you've chosen on the bottom deck supports it.

You can easily rearrange the running order of the icons to keep your favorites at the start, and Samsung's Bixby voice control lets you issue search terms and operational commands just by talking into your remote. You can also use Amazon Alexa, but only if you have an external Alexa listening device.

The Samsung RU8000 is almost



As good with HD content as it is with 4K material.

effortlessly good at handling the HD and standard dynamic range content most households still spend most of their time watching.

Its 'UHD Processor' does a good job of converting HD's 1,920x1,080 resolution into the screen's 3,840x2,160 pixel count. With decent quality HD sources, at least, there's a real sense of added detail, and the results look sharp and clear without, typically, any exaggeration of source noise.

The sharpness that was so apparent with upscaled HD pictures on the Samsung RU8000 serves it even better with native 4K images.

★★★★☆

Looking at the specs you might assume that the RU8000 can't justify its position between the stellar value of the impressive Samsung RU7470 series and Samsung's brighter and more colorful QLED TVs. In the end, though, it actually makes a strong case for itself.

John Archer



\$599, www.bowerswilkins.com

Bowers & Wilkins PX7

Strong all-rounders, and aptX Adaptive support is icing on the cake.

If you're familiar with the PXs, or any Bowers & Wilkins products for that matter, you won't be surprised to read that the PX7s are smart. Not smart/casual, as you may describe the aforementioned Sonys – smart.

Aesthetically they aren't too dissimilar from the original PXs – what with their clearly branded, elliptical ear cups, solid framework, and fabric finish – but they do make significant headway when it comes to comfort. That's thanks to the replacement of the PXs' metal construction with a custom carbon fibre composite, making them lighter and, as a result, more pleasant to wear. Over a matter of weeks, our noggin never feels too burdened, and our ears become quite accustomed to being enveloped by the soft leather pads.

The PX7s have three modes – low, medium, and high – that you can cycle through by pressing the dedicated button on the left earcup, while a fourth, activated by holding down that button, helpfully lets the outside world in for a moment so you can hear, for example, a train platform announcement.

Tonally, everything is democratically represented: highs are crisp, mids are fleshed out, and bass is substantial yet supple. While they're a little on the rich side, with the warmth and neutrality that'll please with the majority, die-hard bass junkies may want to look elsewhere.

★★★★★

It's true, the cheaper Sonys represent slightly better value for money as current pricing stands, and the Boses deliver more advanced noise cancelation. But the PX7s tick all the boxes, and suffice it to say, look the best doing it. Becky Roberts



\$369, rode.com

Rode VideoMic NTG

Jack of all trades – master of, well, all of them.

The latest from Rode is the convergence of its ever-popular NTG field-recording series and industry standard on-camera VideoMic range, and the resulting package is certainly greater than the sum of its parts.

This microphone is housed in a rugged, aerospace-grade aluminium cylinder that still manages to be compact and lightweight, making it ideal for grab-and-go situations if you also consider its 30-hour battery life. Complementing its focused design is a minimalist control interface (two buttons and a gain dial) that allows for intuitive and rapid changes to core features, including high-pass filters and high-shelf boosts for enhancing recorded voice. One of the buttons can switch on a safety channel, allowing you to simultaneously record the same audio at a level 20dB lower, in case your main channel clips and you lose information.

These powerful and intuitive controls are made even more impressive when you look at the unit's connectivity. The VideoMic NTG can hook straight up to your laptop, phone, tablet, or DSLR and intelligently adapt thanks to its USB-C and 3.5mm connections.

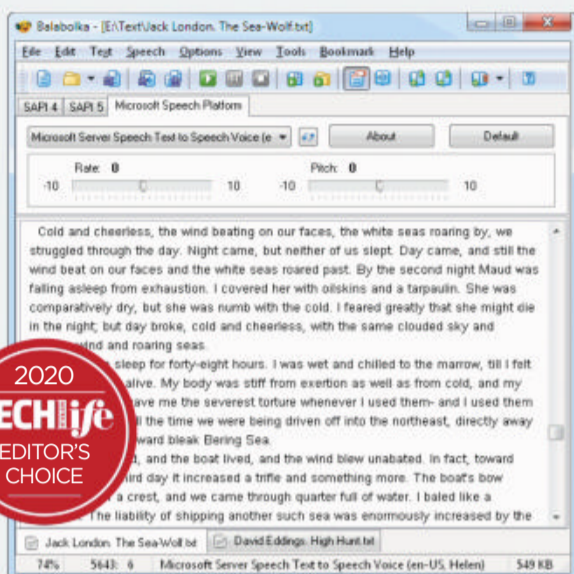
Lastly, the VideoMic NTG has the fidelity to match its ace feature-set. Compared to both its predecessors and competitors, recorded voice on this mic sounds vibrant and accurate, with a relatively neutral sound signature that retains the highs.

★★★★★

Whether you're a videographer, streamer, podcaster, or reporter, this versatile beast is likely all you'll ever need to capture studio-quality audio in the field or at home. Harry Domanski

BARGAIN HUNTER

The best free text-to-speech software.



Balabolka

Free, www.cross-plus-a.com/balabolka

There are a couple of ways to use Balabolka's free text to speech software: you can either copy and paste text into the program, or you can open a number of supported file formats (including DOC, PDF, and HTML) in the program directly. In terms of output, you can use SAPI 4 complete with eight voices to

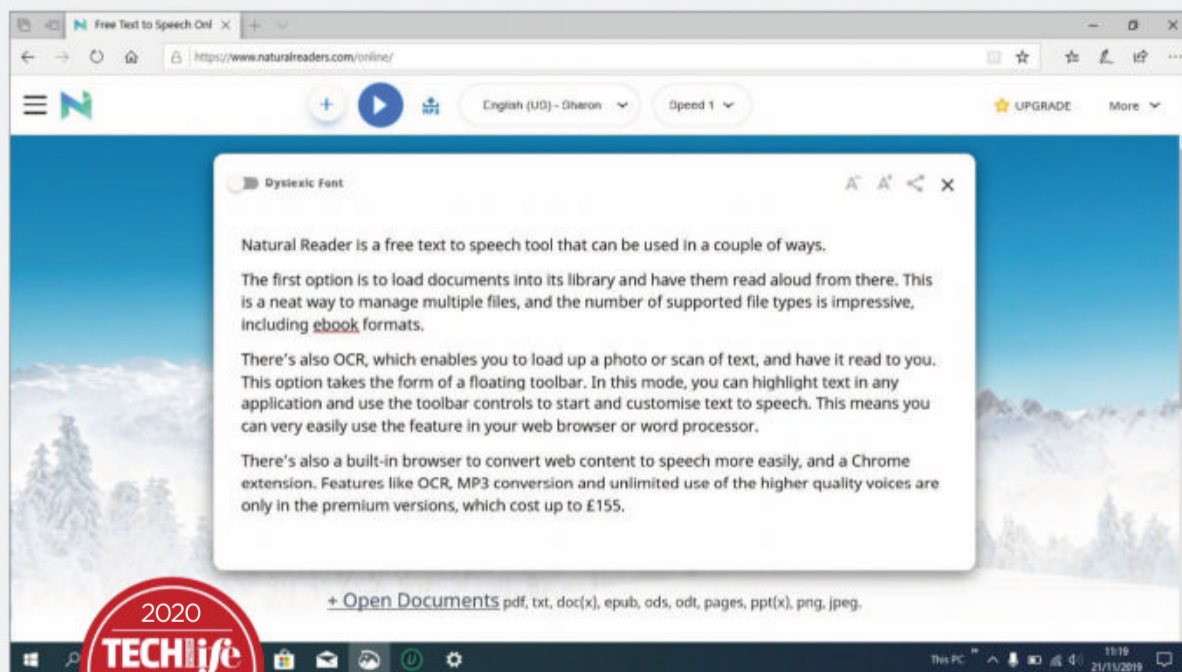
choose from, SAPI 5 with two, or the Microsoft Speech Platform.

This free text to speech software can also save narrations as audio files in a range of formats including MP3 and WAV. For lengthy documents, you can create bookmarks to make it easy to jump back to a specific location and

there are excellent tools on hand to help you to customise the pronunciation of words.

With all these features to make life easier when reading text on a screen isn't an option, Balabolka is best free text to speech software around.

★★★★★



Natural Reader

Free, www.naturalreaders.com

Natural Reader is a free text to speech tool that can be used in a couple of ways.

The first option is to load documents into its library and have them read aloud from there. This is a neat way to manage multiple files, and the number of supported file types is impressive, including ebook formats.

There's also OCR, which enables you to load up a photo or scan of text, and have it read to you. This option takes the form of a floating toolbar. In this mode, you can highlight text in any application and use the toolbar controls to start and customise text to speech. This means you can very easily use the feature in

your web browser or word processor.

There's also a built-in browser to convert web content to speech more easily, and a Chrome extension. Features like OCR, MP3 conversion and unlimited use of the higher quality voices are only in the premium versions, which cost up to US\$110 per year. ★★★★★

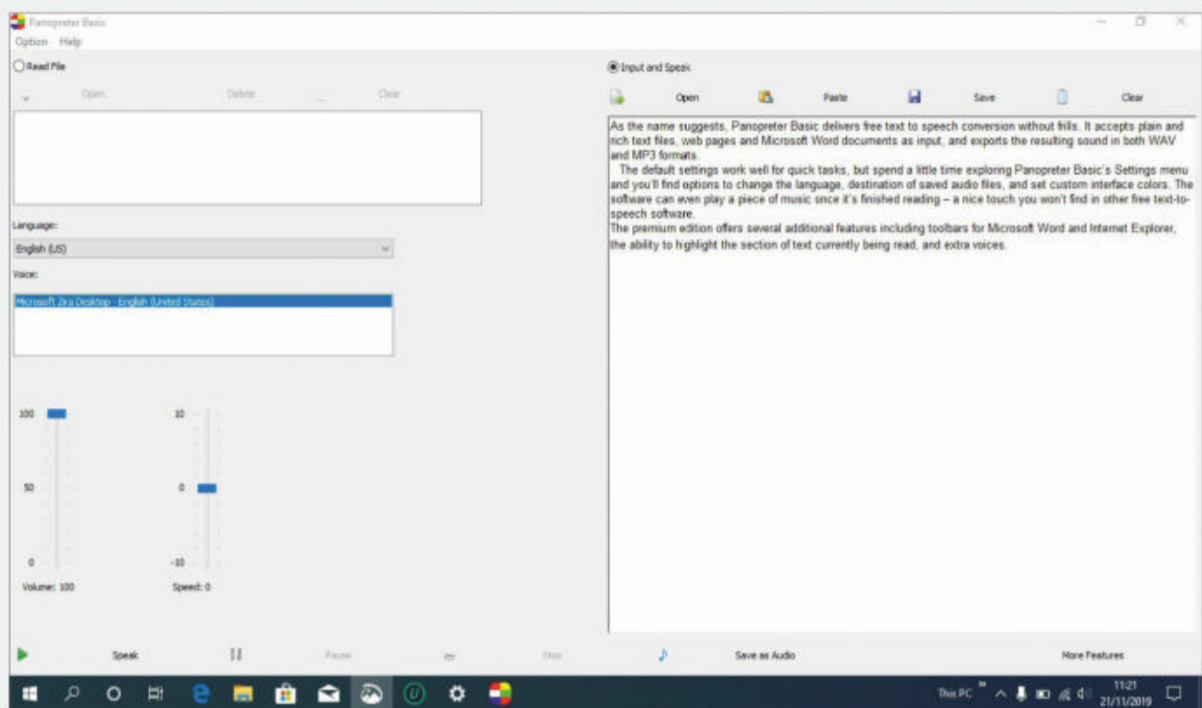


Panopreter Basic

Free, www.panopreter.com

As the name suggests, Panopreter Basic delivers free text to speech conversion without frills. It accepts plain and rich text files, web pages and Microsoft Word documents as input, and exports the resulting sound in both WAV and MP3 formats.

The default settings work well for

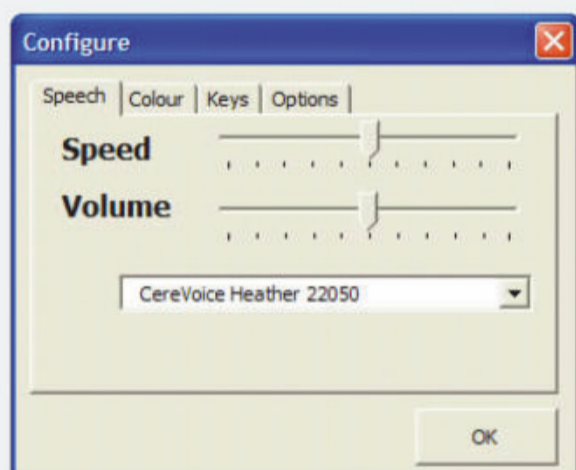


quick tasks, but spend a little time exploring Panopreter Basic's Settings menu and you'll find options to change the language, destination of saved audio files, and set custom interface colors. The software can even play a piece of music once it's finished reading – a nice touch you won't find in other free

text-to-speech software.

The premium edition offers several additional features including toolbars for Microsoft Word and Internet Explorer, the ability to highlight the section of text currently being read, and extra voices.

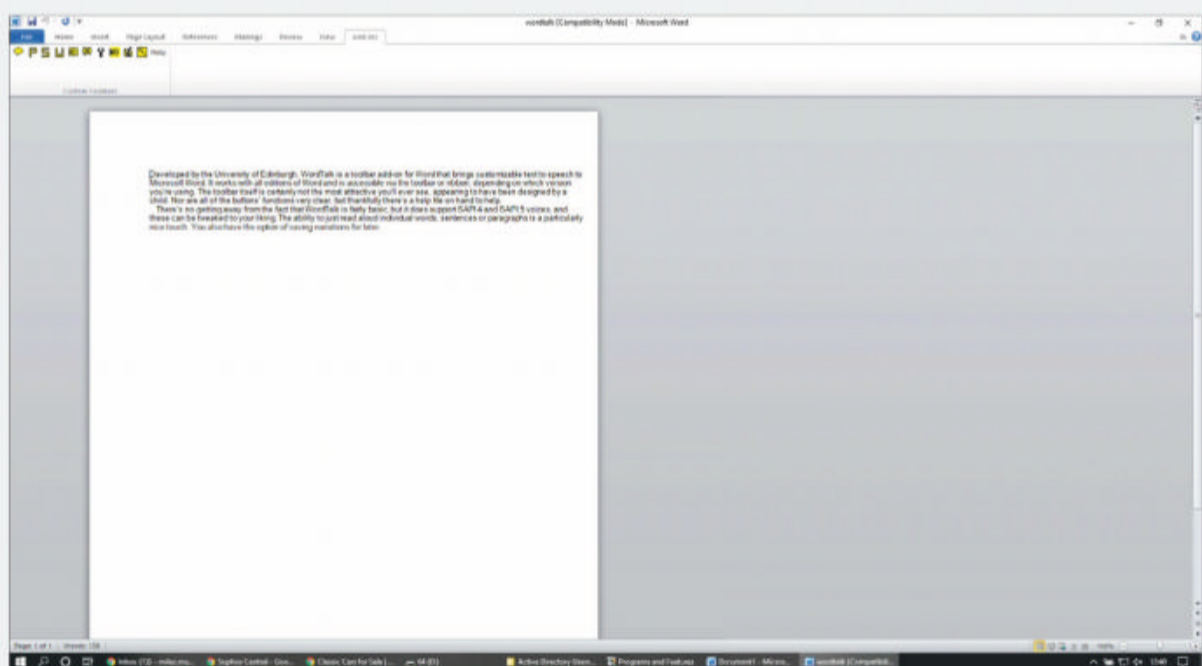
★★★★☆



WordTalk

Free, www.wordtalk.org.uk

Developed by the University of Edinburgh, WordTalk is a toolbar add-on for Word that brings customisable text to speech to Microsoft Word. It works with all editions of Word and is accessible via the toolbar or ribbon, depending on which version you're using. The toolbar itself is



certainly not the most attractive you'll ever see, appearing to have been designed by a child. Nor are all of the buttons' functions very clear, but thankfully there's a help file on hand to help.

There's no getting away from the fact that WordTalk is fairly basic, but it does

support SAPI 4 and SAPI 5 voices, and these can be tweaked to your liking. The ability to just read aloud individual words, sentences or paragraphs is a particularly nice touch. You also have the option of saving narrations for later.

★★★★☆

SUPER GUIDE

Introduction



THE FIRST 30 MINUTES WITH YOUR NEW PC

Treated yourself to a new computer? NICK PEERS reveals how to get it up and running.

You've done it: you've finally replaced your venerable, but creaking PC with a new shiny model. Perhaps the end of support for Windows 7 has forced you to make the move to Windows 10, or perhaps you're switching from one form factor (laptop) to another (desktop). Whatever your reasons for doing so, the process of transitioning involves several steps you may not be familiar with.

This issue we're going to not simply sit with you for the first 30 minutes of your new PC's life, helping you get yourself set up in Windows, we'll also help you migrate everything you need from your old PC to new: files, settings and applications will all make the journey

across. You'll discover what to do with applications that no longer work in the latest version of Windows, plus we'll examine if now is the perfect time to keep your personal data separate from your system drive, adding an extra layer of protection for your data.

And speaking of protection, we'll complete the migration by performing a thorough security audit, ensuring your new PC (as well as your personal data) is as secure as it can be before putting into place a robust backup mechanism for additional peace of mind. Enough tittle tattle, it's time to board the migration train, departing to New PCville in five, four, three...

PART 1 First steps in Windows

Your first task is to get the operating system set up and your basic user settings in place.

PART 2 Repair a Windows install

If you're trying to fix a problem, a refresh or repair install may be the best route to go down. Here's what you need to do...

First steps in Windows

Your first task is to get the operating system set up and your basic user settings in place.

Your first steps with your new PC will vary slightly according to the route you've gone down. If you've purchased a laptop or off-the-shelf desktop PC then you'll find Windows 10 will be installed, but paused at the initial setup process. If you've built your own PC and purchased your own copy of Windows, then obviously you'll need to install that from scratch.

Ready, get set...

After switching on your new computer, you should be taken through the Windows 10 post-setup process where you'll probably be asked to confirm your country and region, connect to your Wi-Fi network and sign into Windows using your Microsoft Account. If you're coming from Windows 7 this may require clicking 'Create account' if you've not already got some form of Microsoft account (for example, a free Outlook email address or OneDrive account).

If you're determined to retain a local user account at this point, click 'Offline Account' followed by 'No' create the same kind of user account as you had in Windows 7.

One important point to remember: you'll need a Microsoft Account to access certain features, including the Microsoft Store for Windows 10 apps, and Windows may automatically convert your account to a Microsoft Account without telling you when you connect your account for any reason.

After setting up your account, assign a PIN number for faster logins and then choose whether to link your OneDrive account to this PC, which is one way to transfer files from your old PC to new (more on that over the page). You'll also be subjected to a series of screens offering features like the Cortana voice assistant and online speech recognition. All of these come at the cost of personal privacy, so if in doubt, leave them disabled. Finally, you should find yourself at the desktop.

Critical steps

Before embarking on the process of transferring programs, data and settings from your old PC, you should take the time to make sure everything's shipshape and



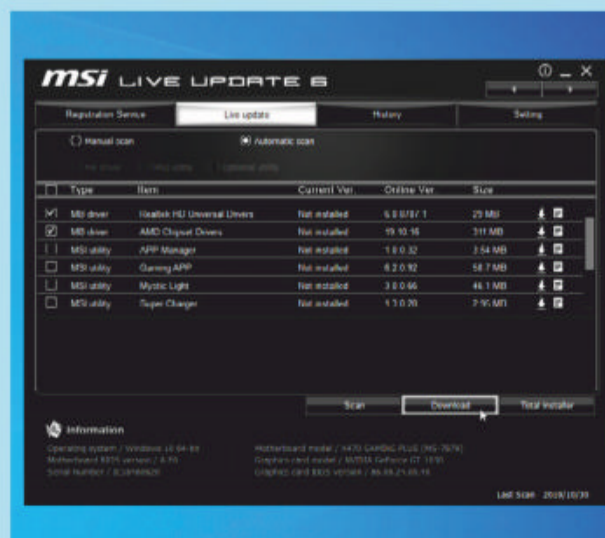
Remove unwanted programs installed by your new PC's manufacturer to free up space and system resources.

ready to go. First, navigate to Start > Settings > Update & Security where you should find a raft of updates waiting for you. Install these and keep checking back for other updates too – consider clicking 'Advanced options' to flick the switch to receive updates for other Microsoft products when you update Windows.

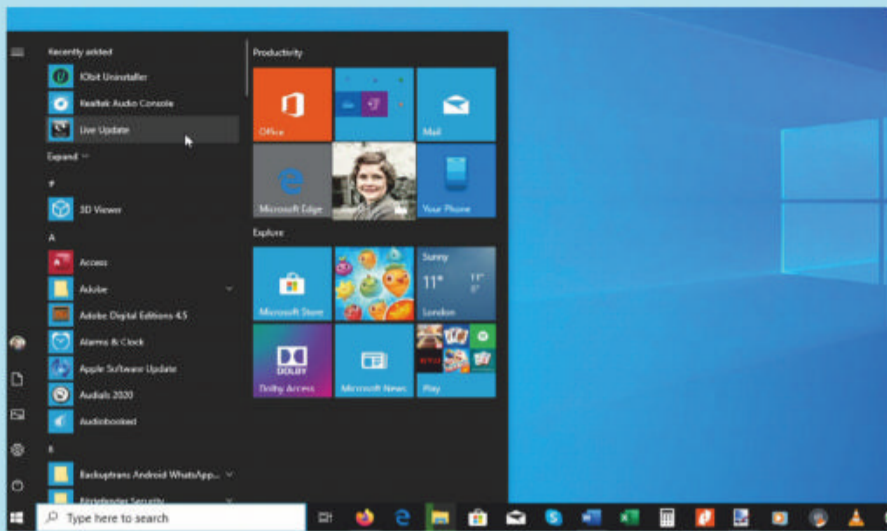
Next, consult your PC's documentation to see if it comes with any additional tools and updaters – for example, installing proprietary driver updates over and above those offered by Windows itself, such as the HP Support Assistant. Speaking of which, your pre-built PC is likely to come with a load of unwanted extras in terms of bloatware – you should be able to get rid of these via 'Settings > Apps > Apps & features' or try IOBit Uninstaller Free (www.iobit.com/advanceduninstaller.php – skip any additional program offerings during the install process). Here, focus your search on Bundlware and also look under Toolbars & Plug-ins for unwanted browser addons to help clean your new PC before you start adding your own software.

SOURCE YOUR OWN DRIVERS

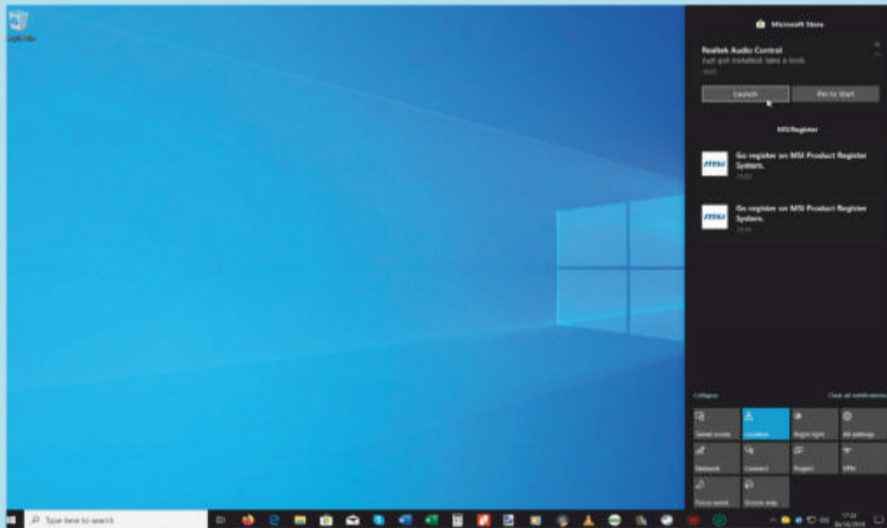
If you've built your own PC, you may need to install drivers yourself from various sources – start with your motherboard's manufacturer. Look out too for related utilities – for example, MSI Live Update for MSI motherboards – that can simplify the sourcing of drivers (and subsequent updates) for you. Repeat for other core components – including your graphics card – before moving on to your peripherals like your printer or game controller. Struggling to find them all? Consider installing Driver Booster 6 (www.iobit.com/en/driver-booster.php) to seek out drivers across your entire system, including updates not normally detected by Windows Update.



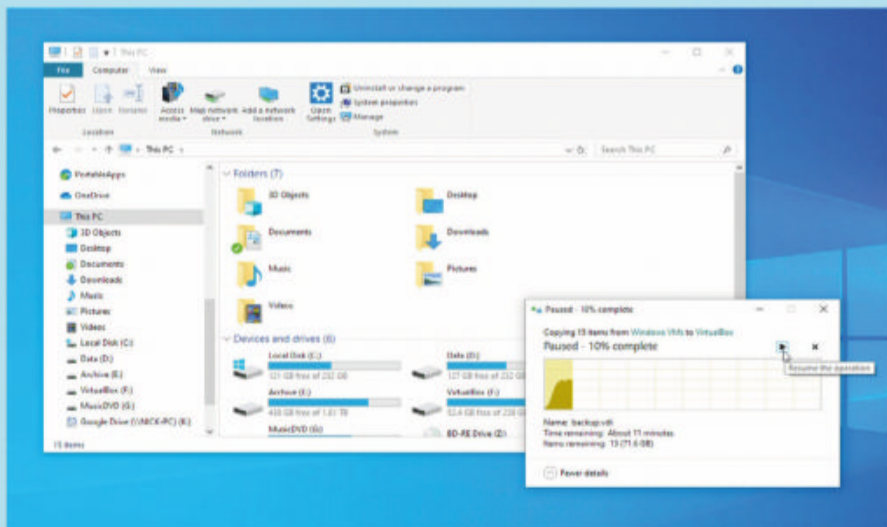
EXPLAINED Differences between Windows 7 and 10.



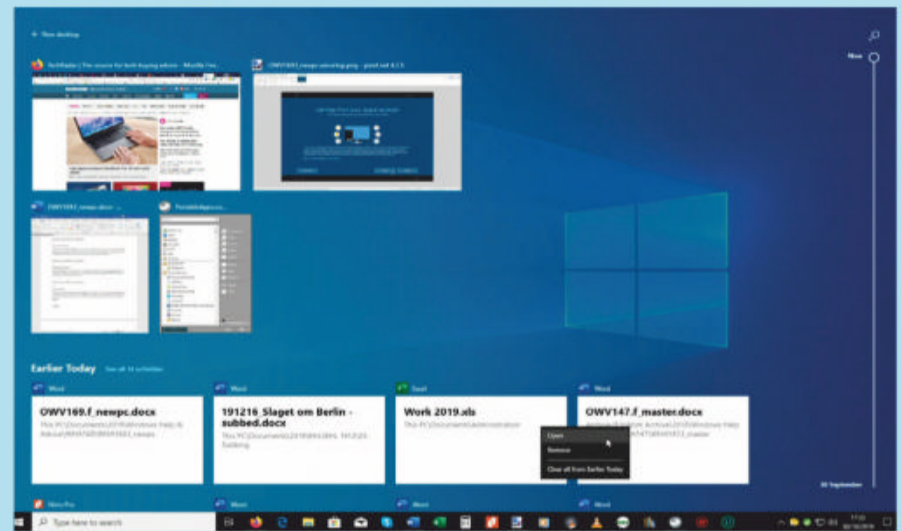
1 DESKTOP CHANGES The Windows 10 desktop is only superficially different to Windows 7, but there are some key changes – the Start button opens a new Start menu, plus if you right-click Start or press Win-X you'll reveal a hidden Start menu with more advanced options.



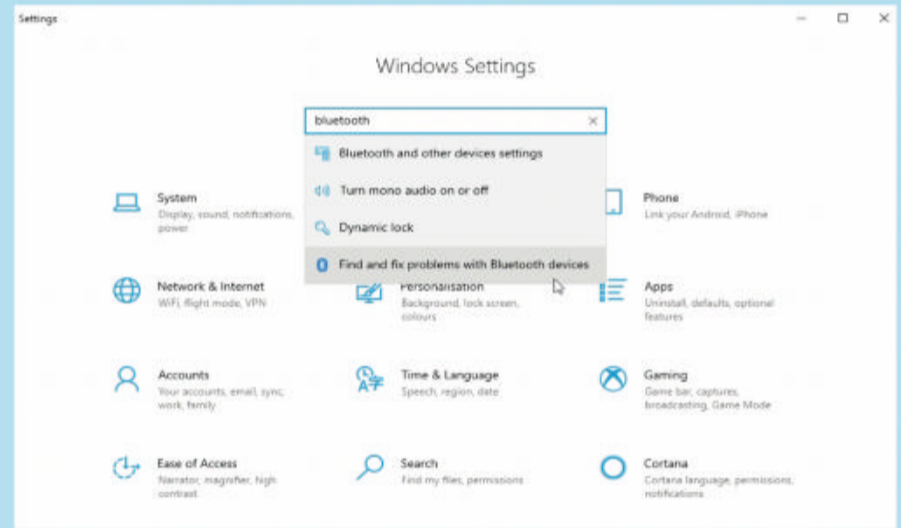
3 NOTIFICATIONS REPLACE ACTIONS The Action Centre is no more – instead, make a note of the speech bubble icon to the right of the Taskbar notification area. Click this to slide out the Notifications Centre where you can read alerts, plus access a selection of quick-action buttons for common tasks.



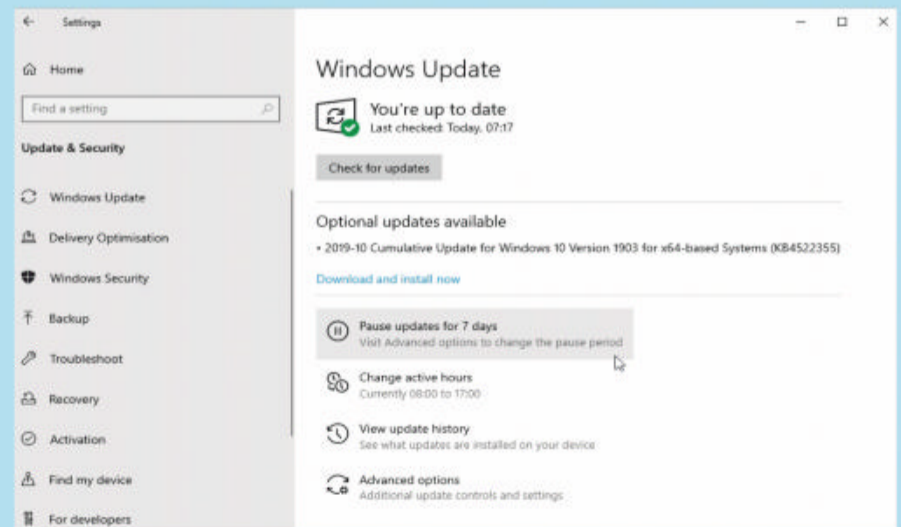
5 REDESIGNED FILE EXPLORER The new-look File Explorer – in our opinion – is far superior to Windows 7's file management tools. The ribbon menu places key features within easy reach, while a new file copy dialogue box allows you to both monitor and pause/resume file transfers.



2 SEARCH YOUR PC Click inside the Search box next to the Start menu to search your PC (and the wider web) for files, programs, settings and more. Next to this is the Task View button: click this to organise your virtual desktops (up to four) and reopen old programs, windows and documents.



4 WHERE'S THE CONTROL PANEL? The Control Panel is still hanging on, but hidden away: most of its features are now housed in the modern-looking Settings pane, accessible via the Start menu. A handy Search button makes any setting easy to find – including shortcuts to those features still only found in the Control Panel itself.



6 WINDOWS UPDATE The days of picking and choosing your updates is over – however, you can now pause updates for up to 30 days after their release. To do this navigate to 'Settings > Update & Security' to pause in seven-day increments. Windows 10 Pro users should click 'Advanced options' for more flexible options.

SUPER GUIDE

Part 1

Move apps and settings

Discover how to move your favourite programs from old PC to new – complete with settings intact.

The next step with your new PC is to set up all your favourite applications, plus transfer across your carefully crafted settings from your old PC. Before going any further, we recommend taking a drive image of your old PC's system drive using Macrium Reflect Free (www.macrium.com/reflectfree.aspx).

Save this image to your backup drive, then install Macrium on your new PC and take a drive image of its hard drive as your baseline backup: Windows 10, all updates and key system utilities only. Should you need to roll back for any reason, you'll save yourself time by skipping the previous section's instructions. Plus, with Macrium installed, you can mount your old PC's drive image as a virtual drive to access any missing files – more on that over the page.

Reinstall key apps

If you're short on time, and willing to pay around US\$50 for the privilege, check out the box below for a program that can migrate everything you need

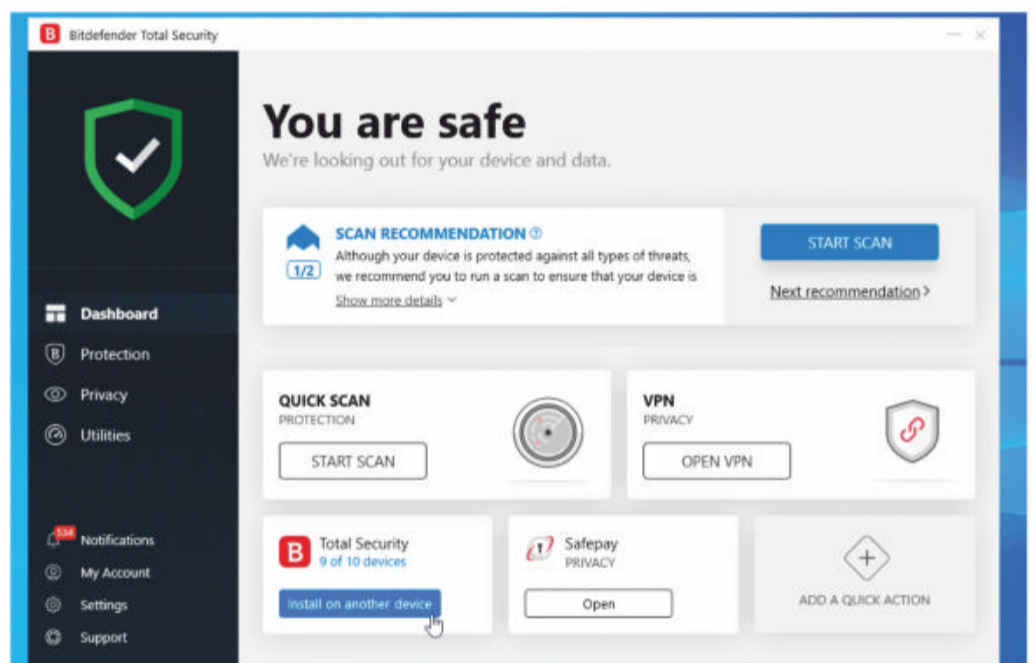
– programs, settings and data – across from your old PC. If you're happy to spend a few hours, however, you can do the job by hand and choose which programs to keep and settings to apply.

Let's start with the basics: your security software. If you're using Microsoft protection then skip to the next paragraph, otherwise either download the latest version of a free tool from the vendor and install that, or check your paid-for package's license terms. Most offer three

or five-PC licenses as standard, so you can install it on your new PC without having to first deactivate your old PC.

If you do need to transfer the licence, look for an option within the security software's main panel to access your account settings. This will often take you to an online portal where you can deactivate the licence on your old PC before activating it on the new one. Next, install your web browser. Looking for a new start? We recommend Firefox (www.getfirefox.com), but most modern

Check your security tool's central interface to see if you have a spare slot to install it on your new PC.



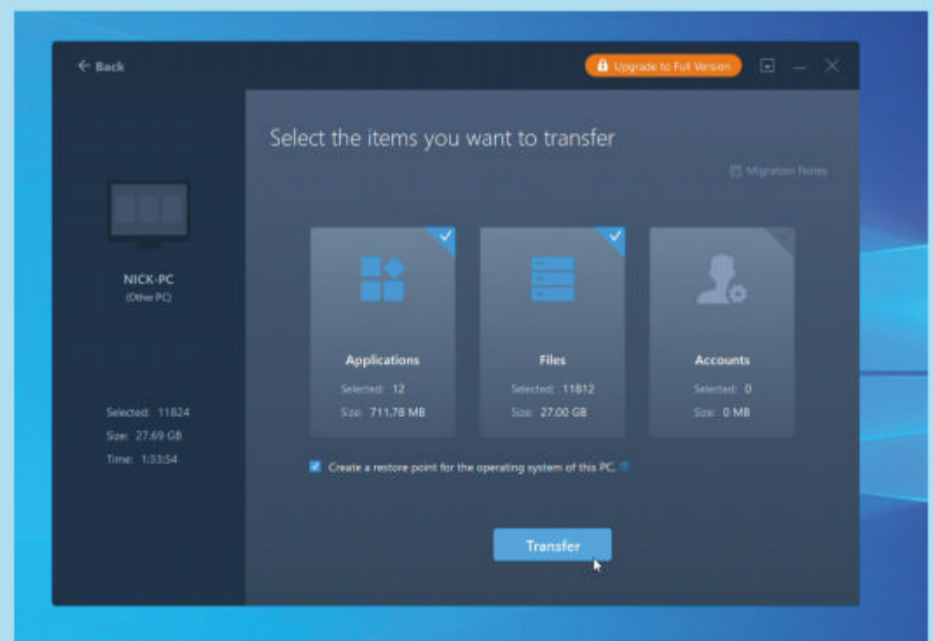
FUSS-FREE PROGRAM TRANSFERS

If you simply want to transfer everything (possible) across from old PC to new, and aren't worried about paying for the privilege, then take a look at EaseUS Todo PCTrans (www.easeus.com/free-pc-transfer-software/).

This program makes it easy to transfer across programs, settings and files from old PC to new – you can transfer directly via your network or create an image file on your old PC that is subsequently transferred across and restored to your new computer.

To transfer this data over your local network, download and install the program on both machines, then choose PC to PC on either machine, select your other PC and enter your user password. Choose which direction the transfer should take, then wait for the files, setting and data to be analysed. Finally, choose what to transfer then sit back and let the program do its job.

A cut-down free version lets you take the program for a test drive, with support for transferring up to two applications and settings from one PC to another. The Professional version removes these limits and costs US\$49.95.



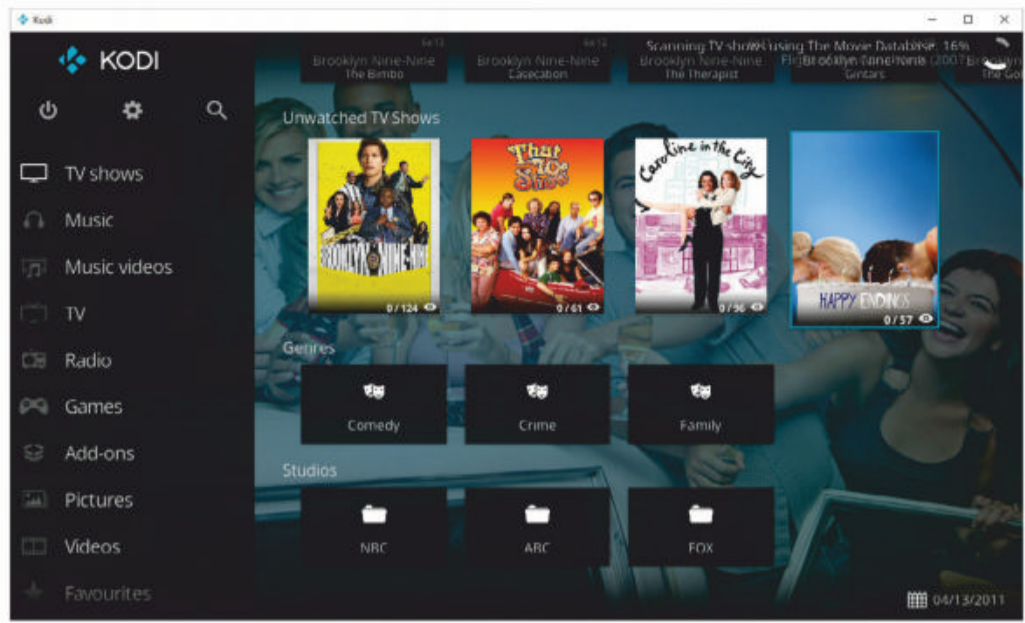
If you're willing to pay, you can transfer all your apps, settings and data from your old PC to the new one with a single app.

browsers now feature a sync tool whereby you can keep all your settings – including bookmarks, addons and tab histories – across multiple devices. If you’ve not already set up sync on your old PC, do so now. Once synced to the cloud, install the browser on your new PC and sign into the same account to sync your settings across. Job done.

You can now continue to install new apps – some, like Adobe CC apps, require activating, so be sure to deactivate them on your old PC before installing them on your new machine. If you’ve upgraded from Windows 7 to Windows 10 then you may discover some older apps no longer work – this may be because you have an older version (check the website to see if a later version supporting Windows 10 is both available and affordable), or visit the website <https://alternativeto.net> to type in your old program name and discover what alternatives exist – both free and commercial.

Some programs to consider: LibreOffice (www.libreoffice.org) replaces Office 2010 or earlier, while Paint.NET (www.getpaint.net) or The GIMP (www.gimp.org) can replace Photoshop. Windows 10 also removes some key functionality from Windows 7 –

Kodi is the perfect replacement for Windows Media Center for viewing content and can play DVDs too.



missing Windows Media Center? Kodi (www.kodi.tv) is your closest equivalent, while LEAWO Blu-ray Player (www.leawo.org/blu-ray-player/) is perfect if all you need is a standalone DVD or Blu-ray player.

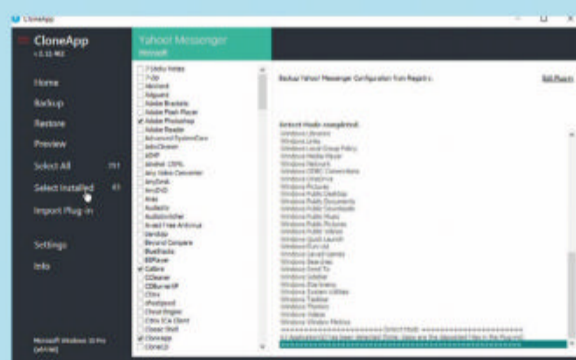
Transfer settings
Some programs sync their settings between PCs using a similar account-based system to your browser – log in on your new PC to see if your preferences have magically appeared. Other programs may be able to save your settings – explore their options or preferences or check their website. If you’re running portable apps, then simply copying the program folder across to your new PC should ensure their settings follow them across.

For those programs that don’t

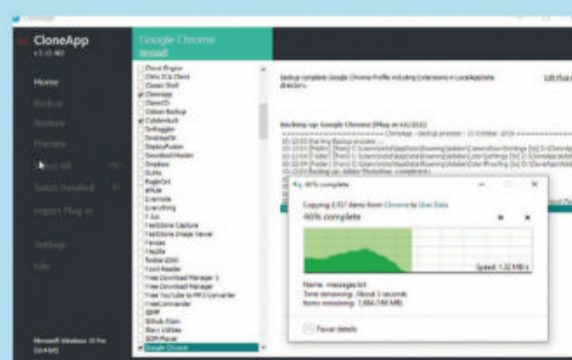
offer such services, try CloneApp (www.getclone.app). The three-step walkthrough cover its key features – note that when ‘restoring’ it’ll restore everything you backed up previously, so be sure to only back up those settings you want to transfer across. We recommend downloading and familiarising yourself with the product manual (www.getclone.app/downloads/ca_docs/manual.pdf) before using it.

If you can’t find a specific program setting, then try visiting its website to see if anyone has documented what Registry keys or configuration files (including their location) are required, then manually copy these across. If all else fails, you might want to simply go through the dialogue boxes taking careful notes of key settings to manually set up your new PC in the same way.

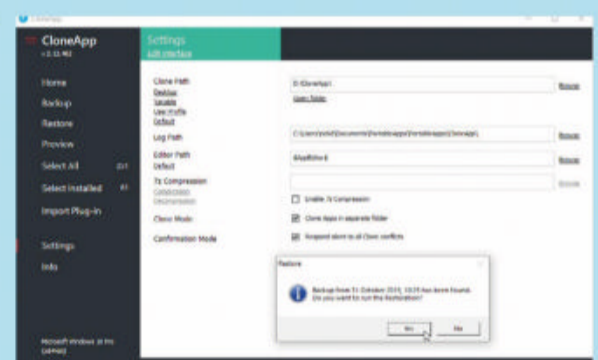
HOW TO Transfer settings with CloneApp.



1 SELECT INSTALLED APPS CloneApp is a portable app – after downloading on to your old PC, right-click CloneApp.exe and choose ‘Run as administrator’. Click ‘Select Installed’ to tick all the supported programs and Windows settings that have been detected on your PC.



2 BACK UP SETTINGS Go through the list, clicking on an item to see what gets backed up, and adding or removing programs as required. Once complete, click Backup – make a note of the backup location and click Yes, then wait for all your settings to be backed up.



3 TRANSFER TO NEW PC Once complete, transfer the entire CloneApp backup directory to your new PC, plus download a fresh copy of CloneApp to run on your new PC. Launch that and choose Settings. Click Browse next to Clone Path to select your backup directory, then click Restore.

SUPER GUIDE

Part 1

Move data to a new PC

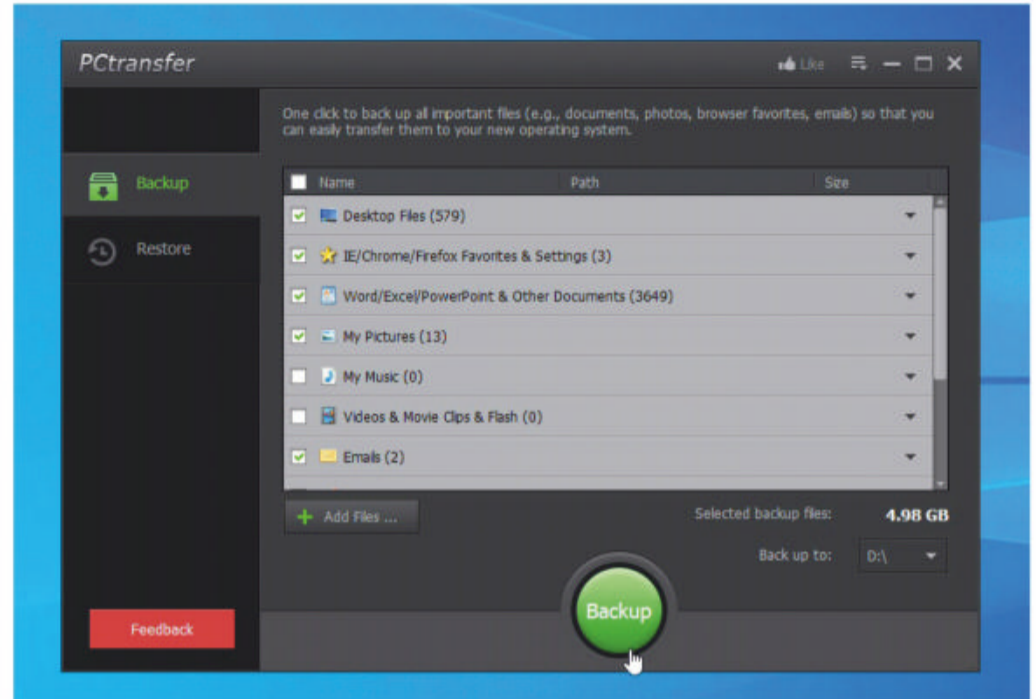
Time to move all your precious files from your old computer to your new one without leaving any behind.

When transferring programs and settings using CloneApp you may have already transferred some of your data too – specifically files stored in supported cloud-based folders like OneDrive and Dropbox. Transferring them this way before setting up your cloud sync accounts is actually a good idea – it’s quicker (and uses less internet bandwidth) for your new PC’s installation to compare all the files you’ve copied across with the copies in the cloud rather than download a fresh copy of them all to your PC, which could literally take days if you’ve hundreds of gigabytes to transfer.

Even if your cloud provider isn’t supported, don’t rush to install and sync just yet. You can transfer those – and other files – using several alternative methods, but first stop for a moment and look at your new PC. How many hard drives does it have? Most come with just one physical drive installed – if it’s 256GB or larger, then why not take advantage of the fact it’s currently relatively empty and partition it in two?

Partitioning allows you to store

IObit PCTransfer works in two stages: back up old PC’s files, then restore to new PC.



your data on a separate drive to Windows and your programs as if you had a second physical disk installed. The benefit is obvious: if Windows crashes, it won’t take your data with it – although you should still back up your data separately to another drive in the usual way. Partitioning only works if you have a large enough drive: you’ll want to leave a minimum 64GB (and preferably 128GB or larger) partition for Windows and all your apps. If your PC fits the

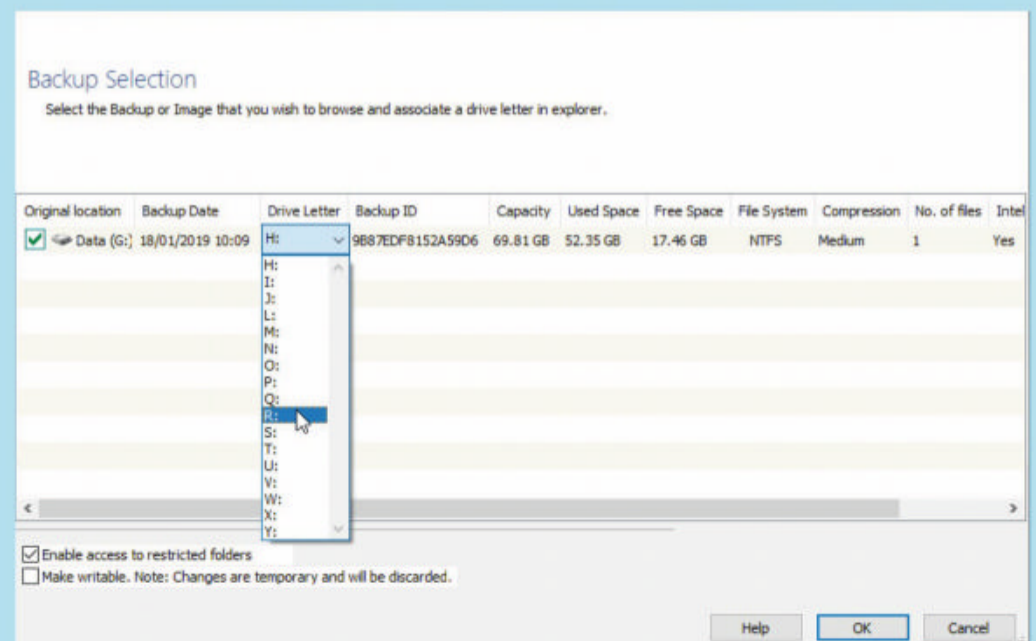
bill, follow the step-by-step guide.

Transfer files manually
You can, of course, transfer files manually via an external drive or over the network – focus your search on your user folders but do take the time to explore other parts of your old PC’s drive for files that have been stored elsewhere. If in doubt, heed our earlier advice and use Macrium Reflect Free to take a fail-safe image of your old PC’s drive – the

RECOVER FORGOTTEN FILES

What happens if, having transferred your files and disposed of your old PC (see over the page), you discover that you forgot to copy across a key file or setting? This is where that fail-safe Macrium Reflect backup we recommended you take earlier comes into its own.

You can mount this as a virtual drive on your new PC in File Explorer, then copy any missing data from it to your new PC. To do this, install Macrium on your new PC if you haven’t already, then navigate to the drive image file and double-click it. Allow Macrium to launch, then place a tick next to the drive or drives and make a note of the drive letter each is going to be assigned (you can change these by clicking the appropriate drive letter). Tick ‘Enable access to restricted folders’ and click OK. From here, just browse the virtual drive(s) like any other in File Explorer, copying any folders or files you missed to their equivalent locations on your new PC.



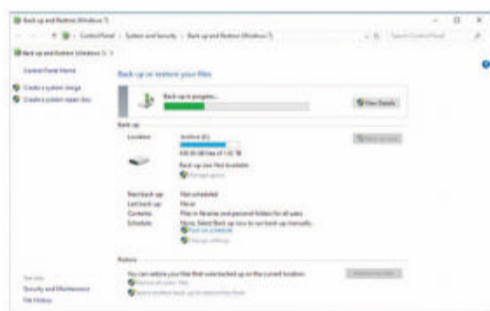
Take drive images of your old PC’s hard drives, and you’ll always have access to your old files. You just need somewhere to store them, such as an external hard drive.

box below reveals what to do if you need to recover a file you missed.

Another way to transfer data from your old PC to new with the help of IObit PC Transfer (www.iobit.com/en/pctransfer.php), a free portable tool that automatically collects together certain files (thus ensuring you're less likely to miss any) while allowing you to manually select additional files and folders too. It's a two-part process: run it on your old PC to transfer your data to a backup drive, then repeat on the new PC, this time choosing Restore to copy everything to your new computer.

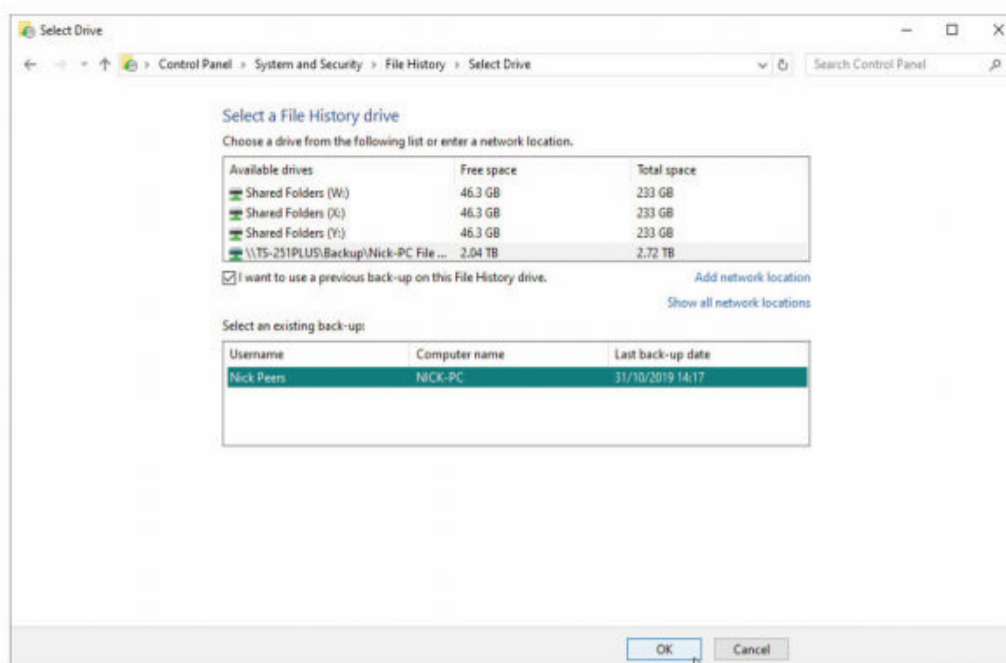
Restore from backups Other files can be transferred one of several ways. If you're switching from Windows 7 and have been diligently using the Backup and Restore tool to back up your key files, run it one last time in Windows 7 to bring your backup bang up to date, then copy the backup to an external or network drive if necessary.

Switch to your new PC and



Don't forget to update your old backup if you plan to use it to transfer data across.

You can also restore data to your new PC from a File History backup made on your old machine.



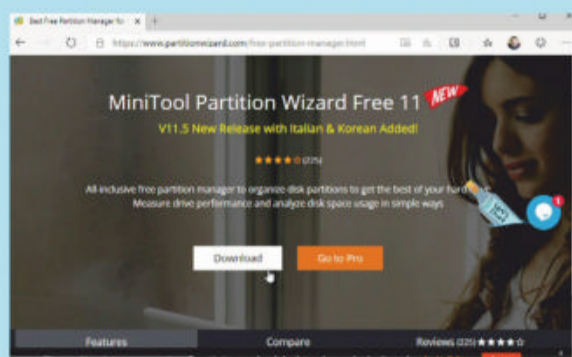
navigate to 'Start > Settings > Update & Security > Backup', clicking 'Go to Backup and Restore (Windows 7)'. Choose 'Select another back-up to restore files from' to locate your old PC's backup file, and then follow the wizard to decide what files to recover and where to put them.

If you were using File History on a newer Windows 8.1 or 10 PC, again make sure the backup is on a drive visible to your new PC. This time, however, type 'control panel' into the Search box, click Control Panel and choose 'Save backup copies of your files with File History' under System and Security. Do NOT switch File History on at this point; instead, click 'Select drive' and if necessary 'Add network location' to connect the

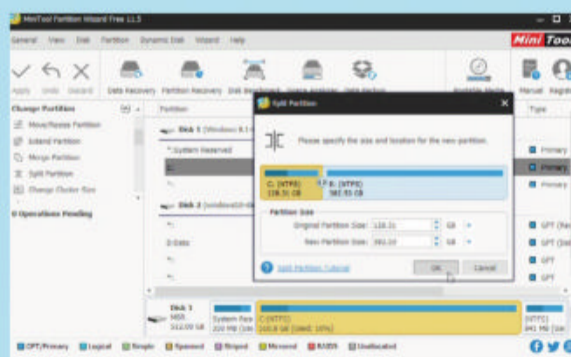
drive containing your old PC's backup. Select this and you should see an option to select a previous backup to reconnect to it: tick 'I want to use a previous back-up on this File History drive'. You should see your old PC backup appear – make sure it's selected and click OK. File History can now run – let it create a 'backup' of your new PC (which won't take long) to complete the link.

Now close Control Panel and type 'file history' into the Search box. Click 'Restore your files with File History' to reveal your new PC's backup. Click the back button once to reveal your old PC's backup and once you're happy this is the correct version, click the green restore button to transfer the files to your new PC.

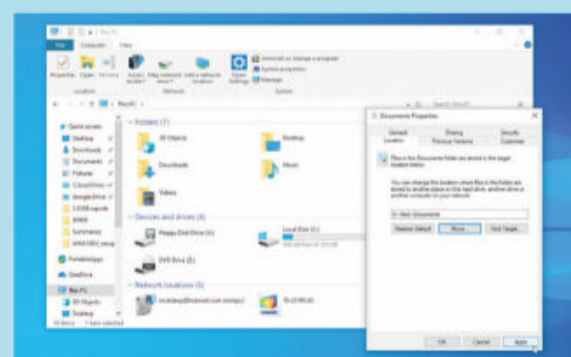
HOW TO Partition your hard drive.



1 PARTITIONING TOOL If your new PC has a single hard drive that's 256GB or larger, then now is the time (while it's relatively empty) to partition it and separate your data from Windows to protect it against possible data loss. Download and install MiniTool Partition Wizard (www.partitionwizard.com).



2 SPLIT A DRIVE IN TWO Open Partition Wizard, identify your system drive (almost certainly labelled C, and the largest partition on the drive) and click 'Split Partition'. Use the slider to allocate the space you want for your data partition – typically all but 64-128GB. Click OK followed by Apply



3 MOVE USER FOLDERS Browse to 'File Explorer > This PC'. Right-click the Documents folder and choose 'Properties > Location'. Click Move, and select a suitable location on your newly formed data drive – such as <Username>\Documents. Click OK followed by Yes, then repeat for other user folders.

SUPER GUIDE

Part 1

Secure your new PC

Before embarking on life with your new PC, take the time to ensure it's as secure as possible.

Your new PC is ready and raring to go: your programs, settings and files have been safely transferred across and your old PC's fate has been decided (the step-by-step guide reveals what to do if you plan to pass it on or dispose of it). But before you take full advantage of that extra speed and power, it's time to make sure your new PC is at least as secure as your old one was.

Start by setting up your backups if you haven't yet done so – both File History and the old Windows 7 backup tools are accessible in Windows 10 via Start > Settings > Update & Security > Backup. File History is more flexible – it stores more versions of your files for example – and is likely to be supported for longer than Windows 7 Backup, so choose that if you've not yet made a choice.

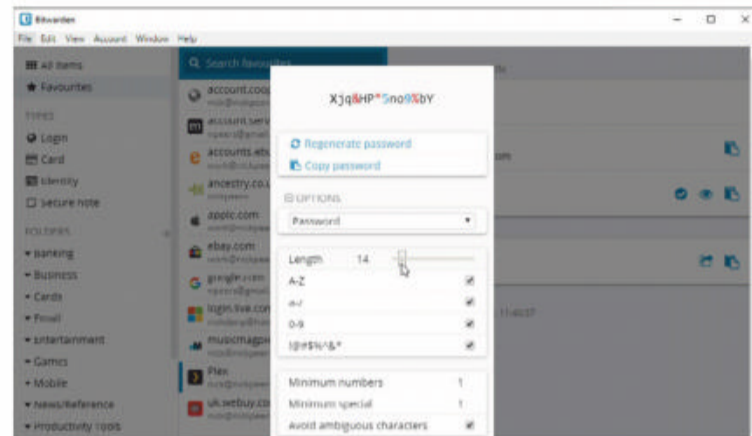
Tighten security Windows 10 provides strong security by default – the built-in Windows Security is now one of the best tools for detecting and removing threats – but third-party software like Bitdefender offer more pro-active tools to help prevent infections. If you're confident you don't need these additional tools, then at least install the free version of Malwarebytes Anti-Malware (www.malwarebytes.com) and be sure to run regular (weekly) scans.

If you stick with Windows' own tools, you might want to strengthen the Windows Firewall by installing Malwarebytes' free Windows Firewall Control (www.binisoft.org/wfc), which adds two-way protection to the firewall, allowing you to monitor which programs and processes are trying to connect to the internet, blocking any suspicious ones (like trojans attempting to download more malware).

You should also fill any gaps normally covered by third-party tools. Need some form of anti-ransomware protection? Try Acronis Ransomware Protection (www.acronis.com/en-gb/personal/free-data-protection/), a free tool with 5GB online storage if you need it for your most sensitive files. Worried out potentially unwanted programs sneaking on to your system? Unchecky (www.unchecky.com) provides some extra warnings, and can even untick certain boxes by default to prevent you from inadvertently adding them to your system.

Protect yourself online Next, make sure you're using a trusted password manager such as Bitwarden (www.bitwarden.com) to securely store your passwords, plus help you generate strong random ones. Aim for a minimum of 12 characters, mixing alphanumeric with symbols where possible. If you've not already done so, introduce two-factor authentication to all your major online accounts – including Bitwarden – to protect them in the event of a password breach. When it comes to managing your 2FA codes, Authy (<https://authy.com>) can be used on multiple devices for convenience's sake.

When backing up to the cloud, how safe is your data? Recognising its security isn't



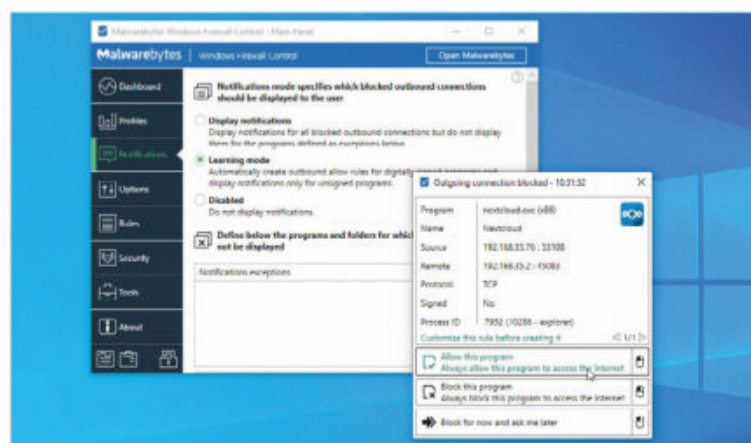
Use your password manager to generate long, randomly generated passwords for extra security.

perhaps as tight as you might expect, Microsoft has introduced Personal Vault, a place where you can add an extra layer of subscription to particularly sensitive files. Don't trust Microsoft? A tool like Cryptomator (<https://cryptomator.org/>) works in a similar way, with encryption keys stored locally for extra protection. If you lose these, however, it's game over for your data, so keep a separate, unencrypted backup of Cryptomator-encrypted data on a local external drive – just in case.

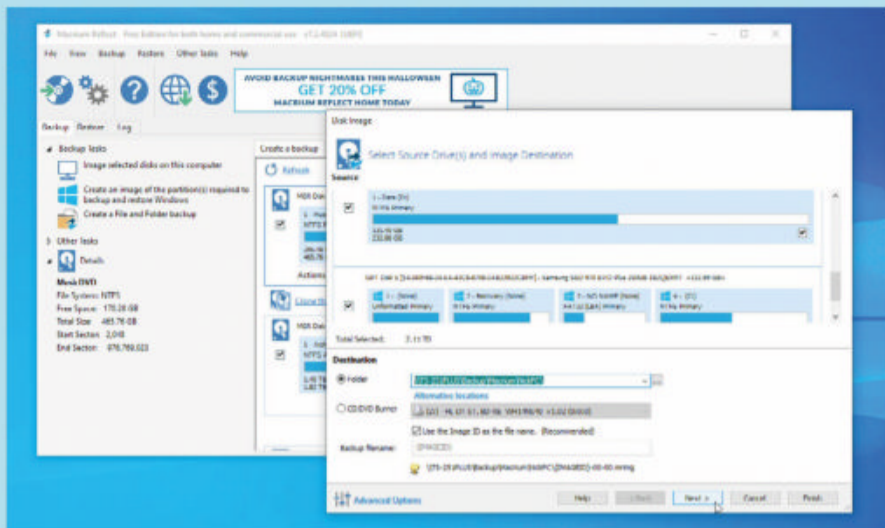
Worried about who might be snooping on your connection? If you've just switched from desktop to laptop, and plan to log on to Wi-Fi hotspots while out and about, a VPN (Virtual Private Network) service is a must, scrambling your data and ensuring snoopers can't intercept sensitive data. Windscribe (<https://windscribe.com>) is a great free choice.

VPNs only protect your data when in transit, so be sure to strengthen your email and browser security independently. If supported, enable DNS over HTTPS within your browser settings (Firefox users will find it under 'Options > General > Network Settings' – click Settings, tick 'Enable DNS over HTTPS' and use the default Cloudflare provider) and install web-safety addons like Norton Web Safe or Bitdefender Traffic Light to help keep you away from unsafe websites.

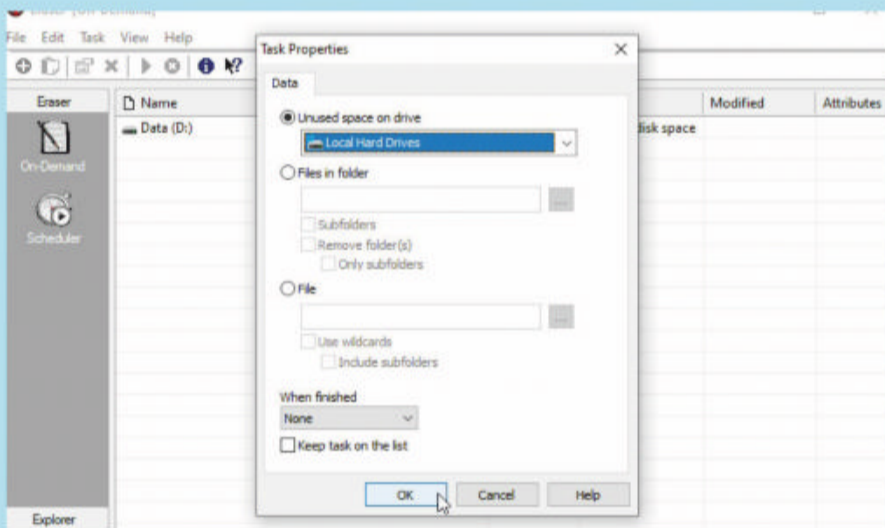
Give Windows Firewall the ability to block outgoing as well as incoming connections with WFC.



EXPLAINED Dispose of your old PC securely



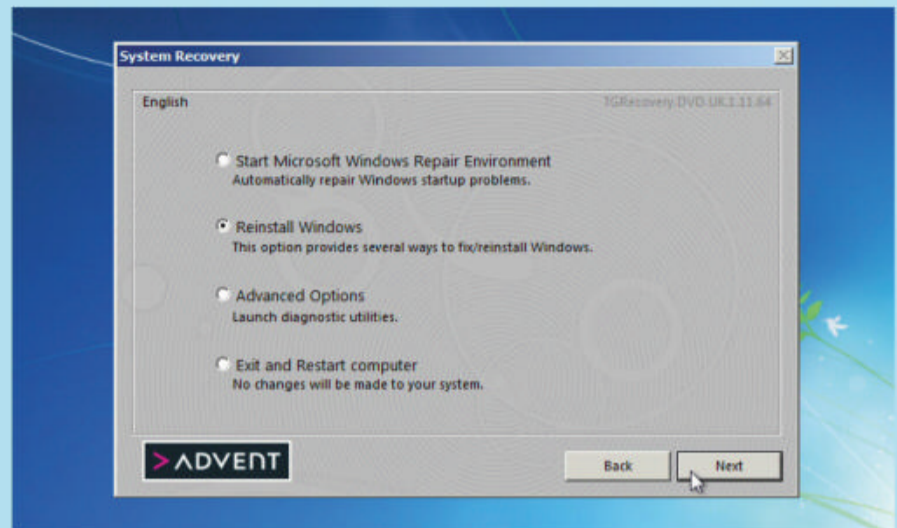
1 TAKE FAIL-SAFE DRIVE IMAGES Still not taken that fail-safe drive image? Install Macrium Reflect Free on your old PC as previously advised, then take an image of all your old PC's internal drives and partitions to ensure you have future access to files and settings you may otherwise forget to take.



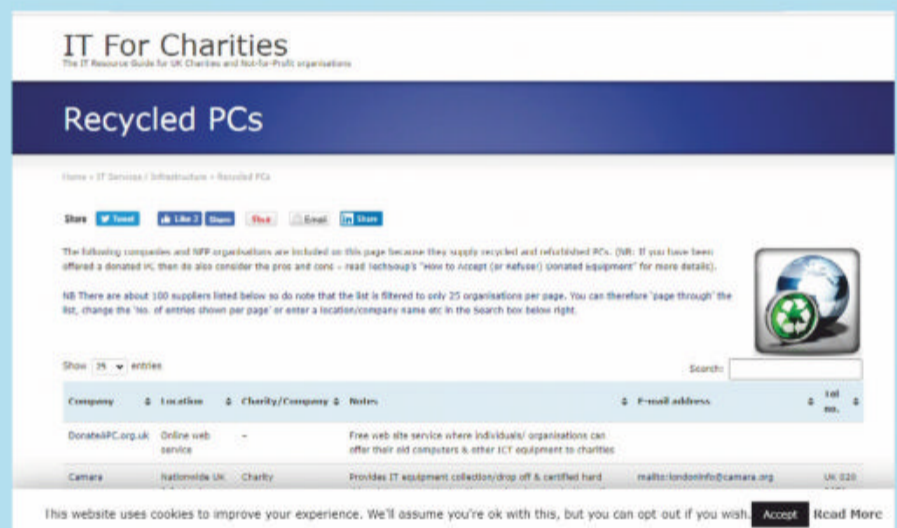
3 SHRED PERSONAL DATA Launch Eraser Portable (<https://portableapps.com/apps/security/eraser-portable>) and choose File > New Task to set up a task to delete all unused space across all drives. Once created, select the task and press Ctrl-R to run it. Be patient – it'll take hours to completely wipe the drive's free space.



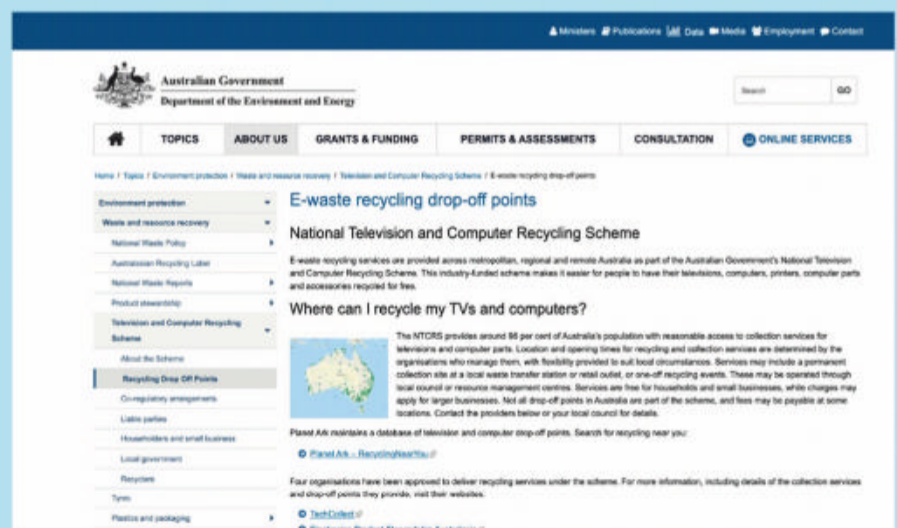
5 WIPE ALL DATA SECURELY If you decide to dispose of the PC, consider removing any hard drives and placing them in USB enclosures to use with your PC new as external devices. Failing that, wipe any drives securely using a bootable disk like Active@ KillDisk Freeware (<http://killdisk.com/killdisk-freeware.htm>).



2 RESTORE TO FACTORY CONDITIONS Consult your PC's support site for instructions on restoring it to factory conditions, having first verified all the apps that required activation to use have been deactivated – not just those you transferred across to your new PC (you never know when you might need them).



4 SELL OR PASS ON Check eBay to see if there's a market for recouping some of your costs by selling the PC or individual components such as the RAM and motherboard on. If not, and if your PC is still reasonably modern and fully working, research charities in your area who might be willing to take it off your hands.



6 RECYCLE RESPONSIBLY If there's nowhere to send your old PC on to, you'll need to dispose of it responsibly. Most local recycling centres will accept old PC equipment in both working and non-working condition – again, some internet research will show recycling services in your local area.

SUPER GUIDE

Part 2

Repair a Windows install

If you're trying to fix a problem, a refresh or repair install may be the best route to go down. Here's what you need to do...

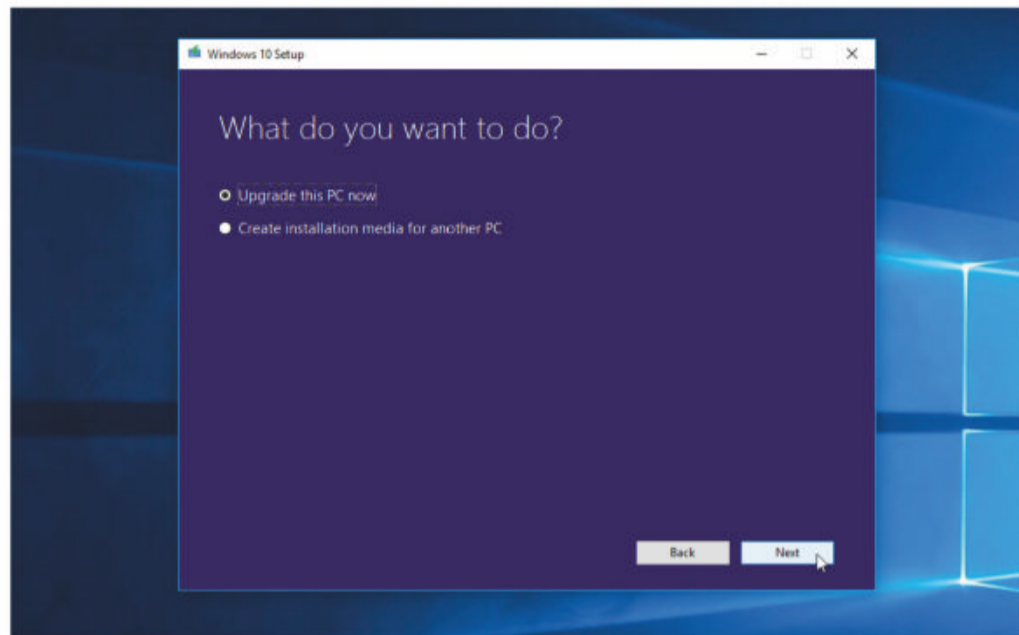
Not all reinstalls require a complete wipe of your hard drive. A repair or refresh installation leaves your programs, settings and files in place, and restricts itself to installing a fresh copy of your Windows files over the top of your existing copy. If your problem is linked to a corrupt file or Windows setting, the repair installation can usually fix it.

All repair installs share one common characteristic: you must launch them from Windows itself. You can't boot from your install media and repair Windows through that; you need to boot into Windows, then start the repair process from there. If you're unable to boot into Windows, therefore, you'll need to turn the page and perform a full destructive recovery instead.

Start the repair

Starting a repair install varies depending on your PC model and what version of Windows you're running. Windows 8.1 and 10 users should (at least initially) avoid the Refresh/Reset options provided under Settings > 'Update &

Windows 10 users can launch a repair install directly from the Media Creation Tool.



recovery'. These options will preserve your files and any apps you've installed through the Microsoft Store, but any desktop programs you've installed will be wiped along with Windows itself.

Instead, you should 'upgrade' your copy of Windows, which performs a similar non-destructive reinstall to Refresh/Reset with the added bonus that your apps – including those you've installed outside of the Microsoft Store – will be preserved. To do so, you'll need your Windows installation media

– see the step-by-step guide on the facing page if you don't have the latest version.

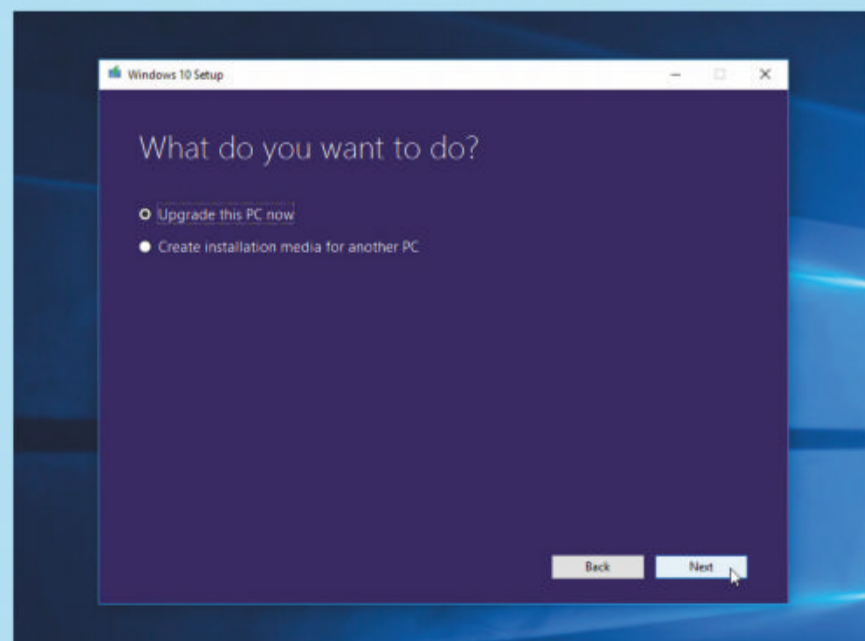
Why do you need the latest install media? It's because upgrade installs only work if the version of Windows on your PC matches that on your install media, so if you've installed Service Pack 1 in Windows 7, for example, you need up-to-date installation media to avoid the laborious task of first attempting to uninstall Service Pack 1 through Windows Update (assuming that you're able to),

POST-REPAIR STEPS

Start by stress-testing your desktop to verify that everything works as it should – sometimes the repair can introduce more problems than it solves, in which case if you're running Windows 8.1 or 10 you can undo the changes. Go to Start > Settings > 'Update & recovery' > Recovery and look for an option to go back to your previous version – click 'Get started' and then follow the prompts.

If the repair doesn't appear to fix your underlying problem, Windows 8.1 and 10 users can take one more intermediate step – the reset or repair. It will see you waving goodbye to all those desktop programs you've installed (including MS Office and your third-party security software), but it will preserve your Microsoft Store apps, files and Windows settings. Leave your install media inserted, then head over to the 'Update & recovery' > Recovery section under Settings. This time, click the 'Get started' button under the Refresh (Windows 8.1) or Reset (Windows 10) option and follow the prompts.

If this more drastic approach doesn't work, or you're running Windows 7, then flip the page for destructive reinstall options.



Windows 8.1 and 10 users can perform a more drastic repair install via the Reset or Refresh option – be warned, you'll lose your desktop apps.

then reinstalling Windows and then downloading and reinstalling Service Pack 1, along with all of your other updates.

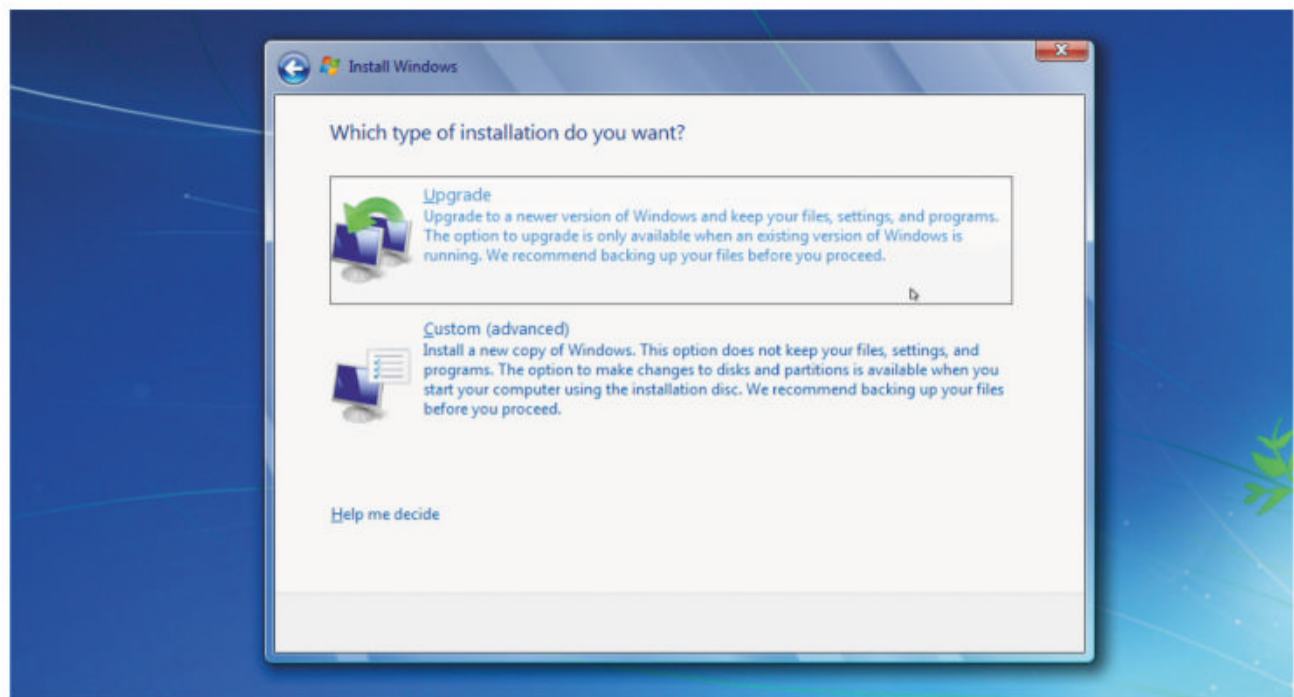
Windows 10 users can also launch the repair process directly from the Media Creation Tool by choosing Upgrade when prompted, but given the amount of time it takes to download the files, you might as well create your install media instead – just in case the upgrade install doesn't work and you decide to go down the path of a full-blown destructive install.

Launch the repair process

The procedure from this point onwards varies according to which version of Windows that you have. If prompted to download updates, do so to save time post-install.

Windows 8.1 and 10 users will be asked what they want to keep. Windows 8.1 users should find settings, personal files and applications are selected by default (click 'Change settings' if this isn't the case), while it's 'Keep personal files and apps' in the case of Windows 10 (don't worry, in this circumstance, 'apps' also applies to any desktop programs that you have installed).

Windows 7 users need to pop in



Choose the Upgrade option when prompted to repair Windows 7.

their install media, double-click setup.exe and follow the regular reinstall process. When prompted, click 'Go online to get the latest updates for installation (recommended)' to download post-SP1 security fixes now, then accept the licence agreement and choose Upgrade when prompted.

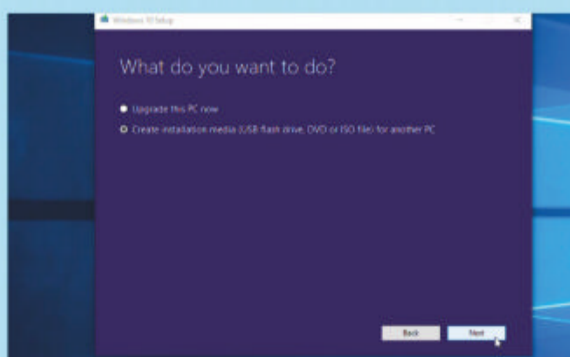
The upgrade process can take up to an hour on whichever version of Windows you're repairing, even on the fastest machine, so be patient. Your PC will reboot several times. If you're reinstalling Windows 7, you'll be prompted to enter your product key again, so have it handy.

Windows 8.1 and 10 will relaunch with the same setup wizard you'd see when upgrading from an earlier version of Windows. It's all very

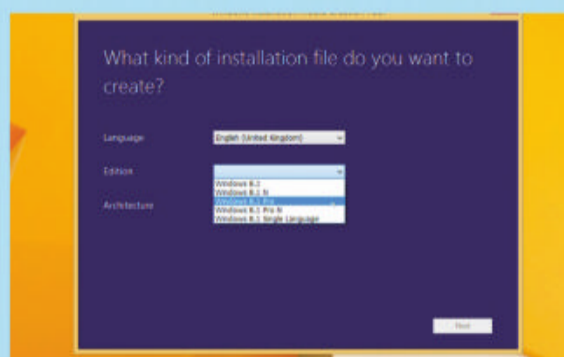
straightforward, but don't skip through the Express settings (if they appear); make sure you review all settings to lock down privacy.

If all goes well, you should find yourself at the desktop, ready to see if your problem has been fixed – start by seeing if the specific issue that you were experiencing before has been solved, then check to see that the rest of Windows still works as it should – if it's not, follow the advice in the 'Post-repair steps' box on the facing page. There's also a possibility – particularly with Windows 7 – that the repair install will result in a non-booting PC. If this happens, dig out the rescue media you created using Macrium Reflect Free (something you should always have handy!) and use it to restore the drive image you took before

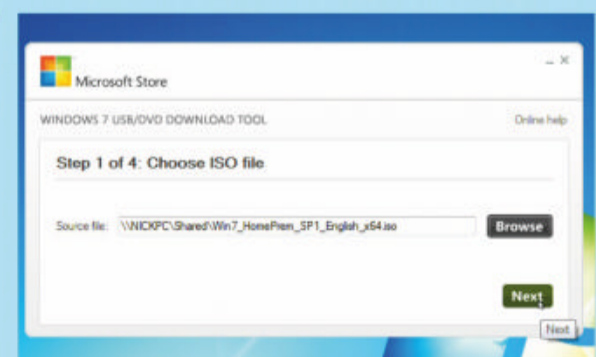
HOW TO Get the latest install media



1 WINDOWS 10 Head to www.microsoft.com/software-download/windows10 and click 'Download tool now'. Once downloaded, open MediaCreationTool.exe. When prompted, select 'Create installation media' and follow the prompts to create either a USB flash drive or an ISO file (for burning to DVD).



2 WINDOWS 8.1 Download the Media Creation Tool from www.microsoft.com/software-download/windows8 – input your language, edition of Windows 8.1 and PC architecture (32-bit or 64-bit) and then click Next. Choose to create either a USB flash drive or an ISO file and then follow the prompts to the end.



3 WINDOWS 7 Go to www.microsoft.com/software-download/windows7 and enter your product key – choose a 32-bit or 64-bit version as required. Once downloaded, double-click the file to burn to DVD, or use the Windows USB Download Tool (<https://wudt.codeplex.com>) to create a USB flash drive.

SUPER GUIDE

Part 2

A full, destructive reinstall

If you're looking to wipe the slate clean, or need to recover from major issues, the nuclear option is always the best one.

Reinstalling Windows from scratch – namely, wiping your system drive to install a fresh version of Windows on to it – is the ultimate choice for anyone looking to revive a slow PC or resolve a major, non-hardware issue. Here we'll step you through the entire process – if you're simply looking to repair an existing Windows install, turn to our guide on the previous page.

Before you begin, make sure your PC is fully backed up. A full reinstall really is destructive – nothing left on your C drive will exist once you've finished.

If you'd like to transfer selected program settings from old installation to new, download the portable CloneApp tool (www.mirisoft.com) to your backup drive. Once complete launch the tool by right-clicking CloneApp.exe and choosing 'Run as administrator' and go through its list of 247 supported apps to see if yours are there. If any are, tick the box beside each one you want to save the settings for. If any apps aren't covered – or you want to back up additional settings – then

Windows 10 users can launch a repair install directly from the Media Creation Tool.

choose Custom where you manually specify the files, folders and Registry keys where your program settings are stored. You should also follow the step-by-step guide on the previous page to ensure you have the latest installation media for your target version of Windows. This will ensure a cleaner, more up-to-date installation from the off.

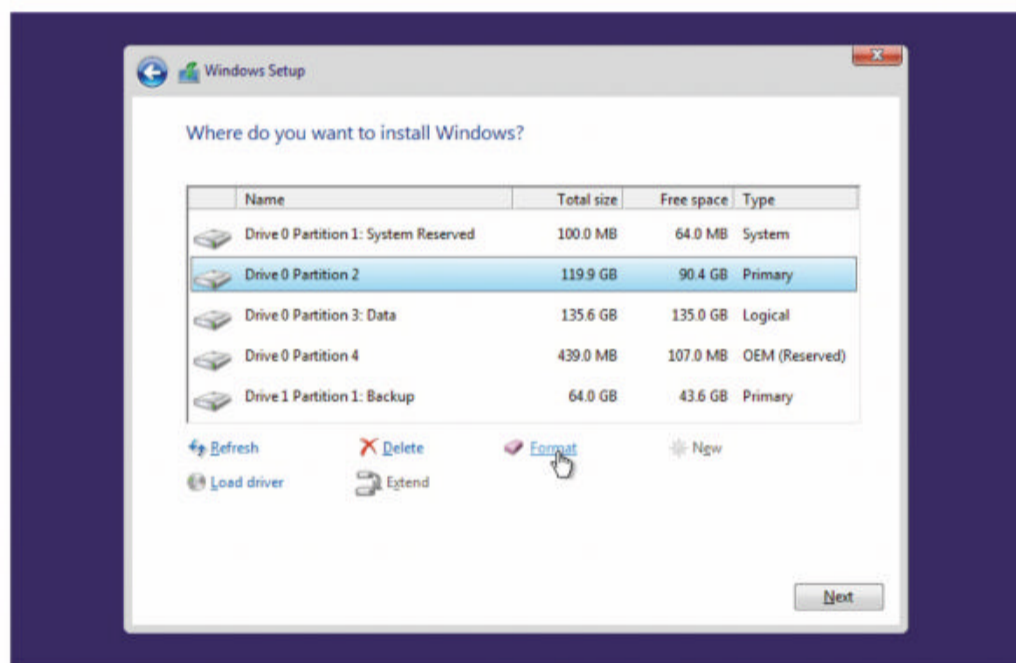
It's also worth sourcing networking and graphics drivers now rather than relying on Windows. Consult your PC or

motherboard manufacturer's website for these, or visit your Wi-Fi adapter or graphics card manufacturer's site – download them to your backup drive.

Uninstall any products that require activation – this should deactivate the licences and allow you to use them with your new install. Be sure to have product keys and program installers to hand.

Start your reinstall

A full destructive reinstall should always be started by booting from

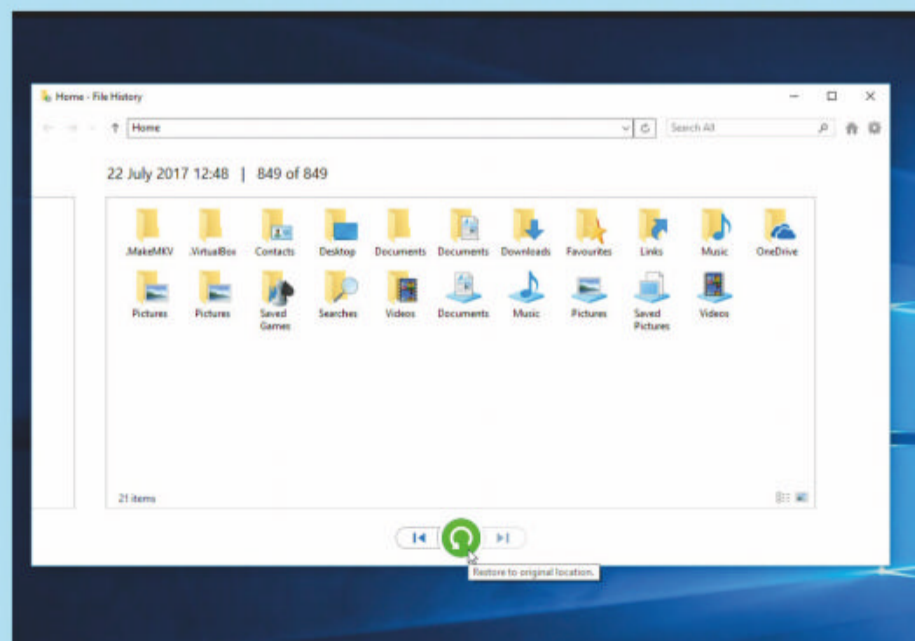


RESTORE PROGRAMS, SETTINGS AND DATA

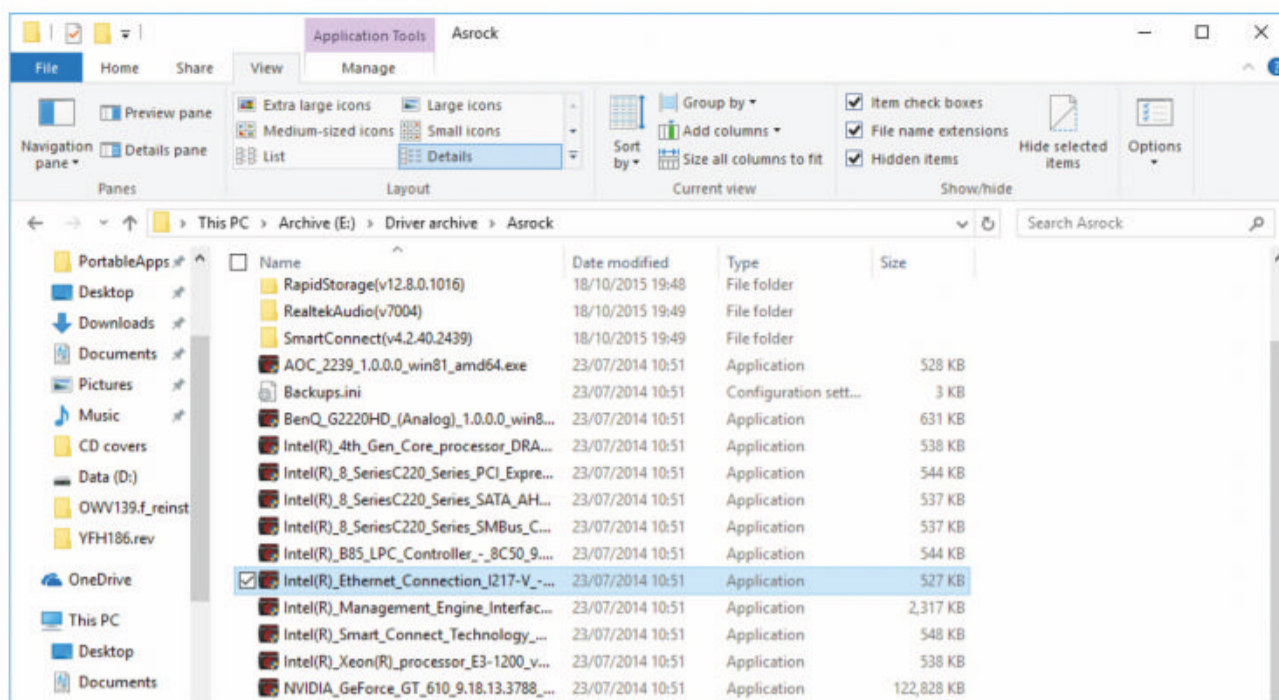
Once Windows is reinstalled, open Windows Update to bring Windows fully up to date – don't be surprised if there are hundreds of updates still to apply in the case of Windows 7 and 8.1. Once it's fully up to date, consider reinstalling Macrium Reflect Free and taking your first drive image – a vanilla backup you can restore in future instead of reinstalling Windows itself.

Next, it's a case of reinstalling your core apps. Once in place, open CloneApp from your data drive. If you click the Restore button, every single program setting you backed up will be restored – if there are any backup settings you don't want to restore, select Options to locate the backup folder, then open it and move any program folders you want to ignore out of the folder temporarily before clicking the Restore button. Now, take your second Macrium Reflect backup – a 'perfect' snapshot, as it were.

Finally, open File History or the Windows Backup and Restore tool and take steps to restore any data you backed up, then make sure the tool is configured to carry on backing up going forward.



Open File History, link it to your previous backup and then you can restore all your data back to its original location with one click.



your installation media, be it a DVD or USB flash drive. Check the step-by-step guide on the previous page for some pointers. The reinstall process doesn't differ much across Windows 7, 8.1 or 10. You'll be asked to verify your language, location and keyboard are set correctly, then it's a case of clicking Install Now. If prompted, enter your product key or click Skip if you're running Windows 10 on a PC you upgraded during the free period. When asked what type of installation you wish to perform, choose the Custom option.

Next comes the trickiest part of the process. A list of drives and partitions will appear – you need to select the one Windows is currently installed on. By default, it should be detected and selected,

but verify it's correct before clicking Format (click the advanced Drive Options button if it's not visible). Click 'OK', then once formatted, verify the drive is still selected and click Next. You'll see a checklist of tasks to be performed – sit back and wait. When Windows reboots, you may a 'press any key' prompt to boot from CD or DVD. Ignore and let the installer continue.

Set up post-install

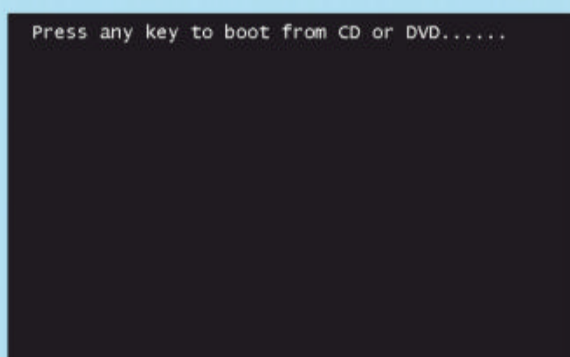
The post-setup prompt begins with Windows 7 users being prompted for their product key, then it's a case of setting up a user account. Windows 8.1 users will get an Express Settings prompt – click the option to customise these and go through them carefully.

Make sure you've got network and graphics drivers sourced.

Post-Creators Update, Windows 10 no longer gives you an Express Settings option. For now, confirm your location and keyboard, set up your network if required and choose 'personal use' when prompted. You can either sign in with your Microsoft account or click 'Offline account' > 'Maybe later' if you plan to stick with the old-style Windows 7 local user account. If you opt for the Microsoft account option now is a good time to set up a PIN to speed up future logins (note: the PIN is tied specifically to this PC, and you can always bypass it using your regular account password should you forget it at any point). You'll then be asked to set up Cortana – this is where Windows 10's notorious privacy settings come into play, so review all of the options carefully, flicking the slider to Off for any you don't need or use.

That's the end of the setup process – Windows will configure itself based on your choices and you'll see a series of messages appear on-screen. When all is ready, you'll find yourself back at the familiar Windows desktop screen of a fresher, faster, smoother-running PC.

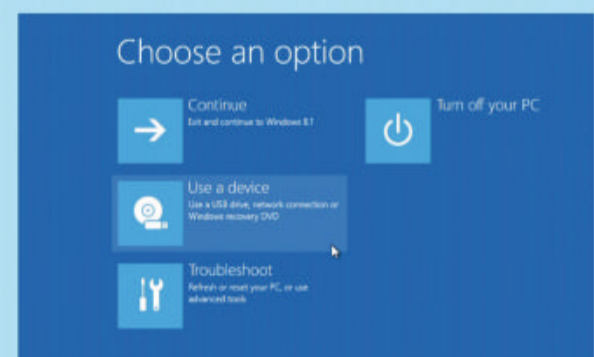
HOW TO Start the install process



1 REBOOT FOR MEDIA If you're running Windows 7, or have Fast Boot disabled, insert your boot media and start your PC. Look for a 'Press any key to boot from CD or DVD' option (even if you've booted from a USB flash drive) – press the key and you should find the Windows install process starts.



2 TWEAK BOOT OPTIONS If you boot back into Windows, restart your PC again, but this time press a key, such as [F11], when prompted to open a boot menu. Do so, select your boot media (choose UEFI if the option appears) to boot; otherwise, enter Setup to change the boot device order.



3 WINDOWS 7 WINDOWS 8.1/10 If Fast Boot is enabled, open Settings in Windows and navigate to 'Update & recovery' > Recovery, then click 'Restart now' under 'Advanced start-up'. When the boot options appear, choose 'Use a device' to select your USB flash drive or DVD from the list.

SUPER GUIDE

Part 2

Other reinstall options

Get the lowdown on three further techniques: reinstall from a recovery partition, downgrade Windows and set up a dual-boot system.

So far, we've covered both traditional reinstall techniques, but there are other reasons – and methods – for reinstalling Windows. First up is the recovery option. Most pre-built PCs come with a built-in manufacturer's recovery partition that enables you to restore Windows to its factory shipped condition. The main advantage of this method – aside from being cheaper and easier for the manufacturer, of course – is that your PC is restored to a guaranteed working state, with all the drivers it needs to function. The downsides are that a lot of extra unwanted software is usually installed alongside Windows, you need to exercise extreme caution not to lose everything on the drive, and that if the recovery partition corrupts – typically due to hardware failure – you're left with no means of reinstalling Windows.

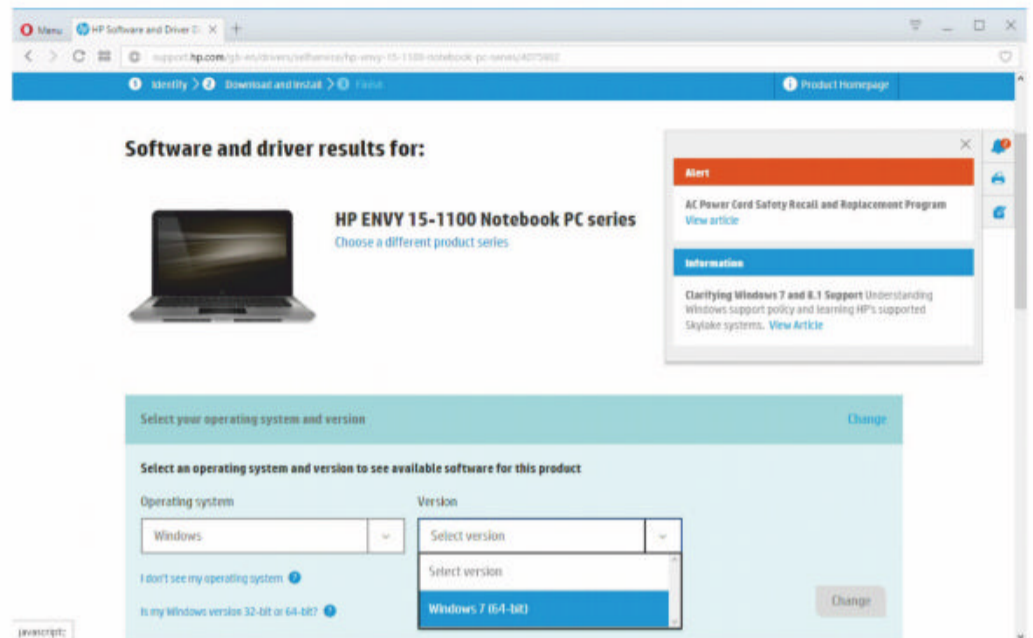
If you're planning to reinstall Windows by this method, look for a prompt to start recovery when you first boot Windows or look for the option under the 'Advanced start-up' menu (see below) – consult your computer's documentation or manufacturer's website for details.

Downgrade Windows

Another reason to reinstall Windows is to revert to an earlier version. If you're pining for Windows 7 or 8.1, then it's usually possible to downgrade your copy of Windows – remember support for Windows 7 ends in January 2020, and Windows 8.1 in January 2023. Before reaching for your old Windows media, however, you need to do some homework first.

First, if you upgraded your PC to Windows 10 from an older version of Windows, restoring that version should be straightforward in the sense you can use your

Fetch the drivers for whichever version of Windows you install.



manufacturer's recovery partition if it still holds the original version, or you can try installing from an old, unused copy of Windows 7 or 8.1 – just follow the guides to preparing and reinstalling Windows earlier on in this feature. Do source the correct drivers for your PC first, though, and verify that your new software is backwards compatible (desktop apps should be, but Microsoft Store apps won't work in Windows 7, and some may not work in Windows 8.1 either).

If your PC came with Windows 8.1 or 10 preinstalled, then going back to Windows 7 will be trickier and possibly even impossible. Before embarking on this, check the web to see if others have had similar success. You'll need to source your own Windows 7 installation media and valid licence, and you'll almost certainly need to have access to your PC's UEFI settings – if Fast Boot is enabled, open Settings > 'Update & recovery' and click 'Restart now' under 'Advanced start-up'. When prompted, select Troubleshoot > Advanced Options > UEFI Firmware Settings.

Once inside your PC's UEFI settings you need to locate and change three settings. First, disable the Fast Boot feature.

Second, disable Secure Boot. And finally, look for a CSM (Compatibility Support Module) option and make sure it's enabled. All three settings need to be made to support Windows 7 – if you can't find them, consult with your PC or motherboard manufacturer.

Once done, you should find you're able to boot from your Windows 7 installation media, enabling you to revert to an earlier copy of Windows.

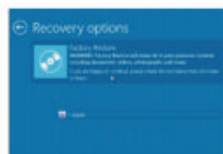
Set up a dual-boot PC

Our final scenario is one where you install two versions of Windows side-by-side. This is a step for advanced users only, and if you're merely planning to install an older version of Windows next to Windows 10 for compatibility purposes, explore alternative options, namely setting up a virtual Windows 7 machine using a tool such as VirtualBox (www.virtualbox.org), which runs inside your main Windows installation.

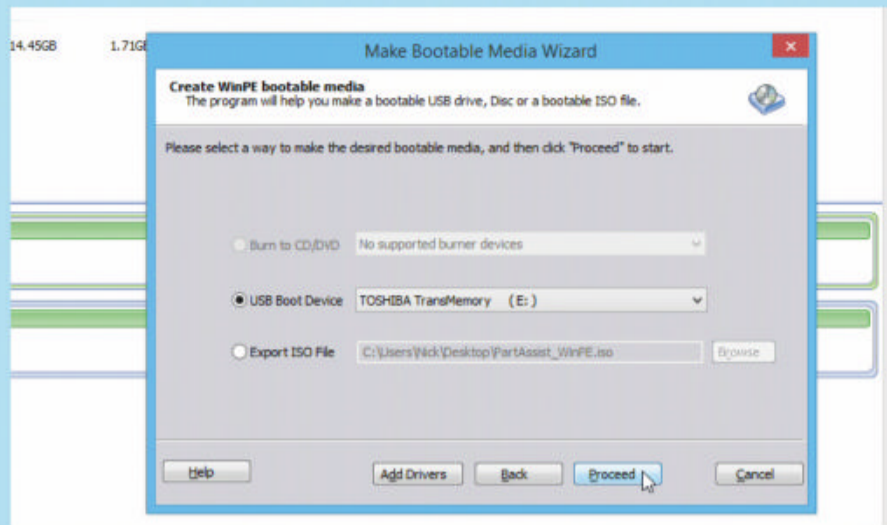
If you are determined to dual-boot your setup, the step-by-step guide on the facing page covers the process of installing an older version of Windows alongside your current one.

Before you begin also make sure you take a fail-safe drive image using Macrium Reflect Free and be sure to create the rescue media, too.

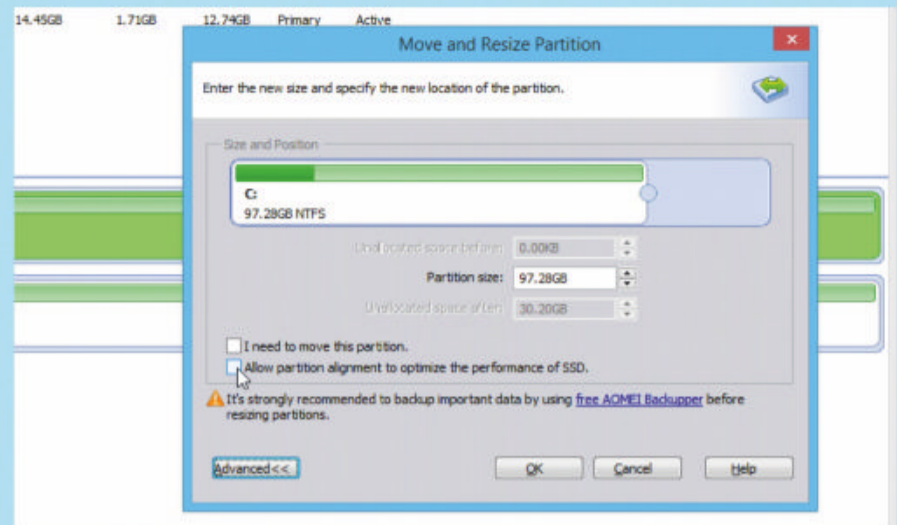
Look under the 'Advanced start-up' menu for factory restore options.



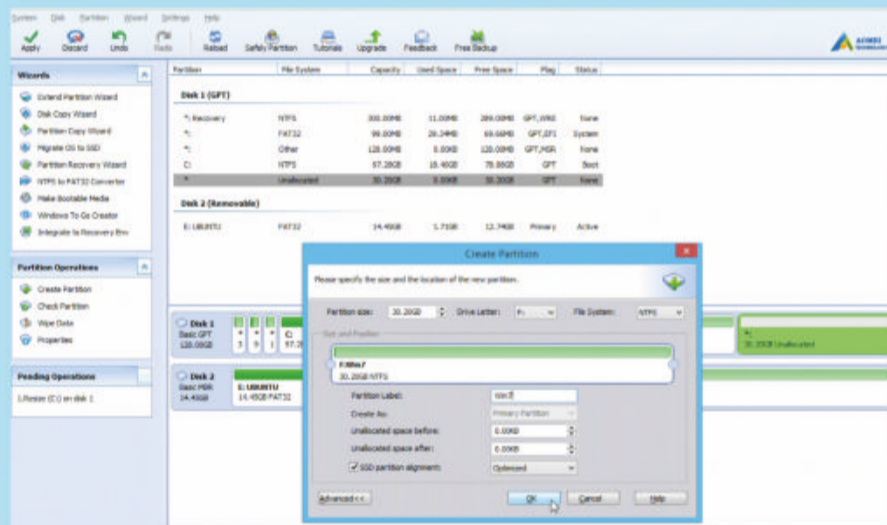
HOW TO Set up a dual-boot PC



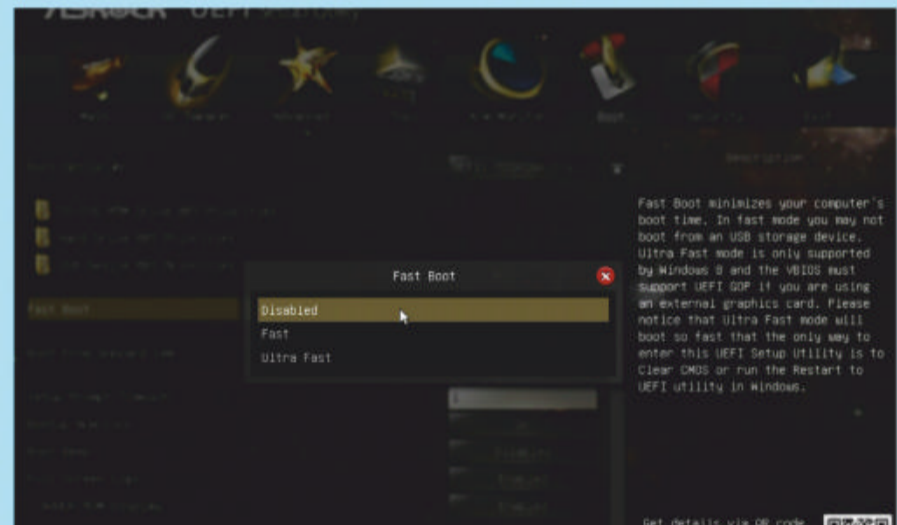
1 PARTITION HARD DRIVE You'll need to partition your drive to free up space on which to store your copy of Windows. The best tool for the job is AOMEI Partition Assistant (www.aomeitech.com/aomei-partition-assistant.html). Start by clicking Make Bootable Media under Wizards to create rescue media.



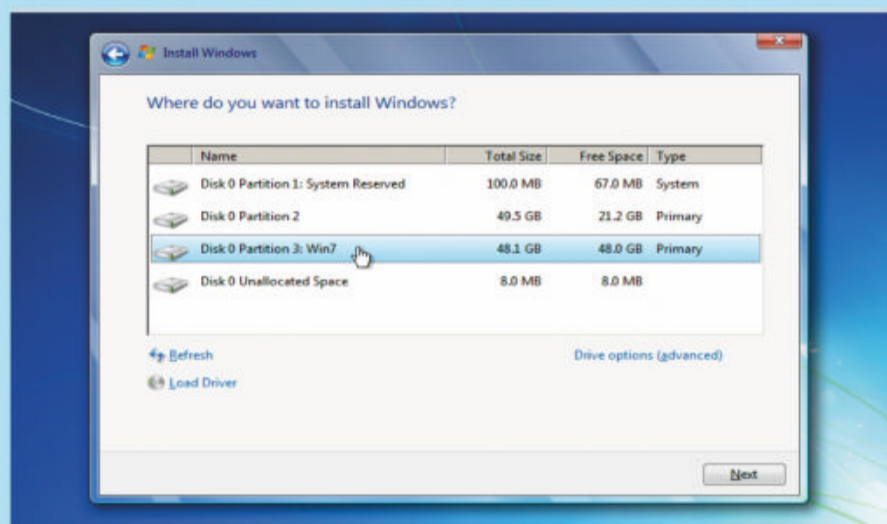
2 SHRINK MAIN PARTITION Select your Windows drive (typically C:) and click Resize/Move Partition under Partition Operations. Use the slider to free up at least 30GB space to the right of the Windows partition. If your drive is an SSD, click 'Advanced >>' and tick 'Allow partition alignment...'. Click 'OK'.



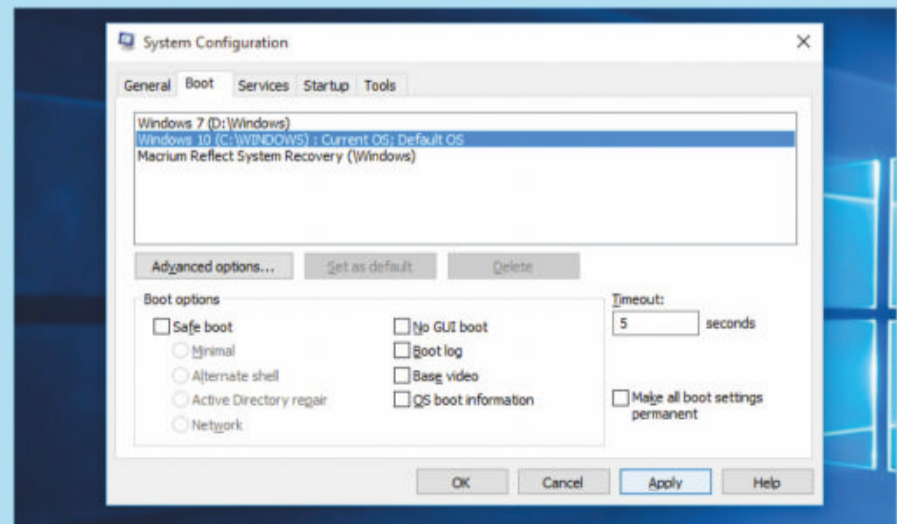
3 ADD NEW WINDOWS PARTITION Now select the newly created Unallocated space to the right of drive C and click 'Create Partition' under Partition Operations. Verify NTFS is the file system and click 'Advanced <<' to give the partition a suitably descriptive label, such as Win7 before clicking OK. Click 'Apply' > Proceed and reboot.



4 TWEAK UEFI SETTINGS If installing Windows 7 alongside Windows 8.1 or 10, you may need to reboot into your UEFI (see the main text) to enable the Compatibility Support Module (CSM), plus disable Fast Boot and Secure Boot. Once done, you should be able to boot successfully from your Windows 7 installation media.



5 INSTALL NEW COPY OF WINDOWS Once the new partition has been created (check in Windows), reboot using the installation media for your target version of Windows. The install process is almost the same as for a regular Windows installation, but be sure to choose the newly created partition as your target during installation.



6 POST-INSTALL STEPS When Windows reboots for the first time you'll see a boot menu appear listing the different versions of Windows you have installed. If the 30-second delay is too long, or you want to change the default, Click 'Start' > Run, type msconfig and press Enter, then make changes from the Boot tab. **TL**

FEATURE

The state of VR

THE STATE OF VR

JOIN US AS WE TAKE A LOOK AT THE CURRENT STATE OF VIRTUAL REALITY IN GAMING AND BEYOND.
BY CHRISTIAN GUYTON

Virtual reality keeps coming back, like a bad smell. Or a nice smell; a pleasing scent of sandalwood for the proponents of VR, as they insist that it's "the future of gaming" or "the next level of immersion." Some of us at TechLife are skeptics, while others think VR just hasn't quite hit its stride yet. There are applications beyond gaming, too, with virtual reality headsets now being used in medical and architectural fields.

The problem is that there have already been a few "futures of gaming." First it was webcam body-tracking, then it was motion controls, then it was touchscreens, then it was motion controls again, then it was, uh, figurines with NFC chips in them? Yeah, we don't know what Nintendo was smoking when it dreamed up the Amiibo, but the point is that gimmicks like VR have been a part of gaming for a long time, and most of these fads have fallen apart.

Virtual reality has stuck around for longer than most, with the industry currently in its "third phase" of VR products. The technology is improving significantly, too, with newer headsets, such as the Vive Cosmos and Oculus Rift S, claiming to offer superior motion tracking, graphical fidelity, and immersion. The amount of money being poured into VR projects has certainly risen in recent years, with even Facebook swooping in to buy up big VR business Oculus for a staggering US\$2.3 billion in 2014.

Where is VR heading, though? Examining the history of the industry demonstrates a lack of innovation since the initial introduction of modern VR headsets. While the hardware has improved, the way VR works hasn't really developed, and there's yet to be a killer app that makes VR headsets a must-have product. So, we're left asking: What's next for virtual reality?



FEATURE

The state of VR

VR technology has been around since the '90s, with the earliest commercial attempt being Sega's brief demonstration at the Consumer Electronics Show in 1993, which was then canned before release. A few other manufacturers took a shot, most notably Sony, but the technology wasn't quite there yet. The experience was fraught with latency issues and tunnel vision, and while it was a hopeful portent of things to come, most gamers weren't exactly blown away.

Fast-forward a couple of decades, and we find ourselves in the mystical, futuristic land of 2012. Plucky tech startup Oculus began a Kickstarter campaign to crowdfund its advanced, high-end Rift VR headset, designed by Palmer Luckey, with the support of id Software co-founder John Carmack, a big proponent of VR. The fundraising campaign was massively successful, raising more than 10 times the original goal of US\$250,000. The finished product was released to consumers in 2016, and was immediately popular, although the initial retail price of US\$599 meant sales were hardly through the roof.

It was a successful innovation, though, and everyone wanted a slice of the VR pie. Sony came back with a vengeance, giving its successful PlayStation 4 console a VR headset, the inventively named PlayStation VR. Cell phone manufacturer HTC partnered with Valve to produce its own contender, the HTC Vive. The competition was fierce, although primarily between HTC and Oculus; Sony's offering was console-specific, as opposed to the



Palmer Luckey, the original creator of the Oculus Rift, has since left the company.

PC-oriented applications of the other two.

Surprisingly, Sony came out ahead; the PSVR was and still is the single most successful system-tethered VR headset ever, selling over four million units in three years, thanks to a lower initial price, compatibility with Sony's existing PS Move motion controllers, and an assurance that the headset would work perfectly with the static PS4 hardware. Oculus outsold HTC by a small margin on its first release units, but both the Rift and Vive shared the same problem: needing to work with a wide

variety of consumers' PCs, both pre-built and custom systems.

This is an issue that has plagued the majority of VR headsets designed to work with PCs. The uncertainty as to whether their rig can support a VR platform drives potential buyers away. With the PSVR, it was simple: If you have a PS4, you can use it. With PC-tethered VR headsets, consumers had to ensure that the system they had was capable of running games in VR – and with a huge variety of custom-built machines in the homes of PC gamers across the globe, that became a problem.

Going Mobile

Of course, the companies behind VR were aware of this, and working on solutions. Oculus produced the Oculus Go, a PC-less offering that went without wires thanks to an integrated Qualcomm chip to handle graphics. It wasn't incredible in terms of graphical fidelity, but it sold well, even exceeding Rift sales in some markets. The more powerful follow-up, the Oculus Quest, was released recently, and you can find our review of it in this very issue.

A different strategy was employed by Samsung, which collaborated with Oculus to corner a slice of the market with a super-cheap solution: a VR headset with a slot for a Samsung Galaxy smartphone, which acted both as a screen and CPU. It sort of worked; the GearVR headset contained its own hardware for motion controls and head tracking, and at less than US\$100, it was far more affordable than other options, although it did require the user to own a

FROM LEFT TO RIGHT: Forte's VFX1 was one of the earliest attempts at VR, using a weird hockey-puck-shaped controller. The original Oculus Rift was a true game-changer for VR. Samsung and Oculus worked together to produce GearVR, a cheaper alternative to full VR headsets.



Galaxy phone.

GearVR sold well, shifting five million units, and spawned legions of imitators of varying degrees of quality. Slightly before its release (but long after Samsung's plans for the GearVR were conceived), Google announced Google Cardboard, a hilarious but undeniably effective VR solution that consumers could buy or even build themselves from cardboard. It used the same smartphone-oriented ideas as the GearVR, but was even cheaper and less sophisticated – because, well, it was made of cardboard. Google put out its own proper answer to Samsung's GearVR, Google Daydream, a few years later.

Where Next?

While all of these products did well, none set the world alight. Google Daydream was discontinued earlier this year, while GearVR hasn't had a new hardware announcement since 2017. PSVR has remained a constant, a good metric of how well VR as a whole is performing, although as the release of the PlayStation 5 looms, it seems likely that Sony may take a moment to evaluate the direction it wants to head regarding VR.

John Carmack himself was recently decorated at the third annual VR Awards, receiving a lifetime achievement award for his work with Oculus. However, during his acceptance speech, he noted that he and some of his colleagues “really haven't been satisfied with the pace of progress” with regard to VR development and expansion. He

RIGHT: The HTC Vive has remained Oculus's main competitor in the VR market.

also admitted that VR is still an incredibly niche market, and remarked that there was a lot of work “yet to be done” before VR could properly hit its stride. Since then, Carmack announced he was standing down from Oculus to focus on artificial intelligence projects instead.

As far as we're concerned, he's right; VR seems to be stagnating. Oculus released the Rift S in early 2019, and a few months later HTC shot back with its Vive Cosmos. Both were quality, high-end headsets, but with more of a focus on improved hardware specs than genuine innovation. Improved camera tracking, higher resolution screens, and so forth; all good improvements, but useless without top-notch software to match it. The biggest change made by the Vive Cosmos is a reworked headset design that enables the wearer to raise the “visor” without removing the whole headset.

Even Oculus, arguably the progenitor of the modern VR headset, isn't moving rapidly. The Quest and Rift S aren't reworkings of VR, just upgrades to existing tech; like the PSVR and Vive Cosmos, they're not pushing the VR industry forward in a meaningful way, even if they are great products. The problem with VR's failure to expand might lie elsewhere, then, perhaps more on the software side.

Blame the Games

A common opinion is that VR is lacking a killer app; that one game or program that is a genuine game-changer. So far, that hasn't materialised. A few cool

Virtual Origins

VR has been kicking about for a while in various forms. Perhaps the most memorable precursor to modern VR was Nintendo's oft-maligned Virtual Boy, a table-mounted headset that demanded you press your eye holes into it to experience wonky stereoscopic 3D games in all their red-tinted 32-bit glory. It was frankly horrible, and a huge commercial failure for Nintendo. The Virtual Boy might be a familiar industry touchstone, but it wasn't a true VR headset; the focus was on headache-inducing parallax 3D. Sony's Glasstron visor was a true predecessor of VR as we know it today; a proper head-mounted display that enabled gamers to take a seat in the cockpit of a war machine in MechWarrior 2. Sony released five models of the Glasstron across three years in the '90s, and while they weren't a huge success, they would set the stage for Sony to produce PlayStation VR nearly 20 years later.

Some smaller companies tried to take a stab at VR before the turn of the century, too, none leaving much impact. In Britain, IBM-funded company Virtuality Group experimented with VR headsets in arcades, and some have argued that the arcade is the perfect setting for VR; a chance to try out games and experiences in virtual reality, without having to fork out hundreds of dollars for the hardware. In fact, modern VR headsets aren't an uncommon sight in arcades today, although the decline of arcades in general doesn't bode very well for that avenue of success.

It's difficult to chart how exactly the history of VR led to Palmer Luckey's Oculus Rift prototype in 2012. It was a fresh start; an effort to revive VR with the new technology of the day. And it worked. VR was back with a bang, ready to enter a new golden age, only to grind to a halt again as the buzz of excitement died down, and the harsh realities set in.



Games Worth Playing

For every good game playable in VR, there are about 7,000 bad ones, based on our expert (not exactly accurate) calculations. Those good games do exist, though. Right off the bat, we've got to recommend Beat Saber, a high-octane, neon-tinted rush of adrenaline – *Guitar Hero* by way of *Star Wars*. Your two controllers become lightsabers as colored blocks race toward you, demanding that you destroy them in time to the music. Similarly fast-paced is bonkers extreme sports game *Sprint Vector*, which sees up to eight players race through all manner of futuristic locales at blistering speeds.

Those interested in a more cerebral experience might enjoy *Budget Cuts*, a tongue-in-cheek stealth title that puts you in the shoes of a human employee in a workplace full of robots. Armed with a portal gun and office supplies, you sneak around, hiding from camera-headed bots. It's got a brilliant, dark sense of humor that reminds us of the original *Portal*.

Black comedy seems to work well in VR, for some reason. *Duck Season* takes you back to a childhood in 1988, where you're eager to play the newest hit game – a thinly veiled *Duck Hunt* rip-off. However, it quickly becomes clear that something is awry inside the *Duck Season* cartridge, with strings of horror, action, and stealth gameplay complementing the opening arcade shooter elements.

Arizona Sunshine and *Space Pirate Trainer* are both enjoyable bouts of zombie- and robot-blasting respectively, while the fantastic *SUPERHOT* is even better in VR. It brings a glorious sense of mastery when you *Matrix*-dodge out of the way of a bullet, throw a bottle at your assailant, and snatch their dropped gun from the air to finish the job. It's as much a puzzle game as it is a shooter, and it feels as good as it looks.



Gorn's exaggerated bodies and showers of blood look great in VR.

excellent *Skyrim VR* or the slightly wonky *Borderlands 2 VR*. But as a general rule of thumb, good VR games need to be built from the ground up to work in VR, and most developers won't dedicate the time and money to make that happen on a large scale.

Plenty of people are willing to take a stab at producing a game for VR, though, perhaps just out of the novelty of it. What this leads to is a wealth of titles that are short games at best, glorified tech demos at worst. Many developers seem to begin with a unique, interesting idea for a game that would work well in VR, but lack the resources to produce it in any form that lasts longer than two hours. Some are insultingly short; *Accounting+*, a game from *Rick and Morty* star Justin Roiland, is hilarious, well crafted, and less than an hour long. And it costs US\$12!

The alternate approach has been to produce virtual sandboxes for gamers to simply mess about in. This is the bread and butter of so many YouTube and Twitch channels – nonsensical tomfoolery in a variety of settings, often employing a key mechanic to keep things interesting. *Blade and Sorcery* puts players in a medieval arena and arms them with a range of era-appropriate weapons and magical spells for beating the living daylights of hapless goons. *Gorn* does a similar thing, but with cartoonishly proportioned gladiators and ridiculous, over-the-top gore.

Finding the Formula
 Fooling around in VR is fun enough, but

these games don't have storylines, objectives, or even really any quantifiable amount of game content. *Pavlov VR* is a lot of fun with some mates, as you mess around with automatic weapons in a facsimile of *CounterStrike*, but it quickly starts to feel more like a demonstration of what VR is capable than an actual game.

Indeed, virtual reality "experiences" are commonplace, enabling VR headset owners to immerse themselves in another life for a short while – all too often, a very short while. That could be a gun range, a rollercoaster, even a plank overlooking an 80-story-high fall. We're not going to talk about the sexy ones; we leave that to less refined journalists. But the point is that VR "games" often aren't games at all, merely snapshots, glimpses into exciting worlds and scenarios that are snatched away almost as soon as they begin.

Even some of the "proper" games released for VR are lacking in content, polish, or simply quality. One problem with virtual reality is that games come in a huge variety of genres, many of which simply don't work in VR. That said, some genres fit excellently with the format of VR. Puzzle games can work excellently in virtual reality, particularly locked-room puzzles, such as the comedic spy jape *I Expect You to Die*.

First-person shooters work relatively well in VR, enabling players to pull off maneuvers that would be impossible within the confines of a conventional FPS. Driving and flight sims can be fantastic, dropping the player into the cockpit of an F1 car or an awesome



A US Navy medic uses a VR parachute training simulator.

spaceship, providing static immediate surroundings while the environment moves around the player. Meanwhile, the extra layer of immersion generated by VR has led to some fantastically scary horror games – *Resident Evil 7: Biohazard* is a particularly jump-scare-fraught delight.

The End of VR?

VR isn't beyond saving. But it feels like we may be approaching a critical juncture; the make-or-break point for this generation of VR, where the format will either evolve and continue or collapse, presumably doomed to return in another decade or so when the technology has evolved.

It's hard to see how a single game could fix the problems with VR at this point, though. VR might need a killer app, but it may not be enough. Industry veterans are still divided on whether VR is really the direction in which gaming is headed, and even tech titans such as Facebook and Google have proven unwilling to sink huge amounts of money into VR projects. Valve, meanwhile, has committed to another bout with it recently-released Index VR.

Oculus is showing no sign of stopping either, with the Oculus Quest supposedly being the final product in its first generation. It's hard to see right now how the second generation will be quantifiably different, though, beyond minor improvements to the displays and processing power of the new headsets.

If VR is left alone to chug along without real support, it will die. Overpriced hardware and a dearth of

proper games have already hamstrung the platform's worth to serious gamers, and super-cheap alternatives could actually have hurt the marketing narrative of VR by convincing many consumers that it's a one-off gimmick, fun for half an hour before you put the cardboard headset down, and go back to using your phone like a normal human being.

Honestly, we'd really love to see VR turn around. The potential is there, and modern headsets provide a far more convincing experience than pre-2010 attempts. But unless developers prove willing to band together and properly push the value of the hardware with new, bigger, more involved games, we don't see it happening. Perhaps the success of VR is inevitable; like cloud-streamed gaming or motion controls, it's one of those USPs that comes back around every few years to have another attempt at success. Whether we'll see it now, or have to wait until the 2030s, is anyone's guess. **TL**

Beyond Entertainment

VR isn't just for gaming, of course. Indeed, Oculus creator Palmer Luckey parted ways with videogames to found a new company specialising in defense technology, putting that VR know-how to work on drones, sensors, and software for the US military. Virtual reality has been examined by numerous militaries worldwide for training purposes, particularly for fighter pilots, where it enables them to experience combat situations without any exposure to real danger.

Virtual reality has also been used for medical purposes. Trainee surgeons can practice complex operations in VR, or rewatch 360-degree videos of more experienced surgeons at work. VR headsets have even been used for experimental therapy purposes, such as a program that simulates the effects of dementia on a person's vision and hearing. Applications such as this can allow family members to see things from the perspective of a relative suffering from a mental health condition.

Another, slightly more esoteric, use of VR tech has been in the fields of archeology and paleontology. Archeologists can map out dig sites using drones and cameras to produce digital copies of the locations, enabling students and scholars all around the world to tap into them and explore areas in virtual reality. As you might have guessed, the next logical step is to recreate those sites as they would have looked in their prime, creating a portal to the past for academics and enthusiasts alike to experience historical locations as they should be. The uses don't stop there. Some businesses have adopted VR for virtual meeting rooms to connect employees in different offices, while architects have used it to demonstrate what their finished building will look like. Perhaps the future of VR isn't in gaming and entertainment at all, but in the world of work instead....

FEATURE

Quantum Computers

QUANTUM COMPUTING

DID YOU KNOW? A 300-qubit computer would contain as many pieces of information as there are atoms in the universe.

QUANTUM CRUNCHERS

A new generation of number-crunchers are harnessing the power of particles: how will these super-fast computers change our world?
JACK PARSONS

Google says it has accomplished 'quantum supremacy'. This is a fancy way of saying its Sycamore processor can do something unique. It worked out a complex maths problem in three minutes and 20 seconds. The search-engine giant says a state-of-the-art supercomputer would struggle to do it in under 10,000 years. This is because Sycamore isn't just an upgrade on existing technology... it's a completely different way of working.

Sycamore is a quantum computer, meaning it's supercharged by the strange behaviour of particles. This advanced processing power could help cure dementia or invent artificial intelligence, so it's no surprise other tech firms are hard at work developing their own versions. Even governments are investing billions into their own research. In fact, the rivalry between the United States and China has been called the '21st-century Space Race'.

While Sycamore is a giant leap for Google, it's only the first step for this tech revolution. The underlying physics that make quantum computing so extraordinary also cause some of its biggest challenges. And we haven't solved many of them yet.

FEATURE

Quantum Computers

To understand how quantum computers work, you need to wrap your head around a mind-boggling fact: objects can be in two places at once. This is very hard to grasp, in part because it's not how we perceive things, and also because for centuries Isaac Newton and other scientists have said the world follows predictable patterns. For instance, an apple always falls down to the ground, even if it bonks you on the head first. And if you take that apple home and put it in your kitchen, you're not suddenly going to find it in your bathroom.

But these rules don't apply at the subatomic level. This is what 'quantum' means: the smallest amount – or quantity – we can measure, the building blocks of the universe. In the early 20th century, scientists like Niels Bohr, Werner Heisenberg and Erwin Schrödinger found that though particles can be found almost anywhere, the certainty of finding one in any particular place is zero. This is because particles can be in two places at once. For instance, electrons spin both up and down simultaneously.

Physicists call this behaviour 'superposition'. To complicate matters, superposition only happens when we're not looking. The moment we try and measure it, the particles lose their uncertain state and only spin up or down. The best physicists can do is work out the chance of which state they will appear in when observed.

As if this wasn't weird enough, particles can also be 'entangled' in pairs or groups. They become deeply linked to one another, so you can't change one without the other changing as well. Albert Einstein called this "spooky action at a distance" because it works even if the particles are at opposite ends of the universe.

If you're struggling with these ideas, you're in good company. Richard Feynman shared the 1965 Nobel Prize in Physics for helping

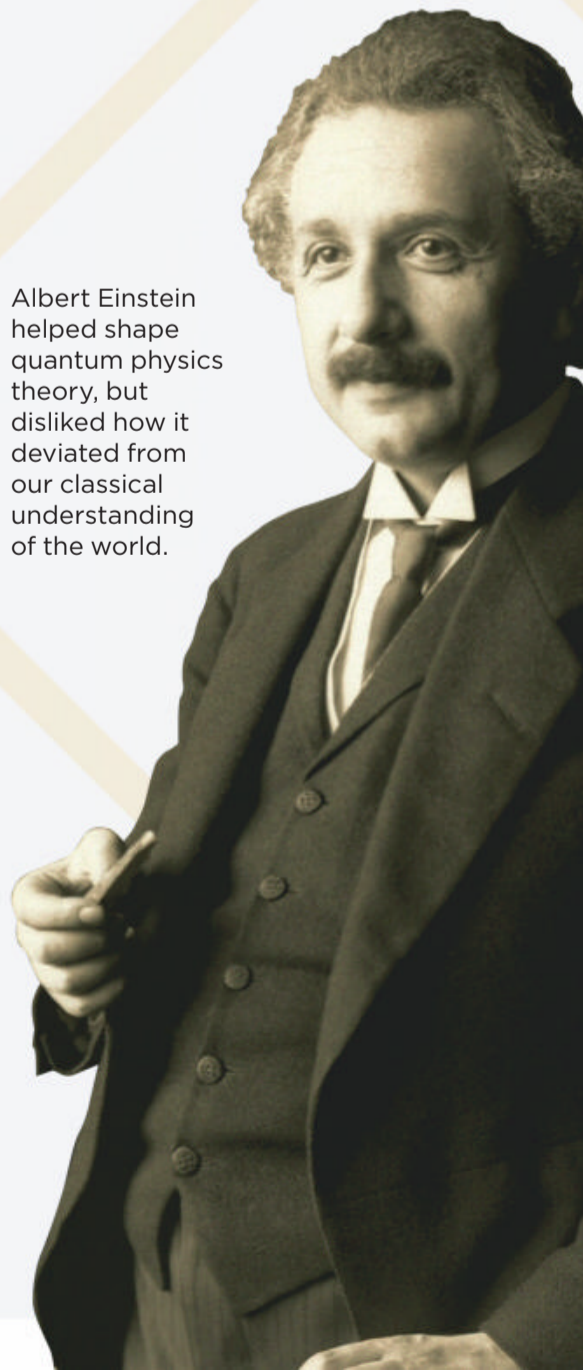
define how quantum physics work, but even he said: "If you think you understand quantum mechanics, you don't understand quantum mechanics." This didn't stop Feynman from proposing the idea of building a quantum computer though.

Incredibly, Feynman told a lecture hall at the California Institute of Technology that it was time to reinvent the computer in 1981. That's the same year IBM coined the phrase 'personal computer', or 'PC' for short. And it would still be another decade before these devices became everyday items.

But all computers – from those early IBMs to your modern-day MacBook – work by processing 'bits' of information. Each bit represents the value one or zero. This binary code forms the basis of all the calculations a computer can process. And the more bits a computer has, the harder the task it can handle.

A quantum computer, Feynman proposed, would use a quantum

Albert Einstein helped shape quantum physics theory, but disliked how it deviated from our classical understanding of the world.



Bits vs qubits

Traditional computers rely on silicon transistors that work like switches to encode bits of data, representing either one or zero. But no matter how many billions of transistors we pack into them, they can only be in one state – a particular combination of ones and zeros – across those billions of transistors. But a qubit, made from a particle, can be both one and zero at the same time thanks to superposition. So while ten bits gives you 1,024 combinations of ones and zeroes – which can represent one number between zero and 1,023 – a qubit can encode all 1,024 numbers simultaneously. Through quantum entangling, 20 qubits can encode over a million numbers at once. A hundred qubits would, in theory, be more powerful than all the supercomputers in the world combined.

Performing operations

A conventional computer operates in single bits, finding outcomes that are either one or zero. This means it can only perform calculations one at a time. A quantum computer, however, uses all its qubits – which are linked by quantum entanglement – simultaneously. This means it can work on a million calculations at once. This makes quantum computers exponentially faster and more powerful. However, the slightest interference – from a change in temperature, electromagnetism, a sound wave or physical vibration – can make qubits stop existing in multiple states at once. This can introduce errors into calculations or even slow quantum computers down to the speeds of a regular one.

Don't bin your laptop

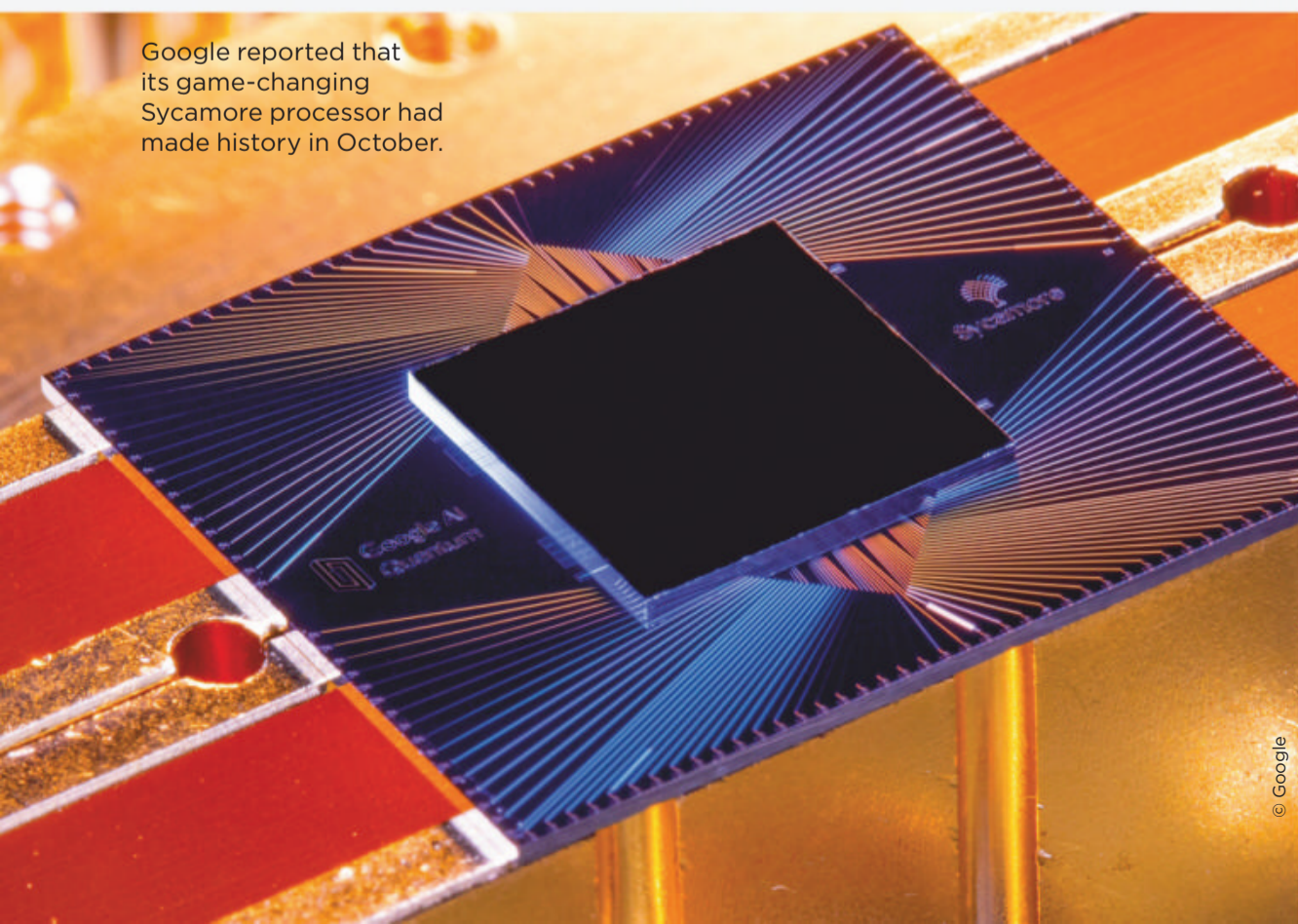
The power and speed of quantum computing will make even the next generation of supercomputers obsolete. So-called 'exascale' computers will be able to perform a billion billion calculations per second. That's an impressive 10 to the power of 18 operations, but quantum computers will carry out 10 to the power of 1,000. Supercomputers are extremely specialist tools. When quantum computers replace them they won't be carrying out even ten per cent of the world's computing tasks. The average user needs a lot less computing power day-to-day and enjoys the portability that quantum computing may never be able to provide. If this changes, users could still connect to a quantum computer using a conventional computer via the cloud.

DID YOU KNOW? As transistors physically can't get much smaller, conventional computers won't get any faster after 2025.



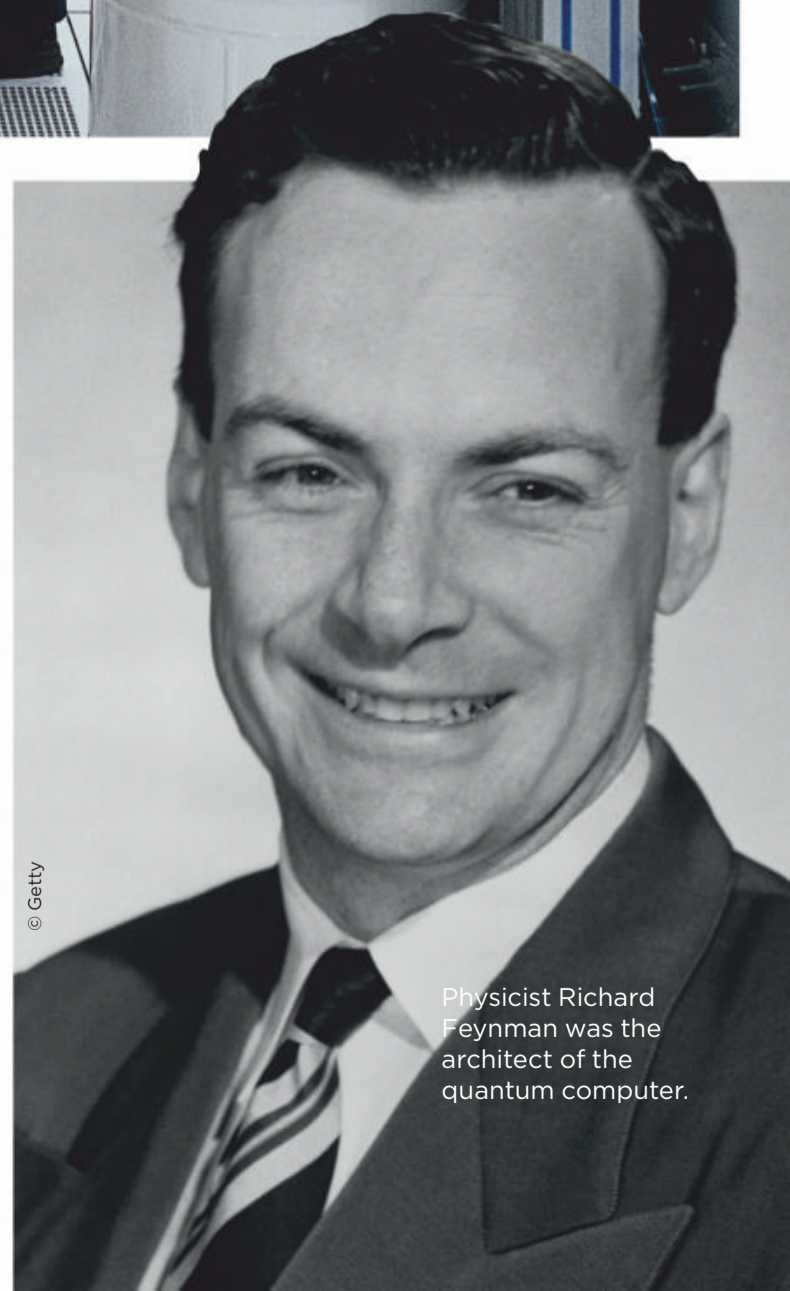
The need to keep qubits cold means quantum computers like the IBM Q System One look like sci-fi fridges.

© Getty



Google reported that its game-changing Sycamore processor had made history in October.

© Google



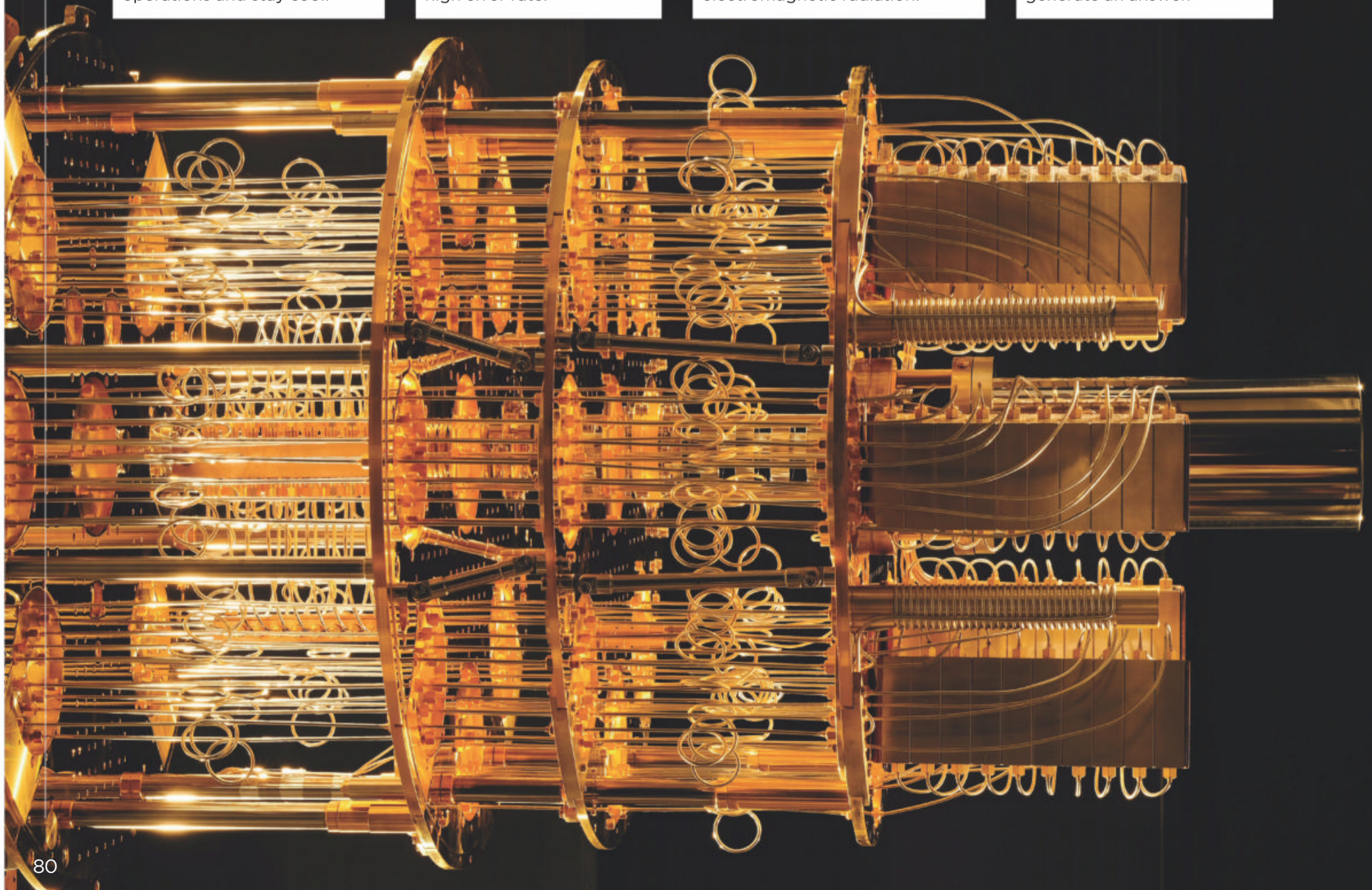
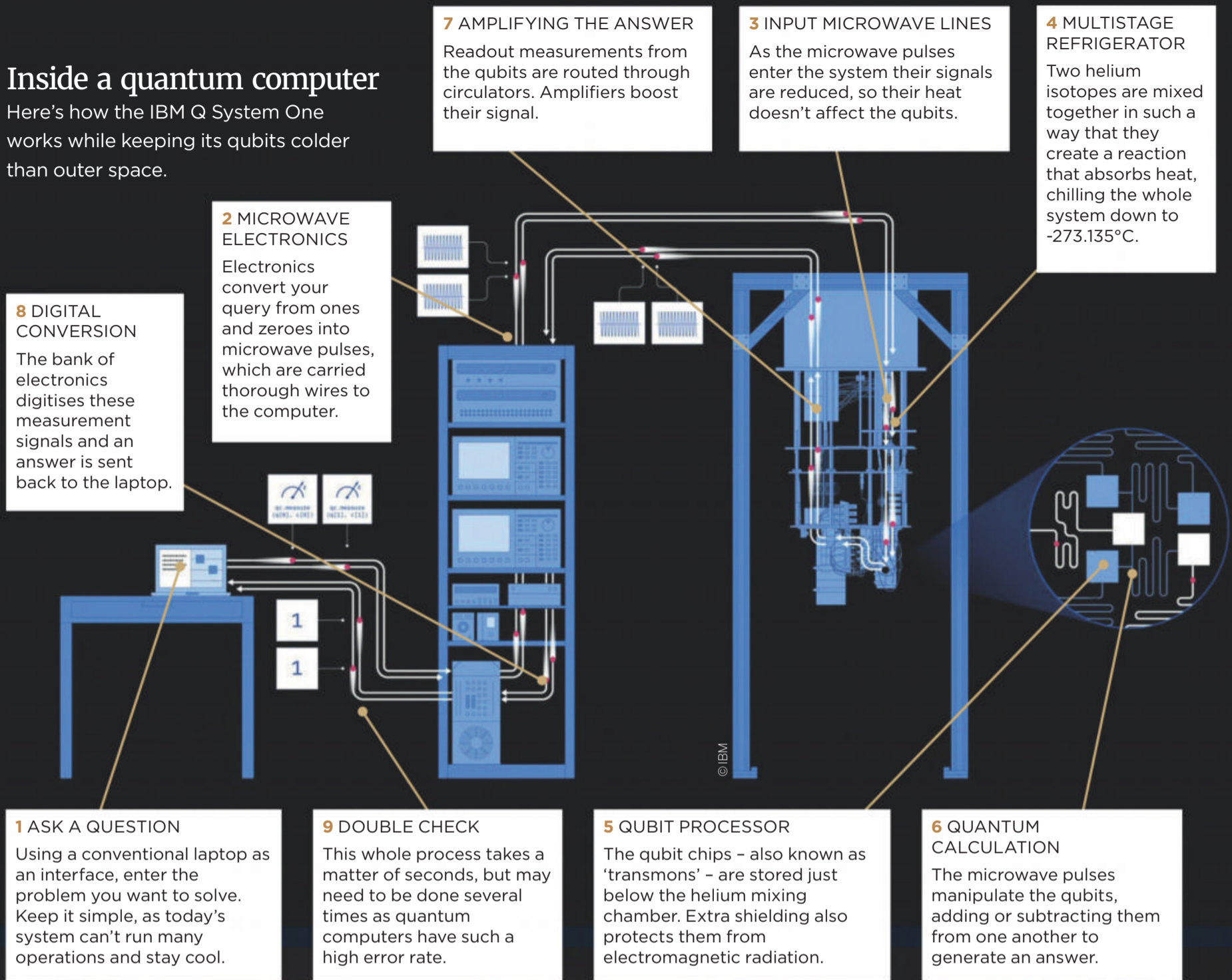
Physicist Richard Feynman was the architect of the quantum computer.

© Getty

FEATURE

Inside a quantum computer

Here's how the IBM Q System One works while keeping its qubits colder than outer space.

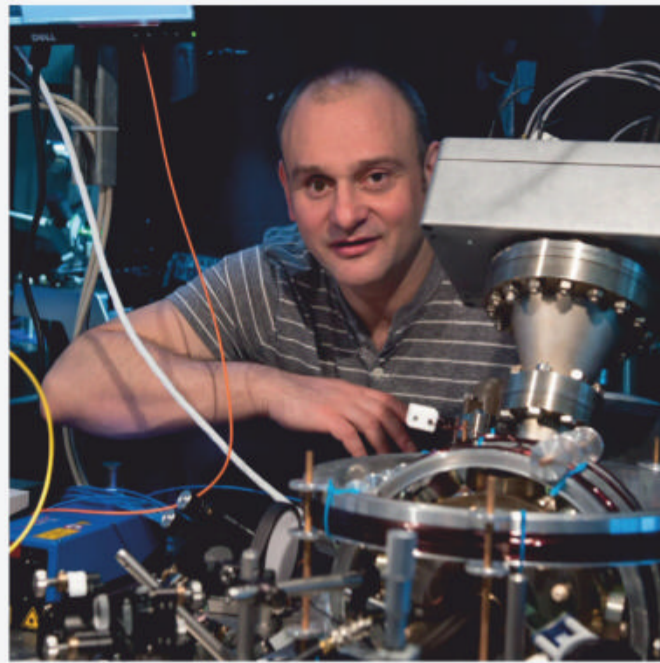


bit, or 'qubit'. These would exist in superposition, so they can hold both one and zero at the same time. If you were to quantum entangle two qubits, they could hold four values at once: 1-0, 0-1, 1-1 and 0-0. As the number of qubits grow, a quantum computer very quickly becomes more powerful than a conventional one, so it can process information in a fraction of the time.

While Feynman provided a blueprint for how the technology could work, actually building a quantum computer proved much harder. Qubits are made from individual atoms or subatomic particles. Just trying to control them risks making them lose their quantum properties. Just linking them together took years of work, with the first two-qubit computer appearing in 1998.

This all changed over 20 years ago, when superconducting circuits were pioneered in Japan. This involves cooling qubits to -273 degrees Celsius using powerful fridges. Using this method, Intel has achieved 49 qubits, and IBM boasts 53. Google's game-changing Sycamore processor also has 53 qubits, but the tech giant's already built another with 72. A start-up with US\$119.5 million in funding called Rigetti even says it's working on a 128-qubit system.

But it's harder to cool large objects than it is smaller ones,



Professor Hensinger thinks trapped-ion quantum computers are the future.

especially when you need them to be colder than the depths of space. So just as superconducting qubits have reached the size that they can achieve quantum supremacy, they may be about to outgrow the refrigerators they rely on.

One alternative is to use ions, any atom with an added electrical charge. These can be trapped using microchips that emit electric fields. Each microchip can then be used as a qubit. Crucially, these can work at room temperature, so solve the fridge problem. But trapped ions have only been tested in labs, and will take a long time to build on the industrial scale that's needed. Microsoft, meanwhile, is experimenting with topological qubits, which would be less sensitive to temperature, but this involves splitting electrons. You could say this technology is in a quantum state of its own: it's both making important breakthroughs and at the same time we're only just beginning to understand it.

Q&A

Prof Winfried Hensinger of the University of Sussex puts Google's achievement into perspective.

How significant is Google's breakthrough?

It's a technical next step, but it's not necessarily as significant as some people think. What Google has done is solved an academic problem – one that is entirely useless in a practical sense. It's a problem that's chosen with one thing in mind: whether a quantum computer can do something a conventional computer can't.

So why are we talking about it?

Google's achievement demonstrates that quantum computers are not like nuclear fusion, which a lot of people often say is ten years away, but never actually arrives. When I started 20 years ago, people were very sceptical. Most of my colleagues rolled their eyes at me when I said I was going to build a quantum computer. That's because it's unbelievably hard to control the quantum effects of atoms. So what Google has achieved is still really nice, as it's demonstrated mastery of manipulating 53 qubits. That's a big milestone.

When do you think quantum computing will come into its own?

Quantum computing will likely follow the same development path as conventional computers. In the 1940s, conventional computers decided World War II by breaking the German Enigma code. However, while they were good for a particular task, they couldn't tell you train times, handle word processing or play video games. It was another 40 to 50 years until we used them for literally everything. It's a gradual process. Quantum computers now are probably approaching those in the 1940s. In the next five years, these machines will be able to solve one particular practical problem.

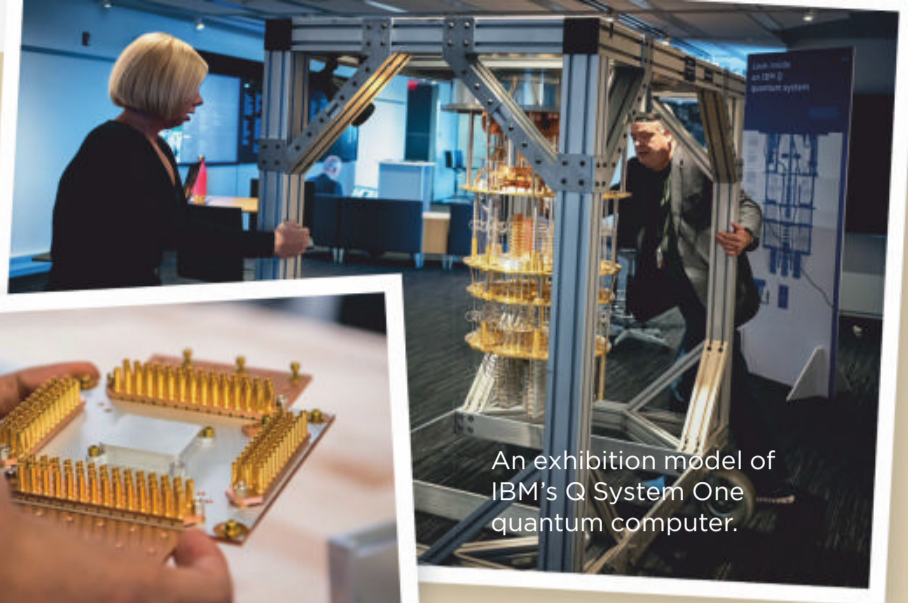
Google's CEO, Sundar Pichai, inspects one of the search giant's quantum computers.



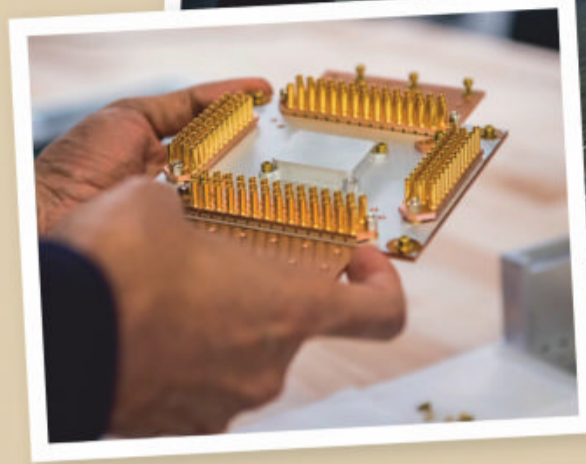
FEATURE

Quantum Computers

WHAT CAN QUANTUM COMPUTING REALLY DO?



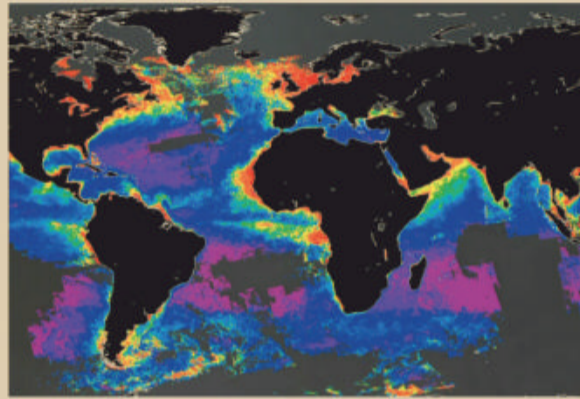
An exhibition model of IBM's Q System One quantum computer.



A vital component of the computer: the quantum processor.



CREATE PERSONALISED MEDICINES
Developing medicine is a long process. You can spend a lot of time and money just trying to find a molecule that can fight a disease. But with a quantum computer you could simulate complex drug designs in a matter of hours. This technology could even tailor treatments to a patient's DNA, making them more effective and reducing side effects. As each one would be unique, it'd also be much harder for viruses and bacteria to develop drug resistance.



COMBAT CLIMATE CHANGE
Predicting the weather is hard because there are so many environmental variables, such as temperature, humidity and wind conditions. Beyond not having an umbrella on hand, faulty forecasts can cause travel chaos for airlines and affect farmers' crops. With a quantum computer, scientists could predict near-term weather patterns perfectly. And they could more accurately assess the long-term effects of climate change before they happen.



END TRAFFIC JAMS
As the world's cities grow bigger and smart cars start to drive themselves, better navigation is going to be needed. As quantum computers can perform multiple calculations at once, they're very good at so-called 'optimisation problems', or finding the best way to do something. Volkswagen have used quantum computers to help taxis find the fastest route to an airport in Beijing and buses avoid traffic jams in Barcelona. The process could also help speed up deliveries.



FIND EARTH 2.0
NASA believes a quantum computer combined with machine learning could process data collected by space telescopes much more efficiently, helping us find habitable planets. What's more, it could even help plan missions. By simulating the many challenges a robotic rover might face on a distant world - like when and where best to recharge their solar batteries - these probes could be better programmed to overcome them.



DESIGN NEW MATERIALS
Back in 2016 - and working with just two qubits - Google engineers simulated a hydrogen molecule for the first time. Since then IBM has managed to model even more complex molecules. Just as this process might be used to design drugs, it could also make new chemicals and materials. This could include longer-lasting batteries, more efficient fertilisers for growing crops and even plastics that are biodegradable.



MAKE THE INTERNET HACK-PROOF
While current passwords take supercomputers centuries to crack, with a quantum computer you could do it in hours. You could access anything: emails, bank accounts, even state secrets. Fortunately, quantum mechanics might also be the solution. Quantum key distribution (QKD) sends information using photons. If you try to read these particles in flight, they'll lose their uncertain state - destroying the data they're carrying and alerting the sender.

DID YOU KNOW? The Defense Advanced Research Projects Agency brought the first quantum network online in 2003

An artist's impression of Google's Sycamore processor.

-273°C

Temperature that researchers work with to preserve the quantum behaviour of qubits.

100

Microseconds it takes for a qubit to lose its quantum properties.

50

The expected number of qubits a 'quantum supreme' computer would need. Google has 53.

1,203km

Furthest recorded distance between a pair of quantum-entangled photons.

\$10bn

The starting cost of developing and building a quantum computer.

1,048,576

Number of states that a 20-qubit quantum computer can process at once.

HELP STATION

Expert solutions for everyday problems

THIS MONTH Q&A

Your questions answered

WINDOWS

Make the most of File Explorer

MAC

Print an amazing photo book

IOS

Tame Siri and Search

SECURITY & PRIVACY

Understanding port forwarding

HOME

NETWORKING

Run your own game server

WEB

SERVICES

Build a website with Wordpress

PHOTOGRAPHY

MASTERCLASS

Shoot studio-style pet portraits

DIGITAL

DARKROOM

Add drama with monochrome

MICROSOFT STORE

DVD player app missing

I purchased the Windows DVD Player app from the Microsoft Store, paying \$22.45 by PayPal. A few days ago, I was forced to reset my laptop, after which this app had disappeared. I've tried to get help from Microsoft support, but it's been a very frustrating exercise. Can you please help?

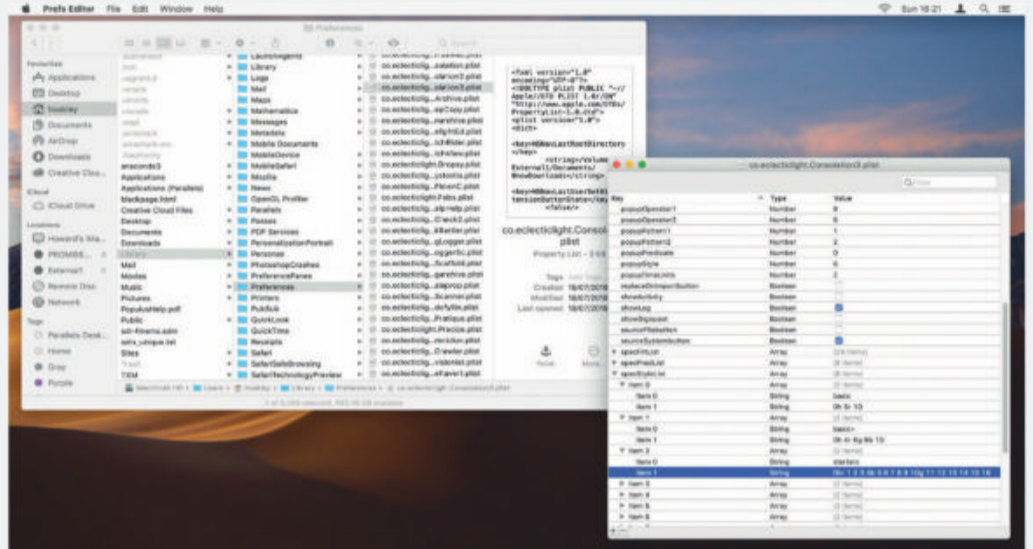
WILL JOBLING

Ordinarily, any software you've purchased through the Microsoft Store should be available to download again after reinstalling Windows – open the Store, verify you're logged into the correct account and then click the '...' button and choose 'My Library' to view all previous purchases and installations. Select 'Ready to install' to filter the list further if necessary.

After Microsoft instructed Will to pay for the app again, he decided to look elsewhere. Luckily, armed with our advice he was more than happy to install the completely free VLC Media Player (www.videolan.org/vlc) instead.

CATHERINE ELLIS

Play DVDs on your PC with VLC for free.



Editing preference files directly is usually unsuccessful – use a purpose-designed utility like the free Prefs Editor instead.

MAC

Getting Preference changes to stick

I've been trying to change a hidden setting in a preferences file, but can't get it to stick. Any idea what am I doing wrong?

ALISON WILLIAMS

Don't be fooled into thinking that what you see and can change in the Property Lists in a Library/Preferences folder controls those settings. This is because apps generally don't access those preferences directly, but through a server built into macOS named `cfprefsd`. That loads the settings

into its cache, and may keep them there even when the application is no longer running. When you open one of those files and make changes, you won't change the data that's being cached by `cfprefsd`, and when it's written back to the preferences file, that will overwrite any changes you made. The same can apply to files which appear to be broken, so you've thrown them into the Trash – they may simply be recreated by macOS.

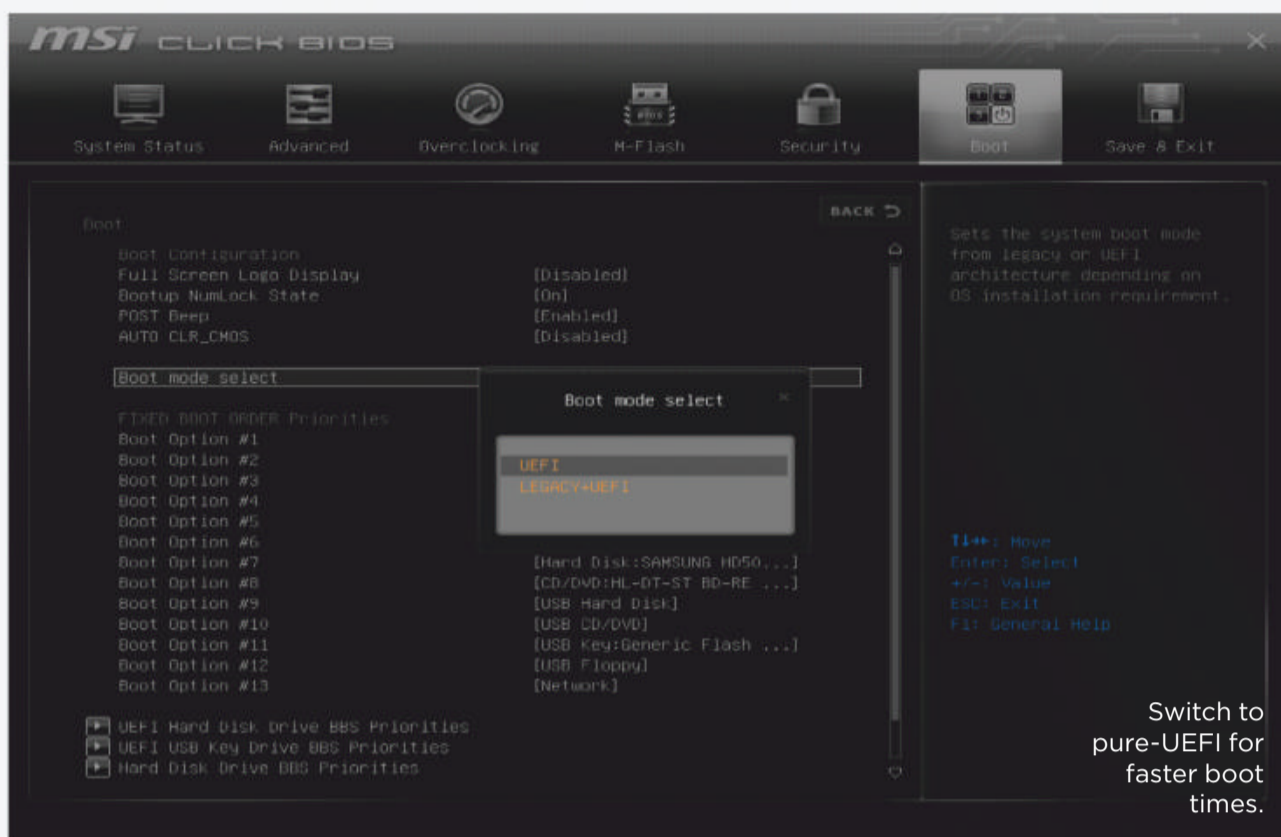
There are two reliable ways to make changes to Preferences files so they stick: one is using the defaults command in Terminal's command line, which is often used in recipes to change features in Finder. The other is to use an app that works with rather than against `cfprefsd`, such as Thomas Tempelmann's free Prefs Editor (apps.tempel.org/index.php).

WINDOWS

Stop sharing a Windows account

My wife and I share a Google account, email and so on, but I use Windows 10 on a PC in my study and she uses the same on a laptop in the lounge. She has recently upgraded to a new laptop which I set up for her, but whereas her previous laptop had her name on the welcome screen, it now has





does to boot into Windows. Can you help eliminate this annoying delay?

FRANK CHARLTON

Sadly, this is normal behaviour on many MSI motherboards, but there are some things you can do to improve matters – one of which is to head into the BIOS, switch to the Boot tab and ensure ‘Boot mode select’ is set to UEFI as opposed to ‘Legacy + UEFI’. Frank had also installed a BIOS update to extend compatibility to the latest Ryzen 3000-series chips – unless you’re intending to install such a chip, we recommend avoiding this update as it’s also been known to slow down the POST process.

CARRIE MARSHALL

GAMING

Bluetooth audio problem

When using my Bluetooth headphones and playing a game, the sound often cuts out when the game starts, having played perfectly well before opening the game, and on the game’s menu screen. Open the game, however, and after a short crackle it’s completely silent.

This behaviour isn’t

consistent with every game and makes me wonder if it’s something to do with DirectX. Any pointers?

DEAN VINEEN

mine, as it appears on my own PC welcome screen. Is there any way we can change the welcome screen name on my wife’s laptop?

MARTIN GULLIVER

This occurs because you’re sharing the same Microsoft Account to log into both PCs. The logical step is to set your wife up with her own Microsoft Account. If you go down this route, start by copying everything inside C:\Users\martin into the C:\Users\Public folder, then use CloneApp (www.mirinsoft.com/ms-apps/cloneapp) to back up any program settings you can’t easily recreate in the new user account. Once done, create the new account via ‘Settings > Accounts > Family & other users’ (click ‘Add a family member’, choose ‘Add an adult’ and then click ‘The person who I want to add doesn’t have an email address’ before following the prompts to create the account, making sure they have administrator access). Once done, log off the Martin account, then log on as your wife. Navigate to C:\users\Public to copy the folders to your new user account. Verify all her existing programs are present – some may need reinstalling if they were installed for a single user rather than all users – and then finally run CloneApp to

restore her preferences. Once you’re happy everything has been transferred across, clean things up by emptying the Public folder and then deleting the old user account via

‘Settings > Accounts > Family & other users.

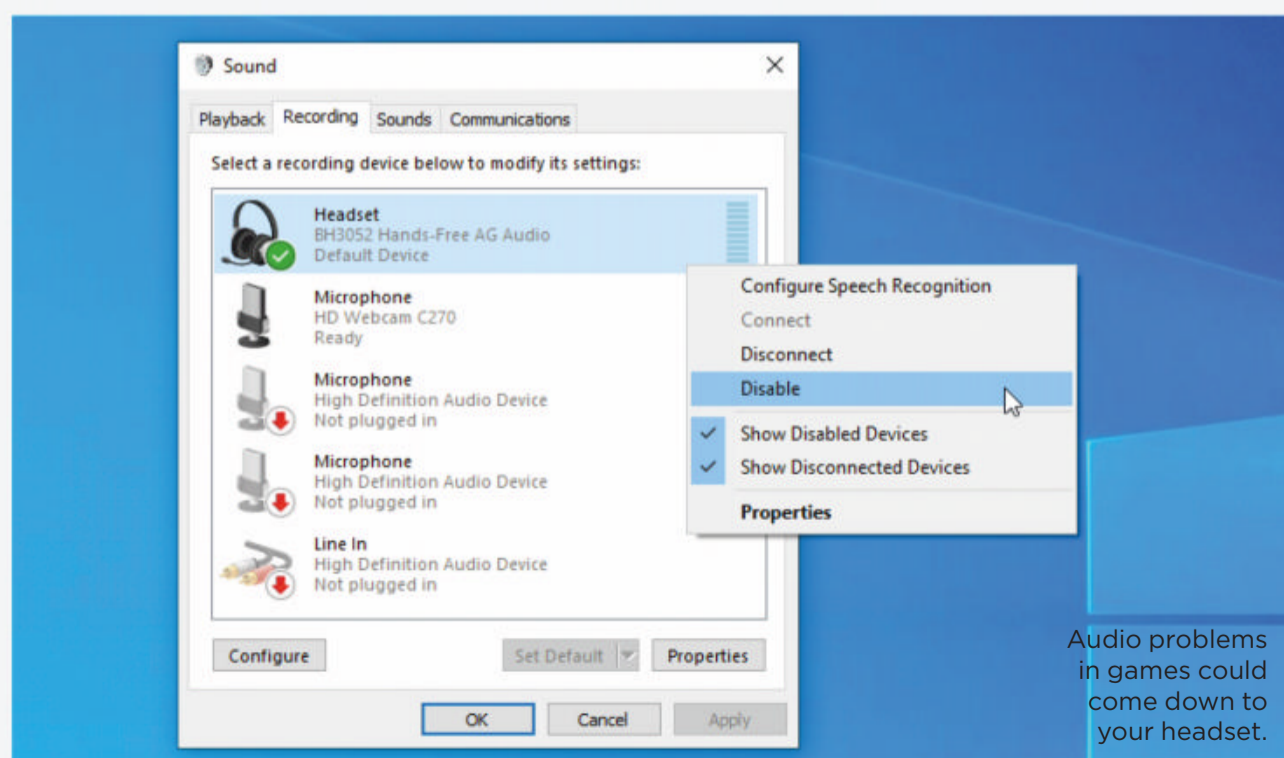
IAN SLEIGHTHOLM

HARDWARE

PC slow to reach POST
I’ve just bought a new PC with an MSI X470 Gaming Pro

motherboard, and it’s lightning quick – except for one crucial aspect. It takes as long (around 20 seconds) to display the POST as it

“
I’ve just bought a new PC with MSI X470 Gaming Pro motherboard, and it’s lightning quick – except for one crucial aspect.



Audio problems in games could come down to your headset.

HELP STATION

Q &A



We traced the cause of this problem to the Bluetooth headphones' built-in mic. Many users have complained of similar issues, and the workaround for those who don't use the mic is to simply disable it: right-click the speaker icon in the Taskbar notification area and choose 'Open Sound settings'. Scroll down to the Related Settings section and click 'Sound Control Panel'. Switch to the Recording tab, right-click your Headset's entry and choose Disable, which should resolve the problem.

NICK PEERS

INTERNET

Can Wi-Fi boosters improve my internet connection?

I have seen numerous adverts relating to a Wi-Fi booster that claims to provide stronger broadband throughout the house. It also alleges to provide a stronger, faster broadband download speed. This suggests that broadband providers don't give you the speed initially promised?

HAROLD HAYWOOD

Wi-Fi signal boosters have no effect on the speed of your internet connection as it's delivered to your home by your broadband provider, but they can improve download speeds over Wi-Fi. To see how this

works, first visit www.speedtest.net in your browser on a PC connected to your router/modem via Ethernet cable. The results here provide the benchmark speed of your internet connection to your home.

Now repeat the test on a Wi-Fi-enabled device (if you're on a mobile, install the free Speedtest app) at different points in your home. You'll see the results vary, with download speeds dropping off the further you travel from your router. A Wi-Fi booster simply acts to relay signals to hard-to-reach places in your home, boosting download speeds to the levels

Improve wireless performance with a Wi-Fi booster.

DriverBooster can track down elusive driver updates.

enjoyed by your wired devices.

ALEX COX

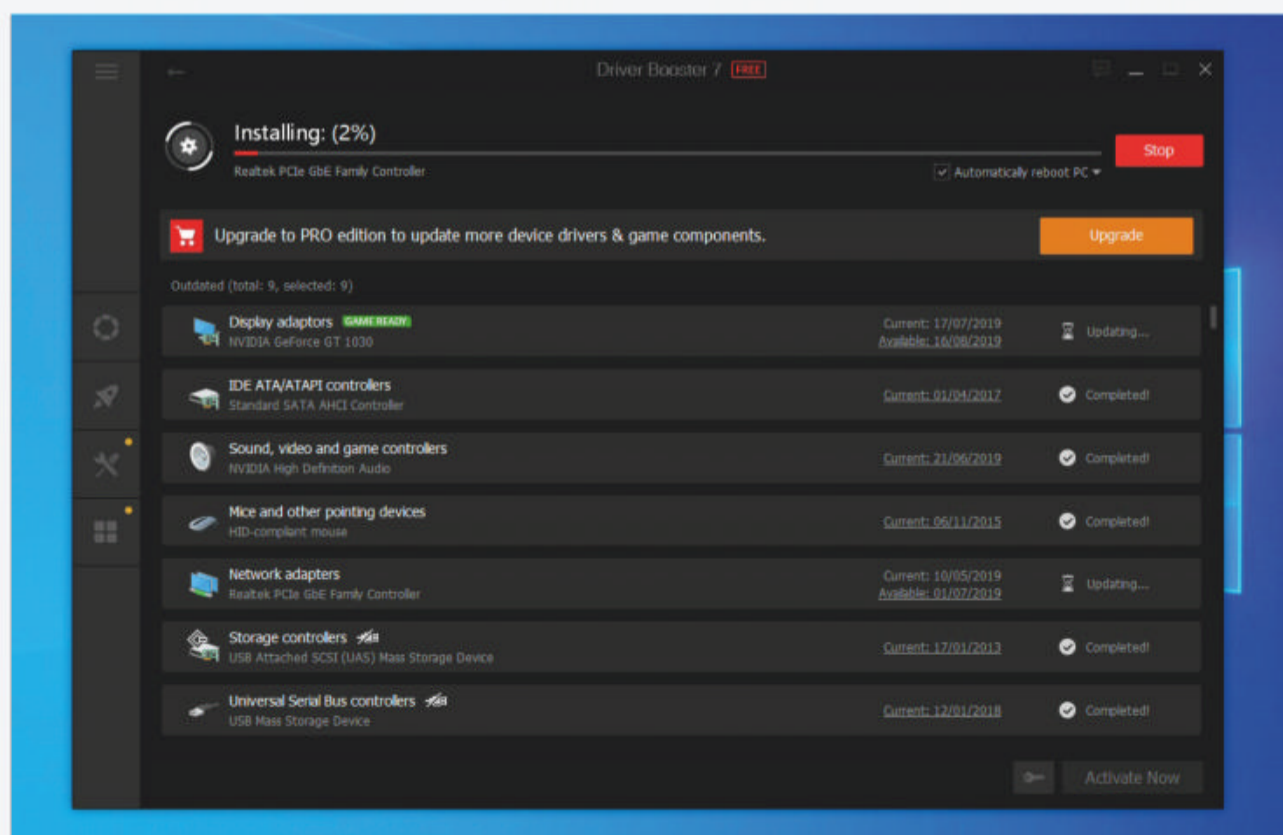
WINDOWS

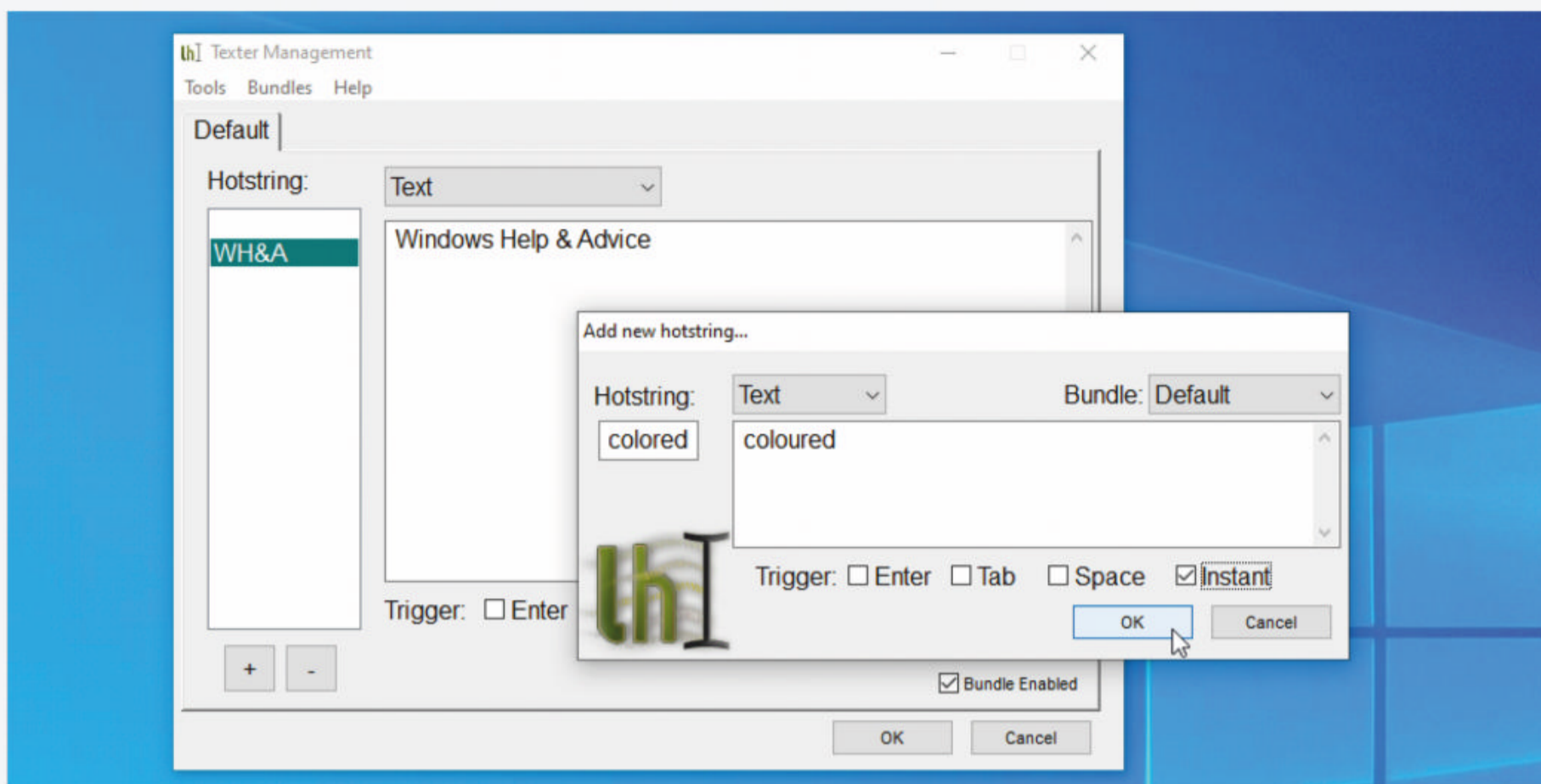
Dual-boot Windows 7 and Windows 10

The pressure to upgrade is mounting, but I'm not ready to give up on Windows 7 yet. I'd like to install a second SSD in my PC and install Windows 10 on a separate drive. Is there some way to choose which system to boot into on startup?

TIM KAYE

First, install your new drive and boot into Windows 7. Press Win+R, type 'diskmgmt.msc' and hit [Enter]. Scroll down to locate the new drive. Right-click the drive's unallocated space and choose Initialise. Choose 'GPT (GUID Partition Table)' and click OK. Next, prepare your Windows installation media on DVD or USB flash drive using the Media Creation Tool (<http://bit.ly/msmctool>). Following on from this, reboot with the installation media plugged in and opt to boot from the drive when prompted. Now simply follow through a regular Windows install process: choose custom when prompted and be sure to select your new drive as the target for the new installation. The installer will





detect the presence of Windows 7 and will set up a dual-boot menu to allow you to switch between Windows 7 and 10 each time you start your PC.

IAN SLEIGHTHOLM

HARDWARE

Updating drivers

What's your recommendation on updating drivers? Let Windows Update handle it, use a third-party tool like DriverBooster, or some other option?

EBI BAQRI

Broadly speaking, if your computer is working as you expect it to, then it's best to leave Windows Update in charge of driver updates. There are, of course, exceptions. If you're a gamer, for example, then you'll want the latest graphics drivers your card supports – install the latest one from Nvidia or AMD and it'll will keep itself updated going forward. Another reason for sourcing and downloading drivers yourself is to troubleshoot problems you believe related to hardware. Start by visiting the support or downloads section of the relevant manufacturer – peripheral, component, motherboard or PC – to see if

newer drivers are available (along with tools for keeping those drivers updated in the future). Tools like DriverBooster (www.iobit.com/en/driver-booster.php) come into their own for keeping all your drivers updated for performance reasons, but also come in handy when you're struggling to find drivers for your system – for example, when your hardware manufacturer stops supporting a particular product.

NICK PEERS

WORD PROCESSING

Get a system-wide autocorrect tool

Can you suggest a free autocorrect tool that works outside of MICROSOFT WORD?

Try Texter – visit <http://bit.ly/texter-win> for download links. Although 12 years old, it works

There are a few options for altering how shortcuts behave, but we'd recommend against using 'instant'.

perfectly in Windows 10. It's a text substitution app that saves you countless keystrokes by replacing abbreviations with commonly used phrases you define. Here's a quick guide to how it works. After installing (or adding to your portable toolkit), launch Texter – it'll appear in your Taskbar notification area. First step is to right-click this icon and choose Manage Hotstrings to bring up the main Texter Management window.

Hotstrings work in the same way as autocorrect entries in Word. Click the '+' button to create your first hotstring. Type the shortcut or frequently misspelled word into the Hotstring box and the correct text where directed.

You'll see four options for triggers: pressing Enter, Tab, or Space, or 'Instant' which means the text is automatically changed as soon as it's typed. We'd recommend 'Instant' for misspelled entries only; other shortcuts should have a trigger.

Open any program and type the misspelling or hotstring before (if applicable) clicking the trigger key. You'll see the text magically change along with a sound effect. Choose Tools > Preferences to configure Texter further.

CATHERINE ELLIS TL

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Wi-Fi signal boosters have no effect on the speed of your internet connection as it's delivered to your home by your broadband provider, but they can improve download speeds over Wi-Fi.

HELP STATION

Windows

Learn how to Make the most of File Explorer

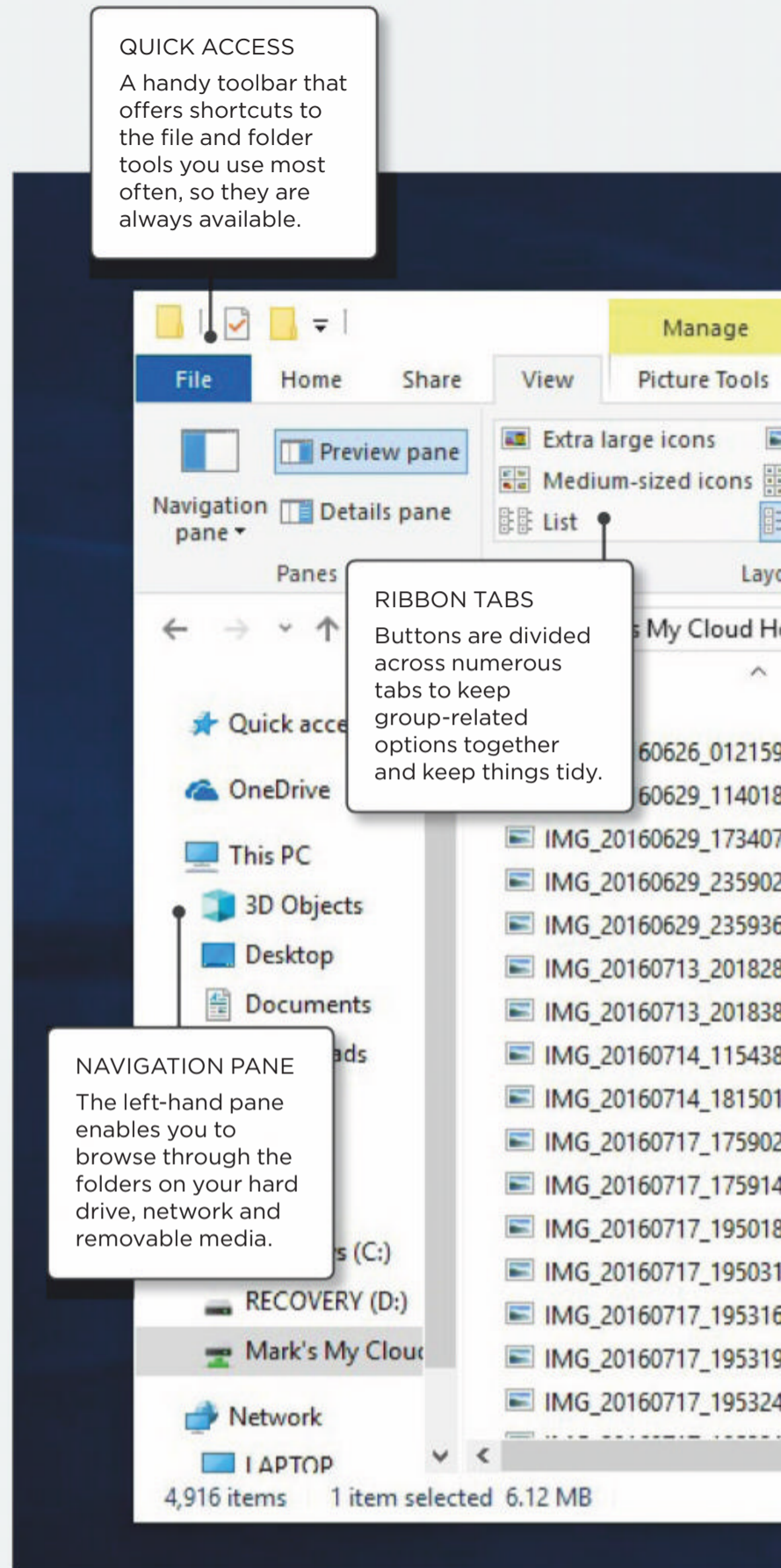
Deceptively simple, File Explorer is capable of much more than you might first think.

SKILL LEVEL
Straightforward

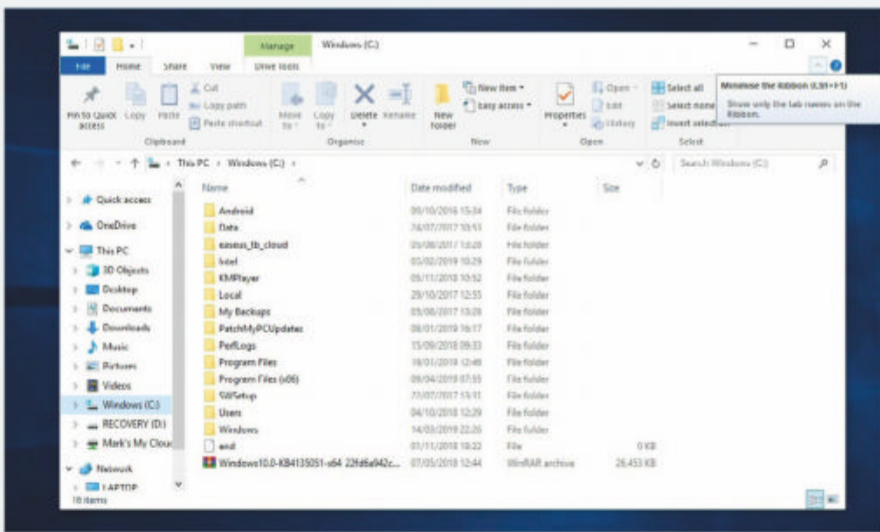
SUITABLE FOR...
Windows 10

When you open a folder on your PC, you may not even think that you are using an app to do so, but you are: File Explorer. On the face of it, this utility is pretty basic, but there's a lot more to it than it first appears. There are many ways you can customise and personalise File Explorer to suit the way you work, and make using Windows that little bit easier. One of the reasons File Explorer looks so basic to start with, is that there is no toolbar and very few buttons visible by default. In fact, there are two toolbars: the Quick Access bar and the Ribbon. These – in conjunction with the right-click context menu and the various panes of the Files Explorer window – give you a huge amount of control over your PC. You can preview files, move and copy items, change properties, jump from one location, and more besides. Let's get started, shall we?
MARK WYCIŚLIK-WILSON

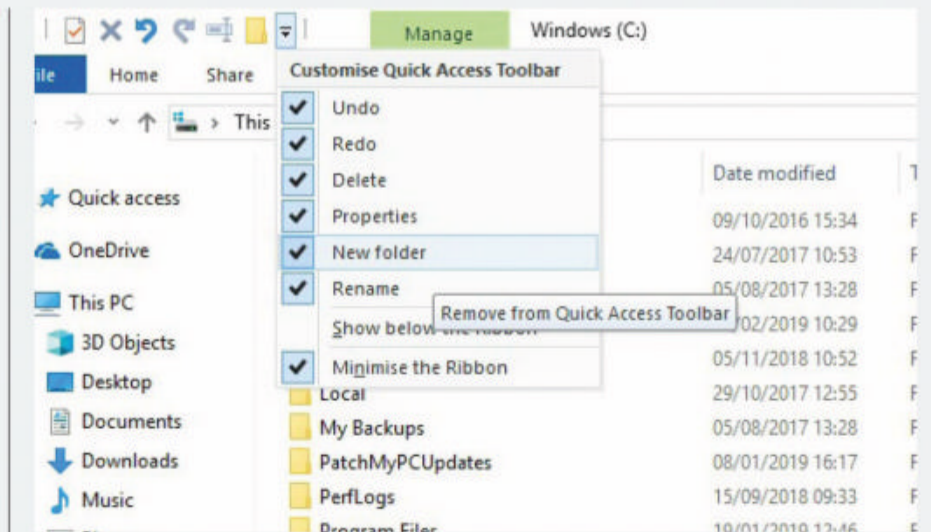
MARK'S BEST TIP!
Right-click the File Explorer icon in the Taskbar to easily access your most frequently used folders.



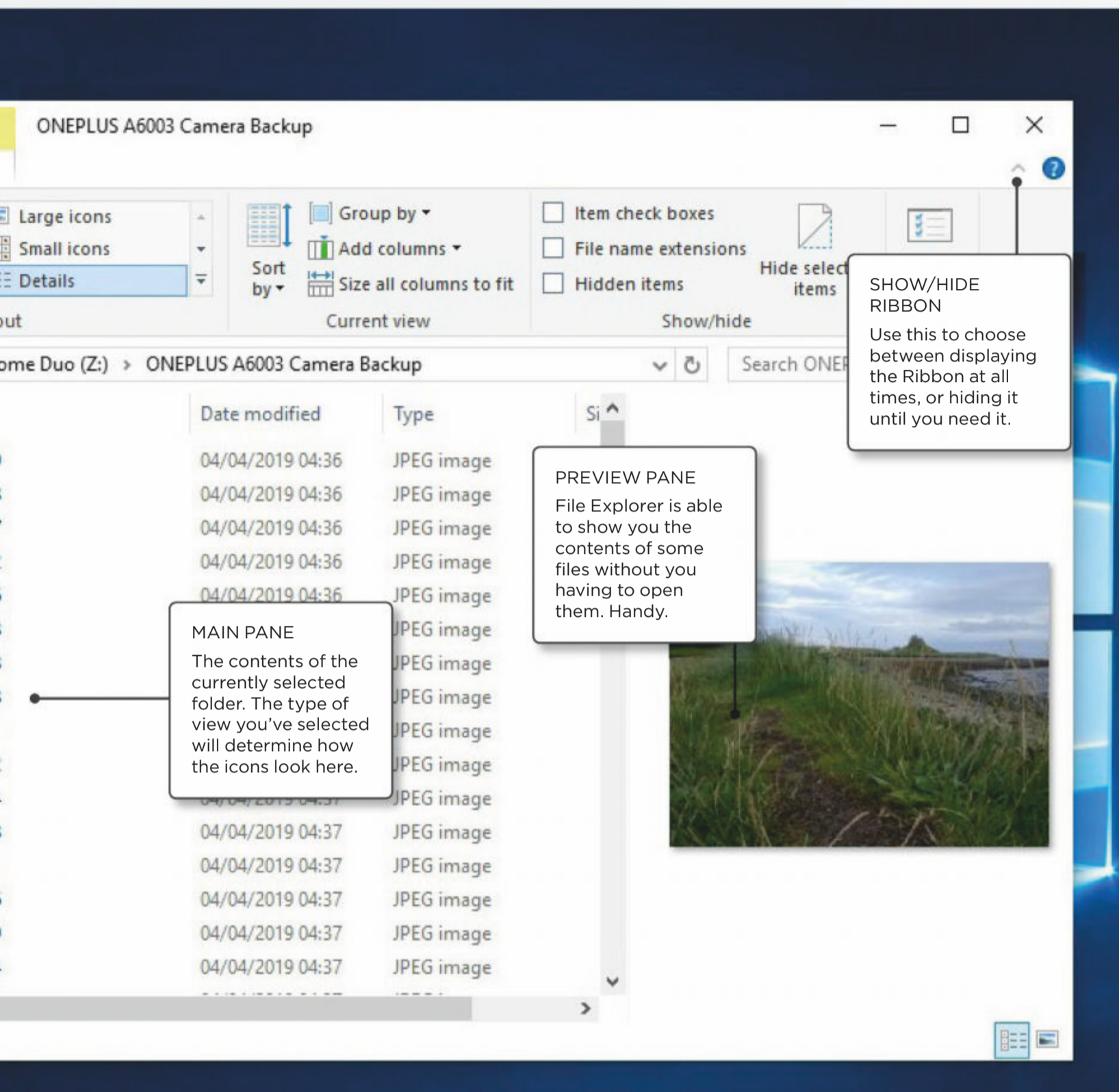
HOW TO Everything you need to know about File Explorer.



1 ACCESS FILE EXPLORER'S RIBBON TOOLBAR File Explorer has a hidden toolbar that gives you access to numerous tools and options. To the far right of the window, next to the '?' icon, click the small down arrow to expand the Ribbon into view – or press Ctrl-F1. If you don't want the Ribbon visible at all times, you can still access its buttons via the Home, Share and View tabs.



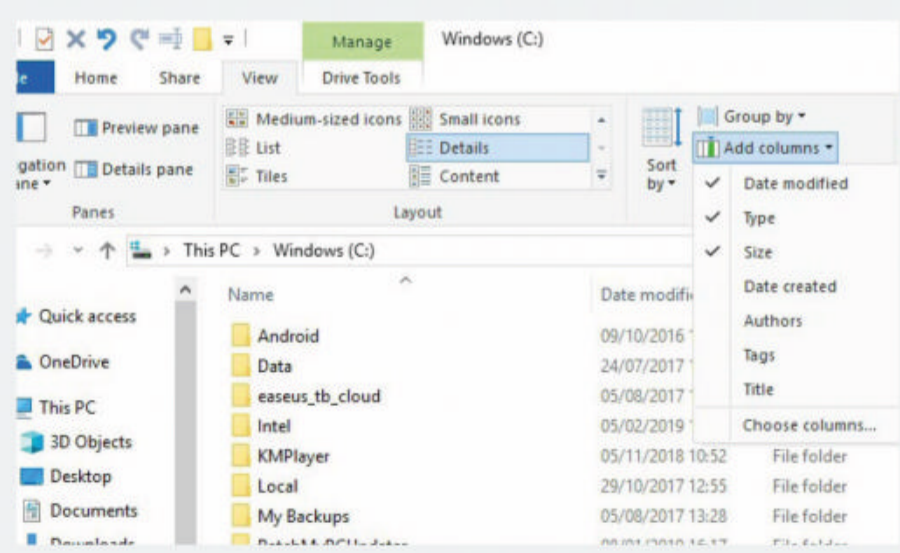
2 THE QUICK ACCESS TOOLBAR The Ribbon provides you with a huge number of tools, many of which you will rarely or never use. To speed up access to commonly used buttons, you can add them to the Quick Access toolbar in the File Explorer title bar. To add and remove buttons from this toolbar, click the down arrow in the left-hand side of the title bar and tick the buttons you would like to be shown.



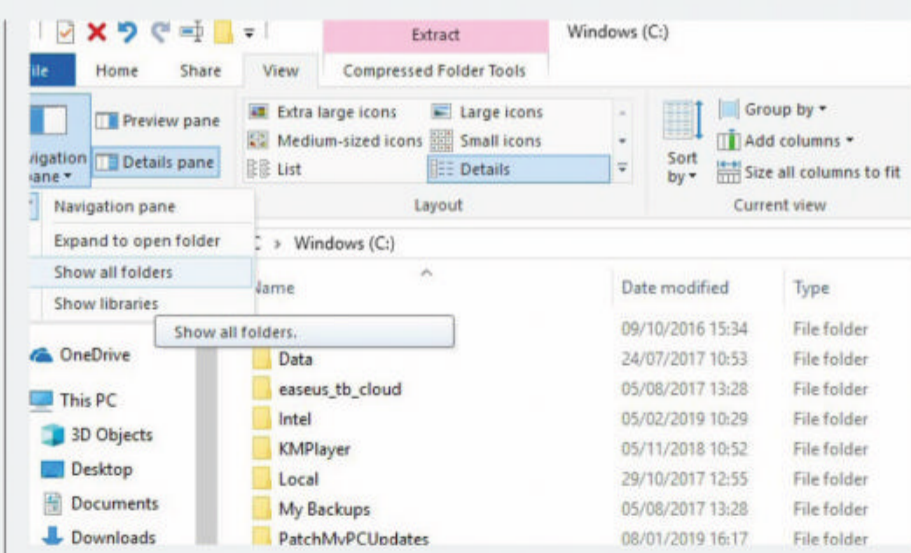
Jargon buster!
FILE EXTENSION
 Comprises three or four letters at the end of a filename after a full stop, and indicates the type of a file. For example, .doc indicates a Word document; .jpg indicates a JPEG image; and .txt is a text file.

THE QUICK ACCESS TOOLBAR
 This customisable toolbar appears in the title bar of File Explorer and gives you easy access to the most frequently used options. While there are a limited number of buttons you can add to the Quick Access toolbar, they can still be incredibly useful.

RIBBON
 The main toolbar in File Explorer is called the Ribbon, just like the one in Microsoft Office. Rather than showing you an huge number of buttons all at once, the Ribbon in File Explorer is divided in a number of tabs.



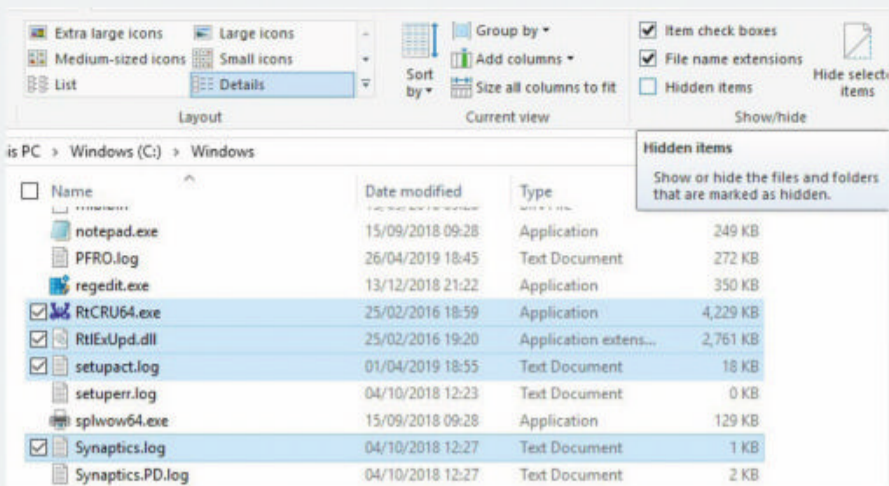
3 CHANGING VIEWS There are various ways to view your files and folders. On the View tab you can choose between eight different file/folder views, everything from small or large icons, to full details of sizes, dates and so on. If you opt for either the List or Details view, you can choose which extra information is displayed by clicking the 'Add columns' button and pick from the list that is displayed.



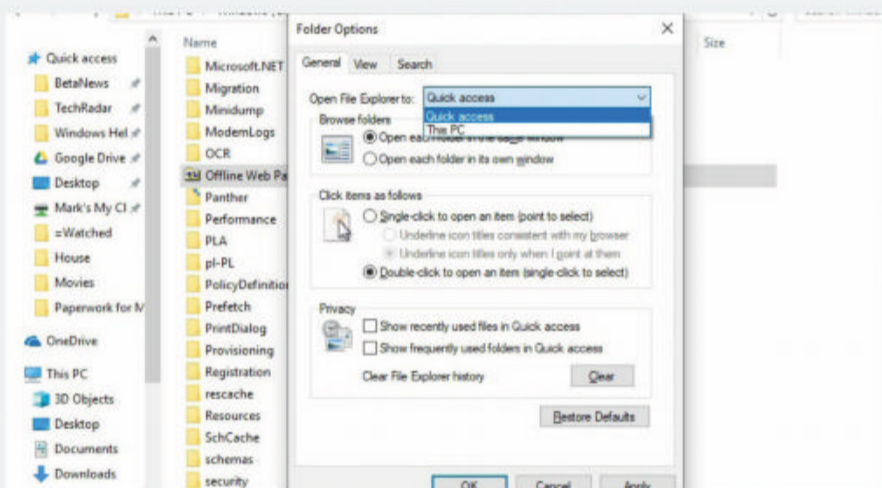
4 OPTIONAL PANES File Explorer windows have a number of panes. The main pane is used to display the contents of folders, but there are others you can enable or disable via the Ribbon > View tab. The Navigation pane allows for easy navigation, while the Preview pane can be used to display files without opening them. The Details pane displays more information about a selected file.

HELP STATION

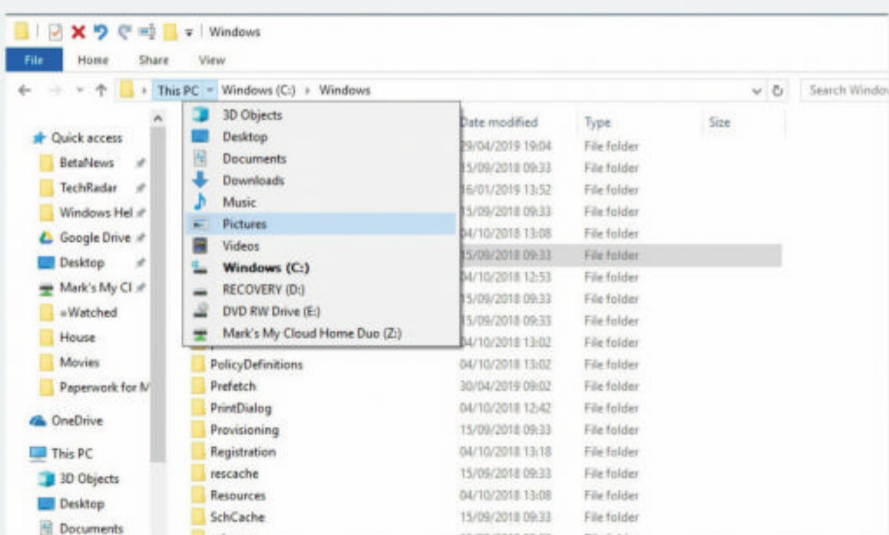
Windows



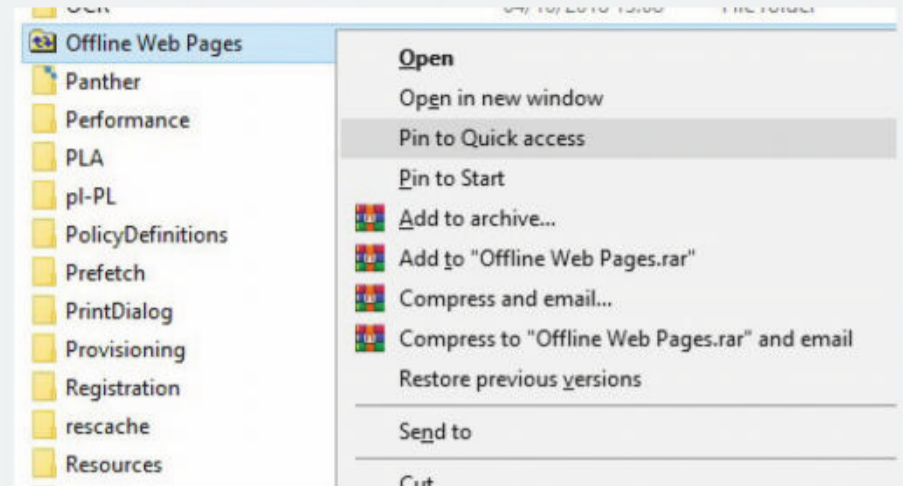
5 SHOW AND HIDE ITEMS By default, File Explorer does not show you file extensions, leaving you to use the icons to determine what type a file is - but you can change this. In the Ribbon > View tab, tick the 'File name extensions' option. While you're here, also tick the 'Item check boxes' option to make it easy to select multiple files at the same time by means of a check box that appears to the left of them.



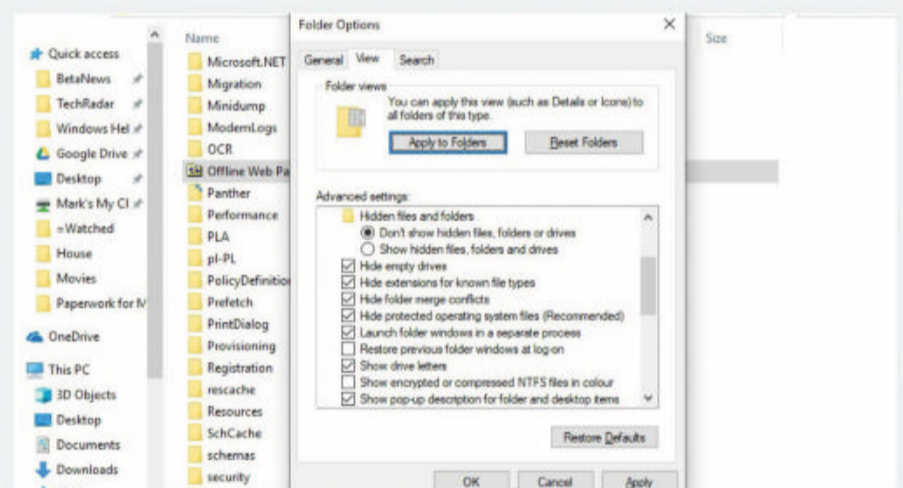
7 CONFIGURE GENERAL FOLDER OPTIONS In the Ribbon > View tab, click the Options button, then click 'Change folder and search options'. The first option you can configure is where File Explorer will open when you launch it - choose between your Quick Access folders or My PC. You can also opt to open folders with a single- rather than a double-click, and hide frequent and recently used locations from Quick Access.



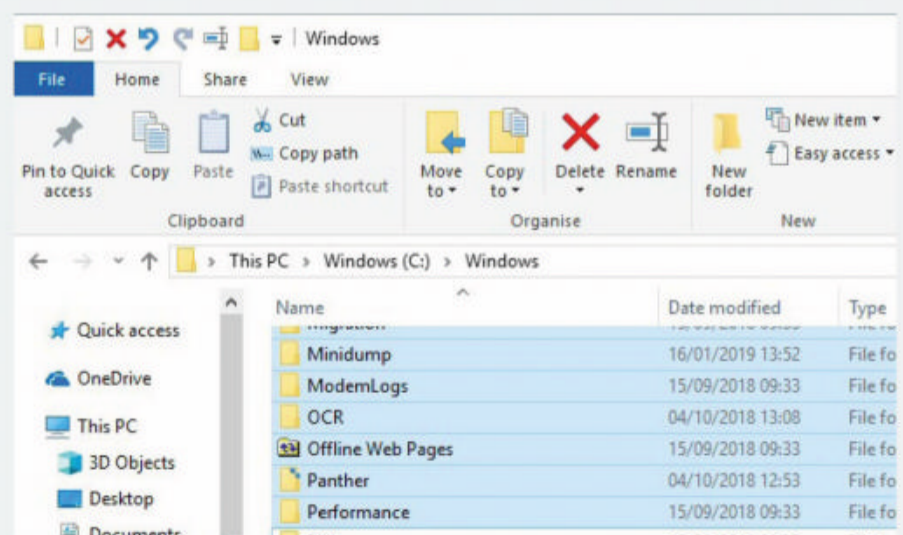
9 NAVIGATING AND SEARCHING FOLDERS While you can use the left-hand Navigation pane to jump between folders, there is another option. Towards the top of the File Explorer window are web-browser-style controls for navigating back and forth through folders. You can also click arrows in the address bar to navigate. To search inside a folder, type a word or two into the search box to the right-hand side.



6 QUICKLY ACCESS FILES AND FOLDERS Just as the Quick Access toolbar can be used to access frequently used options, the Quick Access section of the Navigation pane can be used to access frequently used files and folders. Windows automatically adds items you frequently access to the list, but you can add others simply by right-clicking an item and selecting the 'Pin to Quick access' option.



8 CONFIGURE FOLDER VIEW OPTIONS In the View tab of the Folder Options window, there are more settings you can configure. If you have customised the view of a folder, it is possible to apply these settings to all other folders - by default Windows lets you have a unique view for every folder, if you want. Just click the 'Apply to Folders' button at the top of the dialog box, followed by OK.



10 WORKING WITH FILES AND FOLDERS There is more than one way to do things with files and folders. Some can be accessed by right-clicking to use the context menu, while other options are available in the Quick Access toolbar and the Ribbon. In the Ribbon > Home tab, for instance, you can copy or move a file or folder, access different types of selection, delete unwanted items, and create new folders. **TL**

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HELP STATION

MacOS

Print an amazing photo book

Put your precious digital memories onto paper.

REQUIRES

MacOS High Sierra or later, Photos, Motif extension

YOU WILL LEARN

How to create a photo book within Photos using Motif

IT WILL TAKE

30 minutes

Apple discontinued its photo printing product service last year, but you can still print beautiful photo books in the Photos app, with the Motif extension.

RR Donnelley – the company behind the Motif app – was responsible for physically printing Apple’s photo books (as far back as 2005), so the printed books from Motif are high quality, which is good news as this was one of the main strengths of Apple’s original photo printing service.

Creating a great-looking photo book is as easy as it

used to be, too, and you can tailor the exact look and feel; if you’ve got a particular budget in mind, Motif will adjust its length and complexity to suit.

You can’t just go to your Mac and start making photo books straight away, though. First, you’ll need to add the free-to-install Motif extension to the Photos app. Do this by clicking File > Create > Book > App Store. The Mac App Store will open, and you can download and open the Motif extension from there.

NICK ODANTZIS



QUICK LOOK Starting a project in Motif.

A

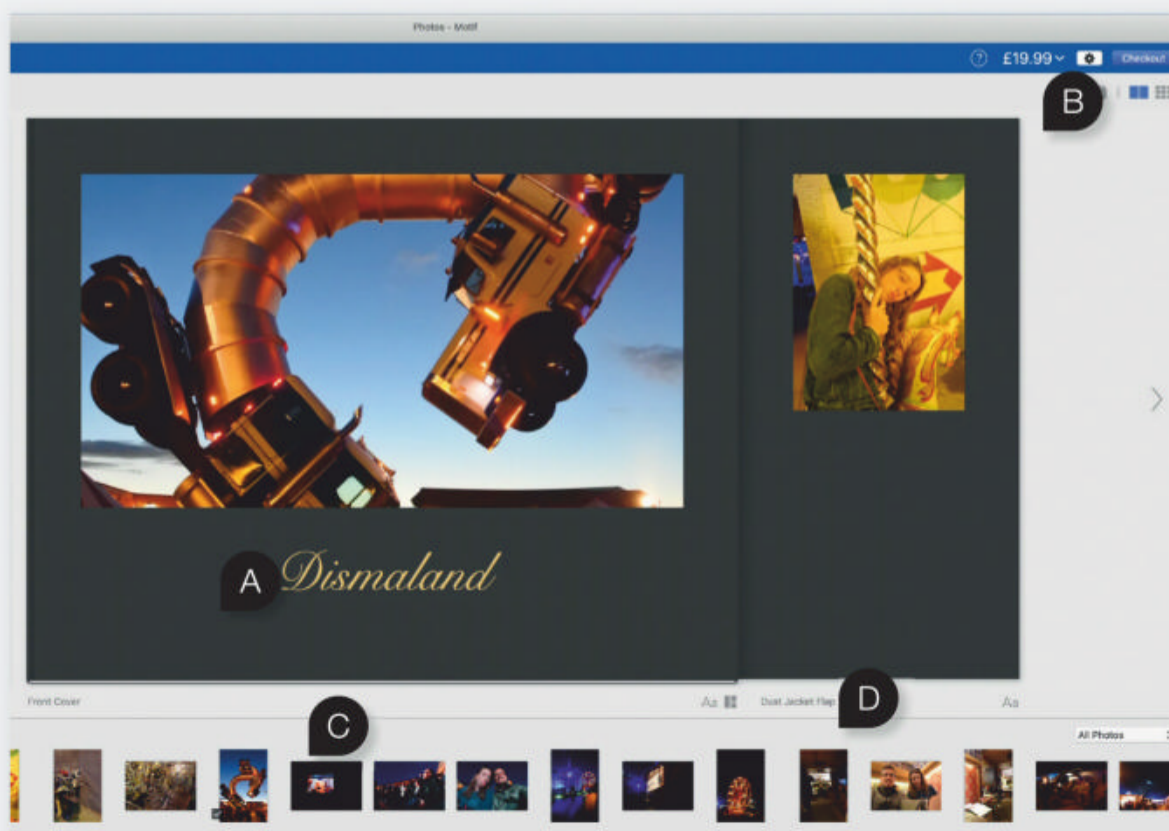
VIEW YOUR PROJECT

This is where you edit your book. You can navigate left or right using the arrows.

B

ALTER PROJECT SETTINGS

You can make changes at any point in your book’s creation by clicking the gear icon.



C

BROWSE ALL IMAGES

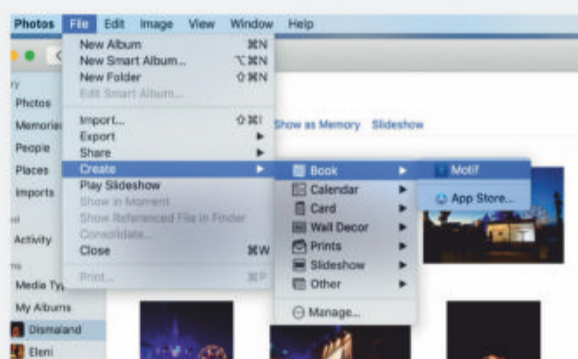
Images you select appear in the image library. Hover over one for a preview.

D

EDIT ELEMENTS

Below the page you’ll find a text icon for adding words, and an image icon for tweaking photos in your book

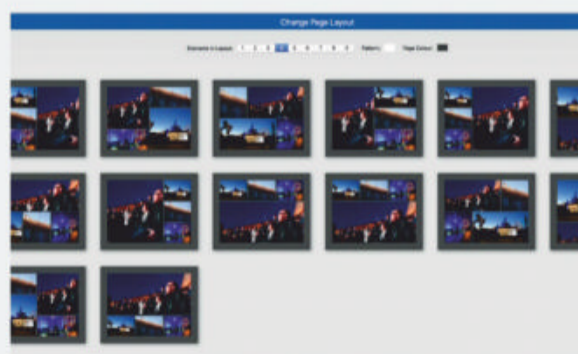
HOW TO Create a photo book from scratch.



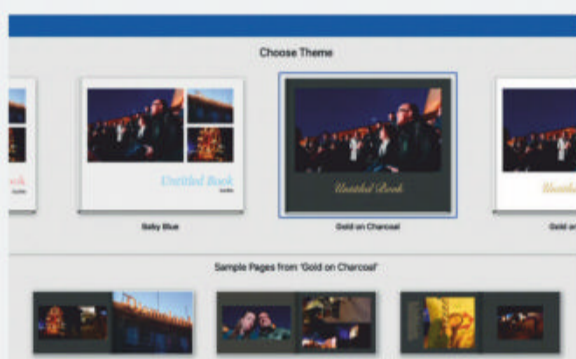
1 CHOOSE YOUR PHOTOS Select the photos, or photo album, you want to use. Then go to File > Create > Book > Motif to open your new project. Choose the kind of book you want by check marking it and clicking Create.



4 CHOOSE BOOK LENGTH If you use autoflow, Motif will give you a recommended book length according to your images. You can adjust this to suit your preferences by changing the page-count or images used; the price adjusts automatically.



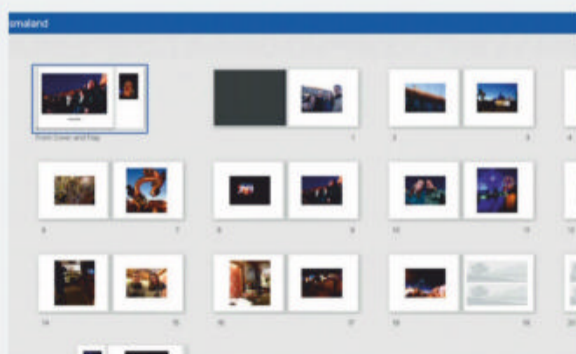
7 ADJUST PAGE LAYOUT To further personalise your book, edit the page layout. Click on the image icon under a page, select the number of images used and pick which layout you like. You can also adjust the background pattern and page color.



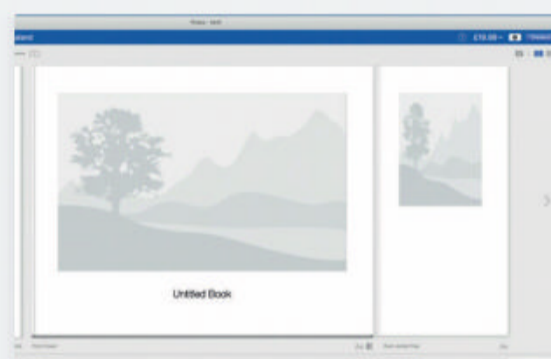
2 THEME IT UP Give your project a theme – just click on one to get an idea of what the pages will look like underneath. Don't worry too much about getting this stage perfect as you can change the theme at any time during the process.



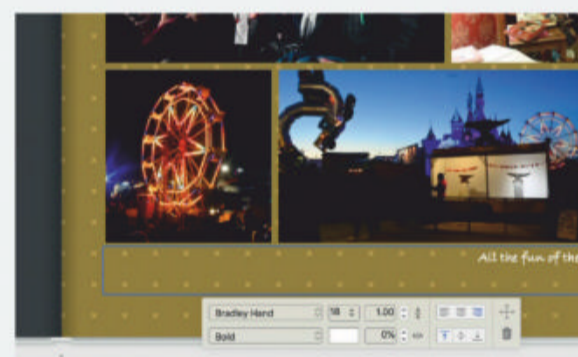
5 ADD IMAGES Not using autoflow means you can add images yourself – just drag one from the image library to an empty image box. Click on it to adjust it; if you want to alter its size, hover the pointer over an edge and click and drag.



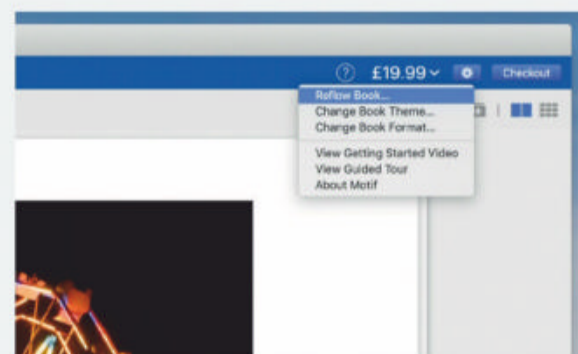
8 GET AN OVERVIEW To get an overall idea of how your book is looking, click the Project View icon (top right). You can drag and drop the thumbnails (a blue line means the page can be put in the current place) and remove or duplicate spreads.



3 TO AUTOFLOW OR NOT? Select the Autoflow Book option if you want Motif to do all the hard work for you, selecting and placing images as it sees fit. Or, click Don't Autoflow and you can manually add as many images and pages as you want.



6 TEXT CUSTOMISATION You can click on text boxes to edit the text inside. Or, if you want to place one elsewhere, click the text icon under a page and a box will appear. You can move this where you want – even over an image.



9 LAST-MINUTE CHANGES? If you change your mind, you can easily make major alterations by clicking on the gear icon to reflow images, or switch format or theme. All done? Click the Checkout button to buy your book. **TL**

Tame Siri and Search

Find out how to personalise your device's helpful nature.

REQUIRES

An iOS 12 device

YOU WILL LEARN

Ways to use Siri & Search to improve your iPhone and iPad experience

IT WILL TAKE

10 minutes

With the introduction of iOS 12 came a bunch of improvements and customisations for Siri & Search that improve your iPhone and iPad's helpfulness.

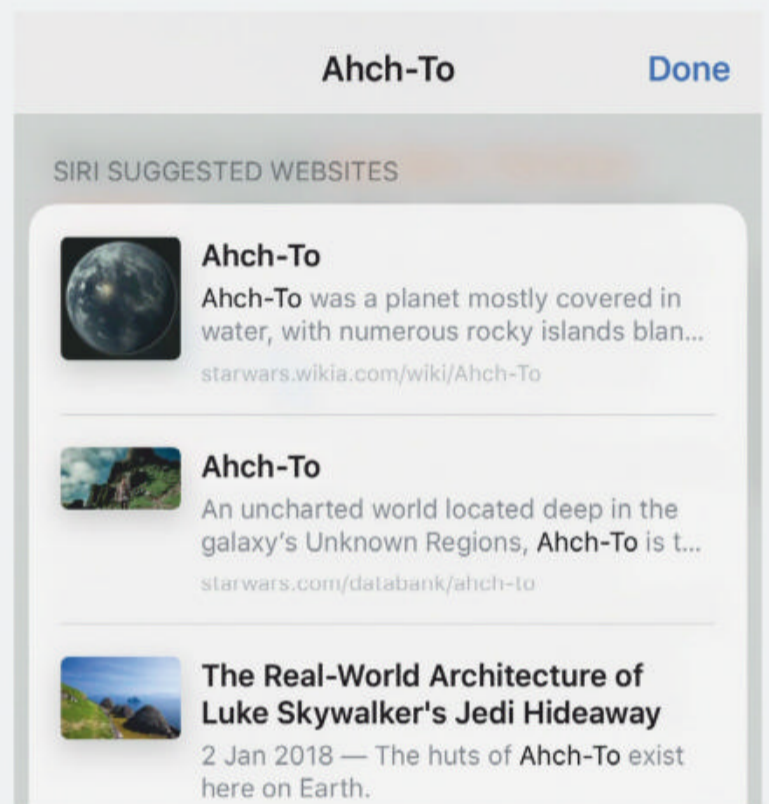
After using iOS 12 for a while, it'll suggest actions on the Lock screen when you wake your device. These are the result of on-device intelligence that learns about your usage – not just of Apple's own software, but third-party apps too. If an app's been updated to work with this, suggestions may be very specific, such as "Show my recent contacts" in Cardhop or "Schedule for today" in Fantastical.

Siri takes repetition, the time of day, and your location into account for its suggestions. As well as the Lock screen, these suggestions can appear in iOS's search results and Look Up feature. You may want to stop info from some apps leaking out onto the Lock screen in particular, so we'll show you how.

It's possible to assign personalised voice commands to suggestions. If you've turned on Type to Siri (see step 7) to avoid speaking to your phone in public, typing those phrases may seem like a lot of work. So, add iOS's Text Replacement feature into the mix.

By doing that, rather than type even short commands like "Text the boss", you can have iOS replace stuff like "#txboss" with "Text <your boss's full name>". This requires some extra thought to prepare, but it means you can still perform complex

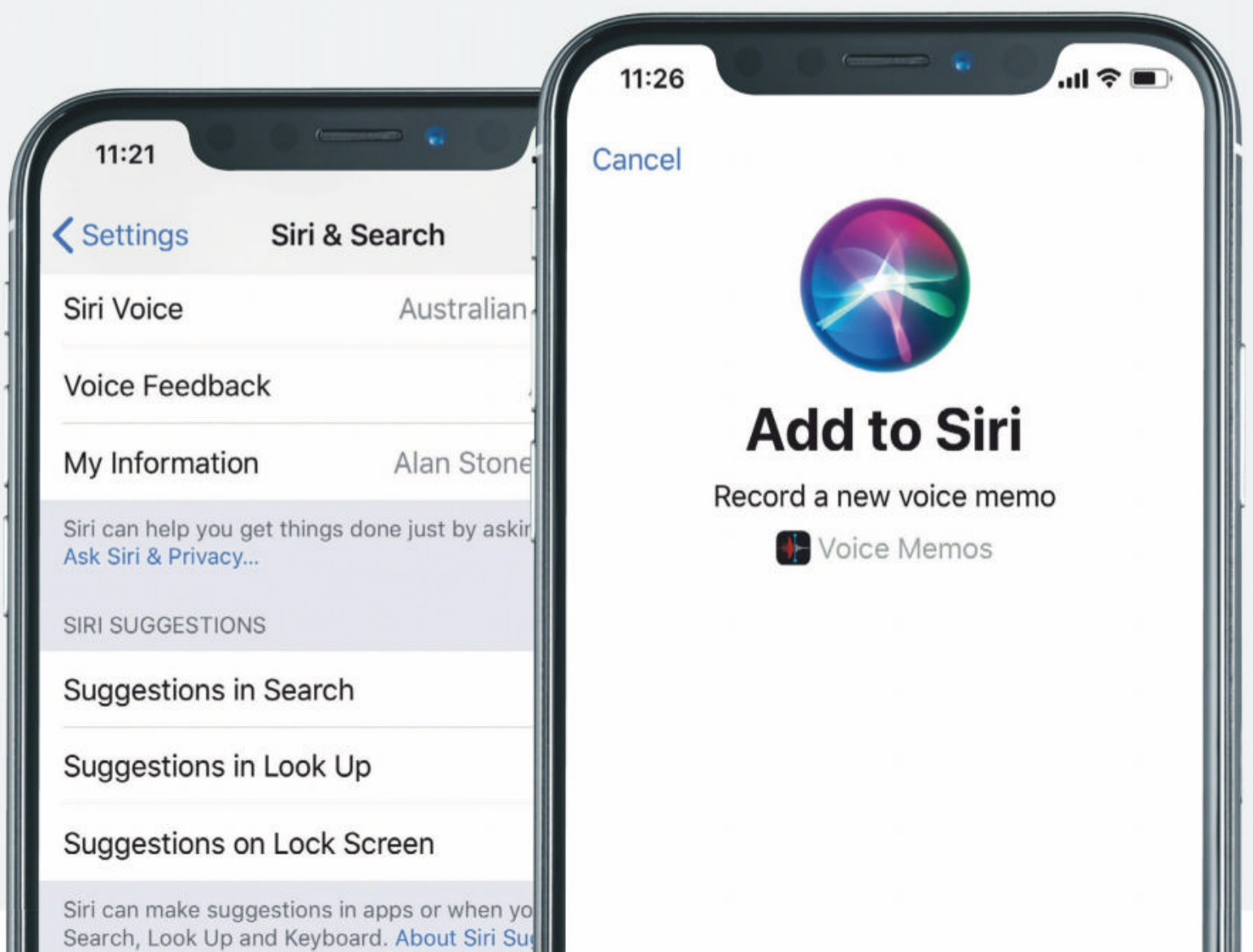
actions with a few key taps instead of jumping to and around another app manually. ALAN STONEBRIDGE



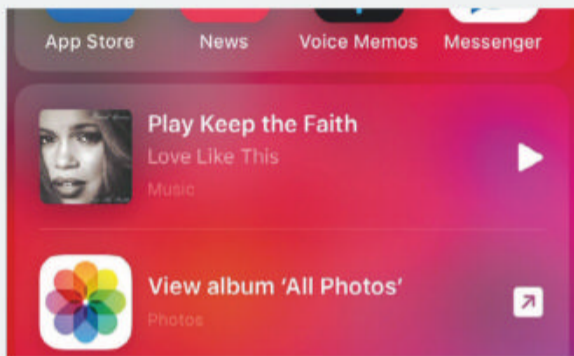
The "Suggestions in Look Up" item refers to rich results like the websites shown above. By turning it off, you may then see only Search Web and Manage Dictionaries commands.

GENIUS TIP

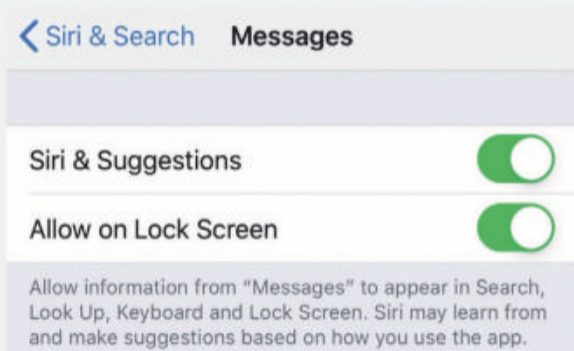
To avoid other people getting up to mischief with your device, think about turning off Allow Siri When Locked in Settings > Siri & Search.



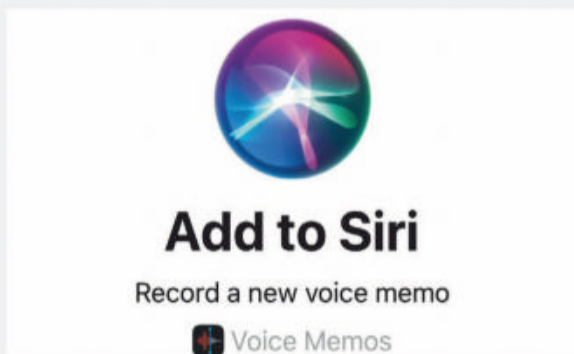
HOW TO Tailor Siri and Search to you.



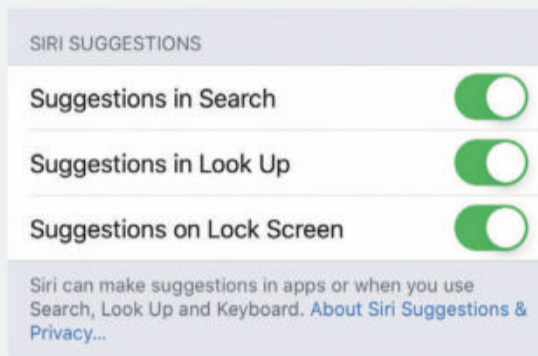
1 SIRI IS CLEVER! Siri's on-device intelligence learns from what you do with the apps on your iOS device. It uses that info to suggest things you might want to do based on observations of past habits, such as at a particular location or time.



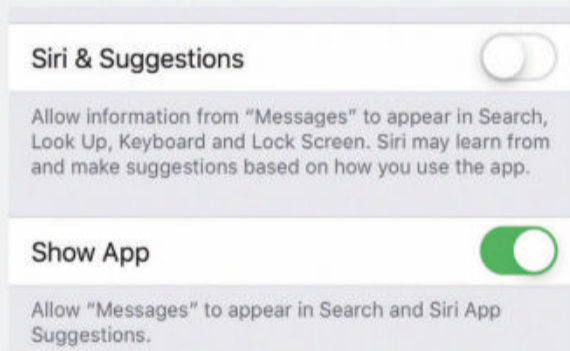
4 CONSIDER YOUR PRIVACY You might keep it turned on to benefit from Siri's suggestions, but turn off Allow on Lock Screen for privacy. That stops hints that you use the app, and your actions in it, being seen by others.



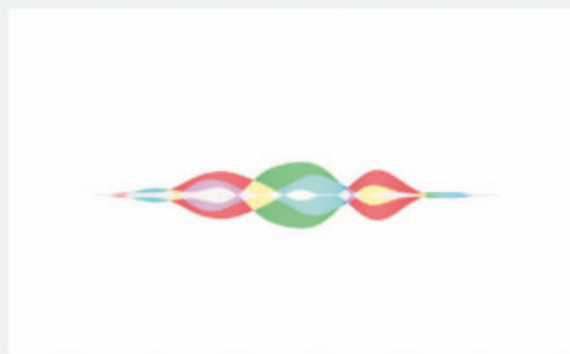
7 EXPLORE COMMANDS Tap one there, or tap All Shortcuts for a longer list of actions, and tap one of those. On the next page, tap the red record button - or tap Type Phrase, if Type to Siri is turned on in Settings > General > Accessibility > Siri.



2 REIN THINGS IN In Settings > Siri & Search, under Siri Suggestions are three switches you can turn off to prevent suggestions appearing on: the Lock screen; in Search results; and when you select text and tap Look Up.



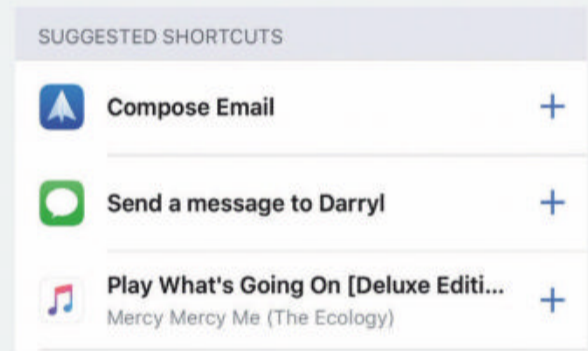
5 EXCLUDE AN APP? If you do turn off the first switch, the second is replaced by Show App. Turn that off if you don't want the app to appear in Search/Today view's suggestions widget, and among search results when you type.



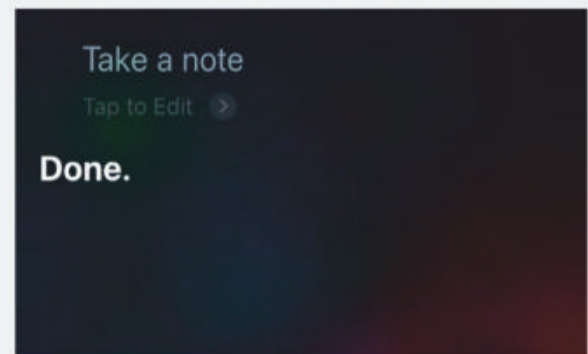
8 SAY YOUR PHRASE Say the phrase you want to trigger your action, then tap the stop button. Tap Done if Siri heard correctly. You'll be taken to Settings > Siri & Search > My Shortcuts. Use this list to review/remove custom voice commands.



3 APP-SPECIFIC CHOICE Lower down, tap an app to refine its Siri integration. The first item lets info from the app appear in Search's results, Look Up, on the Lock screen, and in keyboard's suggestions. Turn it off to stop suggestions for this app.



6 PRE-EMPT SIRI You can set a Siri voice command for an action you perform often, using a phrase of your choice. At the top of Siri's settings page, under Suggested Shortcuts, are three actions it thinks you might want to do this for.



9 TRY IT OUT Call for Siri's help however you prefer - holding the side/Home button or perhaps by saying "Hey Siri", then say the phrase you just assigned. Siri will then coordinate with the relevant app and get it to do what you asked. **TL**

HELP STATION

Privacy & security

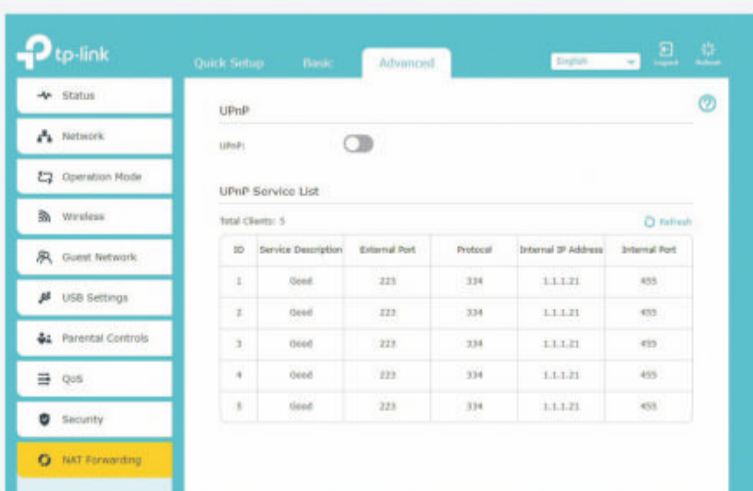
Ports away

The ins and outs of port forwarding.

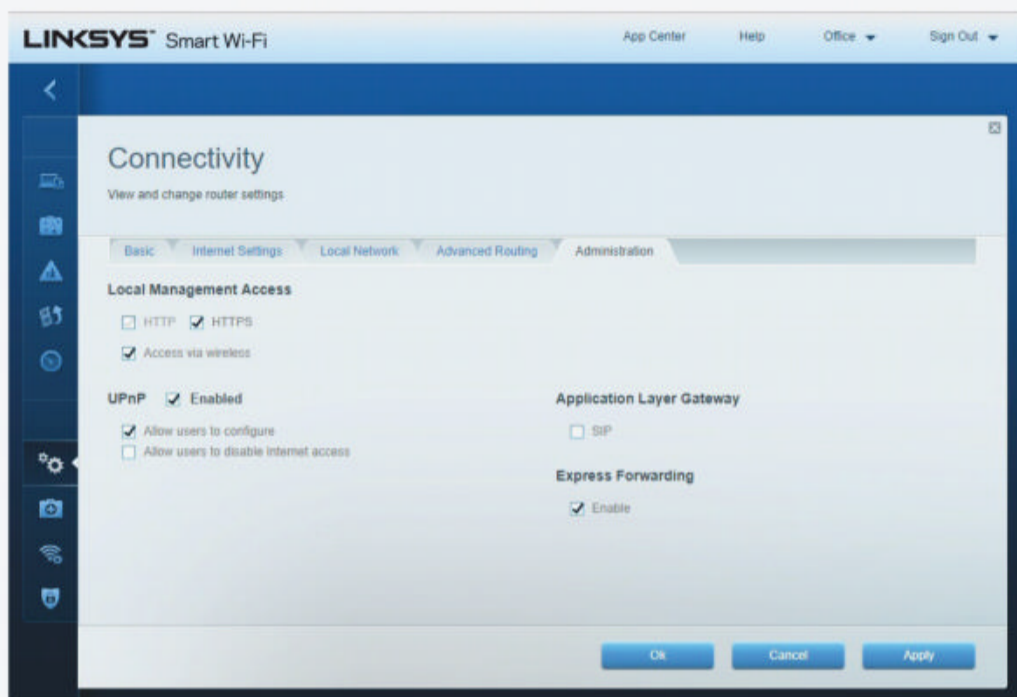
In the last issue we looked at firewalls – what they do and what they protect against. They’re a critical part of your home’s cyber security, keeping rogue hackers and programs from using your internet connection. But firewalls don’t discriminate, and they will block legitimate programs as much as illegitimate ones, and sometimes you have to go into your firewall and create an exception for a program that you do want to be visible to the internet.

As we discussed in the last issue, it’s fairly easy to do that on a PC – whenever the program starts you’ll probably get a popup asking if you want to allow the program access to the internet. But your router is a firewall as well, and although the router automatically allows all outgoing connections, incoming traffic is blocked by default. For most people that’s fine – they only use outgoing connections.

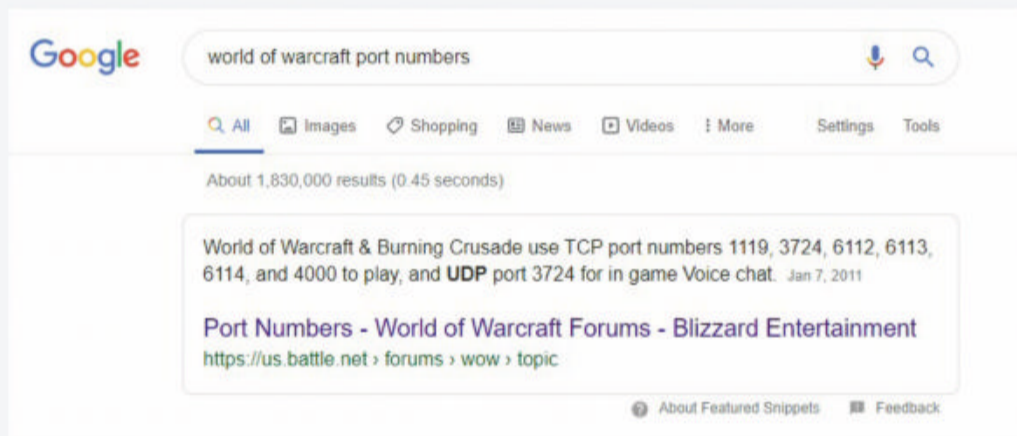
But sometimes you might want to allow an incoming connection. If you’re running a home server of any kind that you want accessible from the internet, then people need to be able to connect to your PC from outside your home network. And that requires “opening a port”, which is to say letting traffic of the appropriate type through the firewall.



The UPnP setting on a Linksys router is found under Connectivity > Administration.



Google always knows.



On TP-Link devices it can be found under NAT Forwarding in the Advanced settings.

It’s all about the services. Let’s talk about services. Network services, quite simply, are what make your system vulnerable to attacks. In this context, they’re any programs that allow outside devices to ‘talk’ to your computer, and your PC runs at least a few of them. An automatic program updater can be a service. Windows file sharing is a service. Peer-to-peer file sharing like BitTorrent is a service. Remote access is a service. Many online games function as services.

(We should note, here, that we’re making a distinction between ‘Windows services’, which are background tasks, and ‘services’ in the networking sense, which refers to any application that ‘serves’ other devices over the network.)

Any service is theoretically a

vulnerability, a way in for remote attacks. So you need to be careful what services you run, and whether that service is properly secured. Your router firewall will probably protect you, but if you start opening ports to them, then you’d better be sure that the service application is up to date and properly secured.

UPnP

Before we get into the actual mechanics of port forwarding, we should talk a bit about UPnP. UPnP is a function on your router that will automate the process of opening ports, and it’s enabled by default on most routers.

Open up your router admin console and search around. Somewhere, you’ll find an on-off setting for UPnP – perhaps in the firewall or administration centres

(unfortunately different router vendors tend to hide the setting in wildly different places).

What this does is allow a program running on a device inside the network to automatically configure port forwarding on the router. So a program, running on your PC, can use UPnP to talk to your router and ask it to open up a port. The port will remain open as long as the program is running, then close when the program does.

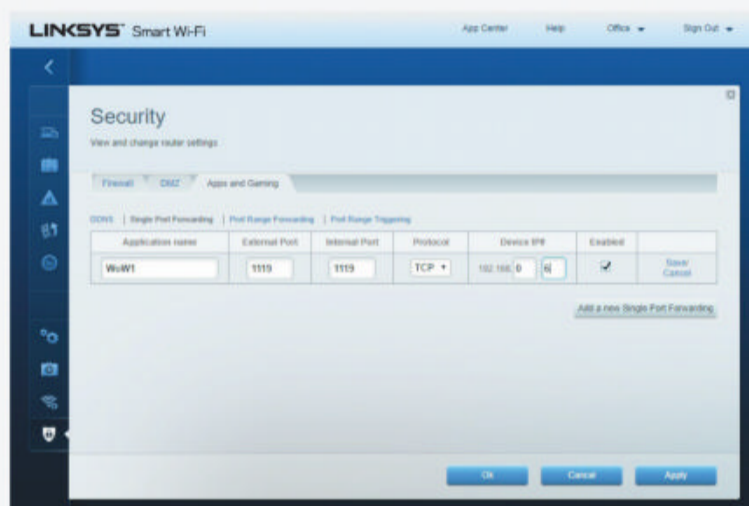
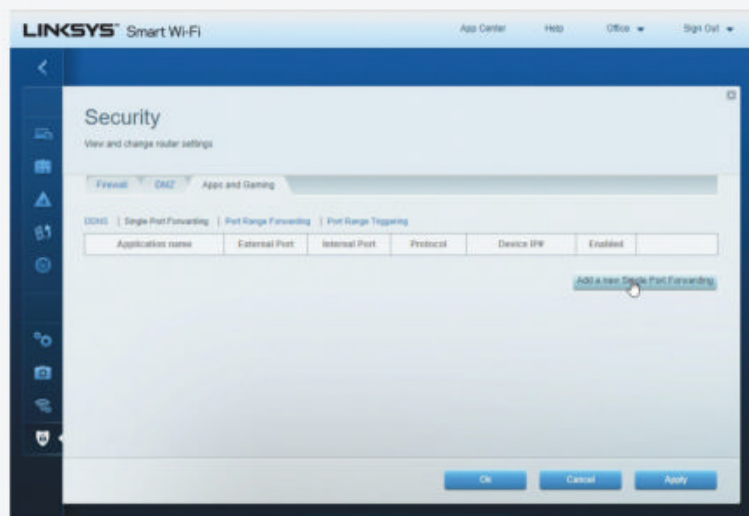
For the user, this is super convenient. You don't have to do anything at all – your application and router work it all out themselves.

Unfortunately, UPnP has problems. Number one is: if any program on your PC can ask the router to open a port without user authorisation, then malware can as well. So a router with UPnP on provides no defence against any malware that might infect your PC. There are even some web-based attacks that can force your router to open a port just by opening a web page – most routers and browsers have patched this now, but many older unpatched routers are still out there.

So should you turn UPnP off? Technically, yes, if you want to be absolutely safe. It is a moderate vulnerability. But if you do, you will have to manually open ports for every service you install on your PC, and many people are willing to take a little extra risk and bank on their protection against malware to keep them safe.

Setting up a port forward
Now we get to the meat of it. If you turn off UPnP, or your application doesn't support UPnP, then you'll have to set a port forward manually. It's not hard, but it can be intimidating.

The first thing you need to do is fix the local IP of the PC you'll be running the service on. We discussed this in the Home Networking column last month,



TOP: Locate the port forwarding setting.

ABOVE: Creating a rule. This forwards traffic on the selected port number to the PC on your network.

so you should refer to that if you want to know how to create a fixed local IP. This is so that the router has a fixed address that it can forward the port to. Make a note of the address.

The next step is to gather information. You need to know what ports that service uses. Some server applications allow you to configure the port in the settings. But others you'll have to look up online. Just Google the name of the service and 'port numbers'. You should get a snippet with the details.

A program may use a single port, multiple ports or a range of ports. They may also use two different protocols – UDP and TCP – and have port numbers for each.

Now that you know the ports, it's time to forward them. The

The DMZ

Do you like living on the edge? Well the, DMZ (demilitarised zone) is for you. Many routers have the ability to configure one or more PCs as being in the DMZ, which means that they will forward all traffic on all ports to that PC. Essentially the router provides zero protection for the devices specified. Needless to say, this is not recommended and you should treat DMZ settings with extreme care.

exact process will differ a little from router to router, but in general follow these steps:

Log into your router administration console.

Find the port forwarding settings. They're usually located under or near the firewall settings. Sometimes they're called 'Virtual Servers' (they mean the same thing).

Click on the button to add a new port forward.

Enter the port number or range of ports if it's a range. Generally the external and internal port numbers will be the same, so fill in the same numbers in both (you can make them different, but that adds a level of complication to your server application setup). Choose whether you're talking about TCP, UDP or both and then enter the local IP number of the PC on your network that's running the server application. You might also have the option of giving this port forwarding rule a name. Click Apply or Add when you're done. (We should note that there are many router models that come preconfigured with rules for popular applications and games – you can use those instead.)

If the app has multiple port numbers or ranges that need to be opened, then you'll have to create additional rules to cover all of them.

What will happen now is that when traffic comes in to the router on the specified port, instead of just rejecting it like it normally would, the router will now forward that traffic on to the PC specified in the rule. Only traffic on the selected port(s) will be forwarded, all other traffic will still be rejected – so you don't need to worry about, say, making your Windows file shares vulnerable by opening up the Minecraft ports. And you should be done – the server software you're running on your PC should now be accessible from the internet. **TL**

HELP STATION

Home Networking

Roll your own game server

Set up your very own corner of the internet to play in.

One of the coolest things you can do on your home network is set up your own game servers. Then you can invite only the people you want to be able to play onto your server, and set the parameters so the game plays the way you want it. You'll be able to set it up to play locally or over the internet. Most game servers actually don't require much processing power to run. You can run it on your main PC, or employ an older machine.

So what games servers can you set up? Quite a few, it turns out, and this month we thought we take a look at how to get started.

Steam games with servers

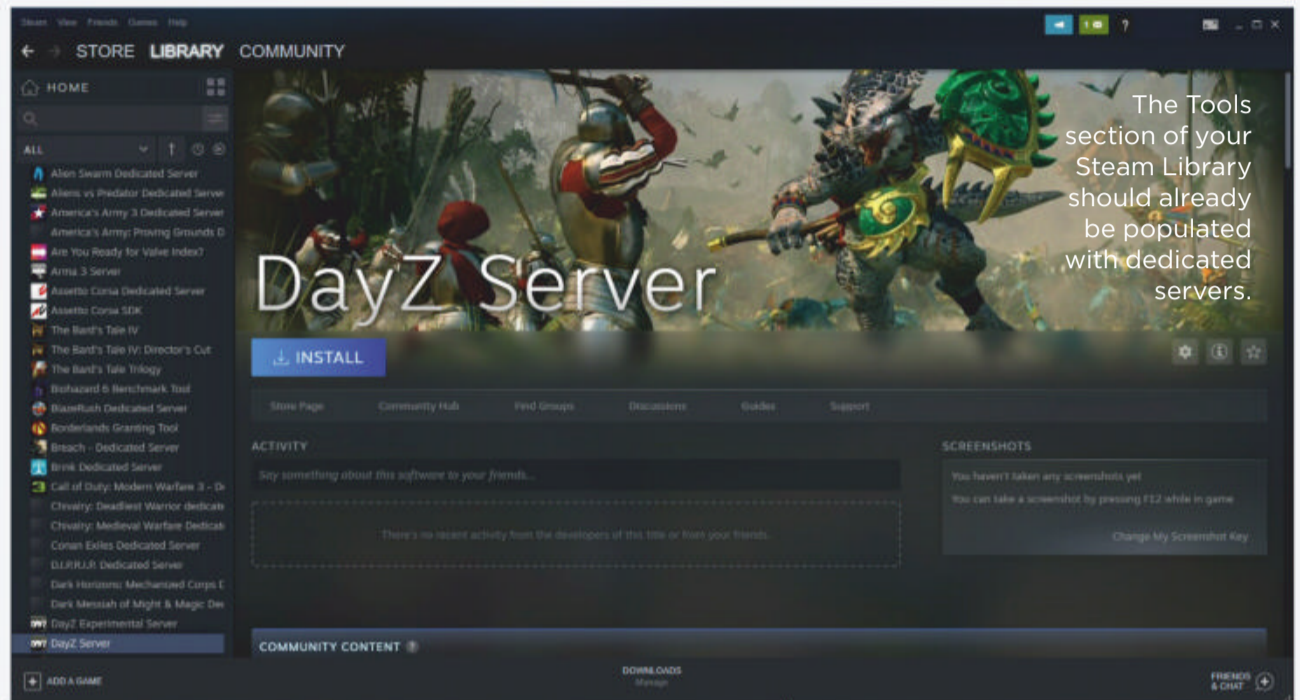
Perhaps the biggest resource for people who want to run their own server is Steam, which provides a variety of server apps, including *Counter-Strike*, *Team Fortress 2*, *Dota 2*, *Ark Survival Evolved*, *Gary's Mod*, *DayZ* and many others.

Unfortunately, not all servers are available via the regular client: many have to be downloaded and managed through SteamCMD, the Steam Command Line.

To start your journey, visit this site:

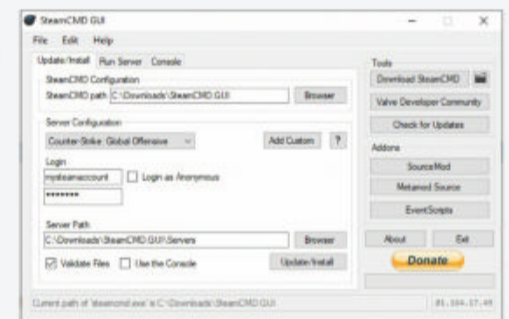
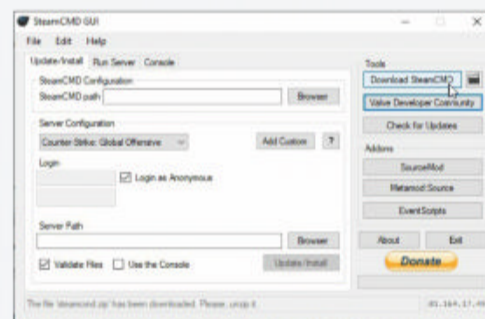
developer.valvesoftware.com/wiki/Dedicated_Servers_List

It has a list of every game server supported on Steam, and whether that server is supported in the Steam Client, or whether you're going to have to dive into SteamCMD. If the game is available in the main Steam Client, then you can do a search, or more conveniently, click on Library and in the selection tool on the left switch over to Tools. You should see all the dedicated



RIGHT: You can download SteamCMD from SteamCMD GUI.

FAR RIGHT: Set up the game and directories.

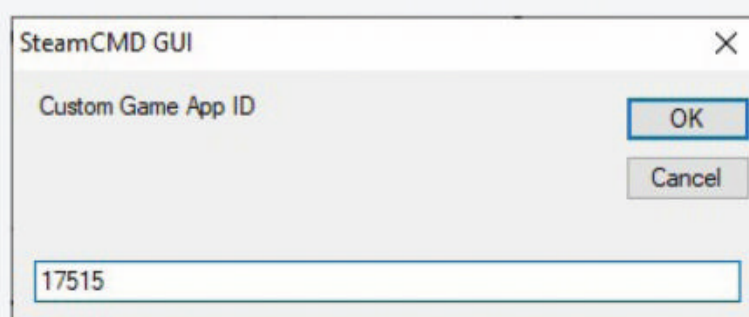


servers available.

You'll still have to look up a guide on setting up the particular server software – in most cases you will have to find and manually edit some configuration files or create batch files since such servers rarely come with a handy graphical interface. For that, Google is your best friend; just search for the name of the game + 'dedicated server'.

If a game is only available through SteamCMD, then getting the server is a little more complicated. A guide can be found at **developer.valvesoftware.com/wiki/**

You'll have to look up the SteamID for the game server you want.



SteamCMD, but we recommend using the SteamCMD GUI, which can be found at **github.com/DioJoestar/SteamCMD-GUI/releases**.

To use the GUI, just download the Zip file of the latest release, unzip and run it. The first thing to do is click on Download SteamCMD on the top right, which will download a zipped copy of the SteamCMD program to the directory that you're running SteamCMD GUI from.

You'll then have to unzip that file manually by going to the directory and extracting it.

Now for the basic configuration. In the SteamCMD path, enter the path of the SteamCMD file that you just extracted. In the Login field, enter your Steam account details, and in the Server Path field enter the directory in which you'd like the servers to be placed.

Now to choose which server you want. SteamCMD GUI comes with a pre-made list of some of the most popular dedicated servers. Just pick one from the drop down list under Server Configuration.

But what if you want what is not covered by pre-packaged list? No worries. Just head back to Steam's list of servers at developer.valvesoftware.com/wiki/Dedicated_Servers_List and look up the App ID of the server you want.

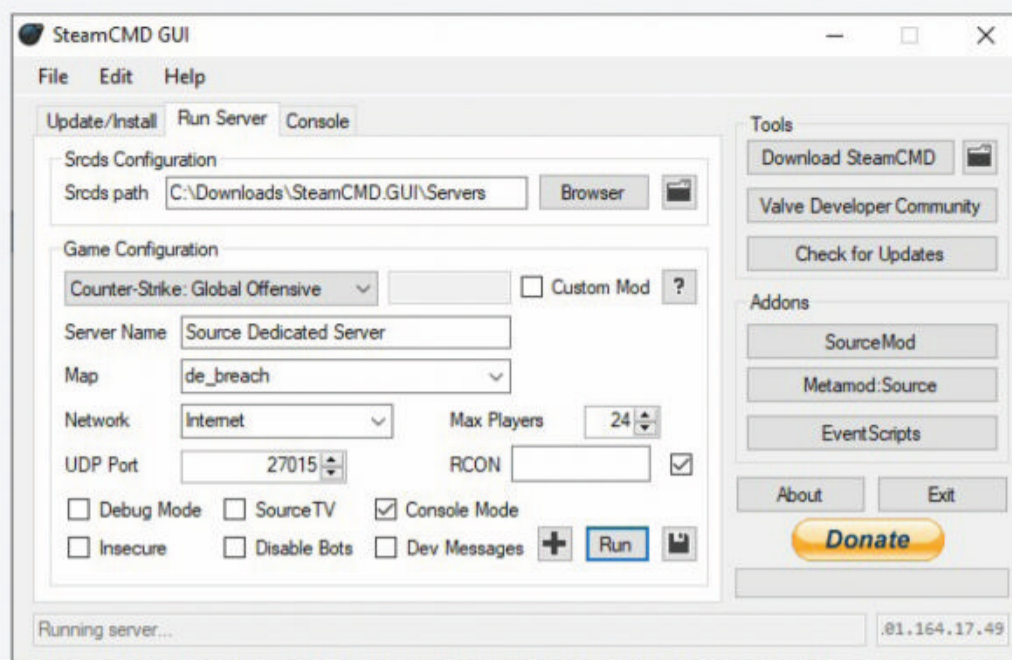
Now, in SteamCMD GUI, you can click on 'Add Custom' to add any one of these. You'll first be asked to enter a name for the server – this is just for your use, to identify which server you're using. Then you'll be asked to enter the App ID.

Now click on Update/Install to download your selected game. SteamCMD will fire up in a command line.

Now here's where we recommend looking up a guide for the particular game server you plan on running. SteamCMD GUI will allow you to start the server by clicking on the Run tab and selecting the game and (if the game is one of the supported ones) setting parameters for the particular server instance. You'll have to point it to the srcds app, which will have been placed in the directory you specified as the Server download directory above.

Then you can click on Run and it will start the server up. By default, it will be in private mode (ie. for your use only on a LAN or via forwarded ports over the internet), but for certain games Steam also allows you to publish the server to Steam to allow the wider world to see and access your server through the regular Steam interface. You'll have to go to steamcommunity.com/dev/managegameservers to do that, which creates a token that you can use to publish your server to

SteamCMD GUI lets you start servers and set parameters, but we recommend looking up the Wiki for the game before you begin.



“
Most game servers actually don't require much processing power to run. You can run it on your main PC, or employ an older machine.



Your kids will love you.

Steam. More information on that can be found on the Steam website.

For a start, we recommend just going with a private server. Try it out on your LAN, work out the kinks, and decide if you want to publish it to Steam.

Google best practices and tips and tricks for the particular server you're running, and you'll have your own personalised server in no time.

Other game servers Steam isn't the only way to run servers, of course – and some of the most popular can be found outside of the steam ecosystem. Two of the big favourites are:

Minecraft
Server download: www.minecraft.net/en-us/download/server
Install guide: minecraft.com.

gamepedia.com/Tutorials/Setting_up_a_server

Ports to forward: TCP 25565

Perhaps nothing will make you more popular with your kids than setting up their own private *Minecraft* server where they can set all the things they want and only ever encounter friends online. The original Mojang *Minecraft* server software is still available for free download.

Terraria

Server download: File included in game download

Install guide: terraria.com

Ports to forward: TCP 7777

Another hugely popular and creative game, *Terraria* is a sandbox style game, this time coming in the form of a platformer that allows players to dig and built across a massive, custom world.

Other resources

Setting up most game servers does require some background knowledge, and we've actually covered a lot of it in *TechLife* over the last few months. Before tackling a dedicated game server we recommend reading:

Dialling home, the *TechLife January 2020* Home Networking Column that covers dynamic DNS, which is extremely useful for home game servers. It allows your server to be found over the internet via a standard web address.

Making a PC findable on your local network, the *TechLife February 2020* Home Networking column that covers creating a fixed IP address for your server, which you'll need for port forwarding.

Ports away, the Privacy and Security column in this issue, which covers the critical area of port forwarding, which allows connections from over the internet into your home server. Excellent additional resources can be found at portforward.com. **TL**

HELP STATION

Web services

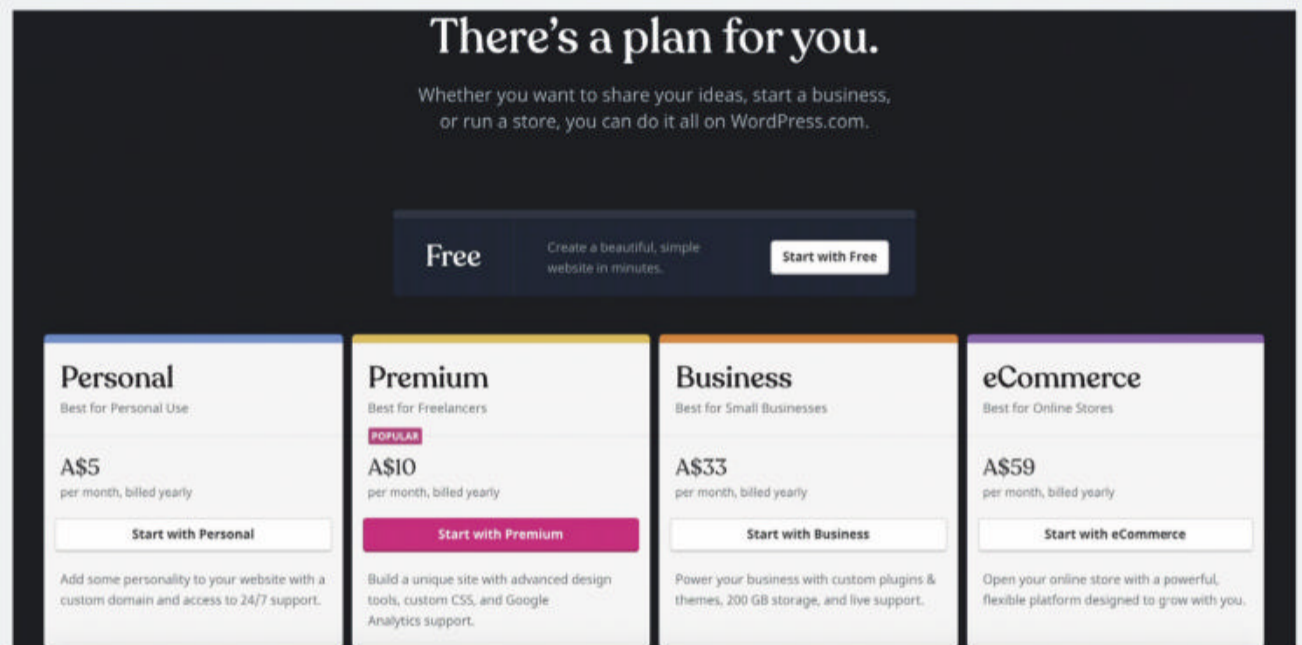
Getting started with Wordpress

Learn how to build your very own website code-free, with Tim Bothwell.

Whether it's recipes on a budget, an obsession with flowers, or filter-free photography, the Internet has created a space for anyone to share their skill or passion with the masses. While creating a website historically required sufficient knowledge of languages such as HTML and CSS, services now exist that allow you to build a website without a piece of code in sight. Launching in 2005, **WordPress.com** is one such platform that's packed with everything you need to create a website using nothing more than a web browser. While we'll admit that there's a bit of a learning curve when first getting started, WordPress is one of the easiest platforms to master. So without further ado, let us walk you through the steps to setting up your very own blog.

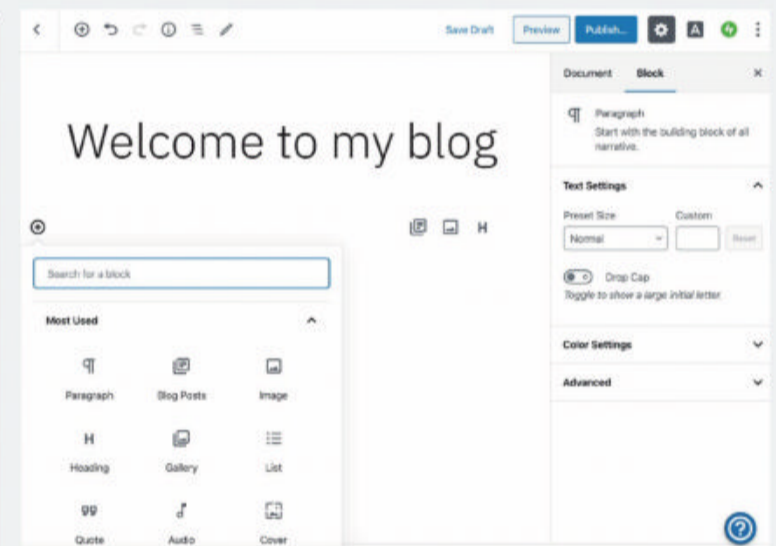
The basics

What's the cost? One of the first things to decide is what plan is right for you. WordPress offers both free and paid-for subscription options. Starting at the lowest tier, the no-cost version of WordPress has all the basics covered for building and running a blog or website. Stepping up to a personal plan for



\$5 per month offers greater storage, no advertising, live chat support and the ability to purchase a custom domain name. Going up again to the premium plan (\$10 per month) unlocks more advanced marketing tools, while a business plan (\$33 per month) offers the ability to install custom themes and plugins. If you're new to WordPress, then we'd recommend starting with the free version so you can determine whether it's worth the upgrade to get certain features.

Getting Started. To create your site, visit <https://wordpress.com/> (not wordpress.org) and click 'Start your website'. If you don't already have an account then

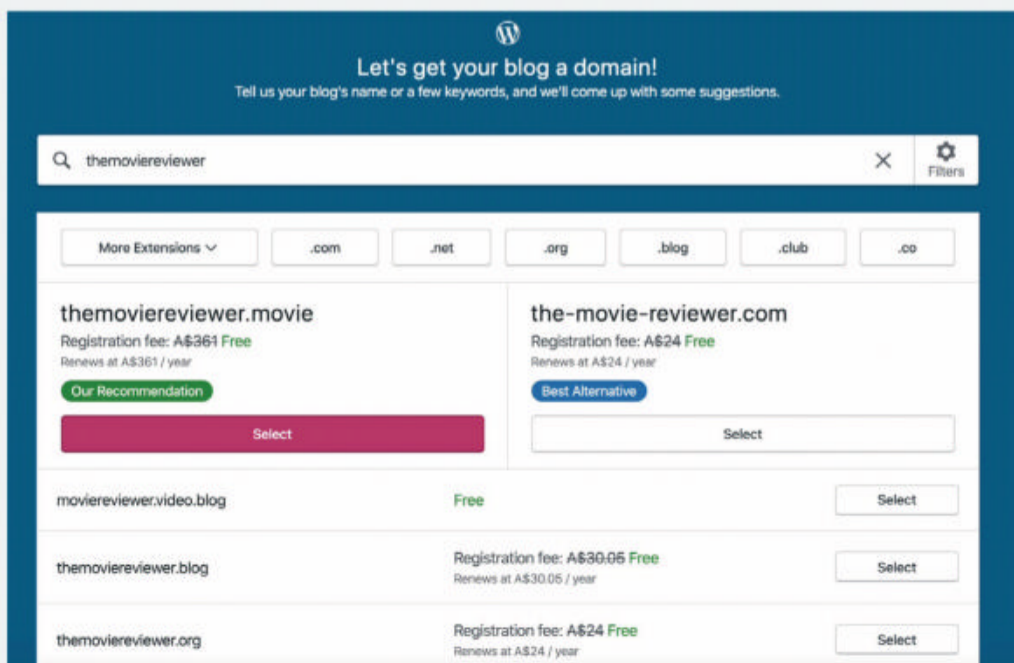


TOP: WordPress offers a number of free and paid-for subscription plans.

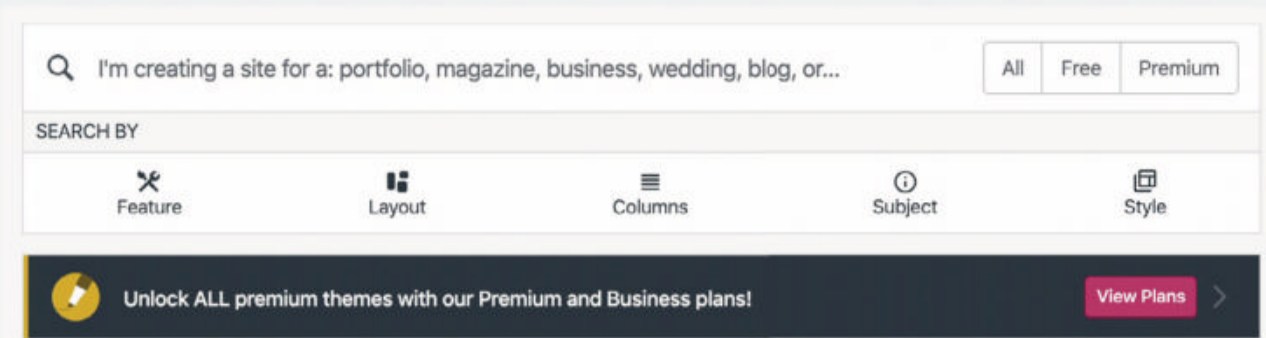
ABOVE: We'd suggest starting with a free domain name.

you'll be asked to provide an email address, username and password before picking whether you want to set up a blog, website or portfolio – for this guide we're going to create a blog. After selecting a topic and name for your website (which you can change later) it's now time to pick a URL. Start by entering a word or phrase and WordPress will provide a list of available address options. Note that any URL mentioning a registration fee requires a paid plan, so we'd recommend starting with one labelled Free (and not 'first year free'). The final step is to pick your plan – as mentioned before, it's a good idea to select 'Start with a free site' so you can figure out what features you actually need.

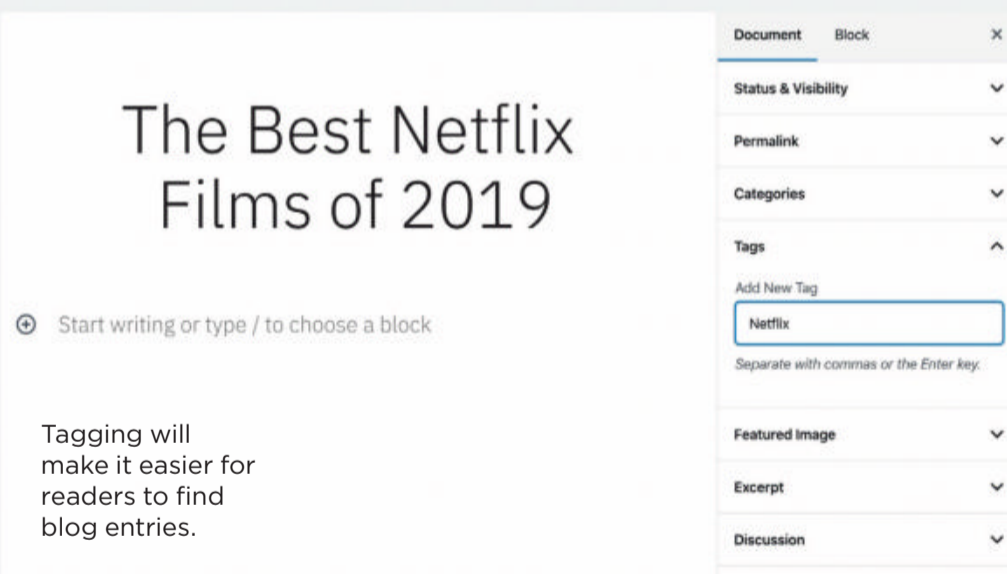
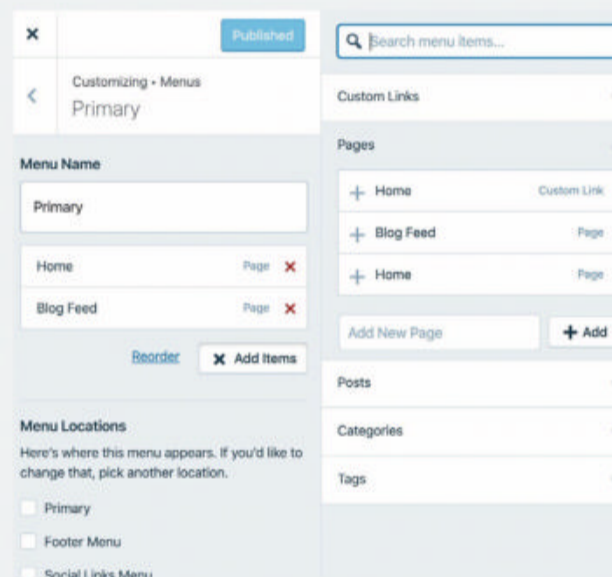
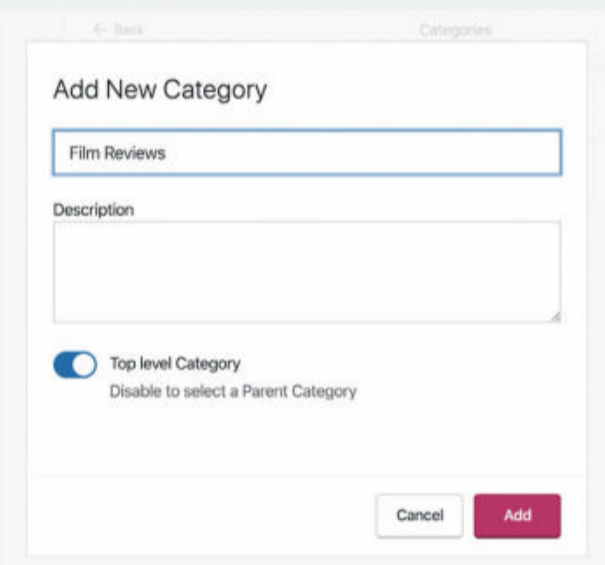
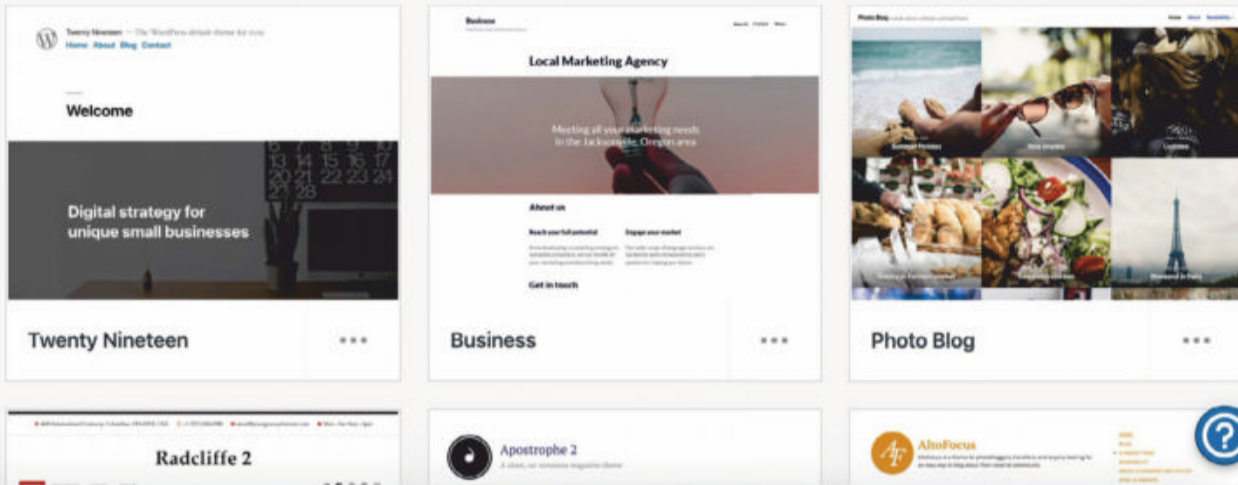
The basics. Once everything is



Create and edit posts using the block editor.

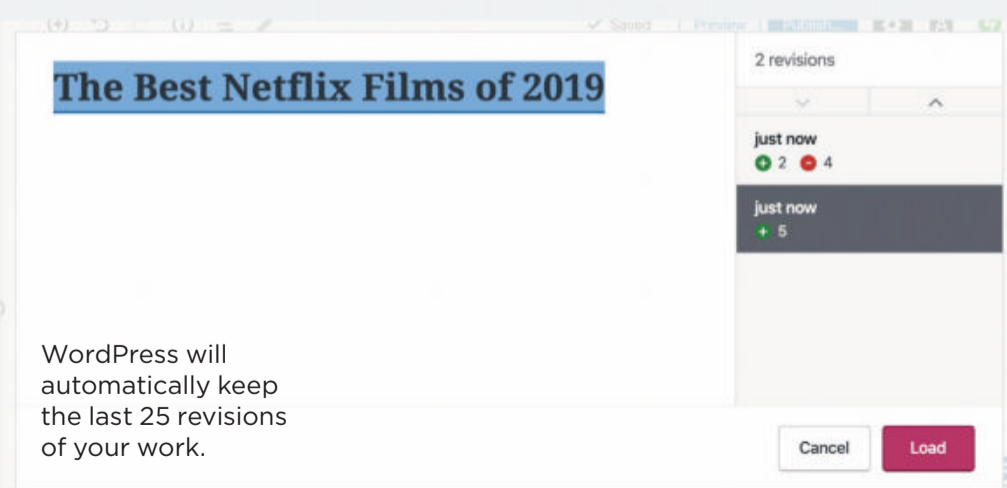


WordPress.com themes 294

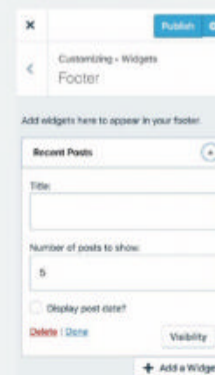


ABOVE LEFT: Keep things organised by categorising every blog post.

ABOVE: You can change and rearrange what appears on your site's menu.



WordPress will automatically keep the last 25 revisions of your work.



Widgets allow you to add additional features to pages and posts.

Pick from one of the 300 themes able to be applied to your site.

set up you'll be taken to the backend of your site which WordPress refers to as My Home. On your blog you can add a combination of pages and posts. A page is any section of your site that will rarely change – such as a homepage, an about page or a contact page. Meanwhile posts are made up of the individual blog entries published on your website. You can add both pages and posts from My Home under the section labelled Site. Still in My Home, you'll want to get familiar with the customizer tool which sits in the menu under Design. With the customizer you can upload a logo, change your blog's name, create menus, add widgets, plus make tweaks to the appearance of your website. One important thing to note is that your site will remain private until you choose to go live (and have verified your email address). To do this, visit My Home and under 'Site Privacy' click 'Launch my site'.

Creating a Post. To create your first blog post, click the button labelled Write at the top of any page to be taken to the block editor. On WordPress, every page and post is made up of multiple 'blocks' that work independently of one another, meaning you can change and edit a block without affecting other elements or blocks on the page. Within the editor click the plus icon to reveal a list of blocks that can be added to your page or post – there's ones for adding a headline, paragraph or photos, plus more advanced blocks that allow you to add a Spotify playlist, YouTube video or Tweet. While creating your post, click the preview button to see how it will look on a desktop, phone or tablet.

Step it up a level **Themes.** Not happy with your blog's design? WordPress offers 300 themes that can be applied to

HELP STATION

Web services



Expert tips

APPS. In addition to managing your blog via a web browser, you can also do so using the desktop and smartphone apps. The mobile app is great for drafting new blog posts on-the-go, while the desktop app features an interface identical to the one in your browser but sits conveniently on your desktop for one-click access.

WORDPRESS.ORG. In addition to being able to build and launch a website from your browser, WordPress also offers its open source software as a download. While it does give you greater functionality and control over your site, it means you'll need to sign up for a web hosting service that can actually house your site on the web. To find out more about the different services, visit <https://en.support.wordpress.com/com-vs-org/>

The mobile app lets you manage and create blog posts on-the-go.

RIGHT: Choose whether you want to allow people to leave comments on posts.

WordPress also offers a downloadable version of its software for greater control over your site.

your website. To review the range, visit My Home > Design > Themes to be presented with a series of recommendations. Alternatively, click 'Show All Themes' to reveal a complete list of designs, along with a search box and filters to help locate the style that's right for you. If you find a theme that you like, click the ellipses icon and select 'Try & Customize' to see what it will look like on your site. Note that some themes require a premium plan or one-off purchase.

Categories. As you begin to

publish more and more, you'll likely start to see a pattern in the kinds of things that you write about. With this in mind, it's a good idea to keep your posts organised using categories. From the block editor open the document settings menu (click the cog icon if it's not currently showing) and click 'Add New Category'. To manage your list of categories, visit My Home > Settings > Writing.

Widgets. While the block editor is great for creating individual pages and posts, widgets allow you to add additional functionality to your site. For example, you can add a widget on your homepage that displays a list of categories, recent posts, even photos from your Instagram feed. To add a widget, visit My Home > Customize > Widgets and search or pick from the list. Note that each theme will dictate where widgets can be placed on your site.

Menus. Something often used by websites to assist with user navigation is menus. Included by default on a number of themes, to edit your menu visit My Home >



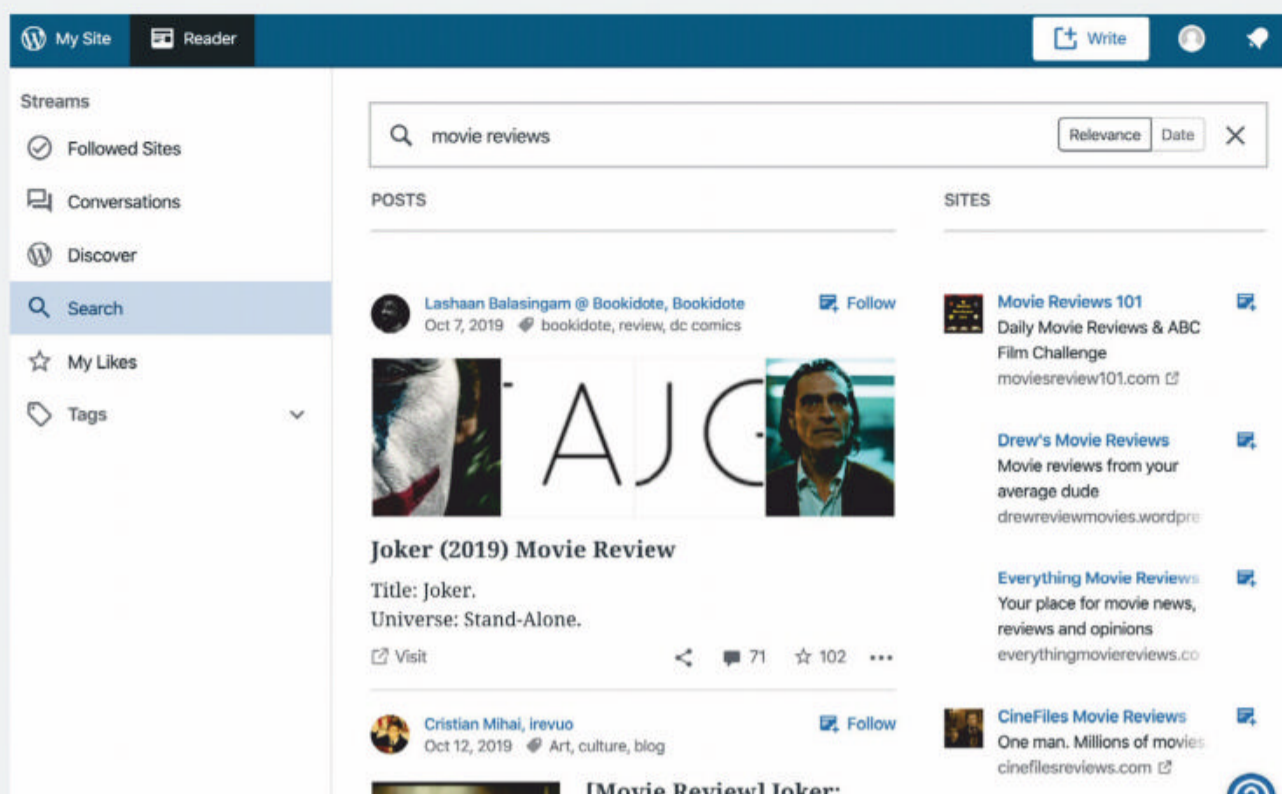
Customizer > Menus. Your menu can consist of individual pages, posts, or a series of posts from a chosen category. Not restricted to one, additional menus can be created and displayed on your blog using a widget.

Tags. In addition to categories, you'll also want to think about adding some tags to every post that you publish. While categories allow you to organise content into different topics, tags are a way to call out the specific things you mention within a blog post. Tags are also how other WordPress users will find your content via the Reader tool (more on this later), so it pays to be selective in what keywords you include. To add tags to a post, open the document settings tab in the block editor.

Autosave. Let's face it... accidents happen. Luckily changes are saved automatically every few seconds. In fact, WordPress keeps the last 25 revisions of your work, meaning you'll always be covered if you hit a wrong key or your browser becomes unresponsive. You can also save changes manually by clicking 'Save Draft' at the top of the block editor. To access past versions of a page or post, click Revisions in the document settings tab.

Step it up a level

Coding. While WordPress is commonly referred to as a 'what you see is what you get' website editor, you also have the option of editing your site using code. Great for those with experience in HTML, just click the ellipses icon in the top-right corner of the

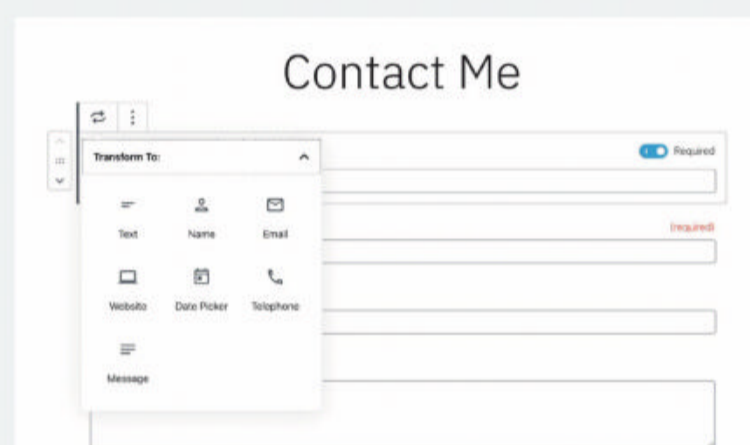


block editor and select 'Code Editor'.

Comments. If you want your blog to be an open forum, you can allow readers to leave comments at the bottom of every post. Turned on by default, to make changes visit My Home > Manage > Settings > Discussion. It's here that you can also apply restrictions to limit spam and offensive content.

Scheduling. If you've got a number of posts ready to go live, then you may want to think about spreading them out over time. To schedule posts for a future date, in the document settings tab of the block editor under 'Status & Visibility' click Immediately to reveal a calendar from which you can pick a date and time for the post to go live.

Forms. In addition to leaving comments, you can also allow readers to get in touch using a form. To set it up, from the block editor add the form block and provide an email address that WordPress will notify each time your form is completed. You can



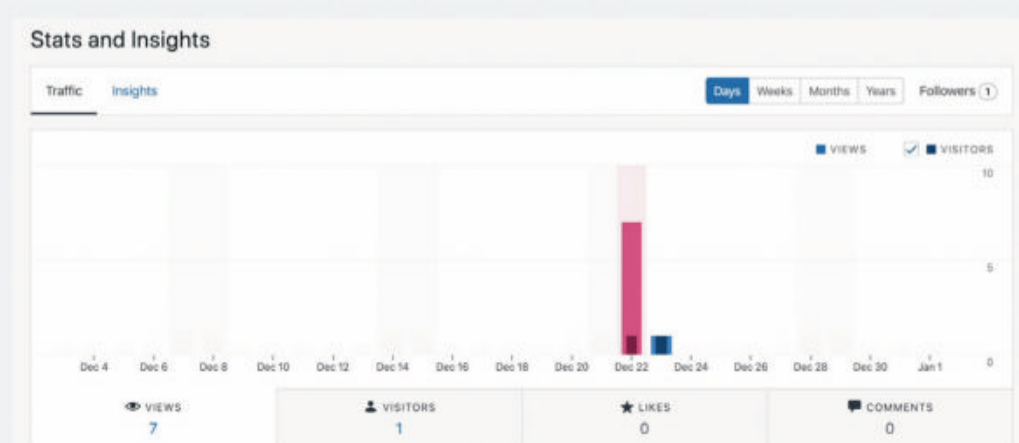
TOP: Create a feed of websites and posts tailored to your interests.

ABOVE: Invite users to leave feedback using the form block.

then pick from a series of common fields for users to fill out. To see a list of completed submissions, visit My Home > Site > Feedback. Forms can be added to both pages and posts.

Stats. Running a blog can take up a lot of time and energy, so you'll likely be interested in knowing how many people are actually visiting your site. Accessed via My Home > Stats you'll find detailed information on the number of page views and visitors across the day, week, month and year. The insights tab also has useful information on what day and time is the most popular in terms of visitors.

Reader. Along with the ability to build and run websites, you're also able to create a personalised feed of sites and stories tailored to your interests using the Reader tool. Accessed from My Home, you can search for websites and posts or alternatively use the tag function to put together a feed of stories talking about a particular topic. **TL**



See useful stats on when people are visiting your blog.

HELP STATION

Photography Masterclass

Shoot studio-style pet portraits

Use off-camera flash and minimal accessories at home for painterly pet shots.

At some point in a photographer's professional career they will be asked to shoot a pet portrait. Professional customers reliably want images of their pets, and many photographic studios will be visited by four-legged subjects on a regular basis.

However, more photographers have embraced the benefits of remote working, freeing themselves from the overheads of a fixed base. This, combined with the common request by clients to have portraits taken in their home, creates the need to work without studio lights and their associated accessories.

The greatest challenge in any environment outside the studio is controlling the ambient light, to enable

the photographer to shape the illumination of the subject. In addition to this, a person's home may be filled with visual distractions and unphotogenic elements, which must be worked out of the frame to create a clean composition.

With a combination of shutter speed, off-camera flash and careful framing it is possible to produce images that appear to have been taken in a controlled studio setting, allowing you to work under any conditions.

Take the lighting look with you wherever you go and learn to work with minimal kit for a painterly, high-contrast animal portrait your clients – or family and friends! – will love.



1 PLACE THE ANIMAL While we lack a seamless background, having the cat sit on a black cushion will make it easier to control background brightness, as more light will be absorbed by the dark material.



2 MAKE THE FLASH DIRECTIONAL Attach a wireless trigger to your speedlight and place this off to one side, at a 90° to 45° angle, elevated slightly above the subject and facing down, approximately where you'd place a strobe.



3 SET SPEEDLIGHT ZOOM Use the controls on the rear of the flash to increase the head zoom position. Select the longest zoom setting (in this case 105mm) to narrow the beam for a focussed effect.



4 CUT AMBIENT LIGHT Increase the shutter speed or stop down the aperture to reduce visible background detail. Start by lowering the ISO, choosing the base sensitivity if possible, then the speed or f-stop if this is insufficient.



5 INCREASE FLASH POWER To further darken the environment, increase the flash output and adjust camera settings to match. This will overpower ambient illumination even more, to help with the seamless background effect.



After

DIRECTIONAL CONTROL.

By adding a single off-camera speedlight, subject illumination stands out from the surroundings, creating a characterful, studio-style animal study.

Before

DISTRACTING AND TWO-DIMENSIONAL.

Use of on-camera flash has produced a flat look and revealed too much background and peripheral detail, giving away the home setting and reducing impact.



6 FOCUS THE LIGHT To reduce light spill further, consider adding a small flash snoot or honeycomb grid to your speedlight. This 9mm model fitted directly to the flash head to create an even more focussed light.



7 ADJUST WB Many home settings feature light bulbs with a low Kelvin setting, creating a warm cast. Use a Tungsten White Balance preset or make a custom setting for a more neutral, studio-like colour palette.



8 ADJUST ZOOM Zoom to exclude edge detail and fill the frame with your faux black background, limiting context to minimise the need for software object removal. Shoot multiple frames to capture the perfect pose. **TL**

HELP STATION

Digital Darkroom Masterclass



Add drama with monochrome

Discover four ways to present powerful black-and-white photographs with a sophisticated and timeless quality.

When colour film first came into production, many people thought that black-and-white photography was done for. Yet, over 80 years later and despite now producing images digitally, the format remains as popular as ever. Get past all the clichés about monochrome, and what you're left with is the fact that it makes images all about texture, tone, light and shape – and that's what makes it such a powerful tool for landscape photography, among other genres. The abstraction from

colour allows the viewer to focus purely on the content of the image itself.

The beauty of black-and-white in the digital age is that you don't need a home darkroom to achieve creative mono effects. Plus, you're not confined to shooting in either colour or black and white, because digital cameras shoot in colour and provide the opportunity to process images any way you please. So, here are four ways to use Photoshop to transform your colour images into mono masterpieces.

“

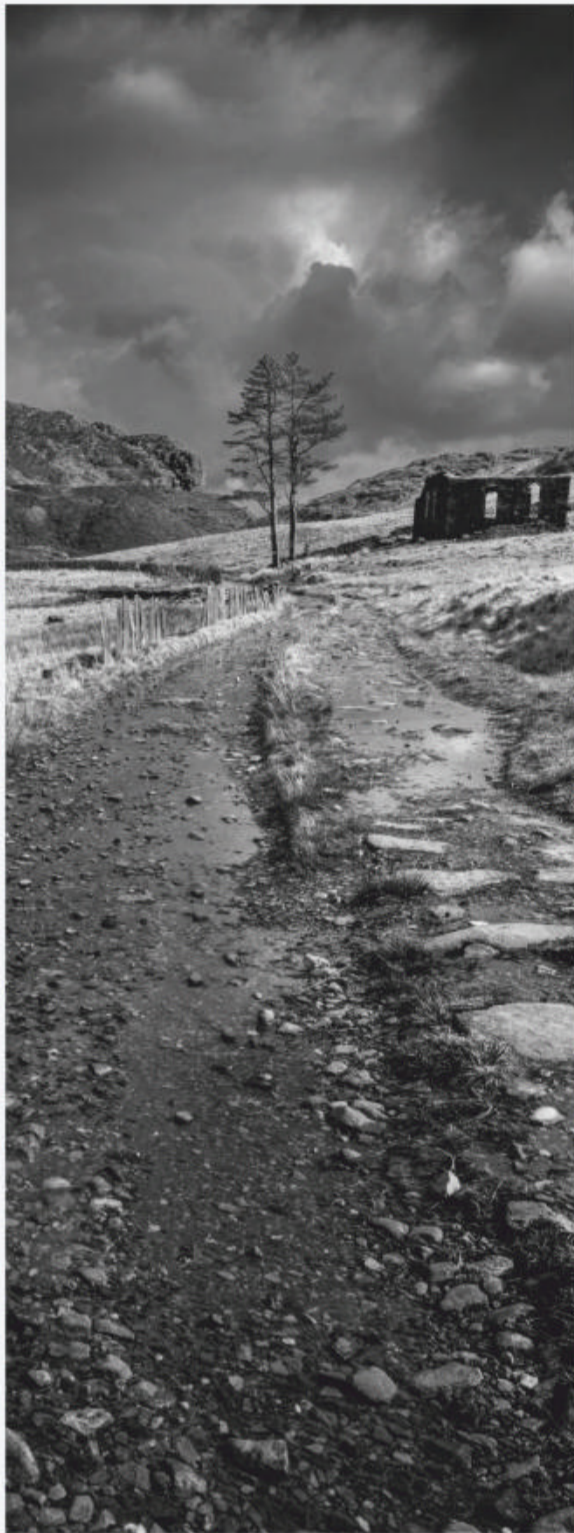
The beauty of black-and-white in the digital age is that you don't need a home darkroom to achieve creative mono effects.



1 **CONVERT TO MONO** Click on the Create New Fill Or Adjustment Layer icon – the half-black half-white circle at the bottom of the Layers Panel – and select Black & White from the pop-up menu. Click on the Preset dropdown menu that's set to Default, and select High Contrast Red Filter. Next, create a Curves Adjustment Layer. Click and drag at a point three quarters of the way up the curve, up to the left slightly; then drag a point a quarter of the way up the Curve down and to the right.



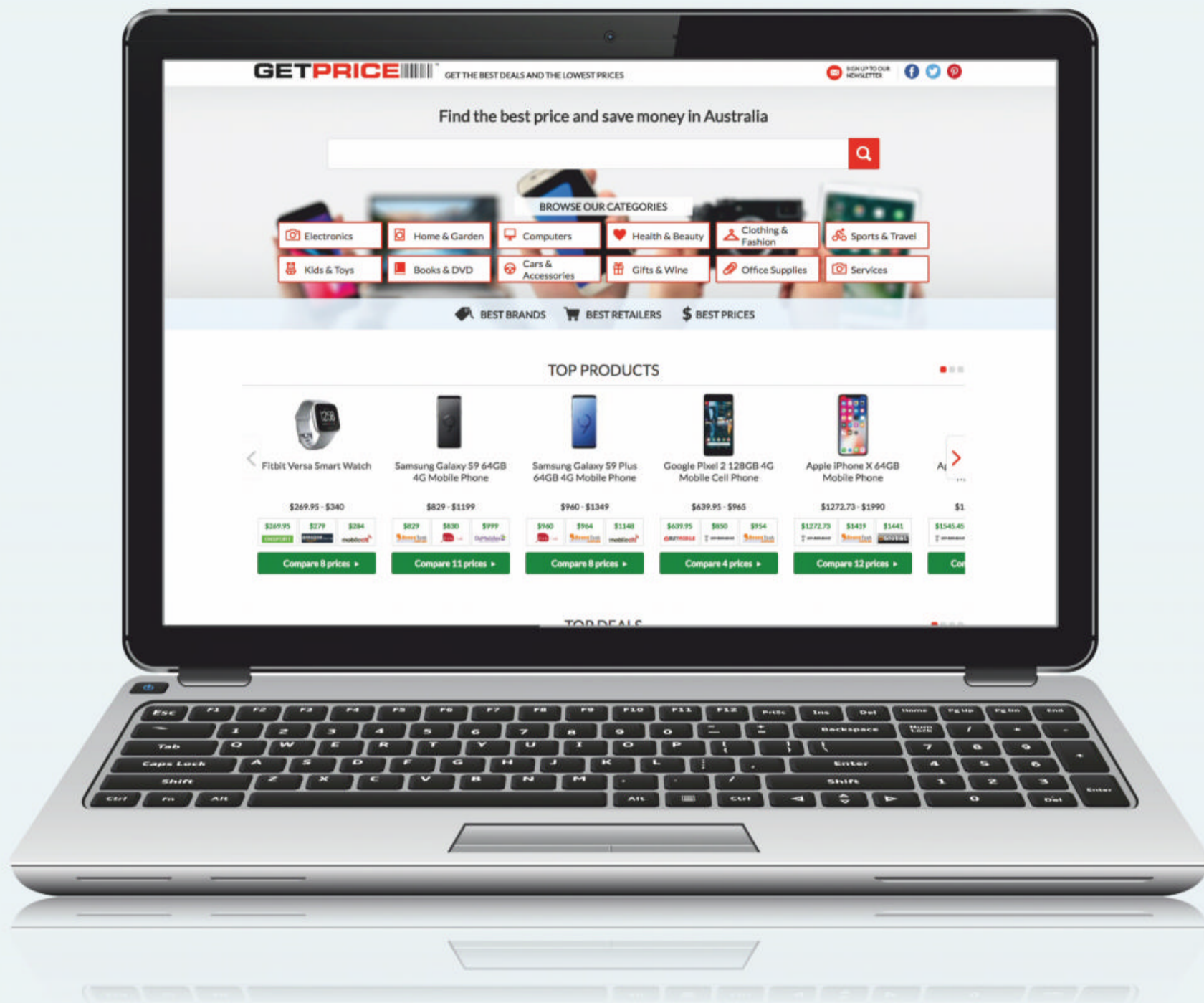
2 ADD A SEPIA TONE Delete the Curve Adjustment Layer by dragging it down to the bin at the bottom of the Layers Panel. Next, click on the Create New Fill Or Adjustment Layer icon and select Photo Filter from the list of options. Click on the dropdown menu that's set to Warming Filter (85) and select Sepia, before reducing Density to 20%. You can, of course, increase or decrease this depending on what you prefer, but try not to make the effect too strong.



3 ACCENTUATE THE FOCAL POINT Delete the Photo Filter Adjustment Layer. Hold down Ctrl/Cmd-Shift-Alt-E to merge all visible layers to a new layer. Now go to Filter > Camera Raw Filter; when the dialog box opens, click on the Radial Filter on the top menu. Make sure Effect is set to outside with Feather at 70 before dragging around the focal point in the image. Set Exposure to -1.20, contrast to +45, Whites to +10 and Blacks to -10 before clicking OK.



4 CONTRAST DESATURATION Delete the layer you created in the last step, then click on the Black & White layer to make it active, before changing the Blending Mode in the Layers Panel from Normal to Soft Light. Now hold down Ctrl/Cmd-J to duplicate the Black & White Layer before changing the Blending Mode of this new Layer back to Normal. To finish this effect off, reduce the Opacity setting of this layer to 80% to allow some of the colour in the original image to show through. **TL**



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SMARTPHONES

APPLE IPHONE 11 PRO

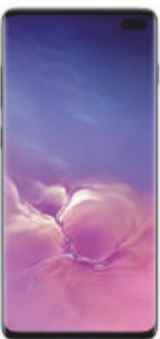
From \$1,749, apple.com/au



Packing the best screen and camera on any phone, plus the fastest processor and a beautiful high-quality build, and you've got a phone that earns its Pro name. It's a totally polished package.

SAMSUNG GALAXY S10+

From \$1,499, samsung.com/au



A premium build, incredible Infinity-O screen with HDR10+, brilliant rear triple camera system and blazing performance in Samsung's slick new One UI make this the Android king.

HUAWEI P30 PRO

From \$1,299, huawei.com



A revolutionary 5x optical zoom (with 10x lossless hybrid zoom) meets a 6.47-inch OLED screen, big battery, and ultra-fast processor for one of the smartest Android phones available.

ONEPLUS 7 PRO

From \$829, oneplus.com



With a world-first in screen tech and the fastest wired charging you'll find, this is an ambitious phone, designed to prove that OnePlus can make higher-end flagships as well as mid-range marvels.



CHEAP SMARTPHONES

SAMSUNG GALAXY S10E

From \$999, samsung.com/au



The modestly sized and pocket-friendly 5.8-inch screen on the S10e is a breath of fresh air. With Samsung's impeccable levels of fit and finish, great software and top specs, it's a deal.

MOTOROLA ONE ACTION

From \$289, motorola.com



One of the most exciting budget smartphones to have launched in... forever. There's a massive 6.3-inch LCD screen on the front, a triple camera on the rear and 128GB of storage inside.

GOOGLE PIXEL 3A

\$649, store.google.com



64GB of storage, always up-to-date Android with no extra cruft, snappy performance and a truly brilliant camera, all in a package that defines 'cheap and cheerful' - it's great value.

HONOR PLAY

From \$485, honor.com



Pitched as a gaming phone, but it's just an all-round brilliant Android phone that's a stone-cold bargain. It has a high-end processor, 6.3-inch screen, good rear cameras and a fantastic design.



SMARTWATCHES

APPLE WATCH SERIES 5

From \$649, apple.com/au



This truly straddles the line between tech and fashion; it's not just the best-looking smartwatch, but its health and fitness features, always-on screen and good apps make it essential.

SAMSUNG GALAXY WATCH ACTIVE

From \$299, samsung.com



Sleek and powerful, this is the best smartwatch for Android users. The screen and design are on par with the Apple Watch, while a collection of new watch faces give it a modern edge.

SAMSUNG GALAXY WATCH

From \$399, samsung.com/au



The circular screen with innovative rotating bezel is the best way to control a smartwatch, and the slick Tizen software is easy to use. It looks good too, and a battery life of up to six days is ace.

FOSSIL SPORT

From \$249, fossil.com



Fossil's fourth generation of smartwatches serves up what's probably the best Wear OS smartwatch available to buy today. Capable and wearable, with good app support.

BUYER'S GUIDE

The best of the best



SOUNDBARS

SONOS BEAM

\$479, [sonos.com](https://www.sonos.com)



If it were just a soundbar, the Beam's great audio would still make it top - but with Amazon Alexa, Apple AirPlay 2 and support for a billion streaming services, it's fantastically flexible.

SAMSUNG Q90

\$1,429, [samsung.com](https://www.samsung.com)



A soundbar, subwoofer and rear surrounds, this is as painless a way to get Dolby Atmos as you'll find. Its 12 channels are driven by 512W of amp, and the new sub gives plenty of rumble.

Q ACOUSTICS M3

\$339, [qacoustics.co.uk](https://www.qacoustics.co.uk)



Want superb sound without a big price and unnecessary extras? Q Acoustics' M3 combines great simplicity and great sound. Impressive, affordable, and it wasn't hit with the ugly stick.

VIZIO 36-INCH 5.1.2 HOME THEATER SOUND SYSTEM

\$799, [vizio.com](https://www.vizio.com)



With a sound as big as its name is long, this is your best affordable Dolby Atmos/DTS:X option. Also known as the SB36512-F6, it ticks all the right boxes in terms of features.



STREAMERS

ROKU STREAMING STICK+

\$145, [roku.com](https://www.roku.com)



The Swiss Army Knife of streaming delivers 4K HDR, isn't locked to a particular ecosystem, has tons of available apps and is a joy to use. It's the best streamer for many people.

CHROMECAST ULTRA

\$75, store.google.com



The Chromecast Ultra is a receiver for phones and laptops and depends on them for control and content - but it's simple, versatile and compatible with iOS, Android, Windows and Mac.

AMAZON FIRE TV STICK 4K

\$63, [amazon.com.au](https://www.amazon.com.au)



4K HDR for under \$100 isn't to be sniffed at. It's best suited to Prime subscribers and Google apps are absent, but it's a very capable and affordable streamer for TV and movies.

APPLE TV 4K

\$249, [apple.com/au](https://www.apple.com/au)



iTunes has the biggest source of 4K HDR and Dolby Atmos movies, and lots of other services have apps here too. You can also easily stream to it from Macs and iOS devices.



GAMES CONSOLES

MICROSOFT XBOX ONE X

\$479, [xbox.com](https://www.xbox.com)



With 4K, Dolby Atmos, Ultra HD Blu-ray and a fairly compact profile this is the best Xbox ever. It's even more powerful than the PS4 Pro and also a great home entertainment hub.

SONY PLAYSTATION 4 PRO

\$389, [playstation.com](https://www.playstation.com)



It's still overkill if you don't have a 4K TV, but with 2160p HDR gaming, the PS4 Pro delivers incredible visuals and is smoother and faster than its non-Pro siblings.

NINTENDO SWITCH

\$429, [nintendo.com.au](https://www.nintendo.com.au)



We love the Switch, which brings Nintendo's great gaming pedigree to genuinely stylish, premium-grade hardware. Forget the specs: it's all about the sheer joy of gaming.

MICROSOFT XBOX ONE S

\$269, [xbox.com](https://www.xbox.com)



The S is smaller, whiter and much cheaper than its big brother, and while you don't get its sibling's super-powered specs you still get Ultra HD Blu-ray. A fine home entertainment hub.



TURNTABLES

PRO-JECT ESSENTIAL III

\$475, project-audio.com



Really sounds great for the money, with an expansive and enjoyable sound across a range of genres and volume levels. It also looks very pleasing, in a variety of high gloss finishes.

CAMBRIDGE AUDIO ALVA TT

\$2,799, cambridgeaudio.com



This Bluetooth turntable is a real game changer. It uses an exhausting array of analogue-to-digital trickery, plus aptX HD to give hi-res/better-than-CD-quality sound, and all wirelessly.

TECHNICS SL-1210GR

\$3,499, technics.com/au



The iconic DJ turntable reimagined as a lustworthy slab of home hi-fi. While we wouldn't take this out clubbing, it's the ultimate deck for gently maturing ravers, and sounds excellent too.

MCINTOSH MT2

\$8,495, mcintoshlabs.com



This beautifully finished deck is perfect for vinyl addicts. It'll wring an incredible amount of detail out of your records, without needing to be plugged into a crazily pricey system.



STREAMING DACS

YAMAHA WXAD-10

\$219, au.yamaha.com



This Yamaha lets you stream everything from Bluetooth to hi-res audio, with support for AirPlay, most of your favourite streaming services and, of course Yamaha's own MusicCast.

GOOGLE CHROMECAST AUDIO

\$49, google.com



A somewhat less audiophile solution perhaps, but so simple and so cheap. Suddenly, all your Android phone's music (plus Google's apps on iOS) can be beamed to your audio setup.

ARCAM RDAC

\$849, arcam.co.uk



For those who stream via AirPlay and UPNP, this is ever so hard to beat. It's essentially a very high quality DAC, and gives a real boost to any decent quality audio files beamed its way.

IFI NANO IONE

\$299, ifi-audio.com



Just want to wring the very most out of Bluetooth? This fag-packet-sized DAC is your new friend. Even the shonkiest MP3 gets a polish, and your higher quality files and streams will shine.



MULTI-ROOM SPEAKERS

NAIM MU-SO 2ND GENERATION

\$2,499 naimaudio.com



Mu-So 2 crushes its competition. An awesome, thumping wall of sound and reliable, versatile software platform and streaming support make for the perfect 21st-century music experience.

SONOS ONE

\$259, sonos.com



Sonos One is compatible with every music service ever, multi-room connectivity is fab, and Alexa comes built in as an added bonus. Many pricier Sonos speakers then await you...

RUARK R5

\$1,999, ruarkaudio.com



Like a mini system for the 21st century, Ruark's R5 chucks in a CD player, DAB and FM radios and two extra inputs, including one pre-amped for use with a turntable. There's even Bluetooth too.

BOWERS & WILKINS FORMATION DUO

\$5,800, bowerswilkins.com



These may look like Bender from Futurama but sound like God yodelling in your ear. The only wireless choice for any real audiophiles out there: highly specced, but not exactly affordable.

BUYER'S GUIDE

The best of the best

BLUETOOTH SPEAKERS

BLUESOUND PULSE FLEX 2I

\$539, bluesound.com



More than a Bluetooth speaker, with Wi-Fi and ethernet included this is more like a portable Sonos. It's AirPlay 2 compatible, and works with streaming services and internet radio.

AUDIO PRO ADDON C3

\$499, audiopro.com



A fine blend of classic Bluetooth portability, high-quality audio and Scandie style. Thanks to Wi-Fi, you can stream higher quality sounds indoors, then revert to Bluetooth in the garden.

ULTIMATE EARS MEGABOOM 3

\$199, ultimateears.com



The best waterproof speaker - it even floats - offers 20 hours of battery life and a hefty sound, perfect for outdoor parties. It works great for kitchen audio duties, too.

CAMBRIDGE AUDIO YOYO M

\$435, cambridgeaudio.com



The best Bluetooth solution for audiophiles' audio files, this is, as you can see, a stereo pair. As such it's more like a classic hi-fi system, but with the convenience of wirelessness.

BLUETOOTH HEADPHONES

AUDIO-TECHNICA ATH-M50XBT

\$299, audio-technica.com



Long battery life and sound that's closer to the more neutral tones of hi-fi cans (though still with a slight extra kick of bass), plus great comfort levels, make these ideal for losing yourself in music.

AKG Y50BT

\$199, au.akg.com



If you want an on-ear alternative to the Marshalls, these 'phones from AKG remain a great option. The sound is punchy and the styling is pretty cool without trying too hard.

OPTOMA NUFORCE BE LIVE5

\$107, optoma.com



These slick earphones offer incredible sound for the price, taking everything from pop to classical in their stride. They're made to stay comfortable for their eight-hour battery life.

SOUNDMAGIC E11BT

\$125, soundmagicheadphones.com



These are as good as buds that cost twice as much. Audio is brilliant, connectivity is rock solid, the necklace-style band stays stable, and the fit is comfortable and secure enough for exercise.

TRUE WIRELESS HEADPHONES

BEATS POWERBEATS PRO

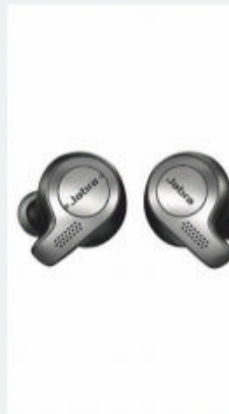
\$295, beatsbydre.com



If you want true wireless buds with quality audio, there's almost nothing to match these, and the way they fit means they cannot fall out and get lost. Beats has knocked it out of the damn park.

JABRA ELITE 65T

\$199, jabra.com.au



Jabra has solved most of the problems that bedevilled earlier true wireless buds. Sound is great, connectivity is rock solid, the fit is secure but comfortable, and they're discreet.

APPLE AIRPODS PRO

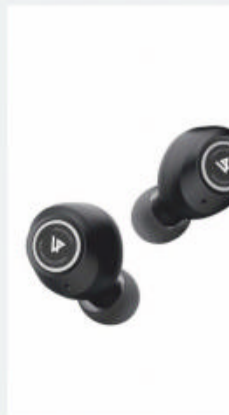
\$399, apple.com/au



Great active noise cancellation, a super-secure in-ear fit, sweat-proofing, adaptive EQ, good battery life and excellent audio quality make these pricey but technically brilliant buds.

LYPERTEK TEVI

\$134, lypertek.com



These are unbeatable at this price - a discreet design, decent battery life, good waterproofing, stable connectivity and good sound make these one hell of a bargain.



LAPTOPS

DELL XPS 13

From \$1,698, [dell.com](https://www.dell.com)



The Dell XPS 13 is thinner and more powerful than ever. Up to 1TB of SSD storage, 16GB of RAM, a 4K screen and fast Intel chips help make it a top quality all-rounder.

MICROSOFT SURFACE BOOK 2

\$1,757, [microsoft.com](https://www.microsoft.com)



Available in 13- or 15-inch sizes, with a 3:2 screen that gives you more height than other laptops, and plenty of power, this is a light and fast machine that's also really flexible.

HUAWEI MATEBOOK X PRO

\$1,993, consumer.huawei.com



This marries style and function, delivering incredibly capable internal hardware in a form factor that also matches Apple's MacBook range in terms of looks and feel.

ALIENWARE AREA-51M

From \$3,999, [alienware.com](https://www.alienware.com)



A gaming laptop packed with power, from the ninth-gen i7 processors, to the newest Nvidia mobile GPUs. The performance you get back is worth the substantial outlay.



2-IN-1 LAPTOPS

MICROSOFT SURFACE BOOK 2

\$1,757, [microsoft.com](https://www.microsoft.com)



Pull the screen away from the keyboard and it's a tablet. Connect them for more graphics power and battery life. A premium, fantastically portable, and supremely versatile system.

HP ENVY X2

From \$899, [hp.com](https://www.hp.com)



The big sell here is the monstrous battery life, with up to 22 hours on one charge. This is because it makes use of ARM architecture, with a Snapdragon 835 CPU powering everything.

DELL XPS 15 2-IN-1

From \$2,549, [dell.com](https://www.dell.com)



With a big screen and great specs, what's not to like about this 2-in-1? Well, the price is steep, but if you can afford it then this is undoubtedly one of the best touchscreen options.

ASUS ZENBOOK FLIP 13

\$1,299, [asus.com](https://www.asus.com)



The Zenbook Flip 13 might be the best laptop Asus has ever released. Tooled up with an eighth-gen Intel Core processor, the tablet mode feels great to use, thanks to a responsive touchscreen.



TABLETS

APPLE IPAD PRO 12.9

From \$1,529, [apple.com/au](https://www.apple.com/au)



The biggest iPad Pro is unbelievably powerful and slick, with an excellent screen, thin and compact design, great battery life and support for the Apple Pencil. Pricey, but worth it.

APPLE IPAD PRO 11

From \$1,449, [apple.com/au](https://www.apple.com/au)



Despite its smaller size, the internals of the 11in iPad Pro are the same as the bigger version: it's supremely powerful, it's incredibly versatile, in short, it's an absolute beast of a tablet.

APPLE IPAD AIR

From \$547, [apple.com/au](https://www.apple.com/au)



With a sharp, vibrant 10.5-inch screen, Apple Pencil support, mega-powerful A12 processor and thin, light body, this a Pro in all but name, for a bargain price. The best all-rounder tablet.

SAMSUNG GALAXY TAB S6

\$999, [samsung.com](https://www.samsung.com)



The finest Android tablet, this delivers a system with a sharp OLED screen, S Pen stylus, excellent audio credentials, powerful internals, and a neat laptop-aping DeX mode.

BACKEND

Ridiculous Tech



USB Vacuum

\$19.95, catch.com.au

If you are the kind of person that needs mess to be addressed the second it is created, even if it is really tiny, then we're not going to make your life any more difficult with our two cents – in fact we're going to make it easier.

Technology is unequivocally the answer to every problem and 'technology' has deemed that a USB-powered vacuum is the perfect solution for all those near microscopic particles that inconveniently settle on your desk. The World's Smallest Vacuum is the perfect fix for what's perhaps the world's smallest problem – a slightly messy workspace.



MarsCat

\$1,299, kck.st/3606PZb

Sure, regular cats are fine, but if kitty didn't poop on the rug, wake you up in the middle of the night, or whinge for food every day it'd be even better, right? MarsCat is the natural evolution of the conventional fleshy cat, perfectly recreating all the purring, pummeling, and scratching you could want with the added benefit of an off switch. Some of kitty 2.0's features include the ability to "hear, feel, and see" and the company says that it comes with different meow sounds and can even "heal with purr sounds".

“
Supremely efficient beings can now check their calendar, make calls, set reminders and receive immediate answers to questions during their shower time.



Kohler Moxie Alexa shower speaker

Bringing back the soap opera.

US\$229, smarthome.kohler.com

Now that smart speakers have infiltrated just about every room in the house, the bathroom – which was traditionally the primary sanctuary for less talented singers – has become somewhat of an audio dead zone. Bathroom fixtures company Kohler Co. wants to change this however, partnering with Harmon Kardon to put a smart speaker

directly in your shower head. In addition to being able to simultaneously immerse yourself in water and music, supremely efficient beings can now check their calendar, make calls, set reminders and receive immediate answers to questions during their shower time, thanks to Alexa integration.

Jigglypuff Bluetooth Speaker

Catch yourself an unlimited supply of winks.

\$58 (\$10 deposit), ebgames.com.au



Sleep deprivation is a serious condition, but when one of the symptoms is inhibited decision making, you might just be affected enough to think that getting a Jigglypuff bedside speaker is a sensible solution to the problem. If we take *Pokemon* lore as fact then there's no better lullaby-maker than old Jiggly... well, except maybe a Wigglytuff. Jigglypuff connects to your lullaby-content-generator of choice via Bluetooth 5.0 for the highest-fidelity sleep-makin' music. Aussies are already able to throw a Poke-ball at this pocket-sized Ambien monster, with EBGames selling pre-orders to anyone already packing oversized eye baggage. **TL**



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